Handbook of Drug Administration via Enteral Feeding Tubes

Third edition

Rebecca White and Vicky Bradnam

Pharmaceutical Press

BPNG

on behalf of the British Pharmaceutical Nutrition Group

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Rebecca White
BSc (Hons) MSc MRPharmS (I Presc) FFRPS
Medical Advisor, Baxter Healthcare Ltd
Compton, UK

Vicky Bradnam
BPharm (Hons) ClinDip MBA_{Open} MRPharmS
Pharmaceutical Consultant, Kent, UK

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Foreword

The need for this text has been highlighted within the British Pharmaceutical Nutrition Group (BPNG) and the British Association of Parenteral and Enteral Nutrition (BAPEN) by healthcare professionals who are challenged on a daily basis by complex patients whose need for medicines does not fit neatly into the categories used by the pharmaceutical industry as part of their process for licensing medicines. To provide the right level of care for these patients, professionals have to make complex and rational decisions concerning medication, which may mean stepping outside the product licence for the medication needed. As healthcare progresses and becomes more technical, such dilemmas become more commonplace. We hope this book will assist healthcare professionals who have an input into either the patients' medicines or their enteral nutrition to understand the necessary decision process they must enter into and how best to optimise their patient care, thereby ensuring the desired outcomes to meet the patients' medical and personal needs.

The data in the individual drug monographs is based on available evidence supplied by the drug companies, to whom we are very grateful for their support, and also on research undertaken by pharmacists.

The production of this text has raised many questions concerning the data available relating to this method of medication administration; the BPNG will continue to support research in this growing area of practice.

Thanks are due to all the healthcare professionals who have given their time and expertise to ensure the practical applicability of this book. Thanks must also go to Rebecca White who has led tirelessly on this project and undertaken much of the research to produce this comprehensive guide to drugs and enteral feeding tubes.

Vicky Bradnam
Pharmaceutical Consultant

Preface

The initiative to prepare these guidelines was taken by the British Pharmaceutical Nutrition Group (BPNG) with the support of the British Association of Enteral and Parenteral Nutrition (BAPEN).

This book reflects current practice and the information available at the time of going to press. Although the authors have made every effort to ensure that the information contained in this reference is correct, no responsibility can be accepted for any errors.

It is important to note that owing to the method of administration concerned, most of the recommendations and suggestions in this reference fall outside of the terms of the product licence for the drugs concerned. It must be borne in mind that any prescriber and practitioner administering a drug outside of the terms of its product licence accepts liability for any adverse effects experienced by the patient.

Readers outside the United Kingdom are reminded to take into account local and national differences in clinical practice, legal requirements, and possible formulation differences.

All enquiries should be addressed to:

Rebecca White at pharmpresseditorial@rpharms.com

About the authors

The British Pharmaceutical Nutrition Group, founded in 1988, is an organisation with a professional interest in nutrition support. The members of this group are pharmacists, technicians and scientists from the health service, academia and industry. The aims of the group are to promote the role of pharmaceutical expertise and experience in the area of clinical nutrition and to ensure the safe and effective preparation and administration of parenteral nutrition through effective education and research initiatives, and to encourage debate into pharmaceutical aspects of nutritional support.

Rebecca White studied at Aston University, Birmingham, and qualified as a pharmacist in 1994. Experience in aseptic services, intensive care and nutrition support was gained through working at Central Middlesex Hospital, Charing Cross Hospital and UCLH over a period of 10 years in London, qualifying as a non-medical prescriber in 2004. During this time Rebecca also completed an MSc, with the School of Pharmacy in London, evaluating opinions, knowledge and protocols relating to drug administration via enteral feeding tubes. In 2004, Rebecca took up the role of lead pharmacist for nutrition and surgery at Oxford University Hospitals NHS Trust, promoted to consultant pharmacist in 2012.

Rebecca has been on the executive committee of the BPNG since 1997, and was a BAPEN honorary officer between 2008 and 2011. In 2003 Rebecca chaired the BAPEN multidisciplinary group that produced guidance on the safe administration of medication via enteral feeding tubes and was part of the NPSA group on wrong route errors.

Rebecca is currently Medical Advisor for Baxter Healthcare Ltd.

Apart from drug nutrient interactions, her other professional interests include parenteral nutrition, intestinal failure and pharmaceutical aspects of surgical and gastroenterological care. She is currently undertaking a part-time PhD under the supervision of Dr David Wright at the University of East Anglia, investigating the ideal medication characteristics for enteral tube drug administration.

Vicky Bradnam studied at The School of Pharmacy, University of London and qualified as a pharmacist in 1985. Experienced in all aspects of a pharmacy service and specialised in paediatrics in 1990, worked as a lead clinical pharmacist in paediatrics,

with an interest in paediatric nutrition, from 1990 to 2000, and continued to practise clinically in paediatrics despite moving into departmental management. Vicky was the Chief Pharmacist for Bromley Hospitals NHS Trust, which became part of South London Healthcare NHS Trust, before leaving the organisation. She holds a Certificate and Diploma in Clinical Pharmacy, an MBA and PRINCE2 practitioner level qualifications. Over the 25 years working as a hospital pharmacist Vicky has worked in both large teaching hospitals and DGHs. She has been involved in management, professional development and leadership, lecturing, service planning, budgetary management and clinical practice. Through her specialisation as a paediatric pharmacist, she has an interest in unlicensed drug administration and the importance of standardising practice for the safety and benefit of the patients. Vicky has been an active member of the BPNG and chaired the group between 2002 and 2004, for her services to the group she was awarded life membership in 2006.

Contributors

Authors

Rebecca White BSc (Hons) MSc MRPharmS (I Presc) FFRPS, Medical Advisor, Baxter Healthcare Ltd, Compton, UK

Vicky Bradnam BPharm (Hons) ClinDip MBA$_{Open}$ MRPharmS, Pharmaceutical Consultant, Kent, UK

Jane Fletcher MMedSci (Human Nutrition), BA, RGN, Nutrition Nurse Team Leader, University Hospitals Birmingham NHS Foundation Trust, Birmingham, UK

Lynne Colagiovanni RGN, Independent Consultant, Birmingham, UK

Kate Pickering RGN DipN BA, Lead Nutrition Nurse Specialist, Leicester Royal Infirmary, University Hospitals of Leicester, Leicester, UK

Professor David Wright BPharm (Hons), PhD, MRPharmS, Deputy Head of School, Head of Medicines Management and Director of Admissions, School of Pharmacy, University of East Anglia, Norwich, UK

Members of the original BAPEN Working Party

Chair: Rebecca White, Oxford Radcliffe Hospitals NHS Trust
Lynne Colagiavanni, University Hospitals Birmingham
Geoffrey Simmonett, PINTT Representative
Fiona Thompson, Glasgow Royal Infirmary
Kate Pickering, Leicester General Infirmary
Katie Nicholls, Princess Alexandra Hospital
Julian Thorne, Torbay Hospital
Julia Horwood, North Thames Medicines Information
Thanks to staff at the pharmacy departments of University College London Hospitals and Oxford University Hospitals NHS Trust

Reviewers

Sarah Zeraschi Consultant Pharmacist – Nutrition, Leeds Teaching Hospitals NHS Trust, Leeds, UK
Clare Faulkner MPharm (Ipresc), Specialist Pharmacist, Oxford University Hospitals NHS Trust, Oxford, UK
Vicky Bradnam BPharm(Hons) ClinDip MBA_{Open} MRPharmS, Pharmaceutical Consultant, Kent, UK
Lucy Thompson MRPharmS, Principal Pharmacist, King's Hospital, London, UK
Jackie Eastwood MRPharmS, Pharmacy Manager, St Mark's Hospital, London, UK
Ruth Newton MRPharmS, Principal Pharmacist, City Hospital, Stoke-on-Trent, UK
Antonella Tonna PhD MRPharmS, Lecturer in Clinical Pharmacy, School of Pharmacy and Life Sciences, Robert Gordon University, Aberdeen, UK
Mel Snelling MRPharmS, Lead Pharmacist – Infectious Diseases, Oxford Radcliffe Hospitals NHS Trust, Oxford, UK
Yogini Jani PhD ClinDip, MRPharmS, Lead Pharmacist – Medication Safety, University College London Hospitals NHS Foundation Trust, London, UK
Diane Evans MRPharmS, Lead Pharmacist – Medicine, Oxford Radcliffe Hospitals NHS Trust, Oxford, UK
Venetia Simchowitz (nee Horn) MRPharmS, Senior Specialist Pharmacist – Clinical Nutrition, Great Ormond Street NHS Trust, London, UK
Scott Harrison MRPharmS, Lead Pharmacist, Oxford Radcliffe Hospitals NHS Trust, Oxford, UK
Mark Borthwick MRPharmS, Consultant Pharmacist, Intensive Care, Oxford Radcliffe Hospitals NHS Trust, Oxford, UK
Allan Cosslett PhD MRPharmS, Lecturer, School of Pharmacy, Cardiff, UK

Contributors from the pharmaceutical industry

The companies listed below have provided information included in the drug monographs in this handbook. *The information was supplied on the understanding that these manufacturers do not advocate off-licence use of their products*.

Drug information

Actavis Ltd (previously Alpharma Ltd)
Alliance Pharmaceuticals Ltd
AstraZeneca UK Ltd
Aventis Pharma Ltd
Bayer plc
Boehringer Ingelheim Ltd
Bristol-Myers Squibb Pharmaceuticals Ltd
Celltech Pharmaceuticals Ltd
Cephalon UK Ltd

CP Pharmaceuticals Ltd
Eisai Ltd
Elan Pharma Ltd
Ferring Pharmaceuticals (UK)
GlaxoSmithKline
Hawgreen Ltd
Janssen-Cilag Ltd
Leo Pharma
Merck Pharmaceuticals
Napp Pharmaceuticals Ltd
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Roche Products Ltd
Rosemont Pharmaceuticals Ltd
Sanofi-Synthelabo
Schwartz Pharma Ltd
Servier Laboratories Ltd
Shire Pharmaceuticals Ltd
Solvay Healthcare Ltd
Special Products Limited
UCB Pharma Ltd
Zentiva Ltd

Enteral feeding tube information

Baxa Ltd
Fresenius Kabi Ltd
Merck Gastroenterology
Novartis Consumer Health
Tyco Healthcare
Vygon (UK) Ltd

Abbreviations

5-ASA	5-aminosalicylic acid
ACE	angiotensin-converting enzyme
AUC	area under the concentration–time curve
b.d.	twice daily
BAPEN	British Association of Parenteral and Enteral Nutrition
BNF	*British National Formulary*
BPNG	British Pharmaceutical Nutrition Group
C_{max}	maximum plasma concentration
COX-II	cyclooxygenase oxidase II
CQC	Care Quality Commission
CSM	Committee on Safety of Medicines (UK)
E/C	enteric coated
EFT	enteral feeding tube
ETF	enteral tube feed
Fr	French gauge (diameter of feeding tube; 1 Fr ~0.33 mm)
GI	gastrointestinal
GP	general practitioner
GTN	glyceryl trinitrate
HETF	home enteral tube feeding
HRT	hormone replacement therapy
i.m.	intramuscular
i.v.	intravenous
ICU	intensive care unit
INR	international normalised ratio
IU	international unit
LDL	low-density lipoprotein
M/R	modified-release
MAOI	monoamine oxidase inhibitor

MIC	minimum inhibitory concentration
NBM	nil by mouth
ND	nasoduodenal
NDT	nasoduodenal tube
NG	nasogastric
NJ	nasojejunal
NMC	National Midwifery Council
NPSA	National Patient Safety Agency
NSAID	nonsteroidal anti-inflammatory drug
OTC	over the counter
PEG	percutaneous endoscopic gastrostomy
PEGJ	percutaneous endoscopic gastrojejunostomy
PEJ	percutaneous endoscopic jejunostomy
PIL	product information leaflet
PUR	polyurethane
PVC	polyvinylchloride
q.d.s	four times daily
RPSGB	Royal Pharmaceutical Society of Great Britain
s.c.	subcutaneous
s/c	sugar-coated
SPC	Summary of Product Characteristics
SSRI	selective serotonin re-uptake inhibitor
t.d.s.	three times daily
t_{max}	time to reach maximum plasma concentration
w/w	weight for weight

Notes on the use of this book

The information provided in this resource is intended to support healthcare professionals in the safe and effective prescribing and administration of drugs via enteral feeding tubes. It is a comprehensive guide covering the legal, practical and technical aspects that healthcare professionals should consider before attempting to prescribe or administer drugs via an enteral feeding tube.

The following chapters are intended to provide background knowledge to inform clinical decisions and we recommend that readers familiarise themselves with the contents of these chapters before using the information contained within the monographs.

The individual monographs contain guidance on the safe administration of specific drugs and formulations. Wherever possible, a licensed formulation route should always be used, and the monographs point the reader to alternatives for consideration. Where alternative routes/formulations are not available, the monographs make recommendations for safe administration via the enteral feeding tube. Any decisions on appropriate drug therapy must be made with the complete clinical condition and wishes of the individual patient in mind. Thought should be given to the care setting the patient is in presently, the future need for administration of medicines via an enteral feeding tube, and the patient's/carer's ability to undertake such administration should care be continued at home.

1
Introduction

Rebecca White

Key Points

- Use of enteral feeding tubes for drug administration is increasing.
- Sizes of feeding tubes are decreasing.
- The range of healthcare professionals involved in drug administration via enteral feeding tubes is increasing.
- Collation of all available information is necessary.

The use of enteral feeding tubes for short- and long-term feeding has increased in both primary and secondary care as a result of a heightened awareness of the importance of adequate nutritional intake. An enteral feeding tube (EFT) provides a means of maintaining nutritional intake when oral intake is inadequate or when there is restricted access to the gastrointestinal (GI) tract, e.g. owing to obstruction. Enteral tube feeds (ETFs) are now commonly used for a wide range of clinical conditions and across a wide age range of people.

The British Artificial Nutrition Survey,[1] which was undertaken by the British Association for Parenteral and Enteral Nutrition, remains the largest annual survey of home artificial nutrition support. The data from the 2011 report indicate that the age distribution of adult patients on home enteral tube feeding (HETF) is skewed to the older age range, with 41% of new registrations being over 70 years. Currently 60% of adult patients on HETF require either some or total support with their HETF. Cerebrovascular accident remains the commonest diagnosis in adults on HETF, but the percentage of patients with cancer has been increasing. A conservative estimate suggests that there

are currently over 30,000 patients in the community using HETF. The majority of these patients have a permanent feeding device, with only 19% using nasoenteric tubes.

It can be difficult to find a suitable drug formulation for administration to a patient with limited GI access or with dysphagia. Although parenteral administration can be used and often guarantees 100% absorption, repeated intravenous, subcutaneous or intramuscular injections are associated with complications and are not suitable for continuous long-term use. There are also other routes that can be considered, such as transdermal, buccal, rectal or topical, but the drugs available in these formulations are limited (see Chapter 6 for further information). In these patients the feeding tube is often the only means of enteral access and is increasingly being used as a route for drug administration.

The nursing profession has shown an increasing interest in this route of drug administration. More publications cover a number of issues relating to this method of drug administration, not least the implications of administering a drug via an unlicensed route (see Chapter 7 for more information). Before any drug is considered for administration via an enteral feeding tube, the patient should be assessed to see whether they can tolerate and manage oral drug administration of appropriate licensed formulations (see Chapter 5 for further information).

Administering a drug via an enteral feeding tube usually falls outside of the terms of the drug's product licence. This has implications for the professionals responsible for prescribing, supplying and administering the drug, as they become liable for any adverse event that the patient may experience. When a drug is administered outside of the terms of its product licence (for e.g. by crushing tablets before administration)*, the manufacturer is no longer responsible for any adverse event or treatment failure. For further information on unlicensed use of medicines, see Chapter 7.

The administration of drugs via enteral feeding tubes also raises a number of other issues – nursing, pharmaceutical, technical and professional. Examples are drug errors associated with the use of i.v. syringes for enteral drug administration; the obstruction of feeding tubes with inappropriate drug formulations; the risk of cross-contamination from sharing of tablet crushing devices; and the risks of occupational exposure to drug powders through inappropriate handling.

There is also a degree of semantics: if the drug is prescribed via the oral route but intended to be given via the feeding tube, then this is a prescribing error. However, if the drug was intended to be given orally but the nurse administered it via the feeding tube, then this is classed as an administration error.

The pharmacist has several key responsibilities and must have access to all the necessary information relating not only to the drug and formulation but also to the patient's condition, the type of feeding tube, and the enteral feed and regimen being used. Pharmacists must be able to assimilate all this information to be able to recommend a suitable formulation for administration via this route. It is also their responsibility to

* Crushing of tablets and opening of capsules are the most common ways in which the product licence is breached; using an injection solution for oral or enteral administration is another example.

inform the medical practitioner about the use of an unlicensed route. When changing between formulations, the pharmacist must ensure bioequivalence to avoid treatment failure or toxicity. In primary care, pharmacists will not readily have access to all this information and will need to further discuss the prescriber's intentions with the prescriber before dispensing the prescription.

The pharmacist must also ensure that nursing staff, patients and carers have enough information to give the drug safely. The provision of information by pharmacists on drug charts, in secondary care and nursing homes, is essential to prevent nursing staff crushing tablets unnecessarily or administering inappropriate dosage forms. In primary care the pharmacist should discuss the intended method of administration with the patient or carer so as to ensure that they understand and are competent to undertake the task. The pharmacist should discuss any identified problems with the prescriber before continuing with dispensing.

Two publications have highlighted a number of these issues.[2,3] Both of these reviews stressed that the administration of drugs via enteral feeding tubes is an area that has implications for each member of the multidisciplinary team; without a holistic view, issues may be overlooked.

This handbook is written *by* practitioners *for* practitioners. It is designed for all healthcare professionals, to provide all the available information in one resource with practical advice and recommendations for the safe and effective administration of drugs via enteral feeding tubes.

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2
Types of enteral feeding tube

Rebecca White

Key Points

- Ensure that you know the type, size and position of the enteral feeding tube before administration of medication via the tube.
- The exit site of the tube may affect drug pharmacokinetics or side-effect profile.

Types of feeding tube

Enteral feeding tubes come in many different types, lengths and sizes, and exit in a variety of places in the GI tract.

Enteral feeding tubes can be inserted via a number of routes: via the nasopharynx, for example nasogastric (NG) or nasojejunal (NJ), or via direct access to the GI tract through the skin, for example gastrostomy or jejunostomy tubes. These ostomy tubes can be placed surgically, radiologically or endoscopically.

The type of feeding tube used will vary depending on the intended duration of feeding and the part of the GI tract the feed needs to be delivered to. Nasoenteric tubes are used for short- to medium-term feeding (days to weeks), whereas ostomy tubes are used for long-term feeding (months to years).

The external diameter of the feeding tube is expressed using the French (Fr) unit where each 'French' is equivalent to 0.33 mm. Enteral feeding tubes are composed of polyvinylchloride (PVC), polyurethane (PUR), silicone or latex. Silicone and latex tubes are softer and more flexible than polyurethane tubes and therefore require thicker walls to prevent stretching and collapsing. As a result of the differences in rigidity, a silicone or latex tube of the same French size as a polyurethane tube will have a smaller internal

diameter. In recent years there has been a trend towards decreasing the size of feeding tubes used for reasons of patient comfort and acceptability.

The different characteristics of the tubing material can also have implications for drug adsorption onto the material; this has been demonstrated with carbamazepine.[1]

Nasogastric (NG) tube

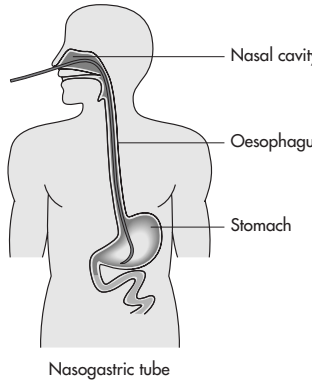

Figure 2.1 Nasogastric tube

The NG feeding tube is inserted via the nose and exits in the stomach. Tubes used via this route in adults can vary from fine-bore tubes (e.g. 6Fr–12Fr) designed specifically for feeding to the Ryles type tubes, usually 12Fr–16Fr, used for aspiration. In some patients, particularly those in intensive care, a large-bore tube may already be *in situ* when feeding is commenced. In this instance the tube can be used to commence the feed, but should be replaced by a fine-bore tube when tolerance to enteral feeding is established. In adults these tubes are usually 90–100 cm long.

Nasoduodenal tube (NDT)

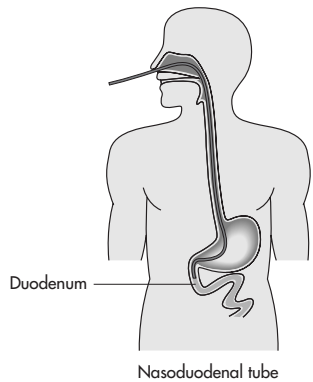

Figure 2.2 Nasoduodenal tube

The nasoduodenal feeding tube is inserted in the same manner as the NG tube but is allowed to pass into the duodenum, usually with assistance, either endoscopic or radiological. This is used to overcome the problems associated with gastric stasis. It is also referred to as 'postpyloric'.

Nasojejunal (NJ) tube

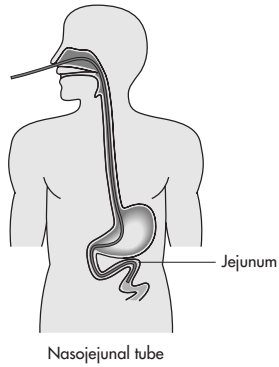

Figure 2.3 Nasojejunal tube

NJ tubes are usually inserted endoscopically or radiologically to ensure that they are in the correct position in the jejunum. If being used to minimise pancreatic stimulation, the tube is passed beyond the hepatic flexure (ligament of Trietz).

These tubes are prone to blockage owing to their length, usually more than 150 cm, and should only be used for drug administration in exceptional circumstances because of the lack of evidence relating to drug adsorption from this site.

There are also tubes that have a gastric aspiration port in addition to the jejunal feeding port. This allows for continuous jejunal feeding while the stomach is decompressed.

Percutaneous gastrostomy

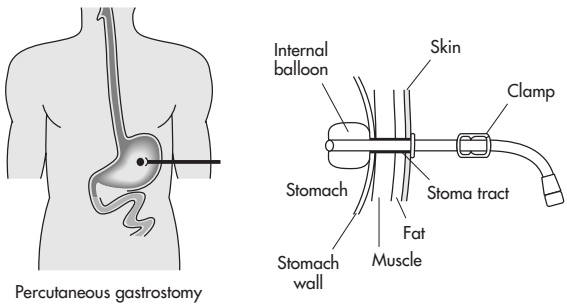

Figure 2.4 Percutaneous gastrostomy

Percutaneous gastrostomy tubes are inserted into the stomach via the abdominal wall, most commonly endoscopically (percutaneous endoscopic gastrostomy, PEG). A permanent tract (stoma) forms after 3 weeks. The device is held in place with an internal balloon or bumper and an external fixator.

Percutaneous jejunostomy

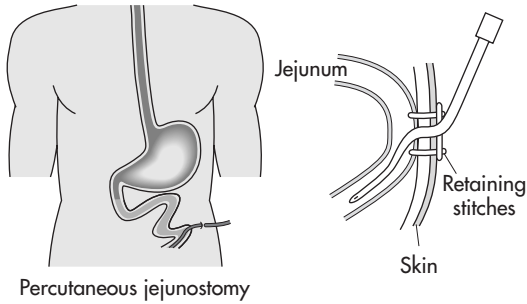

Figure 2.5 Percutaneous jejunostomy

The percutaneous jejunostomy tube is inserted into the jejunum via the abdominal wall, endoscopically (percutaneous endoscopic jejunostomy, PEJ), radiologically or surgically. They are held in place either externally with stitches or internally with a flange or Dacron cuff.

Percutaneous gastrojejunostomy

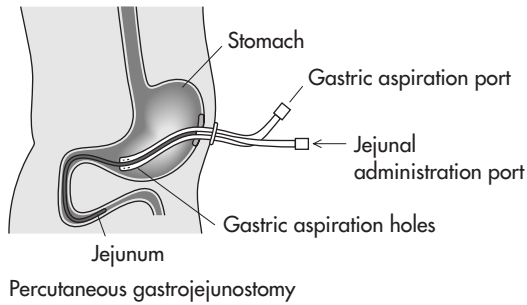

Figure 2.6 Percutaneous gastrojejunostomy

The percutaneous gastrojejunostomy tube is inserted into the stomach via the abdominal wall and the exit of the feeding tube is placed into the jejunum, most commonly endoscopically (percutaneous endoscopic gastrojejunostomy, PEGJ). This can be done as the primary procedure, or a tube can be placed into the jejunum via an existing PEG tube.

Implications of tube type and placement for drug administration

Site of drug delivery

This is of particular concern for feeding tubes exiting in the jejunum. Drug absorption may be reduced owing to effects of pH or delivery beyond the site of drug absorption, as in the case of ketoconazole,[2] or by reduction of the time for which the drug is in contact with the GI tract. Particular care should be taken with drugs with a narrow therapeutic range, although most of these can be effectively monitored through plasma concentrations (e.g. phenytoin or theophylline), or through direct effect (e.g. warfarin). Conversely side-effects can be increased owing to the rapid delivery of drug into the lumen of the small bowel.

Tubes exiting beyond the pylorus usually have different requirements for flushing, e.g. sterile water. Local policy should be consulted.

Size of lumen and length of tube

Narrow tubes and long tubes are more likely to become blocked. Correct choice of formulation and effective flushing are essential to prevent blockage. See Chapters 3 and 4 for further information.

Function of enteral tube

Do not administer drugs via tubes that are being used for aspiration or are on free drainage.

Multilumen tubes

Some enteral tubes have two lumens to enable simultaneous gastric aspiration and jejunal feeding. Ensure that the correct lumen is used for drug delivery.

Confirmation of position

Advice of the National Patient Safety Agency (NPSA) (February 2005)[3] and reinforced in 2011[4] recommends that all patients being fed using a nasogastric tube should have the position of the tube checked regularly using pH indicator paper.

See Chapter 9 for information on syringe size, type and port connection.

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3
Flushing enteral feeding tubes

Kate Pickering

Key Points

- Tube flushing is the single most effective action in prolonging the life of any enteral feeding tube:
  - NG tubes should not be flushed with water prior to gastric placement confirmation[1]
  - a pulsatile flushing action should be used to create turbulence within the inner lumen of the enteral feeding tube.
- Tube blockage may occur owing to:
  - small internal diameter of the tubes
  - inappropriately prepared medications
  - poor flushing technique or poor attention to the flushing regimen prescribed
  - gastric acid, feed and medication interactions
  - bacterial colonisation within the feeding tube[1]

Syringe size

Small syringes create high intraluminal pressures and may damage the tube.[2,3] In order to reduce the risk of rupturing the fabric of the enteral feeding tube, the largest functional syringe size should be used; 30–50 mL syringes are recommended.[4] In clinical practice this tends to be a 50 mL syringe.[5]

Documentation

Medication volumes and flushes should always be recorded. It is essential that flushes are recorded accurately in acute hospitals, on a fluid balance chart. In primary and

secondary care, the patient's prescribed flush must take account of any renal or cardiac impairment. Assessment to decide upon the necessary flush volume may require a reduction in other fluids to effectively maintain fluid balance or commencement of replacement air flushed if indicated.

Air flushing

Nasogastric tubes

It has been suggested that flushing with air before attempting to obtain gastric aspirate may help to flick the tip of the nasogastric feeding tube into the reservoir of gastric secretion, thereby facilitating gastric aspiration. When pH testing, the tube should be cleared of any substance that will contaminate the sample and affect the pH of the gastric aspirate.[6] No water should be instilled until gastric placement is confirmed;[1] aspirate can then be pH tested adhering to National Patient Safety Alert guidance issued in 2005 and re-published in 2011.[7,8]

Other types of enteral feeding tube

If pH testing of other types of enteral feeding tube is indicated (i.e. as recommended by the National Nurses Nutrition Group during balloon gastrostomy tube replacement),[9] air can be used to clear the tube of any substance that will contaminate the sample and effect the pH of the gastric aspirate.[6]

Technique

1. Pre-fill a 50 mL syringe with 30 mL of air.
2. Attach the syringe to the appropriate labelled port of the patient's feeding tube.
3. Ensure that any other enteral access ports are closed and airtight.
4. Ensure that there is an airtight connection between the syringe and the enteral tube and administer the air flush.
5. Listen for any evidence of the air venting into the mouth or upper oesophagus; such venting may suggest misplacement of the tube tip in the upper oesophagus or rupture of the tube.
6. Attempt to aspirate with a 50 mL syringe. This will reduce the likelihood of the inner lumen of the enteral feeding tube collapsing under vacuum.

Frequency

Air flushing should be used to clear substance from the tube each time gastric aspirate is required.

It is suggested that tubes are checked for placement at least every 24 hours.[10]

Air flushing on gastric aspiration

Air flushing is not required in patients who are having gastric aspiration to check residual gastric volume. These patients will, however, require the tube to be flushed with

air/water after the residual aspirate is returned, or discarded, to prevent build-up of debris on the internal lumen of the tube that may result in occlusion (blockage of the tube) (see below).

Water flushing

In the USA, carbonated drinks were once heavily favoured as enteral feeding tube flushes,[11] but trials have demonstrated that warm water performs as well as other fluids tested as an enteral feeding tube flush.[12] It should be noted that acidic flushes such as cola can exacerbate tube occlusion by causing feed to coagulate or protein to denaturise.[13]

Water is the most appropriate fluid with which to flush[4,12] and is as effective as any flush for reducing the formation of, and for clearing previously established, tube occlusions. A pulsatile flushing action should be used to create turbulence within the inner lumen of the enteral feeding tube, cleaning the inner walls more effectively. Research is limited on the type of water to be used, but it is generally accepted that:

- for gastric tubes cared for in the patient home, use fresh drawn tap water (usually boiled and cooled)
- for gastric tube cared for in institutions, use sterile water (where mains water supply can often be routed vast distances meaning the presence of poor pipe condition and pathogenic contamination cannot be ruled out)
- for small bowel enteral tubes beyond the stomach, use only sterile water (to prevent pathogen introduction usually controlled by the stomach's gastric acid production).

Owing to the complexity of the formulations of drugs for enteral administration and the need for accuracy and prompt administration, medication is usually given as a bolus dose with flushing before and after each separate medication administration to ensure patency of the enteral feeding tube. The number of flushes should be factored into the overall fluid requirement of the patient and may result in a large gastric residual. Monitoring should take place to ensure that patients do not develop symptoms after medication administration which are caused by the increased fluid volume. (NB Mixing a number of medicines into a single syringe is NOT considered to be safe practice.)

Volume

The volume used should reflect the diameter of the inner lumen of the nasogastric tube. The flush should be adequate to prevent build-up on the inner wall of the tube. A 15–30 mL water flush is recommended,[14,15] but care should be taken with fluid-restricted patients (see notes below). Water type depends on local policy. Wide-bore enteral tubes may require a higher volume owing to the large diameter of the inner lumen.

Technique

1. Prepare a flush of water (according to local guidelines) in a 50 mL enteral syringe and label if necessary. Place it in a clean tray.

2. Positioning the patient in a semi-recumbent position can help to prevent regurgitation and possible pulmonary aspiration from the flush and/or medication residuals.[16]
3. Stop or suspend enteral feeding.
4. Ensure that any other enteral feeding ports are closed and airtight.
5. Attach the syringe to a port of the patient's enteral feeding tube. Ensure that there is an airtight connection between the syringe and the enteral tube.
6. Using a pulsatile flushing action, administer the flush.
7. Administer the drug and flush; cap off, or connect further enteral feeding depending on the patient's requirements.

Water flushing and drug administration

Mateo[11] found that although 95% of nurses reported flushing enteral feeding tubes after drug administration, only 47% reported that flushing was undertaken prior to drug administration. Flushing with water helps to prevent interactions between feed and drug in the inner lumen of the tube. It is good practice to flush the tube before and after each drug administered[4,17] and before recommencing the feed. If the drug is viscous, flushing or dilution with water may be required during administration (see individual monographs for recommendations).

Water flushing and enteral/oral feeding

Whether the enteral feeding tube is to be used for continuous enteral feeding or for supplementary feeding, regular flushing is essential to prolong the life of the tube. Any tube that is not appropriately flushed will have a higher likelihood of occlusion. Flushing should occur before and after each intermittent feed, every 4–6 hours during continuous feeding,[4,10] and before and after each drug administration. This will help to prevent interactions between the feed and the drugs being administered.

Water flushing after checking residual gastric volume

Gastric aspiration and return of stomach contents via the NG tube in critical care units can increase tube occlusion and bacterial contamination.[16] Feeding tubes should be flushed immediately after gastric aspiration and after the return of the measured gastric contents, in accordance with local policy.

Water flushing after gastric aspiration for pH checking

Only air flushing should be used to clear the NG/enteral feeding tube when gastric aspirate is required for pH testing; instillation of water of any type risks altering the aspirate's pH. Air flushing removes any liquid from the tube, allowing fresh gastric secretions to be aspirated. This aspirate can then be pH tested according to local national policy. In NG tube feeding, water should not be administered until after gastric placement has been confirmed by pH testing or radiology.[1] The appropriate water flush should be administered promptly after the gastric aspiration and pH testing is complete to reduce to likelihood of tube occlusion. It is recommended to check NG tube

placement at least once every 24 hours as tubes may be dislodged after vomiting or coughing.[11]

Risks of water flushing and drug administration via enteral feeding tubes

Oesophageal reflux of medication solutions and flushes can occur in any patient. Especially susceptible are those patients with impaired swallowing, heartburn, gastric reflux and oesophagitis. Any patients who have tubes that travel through the cardiac sphincter of the stomach are at risk of oesophageal and pulmonary reflux.

Fluid-restricted patients

In some cases, for example in children or patients with renal or cardiac disease, the flush volumes recommended above will need to be revised to meet the patient's prescribed fluid restriction. Failure to do this could create an overall positive fluid balance and worsen the patient's disease state. Air flushes may be used to replace water flushes in these circumstances.[18]

General recommendations

- The enteral feeding should be stopped and the tube flushed before a drug is administered.
- In the event that the enteral feeding tube tip is placed within the small bowel, reduced flush volumes will be required to prevent distension and possible retrograde fluid flow resulting in an increased risk of regurgitation and possible pulmonary aspiration. Patients who have undergone full gastrectomy are particularly at risk.
- The patient should be nursed semi-recumbent (sitting up) at an angle of 30 degrees or greater to reduce reflux of the medication and flushes. This promotes gravity-assisted progression of the fluid.[16,19,20,21]
- High-osmolality medication boluses administered into the stomach can delay gastric emptying and lead to a higher gastric residual volume and a greater risk of reflux.[22] The patient may therefore need to remain at 30 degrees for some time to facilitate gastric emptying.

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4
Restoring and maintaining patency of enteral feeding tubes

Lynne Colagiavanni

Jane Fletcher

Key Points

- Effective flushing reduces incidence of tube occlusion.
- Feed is the most common cause of tube occlusion.
- Use of inappropriate drug formulations increases the risk of tube occlusion.

Most patients with a functioning gastrointestinal tract can be tube fed if they are unable to take sufficient nutrition orally. The development of soft, flexible fine-bore tubes that are easy to place has increased the popularity of this method of feeding, but tube occlusion, reported to be as high as 23–35%,[1,2] is a significant problem.

Many different methods have been tried both to prevent and to clear tube occlusion, but few of these have a strong evidence base. Tubes that cannot be unblocked will need to be replaced, which is distressing for the patient, can increase morbidity, results in lost feeding time and has financial implications.

Aetiology of tube occlusion

Tube occlusions can be classified as either internal lumen obstruction or mechanical failure/problem with the tube. Tubes may become kinked or knotted while *in situ*, but internal lumen obstruction is the most common reason for tube occlusion. Feeding tubes become occluded for a variety of reasons, which include:

- Feed precipitate from contact with an acidic fluid
- Stagnant feed in the tube
- Contaminated feed

- Cyclical feeding
- Feeding tube properties
- Incorrect drug administration.

Consideration of each of these potential causes can help in reducing the incidence of tube occlusion.

Feed precipitate caused by contact with acidic fluid

Precipitation of the feed is responsible for tube occlusion in up to 80% of cases.[3] Occlusions are likely if gastric juices, which have an acidic pH, come into contact with feed solutions. Powell *et al*.[3] found that tubes that had been aspirated 4-hourly to check gastric residual volume had significantly more occlusions than those in the control group that had not been aspirated; however, this study was limited by small numbers and there was failure to record any drug administration via the tube. Occlusion occurred even though the tubes had been flushed with 10 mL water before and after each aspiration. In a study by Hofstetter and Allen,[4] precipitation occurred when intact protein feeds were acidified to less than pH 4.5. Interestingly, the same was not found when elemental or semi-elemental feeds were used. The authors conclude that it is the presence of casein in the whole-protein feeds (which is absent from elemental and semi-elemental feeds) that causes the problem.

Tubes with tips in the jejunum occluded far less frequently in both the Hofstetter and Allen study[4] and that of Marcuard and Stegall,[5] and this was assumed to be due to the higher pH of jejunal secretions.

Stagnant feed in the tube

A feed can easily form a clog in a tube if flushes are not given promptly when the feeding is completed or interrupted. Most enteral feeds are suspensions and, when the feed rate is extremely slow or is stopped, the larger particles (calcium caseinate and soy protein) settle in the horizontal portion of the tube.[6] More viscous feeds and those containing fibre are also more likely to cause occlusion.[7]

Contaminated feed

If there is significant bacterial contamination of the feed (bacterial counts ≥10 cfu/mL) this can cause the feed to precipitate, leading to tube occlusion.[8]

Cyclical feeding

The increased use of cyclical rather than continuous feeding may also be a contributory factor to feeding tube occlusion in the acute care setting. Based on work by Jacobs *et al*.,[9] many centres choose to give patients an enteral feeding break of 4–6 hours rather than feeding continuously over 24 hours, supposedly to reduce the risk of aspiration pneumonia. Enteral feeds cause a rise in gastric pH, allowing proliferation of Gram-negative bacteria, which may lead to pneumonia if aspirated. The break is thought to allow

gastric pH to decrease, thus reducing this risk. Given that many patients now receive proton pump inhibitors, which also cause an increase in gastric pH, it may be time to review the theoretical need for enteral feeding breaks.

Feeding tube properties

Within adult practice 'fine-bore' tubes are now used for nasogastric feeding. Fine bore is generally taken to mean 6Fr to 12Fr. Gastrostomy and jejunostomy tubes vary in size depending on the device used and the preference of the healthcare professional inserting them, and can range from 9Fr to 20Fr.

Tube material may be a factor in the rate of occlusion, with polyurethane being shown to be less prone to occlusion than silicone.[10,11] This may be because polyurethane tubes have a larger internal diameter than silicone for the same external size.

Wide-bore tubes may be expected to become occluded less frequently than fine-bore tubes, but Metheny *et al*.[10] found no difference in occlusion rates between polyurethane tubes of three different sizes. This supports the view that material may be more important than diameter.

Silicone has been reported to support the growth of yeasts within the tube, leading to occlusion.[12]

The number of exit holes at the distal tip of the tube may also be important. Tubes with one exit hole have been shown to become occluded less frequently than those with more. This is possibly due to the greater contact between feed and gastric acid.[4]

Incorrect drug administration

The use of enteral feeding tubes to administer drug therapy has increased considerably in recent years and may be a significant factor in tube occlusion. Occlusions can be caused by:

- Particle obstruction from inadequately crushed tablets
- Precipitate formation from interaction between feed and drug formulation
- Precipitate formation from interaction between drugs.

Solutions for feeding tube flushes

Maintaining patency of the tube is to a large extent dependent on regular flushing. Various solutions have been used for flushing feeding tubes, including cranberry juice, cola, carbonated water, meat tenderiser, and pineapple juice.[6,10,13] However, no solution has been shown to be superior to water in preventing occlusion. Both cranberry juice and cola have a low pH, making precipitation with feed more likely, increasing rather than decreasing the risk of tube occlusion.[8]

Two studies have looked at the use of pancreatic enzymes to reduce feeding tube occlusions.[1,14] Both of these studies have limitations, which means that although both show a trend towards fewer occlusions in the study group, it is difficult to recommend

the routine use of pancreatic enzymes on the basis of the data presented. More work on the use of pancreatic enzymes in preventing tube occlusion is needed.

There are also practical problems that may limit their use; these are discussed later in this chapter.

Volume of water to be used when flushing

There are no studies looking specifically at what volume is effective in preventing tube occlusion. From the information available,[14,15] a 15–30 mL flush is recommended, although this may need to be modified in patients with fluid restriction.

Recommendations for preventing feeding tube occlusions

- Use a polyurethane tube.
- Use size 8Fr–12Fr for NG tubes (adults) and 10Fr or above for gastrostomy/jejunostomy tubes.
- Follow national and local guidelines for preparation and administration of enteral feeds to minimise bacterial contamination.
- Attend to all pump alarms promptly and flush tubes with water whenever feed is stopped or interrupted.
- If it is safe to do so, keep gastric residual volume checking to a minimum.
- Use 15–30 mL water to flush the tube before and after each feeding episode, and before and after drug administration.
- If giving more than one drug, give each separately and flush with 10 mL water between each one. (Caution is needed in patients with fluid restriction.) See monographs section for specific drug recommendations.

Unblocking occluded tubes

Attempts to clear an occluded tube are more likely to be successful if the process begins as soon as possible after the occlusion occurs. It is therefore important that pump alarms are attended to promptly.[8]

Three main methods can be used in attempting to clear an occlusion:

- Liquid irrigants
- Pancreatic enzymes
- Mechanical devices.

Liquid irrigants

Many liquids have been used in attempts to clear occluded feeding tubes. These include water (cold or warm), sodium bicarbonate, cola, other carbonated drinks, and meat tenderiser (which contains the proteolytic enzyme papain). There is little evidence to support the use of many of these. Cola has a pH of 2.5 and is likely to make the situation

worse rather than better as it coagulates the protein in a feed. There is no evidence that warm water is any more successful than cold, or that sodium bicarbonate is effective, but as both are harmless and unlikely to make the situation worse, they can be used if individual centres feel they are helpful.

In an attempt to assess the effectiveness of varying irrigants on feed clogs, Marcuard *et al*[16] tested the following: water, Sprite, Coca Cola, Mountain Dew, Pepsi, papain, and activated Viokase (pancreatic enzymes). Parts one and two of this study were done *in vitro,* so clogs were worked on promptly. Activated Viokase was found to be the most successful and papain the least. In the third, *in vivo,* part of the study, Viokase was compared with water for its ability to unblock the tubes. Water was unsuccessful in all cases, whereas Viokase dissolved the clog in 7 of the 10 tubes studied. This particular study would suggest that pancreatic enzymes may be useful in unblocking tubes; however, according to Stumpf *et al*.,[17] Viokase has since been removed from the market. This is discussed further below.

Pancreatic enzymes

The use of pancreatic enzymes to dissolve feed clogs has been studied with differing results. Marcuard and Stegall studied a further 32 patients with a total of 60 tube occlusions over a period of 6 months.[5] In 44 of these occlusions, attempts were made to unblock the tubes. Water was successful in clearing only 12, while activated pancreatic enzymes cleared a further 23. Of the remaining nine, six occlusions were found not to be due to feed. The authors attribute the success of the pancreatic enzymes to the presence of chymotrypsin, a proteolytic agent known to cleave peptide bonds. Stumpf *et al*.[17] went on to assess the efficacy of a Creon (pancreatic delayed release capsule) protocol to clear the blocked NG tubes in the absence of Viokase. They found that the use of Creon was successful in just under half of the patients and noted this was significantly less that the success rate with Viokase.

Two other studies looked at the use of pancreatic enzymes. Nicholson[18] had little success in freeing the clogs, while the study by Bommarito *et al*.[19] is difficult to evaluate as it contains little information on effectiveness. The differences in the results may be due to the differences in methodology. The type of enzyme used, dilutional volumes, dwell times and method of delivery varied between studies, and these may well be significant factors in success or failure.

Crucial to the success of the pancreatic enzymes is that they are 'activated' by being brought to the correct pH. In the study by Marcuard *et al*.,[16] sodium bicarbonate was added to achieve a solution with pH 7.9. This study also delivered the activated solution close to the site of the clog by administration via a fine-bore tube passed inside the nasogastric tube to the level of the clog. In the study by Stumpf *et al*.,[17] Creon was dissolved in a solution of sterile water and sodium bicarbonate 650 mg but the pH achieved was not discussed. A back and forth movement of the syringe was then recommended for delivery of the solution.

Although the above was fairly easy to achieve within the research setting, the practicalities of implementing it in the clinical situation either in acute care or, more

problematically, in the community, make its application limited. It is unlikely that pancreatic enzymes would be readily available in a timely manner to unblock an enteral feeding tube on a hospital ward, in a nursing home or within a patient's home, or that staff would know how much sodium bicarbonate to add in what volume. Finding a very fine-bore tube to pass inside a nasogastric tube would also be extremely difficult.

Therefore, although pancreatic enzymes do seem to be effective in clearing some feed tube occlusions, much work would need to be done in devising protocols/procedures and ensuring supply of relevant solutions and equipment at local level before they could be successfully used in routine practice.

The declogging system Clog Zapper (CorPack Medsystems, Buffalo Grove, IL, USA) is a patented enzyme powder (not pancreatic) within a syringe that is reconstituted with water and administered through a fine-bore tube supplied with the kit and is left to dwell for 30–60 minutes. The powder includes papain, ascorbic acid, maltodextrin and cellulase. Company studies state that Clog Zapper was successful in clearing all tubes on either the first or second attempt in a sample of 17 occluded tubes.[20] The high cost of this product is probably the reason for its low usage, although this should be balanced against the cost of replacing a tube, lost feeding time and the distress that tube replacement causes the patient. Independent studies on the use of this product would be useful.

It should be remembered that pancreatic enzymes, and probably also Clog Zapper, will only be useful if the clog is caused by feed. Clogs due to drug therapy are unlikely to be cleared in this way.

Mechanical devices

Generally it is thought inadvisable to reinsert guidewires or other devices into feeding tubes in an attempt to clear blockages. However, if pre-measured so as not to exceed the length of the tube, and if used with care by an experienced practitioner, they can be helpful. The Enteral Feeding Tube Declogger (Distinctive Medical Products, Cheshire, UK) is a flexible plastic device with a screw thread that is inserted into gastrostomy tubes and rotated to 'bore through' a clog. It is available in a range of French sizes and lengths, and suitable for use with most gastrostomy/jejunostomy tubes. Currently the sizes available make it unsuitable for use with nasogastric tubes. Cost may also be a prohibitive factor in its use.

General recommendations

Many tubes can be unblocked with the use of a 50 mL syringe, water and patience! A withdraw/flush method is the most effective. It can take 30 minutes or more to unblock a tube using this method. The use of small syringes is usually contraindicated as this may result in tube rupture. Should this happen in the oesophagus and go undetected, the consequences could be serious if feeding was recommenced. The risks of tube

rupture should be considered against the possible difficulties of repassing the tube when determining the size of syringe used.

Unblocking nasogastric feeding tubes

- Use 15–30 mL water (warm or cold), in a 50 mL syringe, and a pull/push action.
- Do not use cola or other solutions with an acidic pH.
- Use a smaller syringe (5 mL) with caution if the above fails and seek specialist advice.
- Use a mechanical declogging device of the correct size with gastrostomy/jejunostomy tubes (if available).
- Only use pancreatic enzymes if they are activated to the correct pH and you are able to deliver close to the occlusion.

Prevention is nearly always better than cure. Using the correct tube and caring for it properly with prompt attention to pump alarms and protocols for flushing and drug administration should help to reduce the incidence of tube occlusion. If an occlusion is discovered, it should be dealt with as quickly as possible using techniques supported by the available evidence. If this advice is heeded, the amount of feeding time lost and distress caused to patients from occluded feeding tubes can be reduced.

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5
Drug therapy review

Rebecca White

Key Points

- Reduce drug therapy to the minimum necessary.
- Transfer the patient onto once-daily formulations with a long half-life where possible (not modified- slow-release formulations).
- Determine alternative formulations and routes available where possible.
- Make any therapy changes in an environment in which the patient can be effectively monitored.

Regular drug therapy review and rationalisation is an essential part of effective medical treatment. Annual medication reviews are required as part of the National Service Framework for Older People;[1] within the scope of the framework, medication review is defined as 'a structured, critical examination of a patient's medicines with the objective of reaching an agreement with the patient about treatment, optimising the impact of medicines, minimising the number of medication-related problems and reducing waste'.[2]

The first step in any medication review should be to determine the therapeutic rationale for each prescription and to discontinue any therapy for which this cannot be identified, or where there is inappropriate therapeutic duplication. Drugs can be prescribed unnecessarily, especially within secondary care when many are prescribed 'just in case'. Administering this array of medicines via a feeding tube can often present a daunting challenge to an experienced nurse. The practical and logistical issues become magnified when this dosing regimen is transferred into a home care setting.

The first step should be to determine which of the drugs need to be administered via the feeding tube or whether the patient can still take them orally. The use of alternative routes of administration should be fully explored, but the practical considerations should be borne in mind at all times and offset against using a drug outside the terms of its product licence. Alternative routes such as injections and suppositories are useful for short-term management but are rarely practical in chronic disease management.

Transdermal therapy, sublingual administration and depot injections are useful alternatives for drugs such as GTN, HRT and analgesia. (For further information see Chapter 6.)

Where possible, therapy should be changed to drugs with a prolonged therapeutic effect (not modified/slow-release formulations) to reduce the need for multiple tube manipulations. The choice of drug should be considered in conjunction with local formulary recommendations.

Any changes to therapy should be made in an environment in which the therapeutic response to the change can be monitored. This is particularly important when the therapy will be continued in a different care environment, either by patients themselves or by a carer. As in all aspects of care, discharge planning should start as early as possible, especially if a non-medical carer is required to administer the medication. A process that is straightforward to the ward nurse can seem an impossible task to a patient or carer. Where possible, document all instructions and ensure that other appropriate healthcare professionals are sent a copy, for example district nurses and GPs.

Communication with the wider healthcare team is necessary to ensure continuity of therapy. This is particularly important if the formulation of a drug is prepared extemporaneously or is provided as a manufactured 'special', since inadequate communication may delay supply of medication in the community. It is important to communicate to the prescriber the formulations needed for administration via an enteral feeding tube and that this is an unlicensed use of the medication, thereby providing the prescriber with the full information necessary for them to consider their responsibilities should an adverse event occur; the GMC provides guidance on prescribing unlicensed medicines.[3] (See Chapter 8.)

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6
Choice of medication formulation

Rebecca White

Key Points

- Solutions or soluble tablets are the formulations of choice.
- Do not assume that liquid formulation will be suitable.
- Do not crush tablets or open capsules unless an alternative formulation or drug is unavailable.

When deciding which medication formulation is appropriate for administration via an enteral feeding tube, many factors need to be taken into consideration. It is not necessarily correct to assume that a liquid is preferable to a tablet; unwanted side-effects of the excipients of a liquid formulation must be borne in mind. The needs of the patient or carers must also be considered; it may not be practical for the patient to carry several bottles of liquid medication with them on a daily basis.

In this chapter each of the formulations available will be reviewed. Guidance on how to administer the formulation will be given and advantages and disadvantages listed. See Chapter 9 for further information on appropriate choice of syringe.

Liquid formulations

Solutions

A solution is a homogeneous one-phase system consisting of two or more components. The solute is dispersed in the solvent. The solvent is usually present in the greater amount. Syrup is a notable exception with 66.7% w/w sucrose as the solute in 33.3% w/w of water as the solvent.

Because a solution is a homogeneous system, the drug will be distributed evenly throughout the system. This is in contrast to a suspension, where inadequate mixing or settling may lead to variable dosing.

Water is the most widely used solvent for pharmaceutical products. Some other solvents can be used in combination with water to act as co-solvents and thereby increase the solubility of the drug in the formulation. Examples of excipients used in solutions are ethanol, sorbitol, glycerol and propylene glycol. Inclusion of these excipients can determine the suitability of a solution for administration via an enteral feeding tube; for example, sorbitol can cause diarrhoea (see Disadvantages below).

Administration of solutions

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water (see Chapter 3).
3. Check the relevant monograph – can the drug be administered with feed, or should a specific time interval be allowed before administering the drug?
4. Draw the drug solution into an appropriate size and type of syringe.
5. Flush the drug dose down the enteral feeding tube.
6. Finally, flush the enteral feeding tube with the recommended volume of water (see Chapter 3).
7. Re-start the feed, unless a specific time interval is needed following the administration of the drug.

Alternatively, at step (4) measure the drug solution in a suitable container and then draw into an appropriate size and type of syringe. Avoid syringes that are compatible with parenteral devices. Ensure that the measure is rinsed and that this rinsing water is administered via the enteral feeding tube to ensure the total dose is given. *Do not* measure liquid medicines using a catheter-tipped syringe, as this results in excessive dosing owing to the volume of the tip.

Advantages

- Even drug distribution in the formulation allows accurate dosing.
- Ready to use.
- Easily measured.
- Accurate dosing.
- Suitable for administration via an enteral feeding tube without further manipulation.

Disadvantages

- Co-solvents may be present in sufficient quantities to have a pharmacological effect, especially if present in all drug formulations being used; for example, sorbitol (≥15 g/day) will have a laxative effect.
- May not be considered practical for carrying around.
- Cost.
- Stability and a short shelf-life may be impractical.

Suspensions

A suspension formulation is usually developed when the drug is insoluble or if, for reasons of palatability, the drug is formulated into coated microgranules.

Non-granular suspensions can be administered via enteral feeding tubes but may require further dilution owing to the viscosity and osmolarity.

For granular suspensions, granule size and the viscosity of the formulation must be taken into account when assessing the suitability of the formulation for administration via an enteral feeding tube. Examples of granular suspensions are ciprofloxacin, clarithromycin and lansoprazole. Some granular suspensions contain enteric-coated granules (e.g. Zoton suspension) or modified-release granules (e.g. MST-continus suspension); caution should be exercised with such formulations to avoid changing the absorption characteristics (see individual monographs).

Administration of a suspension (see notes above)

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water (see Chapter 3).
3. Check the relevant monograph – can the drug be administered with feed, or should a specific time interval be allowed before administering the drug?
4. Shake the medication bottle thoroughly to ensure adequate mixing.
5. Draw the medication suspension into the appropriate size and type of syringe.
6. Flush the medication dose down the enteral feeding tube.
7. Finally, flush the enteral feeding tube with the recommended volume of water (see Chapter 3).
8. Re-start the feed, unless a specific time interval is needed following the administration of the drug.

Alternatively, at step (5) measure the drug suspension in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate size and type of syringe. Avoid syringes that are compatible with parenteral devices. Ensure that the measure is rinsed and that this rinsing water is administered via the enteral feeding tube to ensure that the total dose is given. *Do not* measure liquid medicines using a catheter tipped syringe as this results in excessive dosing owing to the volume of the tip.

Advantages

- Ready to use (few exceptions).
- Easy to measure.
- Accurate dosing.

Disadvantages

- Granules in suspension may be too large or the suspension may be too viscous to pass through the enteral feeding tube.

- Settling or inadequate shaking may affect the accuracy of dosing.
- May not be practical to carry around.
- Cost.
- Stability and shelf-life may be impractical.

Solid dosage formulations

Soluble tablets

A soluble tablet dissolves completely when placed in water to give a solution of the drug; this is usually achieved by using an alternative salt form, e.g. prednisolone sodium phosphate.

Administration of soluble tablets

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water (see Chapter 3).
3. Check the relevant monograph – can the drug be administered with feed, or should a specific time interval be allowed before administering the drug?
4. Select an appropriate size and type of syringe for administration.
5. Remove the plunger and place the tablet into the barrel of the syringe.
6. Replace the plunger.
7. Draw 10 mL of water into syringe and allow the tablet to dissolve, shaking as necessary.
8. Inspect the solution to ensure that there are no visible particles.
9. Flush the medication dose down the enteral feeding tube.
10. Draw an equal volume of water into the syringe and also flush this via the enteral feeding tube (this will rinse the syringe and ensure that the total dose is administered).
11. Finally, flush with the recommended volume of water (see Chapter 3).
12. Re-start the feed, unless a specific time interval is needed following the administration of the drug.

Alternatively, at step (4) place the tablet into medicine pot, add 10 mL of water and allow tablet to dissolve. Draw this into an appropriate size and type of syringe. Ensure that the measure is rinsed and that this rinsing water is administered via the enteral feeding tube to ensure that the total dose is given.

Advantages

- Drug is in solution.
- Long expiry date of original packaged drug.
- Usually less expensive than alternative liquid formulation.
- Easy to carry around.
- Accurate dosing.

Disadvantages

- One must allow complete dissolution before administration.

Effervescent tablets

Effervescent tablets are defined as tablets in which more than 75% of the bulk of the tablet is composed of inert agents intended to make the tablet effervesce. These tablets are created by incorporating sodium or potassium carbonates or bicarbonates with tartaric or citric acid; this produces carbon dioxide when placed in water and rapidly breaks the tablets apart. Owing to the nature of the formulation, these preparations tend to have a high sodium content.

These tablets will effervesce and dissolve or disintegrate when placed in water. The volume suggested is usually a quarter to half a tumblerful of water; however, for the purposes of administering these formulations via an enteral feeding tube it may be possible to dissolve them in a smaller volume.[1] (See individual monographs for details.)

Administration of effervescent tablets

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water (see Chapter 3).
3. Check the relevant monograph – can the drug be administered with feed, or should a specific time interval be allowed before administering the drug?
4. Measure a suitable quantity of water into a container of appropriate size to allow effervescence without spillage.
5. Add the effervescent tablet and allow it to disperse.
6. Draw the contents of the measuring pot into an appropriate size and type of syringe.
7. Inspect the syringe contents to ensure that there are no visible particles that might block the tube.
8. Flush the medication dose down the enteral feeding tube.
9. Rinse the measure and administer this water via the enteral feeding tube to ensure that the total dose is given.
10. Finally, flush with the recommended volume of water (see Chapter 3).
11. Re-start the feed, unless a specific time interval is needed following the administration of the drug.

Advantages

- Low osmolarity: will not cause diarrhoea.
- Long shelf-life of original packaged drug.
- Easy to carry around and convenient.
- Generally less expensive than liquids.
- Accurate dosing.

Disadvantages

- May require a large volume to be fully dispersed.
- Must be fully dispersed before administration to avoid gas production in the enteral feeding tube.
- Sodium content can be high.
- Excipients may not dissolve and may sediment out.
- Cannot be dispersed in syringe owing to the production of gas.

Dispersible tablets

Although designed to be given orally, dispersible tablets disintegrate in water to give particles that may or may not suspend in water.

These tablets will usually disperse when placed in a small amount of water, e.g. 10–15 mL; however not all are suitable for administration via an enteral feeding tube as the resultant particles or granules may be too large for administration via fine-bore tubes, e.g. Pentasa dispersible tablets.

Administration of dispersible tablets

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water (see Chapter 3).
3. Check the relevant monograph – can the drug be administered with feed, or should a specific time interval be allowed before administering the drug?
4. Select an appropriate size and type of syringe for administration.
5. Remove the plunger and place the tablet in the barrel of the syringe.
6. Replace the plunger.
7. Draw 10 mL of water into syringe and allow the tablet to disperse, shaking if necessary.
8. Inspect the syringe contents to ensure that there are no large particles that might block the tube.
9. Flush the medication dose down the enteral feeding tube.
10. Draw an equal volume of water into the syringe and flush this via the enteral feeding tube (this will rinse syringe and ensure that the total dose is administered).
11. Finally, flush with the recommended volume of water (see Chapter 3).
12. Re-start the feed, unless a specific time interval is needed following the administration of the drug.

Alternatively, at step (4) place the tablet into medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate size and type of syringe. Ensure that the measure is rinsed and that this rinsing water is administered via the enteral feeding tube to ensure that the total dose is given.

Advantages

- Cost.
- Convenient to carry around.
- Lower electrolyte content than effervescent tablets.

Disadvantages

- Particles/granules of dispersion may be too large for administration via fine-bore tubes.
- Sedimentation during administration may lead to tube blockage.

Orodispersible tablets

Orodispersible tablets are designed to disperse on the tongue. They are not necessarily absorbed sublingually, merely swallowed with the saliva; however, individual monographs should be consulted. They are intended to be taken without water, examples are Feldene Melts or Zoton FasTab.

Administration of orodispersible tablets

The administration of these formulations via enteral feeding tubes varies depending on the medicine concerned. The formulations and dose equivalences vary depending on the intended site of absorption, for example, Zoton FasTabs are enteric-coated microgranules that, although they disintegrate easily in a small amount of water, may block a very fine-bore enteral feeding tube. Also, the dose may be inappropriate; for example, Zelaper is a lower dose than the equivalent oral product of selegiline. Individual monographs should be consulted. If the formulation is suitable for administration via an enteral feeding tube, the same method as for dispersible tablets can be used; see individual drug monographs for more details.

Advantages

- Convenient to carry around.
- Cost.

Disadvantages

- Unsuitability of some formulations for fine-bore tubes owing to site of absorption or formulation characteristics.

Buccal/sublingual tablets

Medicines formulated into buccal or sublingual tablets are designed to be absorbed through the oral mucosa and therefore bypass the first-pass metabolism effects of the liver. These formulations are a useful alternative for patients who are 'NBM' or are unable to swallow, providing the patient is able to produce normal quantities of saliva (caution is needed in head and neck surgery patients). However, they are not suitable for administration via enteral feeding tubes as significantly reduced drug absorption will occur, owing to first-pass metabolism.

Compressed tablets

Ordinary-release tablets are usually made by one of two methods: either direct compression or wet granulation. Compression pressures are usually higher for tablets made directly from drug powder and bulking agent compared to those used in producing

tablets formulated from granules. A variation in the excipients used in the tablet formulation will affect the disintegration time of the tablet when it is placed in water.

(See individual monographs for information on disintegration times.)

When a tablet formulated by wet granulation is placed in water, it will usually disintegrate to give visible granules before deaggregating to give primary drug particles. A large proportion of ordinary-release tablets will disperse sufficiently in water to be suitable for administration via an enteral feeding tube, without the need for crushing.

Advantages

- Cheap.
- Easily obtained.
- Most disintegrate easily when placed in water.
- No need to crush, therefore exposure risk is reduced.

Disadvantages

- Not all tablets will disintegrate easily.
- Variability in dispersion characteristics between generic brands of the same drug.
- Administration method can affect dosing accuracy.

Administration of compressed tablets

There are several methods of administering compressed tablets.

Tablets that disintegrate

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water (see Chapter 3).
3. Check the relevant monograph – can the drug be administered with feed, or should a specific time interval be allowed before administering the drug?
4. Select an appropriate size and type of syringe.
5. Remove the plunger and place the tablet into the barrel of the syringe.
6. Draw 10 mL of water into the syringe and allow the tablet to disintegrate, shaking as necessary (larger volumes may be necessary for some bulky tablets; see individual monographs).
7. Inspect the syringe contents to ensure that there are no large visible particles that might block the tube.
8. Flush the medication dose down the enteral feeding tube.
9. Draw an equal volume of water into the syringe and flush this via the enteral feeding tube; this will rinse the syringe and ensure that the total dose is administered.
10. Finally, flush with the recommended volume of water (see Chapter 3).
11. Re-start the feed, unless a specific time interval is needed following the administration of the drug.

Alternatively, at step (4) place the tablet into a medicine pot and add 10 mL of water (larger volumes may be necessary for some tablets; see individual monographs) and allow the tablet to disintegrate. Draw this into the syringe. Ensure that the measure is rinsed and that this rinsing water is administered via the enteral feeding tube to ensure that the total dose is given.

- Both of the above methods have advantages: Allowing the tablet to disintegrate in a small container allows the patient carer to inspect the dispersion and any particles will be visible when drawn into a syringe; however, there is a risk that some of the dose may be left in the container if it is not rinsed adequately.
- Allowing the tablet to disperse directly in the syringe ensures that the whole dose is given, within a closed system. Particles may not be visible owing to the cloudiness of the dispersion, but using a larger volume for dispersal will usually overcome this problem.

Tablets that do not disintegrate

Several devices are available for crushing tablets. Crushing of tablets should always be considered a last resort because of its effect on dosing accuracy, plus the patient or carer is at risk of exposure to drug powder (see Chapter 8 on health and safety and clinical risk management). There are also legal implications that must be considered (see Chapter 7 on the unlicensed use of medications).

Using a mortar and pestle

NB: This has been demonstrated to reduce dose delivered by 25% through loss of drug on transfer.[2]

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water (see Chapter 3).
3. Check the relevant monograph – can the drug be administered with feed, or should a specific time interval be allowed before administering the drug?
4. Ensure that suitable protective clothing is worn.
5. Place the tablet(s) in the mortar.
6. Crush the tablet(s) to a fine powder, making sure that the powder is contained in the mortar.
7. Add 5 mL of water and crush further to form a paste.
8. Add a further 5–10 mL of water and continue to crush and mix the paste; this should form a fine suspension. Ensure that there are no visible pieces of coating or large tablet particles.
9. Draw this suspension into an appropriate size and type of syringe and administer via the enteral feeding tube.
10. A further 10–20 mL of water should be added to the mortar and stirred with the pestle to ensure that any drug remaining in the mortar or on the pestle is mixed with the water.

11. Draw this water into the syringe and flush it down the enteral feeding tube. This can be repeated to ensure that all the powder is administered.
12. The tube should then be finally flushed with water to ensure that the whole dose is administered (see Chapter 3).
13. Re-start the feed, unless a specific time interval is needed following the administration of the drug.

NB: Care should be taken when using this method in fluid-restricted patients.
The pestle and mortar should be thoroughly cleaned with hot soapy water after each use to avoid cross-contamination.

Using a crushing syringe

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water (see Chapter 3).
3. Check the relevant monograph – can the drug be administered with feed, or should a specific time interval be allowed before administering the drug?
4. Place the tablet in the barrel of the crushing syringe and push the plunger down.
5. Put the cap on the crushing syringe and rotate the barrel of the syringe to crush the tablet.
6. Remove the cap and draw 10–15 mL of water into the crushing syringe.
7. Replace the cap and shake the syringe to ensure that the powder is mixed well.
8. Inspect the syringe contents to ensure that there are no large particles that might block the tube.
9. Flush this suspension down the enteral feeding tube.
10. Draw a further 10–30 mL of water into the crushing syringe and shake before flushing down the enteral feeding tube; this will ensure that the whole dose is given.
11. Finally, flush with the recommended volume of water (see Chapter 3).
12. Re-start the feed, unless a specific time interval is needed following the administration of the drug.

This closed system is preferred for cytotoxics or hormones for which no liquid formulation is available, so as to avoid environmental contamination and exposure of a carer to the medicine.

Modified-release tablets

Modified-release tablets are formulated to release the drug slowly over time. As a rule these are not suitable for administration via enteral feeding tubes because altering the dosage form, for example by crushing, will affect the pharmacokinetic profile of the drug and may result in excessive peak plasma concentrations and side-effects.

Hard gelatin capsules

Some hard gelatin capsules can be opened and the powder mixed with water. There are a number of considerations, including the risk of inhaling powder.

Most capsules are too small to be manipulated and opened, and this should be taken into consideration with elderly or arthritic patients. Some capsules contain granules rather than powder.

Administration of hard gelatin capsules

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water (see Chapter 3).
3. Check the relevant monograph – can the drug be administered with feed, or should a specific time interval be allowed before administering the drug?
4. Open the capsule and pour the contents into a medicine pot.
5. Add 15 mL of water.
6. Stir to disperse the powder.
7. Draw into an appropriate size and type of syringe and administer via the enteral feeding tube.
8. Add a further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
9. Draw up this dispersion and flush it down the tube. This will ensure that the whole dose is given.
10. Flush the enteral feeding tube with the recommended volume of water (see Chapter 3).
11. Re-start the feed, unless a specific time interval is needed following the administration of the drug.

Advantages

- Cheap.
- Convenient.

Disadvantages

- Occupational exposure risk.
- Small capsules may be difficult to open.
- Not all capsules are suitable; the contents may not disperse in water owing to the hygrophobic or hydrostatic nature of the powder.

Soft gelatin capsules

Drugs that are presented in soft gelatin capsules are usually poorly soluble in water and are therefore contained in an oily solution within the capsule; an example is ciclosporin in Neoral. Therefore, it is unlikely that these will be suitable for administration via an enteral feeding tube.

In certain circumstances it may be possible to pierce the capsule shell using a pin and squeeze out the contents (for example the contents of a nifedipine capsule for sublingual use); however, accurate dosing cannot be guaranteed. The volume contained in the capsule can vary depending on the brand of capsule used, and the volume expelled

will vary depending on the skill of the person expelling the contents; for these reasons this method is unreliable and is not recommended.

Enteric-coated tablets

Tablets are given an enteric coating to protect the drug from degradation by the acidic conditions of the stomach or to reduce the incidence of gastric side-effects.

Crushing enteric-coated tablets and administering them via feeding tubes is highly likely to cause tube blockage.

Administering enteric-coated tablets via an enteral feeding tube with the tip placed in the stomach would necessitate crushing or removing the enteric coat prior to administration; therefore, the drug is likely to be degraded in the stomach. The extent of drug degradation is unpredictable and the practitioner should explore alternative therapies or routes before deciding to administer enteric-coated tables via an enteral feeding tube placed in the stomach. If it is decided to administer the drug by this method, the above techniques are applicable but will result in decreased amounts of drug available for absorption and the patient's response to therapy should be monitored carefully. If the patient has a feeding tube with the end in the small intestine (duodenum or jejunum), then crushing or removing the enteric coat prior to administration down the enteral feeding tube is not an issue.

Injectable formulations

Injections vary widely in their suitability for administration via enteral feeding tubes. The injectable formulation may be a different salt form from the oral formulation and therefore the oral bioavailability may be unknown. The pH of injections can also vary widely, making some unsuitable for enteral administration (see Chapter 7). Refer to the individual monographs for information about the appropriateness of different injections for use via an enteral feeding tube.

Advantages

- The drug is in a soluble form.

Disadvantages

- Variable salts.
- Cost.
- Inherent risks of supplying injectable preparation intended for oral/enteral use.

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Further reading

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7
The legal and professional consequences of administering drugs via enteral feeding tubes

David Wright

Key Points

- Understand the legal implications of manipulating a drug formulation prior to administration.
- Be aware of relevant national guidelines.
- Be aware of relevant local protocols.

When considering the practical and clinical issues associated with the administration of drugs via enteral feeding tubes, the healthcare professional should be aware of legal and professional consequences of altering a drug's formulation prior to administration and the administration of drugs via an unlicensed route. The aim of this chapter is to consider the legal and professional frameworks that govern the practice of healthcare professionals and to relate these specifically to the administration of drugs via enteral feeding tubes. It is appropriate at this point to state that providing the healthcare professional is acting in the patient's best interest, following locally agreed protocols and effecting evidence based practice, it is unlikely that any legal or ethical frameworks will be infringed.

The law and ethics that govern the activities of a healthcare professional are provided in Table 7.1. An activity that transgresses one aspect in Table 7.1 will frequently transgress others and may result in more than one action being taken against the professional. If a pharmacist's action results in serious patient harm or death, then they could find themselves in a court of law to answer a criminal charge, in front of the General Pharmaceutical Council's (GPhC) disciplinary committee, and appropriately sanctioned by their employer. Furthermore, the patient or a relative could take out a civil case in order to obtain compensation for the damage or harm caused.

Table 7.1 Different types of law and ethics that govern healthcare professionals

Type	Description	Relevant standards
Criminal law	Legislation that is used by the state to enforce behaviour; i.e. it is legislation that if contravened generally results in the state becoming the prosecutor and a defendant, if found guilty, receiving either imprisonment, community penalty or a fine.	Medicines Act 1968 Misuse of Drugs Act 1972 Data Protection Act 1984
Civil law	Legislation that is used to dispute settlements; i.e. it is used to claim for damages. The claimant is the person or body who has been 'harmed' and the defendant is the person or body who has to prove that they were not liable for the harm caused. The outcome of a successful civil case may be payment of damages by the defendant or an injunction against them.	Applicable to all instances that involve patient care. If you are an employer you may also be liable for any harm that may come to your staff while they are in your employment.
Administrative law	This applies where legislation is devolved from parliament to public bodies to allow them to regulate certain activities. Unlike criminal and civil law, contravention of administrative law will not generally result in a court hearing. It will be dealt with using appropriate mechanisms by the public body and may result in a penalty being imposed, e.g. removal of a care home licence.	The Care Quality Commission (CQC)
Ethics	The principles that are accepted in any profession as the basis for proper behaviour. Transgression of the 'ethics' of the profession may ultimately result in the removal of the individual's right to practice.	Nursing and Midwifery Council Code of Professional Conduct, 1 April 2008 RPSGB Code of Ethics

To place the legal and professional issues surrounding administration of drugs via enteral feed tubes in context, a fictitious scenario is provided in Case Study 7.1 and this will be referred to throughout the chapter.

Case Study 7.1

Mr J.M., 78 years old, has returned to a nursing home from hospital with a PEG tube.

The discharge note states that the medication is as follows:

- Digoxin 62.5 micrograms in the morning
- Zopicone 7.5 mg at night
- Warfarin 5 mg in the morning
- Felodipine 5 mg in the morning

There was no guidance provided in the discharge letter as to how to administer these medicines via the PEG tube. The GP prescribes all of the medicines as tablets or capsules and the nurse, therefore, has to crush or open them all and mix with water before placing them into the tube.

Criminal law

The Medicines Act 1968 governs the supply and administration of all drugs in the UK. The vast majority of drugs prescribed in the UK are 'authorised for marketing' (licensed), under the Medicines Act.[1] A pharmaceutical manufacturer can market the drug solely for the indication for which it has been tested. To remain within the marketing authorisation, the drug must be given to the patient in the authorised form, within the authorised dose range and not to a patient with a condition for which the drug has not been tested for safety by the manufacturer. Frequently drugs are not authorised for use in pregnant women or children, not because they are necessarily unsafe but because the manufacturer chooses not to test the drug in these populations.

Administration of drugs via enteral feeding tubes will generally be outside of the marketing authorisation as manufacturers do not tend to test or license drugs to be administered via this route. It could be argued that by circumventing the oral mucosa, the oesophagus in the case of PEGs and additionally the stomach in the case of PEJs, the bioavailability of the drug may be significantly altered. Furthermore, there is limited evidence demonstrating that drug is lost on the tube itself and this again will affect the effectiveness of the therapy.[2]

The crushing of tablets and opening of capsules prior to administration (which in some circumstances is the only option available for administration via this route) will, in the majority of cases, also place the administration outside of the drug's marketing authorisation. This action will alter the release profile of the drug (to a greater or lesser extent depending on the original formulation) and it is this that is perhaps more likely to cause harm to the patient if not fully considered before being undertaken.

The Medicines Act states that without an appropriate marketing authorisation it is unlawful for any person to sell or supply a medicine in the UK. Doctors, dentists and veterinarians, however, are exempted by the act from this requirement and can request that unauthorised medicines be administered to their patients.[1] If this were not the

case, it would be impossible for standard treatments to be tested or used in unusual situations or for pre-marketing authorisation clinical trials to take place.

In the case study provided, in prescribing drugs for administration via a PEG tube the doctor is within the law by authorising an unlicensed use of a medication. It is important to note, however, that if the nurse had chosen to crush the tablets without the doctor's prior consent, i.e. if the doctor was unaware of the newly sited PEG tube and prescribed solid dose formulations inadvertently, then the nurse's actions would have been unlawful as nurses are presently not allowed to authorise the use of drugs outside of their marketing authority. Although it is common for nurses to seek advice from other healthcare professionals before undertaking this action, and such actions are completely appropriate, it must also be recognised that healthcare professionals other than doctors or dentists, e.g. pharmacists, cannot authorise such actions under the Medicines Act 1968.

If the nurse's actions were unlawful, in practice it is unlikely that this would be identified or acted upon unless the patient is actually harmed. In such instances, although the transgression of the Medicines Act would be helpful in demonstrating that the person's actions fell below that of a competent professional in a civil case and could be used by the professional body in deciding on its punishment (both discussed later), in itself it would probably be deemed a lesser offence.

Perhaps the greatest concern for any healthcare professional is the likelihood of their actions causing harm and ultimately resulting in a criminal record. For criminal law cases to be successful, the prosecutor would need to prove 'beyond reasonable doubt' that any harm seen was due to the healthcare professional's actions, i.e. in this case drug being crushed prior to administration or drug being inappropriately administered via an enteral feeding tube.

It might be difficult for a prosecutor to argue that a side-effect was a direct result of crushing when the side-effect is an expected occurrence in a percentage of patients receiving the drug in its licensed state. Similarly, it would be difficult for a prosecutor to prove 'beyond reasonable doubt' that the drug had been ineffective owing to the administration via the enteral feeding tube or to crushing, as it is a normal expectation that drugs are ineffective in a proportion of all patients.

Civil law

Providing the healthcare professional uses the drug exactly as the marketing authorisation states, the liability in any civil case will usually lie with the manufacturer. If a drug is tampered with prior to administration in a way that is not outlined in the marketing authorisation or is administered by an untested route, the administering person will be giving an 'unauthorised drug'. Liability would lie with the doctor, with the pharmacist if they are aware of the method of administration when supplying, and with the nurse or carer administering the drug. If the doctor and administrator had received advice from a third party on the unlicensed administration, then the third party, such as a medicines information unit, would also be partially liable.

In the case scenario provided, there are many reasons for questioning the appropriateness of administration of drugs via this route and whether crushing of drugs is the most appropriate action. Administration of warfarin with enteral feeds can result in a significant reduction in the amount of drug absorbed and hence a reduced clinical effect.[3] Some zopiclone formulations form a gelatinous mass when mixed with water and may block the enteral feeding tube. Crushing of felodipine, which is a slow-release formulation, may result in J.M. receiving a larger than expected dose initially and subsequently a period of time with no drug in the body. Digoxin has a small therapeutic window and therefore adsorption onto the PEG tube may also alter its clinical effectiveness.

In order for a civil case to be successful, the defendant must be proven to have been negligent. This would require the claimant/plaintiff proving that the defendant had a duty of care to them; that duty of care would need to have been breached; and they would have to provide evidence that they had been damaged as a result of the negligent action. Although all three criteria must be met for a civil case to be successful, unlike in criminal law where a case must be proven 'beyond reasonable doubt', within civil law the case would need to be proven only on the 'balance of probabilities'.

The doctor, the pharmacist and the carer all have a duty of care to J.M. with regard to his drug regimen and it would be more likely that any harm that ensued could be proven 'on the balance of probabilities'.

In order to prove that the duty of care had been breached, the actions of the defendant would be compared with those of a reasonably competent person undertaking a similar role. Consequently, it is worth considering what a 'competent' healthcare professional might do in this situation.

Owing to the relatively frequent nature of this problem, a nurse or at least his or her employer might also introduce a protocol for all staff to follow, thus standardising the approach and level of care. However, blindly following a protocol does not necessarily protect healthcare professionals from liability[4] and all protocols must be up-to-date and based on expert evidence.[5]

It can probably be assumed that a 'competent' nurse would first check with a suitable information source as to the best approach for administering drugs via this route and it would be appropriate for the nurse to clarify either with the hospital ward or the hospital pharmacy department from which J.M. was discharged how these medicines were being administered on the ward. If they were unsure about the appropriateness of the described actions or were unable to obtain the information from the hospital in time, then telephoning a medicines information department would be a suitable alternative.

The nurse's actions and the information received from the reference source(s) used would be documented in the patient's care plan. If the advice had been against crushing tablets and the general practitioner had asked for this action to take place, then a competent nurse would provide this information to the prescriber.

The issue whether patient consent had been obtained prior to the administration of the unlicensed medication might also be taken into account when considering the

appropriateness of the nurse's actions. In order to minimise liability it is believed to be appropriate when administering unlicensed medicines also to 'tell the person (*patient*) about the risks involved and obtain their consent'.[5]

In summary, therefore, a competent nurse administering drugs to a patient via an enteral feeding tube would be working to an up-to-date protocol, would obtain appropriate guidance, would record their actions and the guidance received, would discuss this with the prescriber, would obtain patient consent, and would then undertake the administration.

If, following the above procedure, J.M. was subsequently harmed by his medication, it might be reasonable to assume that the liability would lie solely with the person authorising the drug administration, i.e. the doctor. There are, however, judgements, that show that this may not be the case.

In *Gold v. Essex County Council* (1942)[6] the judge stated that 'if a doctor ordered an obviously incorrect and dangerous dosage of a drug a nurse who administered it without obtaining confirmation from a doctor or higher authority might well be found to be negligent'. Furthermore, if the nurse, after confirmation with a higher authority, is still unhappy he or she should refuse to administer any order that is 'manifestly wrong'.[7]

These judgements clearly demonstrate the need for the administrator not to simply accept directions from a doctor, but to question them if unsure and to obtain independent clarification if they are still not happy with what they are being asked to do.

Similarly, the judgements made with respect to nurses could equally be applied to pharmacists when deciding whether or not to supply medication. If the pharmacist believes that administering the drugs according to the doctor's instructions is inappropriate, then there is an opportunity for them to utilise their professional discretion and refuse the supply. In supplying the medication in full knowledge of its intended use, the pharmacist is perhaps accepting a greater share of the liability than the nurse in administering the drug, as they would be deemed to have greater professional competence in this cognitive domain.

In both instances, if the nurse refuses to administer or the pharmacist refuses to supply, they must remember that they still have a duty of care to the patient and should undertake every action possible to resolve the situation and enable appropriate treatment of the patient. Therefore, it is inappropriate simply to refuse to administer or supply. This action should be reserved as a last resort when the healthcare professional feels on balance of all the available evidence that the drug would cause more harm to the patient if administered via the prescriber's intended route/method than if not given.

Administrative law

The body that has been empowered to regulate care in care homes is the Care Quality Commission (CQC) (previously National Care Standards Commission (NCSC)) and in

2002 national minimum standards were published.[8] The standards relevant to this case study would mainly be 9.1 and 9.4.

Standard 9.1 states that

> The registered person ensures that there is a policy and staff adhere to procedures for the receipt, storage, handling, administration and disposal of medicines …

The design of a protocol for the administration of medicines to patients with swallowing difficulties would demonstrate clear adherence to the CQC guidelines and, providing J.M.'s carer was seen to follow this, there would be no reason for the CQC to become involved in any dispute that followed.

If the home did not have a protocol, or there was evidence that any protocol was not adhered to by the carer, then CQC would start to consider the quality of care provided within the home.

Standard 9.4 states that

> Medicines in the custody of the home are handled according to the requirements of the Medicines Act 1968, guidelines from the Royal Pharmaceutical Society (RPSGB), … and nursing staff abide by the Nursing and Midwifery Council (NMC) standards for the administration of medicines.

The Medicines Act has already been discussed and the NMC standards will be covered when considering professional standards. With respect to crushing of medicines, the RPSGB 'strongly recommends that advice on the storage and administration of medicines should be sought from a community pharmacist, preferably the pharmacist that supplies the home' and has informed pharmacists that 'if a formulation is tampered with then the product will be unlicensed. Pharmacists must consider and advise on the potential for distortion in the bioavailability profile of the medicine and whether there is a need for reduction or increase in the dose and how or whether this can be quantified'. Furthermore, 'pharmacists must consider whether alternative licensed products are available, such as the same drug with a different formulation or a different drug for the same indication'.[9]

In the scenario provided, it would be difficult for a pharmacist to identify other 'licensed' products. Even if a licensed liquid formulation were available as an alternative to crushing tablets, its administration via a PEG or PEJ tube would usually be unlicensed. With little quantitative evidence available to determine whether the liquid formulation or crushed tablet would be better for the patient via this route, the pharmacist would need to identify which option was believed to demonstrate best professional practice.

It would be reasonable for the nurse in this instance to ring the local medicines information department. Although the supplying pharmacist will be able to identify which medicines have special coatings and what alternative formulations are available, they would be less likely to be able to provide specialised advice on administration of medicines by PEG tubes.

Professional standards

The NMC is the responsible body in the UK for reinforcing the standards that nurses are expected to meet and these are broadly outlined in its *The Code: Standards of conduct, performance and ethics for nurses and midwives* published in April 2008.[10] Statements such as 1.3, 'You are personally accountable for your practice. This means that you are answerable for your actions and omissions, regardless of advice or directions from another professional', and 8.1, 'You must work with other members of the team to promote health care environments which are conducive to safe, therapeutic and ethical practice', are relevant in this situation. However, the standards found within 'Guidance for the administration of medicines' that came into effect on 1 June 2002 are perhaps the most pertinent.[11] These start with the guidance:

> The administration of medicines is an important aspect of the professional practice of persons whose names are on the council's register. It is not solely a mechanistic task to be performed in strict compliance with the written prescription of a medical practitioner. It requires thought and exercise of professional judgement.

It would therefore be unprofessional for J.M.'s nurse to accept any direction from a prescriber to crush medication or place it down a PEG tube without first questioning the appropriateness of both of these actions.

Within the principles for the administration of medicines, a nurse is also required to have 'considered the dosage, method of administration, route and timing of the administration in the context of the condition of the patient and co-existing therapies'.

Blind administration of medication via a PEG tube, which may require crushing and mixing with water beforehand, may not only result in a civil case, and close consideration of practices within the home by the CQC, it may also result in the NMC considering the professionalism of the nurse.

Conclusion

This case study demonstrates the need for a good awareness of both professional and legislative guidance with respect to administration of medicines.

For J.M.'s nurse to act both professionally and competently, he or she would need to do the following:

- Ideally work to a protocol written specifically for the administration of medicines outside of their marketing authorisation.
- Seek advice from a pharmacist (preferably working within a medicines information service) on the alternative options available (liquids, alternative routes) and the clinical consequences of crushing and placing medicines down a PEG tube.
- Obtain consent from the patient.
- Record all actions.
- Obtain authorisation, preferably written, from the prescriber if it is decided to administer a medicine outside of its marketing authorisation.

For the pharmacist to act both professionally and competently, they would need to ensure the following:

- That the advice they provided was based on the most up-to-date evidence.
- That the increased risk of harm that would result from administering medicines outside of their marketing authorisation was minimised and justifiable in terms of the potential clinical benefits.

In an ideal world the nurse would have prepared for the meeting with the prescriber in order to have all of the options and relevant information available for this patient at hand and would have obtained this information from an appropriate pharmacist. If the prescriber insisted that the medicines be crushed prior to administration via the PEG tube, it might well be appropriate in this instance for J.M.'s nurse to refuse such a request as it would not be in the patient's best interests and they would not want to be responsible for any harm that ensued.

If the supplying pharmacist was aware of the proposed method of administration and had any concerns regarding its appropriateness, they should also use their professional discretion to refuse the supply. Furthermore, obtaining written authorisation for such action from the prescriber and blindly following it would not be deemed to be professional and would not reduce the level of responsibility that would be attributed to the pharmacist, nurse or carer in a civil court of law.

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8
Health and safety and clinical risk management

Rebecca White

Key Points

- Ensure that organisational medicines policy contains specific information relating to safe administration of liquid medicines and medication administration via feeding tubes. (See www.npsa.gov.uk.)
- Use oral or enteral dispensers when administering medicines intended for the oral route or via an enteral feeding tube.
- Used closed-system crushing syringes for hazardous medicines such as cytotoxic drugs or hormones to protect the healthcare professional or carer from exposure.
- Do not crush modified-release formulations; use alternative formulations of drugs with the same therapeutic effect.
- Identify patients who are having medications administered via the enteral feeding tube that may interact with the enteral feed and design a regimen to limit or eliminate such interactions.
- Do not add drugs to the enteral feed bottle/bag.

Wrong-route errors

There have been numerous case reports in the literature of inadvertent parenteral administration of medication intended to be given orally.[1,2] All of these were direct results of the medication being drawn into a syringe with a connector compatible with i.v. devices. A number of these report serious clinical consequences [3] and even fatalities.[4]

Where possible, medicine pots and medicine spoons should be used to measure liquid medicines for oral administration, and specific oral or enteral syringes or dispensers should be used when the degree of accuracy warrants this. Oral or enteral syringes or dispensers should be used to draw up and administer liquid oral medication doses for administration via an enteral feeding tube. Specifically designed oral and enteral syringes and dispensers are available to enable this to be done safely. Ward managers should ensure that these devices are available on the ward to facilitate administration. Where practical, pharmacists should ensure that these devices are dispensed with medication intended for administration via an enteral feeding tube.

The National Patient Safety Agency (NPSA) *Patient Safety Alert No. 19*[5] made specific recommendations concerning the prevention of wrong-route errors with oral and enteral medicines, feeds and flushes. Manufacturers were required to produce compliant enteral feeding tubes, administration sets and other devices. Measures are currently under way to design route-specific connectors and to standardise tube connectors across manufacturers; however, until this is implemented healthcare providers should endeavour to make purchasing decisions based on best practice. Steps should be taken to ensure that different devices are used for enteral and parenteral administration and that oral or enteral dispensers or syringes are used to draw up medicines and flushes for oral or enteral administration.

Specific recommendations include the following:

- Only oral, enteral or catheter-tip syringes (that are not compatible with i.v. and other parenteral devices) must be used to administer oral enteral medicines, feeds and flushes to patients. (See Chapter 9.)
- Ports on nasogastric and enteral feeding tubes through which medicines, feeds or flushes are administered, or which may be used for aspiration, must be male Luer, catheter or other non-female Luer in design.
- Three-way taps and adaptors that connect with parenteral devices must not be used.
- All healthcare organisations should include procedures for preparation and administration of oral enteral medicines, feeds and flushes in their organisation's medicines policies, and these should be reflected in the organisation's training programmes and competence assessment.

Dosing accuracy

Dose form modification carries a risk of inaccurate dosing through loss of drug on transfer between equipment used to prepare the dose. A medicine straw or similar device should be used minimise any risk of overdosage due to the dead space in the tip of the enteral syringe. This is of significant concern for doses less than 0.5 mL. It has been demonstrated that tablet dissolution in the barrel of a syringe provides 100% dosing and that crushing in a pestle and mortar and transferring into a syringe delivers only 74% of the dose.[6]

A large observational study in Australia[7] evaluated the data from 1207 observation episodes of medication administration rounds in aged-care facilities; 408 (34%) of these

involved alteration of the medication either by crushing tablets or opening capsules. In 61% of instances the altered medication was crushed together in one vessel. Where shared equipment such as pestles and mortars were used these were not cleaned between administration episodes in 59% of cases. In 70% of cases there was evidence of spillage or loss of dose. This highlights the perils of allowing dosage form modification at ward level.

Occupational exposure

Crushing tablets in open containers such as mortars or medicine pots, or opening capsules to obtain the drug powder contained within, will increase the risks of inhalation by the operator. This could potentially lead to sensitisation, allergies, absorption and possible adverse effects. There is also a danger at ward level of exposure of other staff and patients to drug powder resulting from such manipulations. If these operations must be undertaken they should be performed in a room with a closed door and traffic through the room should be limited during the manipulation. It is essential that benches and equipment are thoroughly cleaned following such manipulations to remove any drug residues and to ensure the safety of others. Contamination of the crushing device can have serious consequences if these traces are not removed by cleaning, this was highlighted in a case report of serious anaphylaxis caused by penicillin contamination of a dose by using an unwashed pestle and mortar.[8]

Under the Control of Substances Hazardous to Health Regulations (COSHH)[9] every employer must provide employees with information, instruction and training to ensure that the employee knows the risks created by exposure to substances hazardous to health and the precautions that should be taken. Employers should also provide the necessary equipment to protect the employee from exposure due to necessary manipulation.

Medicines such as corticosteroids, hormones, antibiotics, immunosuppressants, cytotoxics and phenothiazines are irritant or very potent and extra precautions should be taken when handing these medicines. Exposure to such substances is highly dangerous; therefore, contact with the skin and inhalation of dust should be avoided,[10] and protective equipment devices should be used, e.g. crushing syringes.

Crushing inappropriate formulations

Crushing tablets in order to administer them via an enteral feeding tube not only increases the incidence of tube occlusion but also increases the risks of adverse effects. There are many modified-release formulations that are marketed for their once-daily convenience. Crushing these tablets and administering them via enteral feeding tubes can have fatal consequences when the entire daily dose is administered as an immediate-release bolus.[11] Wherever possible, the healthcare professional should consider an alternative formulation of the same drug or a different drug that can be administered via an enteral feeding tube that has the same therapeutic effect.

Minimising interactions

Enteral feeds can have a significant effect on the absorption of medication, particularly if they are administered concurrently via an enteral feeding tube. However, in order for the pharmacist to be in a position to intervene and advise, it must be evident that the medication is being administered via the enteral feeding tube – therefore it must be prescribed correctly.

A number of institutions have developed systems to identify patients receiving their medication via enteral feeding tubes, for example coloured sticker systems to alert nurses to the drugs that have significant interactions with food and enteral feed.[12] Many members of the healthcare team, especially pharmacists[13] and dietitians,[14] are in a position to raise the awareness of potential drug–nutrient interactions. However, it is equally important to empower the patient and carer, and information is now available to support patients and their GPs.[15]

Under no circumstances should drugs be added to the enteral feed bottle/bag. If the feed were to stop or the full volume were not to be delivered, the patient would not receive the prescribed dose of medication, which could have clinically significant consequences.

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9
Syringes and ports

Rebecca White

Key Points

- Ensure that drugs are administered using the correct type of syringe.
- Do not use syringes compatible with parenteral devices for the administration of enteral drugs.
- Choose the appropriate size of syringe to accurately measure the drug concerned.
- Enteral tube syringe design will be changing in 2015/16 in line with the global ISO standard for enteral devices. Further information can be found at www.stayconnected2014.com.

Syringe/dispenser types recommended for enteral drug administration

Oral

- The tip of the syringe is wider than Luer fit to prevent wrong-route errors.
- Dead-space volume of the tip is approximately 0.05 mL.

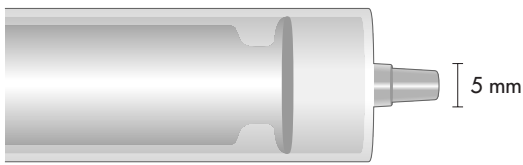

Figure 9.1 Oral syringe

Female Luer/reverse Luer

- The tip of the syringe is designed to connect to a male Luer or male Luer lock ports and devices.
- Dead-space volume of the tip is approximately 0.05–0.15 mL.

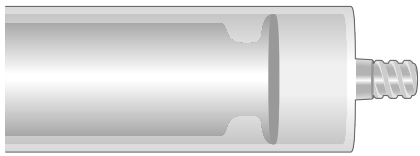

Figure 9.2 Female Luer/reverse Luer syringe

Catheter

- The tip is designed to fit catheters and catheter ports and devices.
- Dead-space volume is approximately 1–1.5 mL.

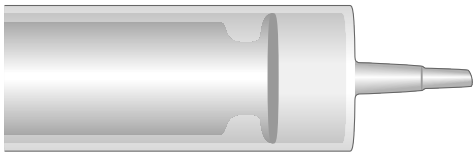

Figure 9.3 Catheter-tipped syringe

Syringe types not recommended for medication administration

Male Luer and Luer lock

- Male Luer and the tip is designed to fit female ports and devices (parenteral devices).
- Dead-space volume of the tip is approximately 0.05 mL.

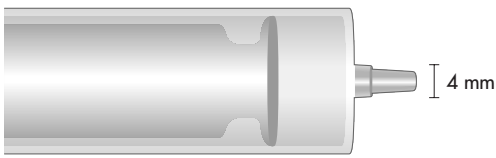

Figure 9.4 Male Luer syringe

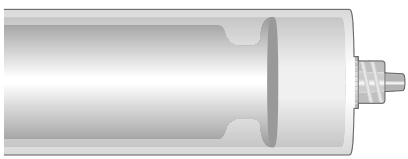

Figure 9.5 Male Luer lock syringe

Ports recommended for enteral devices

Male Luer port

Figure 9.6 Male Luer port

Catheter port

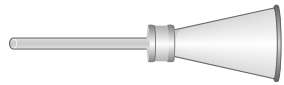

Figure 9.7 Catheter port

Oral port

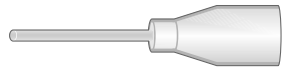

Figure 9.8 Oral port

Ports not recommended for enteral devices

Female Luer

Figure 9.9 Female Luer

Female locking port

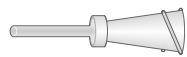

Figure 9.10 Female locking port

Syringe size

The major concerns relating to the size of syringe used are tube fracture and potential damage to local tissues on flushing, and vacuum and the potential damage to tissues on aspiration.

Flushing and administration of medicines

Large syringes will create a lower pressure than smaller syringes; however, the volume in very small syringes (0.5–2 mL) is insufficient to create high enough pressures in the feeding tube because of the internal volume of the tube itself.

Aspiration

Smaller syringes create a lower vacuum pressure than larger syringes; therefore, for aspiration a smaller syringe size is preferable.

Specific manufacturer recommendations

Merck Gastroenterology recommend that care be exercised when using syringes smaller than 50 mL as this can create a pressure greater than the bursting pressure of 80 psi (550 kilopascals). However, they will still permit smaller syringes to be used especially for the administration of small quantities of medicines. This applies to the entire range above. No minimum syringe sizes are set for PEGs or balloon gastrostomies.

Novartis Consumer Health recommend the use of a 20–50 mL syringe for flushing and feed administration. Under no circumstances should syringes less than 5 mL be used for attempting to clear an occluded tube.

Vygon UK do not recommend specific syringe sizes for administration of feeds and medication through enteral feeding tubes; for delivery of medication, select the biggest that can be used while maintaining the accuracy necessary for measurement of the dose. In general, it is suggested that no undue force should be used either to flush or administer any feed, medication or flush. If a tube runs freely it is virtually impossible to deliver sufficient force to cause the tube to burst. If resistance is felt, a gentle push–pull technique should be employed to overcome the blockage. If this is not successful, further clinical advice should be sought. Some drugs are recognised as causing tube blockage, for example granular formulations. If this type of medication is administered through an enteral feeding tube, flushing procedures need to be rigorously enforced and any resistance must result in immediate cessation of the delivery until the blockage can be cleared.

10
Defining interactions

Rebecca White

Key Points

- Drugs can interact with nutritional therapy and nutrients in many ways.
- Steps should be taken to avoid or minimise the effects of significant interactions.
- In the absence of any data, monitor closely for loss of drug effect or increased side-effects.
- The resulting drug and nutrition regimen should be practical and acceptable to the patient/carer.

Introduction

The interrelationship between drugs and nutrients is complex. There are many ways in which drugs and nutrients or nutritional therapy can interact, for example:

- Chemical interaction, binding the drug and reducing its absorption.
- Physical interaction between the drug formulation and the feed formulation, causing a change in the feed consistency and potentially resulting in blockage of the feeding tube.
- Interaction between the drug and a specific nutrient involved in the metabolism of that drug.
- Loss of drug effect due to impaired absorption, increased drug clearance or blocking of pharmacological action.

Effect of drug therapy on nutrient intake

Drug therapy can affect nutrient intake by altering taste, reducing appetite or inducing gastrointestinal (GI) side-effects such as nausea, vomiting, constipation or diarrhoea. These should always be borne in mind when a patient's voluntary nutritional intake changes.[1]

Pharmacokinetic interactions

Interactions between food, feed, nutrients and drugs affect the absorption, distribution, metabolism or elimination of the drug or nutrient.

Factors affecting drug or nutrient absorption

Interactions affecting the absorption of drugs are the most common.

Physiological

The majority of drugs are absorbed via a passive process of diffusion from the gut lumen across the mucosa into the splanchnic circulation. There are a few notable exceptions that utilise existing active transport systems used for nutrients; these include methyldopa and levodopa, whose absorption is decreased by a high-protein diet.[2] The process of passive diffusion is based on contact time and lipophilicity, the latter being influenced by intraluminal pH. Weakly acidic drugs are absorbed from the GI tract at a lower pH because more of the drug is in an unionised form and therefore is more lipophilic; the converse is true for basic drugs.[3] It is unsurprising, therefore, that the absorption of drugs can be increased, decreased or delayed by the physiological affect of food or feed on the GI tract, owing to the ability of food and feeds to alter the pH of the GI tract. Enteral feeds do not have the same effect on gut physiology as food because they are in liquid form and the pH can be very different. Interactions with feed are easier to predict owing to the consistency of the feed compared to a varied diet a patient may eat. Therefore, it cannot be assumed that interactions of this type will be of the same clinical significance for patients on a normal diet or on enteral feeding. Hot food and fatty meals delay gastric emptying to a greater extent than high-protein or carbohydrate meals. This has two principal effects:

- It increases the time the drug spends in the stomach, the time for disintegration and dissolution of the drug is thereby increased and possibly also the degradation of acid-sensitive drugs.
- It delays the time to peak concentrations for drugs absorbed from the small bowel.

However, the combined effect may be to increase the overall absorption of drugs with saturable uptake mechanisms. This delay and reduction in peak plasma concentrations can be beneficial; for example, taking nifedipine with a meal delays and reduces the peak plasma concentrations and subsequently decreases the flushing reaction.

The presence of food or enteral feed in the small bowel increases splanchnic blood flow and this may enhance drug absorption, and may also increase bioavailability owing

to the decreased portal blood flow. This has been purported to be the mechanism by which concentrations of propranolol and metoprolol are higher when it is taken with food compared to dosing in the fasted state.[4] Bile salts released in response to ingestion of fat may promote the absorption of highly lipid-soluble drugs, for example griseofulvin.[5]

Drugs can also affect the absorptive capacity of the GI tract – for example, the diarrhoea caused by colchicine or the effect of metformin on intrinsic factor production, which reduces vitamin B_{12} absorption in 30% of patients – and this side-effects of drugs should always be considered when nutritional intake is being assessed.[6]

Physical interactions

A physical interaction between the drug and a component of the feed or the feed formulation itself may result in a physical change in the consistency of the feed and can result in blockage of enteral feeding tubes or in extreme cases in physical obstruction of the GI tract.

The most commonly reported interaction is that between sucralfate and enteral feed. There is also a potential interaction with the ions in tap water and mineral water (e.g. ciprofloxacin can chelate with such ions),[7] but as yet there have been no publications on the significance of these interactions.

Chemical interactions

There are reported interactions between many drugs and individual components of the diet (e.g. elements such as calcium and iron) which bind to the drug and change its molecular size or solubility and thereby reduce absorption.

- Tetracyclines readily chelate with divalent and trivalent metal cations such as calcium, magnesium and iron – these are present in higher concentrations in enteral feed and milk-based diets than in a normal diet and, therefore, the potential for interaction is greater. Tetracycline absorption is decreased by 80% by co-administration with feed, whereas for doxycycline the reaction is not considered clinically important.
- Ciprofloxacin absorption is decreased 50% by enteral feed; the reaction with levofloxacin and ofloxacin is less significant, and food does not have any effect on the absorption of moxifloxacin.
- The interactions reported with phenytoin[8] and warfarin highlight the potential for a drug to bind to protein in the diet, with a reduction in drug absorption. As yet there are no reports comparing the interaction with whole protein as opposed to amino acid-based feeds.
- Pectin and fibre have also been reported to affect drug absorption. Paracetamol absorption is reduced by pectin, which is present in apples and pears, although the significance is unknown. The absorption of digoxin is reduced by the presence of high amounts of fibre in the diet, but the significance of this is negligible for patients on a normal diet.[9] For drugs such as digoxin with a narrow therapeutic index, close monitoring should be undertaken if major changes in diet occur – for example, a

patient being switched from a high-fibre normal diet to a low-fibre enteral feed – as this potential change in the absorption could cause a rise in the therapeutic level.
- Drugs can also affect nutrient absorption. Antacids containing aluminium or magnesium hydroxide bind to dietary phosphate to form insoluble phosphate salts, which cannot be absorbed. Osteomalacia has been reported secondarily to phosphate depletion due to antacid abuse.

Factors affecting drug distribution

Malnutrition affects drug distribution. A severely malnourished individual will have:

- Reduced plasma proteins for drug binding, increasing the free circulating drug concentrations
- An increase in total body water, increasing the volume of distribution of water-soluble drugs
- Decreased fat stores, decreasing the volume of distribution for fat-soluble drugs
- Reduced microsomal enzyme activity and reduced substrates available for metabolism.[10]

All of these factors should be considered for enterally tube-fed patients. As they are already receiving nutritional support, they could be malnourished and have altered drug distribution characteristics. Only normal-release formulations can be given via the enteral feeding tube, resulting in higher peak plasma concentrations than with modified-release formulations. This could be exacerbated by the potential for decreased protein binding and the altered volume of distribution; for example, higher peak concentrations of nifedipine will lead to more flushing reactions.

Factors affecting drug or nutrient metabolism

The hepatic mixed-function oxidase enzyme system is the predominant pathway by which drugs are metabolised. A low-protein diet has been demonstrated to reduce the function of this enzyme system; by contrast, a high-protein/low-carbohydrate diet has been shown to induce this enzyme system and so significantly enhance the clearance of drugs such as theophylline.[11]

It is known that malnutrition per se reduces the ability to effectively metabolise drugs and increases the incidence of adverse effects.[12]

Drugs can affect the storage, utilisation and excretion of nutrients in a number of ways. The pharmacological activity of a number of drugs is dependent on interaction with a specific nutrient, for example warfarin with vitamin K or methotrexate with folate; also, a substantial number of nutrients are essential co-factors in drug metabolism.

There are reports of significant interactions between drugs and pyridoxine, folate, vitamin D and many other nutrients;[1] these could be both desirable and undesirable.

Grapefruit juice contains a psoralen that inhibits the cytochrome P450 enzyme subfamily, CYP3A. This effect reduces the metabolism of ciclosporin, simvastatin,

terfenadine and calcium-channel blockers (excluding diltiazem and amlodipine), which can cause a clinically significant rise in plasma concentrations.

Changes in the diet can affect gut flora, which in turn can influence the pharmacokinetics of drugs broken down by bacteria in the colon, for example methotrexate.[13] It is predominantly changes in protein source and fibre intake that alter the balance of gut flora.

Monoamine oxidase inhibitors (MAOIs) such as phenelzine enhance the cardiovascular effects of phenylethylamines such as tyramine. Diets that are rich in tyramine-containing foods such as mature cheese, broad bean pods, meat or yeast extracts, or fermented soya bean extract cause hypertension, headaches and palpitations, the scale of the reaction being determined by drug dose and tyramine intake. Dietary advice recommending an intake of less than 5 mg of tyramine per day ensures the safe use of these drugs.[14]

Factors affecting drug or nutrient excretion

The most common group of drugs that affect nutrient excretion are the diuretics. However, there are other drugs that cause an increase in electrolyte excretion: for example, the nephrotoxicity of cisplatin leads to increased magnesium and zinc excretion. Amphotericin is also associated with increased electrolyte excretion.[15]

Physical interaction of drug with delivery device

When administering drugs via an enteral feeding tube, there is the potential for an interaction to occur between the drug and the tubing material. It is therefore important for the healthcare professional to know what type of enteral feeding tube a patient has *in situ* before advice is given or decisions are made as to the appropriateness of using the enteral feeding tube for drug administration.

The apparent loss of carbamazepine suspension during administration through polyvinyl nasogastric tubes was studied *in vitro* to determine whether this effect was reproducible. The investigators demonstrated that administration of undiluted suspension via the tube resulted in a loss of drug dose, whereas a 50% diluted suspension resulted in no drug loss.[16]

Summary

This chapter touches on the complex interactions that can occur between drugs and nutritional therapy. Healthcare professionals should consider such possibilities when reviewing both the nutritional and drug therapy. Because the significance of these interactions is not always clear and patient variation can occur, both clinical knowledge of the patient and technical knowledge of the interaction must be used effectively to monitor the patient's pharmaceutical and nutritional progress. The healthcare team

must understand potential and actual problems that may diminish the therapeutic success on an individual basis.

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5. Welling PG. Influence of food and diet on gastrointestinal drug absorption: a review. *J Pharmacokinet Pharm* 1977; 5: 291–333.
6. Adam JF, Clark JS, Ireland JT, Kesson CM, Watson WS. Malabsorption of vitamin B_{12} and intrinsic factor secretion during biguanide therapy. *Diabetologia* 1983;24: 16–18.
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12. Campbell TC, Hayes JR. Role of nutrition in the drug metabolism enzyme system. *Pharmacol Rev* 1974;26(3): 176.
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15. Boullata JI. Armenti VT eds. *Handbook of Drug-Nutrient Interactions*, Totowa, NJ: Humana Press; 2004.
16. Clark-Schmidt A, Garnett WR, Lowe DR, Karnes HT. Loss of carbamazepine suspension through nasogastric feeding tubes. *Am J Hosp Pharm* 1990;47(9): 2034–2037.

11
Medicines optimisation

Vicky Bradnam

Key Points

- Medicines optimisation should be part of routine practice.
- Medicines optimisation is complex for patients with feeding tubes.
- Medication safety should consider the patient, the carer and any healthcare professionals involved in manipulation and administration.
- The burden of administration via feeding tubes must be taken into consideration and discussed with the patient.
- The *Handbook of Drug Administration via Enteral Feeding Tubes* supports medicines optimisation in practice.

The use of medicines should be evidence based and cost effective; as healthcare professionals we have all been working towards this goal for our patients, but the emphasis has now changed from looking at prescribing data to understanding how we can support our patients with the use of their medicines and to get the best from their medicines.

Medicines optimisation is about ensuring that the right patient gets the right choice of medicine for their condition at the right time. The goal of medicines optimisation is to help the patient to improve their outcomes; to take their medicines correctly; to avoid taking unnecessary medicines; to reduce wastage of medicines and to improve medication safety.

As a healthcare professional, to undertake medicines optimisation we need to adopt the following four principles[1] of good practice:

- To understand the patient experience
- To ensure evidence-based choice of medicines
- To make medicines optimisation part of our routine practice
- To ensure medicines use is as safe as possible.

For patients with enteral feeding tubes, medicines optimisation can be complex as the patient experience will be very different from patients without feeding tubes who can swallow medicines as per the licensed formulation; the choice of medicine needs to consider the method of administration alongside the evidence base. All healthcare professionals dealing with the patient need to consider the route of administration when prescribing medicines; and safety aspects must be considered not only for the patient but also for carers and healthcare staff administering medicines via a feeding tube.

When patients have feeding tubes fitted and medication is required to be administered via the feeding tube, this can add a large burden to the patient, their carer(s) or healthcare staff because of the multiple manipulations and measuring of medicines involved during administration. Medicines optimisation can assist healthcare professionals to understand what is being asked of the patient and to engage the patient in the decisions and choices that can be made around the choice of medication, the formulation to be used or the route of administration available. We must during this process consider if the patient is able to take/use their medicines as we recommend and that they agree to this method of administration, giving patients the confidence to express concerns and discuss issues with healthcare professionals.

The *Handbook of Drug Administration via Enteral Feeding Tubes* is an excellent reference source that can be used by all healthcare professionals during the medicines optimisation process. It provides a comprehensive reference resource, allowing the most appropriate choice of medication for the diagnosed condition, making suitable alternative recommendations where certain medicines cannot be administered via a feeding tube, describing the process that would need to be undertaken by the patient/carer/healthcare professional during administration, and allowing discussion with the patient before the final choice is made to ensure that they can manage their medicines as prescribed.

Reference

1. Royal Pharmaceutical Society. *Medicines Optimisation: Helping Patients to Make the Most of Medicines*. London: Royal Pharmaceutical Society; May 2013.

Abacavir

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Ziagen (ViiV)	Tablet 300 mg	Abacavir (as sulfate). Film-coated tablet.[2] There is no theoretical reason why crushing the tablets would create stability concerns, as long as administration occurred immediately. Furthermore, the ingredients are uniformly distributed throughout the tablet and have not been formulated in a time-dependent matrix.[3]
Ziagen (ViiV)	Oral solution 20 mg/mL	Abacavir (as sulfate). The use of Ziagen oral solution is advised for administration via feeding tubes. Although GSK (now ViiV) have no data to support administration via this route, they are aware of anecdotal reports of patients having been successfully treated in this manner.[4] Contains sorbitol 340 mg/mL.[5]
Kivexa (ViiV) Combined with lamivudine	Tablet 600 mg/300 mg	Film-coated tablet. Contains abacavir (as sulfate) 600 mg and lamivudine 300 mg. No specific data on enteral tube administration. Administer components separately using liquid preparations.
Trizivir (ViiV) Combined with lamivudine and zidovudine	Tablet 300 mg/ 150 mg/300 mg	Film-coated tablet.[4] Contains abacavir (as sulfate) 300 mg, lamivudine 150 mg and zidovudine 300 mg. GSK (now ViiV) have no stability or pharmacokinetic data to support crushing Trizivir tablets. However, there is no theoretical reason why crushing the tablets would create stability concerns, as long as administration occurred immediately. Furthermore, the ingredients are uniformly distributed throughout the tablet and have not been formulated in a time-dependent matrix.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1.5 hours following oral administration for the tablets and 1 hour for the liquid formulation.[2]

Alternative routes available

No alternative route is available for abacavir.

Interactions

Food delays absorption and reduces C_{max} but does not reduce AUC; therefore, abacavir can be taken with or without food.[2] The bioavailability of abacavir has been assessed in the fed and fasted state;[6] although peak plasma concentrations were reduced by 35%, there was no significant difference in total bioavailability. The interaction with food is clinically insignificant.[2,4,5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- The liquid formulation is preferable owing to ease of manipulation.
- Monitor total daily intake of sorbitol.
- No break in feeding is necessary as bioavailability is not significantly affected when the drug is given with food.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into the appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to the jejunal administration of abacavir. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Ziagen 300 mg Tablets (ViiV Healthcare), Summary of Product Characteristics; 21 March 2014.
3. Personal communication, Medical Information Department, GSK (now ViiV); 22 January 2003.
4. Trizivir (ViiV), Summary of Product Characteristics; 25 April 2013.
5. Ziagen Oral Solution (ViiV Healthcare), Summary of Product Characteristics; 21 March 2014.
6. Chittich GE, Gillotin C, McDowell JA, *et al*. Abacavir: absorption, bioavailability, and bioequivalence of three oral formulations, and effect of food. *Pharmacotherapy* 1999; 19: 932–942.

Acamprosate calcium

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Campral EC (Merck Serono)	Tablet 333 mg	Enteric coated preparation. Do **not** crush. Not suitable for enteral tube administration.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Oral bioavailability is low with significant inter-patient variability.[3] Following oral administration, peak plasma concentration occurs 5.2 hours after dose.[4]

Alternative routes available

No alternative routes are available for acamprosate. Injection is used for clinical studies only, no licensed product.

Interactions

Food reduces bioavailability.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Acamprosate should only be used under the supervision of a suitably qualified practitioner and supported by counselling. The specialist should be consulted to recommend alternative therapy.
- Disulfiram is unlikely to be suitable owing to the risk of interaction with the small quantities of alcohol present in liquid medicines.[1]

References

1. *BNF* 67, March 2014.
2. Personal communication, Merck Pharmaceuticals; 23 January 2003.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
4. Campral EC (Merck Serono), Summary of Product Characteristics; 7 December 2011.

Acarbose

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Acarbose (Arrow)	Tablet 50 mg, 100 mg	Tablets should be chewed with the first mouthful of food or swallowed whole with a little liquid immediately before food.[2] No specific data on enteral tube administration are available for this preparation.
Glucobay (Bayer)	Tablet 50 mg, 100 mg	Tablets should be chewed with the first mouthful of food or swallowed whole with a little liquid immediately before food.[3] Tablets do not disperse easily in water but require gentle agitation for approximately 5 minutes. Disperse to give a fine suspension that flushes down an 8Fr NG tube without blockage.[4] Acarbose is insoluble in water.[5] Acarbose in powdered form, obtained by crushing the tablets, and mixed directly with food, has been shown to be more effective than the tablets administered whole.[6,7]

Site of absorption (oral administration)

Acarbose is only minimally absorbed; it is a competitive inhibitor of intestinal alpha-glucosidases found in the brush border of the small intestine. Following oral administration, the first peak plasma concentration occurs after approximately 1 hour, the second peak is a result of breakdown and absorption in the colon and occurs after approximately 20 hours.[3] Only 1–2% of active inhibitor is absorbed following oral administration.[3]

Alternative routes available

No alternative routes are available for acarbose. Acarbose does not exhibit a systemic effect; therefore delivery by another route would be ineffective.[5]

Interactions

The mechanism of action is dependent on its interaction with food. Acarbose is a reversible, competitive inhibitor of the alpha-glycoside hydrolases of the small-intestinal brush border.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to its mechanism of action, acarbose is unlikely to be suitable for diabetic patients on continuous enteral feeding regimens as distribution throughout the meal produces a better response and would not be achievable on a continuous feed. Alternative means of controlling blood sugars should be explored.
- It may be suitable for use during bolus feeding.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed immediately.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

As the mode of action is locally within the small bowel, jejunal administration should not affect efficacy of therapy. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Acarbose 100 mg Tablets (Actavis UK Ltd, Arrow livery), Summary of Product Characteristics, July 2012.
3. Glucobay 50 mg Tablets (Bayer), Summary of Product Characteristics; July 2013.
4. BPNG data on file, 18 June 2004.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
6. O'Dea K, Turton J. Optimum effectiveness of intestinal alpha-glucosidase inhibitors: importance of uniform distribution though a meal. *Am J Clin Nutr* 1985; 41: 511–516.
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Acebutolol

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Acebutolol (Winthrop)	Capsule 100 mg, 200 mg	Acebutalol (as hydrochloride) Also marketed as Sectral, identical formulation, see below.
Acebutolol (Lexon, Winthrop)	Tablet 400 mg	Acebutalol (as hydrochloride). No specific data are available on enteral tube administration for this preparation.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Sectral (Sanofi-Aventis)	Capsule 100 mg, 200 mg	Acebutolol (as hydrochloride). Acebutolol hydrochloride is very soluble in water.[2] Capsule contents pour easily from opened capsule and disperse readily in water to give almost clear very fine dispersion; flushes via an 8Fr NG tube without blockage.[3] Contains starch.[4]
Sectral (Sanofi-Aventis)	Tablet 400 mg	Acebutolol (as hydrochloride). Film-coated tablets. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentrations occur 2–3 hours after oral dosing.[2,4] Acebutolol and its active metabolite undergo biliary excretion with 50% of the dose recovered in the faeces.[4]

Alternative routes available

No alternative routes are available for acebutolol; the parenteral route is available for other beta-blockers.

Interactions

No documented interactions with food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider changing to an alternative beta-blocker that does not require manipulation to administer.
- If an alternative therapy is not appropriate, open the capsule and disperse the contents in water immediately prior to administration.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Open the capsule and pour the contents into a medicine pot.
4. Add 15 mL of water.
5. Stir to disperse the powder.
6. Draw into an appropriate size and type of syringe and administer via feeding tube.
7. Add a further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
8. Draw up this dispersion and flush down the tube. This will ensure that the whole dose is given.
9. Flush the tube with water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of acebutolol. Administer using the above method and monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
3. BPNG data on file, 2005.
4. Sectral 100 mg Capsules (Sanofi-Aventis), Summary of Product Characteristics; 6 July 2011.

Aceclofenac

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Aceclofenac (Accord, Lexon, Mylan)	Tablet 100 mg	Film coated tablets.[2] No specific data on enteral tube administration are available for this preparation.
Preservex (Almirall)	Tablet 100 mg	Film-coated tablet.[3] No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentrations occur 1.25–3.0 hours following ingestion.[2,3]

Alternative routes available

None available for aceclofenac. Diclofenac is an equivalent NSAID available as suppositories or injection.

Interactions

No significant interaction with food has been noted. The rate of absorption was increased in fasted subjects but the AUC was unaffected; it is therefore recommended that aceclofenac be taken after food to reduce GI adverse effects.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Aceclofenac has a similar action to naproxen and diclofenac.[1]
- Consider using ibuprofen due to favourable side-effect profile.[1]
- Consult current NSAID prescribing advice from the National Institute for Health and Care Excellence (NICE).[4]

References

1. *BNF* 67, March 2014.
2. Aceclofenac (Accord), Summary of Product Characteristics; July 2012.
3. Preservex Film Coated (Almirall), Summary of Product Characteristics; January 2011.
4. NICE. *Clinical Knowledge Summaries: NSAIDs — Prescribing Issues*. London: NICE; 2013, http://cks.nice.org.uk/nsaids-prescribing-issues#!scenario (accessed 15 September 2014).

Acemetacin

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Emflex (Merck Serono)	Capsule 60 mg	The contents of the capsules are in powder form and are practically insoluble in water, Merck do not recommend the capsules being opened and the powder administered via an enteral feeding tube.[2] Contains 73.9 mg lactose per capsule.[3]

Site of absorption (oral administration)

Acemetacin is well absorbed following oral administration, but the specific site of absorption is unknown.

Alternative routes available

None for acemetacin, but the rectal route is available for indometacin (see individual monograph).

Interactions

No known interactions with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Change to indometacin or another suitable NSAID (see individual monographs).

References

1. *BNF* 67, March 2014.
2. Merck Serono, Personal communication; March 2014.
3. Emflex (Merck Serono), Summary of Product Characteristics; August 2013.

Acenocoumarol (Nicoumalone)

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Sinthrome (Alliance)	Tablet 1 mg	The manufacturer has no data to support the administration of Sinthrome via enteral feeding tubes. Acenocoumarol is insoluble in water.[2] Tablets disperse in 10 mL of water within 5 minutes to give a very fine white dispersion, which flushes via an 8Fr NG tube without blockage.[3] Contains lactose.[4]

Site of absorption (oral administration)

Acenocoumarol is almost completely absorbed from the upper GI tract,[2] although the specific site is not documented. Peak plasma concentrations occur 1 to 3 hours following oral dosing.[4]

Alternative routes available

None available for acenocoumarol. Heparin can be used as a parenteral alternative.

Interactions

No specific interaction between food and acenocoumarol is documented.[4] However, variable quantities of vitamin K in the diet will have a pharmacological influence on INR.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablet in water immediately prior to administration.
- A prolonged break in feeding is not required.
- Increase frequency of monitoring until stable.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).

7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data on jejunal administration of acenocoumarol. Administer as above. Adjust the dose depending on response.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alliance; January 2003.
3. BPNG data on file, 2005.
4. Sinthrome Tablets 1 mg (Alliance), Summary of Product Characteristics; March 2007.

Acetazolamide

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Diamox (Amdipharm)	Tablet 250 mg	Acetazolamide (as sodium salt). Uncoated tablet.[2] Tablets disintegrate very quickly in 10 mL of water to give a coarse dispersion that settles quickly and flushes down an 8Fr NG tube without blockage, but container and syringe must be rinsed thoroughly to ensure that the total dose is given.[3]
Diamox (Amdipharm)	Injection 500 mg	For i.v. or i.m. administration; i.m. administration is painful owing to the alkaline pH (9.1) of the injection.[4] The injection contains the active drug (as acetazolamide sodium), sodium hydroxide and hydrochloric acid. The reconstituted injection can be stored in a refrigerator for up to 24 hours.[4] There is no theoretical reason to preclude the use of the injection via a feeding tube. There are anecdotal reports of this practice. Extended stability data for the injectable preparation are available.[5]
Diamox SR (Amdipharm)	Capsule 250 mg	Capsule contains slow-release pellets ranging from 0.25 mm to 1.68 mm diameter. Modified-release preparation; do **not** crush. Unsuitable for enteral tube administration.[6]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentrations occur after 1–2 hours in fasted patients[2,6] following administration of the immediate-release product.

Alternative routes available

The parenteral route is available.

Interactions

No recorded evidence of interaction with food.[6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration; tablets are scored and can be halved or quartered.[2]
- Because of cost, only use injection when accurate small doses need to be given.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

No specific data relate to the jejunal administration of acetazolamide. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Diamox Tablets 250 mg (Amdipharm), Summary of Product Characteristics; September 2012.
3. BPNG data on file, 2004.
4. Diamox Sodium 500 mg Powder for Solution for Injection (Amdipharm) Summary of Product Characteristics; September 2012.
5. Trissel LA. *Stability of Compounded Formulations,* 4th edn. Washington, DC: American Pharmacists Association; 2009.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Acetylcysteine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Acetylcysteine (non-proprietary)	Injection 200 mg/mL	No specific data on enteral tube administration are available for this formulation; Teva formulation is identical to the UCB product.[2]
Parvolex (UCB Pharma, previously Celltech)	Injection 200 mg/mL	The injection solution can be given orally but is very bitter.[3] The injection solution has a pH of 6–7.5.[4] The injection solution has been administered orally for the prevention of radiocontrast-induced nephropathy.[5] Contains 322.6 mg (14 mmol) sodium per 10 mL.[6]

Other formulations not licensed in the UK are available through IDIS.

Site of absorption (oral administration)

Specific site of absorption is not documented. Extensive absorption occurs, with peak plasma concentration occurring 1 hour after oral ingestion.[7]

Alternative routes available

Injection can be given parenterally; it has also been used as mouthwash, topically and as a bladder washout.

Interactions

No documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use injection orally.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the injection solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

No specific data. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Acetylcysteine Injection (Teva UK), Summary of Product Characteristics; 28 August 2012.
3. Personal communication, Celltech (now UCB); 17 February 2006.
4. Trissel LA. *Stability of Compounded Formulations,* 4th edn. Washington, DC: American Pharmacists Association; 2009.
5. Shalansky SJ, Pate GE, Levin A, Webb JG. *N*-Acetylcysteine for prevention of radiocontrast induced nephrotoxicity: the importance of dose and route of administration. *Heart* 2005; 91(8): 997–999.
6. Parvolex Injection (UCB Pharma), Summary of Product Characteristics; 28 August 2012.
7. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

Aciclovir

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Aciclovir (Actavis)	Tablet 200 mg, 400 mg, 800 mg	Disperse in water to administer via feeding tube.[2] SPC recommends 50 mL.
Aciclovir (Lexon, Sovereign, Wockhardt)	Tablet 200 mg, 400 mg, 800 mg	No specific data on enteral tube administration are available for this preparation.
Aciclovir (Lexon, Teva)	Dispersible tablet 200 mg, 400 mg, 800 mg	No specific data on enteral tube administration are available for this preparation.
Aciclovir (Ranbaxy)	Dispersible tablet 200 mg, 400 mg, 800 mg	Tablets disintegrate in less than 1 minute in 10 mL of water. Forms a milky coarse dispersion that flushes easily down an 8Fr tube.[3]
Aciclovir (Rosemont)	Suspension 200 mg/5 mL, 400 mg/5 mL	Thick liquid.[4] No specific data on enteral tube administration are available for this preparation. Both strengths contain 2 g/5 mL maltitol. They do not contain sorbitol.[5] The 200 mg/5 mL suspension contains ethanol 16.7 mg/5 mL.[4]
Zovirax (GSK)	Dispersible film-coated tablet 200 mg, 800 mg	Zovirax tablets may be dispersed in a minimum of 50 mL of water or swallowed whole with a little water.[6] Oral liquid and dispersible tablets have a variable bioavailability.[7]
Zovirax (GSK)	Suspension 200 mg/5 mL, 400 mg/5 mL	Extremely viscous liquid difficult to flush via fine-bore tubes and does not flow well under gravity.[8] Both formulations contain sorbitol.[9]
Zovirax (GSK)	Infusion 250 mg, 500 mg	Not suitable for enteral tube administration.

Site of absorption (oral administration)

Aciclovir is only partly absorbed from the GI tract. A specific site of absorption is not documented. Peak plasma concentration occurs 1–2 hours following oral dosing.[10]

Alternative routes available

The parenteral route is available.

Interactions

No specific interactions with food have been documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- In critical situations, it is recommended that the injection be used parenterally to ensure therapeutic concentrations.[9]
- Use dispersible tablets via feeding tube.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse.
5. Flush the medication dose down the feeding tube.
6. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot and add 10 mL of water and allow the tablet to disperse. Draw this solution into the syringe with an appropriate adapter for the tube connector. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Administer using the above method.

There is evidence that aciclovir is absorbed if delivered into the duodenum;[11] therefore, jejunal administration is likely to be effective. However, in view of aciclovir's general low bioavailability, other therapies should be considered.

References

1. *BNF* 67, September 2014.
2. Personal communication, Alpharma (now Actavis) Ltd; 21 January 2003.
3. BPNG data on file, 2004.
4. Rosemont. Aciclovir Oral Suspension, http://www.rosemontpharma.com/products/infections/aciclovir-oral-suspension-1 (accessed 1 September 2014).

5. Personal communication, Rosemont; Ltd; 3 September 2008.
6. Zovirax 200 mg Tablets (GSK), Summary of Product Characteristics; December 2013.
7. Tanna C, Wood C, Lawrence MJ. Competition studies to elucidate the mechanisms of aciclovir uptake in the small intestine. *J Pharm Pharmacol* 1992; 449(Suppl): 1047.
8. BPNG data on file, 2012.
9. Zovirax Suspension (GSK), Summary of Product Characteristics; December 2013.
10. Personal communication, GSK Ltd, 22 January 2003.
11. Lewis LD, Fowle AS, Bittiner SB, Bye A, Isaacs PE Human gastrointestinal absorption of aciclovir from tablet duodenal infusion and sipped solution. *Br J Clin Pharmacol* 1986; 21(4): 459–462.

Acipimox

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Olbetan (Pharmacia)	Capsule 250 mg	No specific data on enteral tube administration is available for this preparation.

Site of absorption (oral administration)

Acipimox is rapidly and completely absorbed from the GI tract. Peak plasma levels occur 2 hours following oral administration.[2]

Alternative routes available

None.

Interactions

No known interactions.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Acipimox may cause eye irritation;[3] therefore capsules should not be opened.
- Use alternative therapy.

References

1. *BNF* 67, March 2014.
2. Olbetan 250 mg Capsules (Pharmacia), Summary of Product Characteristics; February 2014.
3. Sigma-Aldrich. *Material Safety Data Sheet: Acipimox,* http://www.sigmaaldrich.com/MSDS/MSDS/DisplayMSDSPage.do?country=GB&language=en&productNumber=A7856&brand=SIGMA&PageToGoToURL=http%3A%2F%2Fwww.sigmaaldrich.com%2Fcatalog%2Fproduct%2Fsigma%2Fa7856%3Flang%3Den, (accessed 22 September 2014).

Acitretin

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Acitretin (Genus, Lexon)	Capsule 10 mg, 25 mg	No specific data on enteral tube administration are available for this preparation.
Neotigason (Actavis) (previously Roche)	Capsule[1] 10 mg, 25 mg	Retinoids are not water-soluble and are degraded by light, so it is not possible to make an extemporaneous suspension. However, some centres have suggested that patients open the capsules immediately before use and take the contents with food. Neotigason capsules contain a powder preparation. Roche were unaware of any technical reasons why this process would alter the bioavailability or efficacy of the drug, but as it is not a published procedure they have no data to support this practice.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Time to peak plasma concentration is 1–4 hours following an oral dose.[3]

Alternative routes available

None available for acitretin. Topical therapy is available for milder forms of psoriasis.

Interactions

Food increases the bioavailability of acitretin; there is no information on clinical significance because of the wide inter-patient variability in oral absorption.[3] The ingestion of food results in a twofold increase in C_{max} and AUC.[4]

Health and safety

Acitretin is highly teratogenic.[3] Women of childbearing age should not be exposed to the powder if the capsules are opened. Protective clothing should be worn.

Suggestions/recommendations

- As treatment would only be initiated under the supervision of a dermatologist, their opinion should be sought for alternatives. Systemic steroids have been used in severe psoriasis but a rebound flare can occur on discontinuation.[1]
- If continued treatment with acitretin is essential, the capsules should be opened and mixed with water and administered immediately. Noting health and safety precautions.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Open the capsule and pour the contents into a medicine pot.
4. Add 15 mL of water.
5. Stir to disperse the powder.
6. Draw into an appropriate size and type of syringe and administer via the feeding tube.
7. Add a further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
8. Draw up this dispersion into the syringe and flush down the tube. This will ensure that the whole dose is given.
9. Flush the tube with water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

No specific data are available relating to the jejunal administration of acitretin. If indicated, administer using the above method. Monitor for signs of toxicity or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Roche Products Ltd; 25 March 2003.
3. Neotigason 10 mg Capsules (Actavis), Summary of Product Characteristics; March 2013.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Adefovir dipivoxil

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Hespera (Gilead)	Tablet 10 mg	Adefovir (as dipivoxil). Gilead report that the tablets are not enteric coated and are not made as a slow-release preparation; therefore it is considered unlikely that crushing and administering in water via a NG or PEG tube would have significant effect on bioavailability.[2] Adefovir 0.4 mg is soluble in 1 mL water (adjusted to pH 7.2).[2] Each tablet contains 113 mg lactose.[3]

Site of absorption (oral administration)

Adefovir dipivoxil is absorbed in the intestine[4] and peak plasma levels are reached 1.75 hours following oral administration.[3]

Alternative routes available

None for adefovir dipivoxil.

Interactions

Adefovir dipivoxil can be taken with or without food, but high fat meals will delay the t_{max} by 2 hours.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Seek specialist advice for alternative therapy. Tenofovir tablets disperse in water (see monograph).
- If continued therapy with adefovir is considered essential, the tablets may be crushed and administered using the method below. However potential loss of dose should be considered.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Restart the enteral feed.

Intrajejunal administration

There are no specific data relating to the jejunal administration of adefovir dipivoxil. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Gilead; June 2014.
3. Hepsera (Gilead), Summary of Product Characteristics; March 2014.
4. Ming X, Thakker DR Role of basolateral efflux transporter MRP4 in the intestinal absorption of the antiviral drug adefovir dipivoxil. *Biochem Pharmacol* 2010; 79(3): 455–462.

Alendronic acid

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Alendronic acid (Accord, Arrow, Teva)	Tablet 10 mg	No specific data on enteral tube administration are available for this preparation.
Alendronic acid (Accord, Actavis, Arrow, Aurobindo, Lexon, Mylan, Teva, Wockhardt, Zentiva)	Tablet 70 mg	No specific data on enteral tube administration are available for this preparation.
Alendronate (Lexon, Rosemont)	Oral solution 70 mg/100 mL	Rosemont preparation is a sugar-free solution.[2] It contains 6 mg sunset yellow (E110)/100 mL.
Fosamax (MSD)	Tablet 10 mg	Alendronate sodium, 13.05 mg equivalent to 10 mg alendronic acid. Fosamax must be taken at least 30 minutes before the first food, beverage or medication of the day with plain water only. Other beverages (including mineral water), food and some medications are likely to reduce the absorption of Fosamax.[3] Alendronate sodium is soluble in water.[4] No specific data on enteral tube administration are available for this preparation. Each tablet contains 103.95 mg lactose anhydrous.
Fosamax Once Weekly (MSD)	Tablet 70 mg	As alendronate sodium. Licensed for treatment of postmenopausal osteoporosis only.[5] Tablets disperse in 10 mL of water within 2–5 minutes to give very fine particles that disperse easily. The particles settle quite quickly but flush down an 8Fr feeding tube without blockage.[6] In a small retrospective chart review (5 patients), 70 mg alendronate was administered via feeding tubes for an average of 18 months; a reduction in bone turnover markers was noted and there were no reported adverse effects. The authors conclude that alendronate and residronate delivered through feeding tubes in developmentally disabled patients appears to be well tolerated.[7]
Fosavance (MSD)	Tablet[8] 70 mg/ 70 micrograms	Contains alendronate sodium equivalent to 70 mg alendronic acid and 70 micrograms (2800 IU) cholecalciferol (vitamin D_3). No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

The specific site of absorption is not documented; 60–70% of absorption occurs in the first hour. Elevation of gastric pH above 6 is associated with a twofold increase in alendronate absorption.[9]

Alternative routes available

None for alendronic acid. Calcitonin (salmon) nasal spray is licensed for use in postmenopausal osteoporosis (see *BNF* for details). Zoledronic acid injection can be administered once a year, and may be a suitable cost effective alternative. The Scottish Medicines Consortium has approved zoledronic acid for use in postmenopausal osteoporosis in patients unable to tolerate oral treatment options.[10] NICE has not made any recommendations on zoledronic acid yet, current guidance on primary and secondary prevention of osteoporosis and fractures only includes teriparatide as non-oral therapy;[11,12] however, the cost of this therapy is likely to be prohibitive except in exceptional circumstances.

Interactions

Absorption of alendronic acid is reduced significantly if food is ingested within 30 minutes of oral dosing. Absorption is negligible if it is taken with or after food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Alendronate is contraindicated in patients with oesophageal disease. Owing to the risks of oesophageal damage, alendronate should be used with caution via an enteral feeding tube, especially in patients with delayed gastric emptying at risk of oesophageal reflux and those patients unable to sit or stand upright.
- If alendronate is administered via a feeding tube, the once-weekly formulation should be used. The solution is the best preparation available for administration via an enteral feeding tube, or the tablet should be dispersed in water and administered immediately then flushed with at least 50 mL of water. This should be administered first thing in the morning after rising and the patient should remain sitting upright or standing for 30 minutes after the dose is given, this allows for the longest break without food; if the patient is on an overnight feed it may be appropriate to dose in the evening. Enteral feed should be stopped prior to administration for as long as practicable, and should not be re-started for at least 30 minutes after the dose.

Intragastric administration

Using the oral solution:

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Allow as long a break as is feasibly possible.
4. Measure the correct dose of solution in an appropriate syringe.
5. Flush the medication down the feeding tube.
6. Finally, flush with at least 50 mL of water.
7. Ensure that the patient is sitting upright or standing for 30 minutes after the dose.
8. Re-start the feed after the 30 minutes has passed.

Using the tablet:

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Allow as long a break as is feasibly possible.
4. Place the tablet in the barrel of an appropriate size and type of syringe.

5. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
6. Flush the medication dose down the feeding tube.
7. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
8. Finally, flush with at least 50 mL of water.
9. Ensure that the patient is sitting upright or standing for 30 minutes after the dose.
10. Re-start the feed after the 30 minutes has passed.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this solution into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no data on the jejunal administration of alendronate. If indicated, administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Alendronic acid 70 mg Oral Solution (Rosemont), Summary of Product Characteristics; July 2011.
3. Fosamax (MSD), Summary of Product Characteristics; November 2012.
4. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (Medicines Complete: Martindale http://www.medicinescomplete.com).
5. Fosamax Once Weekly (MSD), Summary of Product Characteristics; October 2012.
6. BPNG data on file, 2004.
7. Tanner S, Taylor HM. Feeding tube administration of bisphosphonates for treating osteoporosis in institutionalised patients with developmental disabilities. *Bone* 2004; 34(Suppl. 1): S97–S98.
8. Fosavance (MSD), Summary of Product Characteristics; October 2012.
9. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
10. Scottish Medicines Consortium. *Guidance No. 447/08. Zoledronic acid, 5 mg Solution for Infusion (Aclasta)*. Glasgow: Scottish Medicines Consortium; 11 February 2008, http://www.scottishmedicines.org.uk/files/zoledronic_acid_5mg_solution_for_infusion__Aclasta__FINAL_Feb_2008.doc_for_website.pdf (accessed 1 September 2014).
11. NICE. *Technology Appraisal Guidance 161: Aledronate, Etidronate, Risedronate, Raloxifene, Strontium Ranelate and Teriparatide for the Secondary Prevention of Osteoporotic Fragility Fractures in Postmenopausal Women*. London: NICE; 2008.
12. NICE. *Technology Appraisal Guidance 160: Aledronate, Etidronate, Risedronate, Raloxifene, and Strontium Ranelate for the Primary Prevention of Osteoporotic Fragility Fractures in Postmenopausal Women*. London: NICE; 2008.

Alfacalcidol

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Alfacalcidol (Lexon, Teva)	Capsule 250 nanograms, 500 nanograms, 1 microgram	No specific data on enteral tube administration are available for this preparation.
Alfacalcidol (Amdipharm)	Oily liquid-filled capsule 250 nanograms, 1 microgram	No specific data on enteral tube administration are available for this preparation. 250 nanogram capsule contains 19.19 mg sorbitol.[2] 1 microgram capsule contains 19.19 mg sorbitol.[3]
One-Alpha (Leo)	Capsule 250 nanograms, 500 nanograms, 1 microgram	Soft gelatin capsules.[4] Dose is titrated to biological response. Leo do not recommend opening the capsules owing to the risk of administering an incomplete dose.[3] Contains potassium sorbate.[4]
One-Alpha (Leo)	Oral drops 2 micrograms/mL	1 drop = 100 nanograms.[5] Contains alcohol and sorbitol.[5]
One-Alpha (Leo)	Injection 2 micrograms/mL	One-Alpha injection can be administered orally or via a feeding tube.[6] Contains alcohol and propylene glycol.[7]

Site of absorption (oral administration)

Vitamin D substances are absorbed throughout the GI tract. Absorption is partly dependent on the presence of bile salts.[8]

Alternative routes available

Parenteral formulation.

Interactions

No specific interaction with feed.[9] Concerns regarding alfa-calcidol binding to administration plastics were raised by Joffe *et al.*[10] This study demonstrated loss of dose due to adherence to dialysis bags. However, these data cannot be generalised because of variations in surface area and surface active properties of these plastics.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use oral drops.
- A prolonged break in feeding is not required.
- Monitor levels using appropriate assay.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Put the required number of drops into a medicine pot and add a small amount of water (e.g. 10 mL).
4. Draw this into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Administer as above.

References

1. *BNF* 67, March 2014.
2. Alfacalcidol 250 nanogram Capsules (Amdipharm-Mercury Co Ltd), Summary of Product Characteristics; August 2012.
3. Alfacalcidol 1 microgram Capsules (Amdipharm-Mercury Co Ltd), Summary of Product Characteristics; August 2011.
4. One-Alpha Capsules (Leo), Summary of Product Characteristics; October 2013.
5. One-Alpha drops (Leo), Summary of Product Characteristics; October 2013.
6. Personal communication, Leo Pharmaceuticals; February 2003.
7. One-Alpha Injection (Leo), Summary of Product Characteristics; October 2013.
8. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
9. Brayfield A. *Martindale: The Complete Drug Reference,* 38th edn. London: Pharmaceutical Press; 2014. (Medicines Complete: Martindale http://www.medicinescomplete.com).
10. Joffe P, Ladefoged SD, Cintin C, Lehmann H. 1α-Hydroxycholecalciferol adsorption to peritoneal dialysis bags: influenceof time, glucose concentration, temperature, and albumin. *Nephrol Dial Transplant* 1992; 7: 1249–1251.

Alfuzosin hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Alfuzosin (non-proprietary)	Tablet 2.5 mg	Film coated No specific data on enteral tube administration are available for this preparation.
Alfuzosin (Aurobindo, Lexon, Teva, Winthrop/ Zentiva)	Tablet 2.5 mg	Film coated. Swallow whole. Winthrop/Zentiva brand contains 61 mg lactose anhydrous.[2]
Xatral (Sanofi-Aventis)	Tablet 2.5 mg	Film coated. Tablets do not disperse readily, but if shaken in 10 mL of water for 5 minutes will give a fine dispersion which flushes via a fine bore enteral feeding tube without blockage.[3] Contains lactose.[4]
Alfuzosin (Lexon, Teva, Winthrop)	Tablet 10 mg	Modified-release preparation. Swallow whole, do not crush. Not suitable for enteral tube administration.
Besavar XL (Winthrop/Zentiva)	Tablet 10 mg	Modified-release preparation. Swallow whole, do not crush. Not suitable for enteral tube administration.
Vasran XL (Ranbaxy)	Tablet 10 mg	Modified-release preparation. Swallow whole, do not crush. Not suitable for enteral tube administration.
Xatral XL (Sanofi-Aventis)	Tablet 10 mg	Modified-release preparation. Swallow whole, do not crush. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Absorption is thought to occur maximally in the duodenum and proximal jejunum.[5] Peak plasma levels occur 0.5–3 hours following oral dosing of the non-MR preparation.[2,3]

Alternative routes available

No alternative routes available for alpha-blockers.

Interactions

The pharmacokinetic profile of alfuzosin is not affected by food.[2,3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Due to lack of specific data and frequency of dosing consider alternative therapy such as doxazosin (see monograph).
- Dispersing the tablets may result in increased side effects such as dizziness, fatigue, sweating and postural hypotension. Monitor closely during and following administration.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet into the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered.
7. Finally, flush with the recommended volume of water.
8. Restart the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

It is possible that jejunal delivery may reduce the bioavailability of alfuzosin as the absorption is thought to occur in the duodenum and proximal jejunum. Consider alternative therapy.

References

1. *BNF* 67, March 2014.
2. Alfuzosin (Winthrop/Zentiva), Summary of Product Characteristics; October 2013.
3. BPNG data on file, 2011.
4. Xatral (Sanofi-Aventis), Summary of Product Characteristics; September 2013.
5. Liu Q, Fassihi R. Zero-order delivery of a highly soluble, low dose drug alfuzosin hydrochloride via gastro-retentive system. *Int J Pharm* 2008; 348(1–2): 27–34.

Alimemazine (Trimeprazine) tartrate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Alimemazine (Lexon, Zentiva)	Tablet 10 mg	No specific data on enteral tube administration are available for this preparation.
Alimemazine (Lexon, Zentiva)	Oral solution 7.5 mg/5 mL	Sucrose-based liquid formulation.[2] Zentiva brand is a yellow moderately viscous liquid that flushes through 6Fr with some resistance; it mixes easily with an equal volume of water, which reduces viscosity.[3] Does not contain sorbitol. Contains ethanol.
Alimemazine (Lexon, Zentiva)	Oral solution 30 mg/5 mL	Sucrose-based liquid formulation.[4] Zentiva brand is a clear moderately viscous liquid that flushes through 6Fr with some resistance; it mixes easily with an equal volume of water, which reduces viscosity.[3] Does not contain sorbitol. Contains ethanol.

Site of absorption (oral administration)

Specific site of absorption not documented. Peak plasma concentration occurs 1–2 hours following oral dosing.[5]

Alternative routes available

None available for alimemazine. Chlorphenamine available as injection.

Interactions

No specific interaction with food is documented.[2,3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid formulation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop enteral feed.
2. Flush enteral feeding tube with the recommended volume of water.
3. Draw the syrup into the appropriate size and type of syringe.

4. Flush medication dose down feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. Do not measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

No specific data relating to jejunal administration of alimemazine. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Alimemazine Tartrate 7.5 mg/5 mL Syrup (Zentiva), Summary of Product Characteristics; July 2013.
3. BPNG data on file, 2005 and 2009 (Vallergan liquid tested, same formulation as Zentiva alimemazine).
4. Alimemazine Tartrate 30 mg/5 mL Syrup (Zentiva), Summary of Product Characteristics; July 2013.
5. Sponheim S, Aune H, Gulliksen M, Morland J. Pharmacokinetics of trimeprazine in children. *Pharmacol Toxicol* 1990; 76(3): 243–245.

Alitretinoin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Toctino (Basilea)	Capsule 10 mg, 30 mg	No specific data on enteral tube administration is available for this preparation. Soft capsules, contain soya-bean oil and sorbitol.[2]

Site of absorption (oral administration)

Alitretinoin absorption from the GI tract is variable and dose proportional over the therapeutic range from 10 to 30 mg. When alitretinoin is taken with food, the systemic exposure is enhanced by a factor of four; therefore alitretinoin should be taken with food.[2]

Alternative routes available

None for alitretinoin.

Interactions

Food enhances the systemic exposure.[2]

Health and safety

Alitretinoin is highly teratogenic. Women of child-bearing age should not be exposed to the capsule contents.

Suggestions/recommendations

- As treatment would only be initiated under the supervision of a consultant dermatologist, their opinion should be sought for an alternative treatment.

References

1. *BNF* 67, March 2014.
2. Toctino 10 mg and 30 mg Capsules (Stiefel, a GSK company), Summary of Product Characteristics; 28 August 2013.

Allopurinol

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Zyloric (Aspen, previously GSK)	Tablet 100 mg, 300 mg	GSK have no information on the administration of Zyloric via PEG or NG tubes.[2]
Allopurinol (Actavis)	Tablet 100 mg, 300 mg	Tablets can be crushed, but drug is very insoluble.[3]
Allopurinol (Accord, Lexon, Teva, Wockhardt)	Tablet 100 mg, 300 mg	No specific data on enteral tube administration are available for this preparation.
Xanthomax (Ashbourne)	Tablet 100 mg, 300 mg	No specific data on enteral tube administration are available for this preparation.
Caplenal (Berk)	Tablet 100 mg, 300 mg	No specific data on enteral tube administration are available for this preparation.
Cosuric (DDSA)	Tablet 100 mg, 300 mg	No specific data on enteral tube administration are available for this preparation.
Rimapurinol (Ranbaxy)	Tablet 100 mg, 300 mg	Tablets will disperse if shaken in 10 mL of water for 5 minutes; the milky dispersion flushes via an 8Fr NG tube without blockage.[4]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Allopurinol (Rosemont)	Oral suspension 100 mg/5 mL	Manufactured 'special'. Sugar-free. Thick liquid.[5] No specific data on enteral tube administration are available for this preparation. Contains 1 g/5 mL maltitol and ethanol 1.8 mg/5 mL.[5,6]
Allopurinol	Extemporaneous preparation	Stability data available for allopurinol suspension made with a 2 : 1 mixture of simple syrup and cherry syrup. Stable for 56 days at room temperature.[7] Suspension made with 1 : 1 Ora-Sweet/Ora-Plus is stable for 60 days at room temperature.[8]

Site of absorption (oral administration)

The specific site of absorption is not documented. Peak plasma concentration occurring 1.5 hours post dose.[9]

Alternative routes available

None available for allopurinol. Rasburicase (Fasturtec) injection is licensed for prophylaxis and treatment of acute hyperuricaemia.[1]

Interactions

There are no reports of reduced bioavailability of allopurinol on co-administration with food. The half-life of the active metabolite, oxypurinol, is increased in patients on a low-protein diet and may also be prolonged in malnourished patients. This may increase the risk of toxicity.[10]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the oral suspension if available, but be cautious with fine bore tubes as the suspension may block the tube.
- Otherwise, disperse the tablets in water immediately prior to administration.
- Administer after food.[9]

Intragastric administration

Using the oral suspension:

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure the required dose of oral suspension in an oral syringe.
4. Flush down the enteral feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Using the tablets:
1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

No specific data. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Medical Information, GlaxoSmithKline Ltd; 22 January 2003.
3. Personal communication, Medical Information, Alpharma Ltd (now Actavis), 21 January 2003.
4. BPNG data on file, 2004–2005.
5. Rosemont. Allopurinol Oral Suspension-37, http://www.rosemontpharma.com/products/musculoskeletal-and-joint-disease/allopurinol-oral-suspension-37 (accessed 15 March 2014).
6. Personal communication, Rosemont; 3 September 2008.
7. Dressman JB, Poust RI. Stability of allopurinol and of five antineoplastics in suspension. *Am J Hosp Pharm* 1983; 40(4): 616–618.
8. Allen Jr LV, Erckson III MA. Stability of acetazolamide, allopurinol, azathioprine, clonazepam and flucytosine in extemporaneously compounded oral liquids. *Am J Health Syst Pharm* 1996; 53: 1944–1949.
9. Zyloric Tablets 100 mg, 300 mg (Aspen), Summary of Product Characteristics; November 2013.
10. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Almotriptan

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Almogran (Almirall)	Tablet 12.5 mg	Film-coated tablets. Almotriptan (as dihydrogen malate). Conventional release tablets with the active ingredient readily soluble in water. In theory, the tablets could be crushed and dissolved in water immediately prior to administration. However, Almirall are unable to recommend this off-label method of administration due to a lack of data.[2]

Site of absorption (oral administration)

Almotriptan is well absorbed; the specific site of absorption is not known. Peak plasma concentrations occur 1.5–3 hours following oral administration.[3]

Alternative routes available

None for almotriptan but subcutaneous and intranasal routes are available for sumatriptan and intranasal for zolmitriptan (see individual monographs).

Interactions

No documented interaction with food and can be taken with or without food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Change to sumatriptan or zolmitriptan via an alternative route depending on the severity of the migraine attack and the patient's ability to administer.

References

1. *BNF* 67, March 2014.
2. Personal communication, Almirall; June 2014.
3. Almogran 12.5 mg Film-coated Tablet (Almirall), Summary of Product Characteristics; 15 March 2013.

Aluminium hydroxide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Alu-Cap (Meda)	Capsule 475 mg	Hard gelatin capsule.[1] Licensed for phosphate-binding agent and as an antacid. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Aluminium salts are poorly absorbed and are used for their topical effect.[2]

Alternative routes available

None available for aluminium hydroxide. Parenteral route is available for alternative anti-secretory therapy. No alternative route available for hyperphosphataemia.

Interactions

Aluminium hydroxide interacts with enteral feed, leading to tube blockage.[3] Ascorbic acid and citrate (including that in effervescent tablets) increase the absorption of aluminium possibly leading to toxic levels.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

Use alternative therapy for acid suppression.

References

1. *BNF* 67, March 2014.
2. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
3. Valli C, Schulthess H-K, Asper R, Escher F, Hacki W. Interaction of nutrients with antacids: a complication during enteral tube feeding. *Lancet* 1986; i(8483): 747–748.

Alverine citrate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Spasmonal (Meda, previously Norgine)	Capsule 60 mg	Norgine have no supporting data for alverine being administered via enteral feeding tubes. Administered directly into the mouth, the active ingredient in Spasmonal capsules may cause numbing of the lips and tongue.[2]
Spasmonal Forte (Meda)	Capsule 120 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

The specific site of absorption is not documented. Peak plasma concentration occurs 1–1.5 hours after oral administration.[3]

Alternative routes available

No other routes are available.

Interactions

No documented interaction with food.

Health and safety

Usual precautions apply.

Suggestions/recommendations

- Owing to lack of data, consider changing to mebeverine liquid (see monograph).

References

1. *BNF* 67, March 2014.
2. Personal communication, Medical Information, Norgine Ltd; 24 January 2003.
3. Spasmonal 60 mg (Meda), Summary of Product Characteristics; November 2013.

Amantadine hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Symmetrel (Alliance); also available as Lysovir	Capsule 100 mg	Amantadine hydrochloride is freely soluble in water.[2] The capsules may be opened and mixed with water and administered immediately via an enteral feeding tube.[3] Both Symmetrel and Lysovir contain lactose.
Symmetrel (Alliance)	Syrup 50 mg/5 mL	pH range of Symmetrel syrup is 4.8–5.3.[3] The viscosity is similar to standard enteral feed.[4] Contains sorbitol,[5] 4.65 g/5 mL dose.[6]

Site of absorption (oral administration)

Specific site of absorption is not documented. Amantadine is absorbed slowly and almost completely following oral administration. Peak plasma concentration occurs 3–4 hours following oral dose.[7]

Alternative routes available

None for amantadine.

Interactions

No documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid formulation. Monitor total daily intake of sorbitol.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into the syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There is no specific information relating to jejunal administration of amantadine. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
3. Personal communication, Alliance Pharmaceuticals; January 2003.
4. BPNG data on file, 2012.
5. Symmetrel Syrup (Alliance), Summary of Product Characteristics; September 2010.
6. Personal communication, Alliance Pharmaceuticals; July 2005.
7. Symmetrel Capsules (Alliance), Summary of Product Characteristics; October 2013.

Amiloride hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Amiloride (Actavis)	Tablet 5 mg	Tablets can be crushed, partly insoluble.[2]
Amiloride (Accord, Lexon Wockhardt)	Tablet 5 mg	No specific data on enteral tube administration are available for this preparation.
Amilamont (Rosemont)	Oral solution 5 mg/5 mL	Sugar-free oral solution. Viscosity lower than standard enteral feed.[3,4] Does not contain sorbitol.[5] Contains 3.4 g/5 mL maltitol.

Site of absorption (oral administration)

Amiloride is incompletely absorbed from the gastrointestinal tract.[6] Specific site is not documented. Peak plasma concentration occurs 3–4 hours following oral dosing.[6]

Alternative routes available

None available for amiloride.

Interactions

No documented interaction with food.[5,6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid formulation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to the jejunal administration of amiloride. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma Ltd (now Actavis); 21 January 2003.
3. Personal correspondence, Rosemont; 3 September 2008.
4. BPNG data on file, 2013.
5. Amilamont (Rosemont), Summary of Product Characteristics; June 2013.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Aminophylline

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Phyllocontin Continus (Napp)	M/R tablet 225 mg	Modified-release film-coated tablet. Swallow whole, do not crush.[2] Not suitable for enteral tube administration.
Phyllocontin Continus Forte (Napp)	M/R tablet 350 mg	Modified-release film-coated tablet. Swallow whole, do not crush.[2] Not suitable for enteral tube administration.
Aminophylline (Amdipharm, Hameln)	Injection 25 mg/mL	Aminophylline injection has been used in extemporaneous oral liquid preparations.[3,4] As this is an immediate-release preparation, appropriate adjustment to the dosing frequency should be made.

Site of absorption (oral administration)

Specific site of absorption is not documented. Rate of absorption is decreased by food but extent of absorption is unaffected.[5]

Alternative routes available

Parenteral therapy can be used as a short-term alternative, although dosing in patients already loaded with aminophylline can be complex and expert advice should be sought.

Interactions

There are no data on the effect of food or enteral feed on the absorption of immediate-release aminophylline.[6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Due to complexities of administration give serious consideration to discontinuing aminophylline therapy.
- Where clinically indicated the injection, diluted or formulated into an extemporaneous preparation, may be administered via a feeding tube, dose and frequency may need to be modified. Levels should be checked and the dose adjusted accordingly.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.

3. Measure the required dose of aminophylline extemporaneous preparation into an appropriate size and type of syringe.
4. Administer via feeding tube.
5. Flush the enteral feeding tube with the recommended volume of water.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Aminophylline is absorbed when administered via jejunostomy.[6] Use the above method.

References

1. *BNF* 67, March 2014.
2. Phyllocontin Continus (Napp), Summary of Product Characteristics; July 2006.
3. Nahata MC, Morosco RS, Hipple TF. Stability of aminophylline in bacteriostatic water for injection stored in plastic syringes at two temperatures. *Am J Hosp Pharm* 1992; 49: 2962–2963.
4. Chong E, Dumont RJ, Hamilton DP, Koke PM, Ensom MHH. Stability of aminophylline in extemporaneously-prepared oral suspensions. *J Inform Pharmacother* 2000; 2: 100–106.
5. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
6. Adams D. Administration of drugs through a jejunostomy tube. *Br J Int Care* 1994; 4(1): 10–17.

Amiodarone hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Amiodarone (Actavis)	Tablet 100 mg, 200 mg	Tablets can be crushed. Very bitter taste; if taking orally mix with jam.[2]
Amiodarone (Accord, Lexon, Mylan, Teva)	Tablet 100 mg, 200 mg	No specific data on enteral tube administration are available for this preparation. See notes below.
Cordarone X (Zentiva)	Tablet 100 mg, 200 mg	No specific data on enteral tube administration are available for this preparation.
Amiodarone (Hameln)	Injection 50 mg/mL	Sterile concentrate, contains polysorbate 80.[3]
Cordarone X (Sanofi-Aventis)	Injection 50 mg/mL	Cannot be administered via a feeding tube.[4] The injection contains Tween 80, which is an irritant.

Site of absorption (oral administration)

The specific site of absorption is not documented. Peak plasma concentration occurs 3–7 hours following oral dosing.[5]

Alternative routes available

In the acute setting the parenteral route can be used.

Interactions

No specific interaction with food is documented.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Tablets do not disperse well but can be crushed and mixed with water to form a suspension.[6]
- An extemporaneous formulation can be made and several formulas have been shown to have shelf lives in excess of 90 days when refrigerated.[7]
- Owing to the long half-life of amiodarone (in excess of 50 hours), the omission of occasional doses does not significantly influence the therapeutic effect.[8]

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure that the total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break in feeding is required.

Intrajejunal administration

There are no specific data relating to jejunal administration of amiodarone. Administer as above.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma (now Actavis) Ltd; 21 January 2003.
3. Amiodarone 50 mg/mL sterile concentrate (Hameln), Summary of Product Characteristics; September 2012.
4. Personal communication, Sanofi-Synthelabo; 3 February 2003.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
6. BPNG data on file, 2005.
7. Trissel LA, ed. *Stability of Compounded Formulations*, 4th edn. Washington, DC: American Pharmacists Association; 2009.
8. Cordarone X 100 mg Tablets (Zentiva), Summary of Product Characteristics; February 2013.

Amisulpride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Amisulpride (Arrow, Aurobindo, Lexon, Mylan, Sandoz, Teva)	Tablet 50 mg, 100 mg, 200 mg, 400 mg	No specific data on enteral tube administration are available for this preparation.
Solian (Sanofi-Aventis)	Tablet 50 mg, 100 mg, 200 mg, 400 mg	No specific data on enteral tube administration are available for this preparation.
Solian (Sanofi-Aventis)	Solution 100 mg/mL	Sucrose-based liquid preparation.[2] Does not contain sorbitol.

Site of absorption (oral administration)

Specific site of absorption not documented. Peak plasma concentration occurs 1 hour following oral dosing with a second peak at 3–4 hours.[2]

Alternative routes available

None available for amisulpride. Olanzapine is available as an injection. Specialist advice should be sought if changing therapy.

Interactions

A carbohydrate-rich meal (containing 68% fluids) reduced the AUC, t_{max} and C_{max}; however, the clinical relevance is uncertain.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid formulation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop enteral feed.
2. Flush enteral feeding tube with the recommended volume of water.
3. Draw the solution into the appropriate size and type of syringe.
4. Flush medication dose down feeding tube.

5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step 3 measure the medicine into a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of amisulpride. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Solian Solution (Sanofi-Aventis), Summary of Product Characteristics; September 2013.

Amitriptyline hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Amitriptyline (Accord, Actav, Genesis, Teva, Wockhardt)	Tablet 10 mg, 25 mg, 50 mg	No specific data on enteral tube administration are available for this preparation.
Amitriptyline (Rosemont)	Oral solution 25 mg/5 mL, 50 mg/5 mL	Sugar-free liquid.[2] Golden yellow, slightly viscous liquid. pH approx. 4.5. Mixes easily with an equal volume of water, flushes down tube with very little resistance.[3,4] Contains 3.4 g/5 mL maltitol.[5] Does not contain sorbitol.[2,4]
Amitriptyline (Rosemont)	Oral solution 10 mg/5 mL.	Manufactured 'special'. Sugar-free liquid. Slightly thicker than water.[6] No specific data on enteral tube administration are available for this preparation. Contains 3.4 g/5 mL maltitol.[4] Does not contain sorbitol.[4]
Amitriptyline (Wockhardt)	Oral solution 25 mg/5 mL, 50 mg/5 mL	Sugar-free liquid. No specific data on enteral tube administration are available for this preparation. Contains 10.5 mg ethanol/5 mL and 3.35 g/5 mL maltitol.[7]

Site of absorption (oral administration)

The specific site of absorption is not documented. Amitriptyline is absorbed slowly from the GI tract with peak plasma concentration occurring 4–8 hours following oral dosing.[8]

Alternative routes available

None commercially available for amitriptyline. A case report of buccal administration of amitriptyline using crushed tablets demonstrated effective absorption.[9]

Interactions

No documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid formulation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication suspension into the appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed.

Alternatively, at step (3) measure the medicine in a suitable container. Draw this into the syringe with an appropriate adapter for the tube connector. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of amitriptyline. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Amitriptyline 25 mg/5 mL Oral solution (Rosemont), Summary of Product Characteristics; June 2013.
3. BPNG data on file, 2004.
4. Amitriptyline Hydrochloride Oral Solution-3, http://www.rosemontpharma.com/products/central-nervous-system/amitriptyline-hydrochloride-oral-solution-3 (accessed 1 September 2014).
5. Personal communication, Rosemont Pharmaceuticals Ltd; 3 September 2008.
6. Rosemont. Amitriptyline Hydrochloride Oral Solution-38, http://www.rosemontpharma.com/products/central-nervous-system/amitriptyline-hydrochloride-oral-solution-38 (accessed 1 September 2014).
7. Amitriptyline Hydrochloride oral solution (Wockhardt), Summary of Product Characteristics; September 2010.
8. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
9. Robbins B, Reiss RA. Amitriptyline absorption in a patient with short bowel syndrome. *Am J Gastroenterol* 1999; 94(8): 2302–2304.

Amlodipine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Amlodipine (Accord, Aurobindo, FDC, Lexon, Mylan, Sandoz, Teva, Wockhardt)	Tablet 5 mg, 10 mg	Amlodipine (as besilate). Most brands of tablets will disperse rapidly in water. Accord brand disperses rapidly in water in the barrel of a syringe and can be adminsitered via enteral tube without significant loss of dose.[2]
Amlodipine (Actavis)	Tablet 5 mg, 10 mg	Amlodipine (as mesilate monohydrate). No specific data on enteral tube administration are available for this preparation.
Amlodipine (Rosemont)	Oral solution 5 mg/5 mL, 10 mg/5 mL	Manufactured 'special'. Sugar-free.[3] Thick liquid.[4] No specific data on enteral tube administration are available for this preparation. Contains 385 mg/5 mL ethanol.[4]
Amlostin (Discovery)	Tablet 5 mg, 10 mg	Amlodipine (as maleate). No specific data on enteral tube administration are available for this preparation.
Istin (Pfizer)	Tablet 5 mg, 10 mg	Amlodipine (as besilate). Once-daily dosing in hypertension and angina.[5] Solubility 1:500 in water.[6] Crushing Istin tablets does not alter their efficacy or pharmacokinetics. Crushed tablets will form a suspension in about 30 seconds. This can be taken by mouth or administered via a feeding tube and should be washed down with water.[7] Pfizer does not have any stability data on Istin tablets in suspension and, therefore, recommends the suspension be prepared immediately before use. Tablet disintegrates within 2 minutes when placed in 10 mL of water, to give a very fine dispersion that settles quickly but flushes via an 8Fr NG tube without blockage.[8] *Extemporaneous preparations* (a) Amlodipine 1 mg/ mL suspension (90 days' stability):[9] Amlodipine 5 mg tablets 24 tablets Ora-Sweet/Ora-Plus (equal volumes) to 120 mL (b) Amlodipine 1 mg/mL suspension (56 days' stability at room temperature):[9] Amlodipine 5 mg tablets 20 tablets 1% methylcellulose in syrup (1:1) to 100 mL

Site of absorption (oral administration)

The specific site of absorption is not documented. Peak plasma concentration occurs 6–12 hours post dose.[5]

Alternative routes available

None.

Interactions

No significant interactions with food.[7]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Recommend using the oral solution if available.
- Some brands of amlodipine tablets disperse readily in water (see above) and can be safely administered via a feeding tube; this should be done immediately prior to administration.
- A stable suspension can also be prepared.

Intragastric administration

Either use the correct volume of the oral solution, or use the tablets dispersed in water or the extemporaneous suspension.

Oral solution administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure the correct volume of oral solution for the required dose in an oral syringe.
4. Flush down the enteral feeding tube.
5. Finally, flush the enteral feeding tube with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Tablet administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) Place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

The tablet dispersion should be used for intrajejunal administration as this will have a lower osmolarity than the suspension formulation. Follow the guidance above. There are no specific data relating to the administration of amlodipine via the jejunum. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Nahata MC, Morosco RS, Hipple TF. Stability of amlodipine besylate in two liquid dosage forms. *J Am Pharm Assoc* 1999; 39(3): 375–377.
3. White R, Carta D, Morris C, Wright D. Evaluation of dose recovery from tablet manipulation methods used for enteral tube administration. *GHP/UKCPA 9th Joint National Conference*, May 2013, abstract 57.
4. Rosemont. Amlodipine Oral Solution-39, http://www.rosemontpharma.com/products/cardiovascular-system/amlodipine-oral-solution-39 (accessed 16 March 2014).
5. Istin 5 mg Tablets (Pfizer), Summary of Product Characteristics; February 2013.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
7. Personal communication, Pfizer Pharmaceuticals; 23 June 2003.
8. BPNG data on file, 2004.
9. Personal communication, Rosemont; 3 September 2008.

Amoxicillin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Amoxicillin (Accord, Aurobindo, Kent, Lexon, Mylan, Ranbaxy, Sandoz, Teva, Wockhardt)	Capsule 250 mg, 500 mg	No specific data on enteral tube administration for this preparation.
Amoxicillin (Kent, Lexon, Mylan, Teva)	Suspension 125 mg/5 mL, 250 mg/5 mL	When reconstituted forms a viscous liquid. Flushes with some resistance. Mixes easily with an equal volume of water.[2] Some brands contain sugar, while others are sugar free.
Amoxicillin (Kent, Lexon, Teva)	Sachet 3 g/sachet	No specific data on enteral tube administration are available for this preparation.
Amoxil (GSK)	Paediatric suspension 125 mg/1.25 mL	Sucrose-based powder for reconstitution. No specific data on enteral tube administration are available for this preparation. Contains sucrose 0.6 g/1.25 mL.[3]
Amoxil (GSK)	Sachet SF 3 g/ sachet	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Amoxicillin is absorbed in the upper intestine, with effective absorption when administered into the duodenum or jejunum.[4] Peak plasma concentration occurs 1–2 hours after oral dosing.[5]

Alternative routes available

Parenteral route should be used in serious infections.

Interactions

Food has no significant influence on the absorption of amoxicillin.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Liquid formulations can be administered via feeding tubes. Use the parenteral route for serious infections.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication suspension into the appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. Do not measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Amoxil Paediatric Suspension (GSK), Summary of Product Characteristics; September 2013.
4. Barr WH, Zola EM, Candler EL *et al*. Differential absorption of amoxicillin from the human small and large intestine. *Clin Pharmacol Ther* 1994; 56(3): 279–285.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Anastrozole

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Anastrozole (Accord, Actavis, Consilient, Lexon, Mylan, Niche, Sandoz, Teva, Zentiva)	Tablet 1 mg	Film-coated tablets. No specific data on enteral tube administration are available for this preparation. All makes of tablet contain varying amounts of lactose.
Arimidex (AstraZeneca)	Tablet 1 mg	Film-coated tablets. Anastrozole is moderately soluble in water.[2] Anastrozole tablets disperse in 10 mL of water to give an almost clear dispersion that flushes down an 8Fr NG tube without blockage. However, the tablets are slow to disperse and take in excess of 5 minutes.[3] Contains 93 mg lactose monohydrate.[4]
Nastrosa (Discovery)	Tablet 1 mg	Film-coated tablets. No specific data on enteral tube administration are available for this preparation. Each tablet contains 90.3 mg lactose.[5]

Site of absorption (oral administration)

Specific site of absorption not documented. Peak plasma concentration occurs within 2 hours of dosing.[4]

Alternative routes available

None for anastrozole.

Interactions

Food slightly decreases the rate but not the extent of absorption.[4] Average time to peak plasma concentrations in fed individuals is 5 hours (range 2–12 hours).[2]

Health and safety

Standard precautions apply. However, owing to the class of drug, crushing is not recommended: a closed system should be used.

Suggestions/recommendations

- Disperse tablet in water, agitating to aid dispersion, and flush via the feeding tube.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to jejunal administration. Administer using the above method. Monitor for increased side-effects.

References

1. *BNF* 67, March 2014.
2. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
3. BPNG data on file, 2004.
4. Arimidex (AstraZeneca), Summary of Product Characteristics; January 2014.
5. Nastrosa (Discovery), Summary of Product Characteristics; January 2011.

Arginine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Amargine (Special Products)	Tablet 500 mg	L-Arginine. Manufacturers 'special'. No specific data on enteral tube administration is available for this preparation. Contains lactose.[2]
Amargine (Special Products)	Oral solution 100 mg/mL	L-Arginine. Strawberry flavored liquid. No specific data on enteral tube administration are available for this preparation.
L-Arginine (Martindale)	Oral solution 500 mg/5 mL	No specific data on enteral tube administration are available for this preparation.
Amargine (Special Products)	Powder	L-Arginine. No specific data on enteral tube administration are available for this preparation.
Amargine (Special Products)	Injection 5 g/10 mL	L-Arginine (as hydrochloride). No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

L-Arginine is rapidly absorbed and metabolised by the GI tract.[3]

Alternative routes available

Intravenous route can be used.

Interactions

No known interactions.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the oral solution or mix the powder with water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

For the oral solution:

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw required dose of liquid preparation into appropriate size and type of enteral syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Restart the feed, unless a prolonged break is required.

For the powder:

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure the required amount of powder into a medicines pot.
4. Add 15 mL of water.
5. Stir to disperse the powder
6. Draw into an appropriate syringe and administer via the feeding tube.
7. Add a further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
8. Draw up this dispersion and flush down tube. This will ensure that the whole dose is given.
9. Flush the tube with recommended volume of water.
10. Re-start feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of L-arginine. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF for Children* July 2014 (www.medicinescomplete.com accessed July 2014).
2. Special Products Ltd. www.specialproducts.biz/members-area/product-information (accessed 12 July 2014).
3. Braun L, Cohen M. *Herbs and Natural Supplements: An Evidence Based Guide*,; 3rd edn. Melbourne: Churchill Livingstone-Elsevier; 2010.

Ascorbic acid

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Ascorbic Acid (Actavis, Kent, Lexon)	Tablet 50 mg, 100 mg, 200 mg, 500 mg	Chewable tablets. No specific data on enteral tube administration are available for this preparation.
Ascorbic Acid (various)	Effervescent tablet 1 g	Effervescent tablets are available for general sale, but cannot be prescribed on FP10. This preparation should be suitable for enteral tube administration.
Ascorbic Acid (UCB Pharma)	Injection 100 mg/mL	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Ascorbic acid is readily absorbed by active transport from the intestine.[2]

Alternative routes available

The parenteral formulation can be used in acute situations.

Interactions

Ascorbic acid may increase the absorption of iron in iron-deficiency states.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use effervescent tablets.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure 20–50 mL of water into a measuring pot.
4. Add the effervescent tablet and allow to dissolve.
5. Draw into an appropriate size and type of syringe.
6. Flush the medication dose down the feeding tube.
7. Rinse the measure and administer this also to ensure that the total dose is given.
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Jejunal delivery of ascorbic acid should not affect bioavailability. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
3. Brayfield A. *Martindale: The Complete Drug Reference,* 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Aspirin

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Aspirin (Actavis, Boots, Dexcel, Lexon, Teva, Wockhardt)	Dispersible tablet 75 mg, 300 mg	Disperse readily in water.
Aspirin (Actavis, Alliance, Focus, Lexon, Mylan, Pinewood, Teva, Wockhardt)	Gastro-resistant tablet 75 mg, 300 mg	Enteric-coated; do not crush. Not suitable for enteral tube administration.[2] Brands include Micropirin, Capin, Nu-seals.
Micropirin (non-proprietary)	Dispersible tablet 75 mg	Disperse readily in water.
Aspirin (Aurum)	Suppository 300 mg, 150 mg	Rectal absorption is less reliable.[3]
Co-codaprin (Actavis)	Dispersible tablet 400 mg aspirin plus 8 mg codeine phosphate	Suitable for use via an enteral feeding tube.

Site of absorption (oral administration)

Absorption of non-ionised aspirin occurs in the stomach and small intestine.[3] Food delays absorption but does not affect the overall amount of absorption.[4]

Alternative routes available

Rectal.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use dispersible tablets. If oral absorption is compromised, consider using suppositories.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to dissolve.
5. Flush the medication dose down the feeding tube.
6. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot and add 10 mL of water and allow the tablet to dissolve. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Administer using the above method. Aspirin is commercially available as an enteric-coated preparation; therefore, jejunal administration is unlikely to compromise absorption.

References

1. *BNF* 67, March 2014.
2. Aspirin Gastro-resistant Tablets (Pinewood Labs), Summary of Product Characteristics; June 2011.
3. Brayfield A. *Martindale: The Complete Drug Reference,* 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
4. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Atenolol

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Atenolol (Accord, Actavis, Lexon, Teva, Wockhardt)	Tablet 25 mg, 50 mg, 100 mg	Most brands are film-coated tablets which do not disperse readily in water.[2] The Accord brand is not film coated.[3]
Tenormin '25' (AstraZeneca)	Tablet 25 mg	Film-coated tablets No specific data on enteral tube administration are available for this preparation.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Tenormin LS (AstraZeneca)	Tablet 50 mg	Film-coated tablet. No specific data on enteral tube administration are available for this preparation.
Tenormin (AstraZeneca)	Tablet 100 mg	Film-coated tablet. No specific data on enteral tube administration are available for this preparation.
Atenolol (Lexon)	Oral solution 25 mg/5 mL	No specific data on enteral tube administration are available for this preparation.
Tenormin (AstraZeneca)	Syrup sugar-free 25 mg/5 mL	Protect from light. Clear liquid, non-viscous, flushes easily via an 8Fr NG tube without significant resistance.[2] Viscosity significantly less than standard enteral feed can be administered under gravity.[2] Contains sorbitol.[2]
Tenormin (AstraZeneca)	Injection 500 mg/mL	No specific data on enteral tube administration are available for this preparation.
Co-tenidone (Wockhardt)	Tablet 50/12.5 mg, 100/25 mg	Tablets containing 50 mg atenolol and 12.5 mg chlortalidone or 100 mg atenolol and 25 mg chlortalidone. No specific data on enteral tube administration are available for this preparation.
Kalten (BPC 100)	Capsule 50 mg/2.5 mg/25 mg	Hard gelatin capsules containing 50 mg atenolol, 2.5 mg amiloride hydrochloride, 25 mg hydrochlorthiazide. No specific data on enteral tube administration are available for this preparation.
Beta-Adalat (Bayer-Schering)	Capsule 50 mg/20 mg MR	Hard gelatin capsule containing 50 mg atenolol granules and 20 mg modified-release nifedipine tablet. Not suitable for enteral tube administration.
Tenif (AstraZeneca)	Capsule 50 mg/20 mg MR	Hard gelatin capsule containing 50 mg atenolol granules and 20 mg modified-release nifedipine tablet. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Peak plasma concentration occurs 2–4 hours post oral dose.[4] There are data to demonstrate that atenolol is absorbed in the jejunum and ileum, providing similar bioavailability data to oral absorption.[5]

Alternative routes available

The parenteral route is available.

Interactions

No documented interaction with food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid formulation for gastric administration; no further dilution is necessary.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw medication solution into the appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Jejunal administration will not affect the therapeutic effect of atenolol. Administer using above method.

References

1. *BNF* 67, September 2014.
2. BPNG data on file, 2005 and 2012.
3. Atenolol (Accord), Summary of Product Characteristics; July 2013.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
5. Adams D. Administration of drugs through a jejunostomy tube. *Br J Intensive Care* 1994; 4(1): 10–17.

Atorvastatin

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Atorvastatin (Actavis, Arrow, Consilient, Lexon, Mylan, Pfizer, Sandoz, Teva, Torrent, Wockhardt, Zentiva)	Tablet 10 mg, 20 mg, 40 mg, 80 mg	Atorvastatin (as calcium trihydrate) Many makes of tablet are film coated. No specific data on enteral tube administration are available for this preparation.
Lipitor (Pfizer)	Tablet 10 mg, 20 mg, 40 mg, 80 mg	Atorvastatin (as calcium trihydrate). Film-coated tablets. 10 mg, 20 mg and 40 mg tablets disperse within 2–5 minutes when placed in 10 mL of water, to produce a very fine milky, white dispersion that does not settle quickly. This suspension flushes via an 8Fr NG tube without blockage.[2] Atorvastatin is only slightly soluble in water and is light sensitive.[3] Contains lactose.[4]
Lipitor (Pfizer)	Chewable tablet 5 mg, 10 mg, 20 mg	Atorvastatin (as calcium trihydrate). No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Exact site of absorption is unknown but likely to be the upper intestine as peak plasma concentration is reached 1–2 hours post dose.[3]

Alternative routes available

No alternative routes for any of the 'statins'.

Interactions

No significant interaction with food. Food reduces the AUC and delays absorption of atorvastatin; however, the clinical effect on LDL cholesterol and total cholesterol is not significantly affected.[5,6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablet in water and immediately administer via feeding tube.
- No break in feeding is necessary.
- Atorvastatin can be given at any time during the day.[4]
- Consider therapeutic substitution with simvastatin suspension (see monograph for further details).

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

No specific data relating to jejunal administration of atorvastatin. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
4. Lipitor (Pfizer), Summary of Product Characteristics; August 2013.
5. Whitfield LR, Stern RH, Sedman AJ, Abel R, Gibson DM. Effect of food on the pharmacodynamics and pharmacokinetics of atorvastatin, an inhibitor of HMG-CoA reductase. *Eur J Drug Metab Pharmacokinet* 2000; 25(2): 97–101.
6. Radulovic LL, Cilla DD, Posvar EL, Sedman AJ, Whitfield LR. Effect of food on the bioavailability of atorvastatin, an HMG-CoA reductase inhibitor. *J Clin Pharmacol* 1995; 35(10): 990–994.

Azathioprine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Azathioprine (Arrow, Lexon, Mylan, Teva, Sandoz)	Tablet 25 mg, 50 mg	No specific data on enteral tube administration are available for this preparation.
Azathioprine (non-proprietary)	Tablet 25 mg, 50 mg	Both 25 mg and 50 mg tablets disintegrate within 3 minutes when agitated in a syringe with 10 mL of water. Gives a pale milky yellow dispersion that flushes easily down an 8Fr NG tube.[2]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Imuran (Aspen, previously GSK)	Tablet 25 mg, 50 mg	Film-coated tablets. Tablets disperse in 10 mL water within 5 minutes, to give a pale yellow milky dispersion that flushes easily via an 8Fr NG tube.[2] Contain lactose.[3]
Imuran (Aspen, previously GSK)	Injection 50 mg	Azathioprine (as sodium salt). Injection pH 10–12, when diluted pH 8.5–9.[4] No specific data on enteral tube administration are available for this preparation.
Azamune (Penn)	Tablet 25 mg, 50 mg	No specific data on enteral tube administration are available for this preparation.
Azathioprine (Nova Labs)	Suspension 2.5–100 mg/5 mL	Manufactured 'special'. One month expiry. Viscosity suitable for administration via feeding tube.[5]
Azathioprine (Rosemont)	Suspension 50 mg/5 mL	Unlicensed 'special'. Thick liquid.[6] No specific data on enteral tube administration are available for this preparation.
Azathioprine (extemporaneous suspension)	Suspension 50 mg/mL	*Extemporaneous suspension*: Azathioprine 50 mg tablet: 100 tablets Cherry syrup to 100 mL 60 days' expiry at room temperature.[7]

Site of absorption (oral administration)

Peak plasma concentration occurs 1–2 hours after oral dosing.[3] Data available from animal studies indicate that azathioprine is absorbed mainly through the epithelium of the stomach and ileum. Although no data are available in humans, this information suggests that jejunal delivery of the drug should not adversely affect dosing.[8]

Alternative routes available

Intravenous injection is alkaline and very irritant; the parenteral route should be used only if the oral route is not feasible.[1]

Interactions

No documented interaction with food has been noted. However, administration after food reduces side-effects of nausea.[3]

Health and safety

Azathioprine is a cytotoxic. The tablets should not be crushed owing to the risk of inhaling the powder. Several brands of azathioprine tablets will disperse in water, in a closed system (see Chapter 8);

use of this method will reduce exposure. Gloves should be worn by staff handling azathioprine tablet suspension (the coating on the tablet would usually protect the handler).

Suggestions/recommendations

- Owing to risks of handling cytotoxic drugs, discontinue or use alternative drug where possible. However, in the majority of circumstances in which azathioprine is used it is likely that alternatives will also be cytotoxic.
- The preferred method is to disperse azathioprine tablets in 10 mL of water in the barrel of a syringe, as this is a closed system. Gloves should be worn during this procedure in case of accidental spillage.
- An extemporaneous formulation with 60′ days shelf-life can be made,[6] but this must be made in an environment with suitable containment facilities to handle crushed cytotoxic tablets.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Dispose of the syringe as cytotoxic waste.
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Jejunal administration would not be expected to affect bioavailability. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Imuran Tablets 25 mg (GSK), Summary of Product Characteristics; January 2012.
4. Imuran Injection (GSK), Summary of Product Characteristics; January 2012.
5. Personal communication, Nova Labs; 24 March 2005.
6. Rosemont. Azathioprine Oral Suspension-102, http://www.rosemontpharma.com/products/malignant-disease-a-immunosuppression/azathioprine-oral-suspension-102 (accessed 1 September 2014).
7. Allen LV, Erickson MA. Stability of acetazolamide, allopurinol, azathioprine, clonazepam, and flucytosine in extemporaneously compounded oral liquids. *Am J Health Syst Pharm* 1996; 53: 1944–1949.
8. Personal communication, GlaxoSmithKline; 22 January 2003.

Baclofen

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Baclofen (Actavis, Lexon, Mylan, Teva)	Tablet 10 mg	Teva brand tablets disperse within 2 minutes when placed in 10 mL of water to produce a very fine white dispersion that flushes easily via an 8Fr NG tube.[2] Actavis tablets contain lactose.[3]
Baclofen (Focus, Lexon, Teva)	Oral solution 5 mg/5 mL	No specific data on enteral tube administration are available for this preparation.
Lioresal (Novartis)	Tablet 10 mg	No specific data on enteral tube administration are available for this preparation.
Lioresal (Novartis, previously Cephalon)	Liquid 5 mg/5 mL	Sugar-free liquid. May be diluted with water without affecting the formulation.[4] Very viscous liquid, flows very slowly under gravity, requires dilution to reduce viscosity for administration.[5] Contains sorbitol, 2.75 g/5 mL dose.[6]
Lyflex (Chemidex)	Oral solution 5 mg/5 mL	Sugar-free liquid. Contains sorbitol. May be further diluted with water.[1,7]
Baclofen (Sun Pharmaceuticals)	Intrathecal injection 50 micrograms/mL, 500 micrograms/mL, 2 mg/mL	Not appropriate as a routine alternative to oral route.
Lioresal (Novartis)	Intrathecal injection 50 micrograms/mL, 500 micrograms/mL, 2 mg/mL	Not appropriate as a routine alternative to oral route.

Site of absorption (oral administration)

Baclofen is rapidly and completely absorbed from the GI tract, although the specific site of absorption is not documented. Liquid and tablet formulations are bioequivalent. Peak plasma concentration occurs 0.5–1.5 hours following oral dose.[8]

Alternative routes available

Intrathecal route is available but not an appropriate alternative to oral therapy. Diazepam is available in rectal and parenteral formulations if clinically indicated.

Interactions

Food does not affect the bioavailability of baclofen, but administration after food may reduce GI side-effects.[9]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid formulation for small doses, dilute prior to use to reduce viscosity. Consider dispersing tablets in water for higher doses owing to the sorbitol content of the liquid formulation.
- A prolonged break in feeding is not required.

Intragastric administration

Liquid formulation

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Tablet formulation

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Baclofen (Actavis), Summary of Product Characteristics; April 2011.
4. Lioresal Liquid (Novartis), Summary of Product Characteristics; July 2013.
5. BPNG data on file, 2011.
6. Personal communication, Cephalon; July 2005.
7. Lyflex (Chemidex), Summary of Product Characteristics; May 2011.
8. Lioresal Tablets (Novartis), Summary of Product Characteristics; July 2013.
9. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

Balsalazide sodium

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Colazide (Almirall, previously Shire)	Capsule 750 mg	The capsules can be opened and the powder can be mixed with water; however, the company strongly discourage this as the azo dye will stain skin.[2]

Site of absorption (oral administration)

Balsalazide is not absorbed; the azo bond is cleaved in the colon, releasing mesalazine as the active component.[3]

Alternative routes available

Topical therapy using a rectal 5-ASA formulation should be used first line in local rectal disease.

Interactions

There is no documented interaction with food.[3]

Health and safety

Standard precautions apply. Capsule contents will stain.

Suggestions/recommendations

- Use topical preparations where clinically appropriate.
- Consider changing to sulfasalazine liquid preparation or using alternative therapy such as steroids.

References

1. *BNF* 67, March 2014.
2. Personal communication, Shire Pharmaceuticals; 17 February 2003.
3. Colozide (Almirall), Summary of Product Characteristics; May 2013.

Beclometasone dipropionate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Clipper (Chiesi)	Tablet 5 mg	Modified-release preparation. Do not crush. Swallow tablets whole without chewing; crushing the tablet will render the formulation ineffective.[2] Not suitable for enteral tube administration.

Site of absorption (oral administration)

Beclometasone is hydrolysed to the more active metabolite within the intestine to exert a topical effect on the distal small bowel and colon.[2]

Alternative routes available

None available for beclometasone. Other steroids are available as rectal formulations for the management of distal colonic disease.

Interactions

No specific interaction documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Not suitable for enteral tube administration.
- Consider using prednisolone soluble tablets (see prednisolone monograph) or topical rectal steroid preparation if appropriate.

References

1. *BNF* 67, March 2014.
2. Clipper (Chiesi), Summary of Product Characteristics; December 2008.

Bendroflumethiazide

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Bendroflumethiazide (Actavis, Genesis, Lexon, Wockhardt, Teva)	Tablet 2.5 mg, 5 mg	Bendroflumethiazide is insoluble in water.[2] Wockhardt brand of bendroflumethiazide disperses within 2 minutes when placed in 10 mL of water to give a very fine dispersion and flushs down an 8Fr NG tube without blockage.[3]
Bendroflumethiazide (Rosemont)	Oral suspension 2.5 mg/5 mL	Unlicensed 'special'. Thick viscous liquid.[4] No specific data on enteral tube administration are available for this preparation.
Aprinox (Sovereign)	Tablet 2.5 mg, 5 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[5]

Site of absorption (oral administration)

Specific site of absorption is not documented. Bendroflumethiazide is completely absorbed from the GI tract; onset of diuretic action occurs within 2 hours, with a peak effect between 3 and 6 hours.[5]

Alternative routes available

None available for bendroflumethiazide. Other diuretics such as furosemide and bumetanide are available as injection.

Interactions

No interactions with food are documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse tablets in water.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

No specific data on jejunal administration. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma Pharmaceuticals (now Actavis); 21 January 2003.
3. BPNG data on file, 2004.
4. Rosemont Pharmaceutical. Bendroflumethiazide Oral Suspension-87, http://www.rosemont-pharma.com/products/cardiovascular-system/bendroflumethiazide-oral-suspension-87 (accessed 2 March 2014).
5. Aprinox Tablets (Sovereign), Summary of Product Characteristics; October 2006.

Betahistine dihydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Betahistine (Accord, Lexon, Kent, Mylan, Teva)	Tablet 8 mg, 16 mg	Kent brand 8 mg tablets do not disperse easily in water and require crushing to mix with water. When crushed finely, the powder mixes easily with water and flushes down an 8Fr NG tube.[2] Tablets contain lactose.[3,4]
Serc (Abbott, previously Solvay)	Tablet 8 mg, 16 mg	The tablets can be crushed.[5] Betahistine dihydrochloride is very soluble in water.[6]

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs within 1 hour of oral administration.[7]

Alternative routes available

No alternative is available.

Interactions

No specific interaction with food is documented.[7] Betahistine is recommended to be taken after food.[8]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Crush the tablets and disperse in water immediately prior to administration.
- A prolonged break in feeding is not required.
- Where possible, administer after feed.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break in feeding is required.

Intrajejunal administration

There is no specific information on jejunal administration of betahistine. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Betahistine (Accord), Summary of Product Characteristics; August 2013.
4. Betahistine (Kent), Summary of Product Characteristics; July 2013.
5. Personal communication, Solvay Healthcare; 19 February 2003.
6. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
7. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.
8. Serc (Abbott), Summary of Product Characteristics; January 2014.

Betaine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Betaine (Ambetaine, Special Products Ltd)	Powder for oral solution 500 mg/mL	Manufactured 'special'. The powder is reconstituted with 55 mL of water to produce the 500 mg/mL oral liquid. The oral liquid can be administered undiluted via an enteral feeding tube.[2] Liquid pH is 7–8.
Cystadane (Orphan Europe)	Powder	Powder can be mixed with water, juice, milk, formula or food until completely dissolved and then administered immediately.[3]

Site of absorption (oral administration)

Specific site is not documented.

Alternative routes available

None available for betaine.

Interactions

No documented interactions with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use powder and mix with water prior to administration.
- Alternatively use liquid preparation.
- Titrate dose to response based on plasma homocysteine concentrations.[4]

Intragastric administration

Powder formulation

1. Stop the enteral feed.
2. Flush the tube with the recommended volume of water.
3. Add the required dose of betaine to an appropriate volume of water and stir until dissolved.
4. Draw into an appropriate size and type of syringe and administer via the enteral feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Liquid formulation

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

No specific data on administration via jejunostomy. Administer using the above method. Titrate dose to response.

References

1. *BNF* 67, March 2014.
2. Personal communication, Special Products Ltd; 23 April 2014.
3. Cystadine (Orphan Europe), Summary of Product Characteristics; March 2013.
4. Brayfield A. *Martindale: The Complete Drug Reference,* 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Betamethasone

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Betamethasone (Focus)	Soluble tablet 500 micrograms	Betamethasone as sodium phosphate equivalent to 500 micrograms betamethasone.[2] No specific data on enteral tube administration are available for this preparation.
Betnesol (RPH, previously UCB Pharma)	Injection 4 mg/mL	5.3 mg of betamethasone as sodium phosphate equivalent to 4 mg betamethasone.[3] No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Betamethasone, like all steroids, is rapidly absorbed from the GI tract;[4] specific pharmacokinetics are not documented.[5]

Alternative routes available

The parenteral formulation can be given by i.v. injection or infusion or as a deep i.m. injection.[3]

Interactions

Should be taken after food.[1]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the dispersible tablets for administration via feeding tubes.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to dissolve.
5. Flush the medication dose down the feeding tube.
6. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to dissolve. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data on the jejunal administration of betamethasone. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Betnesol Tablets (Focus Pharmaceuticals), Summary of Product Characteristics; 20 October 2012.
3. Betnesol Injection (RPH Pharmaceuticals), Summary of Product Characteristics; 28 March 2013.
4. Personal communication, Celltech; 31 March 2003.
5. Brayfield A. *Martindale: The Complete Drug Reference,* 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Bethanechol chloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Myotonine (Glenwood)	Tablet 10 mg, 25 mg	Take 30 minutes before food.[2] Extemporaneous preparation can be made.[3] *Bethanechol suspension 5 mg/mL (60 day expiry):* Bethanechol 10 mg tablets 50 tablets Cherry syrup to 100 mL

Site of absorption (oral administration)

Therapeutic effect seen within 1 hour of oral administration.[2] Bethanechol is poorly absorbed from the GI tract.[4]

Alternative routes available

None available in the UK. An injection is licensed in the USA.[4]

Interactions

There is no documented interaction with food; however, bethanechol was discovered before pharmacokinetic studies were routinely completed and there are very few data on pharmacokinetics in general.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Crush tablets and disperse in water immediately prior to administration.
- Alternatively, make an extemporaneous preparation.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly ensuring that there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of bethanechol. Administer using the above method. If using the extemporaneous suspension, dilute with an equal volume of water immediately prior to administration. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Myotonine (Glenwood), Summary of Product Characteristics; October 2010.
3. Allen LV, Erickson MA. Stability of bethanechol chloride, pyrazinamide, quinidine sulphate, rifampicin, and tetracycline hydrochloride in extemporaneously compounded oral liquids. *Am J Health Syst Pharm* 1998; 55: 1804–1809.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingston; 1998.

Bexarotene

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Targretin (Eisai, previously Elan)	Capsule 75 mg	Soft gelatin capsule filled with liquid suspension.[1] One of the ingredients inside the capsule is an irritant to the eyes, skin and mucous membranes and therefore the capsules must be swallowed whole and not chewed or broken open.[2,3] Contains sorbitol.[3]

Site of absorption (oral administration)

Specific site of absorption is unknown.

Alternative routes available

None.

Interactions

Although there are no documented interactions with food, absorption may be enhanced by food and all clinical trials were conducted in fed patients.[3]

Health and safety

Bexarotene is an antineoplastic drug and should be handled as a cytotoxic.

Suggestions/recommendations

- Do not attempt to withdraw contents from capsule.
- Seek specialist advice for alternative therapy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Elan Pharma; 16 January 2003.
3. Targretin Capsules (Eisai), Summary of Product Characteristics; February 2013.

Bezafibrate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Bezafibrate (Mylan)	Tablet 200 mg	No specific data on enteral tube administration are available for this preparation.
Bezalip (Actavis)	Tablet 200 mg	Film-coated tablet.[2] The tablet swells and the coating splits when placed in 10 mL of water; this gives a coarse dispersion. The coating does not disperse and there is a high risk of tube blockage.[3]
Bezafibrate (Sandoz)	Tablet 400 mg	Modified-release preparation. Do not crush. Not suitable for enteral tube administration. Brand name Fibrazate XL.
Bezalip Mono (Actavis)	M/R tablet 400 mg	Film-coated, modified-release tablet. Do not crush.[4] Not suitable for enteral tube administration.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–2 hours after oral administration.[2]

Alternative routes available

None.

Interactions

No specific documented interaction with food. Recommended to be taken after food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Bezafibrate requires three times a day dosing. Consider changing to a once daily fibrate or statin if clinically appropriate. See relevant monographs.
- If bezafibrate therapy is indicated, disperse the tablet in water and administer via the feeding tube; see notes above.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data on jejunal administration. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Bezalip (Actavis), Summary of Product Characteristics; November 2013.
3. BPNG data on file 2005.
4. Bezalip Mono (Actavis), Summary of Product Characteristics; October 2013.

Bicalutamide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Bicalutamide (Accord, Hikma, Kent, Lexon, Medac, Teva, Zentiva)	Tablet 50 mg, 150 mg	No specific data on enteral tube administration are available for this preparation.
Casodex (AstraZeneca)	Tablet 50 mg, 150 mg	Film-coated tablets.[2,3] The tablets do not disperse even when agitated for more than 5 minutes in 10 mL of water; the tablets do crush and mix well with water to form a milky suspension.[4] Contains lactose.[2,3]

Site of absorption (oral administration)

Specific site of absorption unknown. Bicalutamide is well absorbed following oral administration.[2,3]

Alternative routes available

None available for bicalutamide. Other antiandrogens such as buserelin, goserelin, leuprorelin and triptorelin are available as injections or implants.[1]

Interactions

There is no evidence of any clinically relevant effect of food on bioavailability.[2,3]

Health and safety

Protective clothing should be worn when crushing bicalutamide tablets to minimise exposure to dry powder and reduce risk of inhalation. Bicalutamide is a potent anti-androgen. Tablets should not be crushed and handled by pregnant women.

Suggestions/recommendations

- Where possible change to different drug, available in an injectable implantable formulation. If this is not possible and continuation of bicalutamide therapy is considered appropriate consider obtaining a liquid special. Crushing tablets should be considered a last resort and should be done using a closed system where possible (e.g. crushing syringe).
- A prolonged break in the enteral feeding regimen is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a suitable crushing syringe and crush to a fine powder.

4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Flush the medication dose down the feeding tube.
7. Draw another 15 mL of water into the syringe and stir to ensure that any remaining drug is rinsed from the container. Flush this via the feeding tube (this will rinse the syringe and ensure total dose is administered).
8. Finally, flush the enteral feeding tube with the recommended volume of water.
9. Re-start the feed, unless a prolonged break in feeding is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of bicalutamide. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67 (AstraZeneca), March 2014.
2. Casodex Tablets 50 mg (AstraZeneca), Summary of Product Characteristics; May 2012.
3. Casodex Tablets 150 mg (AstraZeneca), Summary of Product Characteristics; May 2012.
4. BPNG data on file, 2004.

Bisacodyl

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Bisacodyl (Genesis, Lexon, Mylan)	Tablet 5 mg	Enteric-coated tablets. Do not crush. Not suitable for enteral tube administration.
Dulcolax (Boehringer Ingelheim)	Enteric-coated tablet 5 mg	Enteric-coated tablets, do not crush.[2] The tablets are designed so that minimal drug is released in the small bowel; the active form is released in the colon by bacterial cleavage.[2] Not suitable for enteral tube administration.
BIsacodyl (Lexon)	Suppository 10 mg	For rectal administration only.
Dulcolax (Boehringer Ingelheim)	Suppository 10 mg	For rectal administration only.
Dulcolax (Boehringer Ingelheim)	Paediatric suppository 5 mg	For rectal administration only.

Site of absorption (oral administration)

There is minimal systemic absorption. Bisacodyl exerts a topical effect in the colon.[3]

Alternative routes available

Rectal route.

Interactions

Not applicable.

Health and safety

Standard precautions apply.

Suggestions recommendations

- Use the suppositories in the morning.
- If not appropriate consider changing to docusate sodium liquid preparation (see monograph).

References

1. *BNF* 67, March 2014.
2. Dulcolax Tablets (Boehringer Ingelheim), Summary of Product Characteristics; September 2012.
3. Dulcolax Suppositories (Boehringer Ingelheim), Summary of Product Characteristics; January 2014.

Bisoprolol fumarate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Bisoprolol (Accord, Actavis, Aurobindo, Lexon, Mylan, Niche, Sandoz, Teva)	Tablet 1.25 mg, 2.5 mg, 3.75 mg, 5 mg, 7.5 mg, 10 mg	Teva brand tablets do not disperse readily in water but will disperse if shaken in 10 mL of water for 5 minutes, the resulting dispersion flushes via 8Fr NG tube without blockage.[6]
Cardicor (Merck Serono)	Tablet 1.25 mg, 2.5 mg, 3.75 mg, 5 mg, 7.5 mg, 10 mg	Film-coated tablet. Do not crush or chew tablets.[2] Cardicor tablets are film-coated and scored but can be crushed if necessary.[3] Tablets disintegrate rapidly in 10 mL of water to form a fine suspension that flushes down an 8Fr NG tube without blockage.[6]
Emcor (Merck)	Tablet 5 mg, 10 mg	Film-coated tablet. Emcor tablets are film-coated and scored but can be crushed if necessary.[3]
Bisoprolol (Rosemont)	Oral solution 2.5 mg/5 mL	Unlicensed special. Solution slightly thicker than water.[4]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 3 hours after oral dosing.[5]

Alternative routes available

None for bisoprolol, other beta-blockers available in parenteral formulation are labetalol, metoprolol, propranolol and atenolol.

Interactions

Absorption is unaffected by food intake.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the oral solution if available, it may need to be diluted with water immediately prior to administration to decrease the resistance to flushing.
- Otherwise disperse tablets in water (preferably Merck or Lederle brand) immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

Oral liquid administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Draw an equal volume of water into the syringe and shake gently.
5. Flush the diluted medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of bisoprolol. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Cardicor (Merk Serono), Summary of Product Characteristics; July 2012.
3. Personal communication, Merck Pharmaceuticals Ltd; 23 January 2003.
4. http://www.rosemontpharma.com/products/cardiovascular-system/bisoprosal-fumarate-oral-soultion-106 (accessed 9/11/2014).
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingston; 1998.
6. BPNG data on file, 2004/5.

Bromocriptine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Bromocriptine (Focus, Meda, Teva)	Tablet 1 mg, 2.5 mg	Bromocriptine (as mesilate). No specific data on enteral tube administration are available for this preparation.
Parlodel (Meda)	Capsule 5 mg, 10 mg	Bromocriptine (as mesilate). Hard gelatin capsules. Capsules open easily; contents pour freely. Contents mix with water when powder is wetted; powder forms a fine dispersion that flushes easily via 8Fr NG tube without blockage.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–3 hours post dose.[3]

Alternative routes available

None.

Interactions

Bromocriptine should be taken after food to minimise the rapid onset of adverse effects such as nausea, vomiting and postural hypotension.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse tablets in water or open capsules and disperse contents in water immediately prior to administration.
- Administer after feed.

Intragastric administration

Capsule administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Avoid a prolonged break in feeding.
4. Open the capsule and pour the contents into a medicine pot.
5. Add 15 mL of water.
6. Stir to disperse the powder.
7. Draw into an appropriate size and type of syringe and administer via the feeding tube.
8. Add a further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
9. Draw up this dispersion and flush down the tube. This will ensure that the whole dose is given.
10. Flush the tube with the recommended volume of water.
11. Re-start the feed, unless a prolonged break is required.

Tablet administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Avoid a prolonged break in feeding.
4. Place the tablet in the barrel of an appropriate size and type of syringe.
5. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
6. Flush the medication dose down the feeding tube.
7. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration of bromocriptine. It is possible that absorption will be faster if the drug is delivered directly into the small bowel. Administer as above. Monitor for increased side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Parlodel Capsules (Meda), Summary of Product Characteristics; January 2014.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Budesonide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Budenofalk (Dr Falk, previously Provalis)	Capsule 3 mg	Hard gelatin capsule containing enteric-coated granules.[2] The capsules can be opened as long as the granules are not chewed or damaged. It may be difficult to try and wash the granules down an enteral feeding tube, as they may stick to the sides.[3] Contains 240 mg sucrose and 12 mg lactose per capsule.[2]
Budenofalk (Dr Falk)	Granule 9 mg	Sachet containing gastro-resistant granules.[4] Granules should not be chewed or crushed and therefore this preparation is not suitable for administration via an enteral feeding tube. Each sachet contains 828 mg sucrose, 36 mg lactose and 900 mg sobitol.[4]
Entocort (AstraZeneca)	CR capsule 3 mg	Hard gelatin capsule containing enteric-coated, modified-release granules.[5] No specific data on enteral administration are available for this preparation.
Entocort (AstraZeneca)	Enema 2 mg/100 mL	Not appropriate for enteral administration.

Site of absorption (oral administration)

Budenofalk capsules, owing to their enteric coating, release the drug in the terminal ileum and caecum, giving a peak plasma concentration at 5 hours.[2] The peak plasma concentration of budesonide occurs at 3–5 hours post dose for Entocort capsules.[5]

Alternative routes available

Topical therapy using enema is licensed for colitis only.[1]

Interactions

Budenofalk and Entocort preparations are advised to be taken before food to reduce the effect on the coating of the enclosed granules and ensure delivery of drug to the desired area of the intestine.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Both Budenofalk and Entocort are formulated to release budesonide in the terminal ileum and ascending colon for the topical treatment of disease in this area. Alteration of this formulation will cause the drug to be released elsewhere and absorbed systemically.
- Patients should be converted to a therapeutically equivalent dose of prednisolone and the soluble tablets used (see prednisolone monograph).

References

1. *BNF* 67, March 2014.
2. Budenofalk 3 mg (Dr Falk), Summary of Product Characteristics; September 2010.
3. Personal communication, Provalis Healthcare; 5 February 2003.
4. Budenofalk 9 mg (Dr Falk), Summary of Product Characteristics; November 2012.
5. Entocort 3 mg CR capsules (AstraZeneca), Summary of Product Characteristics; April 2012.

Bumetanide

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Bumetanide (Lexon, Mylan, Niche, Teva)	Tablet 1 mg, 5 mg	Teva brand 1 mg tablet disperses in 10 mL of water when agitated for 5 minutes to give a fine dispersion that flushes down an 8Fr NG tube without blockage.[2]
Bumetanide (non-proprietary)	Oral solution 1 mg/5 mL	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs between 0.5 and 2.2 hours following oral dosing.[3]

Alternative routes available

Parenteral route is available.

Interactions

Bioavailability is unaffected by food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication liquid into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

No specific information is available relating to jejunal administration of bumetanide. Administer using the above method. Consider dilution of the liquid formulation immediately prior to administration to reduce osmolarity. Monitor for side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Busulfan

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Myleran (Alkopharma, previously GSK)	Film-coated tablet 2 mg	Cytotoxic; film coating protects the handler from exposure. GSK recommends that tablets should not be crushed or broken.[2] Extemporaneous preparation can be made: *Busulfan suspension 2 mg/mL:* Busulfan 2 mg tablets 30 tablets Simple syrup to 30 mL Expiry 30 days, stored in a refrigerator.[3] Any cytotoxic extemporaneous preparation should be made in facilities with suitable containment equipment.
Busulfan (Nova Labs)	Oral suspension	Manufactured 'special'; 1 month expiry. Viscosity is suitable for administration via feeding tube.[4]
Busilvex (Fabre)	Concentrate for infusion 6 mg/mL 10 mL vial	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented.[5]

Alternative routes available

Parenteral route available.

Interactions

No specific interactions with food are documented.[5]

Health and safety

Cytotoxic. Protective clothing should be worn. Dispose of contaminated disposable equipment as cytotoxic waste.

Suggestions/recommendations

- Use the manufactured special suspension when possible or prepare the extemporaneous suspension if suitable containment facilities are available.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of busulfan. Seek specialist advice regarding alternative therapy. Administer using the above method. Monitor for loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, GSK; 22 January 2003.
3. Allen LV. Busulfan oral suspension. *US Pharmacist* 1990; 15: 94–95.
4. Personal communication, Nova Labs; 22 April 2014.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Cabergoline

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Cabergoline (Teva)	Tablet 0.5 mg, 1 mg, 2 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose, 75.8 mg per 0.5 mg tablet 75.3 mg per 1 mg tablet 150.6 mg per 2 mg tablet.[2]
Cabaser (Pharmacia)	Tablet 1 mg, 2 mg	Tablets can be crushed and mixed with tap water to prepare an oral solution.[3] Data available indicate that bioavailability is unaffected by preparation as a solution.[4] Tablets do not disperse readily in water, but will disperse completely to give a clear solution if shaken in 10 mL of water for 5 minutes, this solution flushes via an 8Fr NG tube without blockage.[5] Contains lactose 75.4 mg/1 mg tablet and 150.8 mg/2 mg tablet.
Dostinex (Pfizer)	Tablet 0.5 mg	No specific data on enteral tube administration are available for this preparation. Contains 75.9 mg lactose per tablet.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentrations occur 0.5–4 hours post oral dosing.[6,7]

Alternative routes available

No alternative route is available for cabergoline. Selegiline is available as oral lyophilisate tablets, Zelapar (Athena).

Interactions

Food does not appear to affect absorption and disposition of cabergoline;[6] however, taking it with food improves tolerability.[7,8]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse tablets in water immediately prior to dosing.
- Administer after feed.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to dissolve, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to jejunal administration of cabergoline. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Cabergoline Tablets (Teva), Summary of Product Characteristics; February 2014.
3. Personal communication, Pharmacia Ltd; 11 March 2003.
4. Persiani S, Persiani S, Sassolas G, *et al*. Pharmacodynamics and relative bioavailability of cabergoline tablets vs solution in healthy volunteers. *J Pharm Sci* 1994; 83(10): 1421–1424.
5. BPNG data on file 2005.
6. Cabaser Tablets 1 mg (Pharmacia), Summary of Product Characteristics; January 2014.
7. Dostinex Tablets (Pfizer), Summary of Product Characteristics; December 2013.
8. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Caffeine citrate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Caffeine citrate (Martindale)	Oral solution 10 mg/mL	Aqueous solution. 10 mg caffeine citrate = 5 mg caffeine base. No specific data on enteral tube administration are available for this preparation.
Caffeine citrate (Martindale)	Injection 10 mg/mL	No specific data on enteral tube administration are available for this preparation.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Peyona (Chiesi)	Oral solution 20 mg/mL	Aqueous solution. No specific data on enteral tube administration are available for this preparation.
Peyona (Chiesi)	Injection 20 mg/mL	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Caffeine citrate is completely and rapidly absorbed following oral administration.[2] Peak plasma levels are obtained 30 minutes to 2 hours following oral administration.[3]

Alternative routes available

Caffeine citrate can be administered by intravenous injection.

Interactions

The extent of absorption is not affected by feed but t_{max} may be prolonged.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the oral solution.
- A prolonged break from feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw required dose of liquid preparation into appropriate size and type of enteral syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of caffeine. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* for Children, 2014–2015.
2. Caffeine Citrate Oral Solution (Martindale), Summary of Product Characteristics; November 2013.
3. Peyona (Chiesi), Summary of Product Characteristics; March 2014.

Calcium folinate (Calcium leucovorin)

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Calcium folinate (Hospira, Mylan, Teva)	Tablet 15 mg	Folinic acid (as calcium salt). Teva (formally APS) brand tablets will disperse in 10 mL of water within 5 minutes to give a fine white dispersion that flushes easily via an 8Fr NG tube without blockage.[2] Hospira and Teva brands contain lactose.[3,4]
Calcium folinate (Hospira)	Injection 3 mg/mL, 7.5 mg/mL, 10 mg/mL	Folinic acid (as calcium salt). Can be administered orally. If not for parenteral use, the injection can be stored in the fridge for 24 hours when opened.[5]
Refolinon (Pfizer)	Tablet 15 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[6]
Refolinon (Pfizer)	Injection 3 mg/mL	No specific data on enteral tube administration are available for this preparation.
Sodiofolin (Medac)	Injection 50 mg/mL	Folinic acid (as disodium salt) No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Calcium folinate is absorbed by the proximal portion of the small intestine.[3] Folinic acid is well absorbed following oral administration;[7] peak plasma concentration of folate occurs 1 hour following an oral dose.[8,9]

Alternative routes available

Injection can be given parenterally and orally.

Interactions

No specific interactions with food affecting the absorption of folinic acid are documented. However, many drugs owe their pharmacological activity or side-effect profile to their inhibition of dihydrofolate reductase; folinic acid is used to treat these side-effects or as rescue therapy, for example in chemotherapy regimens containing methotrexate. Folic acid is ineffective in these instances.[10]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse tablets in water immediately prior to dosing.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Calcium folinate (Hospira), Summary of Product Characteristics; March 2009.
4. Calcium folinate (Teva), Summary of Product Characteristics; September 2012.
5. Calcium Folinate Injection (Hospira UK), Summary of Product Characteristics; December 2007.
6. Refolinon Injection (Pfizer), Summary of Product Characteristics; August 2013.
7. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
8. Calcium Leucovorin Tablets (Wyeth), Summary of Product Characteristics; March 2004.
9. Refolinon 15 mg Tablets (Pharmacia), Summary of Product Characteristics; August 2009.
10. White R, Ashworth A. How drug therapy can affect, threaten and compromise nutritional status. *Hum Nutr Diet* 2000; 13: 119–129.

Calcium salts

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Calcium carbonate Cacit (Warner Chilcott, previously Proctor & Gamble)	Effervescent tablet 1.25 g	Providing 500 mg (12.6 mmol) as calcium citrate. Tablet effervesces and dissolves in 10 mL of water. Flushes down an 8Fr NG tube without blockage.[2] This must be allowed to dissolve completely before administration but should not be stored as a solution once dissolved.[3]

Formulations available[1] (*continued*)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Adcal (Straken)	Chewable tablet 1.5 g	Providing 600 mg (15 mmol) as calcium carbonate. No specific data on enteral tube administration are available for this preparation.
Calcichew (Takeda)	Chewable tablet 1.25 g	Providing 500 mg (12.5 mmol) as calcium carbonate. No specific data on enteral tube administration are available for this product.
Calcichew Forte (Takeda)	Chewable tablet 2.5 g	Providing 1 g (25 mmol) as calcium carbonate. Can crush tablets and dissolve in water.[4] No specific data on enteral tube administration are available for this product.
Calcium-500 (Martindale)	Tablet 1.25 g	Film-coated tablet providing 500 mg (12.5 mmol) as calcium carbonate. No specific data on enteral tube administration are available for this preparation.
Calcium chloride Calcium chloride (Aurum, Celltech)	Injection 10% 0.68 mmol/mL	No specific data on enteral tube administration are available for this preparation.
Calcium glubionate Calcium-Sandoz (Alliance)	Syrup: calcium glubionate 1.09 g and calcium lactobionate USP 0.727 g per 5 mL	1.85 mL Calcium-Sandoz syrup = 1 mmol calcium. The manufacturer has no data to support the administration of Calcium-Sandoz syrup via a PEG or NG tube.[5] pH = 6.7, Osmolarity = 2130 mosmol/kg.[5]
Calcium gluconate Effervescent tablets 1 g (Actavis, previously Alpharma)	Effervescent tablet 1 g	Contains 89 mg calcium (2.25 mmol), also contains 4.46 mmol sodium.[6] Can be administered via a feeding tube, once dissolved.[6]
Injection (International Medication Systems, Martindale)	Injection 10% 0.68 mmol/mL	No specific data on enteral tube administration are available for this preparation.
Calcium lactate Calcium lactate (Actavis)	Tablet 300 mg	Tablets can be crushed.[7] Tablet contains 0.96 mmol calcium.
Sandocal-400 (Novartis)	Effervescent tablet 400 mg	Tablet contains 10 mmol calcium.
Sandocal-1000 (Novartis)	Effervescent tablet 1000 mg	Tablet contain 25 mmol calcium.

Site of absorption (oral administration)

Calcium salts are absorbed in the jejunum.

Alternative routes available

The parenteral route can be used in acute deficiency states, in medical emergencies or when GI absorption is compromised.

Interactions

Calcium may bind to phosphate in the enteral feed.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use effervescent tablets dissolved in 30–50 mL of water.
- A prolonged break in feeding is not required, but the tube should be adequately flushed to ensure that the calcium supplement does not come into contact with the feed.

Intragastric administration

Effervescent tablets

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure 30–50 mL of water into a measuring pot.
4. Add the effervescent tablet and allow to dissolve.
5. Draw into an appropriate size and type of syringe.
6. Flush the medication dose down the feeding tube.
7. Rinse the measure and administer this also to ensure that the total dose is given.
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Liquid formulation

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication liquid into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Calcium salts are absorbed in the jejunum. Jejunal administration of the above products should not affect the bioavailability. Effervescent tablets are the preferred formulation for this route owing to the lower osmolarity.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Personal communication, Procter & Gamble Pharmaceuticals; 22 January 2003.
4. Personal communication, Shire Pharmaceuticals; 17 February 2003.
5. Personal communication, Alliance Pharmaceuticals Ltd; January 2003.
6. Personal communication, Alpharma Ltd (now Actavis); 21 January 2003.
7. Calcium Lactate (Actavis), Summary of Product Characteristics; July 2012.

Calcium salts with vitamin D

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Accrete D3 (Internis)	Tablet 1.5 g/400 IU	No specific data on enteral tube administration are available for this preparation.
Adcal D3 (ProStrakan)	Chewable tablet 600 mg/400 IU	No specific data on enteral tube administration are available for this preparation.
Adcal D3 Dissolve (ProStrakan)	Effervescent tablet 600 mg/400 IU	Tablets effervesce in 50 mL of water to give a slightly cloudy solution that flushes via 8Fr NG tube without blockage. However, if left to stand the solution crystallises; therefore, the tube should be flushed well after administration.[2]
Adcal D3 Caplet (ProStrakan)	Tablet 750 mg/200 IU	Film-coated tablet. No specific data on enteral tube administration are available for this preparation.
Cacit D3 (Warner Chilcott, previously Procter & Gamble)	Effervescent granule	Possible to administer via an enteral feeding tube.[3] 4 g sachet provides 500 mg calcium, 440 IU colecalciferol; also contains 0.22 mmol sodium.[4] Contains sorbitol.
Calceos (Galen)	Chewable tablet 500 mg/400 IU	No specific data on enteral tube administration are available for this preparation.
Calcichew D3 (Shire)	Chewable tablet 500 mg/200 IU	Tablets disperse in 10 mL water if agitated for 2 minutes.[5]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Calcichew D3 Caplet (Shire)[6]	Caplet 500 g/400 IU	No specific data on enteral tube administration are available for this preparation.
Calcichew D3 Forte (Shire)	Chewable tablet 500 mg/400 IU	Tablets can be crushed and dispersed in water.[6] Tablets disperse in 10 mL water if agitated for 5 minutes.[5]
Calfovit D3 (Menarini)	Powder 1.2 g/800 IU per sachet	No specific data on enteral tube administration are available for this preparation.
Kalcipos-D (Meda)	Tablet 500 mg/800 IU	No specific data on enteral tube administration available for this preparation.
Natecal D3 (Trinity-Chiesi)	Tablet 600 mg/400 IU	No specific data on enteral tube administration are available for this preparation.
Calcium and ergocalciferol (Actavis)	Tablet 300 mg/400 IU	Tablet contains 300 mg calcium and 400 IU ergocalciferol. Tablets can be crushed.[7] 300 mg calcium lactate = 2.4 mmol calcium.

Site of absorption (oral administration)

Calcium salts are absorbed in the jejunum.

Alternative routes available

The parenteral route can be used in acute deficiency states, in medical emergencies or when GI absorption is compromised.

Interactions

Calcium will potentially bind to phosphate in the feed.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the effervescent granules or tablets; dissolve in 30–50 mL of water.
- A prolonged break in feeding is not required, but the tube should be adequately flushed to ensure that the calcium supplement does not come into contact with the food.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure 30–50 mL of water into a measuring pot.
4. Add the granules or effervescent tablets and allow to dissolve.
5. Draw into an appropriate size and type of syringe.
6. Flush the medication dose down the feeding tube.
7. Rinse the measure and administer this also to ensure that the total dose is given.
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Calcium salts and vitamin D are absorbed in the small bowel; therefore, jejunal administration is not expected to affect bioavailability. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file; 2009.
3. Personal communication, Procter & Gamble Pharmaceuticals; 22 January 2003.
4. Cacit D3 (Procter & Gamble), Summary of Product Characteristics; May 2010.
5. BPNG data on file; 2004.
6. Calcichew D3 Caplets, Summary of Product Characteristics; October 2010.
7. Personal communication, Alpharma Ltd (now Actavis); 21 January 2003.

Candesartan cilexetil

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Candesartan cilexitil (Actavis, Arrow, Conxilient, Lexon, Mylan, Teva, Torrent, Zentiva)	Tablet 2 mg, 4 mg, 8 mg, 16 mg, 32 ng	No specific data on enteral tube administration are available for these preparations. All contain lactose:[2–7]
Candesartan cilexitil (Sandoz)	Tablet 4 mg, 8 mg, 16 mg, 32 mg	No specific data on enteral tube administration are available for this preparation. All contain lactose:[8] 4 mg contains 73.94 mg 8 mg contains 69.57 mg 16 mg contains 139.14 mg 32 mg contains 278.27 mg.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Amias (Takeda)	Tablet 2 mg, 4 mg, 8 mg, 16 mg, 32 mg	16 mg tablets (other strengths not tested) do not disperse readily in water but crush easily and mix well with water to form a fine suspension that flushes down an 8Fr NG tube without blockage.[9] All contain lactose:[10] 2 mg contains 95.4 mg 4 mg contains 93.4 mg 8 mg contains 89.4 mg 16 mg contains 81.3 mg 32 mg contains 162.7 mg.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration is reached 3–4 hours after oral dosing.[10]

Alternative routes available

No other routes of administration are available for any of the angiotensin II receptor antagonists.

Interactions

The bioavailability of candesartan is not significantly affected by food.[10]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- As tablets do not readily disperse, consider changing to irbesartan (see monograph).
- A prolonged break in feeding in not required.

References

1. *BNF* 67, March 2014.
2. Candesartan cilexitil (Actavis), Summary of Product Characteristics; March 2014.
3. Candesartan cilexitil Tablets (Arrow), Summary of Product Characteristics; November 2013.
4. Candesartan cilexitil Tablets (Consilient), Summary of Product Characteristics; December 2012.
5. Candesartan cilexitil Tablets (Torrent), Summary of Product Characteristics; November 2012.
6. Candesartan cilexitil Tablets (Teva), Summary of Product Characteristics; October 2011.
7. Candesartan cilexitil Tablets (Zentiva), Summary of Product Characteristics; July 2011.
8. Candesartan cilexitil Tablets (Sandoz), Summary of Product Characteristics; March 2014.
9. BPNG data on file, 2004.
10. Amias (Takeda), Summary of Product Characteristics; November 2013.

Captopril

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Captopril (Teva, previously Actavis)	Tablet 12.5 mg, 25 mg, 50 mg	Tablets can be crushed.[2] Contains lactose: 12.5 mg tablet contains 47 mg 25 mg tablet contains 33 mg 50 mg tablet contains 66 mg
Captopril (Torrent)	Tablet 12.5 mg, 25 mg, 50 mg	No specific data on enteral tube administration are available for this preparation.
Captopril (Tillomed)	Tablet 12.5 mg, 25 mg, 50 mg	Disintegrates in 10 mL of water within 2 minutes, to give small particles. These tend to stick to the syringe, and the syringe needs to be flushed well to give the full dose, but particles do not block an 8Fr NG tube.[3]
Capoten (Squibb)	Tablet 25 mg, 50 mg	Captopril is freely soluble in cold water (160 mg/mL).[3,4] Tablets disperse in 10 mL of water within 2 minutes to give a fine dispersion that draws into a syringe easily and flushes down an 8Fr NG tube without blockage.[5] All strengths contain lactose.[6]
Noyada (Martindale)	Suspension 5 mg/5 mL, 25 mg/5 mL	Clear slightly viscous liquid. Some resistance on flushing. Non-aqueous suspension does not mix with water.[5]
Captopril extemporaneous preparation	Suspension	*Extemporaneous captopril solution 1 mg/mL:* (56 days' stability refridgerated[7]): Captopril 12.5 mg tablet: 8 tablets Sodium ascorbate injection: 500 mg Sterile water for irrigation: to 100 mL

Site of absorption (oral administration)

Captopril is absorbed in the proximal small bowel.[2] Peak plasma concentrations are reached within 60–90 minutes.[2,8]

Alternative routes available

None available.

Interactions

The presence of food in the GI tract reduces absorption by 30–40%;[7] however, there is no recommendation to take before food.[8]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Captopril tablets can be dispersed in water immediately prior to dosing – a prolonged break in feed is not required – or alternatively the liquid preparation can be used.
- However, it may be more convenient to change to a once-daily dosed ACE inhibitor available as a liquid preparation, e.g. lisinopril (see monograph).

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There is no specific information on jejunal administration of captopril. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma Ltd (now Actavis); 21 January 2004.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
4. Personal communication, Bristol-Myers Squibb; 24 January 2004.
5. BPNG data on file, 2004/5.
6. Capoten (Squibb), Summary of Product Characteristics; August 2013.
7. Nahata M, Morosco R, Hipple T. Stability of captopril in three liquid dosage forms. *Am J Hosp Pharm* 1994; 51: 95–96.
8. Noyada (Martindale), Summary of Product Characteristics: May 2013.

Carbamazepine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Tegretol (Novartis)	Tablet 100 mg, 200 mg, 400 mg	Tablets disintegrate rapidly when placed in 10 mL of water to give a coarse dispersion; this draws up easily into a syringe but the risk of blocking a fine-bore tube is high unless care is taken to keep the granules suspended.[2] Contains sorbitol.[3]
Tegretol (Novartis)	Chewtab 100 mg, 200 mg	No specific data on enteral tube administration are available for this preparation.
Carbamazepine (Taro)	Suspension 100 mg/5 mL	No specific data on enteral tube administration are available for this preparation. Contains sorbitol.[4]
Tegretol (Novartis)	Liquid 100 mg/5 mL	Sugar-free liquid suspension. There are data to suggest that the liquid preparation may adsorb onto the tube and reduce the dose administered. Diluting with an equal volume of water immediately prior to administration appears to prevent this.[5] The liquid preparation has a viscosity higher than that of the 2 kcal/mL and fibre-containing enteral feeds and flows very slowly under gravity. It can be administered via syringe push through an 8Fr NG tube with some resistance but not blockage.[6] Contains sorbitol,[7] 1.25 g/5 mL dose.[8]
Tegretol (Novartis)	Suppository 125 mg, 250 mg	Rectal administration only. Licensed for short-term use (7 days). 125 mg suppository is equivalent to 100 mg tablets.[1]
Carbagen (Mylan)	M/R tablet 200 mg, 400 mg	Film-coated modified-release preparation – do not crush. Not suitable for enteral tube administration. To convert to the liquid preparation, divide the total daily dose by 4 to give the liquid dose, e.g. 400 mg b.d. M/R tablets = 200 mg q.d.s. liquid.
Tegretol Prolonged Release (Novartis	M/R tablet 200 mg, 400 mg	Modified-release preparation – do not crush. Not suitable for enteral tube administration. See notes above for conversion to liquid preparation.

Site of absorption (oral administration)

Specific site is not documented; however, peak plasma concentration occurs up to 12 hours post oral dose with the tablet formulation; 6 hours for the chewable tablets; 2 hours for the liquid formulation,

which also produces a higher peak plasma concentration[9] which may be associated with an increase in side-effects.[3]

Alternative routes available

Suppositories are available (see notes above).

Interactions

Food has no significant effect on absorption from all the dosage forms of carbamazepine;[3] however, enteral feeding may slightly delay and reduce absorption of the liquid preparation, which may help to reduce side-effects such as mild drowsiness and lightheadedness.[10]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation. Dilute with an equal volume of water immediately prior to administration. If giving doses higher than 400 mg/day, divide into four equal doses. Doses above 800 mg/day may cause bloating due to the sorbitol content of the liquid.
- A prolonged break in feeding is not necessary.
- Plasma concentrations can be monitored if subtherapeutic or toxic concentrations are suspected. Dosage should be titrated to effect.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication liquid into an appropriate size and type of syringe.
5. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of carbamazepine. Administer using the above method. An increase in side-effects such as dizziness is possible owing to the rapid delivery into the small bowel. Monitor for increased side-effects or loss of efficacy. Consider decreasing the dose and increasing the dosing frequency if side-effects are problematic.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Tegretol Tablets (Novartis), Summary of Product Characteristics; January 2014.
4. Carbazazepine Oral Suspension (Taro), Summary of Product Characteristics; February 2013.
5. Clark-Schmidt AL, Garnett WR, Lowe DR, Karnes HT. Loss of carbamazepine suspension through nasogastric feeding tubes. *Am J Hosp Pharm* 1990; 47(9): 2034–2037.
6. BPNG data on file, 2011.
7. Tegretol Liquid (Novartis), Summary of Product Characteristics; January 2014.
8. Greenwood J. Sugar content of liquid prescription medicines. *Pharm J* 1989; 242: 553–557.
9. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
10. Bass J, Miles MV, Tennison MB, Holcombe BJ, Thorn MD. Effects of enteral tube feeding on the absorption and pharmacokinetic profile of carbamazepine suspension. *Epilepsia* 1989; 30(3): 364–369.

Carbimazole

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Carbimazole (Amdipharm)	Tablet 5 mg, 20 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]
Neo-Mercazole (Amdipharm)	Tablet 5 mg, 20 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose and sucrose.[3]

Site of absorption (oral administration)

Specific site is not documented. Carbimazole is rapidly metabolised to thiamazole and the peak plasma concentration occurs 1 hour following oral dosing of carbimazole.[3,4]

Alternative routes available

None available for carbimazole.

Interactions

No specified effect of food.[5]

Health and safety

Carbimazole has antithyroid activity, exposure should be minimised. Protective clothing should be worn.

Suggestions/recommendations

- Previous information has shown that tablets disperse in water; however, formulations have changed and no specific information on these formulations is available.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to this route of administration. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Carbimazole (Amdipharm), Summary of Product Characteristics; April 2014.
3. Neo-Mercazole (Amdipharm), Summary of Product Characteristics; October 2012.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
5. Personal communication, Roche; 6 February 2003.

Carbocisteine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Carbocisteine (Arrow, Teva)	Capsule 375 mg	No specific data on enteral tube administration are available for this preparation. Teva brand contains lactose 13.75 mg/capsule.[2]
Mucodyne (Sanofi-Aventis)	Capsule 375 mg	Size 1, yellow hard gelatin capsules printed 'mucodyne 375' in black.[3] Carbocisteine is practically insoluble in water. A 1% suspension has a pH of 2.8–3.0.[4] Contains lactose.[3]
Mucodyne Paediatric (Sanofi-Aventis)	Oral liquid 125 mg/5 mL	Clear red syrup, cherry and raspeberry flavoured.[5] Contains sucrose.[5]
Mucodyne (Sanofi-Aventis)	Suspension 250 mg/5 mL	Clear amber syrup, rum and cinnamon flavoured.[6]

Site of absorption (oral administration)

Peak plasma levels occur within 1–3 hours of oral administration.[3]

Alternative routes available

Depending on clinical indication for carbocisteine, alternatives to be considered are nebulised dornase alfa or acetylcysteine. Specialist advice should be sought.

Interactions

No documented significant interactions with food or enteral nutrition.

Health and safety

Standard precautions apply.

Suggestions/recommendations

Use liquid preparation.

Intragastric administration

1. Stop enteral feed.
2. Flush enteral feeding tube with the recommended volume of water.
3. Draw oral solution into the appropriate size and type of enteral syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Restart the feed, unless a prolonged break is required.

Intrajejunal administration

No specific data available.

References

1. *BNF* 67, March 2014.
2. Carbocisteine Capsules (Teva), Summary of Product Charaacteristics; March 2013.
3. Mucodyne Capsules (Sanofi Aventis), Summary of Product Characteristics: April 2013.
4. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
5. Mucodyne Paediatric (Sanofi Aventis), Summary of Product Characteristics; January 2014.
6. Mucodyne Syrup (Sanofi Aventis), Summary of Product Characteristics; October 2013.

Carvedilol

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Carvedilol (Aurobindo)	Tablet 3.125 mg, 6.25 mg, 12.5 mg, 25 mg	Film coated tablets. No specific data on enteral tube administration are available for this preparation. Contains lactose and sucrose.[2]
Carvedilol (Teva)	Tablet 3.125 mg, 6.25 mg, 12.5 mg, 25 mg	The tablets will disperse in 10 mL of water if shaken for 5 minutes; the resulting dispersion has visible particles but these do not block an 8Fr NG feeding tube.[3] Contains lactose.[4]
Carvedilol (Almus, Tillomed)	Tablet 3.125 mg, 6.5 mg, 12.5 mg, 25 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[5]

Site of absorption (oral administration)

Maximum plasma concentration occurs 1 hour after an oral dose.[2,6] The absorption rate decreases progressively from the jejunum to the ileum through to the colon, and the absorption is delayed by bile and some mucoadhesive agents.[7]

Alternative routes available

None available for carvedilol; other beta-blockers are available as liquid preparations (e.g. propranolol) or parenteral formulations.

Interactions

The absolute bioavailability of carvedilol is not affected by food, but absorption is delayed. For this reason it is recommended that carvedilol be taken after food as this reduces the incidence of rapid vasodilation, rapid hypotension and flushing.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse tablets in water immediately prior to administration.
- Consider using an alternative beta-blocker as an oral solution (bisoprolol, metoprolol or propranolol; see separate monographs).
- Administer after feed.
- If administering during feeding, a prolonged break is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Avoid a prolonged break to reduce incidence of profound hypotension.
4. Place the tablet in the barrel of an appropriate size and type of syringe.
5. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
6. Flush the medication dose down the feeding tube.
7. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Jejunal administration is unlikely to affect absorption. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Carvedilol (Aurobindo), Summary of Product Characteristics; October 2012.
3. BPNG data on file, 2004/5.
4. Carvedilol (Teva), Summary of Product Characteristics; March 2014.
5. Carvedilol (Almus), Summary of Product Characteristics; March 2014.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
7. Cheng J, Kamiya K, Kodama I. Carvedilol: molecular and cellular basis for its multifaceted therapeutic potential. *Cardiovasc Drug Rev* 2001; 19(2): 152–171.

Cefalexin (Cephalexin)

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Cefalexin (Aurobindo, Kent, Mylan, Sandoz, Teva)	Capsule 250 mg, 500 mg	See safety information below.
Cefalexin (Auribindo, Kent, Mylan, Sandoz, Teva)	Tablet 250 mg, 500 mg	See safety information below.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Cefalexin (Aurobindo, Hillcross, Mylan Sandoz, Teva)	Oral suspension 125 mg/5 mL, 250 mg/5 mL	No specific data on enteral tube administration are available for this preparation. The Aurobindo products contain sorbitol.[2] The Sandoz products contain sucrose.[3]
Ceporex (CoPharma)	Capsule 250 mg, 500 mg	See safety information below.
Ceporex (CoPharma)	Tablet 250 mg, 500 mg	Film-coated. See safety information below.
Ceporex (CoPharma)	Syrup 125 mg/5 mL, 250 mg/5 mL, 500 mg/5 mL	Orange suspension when reconstituted. Flushes with some resistance. Mixes easily with an equal volume of water; this reduces resistance to flushing.[4]
Keflex (Flynn)	Capsule 250 mg, 500 mg	See safety information below.
Keflex (Flynn)	Tablet 250 mg, 500 mg	See safety information below.
Keflex (Flynn)	Suspension 125 mg/5 mL, 250 mg/5 mL	As monohydrate. Powder for reconstitution contains active drug. Contains sucrose.[5]

Site of absorption (oral administration)

Peak plasma concentration occurs 1 hour following oral administration.[5] Cefalexin is thought to be absorbed from the duodenum and therefore absorption may be reduced by jejunal administration.[6]

Alternative routes available

None available for cefalexin. Cefradine (alternative first-generation cephalosporin) is available in parenteral formulation.

Interactions

Cefalexin is acid-stable and may be given without regard to meals.[3]

Health and safety

Avoid crushing tablets or opening capsules owing to the risk of sensitisation to cephalosporins.

Suggestions/recommendations

- Use liquid preparation. Give as twice daily dose if clinically appropriate.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

See notes above; absorption may be reduced. Use the higher end of the dose range. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Cefalexin (Aurobindo), Summary of Product Charateristics; September 2012.
3. Cefalexin (Sandoz), Summary of Product Characteristics; February 2008.
4. BPNG data on file, 2005.
5. Keflex (Flynn), Summary of Product Characteristics; March 2011.
6. Adams D. Administration of drugs through a jejunostomy tube. *Br J Intensive Care* 1994; 4(1): 10–17.

Cefixime

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Suprax (Sanofi-Aventis)	Tablet 200 mg	Film coated. No specific data on enteral tube administration are available for this preparation.
Suprax (Sanofi-Aventis)	Suspension 100 mg/5 mL	Dilution not recommended. Absorption is better from suspension than tablets.[2] Contains 2.5 g sucrose/5 mL. Does not contain sorbitol.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented.

Alternative routes available

No alternative routes are available for cefixime. Other cephalosporins are available as parenteral formulations.

Interactions

Absorption of cefixime is not significantly modified by food. Peak concentration may be delayed.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid preparation. Flush well before and after dose. Do not dilute suspension.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication suspension into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of cefixime. Administer using the above method. Flush well before and after dosing to reduce the osmolarity of the suspension. Monitor for lack of effect.

References

1. *BNF* 67, March 2014.
2. Personal communication, Aventis; 13 February 2003.
3. Suprax (Sanofi-Aventis), Summary of Product Characteristics; January 2014.

Cefradine (Cephradine)

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Cefradine (Kent)	Capsule 250 mg, 500 mg	See safety information below. Contains lactose.[2]

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs within 1 hour of oral dosing.[2,3]

Alternative routes available

Parenteral route available.

Interactions

Food delays the absorption but does not affect total bioavailability.[3]

Health and safety

Standard precautions apply. Do not open capsules. Avoid inhalation of capsule contents owing to risk of cephalosporin sensitisation.

Suggestions/recommendations

- Use alternative cephalosporin.
- A prolonged break in feeding is not required.

References

1. *BNF* 67, September 2014.
2. Cefradrine (Kent), Summary of Product Characteristics; September 2012.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Cefuroxime

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Cefuroxime (Pliva, Sandoz, Teva)	Tablet 250 mg	Coated tablet.[2] Cefuroxime (as axetil). No specific data on enteral tube administration are available for this preparation. Sandoz brand contains 0.3 mg aspartame per tablet.[2]
Zinnat (GSK)	Tablet 125 mg, 250 mg	Film-coated tablet. Cefuroxime (as axetil). Tablets may be easily dispersed in water; this may be easier than the suspension to administer via NG.[3]
Zinnat (GSK)	Suspension 125 mg/5 mL	Cefuroxime (as axetil). The suspension may be too viscous to administer via fine bore feeding tubes.[3] Granules for reconstitution.[4] Contains sucrose 3.1 g/5 mL.[4]
Zinnat (GSK)	Sachet 125 mg per sachet	Cefuroxime (as axetil). Same preparation as suspension. Each sachet should be mixed with 10 mL of water immediately prior to administration.[4] Contains sucrose 3.1 g/sachet mL.[4]
Zinacef (GSK)	Injection 250 mg, 750 mg, 1.5 g	Cefuroxime (as sodium salt).[5] No specific data on enteral tube administration are available for this preparation.
Cefuroxime (Flynn, Stravencon)	Injection 250 mg, 750 mg, 1.5 g	Cefuroxime (as sodium salt). No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site is not documented. Cefuroxime axetil is hydrolysed in the intestine to cefuroxime.[6] Peak plasma concentration occurs 2–3 hours following oral dosing with food.[3] The tablets and the suspension preparations are not bioequivalent on a milligram to milligram basis.[2]

Alternative routes available

The parenteral route is available.

Interactions

Food increased the peak plasma concentration and total bioavailability of oral cefuroxime axetil; the peak was delayed slightly.[7,8] The data are inconsistent, with a few studies demonstrating reduced

peak levels; however, antimicrobial activity is unaffected.[9] It is recommended to administer doses after food.[3]

Health and safety

Crushing tablets should be avoided owing to risks of cephalosporin sensitisation.

Suggestions/recommendations

- For a wider bore tube > 10Fr, use suspension formulation. For finer bore tube, consider using tablets dispersed in 10 mL of water.
- For intrajejunal tubes, use the tablets dispersed in water; this may be preferable owing to the lower osmolarity.
- A prolonged break in feeding is not required.

Intragastric administration

See notes above.

Suspension

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of cefuroxime axetil; however, as conversion to cefuroxime occurs in the small bowel, it is unlikely that bioavailability will be affected. Administer using the above method, also see below.

Tablet administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

References

1. *BNF* 67, March 2014.
2. Cefuroxime tablet (Sandoz), Summary of Product Characteristics; March 2013.
3. Personal communication, GSK; 22 January 2003.
4. Zinnat Suspension (GSK), Summary of Product Characteristics; June 2013.
5. Zinacef Injection (GSK), Summary of Product Characteristics; February 2014.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
7. Harding SM. The absolute bioavailability of oral cefuroxime axetil in male and female volunteers after fasting and after food. *J Antimicrob Chemother* 1984; 13: 191–196.
8. Finn A, Straughb A, Meyer M, *et al.* Effect of dose and food on the bioavailability of cefuroxime axetil. *Biopharm Drug Dispos* 1987; 8(5): 519–526.
9. Garraffo R, Drugeon HB, Chiche D. Pharmacokinetics and pharmacodynamics of two oral forms of cefuroxime axetil. *Fundam Clin Pharmacol* 1997; 11: 90–95.

Celecoxib

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Celebrex (Pfizer) (previously Pharmacia)	Capsule 100 mg, 200 mg	The contents of the capsules pour easily from an opened capsule and mix easily with 10 mL of water to form a milky suspension that flushes down an 8Fr NG tube without blockage.[2] However, this requires a degree of manual dexterity owing to the small size of the capsules. Each 100 mg capsule contains 149.7 mg of lactose monohydrate; a 200 mg capsule contains 49.8 mg lactose monohydrate. Pharmacia do not recommend that the capsules be opened and mixed with water, but state that the contents of the capsule can be mixed with pudding or apple sauce immediately prior to administration.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 2–3 hours after oral dosing.[4]

Alternative routes available

Meloxicam (COX II-selective) is available as suppositories. Rectal, topical and parenteral routes are available for other NSAIDs.

Interactions

A high-fat meal delays peak concentrations by approximately 1 hour. Celecoxib can be taken before or after food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Change to an alternative COX II-selective NSAID such as etoricoxib or valdecoxib (see monographs).

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Personal communication, Pharmacia; 11 March 2003.
4. Celebrex (Pfizer), Summary of Product Characteristics; January 2013.

Celiprolol hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Celiprolol (Mylan, Ranbaxy, Teva)	Tablet 200 mg, 400 mg	Ranbaxy 200 mg tablets disperse in 10 mL of water within 5 minutes and flush via an 8Fr NG tube without blockage.[2]
Celectol (Zentavia part of Sanofi-Aventis)	Tablet 200 mg, 400 mg	Film-coated tablets.[1] Celiprolol hydrochloride is freely soluble in water.[3] No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs between 2 and 3 hours after oral dosing.[4] Celiprolol is a hydrophilic compound and it is incompletely absorbed from the GI tract.[5]

Alternative routes available

None available for celiprolol; other beta-blockers are available as parenteral formulations.

Interactions

Celiprolol absorption is significantly affected by food but it is not thought to be clinically relevant.[4] It is advised that it is given first thing in the morning 30 minutes before food or 2 hours after a meal.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to limited data, consider changing to alternative beta-blocker such as atenolol or propranolol (see monographs).

References

1. *BNF* 67, September 2014.
2. BPNG data on file, 2005.
3. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
4. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.
5. Celectol (Winthrop), Summary of Product Characteristics; July 2012.

Cetirizine hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Cetirizine (Actavis, Boots, Dexcel, Galpharm, Omega, Teva, Tillomed, Wockhardt)	Tablet 10 mg	Tillomed brand tablets do not disperse readily in water but will disintegrate if shaken in 10 mL of water for 5 minutes; this forms a fine dispersion that flushes via an 8Fr tube without blockage.[2]
Cetirizine (Mylan, Sandoz, T&R, Teva)	Oral solution 5 mg/5 mL	No specific data on enteral tube administration are available for this preparation. Contains sorbitol in varying amounts.
Cetirizine (Pinewood)	Oral solution 5 mg/5 mL	Viscosity lower than standard enteral feed, flushes easily via 8Fr NG tube without resistance.[3] Contains sorbitol 250mg/mL.[4]
Benedryl (McNeil)	Tablet 10 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose 66.4 mg per tablet.[5]
Benedryl (McNeil)	Oral solution 5 mg/5 mL	No specific data on enteral tube administration are available for this preparation. Contains sorbitol 450 mg/mL.[6]
Benedryl (McNeil)	Liquid release capsule 10 mg	Not suitable for NG administration as liquid volume not accurate when removed from capsules.
Piriteze (GSK)	Tablet 10 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[7]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Piriteze (GSK)	Oral solution 5 mg/5 mL	No specific data on enteral tube administration are available for this preparation. Contains 315 mg sorbitol per mL.[7]
Zirtek (UCB)	Tablet 10 mg	Film-coated. No specific data on enteral tube administration are available for this preparation. Contains 66.4 mg lactose per tablet.[8]
Zirtek (UCB)	Oral solution 5 mg/5 mL	No specific data on enteral tube administration are available for this preparation. Contains 450 mg sorbitol per mL.[9]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 30–90 minutes following oral dosing.[3,8]

Alternative routes available

Parenteral formulation is available for chlorphenamine.

Interactions

No specific interactions with food are documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation, unless sorbitol is contraindicated.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of cetirizine. Monitor for reduced effect or increased side-effects. Administer as above.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Cetirizine Solution (Pinewood), Summary of Product Characteristics; August 2011.
4. BPNG data on file, 2011.
5. Benedryl Tablets (McNeil), Summary of Product Characteristics; September 2011.
6. Benedryl Oral Solution (McNeil), Summary of Product Characteristics; May 2010.
7. Piriteze (GSF), Summary of Product Characteristics; August 2012.
8. Zirtek Tablets (UCB), Summary of Product Characteristics; October 2012.
9. Zirtek Oral Solution, Summary of Product Characteristics; October 2012.

Chloral hydrate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Chloral Mixture BP (Martindale, Special Products)	Oral solution 500 mg/5 mL	Chloral (as hydrate). Manufacturer's 'special'. No specific data on enteral tube administration are available for this preparation. Special Products formulation contains aspartame.[2]
Chloral Elixir Paediatric BP (Martindale)	Injection 200 mg/5 mL	Chloral (as hydrate). No specific data on enteral tube administration are available for this preparation.
Chloral Hydrate (Rosemont)	Oral syrup 500 mg/5 mL	Manufacturer's 'special'. Slightly thicker than water. Contains sucrose.[3]
Welldorm (Marlborough)	Elixir 500 mg/5 mL	Chloral (as hydrate). No specific data on enteral tube administration are available for this preparation. Contains glucose.[4]
Welldorm (Marlborough)	Tablet 707 mg	Cloral (as betaine) 707 mg chloral betaine = 414 mg chloral hydrate.[5] No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Chloral hydrate is rapidly absorbed from the stomach and starts to act within 30 minutes.[4]

Alternative routes available

None available for chloral hydrate.

Interactions

No known interactions.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the oral solution or change to melatonin (see individual monograph).
- A prolonged break from feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw required dose of liquid preparation into the appropriate size and type of enteral syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Restart the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of chloral hydrate Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Special Products. Chloral Hydrate Oral Solution, www.specialproducts.biz/members-area/product-information (accessed 12/07/2014).
3. Rosemont. Chloral Hydrate Oral Syrup-43, www.rosemontpharma.com/products/central-nervous-system/chloral-hydrate-oral-syrup-43 (accessed 12 July 2014).
4. Welldorm Elixir (Marlborough), Summary of Product Characteristics; May 2014.
5. Welldorm Tablets (Marlborough), Summary of Product Characteristics; May 2014.

Chloroquine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Avloclor (Alliance)	Tablet 250 mg	250 mg chloroquine phosphate = 155 mg chloroquine base. No specific data on enteral tube administration are available for this preparation. Contains Magnesium Stearate.[2]
Nivaquine (Sanofi-Aventis)	Syrup 68 mg/5 mL	Chloroquine base 50 mg/5 mL. Contains sucrose base; does not contain sorbitol.[3]
Malarivon (Wallace Mfg)	Syrup 80 mg/5 mL	Chloroquine phosphate 80 mg/5 mL= chloroquine base 50 mg/5 mL.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 1–6 hours after dose.[2]

Alternative routes available

Parenteral route is available; usually reserved for treatment of malaria.

Interactions

Food does not affect the bioavailability of chloroquine. The SPC recommends taking with food or milk to minimise the possibility of gastrointestinal irritation.[2,3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid preparation for intragastric administration.
- Owing to the likely high viscosity and volume of dose for adults (30 mL) of the liquid preparation, consider dilution with water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication syrup into an appropriate size and type of syringe.

5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

See notes above. Use the above method; ensure tube is flushed well. High osmolarity may increase the incidence of GI side-effects.

References

1. *BNF* 67, March 2014.
2. Avloclor (alliance), Summary of Product Characteristics; December 2013.
3. Nivaquine Syrup (Sanofi-Aventis), Summary of Product Characteristics; May 2014.

Chlorphenamine (Chlorpheniramine) maleate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Chlorphenamine (Actavis, Boots, Genesis, Teva, Tillomed)	Tablet 4 mg	Chlorphenamine maleate is soluble 1 : 5 in water.[2] Tablets can be crushed and mixed with water.[3]
Chlorphenamine (Boots, Sandoz, Tillomed)	Sugar-free oral solution 2 mg/5 mL	Oral solution has a similar viscosity to standard enteral feed and flushes via an 8Fr NG tube with little resistance and without blockage.[4] Contains maltitol; does not contain sorbitol.[5]
Chlorphenamine (Archimedes Pharma)	Injection 10 mg/mL	No specific data relating to enteral tube administration of the injection are available.
Piriton (GSK Healthcare)	Tablet 4 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[6]
Piriton (GSK Healthcare)	Syrup 2 mg/5 mL	Liquid flushes via fine-bore tube with some resistance, mixes easily with an equal volume of water.[7] Contains ethanol.[8]

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 2–3 hours following oral dosing.[2]

Alternative routes available

Parenteral formulation is available.

Interactions

Administration with food significantly reduces bioavailability;[2] however, no specific recommendations are made in the SPC.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid preparation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication syrup into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of chlorphenamine. Monitor for loss of effect or increased side-effects. Administer as above. Consider diluting the syrup immediately prior to administration to reduce osmolarity.

References

1. *BNF* 67, March 2014.
2. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
3. Personal communication, Alpharma (now Actavis); 21 January 2003.
4. BPNG data on file, 2011.
5. Chlorphenamine Elixir BP (Sandoz), Summary of Product Characteristics; August 2013.
6. Piriton Tablets (GSK Healthcare), Summary of Product Characteristics; November 2012.
7. BPNG data on file, 2004.
8. Piriton Oral Syrup (GSK Healthcare), Summary of Product Characteristics; May 2010.

Chlorpromazine hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Chlorpromazine (Genus, Teva)	Tablet 25 mg, 50 mg, 100 mg	Coated tablets. Do not crush – not suitable for enteral tube administration. (See health and safety information below).
Chlorpromazine (Rosemont)	Oral solution 25 mg/5 mL, 100 mg/5 mL	Rosemont 'special'. The preparation is slightly more viscous than water.[2] Contains alcohol 12.2 mg/5 mL.[2]
Chlorpromazine (Rosemont)	Oral syrup 25 mg/5 mL, 100 mg/5 mL,	The preparation is slightly more viscous than water.[3] Contains sorbitol, sucrose and alcohol (0.3 mg/5 mL).
Chlorpromazine (Pinewood, Wockhardt)	Oral solution 25 mg/5 mL	No specific data on enteral tube administration are available for this preparation. Pinewood preparation contains sorbitol.[4]
Chlorpromazine (Antigen)	Injection 25 mg/mL (1.2 mL)	Licensed for i.m. administration. No specific data on enteral tube administration are available for this preparation.
Chlorpromazine (Martindale)	Suppository 100 mg	Special order product only. *For equivalent therapeutic effect:* 100 mg rectal = 20–25 mg i.m. = 40–50 mg orally.[1]
Largactil (Sanofi-Avensis)	Injection 25 mg/mL (2 mL)	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 2–4 hours following oral administration.[5]

Alternative routes available

Parenteral route is available. Suppositories are available by special order only.

Interactions

No specific documented interaction with food.[5]

Health and safety

Owing to the risks of contact sensitisation, tablets should not be crushed and solutions should be handled with care.[1]

Suggestions/recommendations

- Use oral solution where possible.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of chlorpromazine. Administer using the above method. Monitor for increased side-effects.

References

1. *BNF* 67, March 2014.
2. Rosemont. Chlorpromazine Hydrochloride Oral Solution-44, www.rosemontpharma.com/products/central-nervous-system/chlorpromazine-hydrochloride-oral-solution-44. (accessed 08 May 2014).
3. Chlorpromazine Oral Syrup (Rosemont), Summary of Product Characteristics; July 2013.
4. Chlorpromazine Oral Solution (Pinewood), Summary of Product Characteristics; February 2012.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Chlortalidone (Chlorthalidone)

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Hygroton (Alliance)	Tablet 50 mg	Scored tablets. Tablet disintegrates within 2 minutes when placed in 10 mL of water; the pale yellow dispersion flushes via an 8Fr NG tube without blockage.[2]
Tenoret (Astra Zenneca)	Tablet 50 mg/12.5 mg, 100 mg/25 mg	Atenolol and chlortalidone combination. No specific data on enteral tube administration are available for this formulation.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 8–12 hours following oral administration.[3]

Alternative routes available

None for chlortalidone. Other diuretics are available in parenteral formulations.

Interactions

No specific interaction with food is documented.[3,4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablet in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data on jejunal administration of chlortalidone. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Hygroton (Alliance), Summary of Product Characteristics; February 2004.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Ciclosporin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Capimune (Mylan)	Capsule 25 mg, 50 mg, 100 mg	Soft capsules. Not suitable for administration via feeding tube.
Capsorin (Morningside)	Capsule 25 mg, 50 mg, 100 mg	Soft capsules. Not suitable for administration via feeding tube.
Deximune (Dexcel)	Capsule 25 mg, 50 mg, 100 mg	Soft capsules. Not suitable for administration via feeding tube.
Neoral (Novartis)	Capsule 10 mg, 25 mg, 50 mg, 100 mg	Soft gelatin capsules. Not suitable for administration via feeding tube.
Neoral (Novartis)	Oral solution 100 mg/mL	The oral solution can be mixed with water, orange juice, squash or apple juice immediately prior to administration.[2] Contains 94.7 mg/mL ethanol.[2]
Sandimmun (Novartis)	Conc. for infusion 50 mg/mL	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Ciclosporin is absorbed in the duodenum and jejunum, reduced bile flow decreases absorption.[3] Absorption is also decreased in short bowel syndrome.[4]

Alternative routes available

Sandimmun injection can be used, one third of the oral dose should be used.[5] Therapeutic drug monitoring is necessary to ensure appropriate dose adjustment.

Interactions

Ciclosporin levels are increased by grapefruit juice,[6] no other specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid formulation, dilute immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop enteral feed.
2. Flush enteral feeding tube with the recommended volume of water.
3. Draw the syrup into the appropriate size and type of syringe.
4. Dilute 1:1 with a suitable liquid (as listed above) and agitate to mix.
5. Flush medication dose down feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container, and dilute 1:1 with a suitable diluent. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this will result in excessive dosing owing to the volume of the tip.

Intrajejunal administration

No specific data relating to jejunal administration of ciclosporin. Administer using the above method and monitor levels and adjust accordingly.

References

1. *BNF* 67, March 2014.
2. Neoral (Novartis), Summary of Product Characteristics; November 2013.
3. Mehta MU, Venkataramanan R, Burckart GJ, *et al*. Effect of bile on cyclosporin absorption in liver transplant patients. *Br J Clin Pharmacol* 1988; 25(5): 579–584.
4. Severijnen R, *et al*. Enteral drug absorption in patients with short bowel. *Clin Pharmcokinet* 2004; 43(14): 951–962.
5. Sandimmun (Novartis), Summary of Product Characteristics; November 2013.
6. Ioannides-Demos LL, Christophidis N, Ryan P, *et al*. Dosing implication of a clinical interaction between grapefruit juice and cyclosporine and metabolite concentrations in patients with autoimmune diseases. *J Rheumatol* 1997; 24: 49–54.

Cilazapril

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Vascace (Roche)	Tablet 500 micrograms, 1 mg, 2.5 mg, 5 mg	Film-coated tablets.[2] Solubility 1 : 200 in water.[3] No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]

Site of absorption (oral administration)

Specific site of absorption is unknown. Peak plasma concentration is reached within 2 hours of oral administration.[2]

Alternative routes available

None available.

Interactions

Food delays and reduces absorption of cilazapril, but this is therapeutically irrelevant.[2,4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Limited data are available.
- Consider changing to alternative once-daily dose ACE inhibitor, for example ramipril or lisinopril (see monographs).

References

1. *BNF* 67, March 2014.
2. Vascace (Roche), Summary of Product Characteristics; November 2013.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
4. Baxter K, ed. *Stockley's Drug Interactions,* 9th edn. London, Pharmaceutical Press; 2010 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Cimetidine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Cimetidine (Accord, Dexcel, Genesis, Kent, Tillomed, Torrenet)	Tablet 200 mg, 400 mg, 800 mg	No specific data on enteral tube administration are available for this preparation.
Tagamet (Chemidex Pharma)	Tablet 200 mg, 400 mg, 800 mg	No specific data on enteral tube administration are available for this preparation.
Cimetidine (Rosemont)	Oral solution 200 mg/5 mL	No specific data on enteral tube administration are available for this preparation. Slightly more viscous than water.[2] Contains maltitol and 7 mg sodium/5 mL.[2,3]
Tagamet (Chemidex Pharma)	Syrup 200 mg/5 mL	Contains insignificant quantity of sorbitol, sucrose and alcohol.[4] Contains 12.8 mg sodium per 5 mL.[4]

Site of absorption (oral administration)

Absorption is from the proximal small bowel. Peak plasma concentration occurs 60–90 minutes after oral dosing.[5]

Alternative routes available

Parenteral formulation is available.

Interactions

Peak concentrations are reduced by food, but overall absorption is unaffected.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid preparation or effervescent tablets.
- Caution is needed when using high doses owing to the sorbitol content of the sugar-free liquids and the sodium content of the effervescent tablets.
- A prolonged break in feeding is not required.

Intragastric administration

Liquid preparation (see below for effervescent tablets)

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.

3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication dose into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Cimetidine can be administered into the jejunum; for this route the effervescent tablets, dissolved in at least 30 mL of water, or the injection should be used.[6]

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure 30 mL of water into a measuring pot.
4. Add the effervescent tablet and allow to dissolve.
5. Draw into an appropriate size and type of syringe.
6. Flush the medication dose down the feeding tube.
7. Rinse the measure and administer this also to ensure that the total dose is given.
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

References

1. *BNF* 67, March 2014.
2. www.rosemontpharma,com/products/gastro-intestinal-system/cimetidine-oral-solution-5 (accessed 09/06/2014).
3. Cimetidine Oral Solution (Rosemont), Summary of Product Characteristics; May 2013.
4. Tagamet Syrup (Chemidex Pharma), Summary of Product Characteristics; February 2009.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
6. Adams D. Administration of drugs through a jejunostomy tube. *Br J Intensive Care* 1994; 4(1): 10–17.

Cinnarizine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Cinnarizine (Lexon, Mylan, Teva)	Tablet 15 mg	Teva brand tablets disperse in 10 mL of water within 5 minutes to give a fine dispersion that flushes easily via an 8Fr NG tube without blockage.[2]
Stugeron (McNeil, Janssen-Cilag)	Tablet 15 mg	Janssen-Cilag tablets may be chewed, sucked or swallowed whole.[3] Both contain lactose and sucrose.[3,4]

Site of absorption (oral administration)

No specific information on site on absorption. Peak plasma concentration occurs 2.5–4 hours following oral administration in fasted subjects.[5]

Alternative routes available

None available for cinnarizine; parenteral and rectal formulations are available for other antiemetics and antihistamines.

Interactions

No specific interaction with food is documented; the dose should be taken after meals.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not necessary.
- The dose should be administered after feed if practicable.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break in feeding is required.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration of cinnarizine. Administer as above. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Stugeron 15 mg (Janssen-Cilag), Summary of Product Characteristics; September 2013.
4. Stugeron 15 (McNeil), Summary of Product Characteristics; September 2013.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Ciprofloxacin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Ciprofloxacin (Accord, Teva, Wockhardt)	Tablet 100 mg, 250 mg, 500 mg, 750 mg	Ciprofloxacin (as hydrochloride). Some brands of tablets disperse in water within 2–5 minutes. Owing to the tablet's bulk, it is quite difficult to see the particles, but the dispersion flushes via an 8Fr NG tube without blockage.[2] Actavis (previously Alpharma) brand tablets can be crushed.[3]
Ciproxin (Bayer)	Tablet 100 mg, 250 mg, 500 mg, 750 mg	Ciprofloxacin (as hydrochloride). The 750 mg tablets have been crushed and mixed with 50 mL of water and delivered via gastric tube.[4]
Ciproxin (Bayer)	Suspension 250 mg/mL	Granules for suspension. Very thick non-aqueous granular suspension. High risk of tube blockage with fine-bore tubes.[2]
Ciprofloxacin (Hospira)	Solution for Infusion 2 mg/mL	Ciprofloxacin (as lactate). No specific data on enteral tube administration are available for this preparation.
Ciproxin (Bayer)	i.v. infusion 2 mg/mL (100 mL, 200 mL)	Ciprofloxacin (as lactate). No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Absorption mainly occurs from the small intestine.[5–7] Peak plasma concentration occurs 60–75 minutes following an oral dose.[5–8] There is case report evidence that ciprofloxacin is absorbed when delivered into the jejunum but that plasma concentrations may be lower; it is recommended that the higher end of the dose range be used.[9]

Alternative routes available

Parenteral route available.

Interactions

The interaction between ciprofloxacin and enteral feeds is well established. Ciprofloxacin binds to divalent ions in the feed. In a study using Pulmocare (high in calcium and magnesium compared to Osmolite and Ensure), the absorption of ciprofloxacin was significantly reduced when Pulmocare was administered immediately following a dose of ciprofloxacin; however, the plasma level achieved was still above the MIC for many important pathogenic bacteria.[4]

When ciprofloxacin, levofloxacin and ofloxacin were added directly to enteral feeds, a loss of dose was observed for all antibiotics; however, the losses were 83%, 61% and 46%, respectively.[10] A reduction in absorption was also noted when the enteral feed was resumed immediately following dosing. The standard fibre feed contained less than half the electrolyte content of Pulmocare; the mean peak level was 44%.[11]

The absorption of ciprofloxacin can be as much as halved by enteral feeds such as Ensure, Jevity, Osmolite, Pulmocare and Sustacal.[12] It is advised not to administer feeds containing dairy products within 1-2 hours of ciprofloxacin.[12]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- For severe infections use the intravenous route.
- Disperse the tablets in water immediately prior to dosing.
- It is recommended that the upper end of the dose range be used.[12]
- Although there is no evidence that a break in feeding is beneficial, it would appear logical to administer the dose during a break in feeding where possible.
- The upper end of the dose range should be also be used for intrajejunal administration.
- The patient should be monitored closely for signs of treatment failure.[12]
- Alternatively, the patient could be transferred to an alternative quinolone as the scale of the interaction appears less, although there are fewer publications relating to these antibiotics.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Allow a break in feeding if possible.
4. Place the tablet in the barrel of an appropriate size and type of syringe.
5. Draw 20 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
6. Flush the medication dose down the feeding tube.
7. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).

8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) place the tablet into a medicine pot, add 20 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Administer as above. See notes above.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Personal communication, Alpharma (now Actavis); 21 January 2003.
4. Cohn SM, Sawyer MD, Burns GA, *et al*. Enteric absorption of ciprofloxacin during tube feeding in the critically ill. *J Antimicrob Chemother* 1996; 38: 871–876.
5. Ciprofloxacin (Teva), Summary of Product Characteristics; December 2011.
6. Ciprofloxacin (Accord), Summary of Product Characteristics; March 2014.
7. Ciproxin (Bayer), Summary of Product Characteristics; September 2013.
8. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
9. Adams D. Administration of drugs through a jejunostomy tube. *Br J Intensive Care* 1994; 4(1): 10–17.
10. Wright DH, Pietz SL, Konstantinides FN, Rotschafer JC. Decreased in vitro fluoroquinolone concentrations after admixture with an enteral feeding formulation. *JPEN J Parenter Enteral Nutr* 2000; 24: 42–48.
11. Mimoz O, Binter V, Jacolot A, *et al*. Pharmacokinetics and absolute bioavailability of ciprofloxacin administered through a nasogastric tube with continuous enteral feeding to critically ill patients. *Intensive Care Med* 1998; 24: 1047–1051.
12. Baxter K, Preston CL. *Stockley's Drug Interactions,* 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Citalopram

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Citalopram (Accord, Actavis, Aurobindo, Focus, Kent, Mylan, Niche, Sandoz, Teva, Tillomed)	Tablet 10 mg, 20 mg, 40 mg	Citalopram (as hydrobromide). Mylan brand tablets are very slow to disperse but will disintegrate if shaken in 10 mL of water for 5 minutes to give a fine dispersion that flushes via an 8Fr NG tube without blockage.[2]
Cipramil (Lundbeck)	Tablet 10 mg, 20 mg, 40 mg	Citalopram (as hydrobromide). Film-coated tablets. No specific data on enteral tube administration are available for this preparation. Contains lactose.[3]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Citalopram (Rosemont)	Oral drops 40 mg/mL	Citalopram (as hydrochloride). Watery liquid. Contains ethanol 100 mg/mL.[4]
Citalopram (Teva)	Oral drops 40 mg/mL	Citalopram (as hydrochloride). Clear liquid. Contains ethanol.[5]
Cipramil (Lundbeck)	Oral drops 40 mg/mL	Citalopram (as hydrochloride). 8 mg citalopram hydrochloride = 10 mg citalopram hydrobromide. 8 mg = 4 drops Can be mixed with water, orange juice or apple juice. Contains 9% (v/v) alcohol.[5]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 2–4 hours following oral dosing.[7] Relative bioavailability is approximately 25% greater for the drops.[6]

Alternative routes available

An intravenous infusion is available from Lundbeck on a named-patient basis. Contact the manufacturer for further details.[7]

Interactions

Absorption is unaffected by food.[8]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use oral drops.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Add 4 drops of the oral solution for every 10 mg of the tablets to 10 mL of water in a suitable container.
4. Draw the medication solution into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Rinse the container with a further 10 mL of water and flush this down the feeding tube to ensure the total dose is administered.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of citalopram. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Cipramil Tablets (Lundbeck), Summary of Product Characteristics; January 2012.
4. www.rosemontpharma.com/products/central-nervous-system/citalopram-oral-drops-95 (accessed 12/6/2014).
5. Citalopram Oral Drops (Teva), Summary of Product Characteristics; October 2012.
6. Cipramil Drops (Lundbeck), Summary of Product Characteristics; January 2012.
7. Personal communication, Lundbeck; January 2006.
8. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Clarithromycin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Clarithromycin (Accord, Sandoz, Teva, Wockhardt)	Tablet 250 mg, 500 mg	No specific data on enteral tube administration are available for this preparation.
Clarithromycin (Sandoz Ltd)	Oral suspension 125 mg/5 mL, 250 mg/5 mL	Liquid viscosity much higher than standard enteral feeds, granular suspension, blocked 8Fr enteral tube.[2] Contains 2.4 g sucrose/5 mL.[3]
Clarithromycin (Actavis, Mylan, Teva)	Tablet 500 mg	Prolonged release tablets – do not crush. Not suitable for enteral tube administration.
Clarithromycin (Actavis, Amdipharm, Teva)	Intravenous infusion 500 mg	No specific data on enteral tube administration are available for this preparation.
Klaricid (Abbott)	Tablet 250 mg, 500 mg	Film coated.[1] No specific data on enteral tube administration are available for this preparation.
Klaricid (Abbott)	Paediatric suspension 125 mg/5 mL, 250 mg/5 mL	Very thick creamy, slightly granular/gritty suspension. Blocks fine NG tube (less than 9Fr) because of the presence of granules and viscosity. If the dose is diluted with an equal volume of water immediately prior to administration, the viscosity is reduced, but there is still a risk of tube blockage with very fine-bore tubes.[4] Contains sucrose.[5]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Klaricid (Abbott)	Granule 250 mg/ sachet	Contents of sachets should be mixed in a small amount of water.[4] No specific data on enteral tube administration are available for this preparation.
Klaricid (Abbott)	i.v. infusion 500 mg	Not suitable for enteral use.
Klaricid XL (Abbott)	Tablet 500 mg	Modified-release tablets – do not crush. Not suitable enteral tube for administration.
Febzin XL (Actavis)	Tablet 500 mg	As citrate. Modified release tablets. Not suitable for administration via feeding tube.

Site of absorption (oral administration)

Absorption is primarily in the jejunum.[5] Peak plasma concentration occurs at 2 hours following oral administration.[6]

Alternative routes available

Parenteral route is available.

Interactions

Food delays peak plasma concentrations slightly, but does not affect bioavailability.[6] There does not appear to be any interaction with enteral feed.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Clarithromycin suspension has been successfully administered via NG tube to 16 ICU patients.[7]
- For tubes 9Fr or larger, use the suspension formulation, diluted with an equal volume of water immediately prior to administration.
- A prolonged break in feeding is not required.
- Consider parenteral therapy or an alternative macrolide such as azithromycin.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific reports of jejunal administration; however, as main site of absorption is in the jejunum absorption should not be adversely affected. Administer using the above method. Monitor for loss of efficacy.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2011.
3. Clarithromycin Suspension (Sandoz), Summary of Product Characteristics; January 2011.
4. BPNG data on file, 2004.
5. Klaricid Oral Suspension (Abbott), Summary of Product Characteristics; May 2014.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
7. Fish DN, Abraham E. Pharmacokinetics of a clarithromycin suspension administered via nasogastric tube to seriously ill patients. *Antimicrob Agents Chemother* 1999; 43(5): 1277–1280.

Clindamycin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Clindamycin (Sandoz)	Capsule 150 mg	Clindamycin (as hydrochloride). Clindamycin hydrochloride is very soluble in water.[2] Contains lactose.[3]
Clindamycin (Focus)	Injection 150 mg/mL	Clindamycin (as phosphate). No specific data on enteral tube administration are available for this preparation.
Dalacin C (Pharmacia)	Capsule 75 mg, 150 mg	Clindamycin (as hydrochloride). Pharmacia have no data to support the administration of clindamycin via enteral feeding tubes.[4] The capsules open easily and the powder pours from the capsule when squeezed; care must be taken to ensure the entire contents of the capsule are emptied out. The powder mixes easily with water and flushes via an 8Fr NG tube without blockage.[5] Contains lactose.[6]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Dalacin C (Pharmacia)	Injection 150 mg/mL (2 mL, 4 mL)	Clindamycin (as phosphate). For i.m. injection or i.v. infusion.[1] No specific data on enteral tube administration are available for this preparation.
Dalacin (Pharmacia)	Paediatric suspension	Discontinued in the UK. Still available via importers, e.g. IDIS.[4]

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs within 1 hour of oral administration.[6]

Alternative routes available

Parenteral route is available. Cream is available for topical treatment only.

Interactions

Food delays the absorption of clindamycin but does not affect the peak concentration.[3,6]

Health and safety

Standard precautions apply. Avoid inhalation of capsule contents.

Suggestions/recommendations

- Where clinically appropriate, change to an alternative antibiotic available as a liquid or dispersible tablet.
- To administer clindamycin, open the capsules and disperse in water immediately prior to administration. Avoid inhalation of capsule contents.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Open the capsule and pour the contents into a medicine pot.
4. Add 15 mL of water.
5. Stir to disperse the powder.
6. Draw into an appropriate size and type of syringe and administer via the feeding tube.
7. Add a further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
8. Draw up this dispersion and flush down the tube. This will ensure that the whole dose is given.
9. Flush the tube with water.
10. Re-start the feed, unless a prolonged break in feeding is required.

Intrajejunal administration

There are no specific data relating to jejunal administration of clindamycin. Administer as above.

References

1. *BNF* 67, March 2014.
2. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
3. Clindamycin (Sandoz), Summary of Product Characteristics; March 2013.
4. Personal communication, Pharmacia; 11 March 2003.
5. BPNG data on file, 2004.
6. Dalacin C (Pharmacia), Summary of Product Characteristics; August 2013.

Clobazam

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Clobazam (Teva)	Tablet 10 mg	No specific data on enteral tube administration are available for this preparation.
Clobazam (Martindale)	Oral suspension 5 mg/5 mL	No specific data on enteral tube administration are available for this preparation. Contains sorbitol 1250 mg/5 mL.[2]
Clobazam (non-proprietary)	Tablet 10 mg	No specific data on enteral tube administration are available for this formulation.
Frisium (Sanofi)	Tablet 10 mg	Not coated.[3] Tablets should disperse in water or can be crushed.[3] Contains lactose.
Tapclob (Martindale)	Suspension 5 mg/5 mL, 10 mg/5 mL	No specific data on enteral tube administration are available for this preparation.

Manufactured 'specials' are available in a variety of strengths, contact specials manufacturers for details.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–4 hours after oral dosing.[3,4]

Alternative routes available

None available for clobazam.

Interactions

Administration with food delays peak plasma concentrations but does not reduce overall bioavailability.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use an alternative drug where clinically appropriate.
- It should be possible to disperse the tablets and suspend them in water immediately prior to administration.
- Alternatively, a manufactured 'special' liquid preparation can be obtained.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data on jejunal administration of clobazam. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Clobazam Oral Suspension (Martindale), Summary of Product Characteristics; February 2013.
3. Frisium (Sanofi), Summary of Product Characteristics; March 2014.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Clomipramine hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Clomipramine (Almus, Mylan, Teva)	Capsule 10 mg, 25 mg, 50 mg	Teva brand capsules – contents pour easily from capsules and disperse in 10 mL of water; this flushes via an 8Fr NG tube without blockage. Requires sufficient manual dexterity owing to the size of the capsules.[2] Contains lactose.[3]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Anafranil (Novartis)	Capsule 10 mg, 25 mg, 50 mg	All size 4 capsules.[4] No specific data on enteral tube administration are available for this preparation. Contains lactose.[3]
Anafranil SR (Novartis)	Tablet *75* mg	Modified-release tablets – do not crush. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Specific site of absorption or time to peak plasma concentrations is not documented in the SPC but completely absorbed following oral administration or IM injection.[4]

Alternative routes available

None available for clomipramine.[4]

Interactions

Food does not significantly affect bioavailability of clomipramine but the peak serum concentrations and therefore onset of action may be delayed.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Capsules can be opened and the contents mixed with water immediately prior to administration.
- The capsules are very small and this may not be practical; consideration should therefore be given to changing to alternative therapy.
- Change to another tricyclic antidepressant that is available in liquid form (e.g. amitriptyline; see monograph).
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Open the capsule and pour the contents into a medicine pot.
4. Add 15 mL of water.
5. Stir to disperse the powder.
6. Draw into an appropriate size and type of syringe and administer via the feeding tube.
7. Add further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
8. Draw up this dispersion and flush down the tube. This will ensure that the whole dose is given.
9. Flush the tube with water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to site of absorption of clomipramine. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Clomipramine (Teva), Summary of Product Characteristics; November 2011.
4. Anafranil (Novartis), Summary of Product Characteristics; July 2012.

Clonazepam

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Clonazepam (non-proprietary)	Tablet 500 micrograms, 2 mg	No specific data on enteral tube administration are available for this preparation.
Clonazepam (Rosemont)	Oral solution 0.5 mg/5 mL, 2 mg/5 mL	Oily solution. Viscosity similar to 1.5 kcal/mL and 2 kcal/mL enteral feeds; slightly thicker than water.[2] Flushes via 8Fr NG tube with some resistance but no blockage.[3] Contains ethanol 100 mg/5 mL.[5]
Rivotril (Roche)	Tablet 500 micrograms, 2 mg	Scored tablets. Tablets disperse in 10 mL of water within 5 minutes to form a coarse dispersion that breaks up when drawn into the syringe and flushes down an 8Fr NG tube without blockage.[4] Contain lactose, 40 mg in 500 microgram tablet and 121.5 mg in 2 mg tablet.[3]
Clonazepam (extemporaneous preparation)		*Extemporaneous preparation 200 micrograms/5 mL*:[5] Clonazepam tablets 2 mg 20 tablets Keltrol 0.4% w/v Methylhydroxybenzoate 0.1 g Propylhydroxybenzoate 0.02 g Propylene glycol 2 mL Syrup BP 40 mL Purified water to 1000 mL Three months' shelf-life at room temperature.
Rivotril (Roche)	Injection 1 mg/mL	No specific data on enteral tube administration of injection preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–4 hours after an oral dose.[6,7]

Alternative routes available

The parenteral route is available and is licensed for the treatment of status epilepticus.

Interactions

No specific interaction with food is documented.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- For very fine-bore tubes consider using a liquid preparation.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Rosemont. Clonazepam Oral Solution-45, www.rosemontpharma.com/products/central-nervous-system/clonazepam-oral-solution-45. (accessed 14 June 2014).
3. BPNG data on file, 2011.
4. BPNG data on file, 2004.
5. Personal communication, Roche; 6 February 2003.
6. Rivotril Tablets (Roche), Summary of Product Characteristics; January 2013.
7. Clonazepam Oral Solution (Rosemont), Summary of Product Characteristics; April 2014.

Clonidine hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Clonidine (Sandoz, Teva)	Tablet 25 micrograms	No specific data on enteral tube administration are available for this preparation. Sandoz brand contains lactose.[2]
Catapres (Boehringer Ingelheim)	Tablet 100 micrograms	Scored tablets. Tablets can be crushed.[3] 100 microgram tablets disperse within 2 minutes when placed in 10 mL of water, to give a fine white dispersion that flushes via an 8Fr NG tube without blockage.[4] Contains lactose.[5]
Catapres (Boehringer Ingelheim)	Injection 150 micrograms/mL (1 mL)	Injection can be given orally.[3] pH 4–4.5.
Dixarit (Boehringer Ingelheim)	Tablet 25 micrograms	Film-coated tablets. Tablets can be crushed.[3] Tablets do not disperse readily in water. Contains lactose.[6]
Clonidine (extemporaneous preparation)	Suspension	*Extemporaneous clonidine suspension 0.1 mg/mL:* Clonidine 300 microgram tablets: 10 tablets Sterile water 1–2 mL Simple syrup to 30 mL Expiry 28 days in a refrigerator.[2]

Site of absorption (oral administration)

Specific absorption site is not documented. Clonidine is well absorbed when administered orally. Peak plasma concentration occurs 1–3 hours after administration.[2]

Alternative routes available

Parenteral formulation is available.

Interactions

No specific interaction with food is documented.[7,8]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use 100 microgram tablets, disperse in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Owing to the lack of data, administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Levinson ML, Johnson CE Stability of an extemporaneously compounded clonidine hydrochloride oral liquid. *Am J Hosp Pharm* 1992; 49: 122–125.
3. Personal communication, Boehringer Ingelheim; 6 March 2003.
4. BPNG data on file, 2005.
5. Catapres (Boehringer Ingelheim), Summary of Product Characteristics; December 2013.
6. Dixarit (Boehringer Ingelheim), Summary of Product Characteristics; April 2014.
7. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
8. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Clopidogrel

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Clopodogrel (Accord, Teva, Zentiva)	Tablet 75 mg	Clopidogrel (as hydrogen sulfate). No specific data on enteral tube administration are available for this preparation. Accord and Zentiva brands contain lactose and hydrogenated castor oil.[2,3] Teva brand contains lactose.[4]

Formulations available[1] (*continued*)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Clopidogrel (Consilient, Sandoz, Teva, Wockhardt)	Tablet 75 mg	Clopidogrel (as hydrochloride). No specific data on enteral tube administration are available for this preparation. All brands contain hydrogenated castor oil.[5–8]
Clopidogrel (Aurobindo)	Tablet 75 mg	Clopidogrel (as bisulfate). No specific data on enteral tube administration are available for this preparation. Each tablet contains 2.88 mg lactose and 5.2 mg hydrogenated castor oil.[9]
Clopidogrel (Actavis, Beacon)	Tablet 75 mg	Clopidogrel (as besilate). No specific data on enteral tube administration are available for this preparation. Tablets contain lactose.[10,11]
Clopidogrel (Rosemont)	Oral solution 75 mg/5 mL	Special product. Thick liquid. Contains ethanol 236.7 mg/5 mL.[12]
Plavix (Sanofi-Aventis, formerly Bristol-Myers Squibb)	Tablet 75 mg, 300 mg	Clopidogrel (as hydrogen sulfate). Film coated. Although the manufacturer has no specific information on this route of administration, there are likely to be alterations in the pharmacokinetics if the tablets are crushed. However, this is unlikely to cause any adverse effects.[13] The tablets can be crushed and mixed with water and flushed down a feeding tube.[2] The tablets do not disperse readily in water. They can be crushed (although this is difficult owing to the coating) and then mixed with 10 mL water; the resulting suspension can then be flushed down an 8Fr NG feeding tube without blockage.[14] 75 mg tablets contain 3 mg lactose, 300 mg tablets contain 12 mg lactose.[4]
Grepid (Beacon)	Tablet 75 mg	Clopidogrel (as besilate). No specific data on enteral tube administration are available for this preparation. Contains 2.6 mg lactose/tablet.[5]

Site of absorption (oral administration)

Specific site of absorption is not documented. The active metabolite cannot be detected in the plasma and therefore time to reach peak plasma concentration has not been defined.[15]

Alternative routes available

None.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation. Dilute immediately before use.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly ensuring that there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure that the total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific reports of jejunal administration of clopidogrel. Administer as above.

References

1. *BNF* 67, March 2014.
2. Clopidogrel (Accord), Summary of Product Characteristics; January 2014.
3. Clopidogrel (Zentiva), Summary of Product Characteristics; January 2014.
4. Clopidogrel (Teva), Summary of Product Characteristics; March 2014.
5. Clopidogrel (Consilient), Summary of Product Characteristics; April 2012.
6. Clopidogrel (Sandoz), Summary of Product Characteristics; January 2014.
7. Clopidogrel (Teva), Summary of Product Characteristics; March 2014.
8. Clopidogrel (Wockhardt), Summary of Product Characteristics; September 2013.
9. Clopidogrel (Aurobindo), Summary of Product Characteristics; January 2013.
10. Clopidogrel (Actavis), Summary of Product Characteristics; October 2013.
11. Clopidogrel (Beacon), Summary of Product Characteristics; April 2014.
12. Rosemont. Clopidogrel Oral Solution-104, www.rosemontpharma.com/products/cardiovascular-system/clopidogrel-oral-solution-104. (accessed 14 June 2014).
13. Personal communication, Bristol-Myers Squibb; 20 January 2003.
14. BPNG data on file, 2004.
15. Plavix (Bristol-Myers Squibb), Summary of Product Characteristics; January 2014.

Clozapine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Clozapine (Genus)	Oral suspension 50 mg/mL	No specific data on enteral tube administration are available for this preparation,
Clozaril (Novartis)	Tablet 25 mg, 100 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]
Denzapine (Britannia)	Tablet 25 mg, 50 mg, 100 mg, 200 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[3]
Denzapine (Britannia)	Suspension 50 mg/mL	Shake well for 10 seconds before use. May be further diluted with water immediately prior to administration. 1 mL of suspension contains 150 mg of sorbitol.[4]
Zaponex (Teva)	Tablet 25 mg, 100 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented; peak levels occur 0.5–4.0 hours following oral dosing at steady state.[4]

Alternative routes available

None available for clozapine.

Interactions

Clozapine suspension is not compatible with orange juice. Neither rate nor extent of absorption is affected by food.[2,3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

Use liquid preparation; because of the clozaril monitoring programmes, the patient will need to be enrolled with the Denzapine Patient Monitoring Service.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the suspension for 10 seconds.

4. Draw required dose into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no data on the jejunal administration of clozapine.

References

1. *BNF* 67, March 2014.
2. Clozaril (Novartis), Summary of Product Characteristics; July 2013.
3. Denzapine Tablets (Britannia), Summary of Product Characteristics; February 2012.
4. Denzapine Suspension (Britannia), Summary of Product Characteristics; March 2012.

Co-amilofruse

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Co-amilofruse (Aurobindo, Wockhardt)	Tablet 2.5 mg/20 mg	Amiloride 2.5 mg/furosemide 20 mg All tablets are immediate release and in theory can be crushed. Aurobindo brand contains lactose.[2]
Co-amilofruse (Aurobindo, Winthrop, Wockhardt)	Tablet 5 mg/40 mg	Amiloride 5 mg/furosemide 40 mg All tablets are immediate release and in theory can be crushed. Aurobindo and Winthrop brands contain lactose.[2,3]
Co-amilofruse (Aurobindo, Wockhardt)	Tablet 10 mg/80 mg	Amiloride 10 mg/furosemide 80 mg All tablets are immediate release and in theory can be crushed.
Frumil LS (Sanofi-Aventis)	Tablet 2.5 mg/20 mg	Amiloride 2.5 mg/furosemide 20 mg. All tablets are immediate release and in theory can be crushed. Contains lactose.[4]
Frumil (Sanofi-Aventis)	Tablet 5 mg/40 mg	Amiloride 5 mg/furosemide 40 mg. All tablets are immediate release and in theory can be crushed. Contains lactose.[4]

Site of absorption (oral administration)

Amiloride and furosemide are absorbed in the proximal small bowel; see monographs on individual components.

Alternative routes available

Furosemide injection is available.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Tablets can be dispersed in water, or crushed and mixed with water immediately prior to administration.
- A break in feeding is not required.
- For very fine-bore tubes, consider using the individual components as liquid preparations (see monographs).

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Bioavailability is unlikely to be affected by jejunal administration. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Co-Amilofruse (Aurobindo), Summary of Product Characteristics; May 2012.
3. Co-Amilofruse (Winthrop), Summary of Product Characteristics; July 2010.
4. Frumil & Frumil LS (Sanofi-Aventis), Summary of Product Characteristics; September 2010.

Co-amilozide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Co-amilozide (CP, Bristol-Myers Squibb)	Tablet 2.5 mg/25 mg	Amiloride 2.5 mg/hydrochlorothiazide 25 mg. CP brand tablets disintegrate rapidly in 10 mL of water to form a coarse dispersion that settles quickly but flushes via an 8Fr NG tube without blockage.[2]
Co-amilozide (Actavis, CP, Bristol-Myers Squibb, Hillcross, Teva)	Tablet 5 mg/50 mg	Amiloride 5 mg/hydrochlorothiazide 50 mg. Tablets can be crushed and dispersed in water.[3] APS brand tablets disperse in 10 mL of water if shaken vigorously for a few minutes; the resulting dispersion flushes via an 8Fr NG tube without blockage.[2]
Moduret 25 (MSD)	Tablet 2.5 mg/25 mg	Amiloride 2.5 mg/hydrochlorothiazide 25 mg. No specific data on enteral tube administration are available for this preparation. Contains lactose.[4]
Moduretic (MSD)	Tablet 5 mg/50 mg	Amiloride 5 mg/hydrochlorothiazide 50 mg. No specific data on enteral tube administration are available for this preparation. Contains lactose.[5]

Site of absorption (oral administration)

Both drugs are absorbed well from the small intestine. Onset of action of both drugs occurs within 2 hours of administration and peak plasma concentrations occur at 3-4 hours following an oral dose.[4,5]

Alternative routes available

None. Other diuretics are available in parenteral formulations.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Personal communication, Alpharma (now Actavis); 21 January 2003.
4. Moduret 25 (Bristol-Myers Squibb), Summary of Product Characteristics; February 2014.
5. Moduretic (Bristol-Myers Squibb), Summary of Product Characteristics; February 2014.

Co-amoxiclav

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Co-amoxiclav (Aurobindo, Mylan)	Tablet 250/125 mg, 500/125 mg	Amoxicillin 250 mg/clavulanic acid 125 mg, amoxicillin 500 mg/clavulanic acid 125 mg. Film coated tablets. Tablets do not disperse readily in water.[2]
Co-amoxiclav (Sandoz)	Oral suspension 125/31 mg/5 mL, 250/62 mg/5 mL 400/57 mg/5 mL	In 5 mL: amoxicillin 125 mg/clavulanic acid 31 mg, amoxicillin 250 mg/clavulanic acid 62 mg, amoxicillin 400 mg/clavulanic acid 57 mg. No specific data on enteral tube administration are available for this preparation.
Co-amoxiclav (Kent)	Oral suspension 125/31 mg, 250/62 mg	Amoxicillin 125 mg/clavulanic acid 31 mg, amoxicillin 250 mg/clavulanic acid 62 mg. No specific data on enteral tube administration are available for this preparation.

Formulations available[1] (*continued*)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Co-amoxiclav (Actavis, Wockhardt)	Injection 500/100 mg, 1000/200 mg	Amoxicillin 500 mg/clavulanic acid 100 mg, amoxicillin 1000 mg/clavulanic acid 200 mg. No specific data on enteral tube administration available for this preparation.
Augmentin (GSK)	Tablet 375 mg, 625 mg	Amoxicillin 250 mg/clavulanic acid 125 mg in 375 mg tablet; amoxicillin 500 mg/clavulanic acid 125 mg in 625 mg tablet. No specific data on enteral tube administration are available for this preparation.
Augmentin (GSK)	Suspension 125/31 mg/5 mL, 250/62 mg/5 mL	In 5 mL: amoxicillin 125 mg/clavulanic acid 31 mg, amoxicillin 250 mg/clavulanic acid 62 mg. When reconstituted is an off-white, creamy suspension, very resistant to flushing. Mixes with an equal volume of water only if shaken.[2]
Augmentin (GSK)	Injection 600 mg, 1.2 g	Amoxicillin 600 mg/clavulanic acid 1.2 g. No specific data on enteral tube administration are available for this preparation.
Augmentin Duo (GSK)	Suspension 400/57 mg/5 mL	Amoxicillin 400 mg/clavulanic acid 57 mg in 5 mL. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs within 1 hour following oral administration.[3]

Alternative routes available

Co-amoxiclav injection is available for parenteral administration.

Interactions

No specific interaction with food is documented. Absorption of Augmentin is optimised at the start of a meal.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use dispersible tablets.
- Disperse in water immediately prior to administration.
- Administer at the start of feed if practicable.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse.
5. Flush the medication dose down the feeding tube.
6. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data on jejunal administration. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Augmentin (GSK), Summary of Product Characteristics; October 2013.

Co-codamol

Formulations available
(Owing to the large number of preparations available containing paracetamol and codeine as co-codamol, only those that might be considered suitable are included below.)[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Co-codamol 8/500 (Bayer, Boots, Teva, Zentiva)	Effervescent tablet 8 mg/500 mg	No specific data on enteral tube administration are available for this preparation. Boots and Zentiva brands contain 50 mg sorbitol per tablet.[2,3]
Co-codamol 15/500 (Amdipharm)	Effervescent tablet 15 mg/500 mg	No specific data on enteral tube administration are available for this preparation.
Co-codamol 30/500 (Amdipharm, Teva, Zentiva)	Effervescent tablet 30 mg/500 mg	No specific data on enteral tube administration are available for this preparation.

Formulations available (*continued*)
(Owing to the large number of preparations available containing paracetamol and codeine as co-codamol, only those that might be considered suitable are included below.)[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Co-codamol (Amdipharm, Teva, Zentiva)	Effervescent tablet 30 mg/500 mg	Amdipharm brand contains 487 mg sorbitol per tablet.[4] Zentiva brand contains 50 mg sorbitol per tablet.[5]
Solpadol (Sanofi-Aventis)	Effervescent tablet 30 mg/500 mg	Tablet will disperse adequately in 10 mL of water with insignificant residue giving no risk of tube blockage.[6] Each tablet contains 16.9 mmol sodium (388 mg).[3]
Tylex (UCB Pharma)	Effervescent tablet 30 mg/500 mg	No specific data on enteral tube administration are available for this preparation. Each tablet contains sodium 14.2 mmol and 25 mg aspartame.[7]
Co-codamol (Actavis, Amdipharm, Boots, Mylan, Teva, Tillomed, Wochardt, Zentiva)	Tablet 8 mg/500 mg, 15 mg/500 mg, 30 mg/500 mg	No specific data on enteral tube administration are available for this preparation.
Co-codamol (Amdipharm, Boots, Glaen, Zentiva)	Capsule 8 mg/500 mg 15 mg/500 mg 30 mg/500 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Paracetamol is absorbed rapidly following oral administration. Administration into the jejunum achieves similar plasma concentrations to oral administration.[8]

Alternative routes available

Rectal and parenteral routes are available for paracetamol; parenteral route is available for codeine.

Interactions

No interaction with food or enteral feed is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use tablets dispersed in 50 mL of water (for adults) for intragastric or intrajejunal administration. If the sodium content is problematical, use liquid preparations of individual components (see monographs).
- Suppositories or injection can be considered useful alternatives.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure 50 mL of water into a measuring pot.
4. Add the effervescent tablet and allow to dissolve.
5. Draw into an appropriate size and type of syringe.
6. Flush the medication dose down the feeding tube.
7. Rinse the measure with 10–20 mL of water and administer this also to ensure that the total dose is given.
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Administer using the above method. Bioavailability should be unaffected.

References

1. *BNF* 67, March 2014.
2. Co-codamol 8/500 Effervescent Tablets (Boots), Summary of Product Characteristics; February 2014.
3. Co-codamol 8/500 Effervescent Tablets (Zentiva), Summary of Product Characteristics; April 2014.
4. Co-codamol 30/500 Effervescent Tablets (Amdipharm), Summary of Product Characteristics; February 2014.
5. Co-codamol 30/500 Effervescent Tablets (Zentiva), Summary of Product Characteristics; April 2014.
6. Solpadol (Sanofi), Summary of Product Characteristics; March 2014.
7. Tylex (Schwarz), Summary of Product Characteristics; March 2014.
8. Adams D. Administration of drugs through a jejunostomy tube. *Br J Intensive Care* 1994; 4(1): 10–17.

Co-fluampicil

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Co-fluampicil (Mylan, Wockhardt)	Capsule 250 mg/250 mg	Flucloxicillin sodium 250 mg and ampicillin trihydrate 250 mg. No specific data on enteral tube administration are available for this preparation.
Co-fluampicil (Wockhardt)	Syrup 125 mg/125 mg	Flucloxicillin sodium 125 mg and ampicillin trihydrate 125 mg. No specific data on enteral tube administration are available for this preparation. Contains 3.14 g/5 mL sucrose and 6.9 mg/5 mL magnesium.
Co-fluampicil (Wockhardt)	Injection 250 mg flucloxacillin sodium/250 mg ampicillin sodium	Flucloxicillin sodium 250 mg and ampicillin trihydrate 250 mg. Contains 1.3 mmol sodium/vial.

Site of absorption (oral administration)

Serum levels achieved following oral administration of co-fluampicil are comparable with those that could be expected as a result of administration of each antibiotic separately.[2]

Alternative routes available

Parenteral route is available and should be used for severe infections.

Interactions

It is recommended that this medicine is given 30 to 60 minutes before meals[2] as the absorption of both flucloxacillin and ampicillin[3] is reduced by food.

Health and safety

Standard precautions apply. Avoid inhalation of the dry powder.

Suggestions/recommendations

- Co-fluampicil requires four daily doses and a break in feeding is required around the dose. This dosing regimen may be suitable for patients on bolus feeding, but may be impractical in patients on continuous feeds.
- Because of the lack of specific data, consider using the individual ingredients separately (see Flucloxacillin monograph) or use an alternative suitable antibiotic.

References

1. *BNF* 67, March 2014.
2. Magnapen Syrup (Wockhardt), Summary of Product Characteristics; October 2009.
3. Eshelman FN, Spyker DA. Pharmacokinetics of amoxicillin and ampicillin: crossover study of the effect of food. *Antimicrob Agents Chemother* 1978; 14(4): 539–543.

Co-flumactone

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Aldactide 25 (Pfizer)	Tablet 25 mg/25 mg	Spironalactone 25 mg and hydroflumethiazide 25 mg. Film coated tablets. No specific data on enteral tube administration are available for this preparation.
Aldactide 50 (Pfizer)	Tablet 50 mg/50 mg	Spironalactone 50 mg and hydroflumethiazide 50 mg. Film coated tablets. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Spironalactone is well absorbed orally (see Spironalactone monograph).[2] Hydroflumethiazide is incompletely but fairly rapidly absorbed from the GI tract.[2] The specific site of absorption of either drug is not documented.

Alternative routes available

None.

Interactions

None known.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Because of the lack of data for the combined preparation, consider using spironalactone with a suitable thiazide diuretic (for which information is available) separately (see Spironalactone, Bendroflumethiazide, Indapamide and Metolazone monographs).

References

1. *BNF* 67, March 2014.
2. Aldactide 25 and 50, Summary of Product Characteristics; February 2014.

Codeine phosphate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Codeine (Actavis, Almus, Teva, Wockhardt)	Tablet 15 mg, 30 mg, 60 mg	No specific data on enteral tube administration are available for this preparation.
Codeine (Thornton & Ross)	Syrup 25 mg/5 mL	Syrup-based preparation. Very viscous, difficult to flush via an 8Fr NG tube. Mixes with an equal volume of water, which reduces resistance to flushing.[2] Codeine syrup is 10 times more viscous than standard enteral feeds; it is too viscous to give undiluted via gravity.[3] Contains ethanol and sucrose.[4]
Codeine (Pinewood, Thornton & Ross, Wockhardt)	Linctus BP 15 mg/5 mL	No specific data on enteral tube administration are available for this preparation. Thornton & Ross brands contain ethanol.[5] Pinewood brand contains sorbitol.[6]
Codeine (various manufacturers)	Injection 60 mg/mL	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs within 1 hour of oral dosing.[7]

Alternative routes available

Parenteral route is available.

Interactions

No interactions are documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation. Dilute immediately before use.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication syrup into an appropriate size and type of syringe.
4. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
5. Flush the medication dose down the feeding tube.
6. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Administer using the above method. Consider diluting liquid with 3–4 times the dose volume of water to reduce osmolarity.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. BPNG data on file, 2011.
4. Codeine Syrup (Thornton & Ross), Summary of Product Characteristics; February 2014.
5. Codeine Linctus (Thornton & Ross), Summary of Product Characteristics; April 2014.
6. Codeine Linctus (Pinewood), Summary of Product Characteristics; May 2013.
7. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Colchicine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Colchicine (Wockhardt)	Tablet 500 micrograms	In theory, tablets can be crushed. Previous manufacturer's tablets have dispersed within 2 minutes when placed in 10 mL of water to give a coarse dispersion that breaks up further when drawn into the syringe. Flushes via an 8Fr NG tube without blockage.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 0.5–2 hours following oral dosing.[3]

Alternative routes available

None available for colchicine. An intra-articular injection of steroids could be considered for acute monoarticular gout if clinically appropriate.

Interactions

No specific interaction with food documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data on jejunal administration. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Colchicine (Wockhardt), Summary of Product Characteristics; June 2010.

Colecalciferol

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Colecalciferol (Special Products)	Capsule 50 000 units, 100 000 units	Manufacturer's 'special'. No specific data on enteral tube administration are available for this preparation.
Desunin (Meda)	Tablet 20 micrograms (800 units)	Tablets can be crushed.[2] Contains sucrose 1.68 mg/tablet.[2]
Fultium D_3 (Internis)	Capsule 20 micrograms (800 units)	Capsules should be swallowed whole.[3] No specific data on enteral tube administration are available for this preparation.
Plenachol (Special Products)	Capsule 20 000 units, 40 000 units	Manufacturer's 'special'. No specific data on enteral tube administration are available for this preparation.
InVita (Consilient)	Oral solution 25 000 units/mL	Oily liquid, can be mixed with food immediately prior to administration.[4]

Site of absorption (oral administration)

Colecalciferol is absorbed from the small intestine in the presence of bile.[2,4]

Alternative routes available

None for colecalciferol. Ergocalciferol can be administered by i.m. injection.

Interactions

The presence of food stimulates bile production and enhances the absorption of colecalciferol.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the oral solution; if dilution is necessary, dilute with a small amount of enteral feed immediately prior to administration.
- See also Calcium with vitamin D monograph.
- A prolonged break from feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw required dose of liquid preparation into appropriate size and type of enteral syringe.
4. If necessary, dilute with 5 mL enteral feed.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of colecalciferol. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014 .
2. Desunin (Meda), Summary of Product Characteristics; June 2013.
3. Fultium D_3 (Internis), Summary of Product Characteristics; April 2014.
4. InVita (Consilient), Summary of Product Characteristics; April 2014.

Colestyramine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Colestyramine (Teva)	Sachet 4 g	Contents of one sachet should be mixed with 120–180 mL fluid.[2] No specific data on enteral tube administration are available for this preparation.
Questran (Bristol-Myers Squibb)	Sachet 4 g	Contents of one sachet should be mixed with 150 mL fluid.[3] Contents of sachet mixed with 100 mL of water forms a cloudy dispersion that is not viscous and will draw into a syringe and flush via an 8Fr NG tube without risk of blockage.[3] Contains sucrose 3.79 g/sachet.[4]
Questran Light (Bristol-Myers Squibb)	Sachet 4 g	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Colestyramine is not absorbed; it binds to bile salts in the small bowel.

Alternative routes available

None available.

Interactions

Colestyramine reduces fat-soluble vitamin levels with prolonged therapy. The co-administration with food does not affect the therapeutic effect of colestyramine. Questran can be mixed with water, fruit juice, skimmed milk and thin soups.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- For hypercholesterolaemia, consider alternative therapy such as a statin.[4]
- For pruritis caused by jaundice, consider using rifampicin (see Rifampicin monograph); seek specialist advice.[5,6]
- If continued therapy is indicated administer using the method below.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Ensure dose is administered 4 hours after any other medication.
4. Empty the sachet into an appropriate container, add 100 mL of water and stir to mix thoroughly. Draw this dispersion into an appropriate syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Clinical effectiveness of colestyramine is not affected by jejunal administration. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Cholestyramine (Teva), Summary of Product Characteristics; February 2011.
3. Questran and Questran Light (Bristol-Myers Pharmaceuticals), Patient Information Leaflet; January 2014.
4. Questran and Questran Light (Bristol-Myers Pharmaceuticals), Summary of Product Characteristics; January 2014.
5. NICE. *Guidance CG67: Lipid Modification: Cardiovascular Risk Assessment and the Modification of Blood Lipids for the Primary and Secondary Prevention of Cardiovascular Disease*. London: NICE; 2010.
6. Hazin R, Abu-Rajab Tamimi T, Abuzetun JY, Zein NN. Recognising and treating cutaneous signs of liver disease. *Cleveland Clin J Med* 2009; 76: 599–606.

Co-magaldrox

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Maalox (Sanofi-Aventis)	Suspension 195 mg/220 mg in 5 mL	Magnesium hydroxide 195 mg/aluminium hydroxide 220 mg in 5 mL. No specific data on enteral tube administration are available for this preparation. Sugar free. Contains sorbitol.[2]
Mucogel (Chemidex)	Suspension 195 mg/220 mg in 5 mL	Magnesium hydroxide 195 mg/aluminium hydroxide 220 mg in 5 mL. No specific data on enteral tube administration are available for this preparation. Sugar free. Contains sorbitol.[3]
Maalox Plus (Sanofi-Aventis)	Suspension 195 mg/220 mg in 5 mL	Magensium hydroxide 195 mg/aluminium hydroxide 220 mg in 5 mL, with simeticone 25 mg/5 mL. No specific data on enteral tube administration available for this preparation. Contains sorbitol 224.85 mg/5 mL.[4]

Site of absorption (oral administration)

Aluminium hydroxide and magnesium hydroxide are poorly absorbed and used for their local acid-neutralising properties.[2]

Alternative routes available

None available for co-magaldrox; other acid suppressants, such as ranitidine or omeprazole, are available in parenteral form (see monographs).

Interactions

Aluminium hydroxide interacts with enteral feed, leading to tube blockage.[5]
Ascorbic acid and citrate (including that in effervescent tablets) increase the absorption of aluminium, possibly leading to toxic levels.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

Use alternative therapy for acid suppression.

References

1. *BNF* 67, March 2014.
2. Maalox Suspension (Sanofi Aventis), Summary of Product Characteristics; March 2014.

3. Mucogel (Chemidex), Summary of Product Characteristics; Januay 2009.
4. Maalox Plus (Sanofi-Aventis), Summary of Product Characteristics; March 2014.
5. Valli C, Schulthess H-K, Asper R, Escher F, Hacki W. Interaction of nutrients with antacids: a complication during enteral tube feeding. *Lancet* 1986; i(8483): 747–748.

Co-phenotrope

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Lomotil (Amdipharm)	Tablet 2.5 mg/ 25 micrograms	Diphenoxylate hydrochloride 2.5 mg, atropine sulfate 25 micrograms. Tablets disperse in 10 mL of water within 5 minutes when agitated to give very fine white dispersion that flushes down an 8Fr NG tube without blockage.[2] Contains sucrose and sorbitol.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Atropine is readily absorbed from the GI tract, mucous membranes, the eye and intact skin.[4] Diphenoxylate hydrochloride is well absorbed from the GI tract.

Alternative routes available

None.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse tablets in water immediately prior to administration.
- Consider changing therapy to loperamide (see monograph).

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.

6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There is no specific information on jejunal administration. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Lomotil (Amdipharm), Summary of Product Characteristics; November 2012.
4. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Co-trimoxazole

Contains a mixture of trimethoprim and sulfamethoxazole in the proportions of 1 part to 5 parts.

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Co-trimoxazole (Actavis, Tillomed)	Tablet 480 mg, 960 mg	No specific data on enteral tube administration are available for this preparation.
Co-trimoxazole (non-proprietary)	Paediatric oral suspension 240 mg/5 mL	No specific data on enteral tube administration are available for this preparation.
Co-trimoxazole (non-proprietary)	Oral suspension 480 mg/5 mL	No specific data on enteral tube administration are available for this preparation.
Septrin (Aspen, previously GSK)	Tablet 480 mg, 960 mg	GSK has no information on the administration of Septrin products via NG or PEG tubes.[2]
Septrin (Aspen)	Paediatric oral suspension 240 mg/5 mL	Extremely viscous creamy suspension. Very difficult to flush via a fine-bore tube. Does not mix readily with water owing to its viscosity; requires shaking. Mixing with 2–3 times the volume with water reduces the viscosity sufficiently to facilitate flushing via a fine-bore tube.[3] Too viscous to be given by gravity.[4] Contains 3.25 g/5 mL sorbitol and 100 mg/5 mL ethanol.[5]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Septrin (Aspen)	Adult suspension 480 mg/5 mL	Creamy, very viscous suspension, very resistant to flushing. Mixes with an equal volume of water if shaken, this reduces resistance to flushing. Viscosity is less than that of paediatric liquid.[3] Slightly less viscous than paediatric liquid but too viscous to be given by gravity.[4] Contains 2.5 g/5 mL sucrose and 100 mg/5 mL ethanol.[6]
Septrin (Aspen)	Injection 96 mg/mL	No specific data on enteral tube administration are available for this preparation. Contains sodium 1.7 mmol/5 mL and ethanol 13.2% vol/5 mL.[7]

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 1–4 hours following oral administration.[5,6]

Alternative routes available

Parenteral route is available, no change in dose is required.

Interactions

The presence of food does not delay or reduce absorption.[6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation. Dilute with 2–3 times volume of water (immediately before use) and shake well before administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Draw 2–3 times the dosage volume of water and a little air into the syringe and shake to mix thoroughly.
6. Flush the medication dose down the feeding tube.
7. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add 2–3 times the dose volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that

the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration. Administer as above but dilute the dose with at least three times the volume of water to reduce osmolarity.

References

1. *BNF* 67, March 2014.
2. Personal communication, GSK; 22 January 2003.
3. BPNG data on file, 2005.
4. BPNG data on file, 2011.
5. Septrin Paediatric Suspension (Aspen), Summary of Product Characteristics; May 2013.
6. Septrin Adult Suspension (Aspen), Summary of Product Characteristics; May 2013.
7. Septrin Infusion (Aspen), Summary of Product Characteristics; May 2013.

Cyclizine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Cyclizine (Amdipharm)	Tablet 50 mg	Cyclizine hydrochloride Scored tablets. Tablets do not disintegrate readily in water, but will disperse if shaken in 10 mL of water for 5 minutes, resulting in a fine dispersion that flushes down an 8Fr NG tube without blockage.[2] Contains lactose.[3]
Valoid (Amdipharm)	Injection 50 mg/mL	Can be given i.m. or i.v. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Oral cyclizine is absorbed via the GI tract, with an onset of action within 2 hours.[3]

Alternative routes available

Parenteral route is available.

Interactions

No specific interaction with food is documented.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- As cyclizine tablets do not disperse readily in water, consider changing to an alternative antihistamine antiemetic such as promethazine (see monograph), or, if sedation is problematical, consider using a phenothiazine such as prochlorperazine (see monograph).
- Alternatively the tablets can be dispersed in water if shaken for 5 minutes; the resulting dispersion should be administered immediately.
- The injection could be used for short-term management.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking as required.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There is no specific information relating to jejunal administration of cyclizine. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Cyclizine (Amdipharm), Summary of Product Characteristics; May 2013.
4. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Cyclophosphamide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Cyclophosphamide (Pharmacia)	Tablet 50 mg	Sugar-coated tablet. Tablet may be difficult to crush owing to small size. Possible health risk from dust exposure.[2]
Cyclophosphamide (Pharmacia)	Injection 500 mg, 1 g	Can be used to prepare a solution for oral use.[2]
Cyclophosphamide (Nova Labs)	Solution 25–100 mg/5 mL	Manufactured 'special' with shelf-life of 15 days. Suitable for enteral tube administration.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1 hour after oral dosing.[4]

Alternative routes available

Parenteral route available.

Interactions

No specific interaction with food is documented.

Health and safety

Cytotoxic. Avoid crushing tablets. Handle as cytotoxic. Treat all contaminated waste, (e.g. syringes) as cytotoxic waste.

Suggestions/recommendations

- Do not crush the tablets.
- Use the injection to prepare an oral solution. This should be undertaken in appropriate facilities.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Do not measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of cyclophosphamide. Consideration should be given to using the parenteral route. Seek specialist advice. If clinically appropriate administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Pharmacia; 11 March 2003.
3. Personal communication, Nova Labs; 24 March 2005.
4. Cyclophosphamide Tablets (Pharmacia), Summary of Product Characteristics; March 2012.

Dantron (Danthron)

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Co-danthramer (Napp)	Capsule 25 mg/200 mg, 37.5 mg/500 mg	Dantron 25 mg + poloxamer '188' 200 mg, dantron 37.5 mg + poloxamer '188' 500 mg. No specific data on enteral administration are available for this preparation.
Co-danthramer (Pinewood)	Suspension 25 mg/200 mg in 5 mL, 75 mg/1000 mg in 5 mL	25 mg/200 mg in 5 mL liquid – quite viscous liquid but flushes down a fine bore tube with little resistance but requires flushing well.[2] Contains sorbitol and ethanol 3.71% v/v.[3]
Co-danthrusate (Waymade)	Suspension 25 mg/200 mg in 5 mL	No specific data on enteral tube administration are available for this preparation. Contains sucrose.[4]
Co-danthrusate (Galen)	Capsule 50 mg/60 mg	Dantron 50 mg and docusate sodium 60 mg. No specific data on enteral tube administration are available for this preparation. Contains lactose.[5]
Co-danthrusate (Focus)	Suspension 50 mg/60 mg	Dantron 50 mg and docusate sodium 60 mg per 5 mL dose. No specific data on enteral tube administration are available for this preparation. Contains sorbitol.[6]

Site of absorption (oral administration)

Dantron is partially absorbed in the small intestine.[3,7] The other constituents of the combination products – poloxamer and docusate – are both wetting agents and are not absorbed.

Alternative routes available

Not applicable.

Interactions

No significant interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation. Flush well after dosing.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Administration into the jejunum is unlikely to affect pharmacological response. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Pinorax Suspension (Pinewood), Summary of Product Characteristics; March 2013.
4. Danlax Suspension (Waymade), Summary of Product Characteristics; December 2004.
5. Normax Capsules (Galen), Summary of Product Characteristics; April 2008.
6. Normax Suspension SF (Focus), Summary of Product Characteristics; November 2008.
7. Co-danthramer (Napp), Summary of Product Characteristics; July 2011.

Dapsone

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Dapsone (Actavis)	Tablet 50 mg, 100 mg	White, uncoated tablets.[2] No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Dapsone (Auden McKenzie)	Tablet 50 mg, 100 mg	No specific data on enteral tube administration are available for this preparation.
Dapsone extemporaneous suspension		Data are available demonstrating that dapsone is chemically stable in aqueous based extemporaneous suspensions. Yielding shelf-lives in excess of 1 month at room temperature and longer if refrigerated.[3,4]

Site of absorption (oral administration)

Following oral administration, peak plasma levels occur within 2 to 8 hours.[5] Steady state levels are not reached for at least 8 days.

Alternative routes available

No alternative routes are available.

Interactions

No specific interaction with food is documented.

Health and safety

Avoid crushing or breaking tablets.

Suggestions/recommendations

Use a manufactured special or extemporaneously prepared liquid.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw required dose of liquid preparation into appropriate size and type of enteral syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

No data are available on the effect of jejunal administration of dapsone; however, time to peak levels would indicate that absorption does not occur in the stomach. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Dapsone 50 mg and 100 mg tablets (Actavis), Summary of Product Characteristics, February 2008.
3. Nahata MC, Morosco RS, Trowbridge JM. Stability of dapsone in two oral liquid dosage forms. *Ann Pharmacother* 2000; 34: 848–850.

4. Kaila N, El-Ries M, Riga A, *et al*. Formulation development and stability testing of extemporaneous suspension prepared from dapsone tablets. *Int J Pharm Comp* 2003; 7: 233–239.
5. American Society of Health-System Pharmacists. *AHFS Drug Information*. Bethesda, MD: American Society of Health-System Pharmacists; 2014 (*Medicines Complete: AHFS Drug Information* http://www.medicinescomplete.com).

Deferasirox

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Exjade (Novartis)	Dispersible tablet 125 mg, 250 mg, 500 mg	Disperse tablet in 100–200 mL of water, apple or orange juice until a fine dispersion is produced;[2] dispersion in milk is not recommended owing to the increased time required to achieve dispersion. Tablets must not be chewed or swallowed whole. Each dispersible tablet contains 136 mg lactose.

Site of absorption (oral administration)

Specific site of absorption not documented. Peak levels occur 1.5–4 hours following an oral dose.[2]

Alternative routes available

No alternative route for deferasirox; desferrioxamine is available in parenteral formulation.

Interactions

Food increases bioavailability, but effect is highly variable; therefore, dose should be administered on an empty stomach.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to the large dispersion volume, consider using deferiprone liquid (see the mongraph on deferiprone).
- If therapy with deferasirox is indicated, disperse the tablet in 100–200 mL of water and flush well via the feeding tube.
- Allow a 1-hour break after stopping the feed before administering the dose.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Allow 1-hour break.

4. Place the tablet into an appropriate container; add 100 mL of water and allow the tablet to disperse; add another 100 mL of water if required to achieve a suitable dispersion. Draw this into an appropriate syringe.
5. Flush the medication dose down the feeding tube.
6. Add a further 15 mL of water to rinse the container (to ensure the full dose is administered); draw into an appropriate syringe and flush down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

No specific data available on jejunal administration.

References

1. *BNF* 67, March 2014.
2. Exjade 125 mg, 250 mg, 500 mg dispersible tablets (Novartis), Summary of Product Characteristics; September 2013.

Deferiprone

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Ferriprox (Swedish Orphan)	Tablet 500 mg	No specific data on enteral tube administration are available for this preparation.
Ferriprox (Swedish Orphan)	Oral solution 100 mg/mL	Clear, reddish orange liquid, aqueous solution. No published data are available for this route of administration.[2] Contains 0.4 mg/mL sunset yellow (E110).[3]

Site of absorption (oral administration)

Rapidly absorbed from the upper part of the gastrointestinal tract; peak levels occur 45–60 minutes following oral administration in fasted patients.[3]

Alternative routes available

None available for deferiprone; desferrioxamine is available in parenteral formulation.

Interactions

Peak levels are delayed slightly by food, but bioavailability is not affected.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid preparation.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw dose of oral solution into appropriate size and type of enteral syringe.
4. Administer dose via feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

No data are available on jejunal administration. Use the above method for administration; monitor therapeutic effect and side-effects closely.

References

1. *BNF* 67, March 2014.
2. Personal communication, Swedish Orphan Medical Information, 14 April 2010.
3. Ferriprox Oral Solution (Swedish Orphan), Summary of Product Characteristics; August 2012.

Deflazacort

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Calcort (Sanofi-Aventis, previously Shire)	Tablet 6 mg	Tablets can be crushed.[2] Tablets disintegrate rapidly when placed in 10 mL of water, to produce a fine white dispersion that flushes down an 8Fr NG tube without blockage.[3] Contain lactose.[4]

Site of absorption (oral administration)

Deflazacort is rapidly absorbed following oral administration. Peak plasma concentration of the active metabolite occurs 1.5–2 hours after oral administration.[4]

Alternative routes available

None available for deflazacort, other steroids available in parenteral and rectal formulations.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of deflazacort. Administer using the above method; monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Shire; 17 February 2003.
3. BPNG data on file, 2004.
4. Calcort (Sanofi-Aventis), Summary of Product Characteristics; August 2013.

Demeclocycline hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Demeclocycline (Amdipharm)	Capsule 150 mg	Hard gelatin capsule. Demeclocyline hydrochloride is sparingly soluble in water.[2]

Site of absorption (oral administration)

Peak plasma concentration occur 3 to 4 hours following an oral dose.[2]

Alternative routes available

None available for demeclocycline. Other antibiotics with similar spectrum are available in injectable form.

Interactions

Food and milk reduce absorption of demeclocycline by approximately 50% through binding to divalent and trivalent ions such as calcium and magnesium; therefore, dose should be given 1 hour before food or 2 hours after.[3] As enteral feeds contain significant concentrations of calcium, magnesium and iron, it is possible that the interaction with enteral feed would be more significant.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- If demeclocycline is being used as an antibiotic, an alternative antibiotic should be considered because of the required frequency of dosing and the significant interaction with food.
- If demeclocycline is being used to manage SIADH, alternative management and specialist advice should be sought.

References

1. *BNF* 67, March 2014.
2. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
3. American Society of Health-System Pharmacists. *AHFS Drug Information*. Bethesda, MD: American Society of Health-System Pharmacists; 2014 (*Medicines Complete: AHFS Drug Information* http://www.medicinescomplete.com).

Desloratadine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Desloratidine (Actavis, Arrow, Aspire, Consilient, Mylan)	Tablet 5 mg	Film-coated tablet. No specific data on enteral tube administration are available for this preparation.
Neoclarityn (MSD)	Tablet 5 mg	Film-coated tablet. No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]
Neoclarityn (MSD)	Syrup 2.5 mg/5 mL	Sugar-free, bubblegum-flavoured solution. No specific data on enteral tube administration are available for this preparation. Contains sorbitol 150 mg/mL.[3]

Site of absorption (oral administration)

Specific site not documented. Peak plasma levels occur 3 hours following oral dosing.[3]

Alternative routes available

None available for desloratadine. Chlorphenamine is available in parenteral form.

Interactions

No interaction with food or grapefruit juice.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use oral solution.
- Flush tube well after administration.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw up dose of oral solution into appropriate enteral syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There is no specific data on the jejunal administration of desloratadine.

References

1. *BNF* 67, March 2014.
2. Neoclarityn Tablets (MSD), Summary of Product Characteristics; September 2013.
3. Neoclarityn Syrup (MSD), Summary of Product Characteristics; September 2013.

Desmopressin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Desmopressin (Aspire, Teva)	Tablet 100 micrograms, 200 micrograms	Desmopressin (as acetate). No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]
DDAVP (Ferring)	Tablet 100 micrograms, 200 micrograms	Desmopressin (as acetate). Tablets can be crushed and dispersed in water;[3] this does not affect oral bioavailability.[4] Tablet disintegrates within 5 minutes when placed in 10 mL of water, the resulting dispersion flushes via an 8Fr NG tube without blockage.[5] Contains lactose.[6]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Desmotabs (Ferring)	Tablet 200 micrograms	Desmopressin (as acetate). As above.
Desmopressin acetate (Actavis, Mylan)	Nasal spray 10 micrograms/spray	Intranasal use only.
DDAVP (Ferring)	Nasal solution 100 micrograms/mL	Desmopressin (as acetate). Used for paediatric doses less than 10 microgram.
Desmospray (Ferring)	Nasal spray 10 micrograms/spray	Desmopressin (as acetate). Intranasal use only.
Nocutil (Norgine)	Nasal spray 10 micrograms/spray	Desmopressin (as acetate). Intranasal use only.
Octim (Ferring)	Nasal spray 150 micrograms/spray	Desmopressin (as acetate). Intranasal use only.
DDAVP Melt (Ferring)	Oral lyophilisate 60 micrograms, 120 micrograms, 240 micrograms	Desmopressin (as acetate). Oral lyophilisate, for sublingual use only;[6] not suitable for administration via enteral feeding tube.
Desmomelt (Ferring)	120 micrograms, 240 micrograms	Desmopressin (as acetate). For sublingual use only;[6] not suitable for administration via enteral feeding tube.
DDAVP (Ferring)	Injection 4 micrograms/mL	Desmopressin (as acetate). Primarily for diagnostic use. Licensed for diabetes insipidus treatment.
Octim (Ferring)	Injection 15 micrograms/mL	Desmopressin (as acetate). Primarily for use in haemophilia, von Willebrand's disease and for testing.

Site of absorption (oral administration)

Following oral administration, absorption occurs primarily in the duodenum and proximal jejunum.[3] Desmopressin is also absorbed sublingually.[7]

Alternative routes available

Nasal, sublingual and parenteral route are available; indications for parenteral route are limited (consult SPC).

Interactions

A standardised 27% fat meal significantly reduced the absorption of oral desmopressin; however, the pharmacodynamic effect was unaffected.[8]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Convert to sublingual tablets or to intranasal administration where possible for long-term therapy. If necessary the conventional tablets can be dispersed in water immediately prior to administration; see below.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no data to support administration via this route; owing to the site of absorption it is possible that bioavailability may be reduced. If indicated, use the method detailed above and monitor for loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Desmopressin Tablets (Teva), Summary of Product Characteristics; March 2013.
3. Personal communication, Ferring Pharmaceuticals; 20 January 2003.
4. Argenti D, Ireland D, Heald DL. A pharmacokinetic and pharmacodynamic comparison of desmopressin administered whole, chewed and crushed tablets, and as an oral solution. *J Urol* 2001; 165(5): 1446–1451.
5. BPNG data on file, 2005.
6. Desmomelt (Ferring), Summary of Product Characteristics; July 2012.
7. DDAVP Melt (Ferring), Summary of Product Characteristics; June 2011.
8. DDAVP Tablets (Ferring), Summary of Product Characteristics; June 2011.

Dexamethasone

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Dexamethasone (Aspen)	Tablet 500 micrograms, 2 mg	Tablets disperse quickly when placed in 10 mL of water; the dispersion settles quite quickly but flushes down an 8Fr NG tube without blockage.[2] Contains lactose.[3]
Dexamethasone (Rosemont)	Oral solution 2 mg/5 mL (Dexsol), 10 mg/5 mL	Dexamethasone (as sodium phosphate). Slightly thicker than water.[4] Contains sorbitol 700 mg/5 mL and maltitol 1375 mg/5 mL.[5,6]
Dexamethasone (Rosemont)	Oral solution 0.5 mg/5 mL	'Special'. Slightly thicker than water.[7] Contains ethanol 197.5 mg/5 mL and sucose.[7]
Dexamethasone (Hameln, Hospira, MSD)	Injection 4 mg/mL, 24 mg/mL	Dexamethasone (as sodium phosphate). No specific data on enteral tube administration are available for this preparation.
Dexamethasone (MSD)	Tablet 2 mg	No specific data on enteral tube administration are available for this preparation. Contain lactose.[8]

Site of absorption (oral administration)

Dexamethasone is readily absorbed from the GI tract. Peak plasma concentration occurs 1–2 hours following oral dosing.[5]

Alternative routes available

Parenteral formulation is available; can be administered via i.v, i.m. or s.c. routes and rectal drip.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use oral solution. Alternatively, the tablets can be dispersed in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication liquid into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

The liquid can be administered using the above method. Alternatively, administer tablets using the method below.

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Dexamethasone Tablets (Aspen), Summary of Product Characteristics; May 2014.
4. Rosemont. Dexamethasone Oral Solution-6, www.rosemontpharma.com/products/endocrine-system/dexamethasone-oral-solution-6 (accessed 15 June 2014).
5. Dexsol (Rosemont), Summary of Product Characteristics; April 2013.
6. Dexamethasone Oral Solution (Rosemont), Summary of Product Characteristics; October 2013.
7. Rosemont. Dexamethasone Oral Solution-49, www.rosemontpharma.com/products/endocrine-system/dexamethasone-oral-solution-49 (accessed 15 June 2014).
8. Dexamethasone Tablets (MSD), Summary of Product Characteristics; November 2012.

Dexibuprofen

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Seractil (Genus)	Tablet 300 mg, 400 mg	Film-coated tablets. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Dexibuprofen is absorbed primarily from the small intestine and peak plasma levels are reached 2 hours following oral administration.[2]

Alternative routes available

None for dexibuprofen; i.v., i.m. and rectal routes are available for diclofenac (see individual monograph).

Interactions

Food may delay the onset of action.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Change to ibuprofen and administer suspension via the feeding tube.

References

1. *BNF* 67, March 2014.
2. Seractil (Genus), Summary of Product Characteristics; April 2004.

Diazepam

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Diazepam (Actavis, Genesis, Teva, Wockhardt)	Tablet 2 mg, 5 mg, 10 mg	Tablets can be crushed and dispersed in water. Teva brand tablets disperse in water within 2 minutes to give fine dispersion that does not block an 8Fr NG tube.[2]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Diazepam (Actavis)	Oral solution 2 mg/5 mL	Slightly viscous liquid. Some resistance on flushing. Mixes with an equal volume of water to reduce resistance.[3]
Diazepam (Rosemont)	Oral suspension 2.5 mg/5 mL, 10 mg/5 mL	Manufactured 'special'. Thick liquid.[4] Contains sucrose and sorbitol 0.68 g/5 mL.[3,4]
Diazepam (non-proprietary)	Strong oral solution 5 mg/5 mL	No specific data on enteral tube administration are available for this preparation.
Diazepam (Hameln)	Injection (solution) 5 mg/mL	For i.v or i.m. injection. No specific data on enteral tube administration are available for this preparation.
Diazepam (Actavis, Wockhardt)	Rectal tubes 2.5 mg, 5 mg, 10 mg	For rectal administration. No specific data on enteral tube administration are available for this preparation.
Diazepam (Durbin)	Suppository 10 mg	For rectal administration.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 15–90 minutes following oral administration.[5] The pharmacokinetics of the liquid preparation are similar to the tablet formulation.

Alternative routes available

Rectal and parenteral routes available.

Interactions

Specific interaction with food is not documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- For intragastric use, use liquid preparation.
- For intrajejunal use consider using tablets dispersed in water to reduce osmolarity.
- A prolonged break in feeding is not required.
- The rectal or parenteral route can be used if GI absorption is compromised.

Intragastric administration

Liquid administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.

3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Tablet administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Personal communication, Rosemont; 20 January 2005.
4. Rosemont. Diazepam Oral Suspension-50, www.rosemontpharma.com/products/central-nervous-system/diazepam-oral-suspension-50 (accessed 15 June 2014).
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Diazoxide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Eudemine(RPH)	Tablet 50 mg	No specific data on enteral tube administration are available for this preparation.
Proglycem (Teva)	Suspension 50 mg/mL	Unlicensed in the UK (manufactured by Teva Pharmaceuticals USA). Chocolate-mint-flavoured suspension. Contains alcohol 7.25%. Contains sorbitol.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak blood concentrations attained within 4 hours after administration of the suspension, with the glycaemic effect beginning within 1 hour.[2,3]

Alternative routes available

No alternative routes available for this preparation.

Interactions

No specific interaction with food documented.

Health and safety

Standard precautions apply. Suspension should be protected from light.

Suggestions/recommendations

- Use the suspension

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the required dose of suspension into an appropriate size enteral syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no data on the jejunal administration of diazoxide.

References

1. *BNF* 67, March 2014.
2. Drug Information Online. Diazoxide. www.drugs.com/monograph/diazoxide.html (accessed 8 September 2014).
3. Daily Med. Proglycem (diazoxide) suspension, http://dailymed.nlm.nih.gov/dailymed/lookup.cfm?setid=b16c7832-2fd9-49af-b923-1dc0d91fd6e2 (accessed 8 September 2014).

Diclofenac

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Diclofenac sodium (Dexcel, Genesis, Focus, Kent, Teva)	Tablet 25 mg, 50 mg	Enteric coated; do not crush. Not suitable for administration via a feeding tube.
Dicofenac potassium (Actavis, Boots)	Tablet 12.5 mg, 25 mg, 50 mg	Sugar coated. No specific data on enteral tube administration are available for this preparation.
Diclofenac M/R (Amdipharm, Discovery, Galen, Sandoz)	M/R tablet and M/R capsule 75 mg, 100 mg	Modified-release preparations; do not crush. Not suitable for administration via feeding tube.
Diclofenac (Rosemont)	Oral suspension 50 mg/5 mL	Manufactured 'special'.[2] Thick liquid. No specific data on enteral tube administration are available for this preparation. Sugar-free oral liquid. Contains ethanol 0.1 mg/5 mL.[2]
Diclofenac (Special Products Ltd)	Dispersible tablet 10 mg	Unlicensed special product. Tablets should be stirred in 10 mL of water for 2 minutes to dissolve the active drug. The suspension should be allowed to settle for 1 minute, then the clear solution can be drawn up and flushed down the feeding tube using a syringe.[3]
Voltarol (Novartis)	Tablet 12.5 mg, 25 mg, 50 mg	Diclofenac (as sodium salt). Enteric-coated; do not crush. Not suitable for administration via a feeding tube. Contains lactose.[4]
Voltarol (Novartis)	Dispersible tablet 50 mg	Diclofenac (as sodium salt). Tablet swells and disperses to give bright pink, cherry-flavoured dispersion. Flushes easily via an 8Fr NG tube.[5]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Voltarol Rapid (Novartis)	Tablet 25 mg, 50 mg	Diclofenac (as potassium salt). Sugar coated. No specific data on enteral tube administration are available for this preparation.
Voltarol SR & Retard (Chiesi, Novartis)	Tablet 75 mg, 100 mg	Modified-release tablets; do not crush. Not suitable for administration via a feeding tube.
Voltarol (Novartis)	Injection 25 mg/mL (3 mL)	Diclofenac (as sodium salt). Licensed for i.m. and i.v. use. Maximum of 2 days of therapy recommended.[6]
Voltarol (Novartis)	Suppository 12.5 mg, 25 mg, 50 mg, 100 mg	Diclofenac (as sodium salt). Rate of absorption is slower than enteric-coated tablets; peak plasma concentrations are reached after 1 hour. Bioavailability is two-thirds that of equivalent oral dose.[7]
Arthrotec (Pfizer, previously Phamacia)	Tablet '50', '75'	'50' tablets contain 50 mg diclofenac and misoprostil 200 micrograms. '75' tablets contain 75 mg diclofenac and misoprostil 200 micrograms. Tablets contain diclofenac in an enteric-coated core surrounded by misoprostil and, therefore, should not be crushed.[8] Contains lactose.[9]

Site of absorption (oral administration)

Specific site of absorption is unknown. Time to peak plasma concentration varies depending on formulation used.[10] As enteric-coated preparations are available it is unlikely that jejunal administration will affect bioavailability.

Alternative routes available

Rectal and parenteral routes are available; route does not affect dosing. Topical formulations can be used for a local action.

Interactions

No specific interaction with food is documented. Food does not affect the absorption of diclofenac potassium.[11]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use dispersible tablets. Disperse tablets in water immediately prior to administration. There should be no reduction in bioavailability from jejunal administration.
- For mild localised pain, consider topical NSAIDs; see *BNF* for further details.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Administer as above.

References

1. *BNF* 67, March 2014.
2. Rosemont. Diclofenac Sodium Oral Suspension-51, www.rosemontphrma.com/products/musco-skeletal-and-joint-disease/diclofenac-sodium-oral-suspension-51 (accessed 15 June 2014).
3. Personal communication, Special Products Ltd; 20 January 2003.
4. Voltarol Tablets (Novartis), Summary of Product Characteristics; December 2013.
5. BPNG data on file, 2004.
6. Voltarol Ampoules (Novartis), Summary of Product Characteristics; December 2013.
7. Voltarol Suppositories (Novartis), Summary of Product Characteristics; December 2013.
8. Personal communication, Pharmacia; 11 March 2003.
9. Arthrotex (Pfizer), Summary of Product Characteristics; November 2013.
10. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.
11. Diclofenac Potassium Tablets (Actavis), Summary of Product Characteristics; January 2014.

Dicycloverine (Dicyclomine) hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Dicycloverine (Zentiva)	Tablet 10 mg, 20 mg	Dicycloverine (as hydrochloride).[2] No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]
Dicycloverine (Zentiva)	Syrup 10 mg/5 mL	Dicycloverine (as hydrochloride). The syrup can be diluted with water immediately prior to administration.[3] Contains sugar.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–1.5 hours post dose.[3]

Alternative routes available

None.

Interactions

There is no documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the syrup, dilute with an equal volume of water immediately prior to administration to reduce viscosity; flush after administration.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
6. Flush the medication dose down the feeding tube.
7. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to the jejunal administration of dicycloverine. Administer using the above method.

References

1. *BNF 67*, March 2014.
2. Dicycloverine Tablets (Zentiva), Summary of Product Characteristics; April 2014.
3. Dicycloverine Syrup (Zentiva), Summary of Product Characteristics; May 2014.

Digoxin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Digoxin (Actavis, Teva)	Tablet 62.5 micrograms, 125 micrograms, 250 micrograms	No specific data on enteral tube administration are available for this preparation. Actavis brand contains lactose.[2]
Digoxin (Amdipharm)	Injection 250 micrograms/mL	No specific data on enteral tube administration are available for this preparation.
Digoxin (BCM specials)	Paediatric injection 100 micrograms/mL	No specific data on enteral tube administration are available for this preparation.
Lanoxin (Aspen, previously GSK)	Tablet 125 micrograms, 250 micrograms	Bioavailability approximately 63%.[2] No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]
Lanoxin (Aspen)	Injection 250 micrograms/mL	No specific data on enteral tube administration are available for this preparation.
Lanoxin-PG (Aspen)	Tablet 62.5 micrograms	No specific data on enteral tube administration are available for this preparation.
Lanoxin-PG (Aspen, previously GSK)	Elixir 50 micrograms/mL	Do not dilute.[3] Bioavailability is approximately 75%.[3] Does not contain sorbitol. Contains sucrose and ethanol.[3] Bright yellow liquid, slightly viscous, flushes via an 8Fr NG tube with very little resistance.[4]

Site of absorption (oral administration)

Absorption of digoxin is mainly from the proximal small intestine. Gastric absorption is minimal. Absorption is not affected by gastrectomy or jejunoileal bypass.[5] Case reports have suggested that absorption of digoxin is not compromised when administered via jejunostomy tube.[6] However, owing to the difference in pharmacokinetics properties between the tablets and liquid formulation, plasma concentrations should be monitored following any administration changes. Absorption may be reduced in malabsorption syndromes and following reconstructive surgery; increased doses may be necessary.[3]

Alternative routes available

Parenteral route is available. The SPC recommends dose reduction of 33% when changing from oral to i.v. route.

Interactions

Absorption of digoxin is slowed and reduced by concurrent intake of high-fibre (high-hemicellulose) meals. Although this is thought to be clinically insignificant, plasma concentrations should be checked when using a high-fibre feed (e.g. Jevity).

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid preparation. Although in theory a dose reduction is indicated, in practice it is unlikely to be clinically important. If the patient is on a high-fibre feed, administer during a break in the regimen if possible. If on a standard feed, a prolonged break in feeding is not required.
- The liquid formulation has a high osmolarity, but dose volumes are small; therefore, flushing well with water immediately post dose should reduce any possibility of related side-effects.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into the syringe with an appropriate adapter for the tube connector. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Administer using the above method. Plasma concentration can be monitored.

References

1. *BNF* 67, March 2014.
2. Lanoxin Tablets (Aspen), Summary of Product Characteristics; March 2012.
3. Lanoxin PG Elixir (Aspen), Summary of Product Characteristics; November 2013.

4. BPNG data on file, 2005.
5. Personal communication, GSK; 22 January 2003.
6. Adams D. Administration of drugs through a jejunostomy tube. *Br J Intensive Care* 1994; 4(1): 10–17.

Dihydrocodeine tartrate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Dihydrocodeine (Actavis, Mylan, Teva, Wockhardt)	Tablet 30 mg	Tablets can be crushed, but liquid preparation is available. Contains lactose.[2–4]
Dihydrocodeine (Martindale)	Oral solution 10 mg/5 mL	Cola coloured and flavoured slightly viscous liquid. Some resistance to flushing via fine-bore NG tube. Mixes easily with an equal volume of water to reduce viscosity.[5]
Dihydrocodeine (Aurum)	Injection 50 mg/mL (1 mL)	Licensed for s.c. or i.m. injection. No specific data on enteral tube administration are available for this preparation.
DF118 Forte (Martindale)	Tablet 40 mg	No specific data on enteral tube administration are available for this preparation.
DHC Continuous (Napp)	M/R tablet 60 mg, 90 mg, 120 mg	Modified-release tablets. Do not crush. Not suitable for enteral feeding tube administration. Convert to liquid preparation; divide total daily dose into 6–4 doses given every 4–6 hours.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1.2–1.8 hours after oral dosing.[2–4,6,7]

Alternative routes available

Parenteral route is available.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw medication liquid into appropriate size and type of syringe.
4. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Dihydrocodeine Tablets (Actavis), Summary of Product Characteristics; June 2011.
3. Dihydrocodeine Tablets (Teva), Summary of Product Characteristics; October 2012.
4. Dihydrocodeine Tablets (Wockhardt), Summary of Product Characteristics; July 2011.
5. BPNG data on file, 2005.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
7. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Diltiazem hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Diltiazem (Actavis, genus, Kent, Mylan)	Tablet 60 mg	Some brands can be crushed and mix with 10 mL of water to form fine suspension that flushes via an 8Fr NG tube without blockage.[2]
Tildiem (Sanofi-Aventis)	Tablet 60 mg	Tablets may be crushed; although this is likely to affect the pharmacokinetics, it is unlikely to cause adverse effects.[3] Contains lactose.[4]

Formulations available[1] (*continued*)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Adizem SR (Napp)	M/R capsule 90 mg, 120 mg, 180 mg; M/R tablets 120 mg	Modified release for twice daily dosing. In-house studies conducted by Napp conclude that there is significant risk of blockage if the spheroids in the capsules are administered via an enteral feeding tube. The company does not recommend this method of administration.[5]
Adizem XL (Napp)	M/R capsule 120 mg, 180 mg, 200 mg, 240 mg, 300 mg	Modified release for once-daily dosing. In-house studies conducted by Napp conclude that there is significant risk of blockage if the spheroids in the capsules are administered via an enteral feeding tube. The company does not recommend this method of administration.[5]
Angitil SR (Chiesi)	M/R capsule 90 mg, 120 mg, 180 mg	Modified release. No specific data on enteral tube administration are available for this preparation.
Angitil XL (Chiesi)	M/R capsule 240 mg, 300 mg	Modified release . No specific data on enteral tube administration are available for this preparation.
Dilcardia SR (Generics, Mylan)	M/R capsule 60 mg, 90 mg, 120 mg	Modified release. No specific data on enteral tube administration are available for this preparation.
Dilzem SR (Cephalon)	M/R capsule 60 mg, 90 mg, 120 mg	Capsules contain modified-release granules. The capsules can be opened to facilitate administration providing the contents are not crushed.[6] No information available on size of granules or risk of blockage. Bioavailability is similar to that of conventional tablets.[7]
Dilzem XL (Cephalon)	M/R capsule 120 mg, 180 mg, 240 mg	Capsules contain modified-release granules. The capsules can be opened to facilitate administration providing the contents are not crushed.[6] No information available on size of granules or risk of blockage. Bioavailability is similar to that of conventional tablets.[8]
Slozem (Merck Serono)	M/R capsule 120 mg, 180 mg, 240 mg, 300 mg	Sustained-release pellets must not be crushed. Capsules can be opened and pellets administered via feeding tube. Pellets may get stuck within the tube, especially smaller-sized tubes.[9] The bioavailability of the capsules is equivalent to the same dose given as conventional tablets.[10]
Tildiem LA (Sanofi-Aventis)	M/R capsule 200 mg, 300 mg	Pellets can be removed from the modified-release capsule but should not be crushed;[2] no information available on tube administration. Bioavailability is 80% of the conventional tablets.[11]

Formulations available[1] (*continued*)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Tildiem Retard (Sanofi-Aventis)	M/R tablet 90 mg, 120 mg	These modified-release tablets should not be crushed.[2] Bioavailability is 90% of the conventional tablets.[12]
Viazem XL (Genus)	M/R capsule 120 mg, 180 mg, 240 mg, 300 mg, 360 mg	Modified release. No specific data on enteral tube administration are available for this preparation.
Zemzard (Galen)	M/R capsule 120 mg, 180 mg, 240 mg, 300 mg	Modified release. No specific data on enteral tube administration are available for this preparation.
Extemporaneous preparation	Suspension	*Extemporaneous diltiazem suspension* 12 mg/mL Diltiazem 60 mg tablets: 20 tablets Cherry syrup to 100 mL Room temperature storage; 60-day expiry. (Adapted from ref. 13.)

Site of absorption (oral administration)

Diltiazem is well absorbed from immediate-release preparations (90%). Peak plasma concentration occurs 3–4 hours after an oral dose.[4] First-pass effect reduces bioavailability to 40%.

Alternative routes available

None.

Interactions

There is no documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Where clinically appropriate, consider changing to an alternative once daily calcium-channel blocker such as amlodipine (see monograph).
- Bioavailability varies among the sustained-release diltiazem preparations. Therefore, despite the theoretical dose being administered, if changing to crushed 60 mg tablets it would be prudent to start at 60 mg three times a day. Owing to the unknown effect on pharmacokinetics of crushing the 60 mg tablets, if the dose is to be increased, increase the frequency to four times daily.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.

6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure that the total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless prolonged break required.

Intrajejunal administration

There are no specific data on jejunal administration of diltiazem. Consider changing therapy. If administering as above, monitor for lack of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Personal communication, Sanofi-Aventis; 3 February 2003.
4. Tildiem (Sanofi-Aventis), Summary of Product Characteristics; March 2014.
5. Personal communication, Napp Pharmaceuticals; 29 January 2003.
6. Personal communication, Elan Pharma; 16 January 2003.
7. Dilzem SR (Cephalon), Summary of Product Characteristics; October 2012.
8. Dilzem XL (Cephalon), Summary of Product Characteristics; March 2012.
9. Personal communication, Merck Pharmaceuticals; 23 January 2003.
10. Slozem Capsules (Merck Serono), Summary of Product Characteristics; April 2012.
11. Tildiem LA (Sanofi-Aventis), Summary of Product Characteristics; March 2014.
12. Tildiem Retard (Sanofi-Aventis), Summary of Product Characteristics; March 2014.
13. Allen L, Erickson M. Stability of baclofen, captopril, diltiazem hydrochloride, dipyridamole and flecanide acetate in extemporaneously compounded oral liquids. *Am J Health Syst Pharm* 1996; 53: 2179–2184.

Dipyridamole

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Dipyridamole (Actavis, Mylan)	Tablet 25 mg, 100 mg	Coated tablets. Tablets can be crushed but the coating may not pulverise;[2] there is a risk of tube blockage. Tablets do not crush readily owing to the coating.[3]
Dipyridamole (Rosemont)	Oral suspension 50 mg/5 mL	Sugar-free suspension. Doses should be given 3–4 times daily. Rosemont advises to take before meals. Thick liquid which may be difficult to administer via a feeding tube without prior dilution with water. Contains ethanol 4.1 mg/5 mL, also contains maltitol.[4,5]

Formulations available[1] (*continued*)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Dipyridamole (Martindale, Rosemont)	Oral suspension 100 mg/5 mL	Manufacturer's 'special'. No specific data on enteral tube administration are available for this preparation. Rosemont product contains ethanol 4.1 mg/5 mL.[4]
Persantin (Boehringer Ingelheim)	Tablet 25 mg, 100 mg	Sugar-coated tablets. Tablets may be crushed.[6]
Persantin (Boehringer Ingelheim)	Injection 5 mg/mL (2 mL)	Licensed for diagnostic use only. pH of solution is 2.5–3. The injection solution could be administered via the tube, [6] but this would require a large number of ampoules.
Persantin Retard (Boehringer Ingelheim)	Capsule 200 mg	Hard gelatin capsule containing modified-release granules. Capsule may be opened and granules flushed through the tube. Boehringer comments that the granules easily block the tube and the procedure should be attempted with caution.[6]
Asasantin Retard (Boehringer Ingelheim)	Capsule 200 mg/25 mg	Dipyridamole 200 mg and 25 mg aspirin. Hard gelatin capsule containing modified-release granules. Capsule may be opened and granules flushed through the tube. Boehringer comments that the granules easily block the tube and the procedure should be attempted with caution.[6]

Site of absorption (oral administration)

Dipyridamole is mainly absorbed in the small intestine.[5] Peak plasma concentration occurs 0.5–2 hours after oral dosing with immediate-release preparations.[5] Absorption of tablets or suspension depends upon having a low pH in the stomach, MR preparations (that are buffered) do not appear to be affected.[7]

Alternative routes available

Parenteral route is not used for therapeutic purposes.

Interactions

There is no documented interaction with food; however, absorption is affected by a low pH in the stomach so it is recommended that the tablets or suspension should be given before food.[5,6]

Health and safety

Standard precautions apply.

Suggestions recommendations

- Evidence supporting the *National Clinical Guidelines for Stroke* are based on the use of MR preparation and patients with feeding or swallowing difficulties should have medicines supplied in a suitable formulation.[8]

- NICE TA90 guidelines recommend giving aspirin alone if diyridamole MR cannot be taken.[9]
- If clinically appropriate, use a liquid preparation. Dilute before use if administering into the jejunum.
- If converting from a modified-release preparation, divide total daily dose into four equal doses.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific reports relating to the jejunal administration of dipyridamole; however, as there is a modified-release preparation that releases dipyridamole into the small bowel, it is unlikely that jejunal administration will adversely affect pharmacokinetics.

Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma (now Actavis); 21 January 2003.
3. BPNG data on file, 2004.
4. Rosemont. Dipyridamole Oral Suspension-7, www.rosemontpharma.com/products/cardiovascular-syste,/dipyridamole-oral-suspension-7 (accessed 19 June 2014).
5. Dipyridamole Suspension (Rosemont), Summary of Product Characteristics; April 2013.
6. Personal communication, Boehringer Ingelheim; 6 March 2003.
7. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London, Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).
8. Royal College of Physicians. *National Clinical Guidelines for Stroke*, 4th edn. London: Royal College of Physicians; 2008, https://www.rcplondon.ac.uk/sites/default/files/national-clinical-guidelines-for-stroke-fourth-edition.pdf (accessed 8 September 2014).
9. Dipyridamole Suspension (Rosemont), Summary of Product Characteristics; September 2002.
10. NICE. *Technology Appraisal 210: Clopidogrel and Modified-release Dipyridamole for the Prevention of Occlusive Vascular Events*. London: NICE; 2010, http://www.nice.org.uk/guidance/TA210 (accessed 8 September 2014).

Disodium etidronate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Didronel (Warner Chilcott, previously Procter & Gamble)	Tablet 200 mg	Avoid giving food for at least 2 hours before and after oral treatment, particularly calcium-containing products such as milk; also avoid iron and mineral supplements and antacids.[1] The manufacturers have anecdotal data of patients crushing tablets and mixing them with water immediately prior to administration. The tablets should only be mixed with plain water owing to the risk of interaction.[2] The tablets do not disperse readily in water but crush easily and suspend in water; the suspension flushes via an 8Fr NG tube without blockage.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented, and the average absorption is about 1% of an oral dose of 5 mg/kg body weight/day.[4]

Alternative routes available

None available for etidronate. Other bisphosphonates are available in parenteral formulations, although indications and doses differ; consult product literature for dosing guidelines.

Interactions

Etidronate absorption may be decreased by food in the stomach or upper portions of the small intestine, particularly materials with a high calcium content such as milk.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider changing to an alternative therapy.
- If continued treatment with etidronate is necessary, stop the enteral feed 2 hours prior to administration. Crush the tablet and disperse in water immediately prior to administration. Flush the tube well. Do not re-start the feed for 2 hours.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Allow a 2-hour break.
4. Place the tablet in a mortar and crush to a fine powder using the pestle.

5. Add a few millilitres of water and mix to form a paste.
6. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
7. Draw this into an appropriate size and type of syringe.
8. Flush the medication dose down the feeding tube.
9. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure that the total dose is administered).
10. Finally, flush the enteral feeding tube with the recommended volume of water.
11. Wait for at least 2 hours before re-starting the feed.

Intrajejunal administration

There are no specific data relating to the jejunal administration of etidronate. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Procter & Gamble; 22 January 2003.
3. BPNG data on file, 2005.
4. Didronel (Warner Chilcott), Summary of Product Characteristics; September 2011.

Docusate sodium

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Dioctyl (UCB, previously Schwarz)	Capsule 100 mg	Soft gelatin capsules. The viscous liquid inside the capsule can be aspirated and suspended in water. Such a transfer is likely to result in inaccurate dosing and therefore is not recommended.[2] Contains sorbitol.[3]
DulcoEase (Boehringer Ingelheim)	Capsule 100 mg	Capsules contain a viscous liquid;[4] aspirating the liquid is likely to result in inaccurate dosing and therefore is not recommended. Contains sorbitol.[4]
Docusol (Typharm)	Adult oral solution 50 mg/5 mL Paediatric oral solution 12.5 mg/5 mL	Both solutions are sugar-free.[5] Adult solution: Slightly viscous clear solution; flushes through a fine-bore tube with slight resistance. Mixes well with an equal volume of water.[6] Contains sorbitol.[5]

Site of absorption (oral administration)

Docusate sodium functions as a faecal softener by acting as a wetting agent in the colon; only minimal quantities are absorbed.[3]

Alternative routes available

Rectal administration is available.

Interactions

No significant interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation.
- Administration into the jejunum will not affect pharmacological response.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Administration directly into the jejunum will not affect the pharmacological response. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Schwarz Pharma; 17 February 2003.
3. Dioctyl (UCB), Summary of Product Characteristics; March 2013.
4. DulcoEase (Boehringer Ingelheim), Summary of Product Characteristics; October 2013.
5. Docusol (Typharm), Summary of Product Charcteristics; April 2014.
6. BPNG data on file, 2004.

Domperidone

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Domperidone (Aurobindo, Co-pharma, Focus, Mylan, Wockhardt)	Tablet 10 mg	Domperidone (as maleate). Tablets will disperse in water, although the time taken is variable. Co-pharma and Wockhardt brands both produce dispersion that does not block an 8Fr NG tube.[2]
Domperidone (Focus, Zentiva)	Suspension 1 mg/mL	Suspension flushes via an 8Fr NG tube with little resistance. Mixes easily with an equal volume of water to reduce viscosity and osmolarity.[2,3] Contains sorbitol 2.275 g/5 mL dose.[4]
Motilium (McNeil Products)	Tablet 10 mg	Domperidone (as maleate). Film coated. Tablets can be crushed.[5,6]
Motilium Instants (McNeil Products)	Tablet 10 mg	Tablet disintegrate on the tongue but require swallowing for adsorption. Not suitable for patients requiring administration of medicines via an enteral feeding tube.[7]
Motilium (Zentiva)	Suppository 30 mg	Rectal administration.[8]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs within 30 minutes following oral administration, and 1–4 hours following rectal administration.[9]

Alternative routes available

Rectal route is available.

Interactions

Administration 90 minutes after a meal increases bioavailability.[9]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the suspension formulation, although the total daily dose of sorbitol should be considered. If administering into the jejunum, dilute the suspension with at least an equal volume of water immediately prior to administration. Alternatively, the suppositories can be used rectally.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Personal communication, MI Zentiva; 31 August 2011.
4. Domperidone Suspension (Zentiva). Summary of Product Characteristics; September 2013.
5. Personal communication, Sanofi-Synthelabo; 3 February 2003.
6. Motilium Tablets (McNeil Products), Summary of Product Characteristics; December 2012.
7. Motilium Instants (McNeil Products), Summary of Product Characteristics; March 2012.
8. Motilium Suppositories (Winthrop Pharma), Summary of Product Characteristics; March 2011.
9. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

Donepezil hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Donepezil (Accord, Actavis, Aurobindo, Consilient, Eisai, Niche, Sandoz, Torrant, Wockhardt, Zentiva)	Tablet 5 mg, 10 mg	Film-coated tablets. No specific data on enteral tube administration are available for this preparpation. All brands contain lactose, the Sandoz brand contains the least with 19 mg in a 5 mg tablet and 38 mg in a 10 mg tablet.[2]
Donepezil (Actavis, Consilient, Sandoz, Teva)	Orodispersible tablet 5 mg, 10 mg	Tablets disperse on the tongue and are then swallowed. Therefore they are not suitable for administration via an enteral feeding tube.
Donepezil (Rosemont)	Oral suspension 1 mg/5 mL, 5 mg/5 mL, 10 mg/5 mL	The 5 mg/5 mL and 10 mg/5 mL suspensions are manufacturer's 'specials'. Slightly thicker than water.[3,4] Contains sorbitol (357 mg/mL for 1 mg/mL suspension).[3–5]
Aricept (Eisai)	Tablet 5 mg, 10 mg	Tablets can be crushed and suspended in water immediately prior to administration.[6] Tablets disintegrate within 5 minutes when placed in 10 mL of water to give a fine dispersion that flushes via an 8Fr NG tube without blockage.[7]

Site of absorption (oral administration)

Donepezil is absorbed in the small intestine.[6] Peak plasma concentration occurs 3–4 hours following oral dosing.[8]

Alternative routes available

None available.

Interactions

The absorption of donepezil is unaffected by food.[8]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the oral suspension.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to the jejunal administration of donepezil. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Donepezil Tablets (Sandoz), Summary of Product Characteristics; April 2014.
3. Rosemont. Donepezil Oral Suspension-141, www.rosemontpharma.com/products/central-nervous-system/donepezil-oral-suspension-141 (accessed 26 June 2014).
4. Rosemont. Donepezil Oral Suspension-127, www.rosemontpharma.com/products/central-nervous-system/donepezil-oral-suspension-127 (accessed 26 June 2014).
5. Donepezil Oral Suspension (Rosemont), Summary of Product Characteristics; January 2014.
6. Personal communication, Eisai; 15 January 2003.
7. BPNG data on file, 2005.
8. Aricept (Eisai), Summary of Product Characteristics; January 2002.

Dosulepin (Dothiepin) hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Dosulepin (Genetics (UK), Genesis, Teva, Waymade)	Capsule 25 mg	Dosulepin (as hydrochloride) No specific data on enteral tube administration are available for this preparation. Contains lactose.[2,3]
Dosulepin (Genesis, Teva, Waymade)	Tablet 75 mg	Dosulepin (as hydrochloride). Coated tablets. No specific data on enteral tube administration are available for this preparation.

Formulations available[1] (*continued*)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Dosulepin (Rosemont)	Oral solution 25 mg/5 mL, 75 mg/5 mL	Available as manufactur's 'special'. Slightly thicker than water.[4] Contains sorbitol 1.14 g/5 mL[5] The 25 mg/5 mL solution contains ethanol 0.2 mg/5 mL.[4]
Prothiaden (Teofarma)	Capsule 25 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[6]
Prothiaden (Teofarma)	Tablet 75 mg	Dosulepin (as hydrochloride). Sugar coated.[7] No specific data on enteral tube administration are available for this preparation.
Thaden (Co-Pharma)	Capsule 25 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[8]
Thaden (Co-Pharma)	Tablet 75 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Dosulepin is readily absorbed from the GI tract; t_{max} is 2.18 hours.[2,8]

Alternative routes available

None available.

Interactions

No specific interactions with food are documented.[6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider changing to an alternative tricyclic antidepressant available in liquid formulation such as amitriptyline (see monograph). Alternatively, use the manufactured 'special' liquid preparation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication liquid into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to the jejunal administration of dosulepin. Administer using the above method, or alternatively disperse the capsule contents in water.

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Open the capsule and pour the contents into a medicine pot.
4. Add 30 mL of water.
5. Stir to disperse the powder.
6. Draw into the syringe and administer via the feeding tube.
7. Add a further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
8. Draw up this dispersion and flush down the tube. This will ensure that the whole dose is given.
9. Flush the tube with recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

References

1. *BNF* 67, March 2014.
2. Dosulepin Capsules (Teva), Summary of Product Characteristics; November 2013.
3. Dosulepin Capsules (Generics UK), Summary of Product Characteristics; May 2010.
4. Rosemont. Dosulepin Hydrochloride Oral Solution-53, www.rosemontpharm.com/products/central-nervous-system/dosulepin-hydrochloride-oral-solution-53 (accessed 26 June 2014).
5. Personal communication, Rosemont Pharma; 20 January 2005.
6. Prothiaden Capsules (Teofarma), Summary of Product Characteristics; July 2010.
7. Prothiaden Tablets (Teofarma), Summary of Product Characteristics; July 2010.
8. Thaden Capsules (Co-Pharma), Summary of Product Characteristics; March 2012.

Doxazosin mesilate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Doxazosin (Aurobindo, Dexcel, Discovery, Genus, Mylan, Teva)	Tablet 1 mg, 2 mg, 4 mg	Doxazosin (as mesilate). Tablets disperse within 2 minutes in 10 mL of water to give a coarse dispersion; this flushes via an 8Fr NG tube without blockage.[2] Contains lactose.[3–5]
Doxazosin MR (Arrow, Actavis, Discovery, Teva, Zentiva)	Tablet 4 mg	Modified-release tablets; do not crush. Not suitable for administration via enteral feeding tubes.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Doxazosin (Rosemont)	Oral solution 1 mg/5 mL, 4 mg/5 mL	Manufacturer's 'special'. Slightly thicker than water.[6]
Cardura (Pfizer)	Tablet 1 mg, 2 mg	Tablets can be crushed and mixed with water immediately prior to administration.[7] The water must not contain excessive chloride ions as this may cause the drug to precipitate out.[7]
Cardura XL (Pfizer)	Tablet 4 mg, 8 mg	Modified-release tablets; do not crush. Not suitable for administration via enteral feeding tubes. Bioavailability compared to conventional tablets is 54% for 4 mg and 59% for 8 mg;[8] therefore, when converting to conventional tablets it is advisable to halve the dose and titrate upwards according to response.

Site of absorption (oral administration)

Specific site of absorption is unknown.[7] Peak plasma level achieved 2–4 hours after oral administration.[3,4]

Alternative routes available

No alternative route is available.

Interactions

No reported interaction with food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- Use the manufacturer's 'special' oral solution.
- A prolonged break in feeding is not required.

Intragastric administration

Administration of the tablets

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).

7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Administration of the oral solution

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. Do not measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no documented reports of jejunal administration of doxazosin. Administer using the above method. Titrate dose to effect.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Doxazosin Tablets (Discovery), Summary of Product Characteristics; May 2010.
4. Doxazosin Tablets (Aurobindo), Summary of Product Characteristics; May 2011.
5. Doxazocin Tablets (Teva), Summary of Product Characteristics; March 2013.
6. Rosemont. Doxazosin Oral Solution-85, www.rosemontpharma.com/products/cardiovascular-system/doxazosin-oral-solution-85. (accessed 26 June 2014).
7. Personal communication, Pfizer; 23 June 2003.
8. Cardura XL (Pfizer), Summary of Product Characteristics; June 2012.

Doxepin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Sinepin (Marlborough, previously Pfizer)	Capsule 25 mg, 50 mg	Doxepin (as hydrochloride). Capsules may be opened and the contents mixed with water.[2] Contains lactose.[3]

Site of absorption (oral administration)

Doxepin is well absorbed from the GI tract, but the specific site of absorption is not known.[2,3]

Alternative routes available

None available for doxepin.

Interactions

There is no reported interaction with food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Open the capsules and disperse the contents in water immediately prior to administration.
- Consider changing to an alternative tricyclic antidepressant available as a liquid preparation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Open the capsule and pour the contents into a medicine pot.
4. Add 15 mL of water.
5. Stir to disperse the powder.
6. Draw into the syringe and administer via the feeding tube.
7. Add a further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
8. Draw up this dispersion and flush down the tube. This will ensure that the whole dose is given.
9. Flush the tube with recommended volume of water.
10. Re-start the feed, unless prolonged break required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of doxepin. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Pfizer; 23 June 2003.
3. Sinepin (Marlborough), Summary of Product Characteristics; January 2014.

Doxycycline

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Doxycycline (Actavis, Kent, Teva)	Capsule 50 mg, 100 mg	Do not open capsules as the contents are irritant.[2]
Vibramycin-D (Pfizer)	Dispersible tablet 100 mg	Tablet disintegrates within 1 minute when placed in 10 mL of water; disintegrates further when drawn into the syringe. Produces some visible particles but does not block an 8Fr NG tube.[3]
Efracea (Galderma)	M/R tablet 40 mg	Modified release; do not crush. Not suitable for administration via enteral feeding tubes.[4]
Periostat (Alliance)	Tablet 20 mg	Film-coated tablet. Not suitable for administration via enteral feeding tubes.[5]

Site of absorption (oral administration)

Doxycycline is rapidly absorbed following oral absorption and is not noticeably influenced by food or milk.[6,7] It is suggested that peak absorption occurs in the duodenum; peak serum levels occur after 2 hours.[6,7]

Alternative routes available

None available for doxycycline.

Interactions

Unlike with other tetracyclines, doxycycline absorption is not influenced by simultaneous ingestion of food or milk;[6,7] however, absorption may be reduced by antacids containing high concentrations of aluminium, calcium or magnesium.[7]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use dispersible tablets. Disperse in 10 mL of water immediately prior to administration.
- A prolonged break in feeding does not appear to be necessary; however, it is possible that there may be a reduction in absorption and, therefore, the dose should be administered during a break in feeding if practical. Alternatively, the higher end of the dose range should be used.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Administer during a break in the feeding regimen if possible.
4. Place the tablet in the barrel of an appropriate size and type of syringe.
5. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
6. Flush the medication dose down the feeding tube.
7. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

As peak absorption may occur in the duodenum, it is possible that bioavailability may be reduced by jejunal administration. Consider using alternative antibiotic or monitor for loss of efficacy. Administer as above.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma (now Actavis); 21 January 2003.
3. BPNG data on file, 2004.
4. Efracea 40 mg Modified Release Hard Capsules (Galderma), Summary of Product Characteristics; February 2014.
5. Periostat 20 mg Film-coated Tablets (Alliance), Summary of Product Characteristics; February 2014.
6. Personal communication, Pfizer; 23 June 2003.
7. Vibramycin-D (Pfizer), Summary of Product Characteristics; December 2008.

Duloxetine hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Cymbalta (Lilly)	Capsule 30 mg, 60 mg	Gastro-resistant hard gelatin capsules containing gastro-resistant microgranules.[2] Micro-granules are approximately 1 mm diameter. The micro-granules pour easily from the capsules; when mixed with water, the micro-granules clump together and the coating partly dissolves to form a milky granular suspension which foams if shaken or when drawn into a syringe. There is a high risk of tube blockage with fine bore tubes.[3] Duloxetine is acid labile;[4] mixing with water dissolves the gastro-resistant coating and subsequent administration via a gastric tube would result in reduced bioavailability. There are no pharmacokinetic data on the bioavailability of non-gastro-resistant drug delivery into the stomach in humans. Contains sucrose.[2]
Yentreve (Lilly)	Capsule 20 mg, 40 mg	Gastro-resistant hard gelatin capsules containing gastro-resistant microgranules.[5] See above. Contains sucrose.[5]

Site of absorption (oral administration)

Specific site of absorption is not documented. Due to gastro-resistant coating, duloxetine will not be released until the micro-granules dissolve in the distal duodenum when the pH exceeds 5.5.

Alternative routes available

No alternative route available for duloxetine.

Interactions

Food delays peak levels by several hours and decreases absorption by 11%, however this is not considered clinically releavent.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Seek specialist advice regarding alternative therapy.
- Not suitable for administration via enteral feeding tubes.

References

1. *BNF* 67, March 2014.
2. Cymbalta (Lilly), Summary of Product Characteristics; March 2014.
3. BPNG data on file, 2011.
4. Committee for Medicinal Products for Human Use. *Review.* London: European Medicines Agency, 2005, http://www.ema.europa.eu/docs/en_GB/document_library/EPAR_-_Scientific_Discussion/human/000572/WC500036776.pdf (accessed 8 September 2011).
5. Yentreve (Lilly), Summary of Product Characteristics; October 2013.

Efavirenz

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Sustiva Hard Capsules (BMS)	Capsule[2] 50 mg 100 mg 200 mg	The contents of three 200 mg capsules can be mixed with at least 5 mL of medium chain triglyceride oil or 15 mL of any aqueous vehicle. Polyethylene glycol should not be used as a vehicle because it affects the bioavailability of Sustiva.[3] *Effect of food:* The bioavailability of a single 600 mg dose of efavirenz in uninfected volunteers was increased 22% and 17%, respectively, when given with a meal of high fat or normal composition, relative to the bioavailability of a 600 mg dose given under fasted conditions.[2] *200 mg capsules:* Contents empty easily from capsule, mix with water and flush via an 8Fr NG tube without blockage.[4] Capsules contain lactose.[2]
Sustiva Tablets (BMS)	Film-coated tablet[1] 600 mg	*Effect of food:* The AUC and C_{max} of a single 600 mg dose of efavirenz film-coated tablets in uninfected volunteers was increased by 28% and 79%, respectively, when given with a high-fat meal, relative to fasted conditions.[5] Each tablet contains 249.6 mg lactose monohydrate.[5]
Sustiva Oral Solution (BMS)	Solution 30 mg/ mL[1]	Excipients include medium-chain triglycerides and benzoic acid.[4] The C_{max} and AUC of a 240 mg dose of Sustiva oral solution were 78% and 97%, respectively, of the values measured when Sustiva was given as a 200 mg hard capsule.[6] *Effect of food:* The AUC and C_{max} of a single 240 mg dose of oral solution in uninfected adult volunteers were increased by 30% and 43%, respectively, when given with a high-fat meal compared to fasted conditions.[6] Clear liquid, flushes easily via NG tube. Non-aqueous; does not mix with water.[4]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 3–5 hours following oral dose.[2]

Alternative routes available

None.

Interactions

- Food: see notes above on individual formulations.
- Grapefruit juice: plasma concentration of efavirenz are possibly increased by grapefruit juice.[1]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Liquid formulation is preferable in terms of ease of manipulation and cost; however, a difference in bioavailability should be noted.
- Because of differences in bioavailability, formulations are not interchangeable.
- No break in feeding is necessary, as bioavailability is increased when given with food.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There is no specific information relating to jejunal administration of efavirenz. Administer using the above method. Monitor for adverse effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Sustiva Hard Capsules (BMS), Summary of Product Characteristics; May 2013.
3. Personal communication, Medical Information Department, Bristol-Myers Squibb; 24 January 2003.
4. BPNG data on file, 2005.
5. Sustiva Tablets (BMS), Summary of Product Characteristics; May 2013.
6. Sustiva Oral Solution (BMS), Summary of Product Characteristics; May 2013.

Eletriptan

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Relpax (Pfizer)	Tablet 20 mg, 40 mg	Eletriptan (as hydrobromide). Film-coated tablets. No specific data on enteral tube administration are available for this preparation. Readily soluble in water.

Site of absorption (oral administration)

Eletriptan is well and rapidly absorbed across the GI tract. Peak plasma concentrations occur 1.5 hours following oral administration.[2]

Alternative routes available

None for eletriptan, but subcutaneous and intranasal routes are available for sumatriptan and intranasal for zolmitriptan (see individual monographs).

Interactions

No documented interaction with food and eletriptan can be taken with or without food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Change to sumatriptan or zolmitriptan via an alternative route depending on the severity of the migraine attack and the patient's ability to administer.

References

1. *BNF* 67, March 2014.
2. Relpax (Pfizer), Summary of Product Characteristics; May 2014.

Enalapril maleate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Enalapril (Actavis)	Tablet 2.5 mg, 5 mg, 10 mg, 20 mg	Tablets can be crushed/suspended and administered via PEG/NG tube.[2]
Enalapril (Dexcel)	Tablet 2.5 mg, 5 mg, 10 mg, 20 mg	Tablets disperse in 10 mL of water within 5 minutes if agitated; lower strengths disperse more rapidly than higher strengths. The fine suspension flushes easily down an 8Fr NG tube.[3]
Enalapril (Accord, Aurobindo, IPG Pharma, Kent, Lexon, Mylan, Teva, Zentiva)	Tablet 2.5 mg, 5 mg, 10 mg, 20 mg	Aurobindo 10 mg tablets disperse in water within 5 minutes to give fine dispersion that flushes easily via an 8Fr NG tube.[4]
Innovace (MSD)	Tablet 2.5 mg, 5 mg, 10 mg, 20 mg	Once-daily dosing in hypertension and heart failure.[1] Enalapril maleate is sparingly soluble in water.[5] No specific data on enteral tube administration are available for this preparation. Contains lactose.[5]
Enalapril Maleate (Rosemont)	Oral solution 5 mg/5 mL	Special. Slightly thicker than water.[6] No specific data on enteral tube administration are available for this preparation.
Enalapril (extemporaneous suspension)	Suspension 1 mg/mL	*Extemporaneous enalapril suspension 1 mg/mL:* Enalapril 5 mg tablet: 20 tablets Cherry syrup to 100 mL Store at room temperature or refrigerate. Expiry 60 days.[7]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs within 1 hour of oral dosing.[5]

Alternative routes available

None available for any of the ACE inhibitors.

Interactions

Absorption of enalapril is not affected by food.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Tablets can be dispersed in water immediately before administration.
- A prolonged break in feeding is not necessary.
- If a liquid preparation is preferred, therapy can be changed to lisinopril (see monograph).

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration of enalapril. Administer using the above method. Monitor for increased side-effects or loss of efficacy and titrate dose accordingly.

References

1. *BNF* 67, March 2014.
2. Personal communication, Medical Information, Alpharma (now Actavis); 21 January 2003.
3. BPNG data on file, 2004.
4. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
5. Innovace Tablets (MSD), Summary of Product Characteristics; November 2013.
6. Rosemont. Enalapril Maleate Oral Suspension-50, http://www.rosemontpharma.com/products/cardiovascular-system/enalapril-maleate-oral-solution-113 (accessed 23 March 2014).
7. Nahata M, Morosco R, Hipple T. Stability of enalapril maleate in three extemporaneously prepared oral liquids. *Am J Health Syst Pharm* 1998; 55: 1155–1157.

Entacapone

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Entacapone (Lexon, Mylan, Wockhardt)	Tablet 200 mg	Film-coated tablets.[2] No specific data on enteral tube administration are available for this preparation.
Comtess (Orion)	Tablet 200 mg	Film-coated tablets. Tablets disintegrate when shaken in 10 mL of water for 5 minutes, to give a bright orange, cloudy dispersion that flushes via an 8Fr NG tube without blockage.[3] The dispersion will stain and therefore crushing tablets to a dry powder should be avoided.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1 hour following oral dosing.[4] There are large intra- and interindividual variations in the absorption of entacapone.

Alternative routes available

None available.

Interactions

Food does not significantly affect the bioavailability of entacapone. Can be taken with or without food, but should be administered at the same time as the levodopa/dopa-decarboxylase dose.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to dosing.
- Administer during or immediately after feed.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate tipped syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking as required.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data on jejunal administration of entacapone. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Entacapone Tablets (Wockhardt), Summary of Product Characteristics; February 2013.
3. BPNG data on file, 2005.
4. Comptess (Orion), Summary of Product Characteristics; August 2013.

Eprosartan

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Teveten (Abbott, previously Solvay)	Tablet 300 mg, 400 mg, 600 mg	Eprosartan (as mesilate). Film-coated tablets. Solvay has no information on the effect on absorption and bioavailability of crushing Teveten tablets.[2] The tablets do not disperse readily in water, but will crush and mix with water and flush via a fine-bore tube without blockage.[3] Contains lactose.[4]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–2 hours post dose in the fasted state.[4]

Alternative routes available

No other routes of administration are available for any of the angiotensin II receptor antagonists.

Interactions

There is conflicting evidence on the effect of food on the absorption of eprosartan. One reference states that absorption is reduced and delayed by food;[5] another states that the bioavailability is increased by food.[6] Neither of these references considers it likely to have clinical consequences. It is recommended that the dose be taken before food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to lack of data, consider changing to irbesartan (see monograph).
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly ensuring that there are no visible lumps of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure that the total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless prolonged break required.

Intrajejunal administration

There are no specific data on intrajejunal administration of eprosartan. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Solvay Healthcare; 19 February 2003.
3. BPNG data on file, 2005.
4. Teveten (Abbott), Summary of Product Characteristics; February 2014.
5. Tenero D. Pharmacokinetics of intravenously and orally administered eprosartan in healthy males: absolute bioavailability and effect of food. *Biopharm Drug Dispos* 1998; 19: 351–356.
6. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Ergocalciferol

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Ergocalciferol (non-proprietary)	Tablet 250 micrograms (10 000 units), 1.25 mg (50 000 units)	No specific data on enteral tube administration are available for this preparation.
Ergocalciferol (Rosemont)	Oral solution 3000 units/mL	Manufacturer's 'special'. No specific data on enteral tube administration are available for this preparation.
Ergocalciferol (Martindale)	Oral solution 3000 units/mL, 6000 units/mL, 10 000 units/mL	Manufacturer's 'special'. No specific data on enteral tube administration are available for this preparation.
Ergocalciferol (non-proprietary)	Injection 7.5 mg (300 000 units/mL)	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

No information available.

Alternative routes available

Ergocalciferol can be administered by intramuscular injection.

Interactions

No known interactions.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Convert dose to cholecalciferol (see individual monograph).

References

1. *BNF* 67, March 2014.

Erythromycin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Erythromycin (Kent, Mayne, Tillomed)	Capsule 250 mg	Contains enteric-coated granules. Capsules are not suitable for opening.
Erythromycin (Aurobindo, Genesis, Sovereign, Teva)	Tablet 250 mg	Enteric-coated tablets. Should not be crushed Not suitable for enteral tube administration.
Erythromycin (Mylan, Pinewood, Teva)	Suspension 125 mg/5 mL, 250 mg/5 mL, 500 mg/5 mL	Erythromycin (as ethyl succinate). Mylan and Teva products are sugar-free. Pinewood make both sugar-free and sugar-containing products. The sugar-free version contains sorbitol.[2]
Erythromycin (Amdipharm)	Injection 1 g	Erythromycin (as lactobionate). No specific data on enteral tube administration are available for this preparation.
Erymax (Cephlon, previously Elan)	Capsule 250 mg	Capsules contain enteric-coated granules. Should not be crushed – not suitable for enteral tube administration.[3]
Erythrocin (Amdipharm)	Tablet 250 mg	Erythrocin (as stearate). Film coated. No specific data on enteral tube administration are available for this preparation.
Erythroped (Amdipharm)	Suspension 125 mg/5 mL, 250 mg/5 mL, 500 mg/5 mL	Erythromycin (as ethyl succinate) granules for suspension. Doses may be administered 2, 3 or 4 times a day. When reconstituted forms a creamy, viscous liquid, resistant to flushing. This mixes with an equal volume of water if shaken, which reduces resistance to flushing.[4] Contains sorbitol.[5]
Erythroped A (Amdipharm)	Tablet 500 mg	Film coated. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Erythromycin ethyl succinate is less susceptible to the adverse effect of gastric acid. It is absorbed from the small intestine.[4] Peak plasma concentration occurs within 1 hour of dosing using the erythromycin ethyl succinate suspension.[4]

Alternative routes available

Parenteral route is available.

Interactions

No specific interaction with food is documented.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- For serious infections, use the parenteral route. For administration via enteral feeding tubes, use the liquid preparation. Use a twice-daily dosing regimen.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data, but, as an enteric-coated preparation is available, jejunal administration is unlikely to affect bioavailability. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Erythromycin SF Suspension (Pinewood), Summary of Product Characteristics; June 2012.
3. Personal communication, Elan; 16 January 2003.
4. Erythroped (Amdipharm), Summary of Product Characteristics; September 2013.
5. BPNG data on file, 2005.

Escitalopram

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Escitalopram (Lexon, Zentiva)	Tablet 5 mg, 10 mg, 15 mg, 20 mg	Film-coated tablets.[2] No specific data on enteral tube administration are available for this preparation.
Cipralex (Lundbeck)	Tablet 5 mg, 10 mg, 20 mg	Escitalopram (as oxalate). Film-coated tablets.[3] No specific data on enteral tube administration are available for this preparation.
Cipralex (Lundbeck)	Oral drops 20 mg/mL (1 mg/drop)	Escitalopram (as oxalate). Sugar free. Can be mixed with water, orange/apple juice. No specific data on enteral tube administration are available for this preparation. Each drop contains 4.7 mg ethanol.[4]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 4 hours following oral dosing.[2,3]

Alternative routes available

Not applicable.

Interactions

Absorption is unaffected by food.[2,3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the oral drops.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Add 1 drop of the oral solution for every 1 mg of the tablets to 10 mL of water in a suitable container.
4. Draw the medication solution into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.

6. Rinse the container with a further 10 mL of water and flush this down the feeding tube to ensure the total dose is administered.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of citalopram. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Escitalopram Tablets (Zentiva), Summary of Product Characteristics; May 2014.
3. Cipralex (Lundbeck), Summary of Product Characteristics; September 2013.
4. Cipralex Oral Drops (Lundbeck), Summary of Product Characteristics; September 2013.

Esomeprazole

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Esomeprazole (Actavis, Consilient, Mylan)	Capsule 20 mg, 40 mg	Esomeprazole (as magnesium dihydrate). Capsules contain enteric-coated granules. No specific data on enteral tube administration are available for this preparation.
Esomeprazole (Actavis, Torrent)	Tablet 20 mg, 40 mg	Esomeprazole (as magnesium dihydrate). Enteric-coated tablets. No specific data on enteral tube administration are available for this preparation.
Nexium (AstraZeneca)	Tablet 20 mg, 40 mg	Esomeprazole (as magnesium trihydrate). Gastroresistant tablet.[2] The preparation is a film-coated tablet containing a compressed core of enteric-coated microgranules. Nexium is licensed for administration via a gastric tube.[2] 20 mg tablets contain 28 mg sucrose and 40 mg tablets contain 30 mg sucrose.[2]
Nexium (AstraZeneca)	10 mg sachet for oral suspension	Esomeprazole (as magnesium trihydrate). Each sachet contains gastroresistant granules which must not be crushed. It is licensed for administration via a gastric tube of 6FG or greater.[3] One sachet contains 6.8 mg sucrose and 2.8 g glucose.
Esomeprazole (Sun Pharmaceuticals)	Injection 40 mg	Esomeprazole (as sodium salt). No specific data on enteral tube administration are available for this preparation.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Nexium (AstraZeneca)	Injection 40 mg	Esomeprazole (as sodium salt). No specific data on enteral tube administration are available for this preparation.
Vimovo (AstraZeneca)	Tablet 500 mg/20 mg	Naproxen 500 mg and esomeprazole 20 mg. Modified release tablet; do not crush. Not suitable for administration via an enteral feeding tube.[4]

Site of absorption (oral administration)

Delivery into the small bowel does not affect absorption as the formulation is enteric coated.[2] Peak plasma concentration occurs 1–2 hours following oral dosing.

Alternative routes available

Parenteral route is available and is indicated when oral intake is not appropriate.[5]

Interactions

Food intake both delays and decreases the absorption of esomeprazole, although this has no significant influence on the effect of esomeprazole on intragastric acidity.[2,6] Therefore, it is recommended that esomeprazole be taken 1 hour before food.[6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Follow instructions in SPC.
- A prolonged break in feeding is not required.
- Alternative proton pump inhibitors include lansoprazole and omeprazole (see monographs).

Intragastric administration

Administer as tablets[2] or suspension.[3]

Administration of tablets through gastric tube

1. Put the tablet into an appropriate syringe and fill the syringe with approximately 25 mL of water and approximately 5 mL of air. For some tubes, dispersion in 50 mL of water is needed to prevent the pellets from clogging the tube.
2. Immediately shake the syringe for approximately 2 minutes to disperse the tablet.
3. Hold the syringe with the tip up and check that the tip has not clogged.
4. Attach the syringe to the tube while maintaining the above position.
5. Shake the syringe and position it with the tip pointing down. Immediately inject 5–10 mL into the tube. Invert the syringe after injection and shake (the syringe must be held with the tip pointing up to avoid clogging of the tip).
6. Turn the syringe with the tip down and immediately inject another 5–10 mL into the tube. Repeat this procedure until the syringe is empty.

7. Fill the syringe with 25 mL of water and 5 mL of air and repeat step (5) if necessary to wash down any sediment left in the syringe. For some tubes, 50 mL water is needed.
8. Finally, flush with recommended volume of water.
9. Re-start feed, unless a prolonged break is required.

Tubes tested by AstraZeneca were fine-bore 10Fr and 8Fr NG tubes.[7] Non-adherence to this procedure will result in tube blockage.[8]

Administration of oral suspension via gastric tubes[3]

1. For a 10 mg dose add the contents of one sachet to 15 mL water in a measuring cup.
2. For a 20 mg dose add the contents of two sachets to 30 mL water in a measuring cup.
3. Stir.
4. Leave for a few minutes to thicken.
5. Stir again.
6. Draw the suspension into a suitable size and type of syringe.
7. Administer via the gastric tube within 30 minutes of reconstitution.
8. Draw another 15 mL water for a 10 mg dose or 30 mL water for a 20 mg dose into the syringe and a little air.
9. Shake the syringe to ensure all traces are removed and administer the contents down the gastric tube.

AstraZeneca have tested the suspension using 6Fr or above. Non-adherence to this procedure will result in tube blockage.[3]

Intrajejunal administration

Although enteric-coated microgranules are not licensed via this route, their intrajejunal administration of the enteric-coated microgranules is unlikely to affect the pharmacokinetic response to esomeprazole.

References

1. *BNF* 67, March 2014.
2. Nexium Tablets (AstraZeneca), Summary of Product Characteristics; January 2014.
3. Nexium Sachets (AstraZeneca), Summary of Product Characteristics; January 2014.
4. Vimovo (AstraZeneca); Summary of Product Characteristics; November 2010.
5. Nexium Injection (AstraZeneca), Summary of Product Characteristics; January 2014.
6. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).
7. Personal communication, AstraZeneca; 18 June 2003.
8. BPNG data on file, 2004.

Ethambutol hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Ethambutol (Genus)	Tablet 100 mg, 400 mg	Film-coated tablets.[2] The tablets can be crushed and mixed with water, the coating takes a few minutes to dissolve. Tablets contain sucrose and sorbitol.[2]
Myambutol (imported by IDIS)	Injection 1000 mg	Unlicensed in UK. Imported by IDIS. No specific data on enteral tube administration are available for this preparation.
Ethambutol (extemporaneous preparation)	Suspension	A formulation for suspension is available; this formula uses ethambutol powder.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs within 4 hours of oral dosing.[4]

Alternative routes available

A parenteral formulation not licensed in the UK is available, see above.

Interactions

The absorption of ethambutol is not considered to be significantly affected by food.[4] However, it has been shown that peak plasma concentrations may be delayed and reduced by a high-fat meal or antacid therapy.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Crush tablets and mix with water.
- A prolonged break in feeding is not required.
- If gastrointestinal function is compromised, consider parenteral therapy.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly ensuring that there are no large particles of tablet or coating.

6. Draw this into an appropriate syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure that the total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to jejunal administration of ethambutol. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Ethambutol (Genus), Summary of Product Characteristics; March 2010.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
4. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
5. Peloquin CA, Bulpitt AE, Jaresko GS, *et al*. Pharmacokinetics of ethambutol under fasting conditions, with food, and with antacids. *Antimicrob Agents Chemother* 1999; 43(3): 568–572.

Ethinylestradiol

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Ethinylestradiol (UCB)	Tablet 10 micrograms, 50 micrograms, 1 mg	Tablets are uncoated and can be crushed; the manufacturer has no bioavailability data for this method of administration. Ethinylestradiol is insoluble in water.[2] Contains lactose.[3]

Site of absorption (oral administration)

Ethinylestradiol is absorbed in the gut but undergoes some first-pass metabolism in the gut wall.[3] Peak plasma concentration occurs 2–3 hours after oral dosing.

Alternative routes available

Topical patches are available for alternative estrogens for contraceptive and hormone replacement use.

Interactions

There is no documented interaction with food.

Health and safety

Use a closed system to crush or disperse tablet, e.g. a crushing syringe. Ensure that adequate precautions are taken to minimise operator exposure.

Suggestions/recommendations

- Use transdermal patches where clinically appropriate.
- A prolonged break in feeding is not required.

Intragastric administration

See notes above.

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of crushing syringe.
4. Crush the tablet and then draw 10 mL of water into the syringe.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Ethinylestradiol pharmacokinetics are unlikely to be affected by jejunal administration. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Celltech; 31 March 2003.
3. Ethinylestradiol (UCB), Summary of Product Characteristics; January 2013.

Ethosuximide

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Ethosuximide (Essential Generics)	Capsule 250 mg	No specific data are available for administration via enteral feeding tubes for this preparation.
Emeside (Chemidex)	Syrup 250 mg/5 mL	Blackcurrant syrup base.[2] Contains sucrose.[2]
Zarontin (Pfizer)	Syrup 250 mg/5 mL	Raspberry flavoured syrup and saccharin base.[3] Slightly viscous liquid; mixes easily with water to reduce resistance to flushing.[4] Contains sucrose.[4]

Site of absorption (oral administration)

No specific site of absorption documented. Peak plasma concentration occurs 1–7 hours after oral dosing.[2]

Alternative routes available

No alternative routes for ethosuximide.

Interactions

There are no documented interactions with food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation diluted with an equal quantity of water immediately prior to administration.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication liquid into an appropriate size and type of syringe.
4. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to the jejunal administration of ethosuximide. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Emeside Syrup (ChemidexPharma), Summary of Product Characteristics; January 2014.
3. Zarontin Syrup (Pfizer), Summary of Product Characteristics; October 2011.
4. BPNG data on file, 2004.

Etodolac

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Eccoxolac (Meda)	Capsule 300 mg	No specific data on enteral tube administration are available for this preparation
Etopan XL (Taro)	Tablet 600 mg	Prolonged release tablets; do not crush.[2] Not suitable for administration via enteral feeding tubes.
Lodine SR (Almirall)	M/R tablet 600 mg	Modified-release tablets; do not crush.[3] Not suitable for administration via enteral feeding tubes.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1 hour following oral dosing.[4]

Alternative routes available

None available for etodolac. Meloxicam (also COX-II-selective) is available as a suppository.

Interactions

Food reduces the rate but not the extent of absorption.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- As there are no data available for etodolac administered via enteral feeding tubes, consider changing to meloxicam suppositories or tablets or etoricoxib tablets (see monographs).

References

1. *BNF* 67, March 2014.
2. Etopan XL (Taro), Summary of Product Characteristics; October 2012.
3. Lodine SR (Almirall), Summary of Product Characteristics; March 2010.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Etoposide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Vepesid (BMS)	Capsule 50 mg, 100 mg	Oral dose is double the i.v. dose.[1] It is not appropriate to open capsules; the soft gelatin capsule contains liquid.[2]
Etopophos (BMS)	Injection 100 mg	Powder for reconstitution. No specific data on enteral tube administration are available for this preparation.
Etoposide (Medac GmbH, Teva)	Infusion concentrate 20 mg/mL	No specific data on enteral tube administration are available for this preparation.
Vepesid (BMS)	Injection 20 mg/mL (5 mL)	No specific data on enteral tube administration are available for this preparation.
Extemporaneous preparation	Solution 10 mg/mL	*Extemporaneous etoposide solution 10 mg/mL:* Etoposide 20 mg/mL injection: 60 mL Sodium chloride 0.9% injection to 120 mL Stability data support 22-day expiry at room temperature;[3] however, as this solution does not contain a preservative, a shelf-life of 7 days may be considered more appropriate. This solution should be prepared in a suitable containment facility. The solution should not be refrigerated as this may lead to precipitation. It should be stored in a glass bottle.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 2 hours after oral dosing. Absorption is incomplete (50%) and variable (25–80%).[4]

Alternative routes available

Parenteral route is available.

Interactions

No specific interaction with food is documented.[4]

Health and safety

Etoposide is cytotoxic. Protective clothing should be worn. Etoposide should not be handled by pregnant women. Administration equipment, e.g. syringes, should be disposed of as cytotoxic waste.

Suggestions/recommendations

- Use an extemporaneously prepared solution preparation. This should be prepared in appropriate facilities.
- A prolonged break in feeding is not required.
- As it is cytotoxic a closed system should be used for administration.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water. Dispose of syringe as cytotoxic waste.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of etoposide. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Bristol-Myers Squibb; 24 January 2003.
3. McLeod HL, Relling MV. Stability of etoposide solution for oral use. *Am J Hosp Pharm* 1992; 49: 2784–2785.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Etoricoxib

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Arcoxia (MSD)	Tablet 30 mg, 60 mg, 90 mg, 120 mg	Film-coated tablets. When placed in 10 mL of water, tablets swell rapidly then disintegrate to give fine granules that settle quickly but disperse easily and flush down an 8Fr NG tube without blockage.[2] Contains lactose: 1.3 mg in 30 mg tablet 2.7 mg in 60 mg tablet 4 mg in 90 mg tablet 5.3 mg in 120 mg tablet.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1 hour after oral dosing in fasted adults.[3]

Alternative routes available

Meloxicam (COX-II-selective) is available as suppositories. Rectal, topical and parenteral routes are available for other NSAIDs.

Interactions

Administration with food delays but does not reduce absorption; this effect is not clinically important.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into the syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of etoricoxib. Administer as above and monitor for lack of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Arcoxia (MSD), Summary of Product Characteristics; July 2013.

Ezetimibe

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Ezetrol (MSD)	Tablet 10 mg	Ezetimibe is insoluble in aqueous media, but tablets disperse in 10 mL of water within 5 minutes if shaken. The fine white dispersion flushes via an 8Fr NG tube without blockage.[2] Each tablet contains 55 mg lactose.[3]
Inegy (MSD)	Tablet 10 mg/20 mg, 10 mg/40 mg, 10 mg/80 mg	Ezetimibe and simvastatin 10 mg/20 mg, 10 mg/40 mg, 10 mg/80 mg, respectively. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Ezetimibe is rapidly absorbed, with the peak plasma concentration of the active metabolite occurring 1–2 hours following oral dosing.[3]

Alternative routes available

No alternative route available.

Interactions

Food does not affect the bioavailability of ezetimibe.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific reports relating to the jejunal administration of ezetimibe. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Ezetrol (MSD), Summary of Product Characteristics; September 2013.

Famciclovir

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Famciclovir (Actavis, Arrow, Mylan, Teva, Winthrop)	Tablet 125 mg, 250 mg, 500 mg, 750 mg	Film-coated tablets. No specific data on enteral tube administration are available for this preparation. Does not contain lactose.[2–5]
Famvir (Novartis)	Tablet 125 mg, 250 mg, 500 mg	Film-coated tablets. The tablets do not disperse readily in water even if agitated for 5 minutes. The tablets are very hard and difficult to crush owing to their unusual shape. They can be crushed with persistence and will suspend in water, although the granules settle quickly. The dispersion will flush through an 8Fr NG tube without blockage.[6] Contains lactose.[7]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration of the active metabolite of famciclovir (penciclovir) occurs within 45 minutes of oral dosing.[7,8]

Alternative routes available

None.

Interactions

Food does not have a significant effect on the bioavailability of famciclovir.[7,8]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider using aciclovir (see monograph). Alternatively crush tablets and disperse in water immediately prior to administration.
- If continuation with famciclovir is considered essential, crush tablets and disperse in water immediately prior to administration. This may result in a potential reduction in dose delivered.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly ensuring that there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure that the total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of famciclovir. Administer using the above method. Monitor for increased incidence of adverse effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Famciclovir (Actavis), Summary of Product Characteristics; September 2011.
3. Famciclovir (Winthrop), Summary of Product Characteristics; September 2009.
4. Famciclovir (Arrow), Summary of Product Characteristics; July 2011.
5. Famciclovir (Teva), Summary of Product Characteristics; June 2012.
6. BPNG data on file, 2004.
7. Famvir (Novartis), Summary of Product Characteristics; October 2013.
8. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Famotidine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Famotidine (Teva)	Tablet 20 mg, 40 mg	Film-coated tablets. No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 1–3.5 hours after dosing.[2]

Alternative routes available

None available for famotidine. Ranitidine and cimetidine as injection.

Interactions

Bioavailability is unaffected by food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- As no liquid preparation is available for famotidine, change therapy to ranitidine. Famotidine 40 mg is equivalent to 300 mg ranitidine (see monograph).

References

1. *BNF* 67, March 2014.
2. Famotidine (Teva), Summary of Product Characteristics; September 2010.

Felodipine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Cardioplen XL (Chiesi)	M/R tablet 2.5 mg, 5 mg, 10 mg	Prolonged-release tablets. Tablets must not be chewed or crushed, therefore not suitable for administration via an enteral feeding tube.
Felotens XL (Genus)	M/R tablet 2.5 mg, 5 mg, 10 mg	Prolonged-release tablets. Tablets must not be chewed or crushed, therefore not suitable for administration via an enteral feeding tube.
Pamid XL (Sandoz)	M/R tablet 2.5 mg, 5 mg, 10 mg	Prolonged-release tablets. Tablets must not be chewed or crushed, therefore not suitable for administration via an enteral feeding tube.
Plendil (AstraZeneca)	M/R tablet 2.5 mg, 5 mg, 10 mg	Film-coated, extended-release tablets. Tablets must not be chewed or crushed, therefore not suitable for administration via an enteral feeding tube.[2]
Vascalpha (Actavis)	M/R tablet 5 mg, 10 mg	Prolonged-release tablets. Tablets must not be chewed or crushed, therefore not suitable for administration via an enteral feeding tube.

Site of absorption (oral administration)

Specific site of absorption is not documented.

Alternative routes available

None for felodipine.

Interactions

No documented interaction with food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Felodipine tablets are modified release and therefore unsuitable. Change to amlodipine (see monograph) and titrate dose to response.

References

1. *BNF* 67, March 2014.
2. Plendil 2.5 mg (AstraZeneca), Summary of Product Characteristics; July 2013.

Fentanyl

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Abstral (Pro-straken)	SL tablet 100 micrograms, 200 micrograms, 300 micrograms, 400 micrograms, 600 micrograms, 800 micrograms	Sublingual tablet placed under tongue at deepest part, not swallowed or chewed. Absorption occurs over 30 minutes; if mouth is dry, patient should moisten buccal mucosa with water before placing tablet.[2] Specific pharmacokinetic data not available; ratio of sublingual to intestinal absorption not known. Contains mannitol.
Effentora (Teva)	Buccal tablet 100 micrograms, 200 micrograms, 400 micrograms, 600 micrograms, 800 micrograms	These tablets are placed in the buccal cavity and allowed to disperse. As only 50% of the dose is absorbed transmucosally and the other 50% following swallowing and gastrointestinal absorption, these may not be an alternative preparation for patients with enteral feeding tubes.[3]
Actiq (Teva)	Buccal lozenge 200 micrograms, 400 micrograms, 600 micrograms, 800 micrograms, 1.2 mg, 1.6 mg	Oromucosal administration, with only 25% absorption via oralmucosal route and 75% from gastrointestinal tract; therefore, this should be considered when dosing breakthrough pain in patients with enteral feeding tubes.[4] Contains fructose.
Breakyl (Meda)	Buccal film 200 micrograms, 400 micrograms, 600 micrograms, 800 micrograms, 1.2 mg	Buccal administration, with 51% absorption via the oral mucosal route and 49% from the GI tract; therefore, this should be considered when dosing breakthrough pain in patients with enteral feeding tubes.[5]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Durogesic DTrans (Janssen)	Patch 12 micrograms/h for 72 hours, 25 micrograms/h for 72 hours, 50 micrograms/h for 72 hours, 75 micrograms/h for 72 hours, 100 micrograms/h for 72 hours	Suitable alternative route for patients with enteral feeding tubes requiring maintenance analgesia; relies on transdermal absorption.[6] See below for morphine equivalence.
Fentanyl (non-proprietary)	Patch 12 micrograms/h for 72 hours, 25 micrograms/h for 72 hours, 50 micrograms/h for 72 hours, 75 micrograms/h for 72 hours, 100 micrograms/h for 72 hours	Suitable alternative route for patients with enteral feeding tubes requiring maintenance analgesia; relies on transdermal absorption. See below for morphine equivalence. Brands include Fencino, Fentalis, Matrifen, Mezolar, Mylafent, Osmanil, Tilofyl, Victanyl.
Instanyl (Nycomed)	Nasal spray 50 micrograms/dose, 100 micrograms/dose, 200 micrograms/dose	Suitable alternative route for patients with enteral feeding tubes requiring analgesia for breakthrough pain. Considered suitable for patients on maintenance therapy of more than 25 micrograms/h transdermal fentanyl or 60 mg/day oral morphine.[7]
PecFent (Archimedes)	Nasal spray 100 micrograms/dose, 400 micrograms/dose	Suitable alternative route for patients with enteral feeding tubes requiring analgesia for breakthrough pain.

Site of absorption (oral/intranasal administration)

Rapid absorption via the transmucosal route.[2,4] Slowly absorbed from the gastrointestinal tract.[2,4] Intranasal fentanyl is rapidly absorbed from the nasal mucosa, with an initial distribution half-life of 6 minutes.[6]

Alternative routes available

Intravenous or transdermal route available for fentanyl. Alternative routes also available for other strong opiates.

Dose conversion:[1]	
Oral morphine/24 h	Transdermal fentanyl/h
45 mg	12 micrograms
90 mg	25 micrograms
180 mg	50 micrograms
270 mg	75 micrograms
360 mg	100 micrograms

Interactions

Transmucosal administration is affected if patients eat or drink while the tablet is in the buccal cavity.[2–4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

Patients requiring strong opioid analgesia equivalent to 45 mg oral morphine/day can be transferred to fentanyl 12 micrograms/h patches. Patches should be used for maintenance background analgesia and the nasal spray for break through pain in patients on more than 25 micrograms/h transdermal fentanyl.

References

1. *BNF* 67, March 2014.
2. Abstral (ProStraken), Summary of Product Characteristics; October 2012.
3. Effentora 100 microgram buccal tablets (Teva), Summary of Product Characteristics; February 2014.
4. Actiq (Teva), Summary of Product Characteristics; October 2013.
5. Breakyl (Meda), Summary of Product Characteristics; October 2013.
6. Durogesic DTrans (Janssen-Cilag), Summary of Product Characteristics; March 2014.
7. Instanyl Nasal Spray (Nycomed), Summary of Product Characteristics; September 2013.

Fesoterodine fumarate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Tovaiz (Pfizer)	Tablet 4 mg, 8 mg	Fesoterodine (as fumarate). Modified-release and film-coated tablet. Swallow whole.[2] Not suitable for administration via enteral feeding tubes.

Site of absorption (oral administration)

Specific site of absorption not documented.

Alternative routes available

None available for fesoterodine.

Interactions

No specific interaction with food documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Modified preparation not suitable for enteral tube administration.
- Consider alternative therapy available in a suitable formulation (see oxybutynin monograph).

References

1. *BNF* 67, March 2014.
2. Tovaiz (Pfizer), Summary of Product Characteristics; October 2012.

Fexofenadine hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Fexofenadine (Teva)	Tablet 120 mg, 180 mg	Film-coated tablet. No specific data on enteral tube administration are available for this preparation.
Telfast (Sanofi-Aventis)	Tablet 30 mg, 120 mg, 180 mg	Film-coated tablets. Sanofi-Aventis have no data to support crushing the tablets and have no data on enteral tube administration.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–3 hours following oral absorption.[3]

Alternative routes available

None.

Interactions

No specific interaction with food is documented. SPC recommends that the dose be taken before a meal.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to lack of data, consider changing to an alternative non-sedating antihistamine available as a liquid, such as cetirizine, desloratadine or loratadine.

References

1. *BNF* 67, March 2014.
2. Personal communication, Aventis; 2 January 2003.
3. Telfast (Sanofi-Aventis), Summary of Product Characteristics; February 2013.

Finasteride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Finasteride (Actavis, Aurobindo, Accord, Consilient, Mylan, Niche, Teva, Wockhardt)	Tablet 1 mg, 5 mg	Film coated. No specific data on enteral tube administration are available for this preparation. Most brands contain lactose.
Proscar (MSD)	Tablet 5 mg	Film coated. Tablets disperse within 5 minutes when placed in 10 mL of water. The resulting pale blue, milky dispersion draws up and flushes easily via an 8Fr NG tube.[2] Contains lactose.[3]
Propecia (MSD)	Tablet 1 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[4]

Site of absorption (oral administration)

Specific site is unknown. Peak plasma concentration occurs 2 hours following oral dosing.[3]

Alternative routes available

None available.

Interactions

Bioavailability is unaffected by food.[3]

Health and safety

Women should not handle crushed or broken tablets if they are or may be pregnant owing to the potential risk to a male fetus.[3] For this reason a 'closed system' should be used to disperse tablet (see Chapter 9).

Suggestions/recommendations

- Tablets can be dispersed in water immediately prior to administration; a closed system should be used to minimise operator exposure.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of finasteride. Administer as above. Monitor efficacy and side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Proscar (MSD), Summary of Product Characteristics; October 2013.
4. Propecia (MSD), Summary of Product Characteristics; November 2013.

Flavoxate hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Urispas 200 (Recordati)	Tablet 200 mg	Flavoxate (as hydrochloride). Film coated tablets.[2] The tablets do not disperse readily in water. The tablets are very hard to crush, but with persistence can be ground to a fine powder, which mixes well with water to form a milky dispersion that flushes via an 8Fr NG tube without blockage.[2] Contains lactose.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentrations of the active metabolite of flavoxate appear in the plasma 30–60 minutes following oral dosing.[3]

Alternative routes available

None available.

Interactions

No specific interaction with food is documented.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

Consideration should be given to changing to an alternative such as oxybutynin or tolterodine (see monographs).

- If continuation with flavoxate is essential, tablets can be crushed and mixed with water, there are no stability data to support this. There may be a reduction in the dose delivered.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure that the total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no data relating to jejunal administration of flavoxate. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Urispas 200 (Recordati), Summary of Product Characteristics; June 2010.

Flecainide acetate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Flecainide (Generics, Actavis, Aurobindo, Meda, Zentiva)	Tablet 50 mg, 100 mg	Flecainide (as acetate). Tablets can be crushed.[2] Generics brand tablets disintegrate within 2 minutes when placed in 10 mL of water to give very fine dispersion that draws up and flushes via an 8Fr NG tube without blockage.[3]
Tambocor (Meda)	Tablet 50 mg, 100 mg	Flecainide (as acetate). No specific data on enteral tube administration are available for this preparation.
Tambocor (Meda)	Injection 10 mg/mL (15 mL)	No specific data on enteral tube administration are available for this preparation.
Tambocor XL (Meda)	Capsule MR 200 mg	Hard capsule containing polymer coated microgranules. Not suitable for enteral feeding tube administration.[4]

Site of absorption (oral administration)

Flecainide is rapidly and almost completely absorbed following oral administration, although the specific site of absorption is not documented.[5]

Alternative routes available

Parenteral route is available.

Interactions

Food reduces the rate but not the extent of absorption.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse tablet in water immediately prior to administration.
- A prolonged break in feeding is not required.
- The parenteral route can be used in acute situations and when gastrointestinal absorption is compromised.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.

3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration. Administer as above. Monitor closely for loss of efficacy or increased side-effects. Plasma concentration can be measured.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma (now Actavis) Ltd; 21 January 2003.
3. BPNG data on file, 2005.
4. Tambocor XL (Meda), Summary of Product Characteristics, May 2013.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Flucloxacillin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Flucloxacillin (Actavis, Aurobindo, Kent, Mylan, Teva)	Capsule 250 mg, 500 mg	Flucloxacillin (as sodium salt). Avoid opening capsules owing to the risk of operator sensitisation.
Flucloxacillin (Actavis, Aurobindo, Kent)	Oral solution 125 mg/5 mL, 250 mg/5 mL	Flucloxacillin (as sodium salt) Kent brand is a pink non-granular liquid, slightly viscous. Flushes with little resistance. Mixes easily with water to reduce viscosity.[2]
Flucloxacillin (Actavis, Wockhardt)	Injection 250 mg, 500 mg, 1 g	Flucloxacillin (as sodium salt) Can be administered enterally.[3]
Floxapen (Actavis)	Capsule 250 mg, 500 mg, 1 g	Flucloxacillin (as sodium salt) Avoid opening capsules owing to the risk of operator sensitisation.

Site of absorption (oral administration)

Flucloxacillin is absorbed in the upper small bowel with the peak plasma concentration occurring after 1 hour.[4] Administration directly into the jejunum is not expected to reduce bioavailability.[3]

Alternative routes available

Injection available, can be given intramuscularly or intravenously.

Interactions

Oral doses should be administered half to one hour before food.[4]

Health and safety

Standard precautions apply. Avoid inhalation of the dry powder.

Suggestions/recommendations

- Flucloxacillin requires four daily doses and a break in feeding is required around the dose. This dosing regimen may be suitable for patients on bolus feeding, but may be impractical in patients on continuous feeds. Consider using an alternative antibiotic or increasing the dose used if prolonged breaks in feeding are not possible.
- Feed should be stopped 1 hour prior to dose and the tube flushed; use the liquid preparations for intragastric administration. Consider using the injection for intrajejunal administration as the osmolarity is lower,[3] or alternatively dilute the oral solution with at least an equal volume of water to reduce osmolarity.
- Restart feed half to 1 hour after the dose.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Allow at least 1 hour before administering dose.
4. Draw the medication solution into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Do not restart the feed for at least 30 minutes.

Alternatively, at step (4) measure the medicine in a suitable container and then draw into the syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Allow at least 1 hour before administering dose.
4. Draw the medication into an appropriate size and type of syringe.
5. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Do not restart the feed for at least 30 minutes.

Alternatively, at step (5) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Adams D. Administration of drugs through a jejunostomy tube. *Br J Intensive Care* 1994; 4(1): 10–17.
4. Floxapen Capsules 250 mg (Actavis), Summary of Product Characteristics; May 2010.

Fluconazole

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/ Administration information
Fluconazole (Accord, Aurobindo, Kent, Medimpex, Mylan, Pliva, Teva, Wockhardt)	Capsule 50 mg, 150 mg, 200 mg	Powder from 50 mg capsules can be mixed with water (Pliva and Medimpex tested).[2] All brands contain lactose.
Fluconazole (Pliva, Hickman Quality)	Intravenous infusion 2 mg/mL	Not suitable for enteral administration owing to large volume.
Azocan (FDA)	Capsule 50 mg, 150 mg, 200 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[3]
Canestan (Bayer)	Capsule 150 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[4]
Diflucan (Pfizer)	Capsule 50 mg, 150 mg, 200 mg	If the suspension is not available, the capsules can be opened and washed down the tube with plenty of water.[5] Powder from 150 mg capsules does not mix well with water.[2]
Diflucan (Pfizer)	Suspension 50 mg/5 mL, 200 mg/5 mL	Orange-flavoured suspension when reconstituted.[6]
Diflucan (Pfizer)	Intravenous infusion 2 mg/mL (100 mL)	Not suitable for enteral administration owing to large volume.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 1–2 hours after oral dosing indicating absorption high in the GI tract.[7]

Alternative routes available

Parenteral route is available.

Interactions

Food and gastric pH do not affect absoprtion.[7]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Fluconazole is absorbed when administered via both gastric and post-pyloric enteral feeding tubes and demonstrates similar pharmacokinetics to oral administration.[8] There is no interaction with enteral feed.[8]
- The suspension should be used and the tube flushed well with water after the dose.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Bioavailability is unaffected by jejunal administration; see notes above. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Azocan (FDA), Summary of Product Characteristics; March 2013.
4. Canestan (Bayer), Summary of Product Characteristics; February 2012.
5. Personal communication, Pfizer; 23 June 2003.

6. Diflucan 10 mg/mL and 40 mg/mL Powder for Oral Suspension (Pfizer), Summary of Product Characteristics; November 2011.
7. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
8. Nicolau DP, Crowe H, Nightingale CH, Quintiliani R. Bioavailability of fluconazole administered via a feeding tube in intensive care unit patients. *J Antimicrob Chemother* 1995; 36: 395–401.

Fludrocortisone acetate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Florinef (Squibb)	Tablet 100 micrograms	Fludrocortisone acetate is practically insoluble in water (0.04 mg/mL).[2,3] However, the usual dose of 100 micrograms will dissolve in 2.5 mL of water. Tablet disintegrates within 2 minutes when placed in 10 mL of water; the fine dispersion settles quickly but flushes via an 8Fr NG tube without blockage.[4]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 4–8 hours following oral dosing.[5]

Alternative routes available

None available for fludrocortisone. General steroid replacement can be achieved using parenteral hydrocortisone.

Interactions

No specific interaction with food is documented.

Health and safety

Mineralocorticoid steroid: avoid exposure to crushed tablets. Standard precautions should be sufficient.

Suggestions/recommendations

- Disperse tablet in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.

6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration of fludrocortisone. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Bristol-Myers Squibb; 24 January 2003.
3. Trissel LA. *Stability of Compounded Formulations,* 5th edn. Washington, DC: American Pharmacists Association; 2012.
4. BPNG data on file, 2004.
5. Florinef (Squibb), Summary of Product Characteristics; August 2013.

Fluoxetine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Fluoxetine (Accord, Actavis, Aurobindo, Mylan, Niche, Teva, Wockhardt, Zentiva)	Capsule 20 mg, 60 mg	Fluoxetine (as hydrochloride). Capsules can be opened and the contents mixed with 10 mL of water, although this requires a degree of manual dexterity owing to the small size of the capsules.[2] There are no stability data to support this method, so this should be done immediately prior to administration.
Fluoxetine (Mylan. Teva, Wockhardt)	Liquid 20 mg/5 mL	Fluoxetine (as hydrochloride). No specific data on enteral tube administration are available for this preparation.
Olena (Amdipharm)	Dispersible tablet 20 mg	Fluoxetine (as hydrochloride) Tablets should be dispersed in half a glass of water immediately prior to administration. Not to be crushed or chewed.[3] Contains sorbitol.[3]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Oxactin (Discovery)	Capsule 20 mg	Fluoxetine (as hydrochloride). No specific data on enteral tube administration are available for this preparation. Contains lactose 58 mg.[4]
Prozac (Lilly)	Capsule 20 mg	Fluoxetine (as hydrochloride). No specific data on enteral tube administration are available for this preparation.
Prozac (Lilly)	Liquid 20 mg/5 mL	Fluoxetine (as hydrochloride). Clear, colourless liquid. Contains sucrose. Does not contain sorbitol.[5]
Prozit (Pinewood)	Oral solution 20 mg/5 mL	Fluoxetine (as hydrochloride). No specific data on enteral tube administration are available for this preparation. Contains ethanol and 3 g/5 mL sucrose.[6]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 6–8 hours following oral absorption.[5]

Alternative routes available

No alternative routes for fluoxetine.

Interactions

Absorption is delayed by 3–4 hours by the presence of food.[4] Can be taken with or without food.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication liquid into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container. Draw this into the syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the

total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific reports of jejunal administration of fluoxetine. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Olena (Amdipharm), Summary of Product Characteristics; December 2013.
4. Oxactin (Discovery), Summary of Product Characteristics; July 2011.
5. Prozac (Lilly), Summary of Product Characteristics; March 2013.
6. Prozit (Pinewood), Summary of Product Characteristics; September 2012.

Flupentixol (Flupenthixol)

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Fluanxol (Lundbeck)	Tablet 500 micrograms, 1 mg	Flupentixol (as dihydrochloride). Sugar coated. No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]
Depixol (Lundbeck)	Tablet 3 mg	Flupentixol (as dihydrochloride). Sugar coated. Tablets do not disperse readily owing to the sugar coating, but disintegrate if shaken in water for 5 minutes to give a pale pink, very fine dispersion that flushes via an 8Fr NG tube without blockage.[3]
Depixol (Lundbeck)	Injection 20 mg/mL	Flupentixol (as decanoate). Depot injection. No specific data on enteral tube administration are available for this preparation.
Depixol Conc (Lundbeck)	Injection 100 mg/mL	Flupentixol (as decanoate). Depot injection. No specific data on enteral tube administration are available for this preparation.
Depixol Low Volume (Lundbeck)	Injection 200 mg/mL	Flupentixol (as decanoate). Depot injection. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Flupentixol is absorbed via the GI tract with the peak plasma concentration occurring 4 hours following oral dosing.[2,4]

Alternative routes available

Depot injection is available.

Interactions

No specific interaction with food is documented.[4,5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Flupentixol should not be stopped abruptly.[5]
- Disperse the tablets in water immediately prior to administration. A prolonged break in feeding is not required. Consider changing to an alternative therapy available in suitable formulation; alternatively, use depot injection every 2 weeks. Seek specialist advice.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration. Administer as above. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Fluanxol (Lundbeck), Summary of Product Characteristics; May 2014.
3. BPNG data on file, 2005.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
5. Depixol 3 mg Tablets (Lundbeck), Summary of Product Characteristics; May 2013.

Flutamide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Flutamide (Sovereign Medical)	Tablet 250 mg	No specific data on enteral tube administration are available for this preparation.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1 hour following oral dosing.

Alternative routes available

None available.

Interactions

There is no documented interaction with food.[3]

Health and safety

Antiandrogen. Standard precautions apply.

Suggestions/recommendations

- No liquid preparation; requires three times daily dosing. Consider alternative treatment; seek specialist advice.
- If continued therapy is indicated, disperse the tablets in water immediately before administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data on jejunal administration of flutamide. Administer as above and monitor for loss of effect or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Flutamide 250 mg Tablets (Sovereign Medical), Summary of Product Characteristics; May 2012.
3. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

Fluvastatin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Fluvastatin (Actavis, Aspire, Sandoz, Wockhardt, Zentiva)	Capsule 20 mg, 40 mg	No specific data on enteral tube administration are available for this preparation.
Lescol (Novartis)	Capsule 20 mg, 40 mg	Fluvastatin (as sodium salt). Hard gelatin capsules: 20 mg = size 3 capsules; 40 mg = size 1 capsules.[2] Both the 20 mg and 40 mg capsules can be opened. The powder pours easily from the capsule and mixes readily with 10 mL of water to form a pale yellow, milky dispersion that flushes easily down an 8Fr NG tube.[3] The 20 mg capsules are more difficult to open owing to their small size.
Fluvastatin (Accord, Actavis, Zentiva)	MR tablet 80 mg	Modified-release; do nut crush or chew. Not suitable for administration via feeding tube. Brands include Dorisin XL, Luvinsta XL, Pinmactil XL, Stefluvin XL. Not suitable for administration via enternal feeding tubes.
Lescol XL (Novartis)	MR tablet 80 mg	Fluvastatin (as sodium salt). Modified-release tablet swallow whole. Not suitable for administration via feeding tube. Absorption is 60% slower than with capsules.[4] Not suitable for administration via enternal feeding tubes.

Site of absorption (oral administration)

Specific site of absorption is not documented. Fluvastatin is absorbed rapidly and completely (98%) following oral administration in fasted patients.[2] Time to peak plasma concentration is 0.5 hours;[5] it is therefore likely that fluvastatin is absorbed in the upper small intestine.

Alternative routes available

No alternative routes of administration are available for the 'statins'.

Interactions

Both total bioavailability and peak plasma concentration are reduced and time to reach peak is delayed when fluvastatin is taken with food, although this has no significant effect on the lipid-lowering effect of fluvastatin.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider changing to a liquid preparation or a tablet that disperses readily in water.
- If it is considered appropriate to continue fluvastatin therapy, open the capsules and mix the contents with water.
- A prolonged break in feeding is not necessary.
- The dose should be given at night;[2] however, if feeding overnight the dose should be given in the morning.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Open the capsule and pour the contents into a medicine pot.
4. Add 15 mL of water.
5. Stir to disperse the powder.
6. Draw into an appropriate syringe and administer via the feeding tube.
7. Add a further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
8. Draw up this dispersion and flush down the tube. This will ensure that the whole dose is given.
9. Flush the tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to jejunal administration of fluvastatin. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Lescol (Novartis), Summary of Product Characteristics; November 2013.
3. BPNG data on file, 2004.
4. Lescol XL80 mg (Novartis), Summary of Product Characteristics; July 2012.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Fluvoxamine maleate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Fluvoxamine (Teva, Wockhardt)	Tablet 50 mg, 100 mg	Fuvoxamine (as maleate). No specific data on enteral tube administration are available for this preparation.
Faverin (Abbott, previously Solvay)	Tablet 50 mg, 100 mg	Fluzoxamine (as maleate). Film-coated tablets.[2] Faverin tablets can be crushed and mixed with water, although the manufacturers have no data to support administration via enteral feeding tubes.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Pharmacokinetic studies were performed using enteric-coated preparations, so absorption occurs in small bowel. Peak plasma concentration occurred after 4–8 hours.[4] Peak plasma concentration occurs 3–8 hours following administration of Faverin.[2]

Alternative routes available

No alternative routes for fluvoxamine.

Interactions

Bioavailability is unaffected by food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to lack of data, consider changing to an alternative SSRI antidepressant available as a liquid preparation. Seek specialist advice for the transfer regimen.

References

1. *BNF* 67, March 2014.
2. Faverin (Abbott Healthcare), Summary of Product Characteristics; April 2014.
3. Personal communication, Solvay; 19 February 2003.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Folic acid

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Folic acid (Actavis, Intrapharm, Teva, Wockhardt)	Tablet 400 micrograms, 5 mg	No specific data on enteral tube administration are available for this preparation. Actavis and Teva brands contain lactose.[2,3]
Folic acid (Wockhardt)	Syrup 2.5 mg/5 mL	Sugar-free oral solution.
Lexpec (Rosemont)	Oral solution 2.5 mg/5 mL	Slightly thicker than water.[4] Sugar and sorbitol free.[4,5]
Folic acid (BCM specials)	Injection 15 mg	Unlicensed; available as special order only. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Dietary folate is hydrolysed and absorbed in the duodenum; folic acid bound to milk proteins is absorbed in the ileum.

Alternative routes available

Injection is available (unlicensed product).

Interactions

There is no documented interaction with food affecting the absorption of folic acid.[6] Several drugs owe their pharmacological activity to their inhibition of dihydrofolate reductase, thereby causing a functional folate deficiency. Corrective therapy is dependent on the drug and desired outcome; for example, low-dose folic acid to reduce gastrointestinal side-effects of once-weekly methotrexate therapy compared with high-dose folinic acid therapy for rescue after high-dose methotrexate chemotherapy.[7]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.

4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Administer using above method.

References

1. *BNF* 67, March 2014.
2. Folic Acid Tablets (Actavis), Summary of Product Characteristics; April 2013.
3. Folic Acid Tablets (Teva), Summary of Product Characteristics; August 2011.
4. Rosemont. Folic Acid Oral Solution-8, www.rosemontpharma.com/products/nutrition-a-blood/folic-acid-oral-solution-8 (accessed 29 June 2014).
5. Lexpec (Rosemont), Summary of Product Characteristics; July 2013.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
7. White R, Ashworth A. How drug therapy can affect, threaten and compromise nutritional status. *J Hum Nutr Diet* 2000; 13: 119–129.

Fosamprenavir

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Telzir (ViiV)	Tablet 700 mg	Fosamprenavir (as calcium). Film-coated tablet. No specific data on enteral tube administration are available for this preparation.
Telzir (ViiV)	Oral suspension 50 mg/mL	Fosamprenavir (as calcium). Children should take the suspension with food Adults should take the suspension on an empty stomach. Pack contains an oral syringe not compatible with enteral tubes; ensure appropriate syringes are supplied.

Site of absorption (oral administration)

Fosamprenavir is hydrolysed to amprenavir in the gut epithelium.

Alternative routes available

None available for fosamprenavir.

Interactions

Advised to take oral suspension without food and on an empty stomach[2] because food reduces the bioavailability. Food minimally affects the bioavailability of the tablets.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use oral suspension.

Intragastric administration

1. Stop the enteral feed.
2. Allow 1–2 hours for the feed to exit the stomach.
3. Flush the enteral feeding tube with the recommended volume of water.
4. Shake the suspension for 5 seconds.
5. Draw the dose into an appropriate size and type of enteral syringe.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

No specific data on jejunal administration are available.

References

1. *BNF* 67, March 2014.
2. Telzir Oral Suspension (ViiV), Summary of Product Characteristics; April 2014.
3. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Fosinopril sodium

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Fosinopril (Aurobindo, Actavis)	Tablet 10 mg, 20 mg	Fosinopril sodium is freely soluble in water.[2] Uncoated tablet.[3] No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentrations occur within 3 hours of an oral dose.[3]

Alternative routes available

None available for fosinopril.

Interactions

Absorption of fosinopril is not affected by the presence of food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- No data are currently available; consider changing to alternative ACE inhibitors available in a suitable formulation.
- If change to alternative ACE inhibitor is not appropriate, crushing the tablets can be considered as they are uncoated and fosinopril is freely soluble in water, but there are no data to support this.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

References

1. *BNF* 67, March 2014.
2. Personal communication, Bristol-Myers Squibb; 24 January 2003.
3. Fosinopril (Actavis) Summary of Product Characteristics; September 2012.

Frovatriptan

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Migard (Menarini Farmaceutica)	Tablet 12.5 mg	Frovatriptan (as succinate monohydrate). Film-coated tablets. No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]

Site of absorption (oral administration)

Frovatriptan is well absorbed; the specific site of absorption is not known. Peak plasma concentrations occur 2-4 hours following oral administration.[2]

Alternative routes available

None for frovatriptan, but subcutaneous and intranasal routes are available for sumatriptan and intranasal for zolmitriptan (see individual monographs).

Interactions

Food has no significant effect on the bioavailability, but delays the t_{max} by 1 hour.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Change to sumatriptan/zolmitriptan via an alternative route depending on the severity of the migraine attack and the patient's ability to administer.

References

1. *BNF* 67, March 2014.
2. Frovatriptan (Menarini Farmaceutica), Summary of Product Characteristics; August 2008.

Furosemide (Frusemide)

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Furosemide (Accord, Genesis)	Tablet 20 mg, 40 mg, 500 mg	No specific data on enteral tube administration are available for this preparation.
Frusol (Rosemont)	Oral solution 20 mg/5 mL, 40 mg/5 mL, 50 mg/5 mL	Oral solution flushes down a fine-bore tube with very little resistance. Mixes easily with an equal volume of water if necessary.[2] Does not contain sorbitol.[3] Contains ethanol 0.5 mL/5 mL and maltitol 2.5 g/5 mL.[4] All strengths have a viscosity lower than standard enteral feeds.[2]
Furosemide (Pinewood)	Oral solution 20 mg/5 mL	No specific data on enteral tube administration are available for this preparation. Contains maltitol and ethanol.[5]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information Administration information**
Furosemide (Rosemont)	Oral solution 5 mg/5 mL	Manufactured 'special'. Contains ethanol 0.5 mL/5 mL, maltitol 2.5 g/5 mL; does not contain sorbitol.[4] No specific data on enteral tube administration available for this preparation.
Furosemide (IMS, Wockhardt)	Injection 10 mg/mL	No specific data on enteral tube administration are available for this preparation.
Lasix (Sanofi-Aventis)	Injection 10 mg/mL	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

The jejunum has a greater absorptive capacity for furosemide than does the ileum, and has been shown to give similar bioavailability to oral administration when given intrajejunally.[6]

Alternative routes available

Injection is available for parenteral administration.

Interactions

Food reduces the bioavailability of furosemide by 30%;[7] however, there are no specific recommendations for the timing of administration in relation to food intake. The liquid preparations and injection are alkaline (pH adjusted with sodium hydroxide).[3] There is risk of precipitation if mixed with acidic fluids, so special care should be taken to flush the tube before and after administration, especially if giving other liquid medication that may be acidic.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation. Flush the tube with water prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Furosemide is absorbed well following jejunal administration. Administer using the method above.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004 and 2012.
3. Frusol 40 mg/5 mL Oral Solution (Rosemont), Summary of Product Characteristics; July 2013.
4. Personal communication, Rosemont, 3 September 2008.
5. Furosemide Oral Solution (Pinewood), Summary of Product Characteristics; Septmber 2011.
6. Adams D. Administration of drugs through a jejunostomy tube. *Br J Intensive Care* 1994; 4(1): 10–17.
7. McCrindle JL, Li Kam Wa TC, Barron W, Prescott LF. Effect of food on the absorption of frusemide and bumetanide in man. *Br J Clin Pharmacol* 1996; 42(6): 743–746.

Gabapentin

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Gabapentin (Actavis, Arrow, Aurobindo, Lexon, Mylan, Sandoz, Teva)	Capsule 100 mg, 300 mg, 400 mg.	No specific data on enteral tube administration are available for this preparation.
Gabapentin (Accord, Aurobindo, Lexon, Teva)	Tablet 600 mg, 800 mg	Film-coated tablets. No specific data on enteral tube administration are available for this preparation.
Neurontin (Pfizer)	Capsule 100 mg, 300 mg, 400 mg	Capsules can be opened and the contents mixed with 10 mL of water; the 100 mg capsule is quite fiddly owing to its small size. The powder mixes easily with water and flushes down an 8Fr NG tube without blockage.[2]
Neurontin (Pfizer)	Tablet 600 mg, 800 mg	Film-coated tablets.[1] No specific data on enteral tube administration are available for this preparation.
Gabapentin (Lexon, Rosemont)	Oral solution 50 mg/mL	Rosemont solution is slightly thicker than water.[3] No specific data on enteral tube administration are available for this preparation. Warning: the level of propylene glycol, acesulfame potassium and saccharin sodium in the Rosemont preparation may exceed the WHO daily intake limits if high doses are given to adolescents and adults with low body weight (39–59 kg).[3]
Gabapentin (extemporaneous preparation)	Oral suspension[4] 100 mg/mL	Gabapentin suspended in either 1% methycellulose in syrup (1:1) or equal volumes of commercially available suspending agents/syrup (Ora Plus/Ora Sweet).[4] These preparations are stable for 91 days at 4°C, or 56 days at 25°C, when stored in plastic dispensing bottles.[4] No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Gabapentin is absorbed via the L-amino acid transport system in the proximal small bowel.[5] Peak plasma concentration occurs 2–3 hours after oral dosing.[6]

Alternative routes available

No alternative routes for gabapentin.

Interactions

Food, including high-fat diets, does not influence the absorption of gabapentin.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- NICE guidelines reinforce the importance of patients receiving the same anti-epileptic formulation consistently.
- Use the oral solution (note warning) or disperse the capsule contents in water.
- A prolonged break in feeding is not required.

Intragastric administration

For oral solution

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw up the required volume of oral solution into an oral syringe and administer via the enteral tube.
4. Flush the tube with recommended volume of water.
5. Re-start feed, unless a prolonged break is required.

For capsules

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Open the capsule and pour the contents into a medicine pot.
4. Add 15 mL of water.
5. Stir to disperse the powder
6. Draw into an appropriate syringe and administer via the feeding tube.
7. Add a further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
8. Draw up this dispersion and flush down tube. This will ensure that the whole dose is given.
9. Flush the tube with recommended volume of water.
10. Re-start feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to jejunal administration of gabapentin. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.

3. Gabapentin Oral Solution (Rosemont), Summary of Product Characteristics; October 2012.
4. Nahata MC. Development of two stable oral suspensions for gabapentin. *Pediatr Neurol* 1999; 20(3): 195–197.
5. Berry DJ, Beran RG, Plunkeft MJ, Clarke LA, Hung WT. The absorption of gabapentin following high dose escalation. *Seizure* 2003; 12(1): 28–36.
6. Neurontin (Pfizer), Summary of Product Characteristics; April 2013.

Galantamine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Galantamine (Lexon, Teva)	Tablet 8 mg, 12 mg	Galantamine (as hydrobromide). No specific data on enteral tube administration are available for this preparation.
Reminyl (Shire)	Tablet 8 mg, 12 mg	Galantamine (as hydrobromide). Film-coated tablets; will dissolve in water.[2] Solubility of galantamine hydrobromide is 31 mg/mL in water.[3] Tablets disperse within 5 minutes when placed in 10 mL of water to give a fine dispersion that settles quickly but flushes easily via an 8Fr NG tube without blockage.[4]
Galantamine (Sandoz)	Oral solution 4 mg/mL	Galantamine (as hydrobromide). Clear, colourless solution.[5] Contains 0.33 g sorbitol/mL.[5]
Reminyl (Shire)	Oral solution 4 mg/mL	Galantamine (as hydrobromide). Sugar free; does not contain sorbitol.[3] Oral solution can be mixed with water.[6] Shire does not have any specific information on the administration of the oral solution via enteral feeding tube.[6] Pack contains an oral syringe not compatible with enteral devices.
Galantamine (Actavis, Aspire, Consilient, Lexon, Mylan, Zentiva)	M/R capsule 8 mg, 16 mg, 24 mg	Modified-release preparation; do not crush. Not suitable for administration via enteral feeding tubes. Brands include Acumor XL, Elmino XL, Galsya XL, Gatalin XL, Lotprostin XL.
Reminyl (Shire)	M/R capsule 8 mg, 16 mg, 24 mg	Galantamine (as hydrobromide). Modified-release preparation. Not suitable for administration via enteral feeding tubes.

Site of absorption (oral administration)

Specific site of absorption is not documented. Absorption is rapid with both tablets and oral solution, with peak plasma concentrations occurring within 1 hour.[3]

Alternative routes available

None available.

Interactions

Co-administration of galantamine with food is recommended as this slows the rate, but not the extent, of absorption and reduces cholinergic side-effects.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation; dilute with water prior to administration.
- Administer during or immediately after feed.
- Alternatively, tablets can be dispersed in water immediately prior to administration.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of galantamine. Administer using the above method and monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Shire; 17 February 2003.
3. Reminyl Oral Solution (Shire), Summary of Product Characteristics; August 2013.
4. BPNG data on file, 2005.
5. Galantamine Oral Solution 4 mg/mL (Sandoz), Summary of Product Characteristics; May 2013.
6. Personal communication, Shire; 21 February 2005.

Ganciclovir

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Cymevene (Roche)	Infusion 500 mg vial	As sodium salt. Powder for reconstitution. No specific data on enteral tube administration are available for this preparation.
Extemporaneous preparation[2] (the pharmacokinetic and clinical efficacy of this preparation has not been tested)	Suspension 25 mg/mL	Suspension should be prepared in an area with appropriate preparation and containment facilities. 1. Aseptically reconstitute 5 vials (500 mg) of ganciclovir using 3 mL per vial. Shake well until dissolved. 2. Transfer the contents of the vials (total volume 15 mL) into a suitable measure. 3. Add 50 mL of Ora-Sweet (US suspending agent). 4. Add 1 mL of 3% hydrogen peroxide solution. 5. Mix well. 6. Make to volume (100 mL) using Ora-Sweet. 7. Mix thoroughly. 8. Dispense in amber bottle. Label 'shake well before each use'. 9. Assign an expiration date of 28 days.

Site of absorption (oral administration)

Ganciclovir is absorbed in the small bowel and absorption is not pH dependent.[2]

Alternative routes available

Parenteral route is available.

Interactions

Food delays peak plasma concentrations and increases overall bioavailability. It is proposed that food delays transit time and allows for increased paracellular diffusion;[2] therefore, enteral feed may not increase bioavailability to the same extent.

Health and safety

Caution in handling:[1] Ganciclovir is toxic and personnel should be adequately protected during handling and administration. If the solution comes into contact with skin or mucosa, wash off immediately with soap and water.

Suggestions/recommendations

- Oral bioavailability is poor; consider changing to valganciclovir.
- Seek advice regarding alternative treatment.

- Use a parenteral formulation where clinically appropriate. Use of the extemporaneous suspension above should be considered a last resort because of the lack of supporting data.

References

1. *BNF* 67, March 2014.
2. Personal communication, Roche; 6 February 2003.

Glibenclamide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Glibenclamide (Actavis)	Tablet 2.5 mg, 5 mg	Alpharma (now Actavis) advises caution because of the unknown effect on efficacy of crushing tablets.[2]
Glibenclamide (APS)	Tablet 2.5 mg, 5 mg	Tablets disperse in water within 5 minutes to give a very fine dispersion that flushes down an 8Fr NG tube without blockage.[3]
Glibenclamide (Lexon, Teva, Wockhardt)	Tablet 2.5 mg, 5 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Glibenclamide is rapidly absorbed, with detectable levels in the plasma within 15–60 minutes and a peak between 2 and 4 hours, although no specific site of absorption is documented.[2]

Alternative routes available

None available for glibenclamide. Long-acting insulins are available for parenteral administration; seek specialist advice.

Interactions

No specific interaction with food is documented, although it is recommended that glibenclamide be taken with breakfast or the first main meal of the day.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse tablet in water immediately prior to administration. The dose should be given shortly after starting enteral feed. No break in feeding regimen is necessary, but the tube must be flushed before and after dosing to prevent blockage. Ensure that blood glucose levels are monitored closely and the dose is adjusted according to response, until a stable drug and feeding regimen is determined.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into the syringe with an appropriate adapter for the tube connector. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of glibenclamide. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma (Now Actavis); 21 January 2003.
3. BPNG data on file, 2004.

Gliclazide

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Gliclazide (Accord, Actavis, Bristol Labs, Generics, Genus, Lexon, Mylan, Teva, Wockhardt)	Tablet 80 mg	Alpharma (now Actavis) do not recommend crushing the tablets owing to the unknown effect on the pharmacokinetics and glycaemic control.[2] Alpharma (Actavis) and Generics brands disperse in 10 mL of water within 5 minutes to give a coarse dispersion. This flushes without blockage but leaves a residue on the syringe and may leave residue inside tube;[3] however, this is unlikely to be active drug as gliclazide is soluble in water.[4] Wockhardt brand takes 2–3 minutes to disperse when shaken in 10 mL of water; this forms a finer dispersion than the Alpharma (Actavis) and Generics brands, but also leaves a slight residue on the syringe.[3]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Diamicron (Servier)	Tablet 80 mg	Scored. Tablets can be crushed and dispersed in water immediately prior to administration.[5] Contains lactose.[6]
Gliclazide MR (Consilient, Lexon, Mylan, Teva)	M/R tablet 30 mg	Modified-release tablet; do not crush or chew. Not suitable for administration via an enteral feeding tube.
Diamicron MR (Servier)	M/R tablet 30 mg	Modified-release tablet. Diamicron MR 30 mg may be considered to be approximately equivalent in therapeutic effect to standard preparation Diamicron 80 mg. Diamicron MR is a hydrophilic matrix preparation and should not be crushed.[5]

Site of absorption (oral administration)

Specific site of absorption is not documented. Average time to peak plasma concentration is 4 hours.[5]

Alternative routes available

No alternative route available. Insulin can be administered parenterally if clinically appropriate.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration. As it is possible that some residue may be left in the syringe, ensure that blood glucose levels are monitored closely and the dose is adjusted according to response, until a stable drug and feeding regimen is determined.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma (now Actavis); 21 January 2003.
3. BPNG data on file, 2004.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
5. Personal communication, Servier Laboratories; 3 March 2003.
6. Diamicron 80 mg Tablets (Servier), Summary of Product Characteristics; February 2012.

Glimepiride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Glimepiride (Accord, Lexon, Teva)	Tablet 1 mg, 2 mg, 3 mg, 4 mg	Scored tablets. No specific data on enteral tube administration are available for this preparation. Contain lactose.[2]
Amaryl (Sanofi-Aventis)	Tablet 1 mg, 2 mg, 3 mg, 4 mg	Scored tablets. No specific data on enteral tube administration are available for this preparation. Contains lactose.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs approximately 2.5 hours after oral dosing.[2]

Alternative routes available

No alternative route for any sulfonylureas. Insulin can be administered parenterally if clinically appropriate.

Interactions

There is no specific interaction with food, but to optimise effect the dose should be taken shortly before main meal of the day.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse tablet in water immediately prior to administration. This should be given immediately prior to the first bolus feed of the day, or before the feed infusion is started.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of glimepiride. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Glimepiride (Accord), Summary of Product Characteristics; February 2012.
3. Amaryl (Sanofi-Aventis), Summary of Product Characteristics; October 2013.

Glipizide

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Glipizide (Lexon, Mylan)	Tablet 5 mg	No specific data on enteral tube administration are available for this preparation.
Minodiab (Pfizer)	Tablet 5 mg	The tablets can be crushed and dispersed in water, but as there are no stability data it is recommended that this be done immediately prior to administration.[2]

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 1–3 hours after oral dosing.[3]

Alternative routes available

None available for any of the sulfonylureas.

Interactions

Total bioavailability is not affected by food, but peak plasma concentrations are delayed by 40 minutes. Therefore, to obtain the greatest reduction in postprandial hyperglycaemia, it is recommended that glipizide be given 30 minutes before food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Crush the tablets and disperse in water immediately prior to administration. This should be flushed down tube 30 minutes before enteral feed is commenced; blood sugar control persists for up to 24 hours after a single dose of glipizide.[3]

Intragastric administration

1. Administer the dose 30 minutes prior to starting enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Wait at least 30 minutes before starting the feed.

Intrajejunal administration

There are no specific data relating to the jejunal administration of glipizide. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Pharmacia; 11 March 2003.
3. Minodiab 5 mg Tablets (Pfizer), Summary of Product Characteristics; September 2012.
4. Personal communication, Pfizer; 23 June 2003.

Glyceryl trinitrate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Short-acting preparations		
Glyceryl trinitrate (Actavis, Lexon)	Sublingual tablet 300 micrograms, 500 micrograms, 600 micrograms	Intended for sublingual administration; not suitable for administration via feeding tube. Peak plasma concentration occurs 6 minutes following sublingual administration.
Glyceryl trinitrate (Ayrton Saunders, Egis, Roche, Sanofi-Aventis, Merck-Serono, Martindale, Teva)	Sublingual spray 400 micrograms	Intended for sublingual administration; not suitable for administration via feeding tube.
Long-acting preparations		
Glyceryl trinitrate (UCB, Schwarz, 3M, Schering-Plough, Novartis, Meda, Goldshield)	Transdermal patch 5 mg/24 hours, 10 mg/24 hours, 15 mg/24 hours	Transdermal application only. Deponit, Minitran, Nitro-Dur, Transiderm-Nitro, Trintek.
Recogesic (ProStrakan)	Rectal ointment 4 mg/g	Topical use only.
Parenteral preparations		
Glyceryl trinitrate (Faulding, DBL, Schwarz, Merck-Serono, UCB)	Injection 1 mg/mL, 5 mg/mL	Parenteral use only. Contains ethanol and propylene glycol.

Site of absorption (oral administration)

Peak plasma concentrations of the active metabolites of glyceryl trinitrate are detected 1 hour following oral administration; however, extensive first-pass metabolism makes the oral route unsuitable.[2] Bioavailability of transdermal absorption is 70% of that achieved after i.v. administration.

Alternative routes available

Sublingual, topical and parenteral routes are available.

Interactions

Not applicable.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use transdermal preparation for prophylactic therapy. The use of sublingual tablets may not be appropriate for patients with impaired local absorption following maxillofacial surgery or in patients with an impaired swallow; the sublingual spray should be considered in these patients.

References

1. *BNF* 67, March 2014.
2. Nitro-Dur Patch (MSD), Summary of Product Characteristics; January 2011.

Glycopyrronium bromide

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Robinul Forte (First Horizon)	Tablet 2 mg	Unlicensed in UK. Tablets disperse in 10 mL of water within 5 minutes to give a coarse dispersion that settles quickly. Flushes via an 8Fr NG tube without blockage, but there is a risk of leaving drug in the syringe.[2]
Glycopyronnium (Amdipharm, Accord)	Injection 200 micrograms/mL	Intramuscular injection results in predictable peak plasma concentration at 30 minutes.[3] No specific data on enteral tube administration are available for this preparation.
Robinul (AMCo)	Powder 3 g	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Oral absorption is poor. Peak plasma concentration occurs 5 hours following oral dosing.[3]

Alternative routes available

Parenteral route is available.

Interactions

No specific interaction with food is documented.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data on jejunal administration of glycopyrronium. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
4. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Granisetron

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Granisetron (Mylan)	Tablet 1 mg	Granisetron (as hydrochloride). No specific data on enteral tube administration are available for this preparation.
Kytril (Roche)	Tablet 1 mg, 2 mg	Granisetron (as hydrochloride). Tablets can be crushed.[2] Tablet does not disintegrate readily but disperses in 10 mL of water if shaken for 5 minutes; this fine dispersion flushes via an 8Fr NG tube without blockage.[2] 1 mg tablet contains 69.38 mg lactose monohydrate. 2 mg tablet contains 138.76 mg lactose monohydrate.[3]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Granisetron (Hameln)	Injection 1 mg/mL	Granisetron (as hydrochloride). No specific data on entersl tube administration are available for this preparation.
Sancuso (ProStraken)	Transdermal patch 3.1 mg/24 hours	Patch can remain in place for 7 days. Licensed for prevention of nausea in emetogenic chemotherapy treatment.[4] Slow onset of action; patch must be in place 24–48 hours prior to chemotherapy.

Site of absorption (oral administration)

Granisetron is rapidly absorbed. The specific site of absorption and time to peak plasma concentration are not documented.[3,5]

Alternative routes available

Parenteral formulation is available. Can be administered by i.v. injection or infusion.

Interactions

The absorption of granisetron is not affected by food.[6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Crush the tablets, or consider changing to ondansetron oral solution (see monograph).
- A prolonged break is feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of granisetron. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, September 2014.
2. BPNG data on file, 2004.
3. Kytril (Roche), Summary of Product Characteristics; October 2013.
4. Sancuso (ProStraken), Summary of Product Characteristics; July 2012.
5. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.
6. Personal communication, Roche; 6 February 2003.

Griseofulvin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Grisofulvin (non-proprietary)	Tablet 125 mg, 500 mg	Film-coated tablets. Grisovin (GSK) tablets are insoluble in water and it is likely that if crushed the dispersion of tablets in water would sediment rapidly. This may lead to inaccurate dosing.[2]

Site of absorption (oral administration)

No specific site is documented; however, absorption from the gastrointestinal tract is variable and incomplete. On average, less than 50% of the oral dose is absorbed, but fatty foods and a reduction in particle size will increase the rate and extent of absorption.[3] Peak plasma levels are achieved by 4 hours and maintained for 10–20 hours.[3]

Alternative routes available

None for griseofulvin.

Interactions

Food ingestion alters the absorption of griseofulvin; relative bioavailability can be increased by 120% in the presence of fats.[4] As enteral feeds are relatively low in fat compared with the high-fat diet referred to in the literature,[5,6] the significance of the interaction is uncertain in relation to griseofulvin absorption.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to lack of data, suitable formulation and the unpredictable effect of food on absorption, consider an alternative drug such as terbinafine (see monograph).

References

1. *BNF* 67, March 2014.
2. Personal communication, GSK; 22 January 2003.
3. Grisal 250 (Aegis), Summary of Product Characteristics; October 2006.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
5. Crounse RG. Human pharmacology of griseofulvin: the effect of fat intake on gastrointestinal absorption. *J Invest Dermatol* 1961; 37: 529.
6. Ogunbona FA, Smith IF, Olawoye OS, *et al*. Fat contents of meals and bioavailability of griseofulvin in man. *J Pharm Pharmacol* 1985; 37: 283–284.

Haloperidol

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Haloperidol (Amdipharm, Lexon, Pinewood, Teva)	Tablet 500 micrograms, 1.5 mg, 5 mg, 10 mg, 20 mg	No specific data on enteral tube administration are available for this preparation.
Haloperidol (Lexon, Rosemont, Wockhardt)	Oral liquid 5 mg/5 mL, 10 mg/5 mL	No specific data on enteral tube administration are available for this preparation.
Dozic (Rosemont)	Oral liquid 5 mg/5 mL	Viscosity similar to water; flows easily via NG tube.[2] Sugar free.
Haldol (Janssen-Cilag)	Tablet 5 mg, 10 mg	No specific data on enteral tube administration are available for this preparation. Contain lactose.[3]
Haldol (Janssen-Cilag)	Oral liquid 2 mg/mL	Sugar-free, pH-adjusted oral solution.[4]
Haldol (Janssen-Cilag)	Injection 5 mg/mL (1 mL)	No specific data on enteral tube administration are available for this preparation.
Haldol (Janssen-Cilag)	Depot injection 50 mg/mL, 100 mg/mL	Haloperidol (as decanoate). No specific data on enteral tube administration are available for this preparation.
Serenace (Teva)	Capsule 500 micrograms	Powder empties easily from capsule and disperses readily in water; quite fiddly owing to small capsule size.[5]

Site of absorption (oral administration)

Absorption is rapid following oral dosing;[4] no specific site of absorption is documented.

Alternative routes available

Injection is available for intravenous or intramuscular use.

Following intramuscular administration of 2 mg, peak plasma concentrations were similar to oral administration but were reached after 20 minutes.[6]

Interactions

There is no documented interaction with food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the oral liquids; all brands are oral solutions and do not require further dilution prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of haloperidol. Administer using the above method. Monitor for increased side-effects of loss of efficacy.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2011.
3. Haldol Oral Liquid (Janssen-Cilag), Summary of Product Characteristics; October 2013.
4. Haldol Tablets (Janssen-Cilag), Summary of Product Characteristics; October 2013.
5. BPNG data on file, 2004.
6. Haldol Injection (Janssen-Cilag), Summary of Product Characteristics; October 2013.

Hydralazine hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Hydralazine (Actavis, Lexon, Mylan)	Tablet 25 mg, 50 mg	No specific data on enteral tube administration are available for this preparation. Actavis tablets contain lactose.[2]
Apresoline (Amdipharm)	Tablet 25 mg	No specific data on enteral tube administration are available for this preparation. Sugar coated.[3] Contains sucrose.[3]
Apresoline (Sovereign)	Injection 20 mg	Powder for reconstitution. Reconstituted injection can be given orally.[4]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 0.5–1.5 hours following oral dosing.[2,5]

Alternative routes available

Parenteral route is available.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider changing therapy.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to jejunal delivery of hydralazine. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Hydalazine (Actavis), Summary of Product Characteristics; July 2009.
3. Apresoline (Amdipharm), Summary of Product Characteristics; Jan 2013.
4. *BNF for Children*; January 2014.
5. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Hydrocortisone

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Hydrocortone (MSD, Lexon)	Tablet 10 mg, 20 mg	Scored tablets. MSD tablets disintegrate readily in 10 mL of water within 2 minutes to give a fine dispersion that flushes down an 8Fr NG tube without blockage.[2]
Hydrocortisone (Amdipharm, Teva)	Tablet 10 mg	No specific data on enteral tube administration are available for this preparation. Amdipharm tablets contain 199.94 mg lactose per tablet.[3]
Hydrocortisone (Rosemont)	Oral suspension 5 mg/5 mL, 10 mg/5 mL	Unlicensed 'special' products. Thick liquid.[4] No specific data on enteral tube administration are available for this preparation.
Efcortesol (Amdipharm)	Injection 100 mg	Hydrocortisone (as sodium phosphate). No specific data on enteral tube administration are available for this preparation.
Solu-Cortef (Pharmacia)	Injection 100 mg	Hydrocortisone (as sodium succinate). No specific data on enteral tube administration are available for this preparation.
Plenadren (ViroPharma)	M/R tablet 5 mg, 20 mg	Modified release preparation; do not crush. Not suitable for enteral tube administration. Change to immediate-release tablets using the same total daily dose but monitor clinical response as bioavailability of Plenadren is lower than that of immediate release tablets.[5]

Site of absorption (oral administration)

Specific site is not documented; however, hydrocortisone is readily absorbed. The peak plasma concentration occurs 90 minutes after oral administration.[6]

Alternative routes available

Parenteral route is available. Rectal route is used for topical treatment only.

Interactions

No specific interaction with food is documented.[6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration. A prolonged break in feeding is not required.
- Injection can be used parenterally if enteral absorption is compromised.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data available relating to jejunal administration. Use the method detailed above.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Hydrocortisone 10 mg Tablets (Amdipharm Mercury), Summary of Product Characteristics; June 2013.
4. Rosemont. Hydrocortisone Oral Suspension-112, www.rosemontpharma.com/products/endocrine-system/hydrocortisone-oral-suspension-112 (accessed 15 January /01/2014).
5. Plenadren (ViroPharma), Summary of Product Characteristics; October 2013.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Hydromorphone hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Palladone (Napp)	Capsules 1.3 mg, 2.6 mg	Capsules can be opened and sprinkled onto soft food;[1] however no specific data on enteral tube administration are available for this preparation. Contains lactose.[2]
Palladone SR (Napp)	M/R capsule 2 mg, 4 mg, 8 mg, 16 mg, 24 mg	Modified-release capsules. In-house studies conducted by Napp have given mixed results when administering the spheroids from the capsules via enteral feeding tubes. A common problem was blockage and, therefore, this route of administration is not recommended.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented.[3]

Alternative routes available

None for hydromorphone. Other opioid analgesics are available in parenteral and topical formulations.

Interactions

No specific interaction with food is documented.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Do not attempt to administer contents of modified-release capsules via the feeding tube owing to the high risk of blockage. Change to an alternative opiate available as liquid, e.g. morphine or oxycodone.
- Hydromorphone hydrochloride 1.3 mg oral is approximately equivalent to 10 mg of oral morphine or 5 mg of oral oxycodone.[1]
- For background maintenance analgesia, consider modified-release preparations with smaller granules (see Morphine monograph) or topical preparations, e.g. fentanyl or buprenorphine.

References

1. *BNF* 67, March 2014.
2. Personal communication, Napp; 29 January 2003.
3. Palladone (Napp), Summary of Product Characteristics; September 2008.

Hydroxycarbamide (Hydroxyurea)

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Hydroxycarbamide (Medac)	Capsule 500 mg	No specific data on enteral tube administration are available for this preparation. Contains 25 mg lactose/capsule.[2]
Hydrea (Squibb)	Capsule 500 mg	Soluble 1 : 10 to 1 : 30 in water.[2] Excipients are not soluble. Contains 42.2 mg lactose/capsule.[3]
Siklos (Nordic Pharma)	Tablet 100 mg, 1 g	Film coated Tablets can be disintegrated immediately before use in a small quantity of water (5 mL).[4] No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 0.5 to 2 hours after oral dosing.[2,3] Oral bioavailability is almost complete.[4]

Alternative routes available

None available for hydroxycarbamide.

Interactions

No specific interaction with food is documented.[4]

Health and safety

Hydroxycarbamide is cytotoxic. Suitable protective clothing should be worn. Contaminated equipment should be disposed of as cytotoxic waste. Steps should be taken to minimise operator exposure to the powder.

Suggestions/recommendations

- Use Siklos tablets dispersed in water immediately before administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.

6. Draw another 10mL mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There is no specific information relating to the jejunal administration of hydroxycarbamide. Administer as above. Seek specialist advice.

References

1. *BNF* 67, March 2014.
2. Hydroxycarbamide (Medac), Summary of Product Characteristics; October 2008.
3. Hydrea (Squibb), Summary of Product Characteristics; May 2012.
4. Siklos (Nordic Pharma), Summary of Product Characteristics; Oct 2012.

Hydroxyzine hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Atarax (Alliance, previously Pfizer)	Tablet 10 mg, 25 mg	Sugar-coated tablets; crushing may be difficult.[2,3] No specific data on enteral tube administration are available for this preparation.
Ucerax (UCB Pharma)	Syrup 10 mg/5 mL	No specific data on enteral tube administration are available for this preparation. Contains sucrose and alcohol (100 mg/5 mL), does not contain sorbitol.[4]
Ucerax (UCB Pharma)	Tablet 25 mg	Film coated.[5] No specific data on enteral tube administration are available for this preparation. Contains lactose.[5]

Site of absorption (oral administration)

Specific site is not documented. Hydroxyzine is rapidly absorbed from the GI tract, with peak plasma level reached approximately 2 hours following oral administration; an antihistamine therapeutic effect starts 1 hour after oral administration and the sedative effect starts 5–10 minutes with the liquid preparation and 30–45 minutes with the tablets.[4,5]

Alternative routes available

No alternative route available for hydroxyzine. Parenteral formulation is available for chlorphenamine.

Interactions

No specific interaction with food or feed.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid preparation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication liquid into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data on jejunal administration. Administer as above; consider diluting the liquid preparation immediately prior to administration to reduce osmolarity. Monitor for lack of efficacy and increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Pfizer; 23 June 2003.
3. Atarax (Alliance), Summary of Product Characteristics; March 2013.
4. Ucerax Syrup (UCB Pharma), Summary of Product Characteristics; May 2012.
5. Ucerax Tablets (UCB Pharma), Summary of Product Characteristics; May 2012.

Hyoscine butylbromide

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Buscopan (Boehringer Ingelheim)	Tablet 10 mg	Sugar coated.[2] Tablets may be crushed but are sugar coated.[3] Soluble 1:1 in water.[4]
Buscopan (Boehringer Ingelheim)	Injection 20 mg/mL	Injection can be given orally; pH is 3.7–5.5.[1,3]

Site of absorption (oral administration)

Hyoscine butylbromide has a low systemic absorption; it exhibits a predominantly local effect in the gut.[3,4]

Alternative routes available

Parenteral formulation can be given i.v. or i.m.

Interactions

No documented interaction with food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to the risk of tube blockage from crushing sugar-coated tablets, the Buscopan injection should be used via enteral feeding tubes. A prolonged break in feeding is not necessary. If the tube exits in the jejunum, consider using parenteral therapy.
- Consider changing to dicycloverine liquid (see monograph) as an alternative therapy.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw up appropriate dose of injection into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

No data are available relating to jejunal administration; however, jejunal administration is unlikely to affect therapeutic response. Consider changing to parenteral therapy if enteral absorption is compromised.

References

1. *BNF* 67, March 2014.
2. Buscopan (Boehringer Ingelheim), Summary of Product Characteristics; August 2013.
3. Personal communication, Boehringer Ingelheim; 6 March 2003.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Hyoscine hydrobromide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Hyoscine hydrobromide (Boots, Bayer, Forest Labs)	Tablet 150 micrograms, 300 micrograms	No specific data on enteral tube administration are available for this preparation. Joy-rides, Kwells, Kwells Kids all contain mannitol.[2–4]
Scopaderm TTS (Novartis)	Patch 1 mg/72 hours	Apply behind the ear to a hairless patch of skin; replace every 72 hours.
Hyoscine (Wockhardt, UCB Pharma)	Injection 400 micrograms/mL, 600 micrograms/mL	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Hyoscine hydrobromide is readily absorbed from the GI tract; it is also well absorbed following application to the skin.[5]

Alternative routes available

Topical patch and parenteral formulation.

Interactions

There is no documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use transdermal patch where clinically appropriate.

References

1. *BNF* 67, March 2014.
2. Joy-Rides (Forest Labs), Summary of Product Characteristics; July 2012.
3. Kwells (Bayer), Summary of Product Characteristics; November 2007.
4. Kwells Kids (Bayer), Summary of Product Characteristics; August 2007.
5. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Ibandronic acid

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Ibandronic acid (Actavis, Aspire Pharma, Consilient Health, Lexon, Mylan, Teva)	Tablet 50 mg, 150 mg	Ibandronic acid (as sodium monohydrate). Film-coated tablet. Do not crush or chew. No specific data on enteral tube administration are available for this preparation. Contains lactose.
Bonviva (Roche)	Tablet 150 mg	Ibandronic acid (as sodium monohydrate). Film-coated tablet. No specific data on enteral tube administration are available for this preparation. Contains 162.75 mg lactose per tablet.[2]
Bonviva (Roche)	Injection 1 mg/mL (3 mL pre-filled syringe)	No specific data on enteral tube administration are available for this preparation.
Bondronat (Roche)	Tablet 50 mg	Ibandronic acid (as sodium monohydrate) Film-coated tablet. No specific data on enteral tube administration are available for this preparation.
Bondronat Concentrate (Roche)	Infusion 2 mg, 6 mg	Ibandronic acid (as monosodium salt, monohydrate). No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Absorption occurs from the upper GI tract and is rapid after oral administration. The absolute bioavailability is about 0.6%.[2]

Alternative routes available

Parenteral route available.

Interactions

Products containing calcium and other multivalent cations (magnesium, aluminium and iron) including milk and food are likely to interfere with absorption. Therefore, delay intake at least 30 minutes to 1 hour following ibandronic acid.[2–4] Bioavailability is decreased by 75% when ibandronic acid is administered 2 hours after a standard meal; therefore, it is recommended that it should be administered at least 6 hours after fasting.[2,3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Due to lack of specific data and significant risk of interaction, enteral tube administration of ibandronic acid is not recommended. Seek specialist advice regarding alternative therapy.
- For patients on overnight feeds, the parenteral route should be used.
- It is advised by Roche that tablets should not be crushed as this increased the risk of oropharangeal ulceration.

References

1. *BNF* 67, March 2014.
2. Bonviva (Roche), Summary of Product Characteristics; December 2013.
3. Bondronat (Roche), Summary of Product Characteristics; December 2013.
4. Baxter K, Preston CL. *Stockley's Drug Interactions,* 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Ibuprofen

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Ibuprofen (Accord, Actavis, Boots, Lexon, Mylan, Omega, Pfizer, SSL Int, Reckitt Benckiser, Teva, Wockhardt)	Tablet 200 mg, 400 mg, 600 mg	Actavis recommends that tablets should not be crushed.[2] Many brands contain lactose.
Ibuprofen (Bayer, Boots, Reckitt Benckiser, Teva)	Tablet 342 mg, 684 mg	As lysine. No specific data on enteral tube administration are available for this preparation.
Ibuprofen (Dexcel, Pfizer, Reckitt Benckiser)	Liquid capsule 200 mg, 400 mg	No specific data on enteral tube administration are available for this preparation.
Ibuprofen (Boots, Lexon, McNeil, Pinewood, Teva, Thornton & Ross, Wockhardt)	Oral suspension 100 mg/5 mL	No specific data on enteral tube administration are available for this preparation.
Ibuprofen (Reckitt Benckiser)	S/R capsule 300 mg	Slow-release capsules; do not crush. Not suitable for enteral tube administation.
Brufen (Abbott)	Tablet 200 mg, 400 mg, 600 mg	200 mg and 400 mg strength are sugar coated; 600 mg strength is film coated. Contain lactose.[3]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Brufen (Abbott)	Syrup 100 mg/5 mL	Brufen syrup is extremely viscous and should be mixed with an equal volume of water prior to administration via a feeding tube to reduce the viscosity and reduce resistance to flushing down the feeding tube.[4] Contains sorbitol 500 mg/5 mL dose.[5]
Brufen (Abbott)	Granule 600 mg/ sachet	No specific data on enteral tube administration are available for this preparation. Contains 6.5 mmol sodium per sachet.
Brufen (Abbott)	M/R tablet 800 mg	Modified release preparation; do not crush. Not suitable for enteral tube administration.
Anadin Liquifast (Pfizer)	Effervescent tablet 200 mg	Dissolve in a glass of water.[6] Each tablet contains 8.8 mmol sodium and 2.2 mmol potassium. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–2 hours after oral dosing.[6]

Alternative routes available

None for ibuprofen. Alternative routes are available for diclofenac, but the difference in efficacy and side-effect profile should be considered.

Interactions

Peak plasma concentrations are reduced and delayed when administered with food.[6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation; dilute with an equal volume of water immediately prior to administration where possible.
- Alternatively, use the granules dispersed in 20 mL of water.
- The effervescent tablets may also be appropriate; note electrolyte content.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.

5. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of ibuprofen; administer as above.

References

1. *BNF* 67, March 2014.
2. Anadin Liquifast 200 mg Effervescent Tablets (Pfizer), Summary of Product Characteristics; September 2012.
3. Brufen (Abbott), Summary of Product Characteristics; March 2012.
4. BPNG data on file, 2004.
5. Personal communication, Abbott Laboratories; August 2005.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Imipramine hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Imipramine (Actavis, Lexon, Teva)	Tablet 10 mg, 25 mg	Alpharma (now Actavis) brand tablets are difficult to crush owing to their small size and coating, but once crushed they disperse well in water and flush via an 8Fr NG tube without blockage, although inadequate crushing may lead to large particles that might block fine-bore tubes.[2]
Imipramine (Rosemont)	Oral solution 25 mg/5 mL	Imipramine (as hydrochloride) Thick liquid. No specific data on enteral tube administration are available for this preparation. Contains sorbitol 1500 mg/5 mL.[3]

Site of absorption (oral administration)

Site of absorption is not specified.[3] Absorption is reduced when gastric pH is in the range 3.6–6.0.[4]

Alternative routes available

None available for imipramine.

Interactions

Food does not affect the absorption or the bioavailability of imipramine;[3] however, the pH buffering effect of enteral feed may affect absorption (see note above).

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the oral solution, but it may need to be diluted with an equal volume of water to reduce the viscocity.
- Owing to lack of data, consider changing to an alternative tricyclic antidepressant available as a liquid. Seek specialist advice for transference of therapy.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication oral solution into an appropriate size and type of syringe.
4. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. Do not measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There is no specific information relating to jejunal administration of imipramine. Administer using the above method. Monitor for loss of efficacy and increased side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Imipramine Oral Solution (Rosemont), Summary of Product Characteristics; May 2013.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Indapamide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Indapamide (Lexon, Niche, Servier, Teva, Winthrop, Zentiva)	Tablet 2.5 mg	Winthrop brand tablets disperse in 10 mL of water within 2 minutes to give a fine dispersion that flushes via an 8Fr NG tube without blockage.[2] Most generic tablets contain lactose.
Indapamide (Actavis, Consilient, Generics, Genus, Lexon, Niche, Servier, Teva)	P/R tablet 1.5 mg	Prolonged-release preparation; do not crush. Not suitable for enteral tube administration. Change to a conventional-release tablet.
Natrilix (Servier)	Tablet 2.5 mg	Film-coated tablet. Tablets can be crushed and mixed with water immediately prior to administration.[3] Contains 57.5 mg lactose per tablet.
Natrilix SR (Servier)	M/R tablet 1.5 mg	Prolonged-release preparation; do not crush. Not suitable for enteral tube administration. Change to conventional-release tablet.

Site of absorption (oral administration)

Specific site of absorption is not documented. Rapidly and completely absorbed following oral administration. Peak plasma concentration occurs 1–2 hours following oral dose.[4]

Alternative routes available

None available for indapamide.

Interactions

No specific interaction with food is documented.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse conventional-release tablets in water immediately prior to administration.
- Consider using bendroflumethiazide oral solution (see monograph)
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.

4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of indapamide. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Personal communication, Servier; 3 March 2003.
4. Natrilix (Servier), Summary of Product Characteristics; November 2011.

Indometacin (Indomethacin)

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Indometacin (Actavis, Genesis, Kent, Lexon, Ranbaxy, Sandoz)	Capsule 25 mg, 50 mg	Alpharma (now Actavis) advise against opening the capsules.[2]
Indometacin (Actavis, Aspen, Lexon)	Suppository 100 mg	Rectal administration only.
Indometacin M/R preparations (Lexon, Sandoz)	M/R capsule 75 mg	Modified-release preparation; do not crush. Not suitable for enteral tube administration.
Indo-Paed (1APharma)	Suspension 25 mg/5 mL	Unlicensed in the UK. Licensed in Germany. Import via IDIS. Slightly viscous suspension.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 30–120 minutes following oral dosing. Rectal administration produces earlier but lower peak concentrations.[3]

Alternative routes available

Suppositories are available for rectal administration.

Interactions

Absorption is delayed but not reduced by food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Change to suppositories administered once daily at night if clinically indicated. If the rectal route is not appropriate, consider changing to an alternative NSAID, e.g. diclofenac (see monograph).
- If continuation of indometacin is indicated, use unlicensed imported liquid.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma (now Actavis); 21 January 2003.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Indoramin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Indoramin (Generics, Lexon)	Tablet 20 mg	No specific data on enteral tube administration are available for this preparation.
Baratol (Shire)	Tablet 25 mg	Indoramin (as hydrochloride). Film-coated tablet. Readily soluble in water.[2] No specific data on enteral tube administration are available for this preparation. Contains lactose.[3]
Doralese (Chemidex)	Tablet 20 mg	Indoramin (as hydrochloride) Film-coated tablet.[4] Tablets disperse rapidly when placed in 10 mL of water; the dispersion settles quickly but flushes down an 8Fr NG tube without blockage.[5] Contains lactose.[4]

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 1–2 hour following oral dosing.[3,4]

Alternative routes available

None available for indoramin.

Interactions

Alcohol increases the rate and extent of indoramin absorption. No interaction with food is documented.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There is no specific information relating to jejunal administration of indoramin. Administer using the above method. Monitor for loss of efficacy and increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Shire; 17 February 2003.
3. Baratol (Amdipharm), Summary of Product Characteristics; August 2009.
4. Doralese (Chemidex Pharma), Summary of Product Characteristics; January 2011.
5. BPNG data on file, 2004.

Inositol nicotinate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Hexopal (Genus, previously Sanofi-Synthelabo)	Tablet 500 mg	Tablets can be crushed; this is not expected to significantly affect the pharmacokinetics.[2]
Hexopal Forte (Genus)	Tablet 750 mg	As above.

Site of absorption (oral administration)

Specific site of absorption is not documented.[3]

Alternative routes available

None available for inositol.

Interactions

No specific interaction with food is documented.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Crush the tablets and disperse in water immediately prior to administration.
- However, owing to the lack of data, consideration should be given to reviewing the therapy and advice sought regarding alternative treatment.[4]

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly ensuring that there are no visible lumps of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There is no specific information relating to jejunal administration of inositol. If necessary, administer using the above method. Monitor for lack of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Sanofi-Synthelabo; 3 February 2003.
3. Hexopal (Sanofi), Summary of Product Characteristics; January 2008.
4. NICE. *Technology Appraisal TA223: Cilostazol, Naftidrofuryl Oxalate, Pentoxifylline and Inositol Nicotinate for the Treatment of Intermittent Claudication in People with Peripheral Arterial Disease*. London: NICE; 2011, http://www.nice.org.uk/Guidance/TA223 (accessed 22 September 2014).

Irbesartan

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Irbesartan (Accord, Actavis, Aspire, Aurobindo, Sandoz)	Tablet 75 mg, 150 mg, 300 mg	Film-coated tablets. No specific data on enteral tube administration are available for this preparation.
Irbesartan with hydrochlorthiazide (Actavis, Aurobindo)	Tablet 150 mg/12.5 mg, 300 mg/12.5 mg, 300 mg/25 mg	Irbesartan 150 mg/hydrochlorthiazide 12.5 mg; irbesartan 300 mg/hydrochlorthiazide 12.5 mg; irbesartan 300 mg/hydrochlorthiazide 25 mg. No specific data on enteral tube administration are available for this preparation.
Aprovel (Sanofi, previously Bristol-Myers Squibb)	Tablet 75 mg, 150 mg, 300 mg	Film-coated tablet. Irbesartan is practically insoluble in water.[2] Tablets disperse in 10 mL water within 2–5 minutes to give fine milky dispersion with some larger particles; these break up when drawn into the syringe and flush down an 8Fr NG tube without blockage.[3] Contains lactose.[4]
CoAprovel (Sanofi, previously Bristol-Myers Squibb)	Tablet 150 mg/12.5 mg, 300 mg/12.5 mg, 300 mg/25 mg	Film coated. Irbesartan 150 mg/hydrochlorthiazide 12.5 mg; irbesartan 300 mg/hydrochlorthiazide 12.5 mg; irbesartan 300 mg/hydrochlorthiazide 25 mg. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–1.5 hours after oral dosing.[4]

Alternative routes available

No other routes of administration are available for any of the angiotensin II antagonists.

Interactions

There is no significant interaction with food.[4] Food appears to have little or no effect on the bioavailability of irbesartan.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of irbesartan. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Bristol-Myers Squibb; 24 January 2003.
3. BPNG data on file, 2004.
4. Aprovel (Sanofi), Summary of Product Characteristics; October 2013.
5. Baxter K, Preston CL. *Stockley's Drug Interactions,* 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Iron preparations

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Ferrous sulfate (Actavis, Lexon, Sandoz, Wockhardt)	Tablet 200 mg	65 mg iron/tablet. Sugar-coated tablets. No specific data on enteral tube administration are available for this preparation.
Ironorm drops (Wallace Mfg)	Oral drops 625 mg/5 mL	625 mg ferrous sulfate (125 mg iron)/5 mL. Usual adult dose 0.6 mL/day.
Feospan (Intrapharm)	Capsule 150 mg,	150 mg ferrous sulfate (47 mg iron)/capsule. Modified-release capsule; do not crush. Not suitable for enteral tube administration.
Ferrograd (Teofarma)	Tablet 325 mg	325 mg ferrous sulfate (105 mg iron)/tablet. Film-coated modified-release tablets; do not crush. Not suitable for enteral tube administration.
Ferrous gluconate (Kent, Lexon)	Tablet 300 mg	35 mg iron/tablet. No liquid preparation. No specific data on enteral tube administration are available for this preparation.
Ferrous fumarate (Amdipharm, Aspire, Lexon)	Tablet 210 mg	68 mg iron/tablet. No specific data on enteral tube administration are available for this preparation.
Ferrous fumarate (Amdipharm)	Syrup 140 mg/5 mL	45 mg iron/5 mL.
Fersamal (Goldshield)	Suspension 140 mg/5 mL	Ferrous fumarate; 45 mg iron/5 mL. Orange/brown liquid, quite difficult to flush; mixes easily with an equal volume of water; this reduces viscosity and reduces resistance to flushing.[2]
Galfer (Thornton & Ross)	Tablet 305 mg	Ferrous fumarate; 45 mg iron/tablet. No specific data on enteral tube administration are available for this preparation.
Galfer (Thornton & Ross)	Syrup 140 mg/5 mL	Ferrous fumarate; 45 mg iron/5 mL. Viscous brown coloured liquid.[3] Contains maltitol.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Niferex (Tillomed)	Elixir 100 mg/5 mL	Polysaccharide–iron complex. Dose 5 mL once or twice daily. Sugar free.
Sytron (Forum, previously Link)	Elixir 190 mg/5 mL	Sodium feredetate; 27.5 mg iron/5 mL. The complex is split in the upper GI tract to release elemental iron.[5] Contains sorbitol 40% w/v;[4] sugar free.
Iron with folic acid Lexpec with Iron-M (Rosemont)	Syrup	80 mg iron/5 mL with 500 micrograms folic acid/5 mL. Contains sorbitol 0.91 g/5 mL.
Feofol (Intrapharm)	Capsule 150 mg/ 500 micrograms	Ferrous sulfate 150 mg with 500 micrograms folic acid. Modified release; do not crush. Not suitable for enteral tube administration.
Ferrograd folic (Teofarma)	Tablet 325 mg/ 350 micrograms	Ferrous sulfate 325 mg with 500 micrograms folic acid. Film coated modified-release tablets; do not crush. Not suitable for enteral tube administration.
Galfer FA (Thornton & Ross)	Capsule 305 mg/ 350 micrograms	Ferrous fumarate 305 mg with 350 micrograms folic acid. No specific data on enteral tube administration are available for this preaparation.
Pregaday (RPH)	Tablet 305 mg/ 350 micrograms	Ferrous fumarate 305 mg with 350 micrograms folic acid. Film-coated tablets. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Iron is predominantly absorbed in the duodenum and proximal jejunum;[4] it is therefore possible that jejunal administration will reduce bioavailability.

Alternative routes available

Parenteral route is available, as CosmoFer and Venofer (see SPC for dosing information and HMRA/CHM advice on serious hypersensitivity reactions with i.v. iron, August 2013).

Interactions

Iron is best absorbed when taken between meals; however, owing to the high incidence of gastrointestinal side-effects, it is recommended that iron preparations be taken with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Ferrous sulfate 200 mg t.d.s. is equivalent to ferrous fumarate liquid 10 mL b.d. or sodium feredetate 10 mL t.d.s.
- Use a liquid preparation. The viscosity may necessitate dilution of the dose with water immediately prior to administration. It is not necessary to administer after feed, but this may reduce GI side-effects.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Jejunal administration is likely to result in reduced absorption; the dose should be titrated to response or the parenteral route should be considered. Administer as above.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Galfer (Thornton & Ross), Summary of Product Characteristics; February 2010.
4. Personal communication, Link Pharmaceuticals; February 2003.
5. Sytron (Forum), Summary of Product Characteristics; December 2013.

Isoniazid

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Isoniazid (Focus, UCB previously Celltech)	Tablet 50 mg, 100 mg	UCB tablets can be crushed.[2] UCB tablets disperse when shaken in 10 mL of water to form a fine white dispersion that flushes via an 8Fr NG tube without blockage.[3]
Isoniazid (Martindale, Rosemont, and local specials units)	Elixir (BPC) 50 mg/5 mL	Available as manufactured 'special'. *Isoniazid Elixir (BPC)*:[4] Isoniazid: 10.0 g Citric acid monohydrate: 2.5 g Sodium citrate: 12.0 g Concentrated anise water: 10 mL Compound tartrazine solution: 10 mL Glycerol: 200 mL Chloroform water, double-strength: 400 mL Water for preparations: to 1000 mL This preparation is a non-viscous liquid that flushes easily via NG tube without further dilution.[3]
Isoniazid (Alliance)	Injection 25 mg/mL (2 mL)	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentrations are achieved 1–2 hours after oral dosing.[5]

Alternative routes available

Parenteral route is available.

Interactions

The bioavailability of isoniazid is reduced by high-carbohydrate diet and by antacid therapy.[5] A high-carbohydrate diet also significantly prolongs the elimination half-life in slow acetylators.[5] For maximal absorption, isoniazid should be taken without food, hence the manufacturer's recommendation to take 30 minutes before or 2 hours after food.[6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid preparation.
- Give dose before food/feed if practical.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Allow 1-hour break if practical.
4. Draw the medication solution into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of isoniazid. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Celltech; 31 March 2003.
3. BPNG data on file, 2005.
4. Lund W. *The Pharmaceutical Codex,* 12th edn. London: Pharmaceutical Press; 1994.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
6. Baxter K, Preston CL. *Stockley's Drug Interactions,* 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Isosorbide dinitrate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Isosorbide dinitrate (Actavis)	Tablet 10 mg, 20 mg	Crushing the tablets is not recommended; use an alternative route.[2]
Isosorbide dinitrate (Actavis, Lexon)	Tablet 10 mg, 20 mg	No specific data on enteral tube administration are available for this preparation.
Isoket Retard (UCB Pharma, previously Schwarz)	M/R tablet 20 mg, 40 mg	Modified-release tablets. Although these tablets can be halved, they are unsuitable for administration via enteral feeding tube.[3]
Isoket (UCB Pharma)	Solution for infusion/ injection 0.5 mg/mL, 1 mg/mL	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site is not documented. However, isosorbide dinitrate is readily absorbed from the oral mucosa and also following oral administration.[4] Peak plasma concentration occurs 30–60 minutes following oral dosing.[5]

Alternative routes available

Isosorbide dinitrate aerosol spray (Angitak) is available for short-acting use; a parenteral formulation is also available, Isoket injection. Glyceryl trinitrate can be used as an alternative and is available as topical patches and injection (see *BNF* for available products).

Interactions

No specific interaction with food is documented.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- If intestinal absorption is uncertain and the drug is being used in a critical care situation, use glyceryl trinitrate or isosorbide dinitrate infusion. For all other situations, consider using glyceryl trinitrate patches (see *BNF* for dosing recommendations).

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma (now Actavis); 21 January 2003.
3. Personal communication, Schwarz Pharma; 17 February 2003.
4. Isosorbide Dinitrate (Actavis), Summary of Product Characteristics; June 2009.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Isosorbide mononitrate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Immediate-release preparations		
Isosorbide mononitrate (Accord, Actavis, Dexcel, Durbin, Lexon)	Tablet 10 mg, 20 mg, 40 mg	Alpharma (now Actavis) does not recommend crushing the tablets.[2] Dexcel brand tablets do not readily disperse in water. APS brand disperse in 10 mL of water within 5 minutes if agitated. The resulting dispersion flushes via an 8Fr NG tube without blockage.[3] Solubility in water 1:10 to 1:30.[4]
Ismo (Durbin)	Tablet 10 mg, 20 mg	No specific data on enteral tube administration are available for this preparation.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Modified-release preparations		
Chemydur 60XL (Amdipharm)	M/R tablet 60 mg	Modified-release tablets; do not crush. Not suitable for enteral tube administration.
Elantan LA (UCB Pharma) (previously Schwarz)	Capsule 25 mg, 50 mg	Capsules containing slow-release microgranules. Schwarz has anecdotal data relating to the administration of the microgranules suspended in water immediately prior to administration via an enteral feeding tube.[5] There is no information on the bore size of the tubes or the incidence of blockage.
Imdur (AstraZeneca), Isib XL (Ranbaxy), Modisal (Sandoz), Monomax (Chiesi), Monomil XL (Teva), Monosorb XL (Dexcel), Zemon (NeoLab)	Tablet 60 mg	Modified-release tablets; although they are suitable for halving, they must not be crushed. Not suitable for enteral tube administration.
Ismo Retard (Durbin)	Tablet 40 mg	Modified-release tablets; do not crush. Not suitable for enteral tube administration.
Isodur (Galen)	Capsule 25 mg, 50 mg	Modified-release capsules; do not crush. Not suitable for enteral tube administration.
Isotard (ProStraken), Generic (Lexon)	Tablet 25 mg, 40 mg, 50 mg, 60 mg	Modified-release tablets; do not crush. Not suitable for enteral tube administration.
Monomax SR (Chiesi)	Capsule 40 mg, 60 mg	Modified-release capsules. No data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs within 1 hour of oral dosing.

Alternative routes available

Glyceryl trinitrate can be used as an alternative and is available as topical patches and injection (see *BNF* for available products).

Interactions

The rate of absorption is slowed by food but overall bioavailability is unchanged.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- If intestinal absorption is uncertain and the drug is being used in a critical care situation, use glyceryl trinitrate injection. For all other situations, consider using glyceryl trinitrate patches (see *BNF* for dosing recommendations).

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma (now Actavis); 21 January 2003.
3. BPNG data on file, 2004.
4. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.
5. Personal communication, Schwarz Pharma; 17 February 2003.

Ispaghula husk

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Fybogel (Reckitt Benckiser)	Granule 3.5 g/ sachet	Plain, orange or lemon flavours. No specific data on enteral tube administration are available for this preparation. Contains 16 mg aspartame/sachet. Sugar and gluten free.[2]
Isogel (Potters)	Granule 90%	No specific data on enteral tube administration are available for this preparation. Contains aspartame. Sugar and gluten free.
Ispagel Orange (LPC)	Granule 3.5 g/ sachet	No specific data on enteral tube administration are available for this preparation. Contains aspartame. Sugar and gluten free.
Regulan (Procter & Gamble)	Granule 3.5 g/ sachet	No specific data on enteral tube administration are available for this preparation. Contains aspartame.
Fybogel Hi-Fibre (Reckitt Benckiser)	Granule 3.5 g/ sachet	Lemon and orange flavours. No specific data on enteral tube administration are available for this preparation. Contains aspartame.[3]
Fybogel Mebeverine (Forum Health)	Granules in sachet 3.5 g + 135 mg	Contains ispaghula husk and mebeverine 135 mg.[4] No specific data on enteral tube administration are available for this preparation. Contains aspartame.

Site of absorption (oral administration)

Ispaghula husk is not absorbed from the GI tract; its pharmacological action is through its action as a bulking agent.[2]

Alternative routes available

Not applicable.

Interactions

No significant interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Not recommended for use via the feeding tube owing to the risk of blockage as the suspending agent begins to thicken.
- If chronic constipation is a problem, seek dietetic advice on the suitability of a fibre-enriched feed.

References

1. *BNF* 67, March 2014.
2. Fybogel (Reckitt Benckiser), Summary of Product Characteristics; January 2007.
3. Fybogel Hi-Fibre (Reckitt Benckiser), Summary of Product Characteristics; August 2009.
4. Fybogel Mebeverine (Forum Health), Summary of Product Characteristics; August 2012.

Isradipine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Prescal (Novartis)	Tablet 2.5 mg	Twice-daily dosing.[1] Solubility in water is very low.[2] No specific data on enteral tube administration are available for this preparation. Contains 74.4 mg lactose/tablet.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Detectable in plasma after 20 minutes, peak plasma concentration occurs 2 hours post dose.[3]

Alternative routes available

No alternative route is available for isradipine.

Interactions

Peak plasma concentrations are delayed by 1 hour, although total bioavailability is not affected by food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- No data are currently available; consider changing to amlodipine (see monograph).

References

1. *BNF* 67, March 2014.
2. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
3. Prescal Tablets 2.5 mg (Novartis), Summary of Product Characteristics; January 2014.

Itraconazole

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Itraconazole (Actavis, Lexon, Sandoz)	Capsule 100 mg	No specific data on enteral tube administration are available for this preparation.
Sporanox (Janssen)	Capsule 100 mg	In past experience, patients who received the contents of capsules via NG tubes indicated reduced absorption. A published report of itraconazole administration via an NG tube shows that itraconazole capsules were dissolved in cranberry juice and administered. However, this is not recommended by Janssen.[2]
Sporanox (Janssen)	Oral liquid 10 mg/mL	Pale yellow, slightly viscous liquid with pH of approximately 2. Will flush down the tube with some resistance.[3] Contains 190 microlitres sorbitol/mL.[4]
Sporanox (Janssen)	Concentrate for infusion 10 mg/mL (25 mL)	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 2 hours after oral dose of the liquid preparation in fasted patients and 2–5 hours for the capsules.[4,5]

Alternative routes available

Parenteral formulation is available and should be used if enteral absorption is compromised.

Interactions

Maximal absorption of itraconazole capsules occurs immediately after a meal. Ingestion of food increased the systemic bioavailability of itraconazole. However, impaired gastric acid secretion may reduce absorption, although this is not thought to be clinically important.[6] The liquid formulation should be taken before food; when the oral solution is taken with food the absorption is reduced by 25%.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Stop feed at least 2 hours pre-dose and flush the tube well. Use a liquid preparation undiluted. Flush tube well after dose. Do not re-start feed for at least 1 hour post-dose.
- It is possible that absorption will be reduced with administration directly into the duodenum or jejunum owing to the higher pH; there are no data to support administration via this route.
- Use the parenteral route if reduced enteral absorption is suspected or if a break in enteral feeding is not possible.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Wait for 2 hours before administering dose.
4. Draw the medication solution into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Do not restart the feed for at least 1 hour.

Alternatively, at step (4) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no data on jejunal administration. See notes above. Consider using parenteral formulation.

References

1. *BNF* 67, March 2014.
2. Personal communication, Janssen-Cilag; 22 January 2003.
3. BPNG data on file, 2004.
4. Sporanox Liquid (Janssen), Summary of Product Characteristics; July 2013.
5. Sporanox Capsules (Janssen), Summary of Product Characteristics; April 2013.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Ketamine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Ketalar (Pfizer)	Injection 10 mg/mL (20 mL vial)	Ketamine (as hydrochloride). No specific information on enteral tube administration of undiluted injection.
Ketalar (Pfizer)	Injection 50 mg/mL (10 mL vial)	Ketamine (as hydrochloride). No specific information on enteral tube administration of undiluted injection.
Ketalar (Pfizer)	Injection 100 mg/mL (10 mL vial)	Ketamine (as hydrochloride). No specific information on enteral tube administration of undiluted injection.
Extemporaneous preparation	Oral solution	An oral solution can be prepared by dilution of the injection with further water for injection to produce an appropriate concentration, usually 50 mg/5 mL; this solution is extremely stable[2] but is usually assigned a 7 day refrigerated shelf life based on microbiological concerns. Extemporanous preparations usually contain flavouring agents to mask the taste of ketamine, which is very bitter, this is not necessary for enteral tube administration.

Site of absorption (oral administration)

Bioavailability of ketamine given orally is less than 20%; peak levels occur approximately 30 minutes following oral adminsitration.[3]

Alternative routes available

The use of ketamine for neuropathic pain is an unlicensed indication and should be managed by specialists. Low-dose subcutaneous and intravenous infusions have been used in pain management but should be under the supervision of specialists.

Interactions

No interaction with food documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use oral solution.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the required dose into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

No specific information is available on jejunal administration of ketamine.

References

1. *BNF* 67, March 2014.
2. Gupta Vishnu D. Stability of ketamine hydrochloride injection after reconstitution in water for injection and storage in 1 mL tuberculin polypropylene syringes for pediatric use. *Int J Pharm Compound* 2002; Jul/Aug: 316–317.
3. Grant IS, Nimmo WS, Clements JA. Pharmacokinetics and analgesic effects of i.m. and oral ketamine. *Br J Anaesth* 1981; 53: 805–810.

Ketoconazole

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Nizoral (Janssen)	Tablet 200 mg	Tablets discontinued in the EU, but are available on special request for Cushing's syndrome. Tablets disperse in 10 mL of water within 2 minutes to give a very fine dispersion that flushes easily via an 8Fr NG tube without blockage.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs approximately 2 hours after oral dosing.[3]

Ketoconazole requires an acidic pH for optimal absorption. Therefore, jejunal administration or administration in post-gastrectomy patients is likely to result in decreased bioavailability.[4]

Alternative routes available

None available for ketoconazole. Other antifungals are available in parenteral formulations.[1]

Interactions

The specific interaction with food is poorly defined, with conflicting data in the literature.[5] The data sheet recommends taking ketoconazole with food to increase absorption;[3] however, as continuous feeding may cause a pH buffering effect in the stomach, it may be prudent to withhold feed for 2 hours following the dose as recommended for acid-neutralising medicines.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Change to an alternative oral antifungal preparation (see MHRA press release and EMA safety warning).[6,7]
- If used for Cushing's syndrome: disperse the tablets in water immediately prior to administration.[8]

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Wait 30 minutes before administering dose.
4. Place the tablet in the barrel of an appropriate size and type of syringe.
5. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
6. Flush the medication dose down the feeding tube.
7. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
8. Finally, flush with the recommended volume of water.
9. Do not re-start feed for at least 2 hours.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Not suitable for jejunal administration. See notes above.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Nizoral (Janssen-Cilag), Summary of Product Characteristics; May 2001.
4. Adams D. Administration of drugs through a jejunostomy tube. *Br J Intensive Care* 1994; 4(1): 10–17.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
6. MHRA. *Press Release: Oral Ketoconazole-containing Medicines should no Longer be used for Fungal Infections*. London: Medicines and Healthcare products Regulatory Agency; 26 July 2013, http://www.mhra.gov.uk/NewsCentre/Pressreleases/CON297530 (accessed 9 September 2014).
7. EMA. *Press Release: European Medicines Agency Recommends Suspension of Marketing Authorisations for Oral Ketoconazole*. London: European Medicines Agency; 26 July 2013, http://www.ema.europa.eu/ema/index.jsp?curl=pages/news_and_events/news/2013/07/news_detail_001855.jsp&mid=WC0b01ac058004d5c1 (accessed 9 September 2014).
8. MHRA. *Drug Safety Updates*. *Oral Ketoconazole:Do Not Prescribe or Use for Fungal Infections – Risk of Liver Injury Outweighs Benefits*. London: Medicines and Healthcare products Regulatory Agency; August 2013, http://www.mhra.gov.uk/Safetyinformation/DrugSafetyUpdate/CON300403 (accessed 9 September 2014).

Ketoprofen

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Ketoprofen (non-proprietary)	Capsule 50 mg, 100 mg	No specific data on enteral tube administration are available for this preparation.
Orudis (Sanofi-Aventis)	Capsule 50 mg, 100 mg	Take after food.[2] No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]
Orudis (Sanofi-Aventis)	Suppository 100 mg	Bioavailability of the suppositories is comparable to the capsule preparation.[3] However, the dosage recommendation is 100 mg at night.
Oruvail (Sanofi-Aventis)	Injection 50 mg/mL (2 mL)	Injection i.m. recommended for 3 days' treatment only.[4] No specific data on enteral tube administration are available for this preparation.
Oruvail (Sanofi-Aventis)	Gel 2.5%	Only suitable for topical relief of mild musculoskeletal pain.[1]
Powergel (Menarini)	Gel 2.5%	Only suitable for topical relief of mild musculoskeletal pain.[1]
Ketoprofen (Lexon)	M/R capsule 100 mg, 200 mg	Modified-release capsules; contents must not be crushed. Not suitable for administration via an enteral tube.
Oruvail (Sanofi-Aventis)	M/R capsule 100 mg, 150 mg, 200 mg	Modified-release preparation; do not crush. Not suitable for enteral tube administration.
Ketovail (Winthrop)	M/R capsule 100 mg, 200 mg	Modified-release preparation;[5] do not crush. Not suitable for enteral tube administration.
Ketocid (Chiesi)	M/R capsule 200 mg	Modified-release preparation; do not crush. Not suitable for enteral tube administration.
Axorid (Meda)	M/R capsule 100 mg/20 mg, 200 mg/20 mg	Ketoprofen 100 mg and omeprazole 20 mg; ketoprofen 200 mg and omeprazole 20 mg. Modified-release preparation; do not crush. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 0.5–1 hour after oral dosing.[2]

Alternative routes available

Parenteral route is available; maximum course length of 3 days. Suppositories and topical gel are available; see SPC for dosing guidance.

Interactions

Food may reduce the bioavailability of ketoprofen, but this is unlikely to be clinically significant.[6] It is recommended that oral doses be taken after food to reduce the incidence of gastrointestinal side-effects.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- The rectal route can be used in the short term without dosage adjustment. However, the practicalities of the rectal route may make long-term treatment via this route inappropriate and an alternative equivalent nonsteroidal should be considered. Ibuprofen has similar anti-inflammatory properties.[1]

References

1. *BNF* 67, March 2014.
2. Orudis (Sanofi), Summary of Product Characteristics; May 2012.
3. Orudis Suppositories (Sanofi-Aventis), Summary of Product Characteristics; May 2011.
4. Oruvail i.m. Injection (Sanofi-Aventis), Summary of Product Characteristics; May 2011.
5. Ketovail (Winthrop), Summary of Product Characteristics; January 2010.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Ketorolac trometamol

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Ketorolac (non-proprietary)	Injection 30 mg/mL (1 mL)	No specific data on enteral tube administration are available for this preparation.
Toradol (Roche)	Injection 30 mg/mL (1 mL)	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 30–60 minutes after oral dosing.[2]

Alternative routes available

Parenteral route can be used.

Interactions

No oral product are now available, so this interaction is not significant.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Ketorolac is only recommended for short-term use. No oral preparations are available; therefore, either use the injection parenterally or consider changing to another suitable analgesic.

References

1. *BNF* 67, March 2014.
2. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Labetalol hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Labetalol (Lexon, Mylan)	Tablet 100 mg, 200 mg, 400 mg	Film coated. No specific data on enteral tube administration are available for this preparation.
Trandate (PharSafer, previously Celltech)	Tablet 50 mg, 100 mg, 200 mg, 400 mg	Film-coated tablet Celltech does not recommend crushing tablets for administration via a feeding tube as the tablets are film coated and may block the feeding tube.[2] Tablets do not disperse readily in water. They are difficult to crush owing to the coating, but ground tablets do disperse in water. Adequate time must be allowed for the coating to dissolve. The resulting suspension can be administered via an 8Fr NG tube without blockage.[3]
Trandate (PharSafer)	Injection 5 mg/mL (20 mL)	pH is 4. Can be given orally but has a bitter taste, which can be masked using fruit juice.[2]
Extemporaneous preparation	Suspension 10 mg/mL	*Extemporaneous labetalol suspension 10 mg/mL:* Labetalol tablets 400 mg: 3 tablets Simple syrup to 120 mL Store in refrigerator. Expiration 28 days.[4]

Site of absorption (oral administration)

Site of absorption not documented.

Alternative routes available

Parenteral route is available; see SPC for dosing guidelines.

Interactions

There is no documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to the lack of data relating to administration via enteral feeding tubes, consider changing to an alternative beta-blocker such as atenolol or propranolol (see monographs) if clinically appropriate.
- If it is not appropriate to change therapy, crush the tablets and disperse in water immediately prior to administration. Alternatively, an extemporaneous suspension can be made.

Intragastric administration

1. See notes above. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure that the total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of labetalol. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Celltech Pharmaceuticals; 31 March 2003.
3. BPNG data on file, 2005.
4. Nahata MC. Stability of labetalol hydrochloride in distilled water, simple syrup, and three fruit juices. *DICP* 1991; 25: 465–469.

Lacidipine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Motens (GSK)	Tablet 2 mg, 4 mg	Film-coated tablets.[2] Highly lipophilic drug, therefore very poorly soluble in water.[2] Light-sensitive.[2] No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 30–150 minutes post oral dose.[2]

Alternative routes available

None.

Interactions

There is no documented interaction with food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to poor solubility and light sensitivity, it is not appropriate to crush the tablets; consider changing to amlodipine (see monograph).

References

1. *BNF* 67, March 2014.
2. Motens Tablets 2 mg (GSK), Summary of Product Characteristics; September 2014.

Lacosamide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Vimpat (UCB Pharma)	Tablet 50 mg, 100 mg, 150 mg, 200 mg	Film coated. No specific data on enteral tube administration are available for this preparation.
Vimpat (UCB Pharma)	Syrup 15 mg/mL	Slightly viscous clear yellow/brown liquid. Contains sorbitol 187 mg/mL and aspartame 0.032 mg/mL.[2] Vimpat syrup has been successfully administered via gastrostomy.[3]
Vimpat (UCB Pharma)	Intravenous infusion 10 mg/mL (200 mg vial)	No data available relating to enteral administration of this preparation.

Site of absorption (oral administration)

Specific site not documented. Lacosamide is rapidly and completely absorbed following oral administration. Peak plasma levels occur 0.5–4 hours following oral administration.[2]

Alternative routes available

Intravenous infusion is licensed for 5 days of use. Dose conversion is not necessary.

Interactions

Food does not affect the rate or extent of absorption.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

Use syrup.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw required dose into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

No specific information is available on jejunal administration of lacosamide. Administer using the above method. Monitor closely for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Vimpat (UCB Pharma), Summary of Product Characteristics; March 2013.
3. Tilz C, Resch R, Hofer T, Eggers C Successful treatment of refractory convulsive status epilepticus by non-parenteral lacosamide. *Epilepsia* 2010; 51(2): 316–317.

Lactulose

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Lactulose (Lexon, Teva)	Solution 3.1–3.7 g/5 mL	Lactulose liquid is sticky and may need to be diluted with water.[2] Undiluted lactulose liquid is very difficult to flush down a fine-bore feeding tube as the viscosity is 20 times that of standard enteral feed;[3] the resistance is such that it is difficult to tell whether the tube is blocked. Dilution with 2–3 times the volume of water produces a solution that can be flushed down the tube with less resistance.[4]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Duphalac (Abbott)	Solution 3.35 g/5 mL	Can be diluted with water.[5]
Lactugal (Intrapharm)	Solution 99.9% v/v[3]	No specific data on administration via enteral tubes are available for this preparation.[6]

Site of absorption (oral administration)

Lactulose is not broken down or absorbed in the stomach or small intestine. Its site of action is locally in the colon.[6]

Alternative routes available

Not applicable.

Interactions

No significant interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Dilution with 2–3 times the volume of water immediately prior to administration will reduce the viscosity and allow the solution to pass more easily down the feeding tube.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication suspension into an appropriate size and type of syringe.
4. Draw twice the volume of water and a little air into the syringe and shake to mix thoroughly.
5. Flush the medication dose down the feeding tube.
6. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then add twice the volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

As the site of action is the colon, lactulose will have a therapeutic effect if it is delivered directly into the stomach or jejunum. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Solvay; 19 February 2003.
3. BPNG data on file, 2011.
4. BPNG data on file, 2004.
5. Dulphalac (Abbott), Summary of Product Characteristics; January 2014.
6. Lactugal (Intrapharm), Summary of Product Characteristics; December 2013.

Lamivudine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Lamivudine (Sandoz)	Tablet 100 mg	Film coated tablet.[2]
Epivir (ViiV, previously GSK)	Tablet 150 mg, 300 mg	Although there is no theoretical reason why the tablets cannot be crushed, GSK recommends using the liquid preparation in order to avoid exposure of the operator to active constituents of the crushed tablet.[3]
Epivir (ViiV previously GSK)	Oral solution 50 mg/5 mL	GSK is aware of anecdotal reports of Epivir being administered successfully via enteral feeding tubes.[2] Contains sucrose 1 g/5 mL.[3]
Zeffix (ViiV)	Tablet 100 mg	Tablet disperses in 10 mL of water within 2 minutes to give a pale orange dispersion that settles quickly but re-disperses easily and flushes via an 8Fr NG tube without blockage.[4]

With zidovudine – see Zidovudine monograph.
With abacavir and zidovudine – see Abacavir monograph.

Site of absorption (oral administration)

The specific site of absorption is not documented. Lamivudine is well absorbed orally, with peak plasma concentrations occurring within 1 hour.[4]

Alternative routes available

None available for lamivudine.

Interactions

Food delays the absorption and reduces the peak concentrations of lamivudine but does not affect bioavailability.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use oral solution for administration via the feeding tube. Alternatively, Zeffix tablets can be dispersed in water.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

1. There are no specific data on jejunal administration of lamivudine. Administer using the above method. Alternatively, the tablets can be used, following the method below. Monitor for increased side-effects or loss of efficacy. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

References

1. *BNF* 67, March 2014.
2. Lamivudine (Sandoz), Summary of Product Characteristics; June 2013.
3. Personal communication, GlaxoSmithKline; 22 January 2003.
4. BPNG data on file, 2004.
5. Epivir Oral Solution (ViiV), Summary of Product Characteristics; April 2013.

Lamotrigine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Lamotrigine (Accord, Actavis, Arrow, Aurobindo, Consilient, Teva)	Tablet 25 mg, 50 mg, 100 mg, 200 mg Dispersible tablets 5 mg, 25 mg, 100 mg	No specific data on enteral tube administration are available for these preparations. Dispersible preparation should be suitable for administration via the feeding tube.
Lamictal (GSK)	Tablet 25 mg, 5 mg, 100 mg, 200 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]
Lamictal (GSK)	Dispersible tablet 2 mg, 5 mg, 25 mg, 100 mg	The tablets should be dispersed in a minimal amount of water and taken immediately.[3] Tablets disintegrate rapidly when placed in 10 mL of water; the resulting dispersion flushes down an 8Fr NG tube without blockage.[4]

Site of absorption (oral administration)

No specific site of absorption is documented. Peak plasma concentration occurs 2.5 hours after dosing.[2]

Alternative routes available

No alternative routes for lamotrigine.

Interactions

Lamictal dispersible tablets do not interact with enteral feeds.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse dispersible/chewable tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.
- The MHRA recommends that patients should be maintained on a specific manufacturer's product.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).

7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration of lamotrigine. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Lamictal Combined Tablets (GSK), Summary of Product Characteristics; February 2013.
3. Personal communication, GSK; 22 January 2003.
4. BPNG data on file, 2004.

Lansoprazole

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Lansoprazole (Actavis, Arrow, Consilient, Lexon, Mylan, Teva)	Capsule 15 mg, 30 mg	Hard gelatin capsule containing gastroresistant granules.[2] Granules can be emptied from capsules and mixed with 10 mL of 8.4% sodium bicarbonate;[3] this has been shown to be effective when administered nasogastrically[4] and has a shelf-life of 14 days when stored in the fridge.[5]
Lansoprazole (Lexon, Teva)	Orodispersible tablet 15 mg, 30 mg	This product is **not** absorbed sublingually. No specific data on enteral tube administration are available for this preparation.
Zoton FasTab (Pfizer)	Orodispersible tablet 15 mg, 30 mg	This product is **not** absorbed sublingually. Orally dispersing gastroresistant tablets speckled with orange to dark brown gastroresistant microgranules.[6] Licensed for nasogastric tube administration.[6] FasTabs can be dispersed in 10 mL of water; the granules settle quickly but can be drawn into a syringe and administered via an 8Fr NG tube without blockage.[7] 15 mg FasTab tablet contains 15 mg lactose and 4.5 mg aspartame.[6] 30 mg FasTab tablet contains 30 mg lactose & 9 mg aspartame.[6]

Site of absorption (oral administration)

Enteric-resistant granules ensure the drug is delivered to the small intestine. Peak plasma concentration occurs 1.5–2 hours following oral dosing.[2]

Alternative routes available

No alternative route is available for lansoprazole. Parenteral route is available for esomeprazole, omeprazole and pantoprazole.

Interactions

The intake of food with lansoprazole slows down the absorption and decreases the bioavailability by about 50%; it is, therefore, recommended that lansoprazole is taken 1 hour before meals.[2,8]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- For enteral feeding tubes larger than 8Fr, the FasTab formulation can be dispersed in 10 mL of water and flushed down the feeding tube using a push–pull technique to keep the granules suspended.
- For fine-bore tubes smaller than 8Fr, dissolve the contents of the capsule in 8.4% sodium bicarbonate before administration.
- If the tube becomes blocked, lock the tube using 8.4% sodium bicarbonate to dissolve any enteric-coated granules lodged in the tube.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the FasTab tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube using a push–pull technique to keep granules suspended.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe, taking care to draw up all the enteric-coated granules. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Using capsules

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Open the capsule and pour the contents into a medicine pot.
4. Add 15 mL of sodium bicarbonate 8.4%.
5. Stir to dissolve the granules.
6. Draw into the syringe and administer via the feeding tube.
7. Add a further 15 mL of water to the medicine pot; stir to ensure that any drug remaining in the pot is mixed with water.

8. Draw up this dispersion and flush down tube. This will ensure that the whole dose is given.
9. Flush the tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Lansoprazole is absorbed in the small bowel; therefore, jejunal administration is not expected to reduce bioavailability. Administer using either of the methods above.

References

1. *BNF* 67, March 2014.
2. Lansoprazole Capsules (Actavis), Summary of Product Characteristics; May 2012.
3. Sharma VK, Vasudeva R, Howden CW. Simplified lansoprazole suspension: a liquid formulation of lansoprazole – effectively suppresses intragastric acidity when administered through a gastrostomy. *Am J Gastroenterol* 1999; 94(7): 1813–1817.
4. Taubel JJ, Sharma VK, Chiu YL, Lukasik NL, Pilmer BL, Pan WJ. A comparison of simplified lansoprazole suspension administered nasogastrically and pantoprazole administered intravenously: effects on 24-h intragastric pH. *Aliment Pharmacol Ther* 2001; 15(11): 1807–1817.
5. DiGiacinto JL, Olsen KM, Bergman KL, Hoie EB. Stability of suspension formulations of lansoprazole and omeprazole stored in amber-coloured plastic oral syringes. *Ann Pharmacother* 2000; 34: 600–605.
6. Zoton FasTab (Pfizer), Summary of Product Characteristics; June 2011.
7. BPNG data on file, 2004.
8. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Leflunomide

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Leflunomide (Lexon, Medac GmbH, Mylan, Sandoz, Winthrop, Zentiva)	Tablet 10 mg, 20 mg	Film-coated tablets. No specific data on enteral tube administration are available for this preparation. Contains lactose.[2–4]
Leflunomide (Medac GmbH)	Tablet 15 mg	Film-coated tablets. No specific data on enteral tube administration are available for this preparation. Contains lactose.[5]
Arava (Sanofi-Aventis)	Tablet 10 mg, 20 mg, 100 mg	Film-coated tablets. There is no theoretical reason why the tablets cannot be crushed. The manufacturer has no data to support this method of administration. Patients should be monitored for exaggerated or diminished response.[6] Tablets disperse if shaken in 10 mL of water for 5 minutes to form a cloudy dispersion that flushes via an 8Fr NG tube without blockage.[7] Tablets contain lactose.[8]

Site of absorption (oral administration)

Following oral administration, leflunomide is converted to the active metabolite within the GI mucosa and on first pass through the liver. Absorption is variable, with peak plasma concentrations of the active metabolites occurring between 1 and 24 hours following oral dosing.[8]

Alternative routes available

No alternative routes available.

Interactions

The effect of leflunomide is unaffected by food.[8]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data on jejunal administration of leflunomide; however, as metabolism to active metabolite occurs in the GI mucosa and liver, jejunal administration should not affect absorption. Administer using the above method. Monitor for increased side-effects and loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Leflunomide (Sandoz), Summary of Product Characteristics; January 2014.
3. Leflunomide (Zentiva), Summary of Product Characteristics; November 2013.
4. Leflunomide 10 mg (Medac GmbH), Summary of Product Characteristics; July 2013.
5. Leflunomide 15 mg (Medac GmbH), Summary of Product Characteristics; July 2013.
6. Personal communication, Aventis Pharma; 2 January 2003.
7. BPNG data on file, 2005.
8. Arava (Sanofi-Aventis), Summary of Product Characteristics; December 2012.

Lercanidipine hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Lercandipine (Arrow, Actavis, Winthrop, Zentiva)	Tablet 10 mg, 20 mg	Lercandipine (as hydrochloride). Film-coated tablets.[2–4] No specific data on enteral tube administration are available for this preparation. Congtains lactose.[2–4]
Zanidip (Recordati)	Tablet 10 mg 20 mg	Film-coated tablets.[5] No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentrations occur 1.5–3 hours post oral dose.[5] Absolute bioavailability of oral administration to fed patients is 10%.[5]

Alternative routes available

No alternative route available for lercanidipine.

Interactions

Oral availability of lercanidipine increased four fold when ingested 2 hours after a high-fat meal; for this reason lercanidipine should be taken before meals.[2–5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to lack of data and risk of variable absorption, consider changing to amlodipine (see monograph).

References

1. *BNF* 67, March 2014.
2. Lercanidipine (Actavis), Summary of Product Characteristics; March 2010.
3. Lercanidipine (Arrow), Summary of Product Characteristics; November 2013.
4. Lercanidipine (Zentiva), Summary of Product Characteristics; February 2011.
5. Zanidip (Recordati), Summary of Product Characteristics; October 2010.

Levetiracetam

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Levetiracetam (Accord, Actavis, Arrow, Aurobindo, Consilient Health, Desitin Pharma, Lexon, Mylan, Teva, Wockhardt)	Tablet 250 mg, 500 mg, 750 mg, 1000 mg	Film coated.[2,3] No data available on administration via enteral tubes are available for this preparation.
Levetiracetam (Desitin)	Granule 250 mg/sachet, 500 mg/sachet, 1000 mg/sachet	No specific data on enteral tube administration are available for this preparation.
Levetiracetam (Beacon, Consilient, Desitin Rosemont)	Oral solution 100 mg/mL	Clear liquid. May be diluted with water prior to administration. Contains 300 mg/mL maltitol.[4,5]
Levetiracetam (Actavis, Aurobindo)	Oral solution 100 mg/mL	Clear liquid. May be diluted with water prior to administration. Contains 290 mg/mL maltitol.[6]
Keppra (UCB Pharma)	Tablet 250 mg, 500 mg, 750 mg, 1000 mg	Film-coated tablets.[1] Keppra tablets are immediate release and, therefore, may be crushed and sprinkled on food or given via enteral feeding tubes. Keppra is water soluble: 1.04 g/mL at room temperature. There are no stability data on the suspension of tablets in water and therefore the suspension should be administered immediately.[7] The 500 mg tablets (only strength tested) disperse in 10 mL of water if shaken for 5 minutes. This forms a milky, even dispersion that flushes down an 8Fr NG tube without blockage.[8]
Keppra (UCB Pharma)	Oral solution 100 mg/mL	Sugar-free, clear liquid. Has a viscosity lower than standard enteral feed, can be administered under gravity.[9] Contains maltitol.[10]
Keppra (UCB Pharma)	Concentrate for infusion 100mg/mL	

Site of absorption (oral administration)

Specific site of absorption is not documented. Oral bioavailability is close to 100% and peak plasma concentration occurs at 1.3 hours post dose.[7]

Alternative routes available

No alternative routes for levetiracetam. Parenteral infusion is available, no dose adjustment is necessary when switching between routes.

Interactions

The extent of absorption is unaffected by food; the rate is slightly decreased.[7]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid preparation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to the jejunal administration of levetiracetam. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Levetiracetam Tablets (Consilient Health), Summary of Product Characteristics; July 2011.
3. Levetiracetam Tablets (Actavis), Summary of Product Characteristics; January 2014.
4. Levetiracetam Liquid (Consilient Health), Summary of Product Characteristics; July 2011.
5. Levetiracetam Liquid (Beacon), Summary of Product Characteristics; November 2012.
6. Levetiracetam Liquid (Actavis), Summary of Product Characteristics; December 2013.
7. Keppra (UCB), Summary of Product Characteristics; January 2014.
8. BPNG data on file, 2004.
9. BPNG data on file, 2011.
10. Keppra Liquid (UCB), Summary of Product Characteristics; January 2014.

Levocetirizine hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Levocetirizine (Actavis, Consilient Health, Lexon, Mylan, Teva)	Tablet 5 mg	Film-coated.[2] No specific data on enteral tube administration are available for this preparation.
Xyzal (UCB Pharma)	Tablet 5 mg	Film-coated tablet.[3] No specific data on enteral tube administration are available for this preparation.
Xyzal (UCB Pharma)	Oral solution 2.5 mg/5 mL	Sugar-free oral solution. Can be diluted with water immediately before use.[4] Solution flushes easily via 8Fr tube without resistance or blockage.[5] Contains maltitol 0.4 mg/mL.[4]

Site of absorption (oral administration)

Specific site of absorption not documented. Peak plasma levels occur 0.9 hours following oral dosing.[2–4]

Alternative routes available

No alternative route available for levocetirizine; parenteral route available for chlorphenamine.

Interactions

Food delays the absorption but does not affect the total bioavailability of levocetirizine.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid preparation.

Intragastric administration

1. Stop enteral feed.
2. Flush enteral feeding tube with the recommended volume of water.
3. Draw the oral solution into the appropriate size and type of enteral syringe.
4. Flush medication dose down feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

No specific data are available.

References

1. *BNF* 67, March 2014.
2. Levocitirizine (Actavis), Summary of Product Characteristics; July 2011.
3. Xyzal Tablets (UCB Pharma), Summary of Product Characteristics; January 2012.
4. Xyzal Oral Solution (UCB Pharma), Summary of Product Characteristics, January 2012.
5. BPNG data on file, 2010.

Levodopa

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Co-beneldopa (benserazide/levodopa)		
Co-beneldopa (Beserazide/levodopa) (Lexon, Teva)	Capsule '62.5', '125', '250'	Capsule '62.5' contains 12.5 mg benserazide and 50 mg levodopa; '125' contains 25 mg benserazide and 100 mg levodopa; '250' contains 50 mg benserazide and 200 mg levodopa. No specific data on enteral tube administration are available for this preparation.
Madopar (Roche)	Capsule '62.5', '125', '250'	Capsule '62.5' contains 12.5 mg benserazide and 50 mg levodopa; '125' contains 25 mg benserazide and 100 mg levodopa; '250' contains 50 mg benserazide and 200 mg levodopa. There are no stability data available for opening the capsules and dispersing in water; the dispersible tablets should be used.[2]
Madopar (Roche)	Dispersible tablet '62.5', '125'	Capsule '62.5' contains 12.5 mg benserazide and 50 mg levodopa; '125' contains 25 mg benserazide and 100 mg levodopa. Tablets disperse in 10 mL of water within 2 minutes to give a cloudy white dispersion that flushes via an 8Fr NG tube without blockage.[2]
Madopar CR (Roche)	Capsule '125'	Capsule '125' contains 25 mg benserazide and 100 mg levodopa. Modified-release capsules; do not crush. Not suitable for enteral tube administration.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Co-careldopa (carbidopa/levodopa)		
Co-carldopa (Accord, Lexon)	Tablet 10 mg/100 mg, 25 mg/100 mg	Carbidopa 10 mg and levodopa 100 mg; carbidopa 25 mg and levodopa 100 mg. No specific data on enteral tube administration are available for this preparation.
Sinemet-62.5 (MSD)	Tablet 12.5 mg/50 mg	Carbidopa 12.5 mg and levodopa 50 mg. Tablets disperse readily when placed in 10 mL of water to form a pale yellow dispersion that settles quickly but flushes via an 8Fr NG tube without blockage. Care must be taken to administer whole dose owing to the tendency for settlement to the bottom of the container/syringe.[2]
Sinemet-110 (MSD)	Tablet 10 mg/100 mg	Carbidopa 10 mg and levodopa 100 mg. Tablets disperse readily when placed in 10 mL of water to form a bright blue dispersion that settles quickly but flushes via an 8Fr NG tube without blockage. Care must be taken to administer whole dose owing to the tendency for settlement to the bottom of the container/syringe.[2]
Sinemet-Plus (MSD)	Tablet 25 mg/100 mg	Carbidopa 25 mg and levodopa 100 mg. Tablets disperse readily when placed in 10 mL of water to form a bright yellow dispersion that settles quickly but flushes via an 8Fr NG tube without blockage. Care must be taken to administer whole dose owing to the tendency for settlement to the bottom of the container/syringe.[2]
Sinemet-275 (MSD)	Tablet 25 mg/250 mg	Carbidopa 25 mg and levodopa 250 mg. Tablets disperse readily when placed in 10 mL of water to form a pale blue dispersion that settles quickly but flushes via an 8Fr NG tube without blockage. Care must be taken to administer whole dose owing to the tendency for settlement to the bottom of the container/syringe.[2]
Half Sinemet CR (MSD)	Tablet 25 mg/100 mg	Carbidopa 25 mg and levodopa 100 mg. Modified-release tablets. Do not crush; not suitable for administration via enteral feeding tube.
Sinemet CR (MSD)	Tablet 50 mg/200 mg	Carbidopa 50 mg and levodopa 200 mg. Modified-release tablets. Do not crush. Not suitable for administration via enteral feeding tube.
Adodespan (Accord)	Tablet 50 mg/200 mg	Carbidopa 50 mg and levodopa 200 mg. Prolonged release; do not crush. Not suitable for enteral tube administration.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Lecado (Sandoz)	Tablet 25 mg/100 mg, 50 mg/200 mg	Carbidopa 25 mg and levodopa 100 mg; carbidopa 50 mg and levodopa 200 mg. Modified-release tablets; do not crush. Not suitable for enteral tube administration.
Duodopa (AbbVie)	Intestinal gel 5 mg/20 mg per mL	Carbidopa 5 mg/mL and levodopa 20 mg/mL. Licensed for enteral tube administration, using a portable pump.[3]

Site of absorption (oral administration)

Levodopa is absorbed by the active transport system normally responsible for the absorption of large neutral amino acids in the upper small bowel.[4,5] Time to reach peak plasma concentrations of levodopa varies widely between individuals but peak concentrations generally occur within 2 hours of oral dosing.[6]

Alternative routes available

None available for levodopa. Apomorphine is available as a parenteral formulation.

Interactions

Protein in the diet and in the circulating system competes with levodopa for absorption and transport into the brain. Diets that do not exceed 0.8 g/kg of protein are reported to eliminate this problem. Timing of feed and dosing of levodopa should be as consistent as possible to reduce fluctuations in daily response.[7] Administration after food delays the time to peak plasma concentration and reduces total bioavailability.[8]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Ensure that enteral diet is optimised and that, if appropriate, protein content does not exceed 0.8 g/kg.
- Use Madopar dispersible tablets or disperse Sinemet tablets in water immediately prior to administration.
- For patients on modified-release preparations, convert to dispersible tablets and increase dosing frequency.
- Duodopa is only to be used for the treatment of advanced levodopa-responsive Parkinson's disease with severe motor fluctuations and hyperdyskinesia when available combinations of Parkinson medicinal products have not given satisfactory results.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to dissolve, shaking if necessary.
5. Flush the medication dose down the feeding tube.

6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to dissolve. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Bioavailability should be unaffected by jejunal delivery of levodopa; time to peak may be shorter. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Duodopa (AbbVie), Summary of Product Characteristics; October 2013.
4. Lennernas H, Nilsson D, Aquilonius SM, Ahrenstedt O, Knutson L, Paalzow LK The effects of L-leucine on the absorption of levodopa, studied by regional jejunal perfusion in man. *Br J Clin Pharmacol* 1993; 35(3): 243–250.
5. BPNG data on file, 2004.
6. Madopar Dispersible Tablets (Roche), Summary of Product Characteristics; December 2012.
7. Personal communication, Roche; 6 February 2003.
8. Baruzzi A, Contin M, Riva R, *et al*. Influence of meal ingestion time on pharmacokinetics of orally administered levodopa in parkinsonian patients. *Clin Neuropharmacol* 1987; 10(6): 527–537.

Levofloxacin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Levofloxacin (Accord, Actavis, Beacon, Lexon, Mylan, Teva)	Tablet 250 mg, 500 mg	Levofloxacin (as hemihydrate).[2] Film-coated tablets. No specific data on enteral tube administration are available for this preparation. Actavis brand contains lactose.[2]
Levofloxacin (Actavis, Beacon, Hospira)	Infusion 5 mg/mL	No specific data on enteral tube administration are available for this preparation.
Tavanic (Sanofi-Aventis)	Tablet 250 mg, 500 mg	Levofloxacin (as hemihydrate). Film-coated tablets.[3] Tablets do not disperse readily in water. The tablet can be crushed, but the flaky coating makes crushing difficult. It takes a few minutes for the coating to dissolve when mixed with water. The tablet then forms a milky dispersion that flushes via an 8Fr NG tube without blockage.[4]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Extemporaneous preparation	Suspension 50 mg/mL	*Extemporaneous levofloxacin suspension 50 mg/mL:* Levofloxacin tablets 500 mg: 10 tablets Ora-plus 50%/Strawberry syrup 50% to 100 mL Store in a refrigerator; expiration 57 days.[5]
Tavanic (Sanofi-Aventis)	Infusion 5 mg/mL	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs within 1–2 hours of oral dosing.[3]

Alternative routes available

Parenteral route is available.

Interactions

There is a documented *in-vitro* interaction between levofloxacin and Ensure, resulting in decreased plasma concentration,[6] although there are no *in-vivo* data.[7]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- For serious infections use the parenteral formulation.
- As the tablets do not disperse readily in water, consider changing to an alternative antibiotic available in a liquid or dispersible tablet formulation.
- When continued therapy with oral levofloxacin is essential use the extemporaneous preparation or liquid 'special' if available; consider using the higher end of the dose range.
- Stop feed 1 hour before dose and restart feed 2 hours after dose.

Intragastric administration

See notes above. NB: Tablet crushing in an open device such as a tablet crusher or pestle and mortar can result in a 15-25% reduction in the dose delivered.

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Wait for at least 1 hour.
4. Place the tablet in a mortar and crush to a fine powder using the pestle.
5. Add a few millilitres of water and mix to form a paste.
6. Add up to 15 mL of water and mix thoroughly, ensuring that there are no visible lumps of tablet.
7. Draw this into an appropriate size and type of syringe.

8. Flush the medication dose down the feeding tube.
9. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure that the total dose is administered).
10. Finally, flush the enteral feeding tube with the recommended volume of water.
11. Wait for 2 hours before re-starting the feed.

Intrajejunal administration

There are no specific data on jejunal administration of levofloxacin. Consider an alternative antibiotic. Administer using the above method; use the higher end of dose range. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Levofloxacin (Actavis), Summary of Product Characteristics; November 2011.
3. Tavanic (Sanofi-Aventis), Summary of Product Characteristics; July 2013.
4. BPNG data on file, 2005.
5. Van den Bussche HL, Johnson CE, Fontana EM, Meram JM. Stability of levofloxacin in an extemporaneously compounded oral liquid. *Am J Health Syst Pharm* 1999; 56(22): 2316–2318.
6. Wright DH, Pietz SL, Konstantinides FN, Rotschafer JC. Decreased in vitro fluoroquinolone concentrations after admixture with an enteral feeding formulation. *JPEN J Parenter Enteral Nutr* 2000; 24(1): 42–48.
7. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Levomepromazine (Methotrimeprazine)

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Nozinan (Sanofi-Aventis, previously Link)	Tablet 25 mg	Levomepromazine (as maleate).[2] Tablets disperse within 2 minutes when placed in 10 mL of water to give a coarse dispersion; some of the larger particles break up when drawn into the syringe. The dispersion flushes via an 8Fr NG tube without blockage, although it is likely to block finer tubes.[3]
Nozinan (Sanofi-Aventis, previously Link)	Injection 25 mg/mL	Levomepromazine (as hydrochloride). pH 4.0–5.0. Can be administered orally if necessary.[4]

Site of absorption (oral administration)

There is no specific information on the site of absorption of levomepromazine.[4] Peak plasma concentration occurs 1–3 hours following oral dosing.[5]

Alternative routes available

Parenteral route is available; can be administered by i.v., i.m. or s.c. injection.

Interactions

There is no documented interaction with food or enteral feed.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to dosing.
- A prolonged break in feeding is not required.
- Alternatively, use the parenteral route.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to dissolve, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to dissolve. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There is no specific information relating to jejunal administration of levomepromazine. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Nozinan (Sanofi-Aventis), Summary of Product Characteristics; December 2011.
3. BPNG data on file, 2005.
4. Personal communication, Link Pharmaceuticals; 4 February 2003.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Levothyroxine sodium

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Levothyroxine (Actavis, Amdipharm, Teva, Wockhardt)	Tablet 25 micrograms, 50 micrograms, 100 micrograms	Tablets can be crushed.[2] Care should be taken to avoid third-party contact.[3] Tablets disperse in 10 mL of water if shaken for 3–5 minutes to give a fine dispersion that flushes via an 8Fr NG tube without blockage.[4]
Levothyroxine Solution (Amdipharm, Lexon, Teva)	Oral solution 25 micrograms/5 mL, 50 micrograms/5 mL, 100 micrograms/5 mL.	No specific data on enteral tube administration are available for this preparation.
Evotrox (Almus)	Oral solution 25 micrograms/5 mL, 50 micrograms/5 mL 100 micrograms/5 mL.	No specific data on enteral tube administration are available for this preparation. All strengths were re-formulated in 2010, leading to an increase in potency of 10%; the manufacturer recommends increased monitoring of patients on these preparations.[1]
Levothyroxine Sodium (Rosemont)	Oral solution 20 micrograms/mL, 25 micrograms/mL	Unlicensed preparation. Slightly thicker than water.[5] No specific data on enteral tube administration are available for this preparation.
Extemporaneous preparation[6]		*Extemporaneous levothyroxine suspension 25 micrograms/mL:* Levothyroxine tablets 100 micrograms: 30 tablets Glycerol: 48 mL Sterile water for irrigation to 120 mL Label 'Shake well before use'. Store in refrigerator; 8-day expiry.

Site of absorption (oral administration)

Specific site of absorption is not documented. Some enterohepatic recirculation occurs.[7]

Alternative routes available

Anecdotal evidence exists for rectal administration of levothyroxine. Liothyronine injection is available for parenteral use when the oral route is not appropriate.

Interactions

There is no documented interaction with food.

Health and safety

Inhalation of crushed tablets should be avoided. Standard precautions apply.

Suggestions/recommendations

- Use the oral solution, or
- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

For oral solution

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication dose into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

For dispersed tablets

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to dissolve. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

No specific data. Administer using the above method.[7]

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma (now Actavis); 21 January 2003.
3. Personal communication, Celltech; 31 March 2003.
4. BPNG data on file, 2004/5.
5. Rosemont. Levothyroxine Sodium www.rosemontpharma.com/products/endocrine-system/levothyroxine-sodium-59 (accessed 20 February 2014).
6. Boulton DW, Fawcett P, Woods DJ. Stability of an extemporaneously compounded levothyroxine sodium oral liquid. *Am J Health Syst Pharm* 1996; 52: 1157–1161.
7. Levothyroxine (Celltech), Summary of Product Characteristics; October 2001.

Linezolid

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Zyvox (Pharmacia)	Tablet 600 mg	Film coated. No specific data on enteral tube administration are available for this preparation.
Zyvox (Pharmacia)	Suspension 100 mg/5 mL	Powder for reconstitution, 150 mL. Contains sucrose as base; contains sorbitol as additional sweetener only.[2] Also contains 500 mg mannitol/5 mL and 1.7 mg/mL sodium. The suspension has been delivered to patients via enteral tube without a reduction in bioavailability.[3]
Zyvox (Pharmacia)	Intravenous infusion 2 mg/mL	Not suitable for enteral tube administration.

Site of absorption (oral administration)

Absorption begins in the stomach although the majority of absorption takes place in the small intestine, so full absorption may not occur if linezolid is delivered directly into the jejunum.[4]

Alternative routes available

Parenteral route is available.

Interactions

Bioavailability is not affected by food.[3] As a reversible non-selective inhibitor of monoamine oxidase, patients on diets containing greater than 100 mg tyramine per meal may experience a pressor response, leading to raised blood pressure. Enteral feed contents should be checked for tyramine content.[2,5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid formulation.
- A prolonged break in feeding is not required.
- It is possible that absorption may be reduced following intrajejunal administration.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.

3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

See notes above. Consider monitoring plasma concentration or using parenteral therapy.

References

1. *BNF* 67, March 2014.
2. Zyvox (Pharmacia), Summary of Product Characteristics; October 2013.
3. Beringer P, Nguyen M, Hoem N *et al*. Absolute bioavailability and pharmacokinetics of linezolid in hospitalized patients given enteral feedings. *Antimicrob Agents Chemother* 2005; 49(9): 3676–3681.
4. Personal communication, Pharmacia; 11 March 2003.
5. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Lisinopril

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Lisinopril (Accord, Actavis, Aurobindo, Mylan, Sandoz, Zentiva)	Tablet 2.5 mg, 5 mg, 10 mg, 20 mg, 30 mg, 40 mg	Lisinopril (as dihydrate). No specific data on enteral tube administration are available for this preparation.
Lisinopril (Ranbaxy)	Tablet 2.5 mg, 5 mg, 10 mg, 20 mg	All tablets disperse in 10 mL of water within 2 minutes to give a very fine dispersion that flushes easily via an 8fr NG tube.[2]
Zestril (AstraZeneca)	Tablet 2.5 mg, 5 mg, 10 mg, 20 mg	Lisinopril (as dihydrate).[3] No specific data on enteral tube administration are available for this preparation. Contains mannitol.[3]

Formulations available[1] (*continued*)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Lisinopril (Rosemont)	Oral solution 5 mg/5 mL	Unlicensed special. Watery liquid which in theory should be able to be administered via an enteral feeding tube, but it has not been tested.[4]
Lisinopril (extemporaneous preparation)	Suspension 2 mg/mL	*Extemporaneous lisinopril syrup 2 mg/mL:* Lisinopril 5 mg tablet: 48 tablets Sterile water for irrigation: 5 mL Simple syrup to 120 mL Grind the tablets and add water to form a paste, then gradually add syrup to form a suspension. Store at room temperature or refrigerate. 30-day shelf-life.[5]
Carace Plus (Bristol-Myers Squibb)	Tablet 20 mg/12.5 mg	Lisinopril 20 mg and hydrochlorothiazide 12.5 mg. Lisinopril is soluble 1:10 to 1:30 of water.[6] No specific data on enteral tube administration are available for this preparation.
Zestoretic (AstraZeneca)	Tablet '10' 10 mg/12.5 mg, '20' 20 mg/12.5 mg	Tablet '10' contains lisinopril 10 mg and hydrochlorothiazide 12.5 mg; '20' contains (lisinopril 20 mg and hydrochlorothiazide 12.5 mg. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration of lisinopril occurs within 7 hours of oral dosing.[3]

Alternative routes available

None available.

Interactions

Absorption is unaffected by food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use 'special' liquid preparation or disperse tablets in water immediately prior to administration.
- A prolonged break in feeding is not necessary.

Intragastric administration

Instructions for administration of liquid formulations. For tablet formulations see method below.

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to the jejunal administration of lisinopril. Owing to the higher osmolarity of liquid preparations, it is recommended that the tablets be used for jejunal administration.

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to dissolve, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to dissolve. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Zestril (AstraZeneca), Summary of Product Characteristics; December 2013.
4. Rosemont. Lisinopril Oral Solution-60, www.rosemontpharma.com/products/cardiovascular-system/lisinopril-oral-solution-60 (accessed 20 February 2014).
5. Webster A, English B, Rose D. The stability of lisinopril as an extemporaneous syrup. *Int J Pharm Compound* 1997; 1: 352–353.
6. Personal communication, Bristol-Myers Squibb; 24 January 2004.

Lithium

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Camcolit (Norgine)	Tablet 250 mg, 400 mg	Lithium (as carbonate). Film-coated, 400 mg are modified-release tablets; do not crush. Not suitable for enteral tube administration.
Liskonium (GSK)	Tablet 450 mg	Lithium (as carbonate). Film-coated, modified-released tablets; do not crush. Not suitable for enteral tube administration.
Priadel (Sanofi-Aventis)	Tablet 200 mg, 400 mg	Lithium (as carbonate). Film-coated, modified-released tablets; do not crush. Not suitable for enteral tube administration.
Li-Liquid (Rosemont)	Solution 509 mg/5 mL, 1.018 g/5 mL	Lithium (as citrate tetrahydrate).[2] Sorbitol 0.4 g/5 mL. Yellow moderately viscous liquid, slightly thicker than water. Flushes via 6Fr tube with some resistance. Mixes easily with an equal volume of water.[3]
Priadel (Sanofi-Aventis)	Solution 520 mg/5 mL	Lithium (as citrate tetrahydrate). Sugar-free. Dilution of Priadel liquid is not recommended.[4] Contains 96% ethanol 0.26 mL/5 mL.[5]

Site of absorption (oral administration)

Lithium is readily and completely absorbed from the GI tract.[7] Lithium is absorbed in both the jejunum and the ileum, but not the colon.[6] Peak levels occur 1.5 hours following oral administration of the liquid preparation.[4]

Alternative routes available

There are no alternative routes available for lithium.

Interactions

There is no reported interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid formulation.
- Convert dose from solid formulations, lithium carbonate 200 mg = lithium citrate 509 mg.

- Give in two divided doses.
- Monitor levels 4–5 days following formulation change.[2]
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop enteral feed.
2. Flush enteral feeding tube with the recommended volume of water.
3. Draw the solution into the appropriate size and type of syringe.
4. Flush medication dose down feeding tube.
5. Draw another 10 mL of water into the syringe and also flush this via feeding tube (this will rinse syringe and ensure total dose is administered).
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

No specific data relating to jejunal administration of lithium. Administer using the above method, monitor levels and adjust accordingly.

References

1. *BNF* 67, March 2014.
2. Li-Liquid (Rosemont), Summary of Product Characteristics; June 2013.
3. BPNG data on file, 2009.
4. Priadel (Sanofi-Aventis), Summary of Product Characteristics; January 2014.
5. Personal communication, Sanofi Aventis; 20 January 2009.
6. Diamond JM, Ehrlich BE, Morawski SG, Santa Ana CA, Fordtran JS. Lithium absorption in tight and leaky segments of the intestine. *J Membr Biol* 1983; 72(1–2): 153–159.
7. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Lofepramine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Lofepramine (Arrow, Lexon, Mylan, Teva)	Tablet 70 mg	Lofepramine (as hydrochloride). No specific data on enteral tube administration are available for this preparation.
Lomont (Rosemont)	Oral suspension 70 mg/5 mL	Lofepramine (as hydrochloride).[2] Pale yellow, cloudy suspension. Quite viscous and difficult to flush. Mixes well with an equal volume of water, which reduces flushing resistance.[3] Sugar-free suspension, contains sorbitol 1.36 g/5 mL.[4]
Gamanil (Merck)	Tablet 70 mg	Lofepramine (as hydrochloride). Film-coated tablets. Gamanil tablets are coated but can be crushed.[5]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1 hour following oral dosing.[5]

Alternative routes available

No alternative routes for lofepramine.

Interactions

No specific interaction with food is documented.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the suspension formulation, shake well before use.
- Dilute with an equal volume of water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to the jejunal administration of lofepramine. Administer as above and monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Lomont (Rosemont), Summary of Product Characteristics; September 2013.
3. Personal communication, Rosemont; 20 January 2005.
4. BPNG data on file, 2004.
5. Personal communication, Merck; 23 January 2003.

Loperamide hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Loperamide (Boots, Lexon, McNeil, SSL International, Teva, Wockhardt)	Capsule 2 mg	No specific data on enteral tube administration are available for this preparation.
Loperamide (non-proprietary)	Tablet 2 mg	No specific data on enteral tube administration are available for this preparation.
Imodium (Janssen-Cilag)	Syrup 1 mg/5 mL	Sugar-free. Loperamide syrup can be given undiluted into the small bowel.[2] Imodium liquid is not viscous and draws into a syringe and flushes down an NG tube without resistance; the liquid mixes well with water and flushes easily.[3]

Site of absorption (oral administration)

Imodium is absorbed in the gut and acts by binding to the mu receptors all along the gut.[2] Owing to its high affinity for the gut wall and its high first-pass metabolism, very little loperamide reaches the systemic circulation.[4]

Alternative routes available

No alternative routes available for loperamide.

Interactions

There is no documented interaction with food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation undiluted. Flush well after dosing. Alternatively, the tablets can be used without risk of blockage, although efficacy is unknown.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into the syringe with appropriate adapter for tube connector. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Jejunal administration will not affect the therapeutic response to loperamide. However, owing to the potential osmotic effect of the liquid preparation, it may be appropriate to further dilute the dose with water immediately prior to administration.

References

1. *BNF* 67, March 2014.
2. Personal communication, Janssen-Cilag; 22 January 2003.
3. BPNG data on file, 2004.
4. Imodium (Janssen-Cilag), Summary of Product Characteristics; September 2012.

Lopinavir with ritonavir

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Kaletra (AbbVie)	Tablet 100 mg/25 mg	Contains lopinavir 100 mg and ritonavir 25 mg Film coated. No specific data on enteral tube administration are available for this preparation.
Kaletra (AbbVie)	Tablet 200 mg/50 mg	Contains lopinavir 200 mg and ritonavir 50 mg Film coated. No specific data on enteral tube administration are available for this preparation.
Kaletra (AbbVie)	Oral solution 400 mg/100 mg/ 5 mL	Contains lopinavir 400 mg and ritonavir 100 mg per 5 mL. Contains 42% alcohol and propylene glycol 153 mg/mL. Slightly viscous liquid.

Site of absorption (oral administration)

Specific site of absorption is not documented.

Alternative routes available

No alternative route available for lopinavir.

Interactions

Fat significantly enhances absorption of lopinavir; dose should be taken with meals – preferably a high-fat meal.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Although data are limited, there are concerns that absorption may be reduced if administered via an enteral feeding tube.[3]
- Use liquid preparation; monitor therapy closely for loss of efficacy.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the required volume of liquid medication into the syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

A case report indicates that Kaletra may not be absorbed when administered via jejunostomy tube.[4]

References

1. *BNF* 67, March 2014.
2. Kaletra 80 mg/20 mg Oral Solution (AbbVie), Summary of Product Characteristics; December 2013.
3. King JR, Yogev R, Aldrovandi G, Chadwick E, Acosta EP. Pharmacokinetics of antiretrovirals administered to HIV-infected children via gastrostomy tube. *HIV Clin Trials* 2004; 5(5): 288–293.
4. Kamimura M, Watanabe K, Kobayakawa M, *et al*. Successful absorption of antiretroviral drugs after gastrojejunal bypass surgery following failure of therapy through a jejunal tube. *Intern Med* 2009; 48: 1103–1104.

Loratadine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Loratadine (Actavis, Boots, Lexon, Teva)	Tablet 10 mg	No specific data on enteral tube administration are available for this preparation.
Loratidine (Boots, Sandoz)	Orodispersible tablet 10 mg	Tablets are **not** absorbed through the oral mucosa. No specific data on enteral tube administration are available for this preparation.
Loratadine (Lexon, Mylan, Pinewood, Teva, Wockhardt)	Syrup 5 mg/5 mL	No specific data on enteral tube administration are available for this preparation. However, no problem is envisaged with enteral tube administration of this preparation.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Clarityn (MSD)	Tablet 10 mg	No specific data on enteral tube administration are available for this preparation.
Clarityn (MSD)	Syrup 5 mg/5 mL	Contains sucrose 3 g/5 mL;[2] does not contain sorbitol.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1 hour following oral administration.[2]

Alternative routes available

No alternative route of administration is available for loratadine. A parenteral formulation is available for chlorphenamine.

Interactions

No specific interaction with food is documented.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation. Dilute with an equal volume of water prior to jejunal administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to the jejunal administration of loratadine. Administer using the above method. Consider further dilution of the liquid immediately prior to administration to reduce osmolarity. Monitor for loss of effect or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Clarytin (MSD), Summary of Product Characteristics; January 2014.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Lorazepam

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Lorazepam (Genus, Lexon, Mylan, Teva)	Tablet 1 mg, 2.5 mg	Tablets can be crushed. Tablets can also be administered sublingually.[2,3]
Lorazepam (Rosemont)	Oral solution 0.5 mg/5 mL, 1 mg/5 mL	Unlicensed 'special'.[4] Watery liquid, which should be suitable for enteral tube administration, but this preparation has not been tested.
Ativan (Pfizer)	Injection 4 mg/mL	Injection can be used sublingually.

Site of absorption (oral administration)

Specific site of absorption is not documented. Following oral administration, peak plasma concentration occurs after 2 hours.[4] Lorazepam is also absorbed sublingually.

Alternative routes available

Parenteral route is available. Injection and tablets can also be used sublingually.[2,3]

Interactions

Specific interaction with food is not documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation if available, or change to an alternative therapy available as a liquid preparation if clinically appropriate; both diazepam and temazepam are available in liquid formulation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw medication solution into an appropriate size and type of syringe.

4. Flush medication dose down the feeding tube.
5. Finally, flush the enteral feeding tube with the recommended volume of water.
6. Re-start the feed.

Intrajejunal administration

There are no specific data on jejunal administration of lorazepam. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Ghanchi FD, Khan MY. Sublingual lorazepam as premedication in peribulbar anesthesia. *J Cataract Refract Surg* 1997; 23(1): 1581–1584.
3. Grennblatt DJ, Divoll M, Harmatz JS, Shader RI. Pharmacokinetic comparison of sublingual lorazepam with intravenous, intramuscular, and oral lorazepam. *J Pharm Sci* 1982; 71(2): 248–252.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Losartan potassium

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Losartan (Dexcel, Lexon)	Film-coated tablet 12.5 mg, 25 mg, 50 mg, 100 mg	Film coated. No specific data on enteral tube administration are available for this preparation.[2]
Losartan Potassium (Actavis, Sandoz, Teva)	Film-coated tablet 25 mg, 50 mg, 100 mg	Film coated. No specific data on enteral tube administration are available for this preparation.[3,4]
Losartan Potassium (Rosemont)	Oral suspension 50 mg/5 mL	Unlicensed product. Thick liquid.[5] No specific data on enteral tube administration are available for this preparation. Contains ethanol 8.4 mg/5 mL.
Cozaar (MSD)	Tablet 25 mg, 50 mg, 100 mg	Film-coated tablets.[6] Tablets do not disperse readily in water, but crush easily and mix with 10 mL of water to form a fine suspension that flushes down an 8Fr NG tube without blockage.[7] Contains lactose.[6]
Cozaar (MSD)	Powder and solvent for oral suspension 2.5 mg/mL	No specific data on enteral tube administration are available for this preparation. Contains sorbitol 50.6 mg/mL and lactose 1.275 mg/mL.[8]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Cozaar-Comp (MSD)	Tablet 50 mg/ 12.5 mg	Tablet contains losartan 50 mg and hydrochlorothiazide 12.5 mg. Film-coated tablets.[9] No specific data on enteral tube administration are available for this preparation. Contains lactose.[9]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentrations of losartan are reached within 1 hour of oral dosing.[2,6] Systemic bioavailablity is 33% of the tablets.[6]

Alternative routes available

No other routes of administration are available for any of the angiotensin II antagonists.

Interactions

Food does not affect absorption of losartan.[6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- If the route of administration is likely to be long term, consider changing to irbesartan (see monograph) owing to lack of data and poor dispersion characteristics.
- If continued therapy with losartan is indicated, the tablets can be crushed and mixed with water immediately prior to administration or use the oral suspension.
- A prolonged break in feeding is not required.

Intragastric administration

1. See notes above.
2. Stop the enteral feed.
3. Flush the enteral feeding tube with the recommended volume of water.
4. Place the tablet in a mortar and crush to a fine powder using the pestle.
5. Add a few millilitres of water and mix to form a paste.
6. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
7. Draw this into an appropriate size and type of syringe.
8. Flush the medication dose down the feeding tube.
9. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure that the total dose is administered).
10. Finally, flush the enteral feeding tube with the recommended volume of water.
11. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of losartan. Use the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Losartan (Dexcel), Summary of Product Characteristics; October 2010.
3. Losartan Potassium (Actavis), Summary of Product Characteristics; January 2011.
4. Losartan Potassium (Sandoz), Summary of Product Characteristics; March 2011.
5. Rosemont. Losartan Potassium Oral Suspension-99, www.rosemontpharma.com/products/cardiovascular-system/losartan-potassium-oral-suspension-99 (accessed 22 February 2014).
6. Cozaar (MSD), Summary of Product Characteristics; June 2012.
7. BPNG data on file, 2004.
8. Cozaar Oral Suspension (MDS), Summary of Product Characteristics; June 2012.
9. Cozaar-Comp (MSD), Summary of Product Characteristics; January 2012.

Macrogols

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Movicol (Norgine)	Oral powder 13.125 g/sachet	Macrogol 3350. Norgine has anecdotal reports of Movicol being administered via enteral feeding tubes, but does not have specific data.[2] Sachet dissolves in 125 mL of water to give a clear solution that draws up easily but owing to its volume requires several manipulations to administer the dose. The solution flushes well via a fine-bore feeding tube.[3] When dissolved in 125 mL of water, the solution also contains sodium 65 mmol/L, chloride 53 mmol/L, potassium 5.4 mmol/L, bicarbonate 17 mmol/L.[4]
Movicol Chocolate (Norgine)	Oral powder 13.125 g/sachet	Sachet for reconstitution as above. Electrolyte profile as above.
Movicol liquid (Norgine)	Liquid concentrate for oral solution	25 mL of liquid concentrate should be mixed with 100 mL of water prior to administration. Provides the same constituents as above.
Movicol-Half (Norgine)	Oral powder 6.563 g/sachet	Macrogol 3350. Electrolyte profile as above.[5]
Movicol Paediatric (Norgine)	Oral powder 6.563 g/sachet	Macrogol 3350. Electrolyte profile as above.[6] Available as plain or chocolate flavour.[1]
Laxido Orange (Galen)	Oral powder 13.125 g/sachet	Sachet contents dissolve quickly to give a clear solution, which flushes easily via an 8Fr NG tube without blockage.[7] Electrolyte profile as for Movicol.[8]
Molaxole (Meda)	Oral powder 13.125 g/sachet	Electrolyte profile as for Movicol.[9]

Site of absorption (oral administration)

Macrogol 4000 and Macrogol 3350 are not absorbed or broken down in the GI tract; they act by decreasing intestinal fluid resorption.[4,7]

Alternative routes available

Not applicable.

Interactions

There is no significant interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Dissolve the powder in water as directed and flush down the feeding tube. Flush well after dosing. No prolonged break in feeding is necessary.
- Not suitable for fluid-restricted patients owing to the large volume necessary to administer the dose.
- If chronic constipation is a problem, seek dietetic advice on the suitability of a fibre-enriched feed.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure the appropriate quantity of water into a suitable size container.
4. Add the contents of the sachet and allow to dissolve.
5. Draw into an appropriate size and type of syringe; owing to the large volume this will be several syringe volumes.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

As the mechanism of action is local within the bowel, jejunal administration should not affect efficacy. Administer as above.

References

1. *BNF* 67, March 2014.
2. Personal communication, Norgine; 24 January 2003.
3. BPNG data on file, 2004.
4. Movicol (Norgine), Summary of Product Characteristics; May 2011.
5. Movicol-Half (Norgine), Summary of Product Characteristics; Jan 2009.
6. Movicol Paediatric Plain (Norgine), Summary of Product Characteristics; May 2011.
7. BPNG data on file, 2010.
8. Laxido Orange (Galen), Summary of Product Characteristics; 31 January 2013.
9. Molaxole (Meda), Summary of Product Characteristics; 27 September 2010.

Magnesium preparations

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Magnesium glycerophosphate (special, distributed by IDIS)	Tablet 4 mmol/ tablet	Produced by a variety of 'specials' manufacturers. Some will disperse in water.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Magnesium glycerophosphate (Special Products)	Oral liquid 1 mmol/mL	Unlicensed manufactured 'special'. The oral liquid can be administered undiluted via an enteral feeding tube.[3] pH 8.
Magnesium sulphate (Auden McKenzie, Aurum, Celltech)	Injection 50% (2 mmol/mL)	Not suitable for enteral administration.
Magnesium sulphate (GSL-Epsom Salts)		Poorly absorbed orally, used as laxative.
Magnaspartate (KoRa)	Sachet 6.5 g	Magnesium-L-aspartate. 10 mmol magnesium/sachet. Manufacturer recommends 1 sachet/200 mL water. Licensed as food for medical purposes. Prescribable as 'ACBS'. Product information available from www.kora-health.com.[4]
Magnesium oxide (specials manufacturers)	Capsules various strengths	Converted to magnesium chloride by gastric acid.[2] No specific data on enteral tube administration are available for this preparation.
Magnesium Hydroxide Mixture BP (various manufacturers)		Poorly absorbed orally, used as laxative.

Site of absorption (oral administration)

The main site of absorption of magnesium is the distal small intestine.[2]

Alternative routes available

Magnesium sulfate injection available for parenteral use.

Interactions

No specific interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use manufactured special liquid, or Magnaspartate sachets.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.

3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Some magnesium salts such as the oxide, hydroxide and trisilicate are converted by gastric acid to the chloride salt. Therefore, these salts administered directly into the jejunum are likely to have a reduced bioavailability.

Use glycerophosphate solution, as above, and titrate dose to response.

References

1. *BNF* 67, March 2014.
2. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
3. Personal communication, Special Products; 20 January 2003.
4. Health professionals information. www.kora-health.com (accessed 12 September 2014).

Maraviroc

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Celsentri (ViiV)	Tablet 150 mg, 300 mg	Film-coated. Manufacturer advises not to crush or split tablets.[2] A single report of crushing tablets for administration indicated that absorption may be affected.[3]

Site of absorption (oral administration)

Specific site of absorption not documented. Absorption following an oral dose is variable with multiple peaks; median peak levels occur at 2 hours (range 0.5–4 hours).[2]

Alternative routes available

None available for maraviroc.

Interactions

A high-fat breakfast reduced absorption by 33%. However there were no food restrictions in the efficacy and safety studies for maraviroc, therefore the dose can be taken with or without food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Tablet crushing is not recommended unless pharmacokinetic monitoring is available.
- Seek specialist advice for alternative therapy.

Intragastric administration

See above.

Intrajejunal administration

See above.

References

1. *BNF* 67, March 2014.
2. Celsentri 150 mg tablet (ViiV Healthcare), Summary of Product Characteristics; 21 February 2013.
3. Vourvahis M, McFadyen L, Checchio T, *et al.* (2013). Update from Study A4001031: maraviroc pharmacokinetics in CCR5-tropic HIV-1-infected children aged 2 to < 18 years. In: *7th IAS Conference on HIV Pathogenesis and Treatment*, abstract MOPE044.

Mebendazole

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Mebendazole (OTC product)	Tablet 100 mg	Ovex (Janssen-Cilag) tablets can be chewed.[2] No specific data on enteral tube administration are available for this preparation.
Vermox (Janssen-Cilag)	Tablet 100 mg	No specific data on enteral tube administration are available for this preparation.
Vermox (Janssen-Cilag)	Suspension 100 mg/5 mL	The manufacturer has no specific data regarding the administration of the liquid via an enteral feeding tube.[2] Sucrose-based suspension; does not contain sorbitol.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented.[3]

Alternative routes available

None available for mebendazole.

Interactions

No specific interaction with food is documented.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. Do **not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

No specific data are available on jejunal administration of mebendazole. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Janssen-Cilag; 22 January 2003.
3. Vermox Suspension (Janssen-Cilag), Summary of Product Characteristics; March 2011.

Mebeverine hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Colofac (Solvay)	Tablet 135 mg	Tablets can be crushed.[2] Also marketed as Boots IBS Relief.[3]
Mebeverine hydrochloride (non-proprietary)	Liquid 50 mg/5 mL	15 mL liquid = 1 tablet. Yellow, banana-flavoured, sugar-free suspension.[3] Sodium 2.5 mmol/15 mL dose.[3] NB: Liquid preparation is £6.85 per dose.
Colofac MR (Solvay)	M/R capsule 200 mg	Do not crush. Not suitable for administration via enteral feeding tube.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Mebeverine (Arrow, Generics, Hillcross)	Tablet 135 mg	No specific data on enteral tube administration are available for this preparation.
Fybogel Mebeverine (Reckitt Benckiser)	Sachet	Each sachet contains ispaghula husk 3.5 g, mebeverine hydrochloride 135 mg. Not suitable for enteral tube administration due to risk of blockage from ispaghula husk.

Site of absorption (oral administration)

Specific site of absorption is not documented. Rapid and complete absorption occurs following oral administration.[3]

Alternative routes available

None for mebeverine. Hyoscine butylbromide (Buscopan) is available in parenteral formulation.

Interactions

There is no documented interaction with food; mebeverine is most effective when given 20 minutes before food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation 20 minutes before feeds. However, the cost of therapy may be prohibitive.

Intragastric administration

1. Best given 20 minutes before feed commences.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Wait 20 minutes before starting the feed.

Alternatively, at step (4) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. Do **not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of mebeverine. Use the above method and monitor for signs of loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Solvay; 19 February 2003.
3. Colofac (Solvay), Summary of Product Characteristics; March 2013.

Mecysteine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Visclair (Ranbaxy)	Tablet 100 mg	Sugar-coated, enteric-coated tablets. Do not crush.[2] Not suitable for enteral tube administration.

Site of absorption (oral administration)

Specific site of absorption not documented.[2]

Alternative routes available

None.

Interactions

No documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations:

- Change therapy to carbocisteine (see monograph).

Intragastric administration

See above.

Intrajejunal administration

See above.

References

1. *BNF* 67, March 2014.
2. Visclair (Ranbaxy), Summary of Product Characteristics; 24 April 2006.

Medroxyprogesterone acetate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Provera (Pharmacia)	Tablet 2.5 mg, 5 mg, 10 mg, 100 mg, 200 mg, 400 mg	The tablets can be crushed and dispersed in water; as there are no stability data, this should be done immediately prior to administration.[2] The 5 mg and 100 mg tablets (only strengths tested) disperse in 10 mL of water within 5 minutes. The 5 mg tablets give a fine dispersion, the 100 mg a slightly coarser dispersion; both flush via an 8Fr NG tube without blockage.[3]
Clinanor (ReSource Medical)	Tablet 5 mg	Film-coated tablets. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 2–6 hours following oral dosing.[4]

Alternative routes available

Parenteral route is available.

Interactions

There is no documented interaction with food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to dissolve, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to dissolve. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data on jejunal administration. Administer as above.

References

1. *BNF* 67, March 2014.
2. Personal communication, Pharmacia; March 11 2003.
3. BPNG data on file, 2004.
4. Provera (Pharmacia), Summary of Product Characteristics; June 2012.

Mefenamic acid

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Mefenamic acid (Amdipharm, Arrow, Sanofi-Synthelabo, Tarus, Winthrop)	Capsule 250 mg	No specific data on enteral tube administration are available for this preparation.
Mefenamic acid (Alpharma, Ashbourne, Sanofi-Synthelabo, Tarus, Teva, Winthrop)	Tablet 500 mg	No specific data on enteral tube administration are available for this preparation.
Mefenamic acid (Chemidex)	Paediatric oral suspension 50 mg/5 mL	Very expensive, £79.98 per 125 mL bottle.[1] Strength inappropriate for adult dosing. Contains ethanol.[1]
Ponstan (Chemidex)	Capsule 250 mg, 500 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Mefenamic acid is well absorbed following oral absorption, with peak plasma concentrations occurring 2–4 hours post dose.[2]

Alternative routes available

None available for mefenamic acid. Other NSAIDs are available in rectal and parenteral formulations.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to the lack of data, high cost of the liquid preparation and the high volume of the adult dose, consider changing to an alternative NSAID if clinically appropriate.

References

1. *BNF* 67, March 2014.
2. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Megestrol acetate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Megace (Bristol-Myers Squibb)	Tablet 160 mg	Megestrol acetate is practically insoluble. Tablets disintegrate rapidly when placed in 10 mL of water to give a fine dispersion that settles quickly but flushes via an 8Fr NG tube without blockage.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–3 hours following oral administration.[3]

Alternative routes available

None available for megestrol.

Interactions

No specific interaction with food is documented.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to dissolve, shaking if necessary.

5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to dissolve. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data available on jejunal administration. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Megace (BMS), Summary of Product Characteristics; June 2013.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Melatonin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/ Administration information
Circadin (Flynn)	Tablet 2 mg	Prolonged-release tablets. Do not crush.[2] Not suitable for enteral tube administration.
Kidnaps (Special Products Ltd)	Oral liquid 1 mg/mL	Special product. Unlicensed. Contains alcohol. Sugar-free. Strawberry-flavoured.
Kidmel (Special Products Ltd)	Oral liquid 1 mg/mL	Special product. Unlicensed. Alcohol- and sugar-free.
Melatonin (various specials manufacturers)	Oral liquid (various strengths) Capsule (various strengths)	Available on a named-patient basis from specials manufacturers.

Site of absorption (oral administration)

Specific site not documented. Peak plasma levels occur 30 minutes after oral dosing of the liquid preparation; undergoes significant first-pass metabolism.[3]

Alternative routes available

None.

Interactions

No specific interaction with food documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use an unlicensed liquid special.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the required dose into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

No specific information is available for jejunal administration. Administer using the above method and monitor for loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Circadin (Flynn), Summary of Product Characteristics; August 2013.
3. Bourne R. Pharmacokinetics of oral melatonin in patients recovering from critical illness. *Critical Care*. 2008; 12 (Suppl. 2): p511.

Meloxicam

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Meloxicam (Niche)	Tablet 7.5 mg, 15 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak concentrations occur within 6 hours.[2]

Alternative routes available

Suppository formulation has been discontinued. Other non-steroidal preparations are available as rectal or parenteral formulations.

Interactions

There is no documented interaction with food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Due to lack of data for generic formulations, consider alternative therapy using a liquid dispersible non-steroidal analgesic alternative (see ibuprofen, diclofenac).

Intragastric administration

No specific recommendations.

Intrajejunal administration

There are no specific data relating to the jejunal administration of meloxicam.

References

1. *BNF* 67, March 2014.
2. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Memantine hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Memantine (Torrent)	Tablet 10 mg, 20 mg	Film-coated tablets. No specidic data on enteral tube administration are available for this preparation.
Ebixa (Lundbeck)	Tablet 10 mg	Scored, film-coated tablets. No specific data on enteral tube administration are available for this preparation.
Ebixa (Lundbeck)	Oral solution 5 mg/actuation (10 mg/mL)	Solution should be added to water for ease of administration, then drawn into enteral syringe. Contains sorbitol 500 mg/5 mL.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 3–8 hours following oral dosing.[2]

Alternative routes available

None available for memantine.

Interactions

Food does not affect memantine absorption.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use oral solution.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Add the required dose of oral solution to 10 mL of water in an appropriate container.
4. Draw into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Rinse the measure and administer this also to ensure that the total dose is given.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There is no specific information relating to the jejunal administration of memantine. Peak plasma concentration occurs several hours after dosing, so the site of absorption is highly unlikely to be the stomach or duodenum; therefore, jejunal administration should not affect bioavailability. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Ebixa (Lundbeck), Summary of Product Characteristics; 16 May 2012.

Menadiol sodium phosphate (Vitamin K)

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Menadiol Diphosphate (Alliance)	Tablet 10 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Absorbed from the GI tract without being dependent on the presence of bile salts.[2]

Alternative routes available

Alternative routes available for this preparation include i.v. or i.m. administration.

Interactions

No specific interaction with food documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use an alternative route of vitamin K product.

Intrajejunal administration

There are no data on the jejunal administration of menadiol sodium phosphate.

References

1. *BNF* 67, March 2014.
2. Menadiol Diphosphate (Alliance), Summary of Product Characteristics; August 2011.

Meptazinol

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Meptid (Almirall)	Tablet 200 mg	Meptazinol (as hydrochloride). Film-coated tablet.[2] The manufacturer has no specific information on manipulation of the tablets or administration via an enteral feeding tube. There is no theoretical reason why the tablet could not be crushed.[3]
Meptid (Almirall)	Injection 100 mg	Meptazinol (as hydrochloride).

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma levels occur within 90 minutes of oral administration.[2]

Alternative routes available

Injection available suitable for i.m. or i.v. use. Oral meptazinol 200 mg is equivalent to oral morphine 10 mg, but response varies so dose titration may be necessary.

Interactions

No specific interaction with food or enteral feeds documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Change to an alternative opiate analgesic due to the lack of data and unavailability of a suitable formulation.
- Morphine or tramadol are appropriate agents to transfer to and are available in suitable formulations for enteral tube administration.

References

1. *BNF* 67, March 2014.
2. Meptid (Almirall), Summary of Product Characteristics; 24 March 2011.
3. Personal communication, Almirall; 26 February 2014.

Mercaptamine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Cystagon (Orphan Europe)	Capsule 50 mg, 150 mg	Mercaptamine (as bitartrate). Hard gelatin capsules. Capsules can be opened and contents sprinkled onto food or into milk; avoid adding to acidic drinks such as orange juice.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma levels occur 1.4 hours following oral dosing.[2]

Alternative routes available

None available for mercaptamine.

Interactions

No documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Open capsules and mix with water immediately prior to administration.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into the appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Due to the lack of data on jejunal administration of mercaptamine, seek specialist advice.

References

1. *BNF* 67, March 2014.
2. Cystagon 50 mg Hard Capsules (Orphan Europe), Summary of Product Characteristics; 25 July 2013.

Mercaptopurine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Puri-Nethol (Alkopharma)	Tablet 50 mg	GSK (previous licence holder) has no information on the administration of Puri-Nethol via enteral feeding tube.[2]
Mercaptopurine	Tablet 10 mg	Manufactured 'special'. No specific data on enteral tube administration are available for this preparation.
Xaluprine (Nova)[3]	Oral suspension 20 mg/mL	Gloves should be worn at all times when handling liquid preparation. Bottle should be shaken vigorously for 30 seconds before withdrawing dose. Bottle is provided with adapter and oral syringes; ensure dose can be safely transferred into enteral syringe.[3] Contains aspartame and sucrose.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 0.5–4 hours following oral administration.[4]

Alternative routes available

No alternative available.

Interactions

The dose should not be taken with milk or dairy products as this may contain xanthine oxidase which may reduce plasma concentrations of mercaptopurine.[3]

Health and safety

Cytotoxic drug. Do not crush tablets. Use closed systems wherever possible. Protective clothing should be worn. Dispose of the syringe safely as cytotoxic waste.

Suggestions/recommendations

- Use liquid preparation.
- Dose should be taken 1 hour before or 2 hours after milk/dairy-containing feeds.
- Dose should be administered in the evening.

Intragastric administration

1. Stop the enteral feed 2 hours before the dose
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly for 30 seconds to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush well with water following the dose.
8. Allow 1 hour before re-starting the feed.

Do not measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There is no specific information relating to jejunal administration of mercaptopurine. Seek specialist advice.

References

1. *BNF* 67, March 2014.
2. Personal communication, GSK; 22 January 2003.
3. Xaluprine (Nova), Summary of Product Characteristics; February 2014.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Mesalazine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Asacol (Warner Chilcott)	Foam enema 1 g	Rectal administration. Local therapeutic action only.
Asacol (Warner Chilcott)	Suppository 250 mg, 500 mg	Rectal administration. Local therapeutic action only.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Asacol MR (Warner Chilcott)	E/C tablet 400 mg, 800 mg	These tablets are enteric coated to release mesalazine in the terminal ileum; the tablets cannot be split or crushed.[2] Do not crush. Not suitable for enteral tube administration.
Ipocol (Sandoz)	E/C tablet 400 mg	Enteric-coated tablets. Do not crush. Not suitable for enteral tube administration.
Mezavant XL (Shire)	E/C tablet 1.2 g	Modified-release, enteric-coated tablets. Do not crush. Not suitable for enteral tube administration.
Octasa (Tillotts)	E/C tablet 400 mg, 800 mg	Modified-release, enteric-coated tablets. Do not crush. Not suitable for enteral tube administration.
Pentasa (Ferring)	M/R tablet 500 mg, 1 g. M/R granules 1 g/sachet	Granules and tablets should not be crushed. Modified-release tablets disperse in water to give granules. The M/R granules in the tablets are slightly smaller than those in the sachets[3] and therefore the tablets should be used in preference to the sachets; however, the tablet contents can only be drawn into a catheter-tipped syringe owing to their size and will only flush down a 16Fr tube without blockage.[4]
Pentasa (Ferring)	Retention enema 1 g	Rectal administration. Local therapeutic action only.
Pentasa (Ferring)	Suppository 1 g	Rectal administration. Local therapeutic action only.
Salofalk (Dr Falk)	E/C tablet 250 mg. M/R granule 500 mg/sachet, 1 g/sachet, 1.5 g/sachet, 3 g/sachet	Enteric-coated pH-dependent tablets; must not be crushed.[5] Do not crush. Not suitable for enteral tube administration. Granule size is 1 mm;[6] therefore, trying to administer whole granules via enteral feeding tubes will result in blockage.
Salofalk (Dr Falk)	Enema 2 g	Rectal administration. Local therapeutic action only.
Salofalk (Dr Falk)	Suppository 500 mg	Rectal administration. Local therapeutic action only.
Salofalk (Dr Falk)	Rectal foam 1 g/application	Rectal administration. Local therapeutic action only.

Site of absorption (oral administration)

Mesalazine is absorbed in the small bowel but its action is locally in the terminal small bowel and colon; therefore, all preparations are formulated to release the mesalazine low down in the bowel.

Alternative routes available

Topical therapy using a rectal 5-ASA preparation should be used first-line in local rectal disease.

Interactions.

Food delays absorption for 1–2 hours but does not change the rate or extent of absorption.[6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- None of the oral preparations are suitable for enteral tube administration, as they cannot be crushed. Use topical preparations where clinically appropriate. Consider changing to sulfasalazine liquid preparation or using alternative therapy such as steroids. Seek specialist advice.

References

1. *BNF* 67, March 2014.
2. Personal communication, Procter & Gamble (original licence holder, Asacol); 22 January 2003.
3. Personal communication, Ferring Pharmaceuticals; 20 January 2003.
4. BPNG data on file, 2004.
5. Personal communication, Provalis Healthcare; 5 February 2003.
6. Salofalk (Dr Falk), Summary of Product Characteristics; June 2014.

Mesna

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Mesna (Baxter)	Tablet 400 mg, 600 mg	Film-coated.[1] No specific data on enteral tube administration are available for this preparation.
Mesna (Baxter)	Injection 100 mg/mL (4 mL, 10 mL ampoule)	For oral administration, contents of ampoule are taken in a flavoured drink such as orange juice or cola, which may be stored in a refrigerator for up to 24 hours in a sealed container.[1]

Site of absorption (oral administration)

Specific site of absorption is not documented. Absorption is rapid following oral administration. Peak plasma levels occur within 3–4 hours of an oral dose.[2]

Alternative routes available

Parenteral route is available.

Interactions

No interactions documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use injection via enteral tube.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw up the appropriate dose of injection into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no data on the jejunal administration of mesna. Use parenteral therapy.

References

1. *BNF* 67, March 2014.
2. American Society of Health-System Pharmacists. *AHFS Drug Information*. Bethesda, MD: American Society of Health-System Pharmacists; 2014 (*Medicines Complete: AHFS Drug Information* http://www.medicinescomplete.com).

Mesterolone

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Pro-Viron (Bayer)	Tablet 25 mg	Scored tablets. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma levels occur 1–2 hours following an oral dose.[2]

Alternative routes available

None available for mesterolone.

Interactions

No specific interaction with food or enteral feed documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

Owing to the lack of data seek specialist advice regarding alternative therapy.

References

1. *BNF* 67, March 2014.
2. Pro-Viron (Bayer), Summary of Product Characteristics; 30 March 2013.

Metformin hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Metformin (Aurobindo, Genesis, Wockhardt, Zentiva)	Tablet 500 mg, 850 mg	Zanza brand tablets do not disperse well in water but do crush easily and mix with water to form a fine suspension that flushes easily via an 8Fr NG tube.[2]
Metformin XL (Consilient, Genus, Morningside)	Tablet 500 mg	Modified-release tablets; do not crush. Not suitable for enteral tube administration.
Metformin (Rosemont, Pinewood, Zentiva)	Oral solution 500 mg/5 mL	Clear solution. Does not contain sorbitol; contains maltitol.[3–5]
Glucophage (MerckSerono)	Tablet 500 mg, 850 mg	Tablets are film coated but can be crushed if required.[6] Tablets do not disperse well in water owing to the size of the tablet, but do crush easily and disperse well in water to form a fine suspension that flushes easily via an 8Fr NG tube.[2]
Glucophage (MerckSerono)	Powder for oral solution 500 mg, 1000 mg	Sachets of powder for reconstitution. SPC advises reconstitution with 150 mL water.[7] Sachets dissolve completely in 20 mL of water to give a cloudy solution, with a pH of 4.5, which flushes easily via an 8Fr feeding tube without blockage.[8]
Glucophage SR (MerckSerono)	M/R tablet 500 mg, 750 mg, 1000 mg	Modified-release tablets; do not crush. Not suitable for enteral feeding tube administration.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 2.5 hours after oral dosing.[9]

Alternative routes available

None available for metformin. Insulin can be used for parenteral therapy.

Interactions

Food decreases, delays and reduces the absorption of metformin; however, the dose should be taken with or after food.[9]

A decrease in vitamin B_{12} absorption has been observed in long-term treatment; this is considered to be clinically insignificant.[9]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Where possible, use oral sachets and dissolve in a small volume of water, the oral solution may need to be used for doses of 850 mg, although the sachets dissolve completely and part volumes could be given to facilitate administration of 850 mg using this formulation.

Intragastric administration

Oral powder sachet administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Empty the contents of the sachet into a suitable container.
4. Add 20 mL of water and allow to dissolve completely.
5. Draw the solution into an appropriate size and type of syringe.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed immediately.

Oral solution administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure the required dose of oral solution in an appropriate size and type of syringe.
4. Flush the medication down the enteral feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the enteral feed immediately.

Intrajejunal administration

There are no specific data relating to jejunal administration of metformin. Monitor blood sugar levels for loss of effect. Use the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Metformin (Rosemont), Summary of Product Characteristics; December 2013.
4. Metformin Hydrochloride 500 mg/5 mL Oral Solution (Zentiva), Summary of Product Characteristics; December 2011.
5. Metformin Hydrochloride 500 mg/5 mL Oral Solution (Pinewood), Summary of Product Charcteristics; January 2014.
6. Personal communication, Merck; 23 January 2003.
7. Glucophage Powder for Oral Solution (Merck), Summary of Product Characteristics; January 2014.
8. BPNG data on file, 2009.
9. Glucophage (MerckSerono), Summary of Product Characteristics; October 2007.

Methadone hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Methadone (non-proprietary)	Tablet 5 mg	No specific data on enteral tube administration are available for this preparation. Brands include Physeptone.
Injection (non-proprietary)	Injection 10 mg/mL (1 mL, 2 mL, 3.5 mL, 5 mL)	Brands include Physeptone and Synastone.
Methadone (non-proprietary)	Injection 25 mg/mL, (2 mL), 50 mg/mL (1 mL)	Brands include Synastone.
Methadone Linctus (non-proprietary)	Linctus 2 mg/5 mL	Thornton and Ross ceased manufacture of this strength of methadone in November 2013.
Methadone (non-proprietary)	Oral solution 1 mg/mL	Free-flowing green-coloured liquid. Brands include Metharose and Physeptone. Also available sugar free; sugar-free solutions contain sorbitol.[2]
Methadose (Rosemont)	Oral concentrate 10 mg/mL	Blue liquid; not to be used undiluted.
Methadose (Rosemont)	Oral concentrate 20 mg/mL	Brown liquid; not to be used undiluted.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma levels occur 1–5 hours following a single oral dose.[2]

Alternative routes available

Parenteral route available.

Interactions

No specific interaction with food or enteral feeds documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Methadone liquid has been administered via enteral feeding tube.[3]

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into the appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

- There are no specific data available on the jejunal administration of methadone, however theoretically there should be no effect on absorption.
- Administer using the above method and monitor for side-effects or lack of efficacy.

References

1. *BNF* 67, March 2014.
2. Methadone Oral Solution 1 mg/mL (Thornton and Ross), Summary of Product Characteristics; 8 November 2011.
3. de Conno F, Groff L, Brunelli C, Zecca E, Ventafridda V, Ripamonti C Clinical experience with oral methadone administration in the treatment of pain in 196 advanced cancer patients. *J Clin Oncol* (1996); 14: 2836–2842.

Methenamine hippurate (Hexamine hippurate)

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Hiprex (Meda)	Tablet 1 g	Scored tablets. No specific data on enteral tube administration are available for this preparation; however, tablets can be crushed and mixed with milk or fruit juice.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma levels occur 1–2 hours following oral dosing.[2]

Alternative routes available

None available for methenamine. Alternative antibacterial agents are available for administration via a variety of routes.

Interactions

No specific interaction with food or enteral feed documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

Owing to the lack of data on enteral administration, seek specialist advice and change therapy to an alternative antibiotic available as an appropriate liquid preparation.

References

1. *BNF* 67, March 2014.
2. Hiprex (Meda), Summary of Product Characteristics; 31 March 2010.

Methotrexate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Methotrexate (Accord, Amdipharm, Hospira, Orion, Sandoz, Teva, Pharmacia/Pfizer (Maxtrex))	Tablet 2.5 mg, 10 mg	The tablets will disperse in water.[2,3]
Methotrexate (Hameln, Medac)	Injection 2.5 mg/mL, 25 mg/mL, 100 mg/mL	The injection can be diluted with water and administered orally.[4] The absorption from the solution gives similar plasma concentration to tablet preparation.[4] An extended expiry can be given if a preservative is used.[2]
Methotrexate (Nova Labs)	Suspension 2.5–50 mg/5 mL	Manufactured 'special'. Shelf life 1–3 months. The viscosity is such that the product remains suspended on standing, but viscosity reduces on shaking to facilitate administration. This should be suitable for administration via a feeding tube and is unlikely to cause blockage, although Nova Labs has no specific data.[5]

Site of absorption (oral administration)

Methotrexate is well absorbed from the GI tract by an active transport mechanism utilised by dietary folate. Peak plasma concentration occurs 1–5 hours following oral administration. Methotrexate also undergoes enterohepatic circulation.[6]

Alternative routes available

Parenteral route is available. Subcutaneous injections once weekly have been used for rheumatoid arthritis and Crohn's disease.

Interactions

No interaction with feed is documented. Vitamin preparations containing folic acid or its derivatives may alter response to methotrexate.[7]

Health and safety

Cytotoxic drug. Do not crush the tablets. Use closed systems wherever possible. Protective clothing should be worn. Dispose of any contaminated syringes safely as cytotoxic waste.

Suggestions/recommendations

- Where practical, use a commercially prepared 'special' suspension. Alternatively, the tablets can be dispersed in water, using a closed system.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Do not measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Tablet administration (closed system)

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to dissolve, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed.

Intrajejunal administration

The absorption of methotrexate is unlikely to be reduced by jejunal administration. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Pharmacia; 11 March 2003.
3. BPNG data on file, 2004.
4. Personal communication, Mayne; 29 January 2003.
5. Personal communication, Nova Labs; 24 March 2005.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
7. Maxtrex (Pharmacia), Summary of Product Characteristics; September 2013.

Methyldopa

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Methyldopa (Actavis, Genesis)	Tablet 125 mg, 250 mg, 500 mg	Tablets can be crushed; however, the tablet coating may not dissolve and may block the tube.[2]
Aldomet (Aspen)	Tablet 250 mg, 500 mg	Film coated. No specific data on enteral tube administration are available for this preparation.
Extemporaneous preparations		Formulas for extemporaneous preparations are available. Contact Nova Labs for details and current stability data.

Site of absorption (oral administration)

Absorption occurs throughout the small bowel and is thought to be via the active transport system used by dietary amino acids.[3] Bioavailability is variable but approximately 25%. Peak plasma concentration occurs 2–3 hours after oral administration.[4]

Alternative routes available

No alternative routes available for methyldopa. Other antihypertensives are available in parenteral formulations.

Interactions

No specific interaction with food is documented. Absorption of methyldopa is reduced by iron salts.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Where clinically appropriate, change to an alternative antihypertensive therapy.
- Alternatively, tablets could be crushed and dispersed in water immediately prior to administration. NB: Dose delivery from crushed tablets using pestle and mortar or crushing devices can result in 10–30% loss of dose.
- A prolonged break in feeding is not required.

Intragastric administration

See notes above.

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.

6. Draw this into an appropriate syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Jejunal administration is unlikely to affect bioavailability.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma; 21 January 2003.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
4. Aldomet (Aspen), Summary of Product Characteristics; November 2013.

Methylprednisolone

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Medrone (Pfizer)	Tablet 2 mg, 4 mg, 16 mg, 100 mg	Scored tablets; disperse in water.[2] Contain lactose.[3]
Solu-Medrone (Pharmacia)	Injection 40 mg, 125 mg, 500 mg, 1 g, 2 g	As sodium succinate. No specific data on enteral tube administration are available for this preparation.
Depo-Medrone (Pharmacia)	Injection 40 mg/mL	As acetate. Deep i.m. injection only.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1.5–2.3 hours following oral dosing.[3]

Alternative routes available

Parenteral route is available.

Interactions

Specific interaction with food is not documented.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.
- Parenteral route should be used if absorption is compromised.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to dissolve, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to dissolve. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration. Administer using the method above. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Pharmacia (previous MA holder); 11 March 2003.
3. Medrone (Pfizer), Summary of Product Characteristics; September 2013.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Metoclopramide hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Metoclopramide (Accord, Actavis, Genesis, Teva)	Tablet 10 mg	Teva tablets can be crushed but use of a liquid preparation is recommended.[2]
Metoclopramide (Rosemont)	Syrup 5 mg/5 mL	Sugar-free. Clear, non-viscous liquid, flushes easily via fine-bore tube without further dilution.[3] Viscosity less than standard enteral feeds.[4] Contains sorbitol 0.23 g/5 mL.[5]

Formulations available[1] (*continued*)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Metoclopramide (Antigen, Phoenix, Hameln, Goldshield)	Injection 5 mg/mL (2 mL)	i.m. or i.v. injection. No specific data on enteral tube administration are available for this preparation.
Maxolon (Amdipharm) (previously Shire)	Tablet 5 mg, 10 mg	Tablets can be crushed, but use of a liquid preparation is recommended.[6]
Maxolon (Amdipharm)	Injection 5 mg/mL (2 mL)	No specific data on enteral tube administration are available for this preparation.
Maxolon High Dose (Amdipharm)	Injection 5 mg/mL (20 mL)	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

No specific site is documented. Peak plasma concentration occurs 0.5–2 hours following oral dosing in fasted subjects.[7]

Alternative routes available

Parenteral route is available.

Interactions

No specific interaction with food is documented.[8]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation. No further dilution is necessary for intragastric administration. A prolonged break in feeding is not required.
- Parenteral route can be used if absorption is compromised.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There is no specific information on jejunal administration. Administer using the above method and monitor for efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma; 21 January 2003.
3. Personal communication, Shire; 17 February 2003.
4. BPNG data on file, 2004.
5. Personal communication, Rosemont; 20 January 2005.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
7. Metoclopramide Oral Solution (Rosemont), Summary of Product Characteristics; July 2013.
8. BPNG data on file, 2011.

Metolazone

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Metolazone (special manufacture or imported)	Tablet 2.5 mg, 5 mg	Unlicensed. No specific data on enteral tube administration are available for this preparation.
Extemporaneous preparation	1 mg/mL	Preparations using crushed tablets in ora-sweet/ora plus (50:50) or cherry syrup have been demonstrated to be stable at room temperature for 60 days.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented; diuretic effect occurs within 1 hour of an oral dose.[3]

Alternative routes available

None available for metolazone. Furosemide and bumetanide available as parenteral formulations.

Interactions

There is no documented interaction with food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider an alternative diuretic, the British Society for Heart Failure recommend transferring patients to bendroflumethiazide unless contraindicated.[4]
- Disperse the tablet in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to dissolve, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to dissolve. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of metolazone. Administer using the above method. Monitor for increased side-effects of loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Allen LV, Erickson MA. Stability of ketoconazole, metolazone, metronidazole, procainamide hydrochloride, and spironolactone in extemporaneously compounded oral liquids. *Am J Health-Syst Pharm* 1996; 53: 2073–2078.
3. Metenix 5 (Sanofi Aventis), Summary of Product Characteristics; 21 September 2010.
4. British Society for Heart Failure. http://www.bsh.org.uk/ (accessed 11 September 2014).

Metoprolol tartrate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Metoprolol (Accord, Actavis, Aurobindo, Teva)	Tablet 50 mg, 100 mg	Tablets can be crushed.[2] Tablets do not disperse readily in water.
Betaloc (AstraZeneca)	Injection 1 mg/mL (5 mL)	No specific data on enteral tube administration are available for this preparation.
Lopresor (Recordati)	Tablet 50 mg, 100 mg	No specific data on enteral tube administration are available for this preparation.
Lopresor SR (Recordati)	M/R tablet 200 mg	Swallow whole, do not chew.[1] Modified-release preparation; do not crush. Not suitable for enteral tube administration.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Metoprolol Tartrate (Rosemont)	Oral solution 12.5 mg/5 mL, 50 mg/5 mL	Manufacturer's 'special'. Slightly thicker than water.[3]
Metoprolol (Martindale)	Suspension 10 mg/5 mL	Manufacturer's 'special'. Viscous white suspension. Flushes with some resistance. Mixes with an equal volume of water to reduce viscosity.
Extemporaneous preparation	Suspension 10 mg/mL	*Extemporaneous metoprolol suspension 10 mg/mL:* Metoprolol 100 mg tablets: 10 tablets Cherry syrup to 100 mL Store in a refrigerator or at room temperature. 60-day expiry.[4]

Site of absorption (oral administration)

Specific site of absorption is not documented. Metoprolol is absorbed rapidly with peak plasma concentrations occurring 1.5–2 hours after oral dosing.[5]

Alternative routes available

Parenteral route is available; see SPC for dosing guidelines.

Interactions

Food may increase the bioavailability of metoprolol;[6] however, there is no comment on clinical significance therefore it may be assumed not to be clinically important.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Where clinically appropriate change to an alternative beta-blocker available as a liquid formulation.
- The 'special' or an extemporaneous suspension can be used if continuation with metoprolol is clinically appropriate. The tablet can be crushed and dispersed in water; however, this should be considered a last resort due to effect on dosing accuracy
- Parenteral route may be considered appropriate where control of heart rate or blood pressure is critical or where enteral absorption is compromised.

Intragastric administration

For administration of suspension, special or extemporaneous

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
6. Flush the medication dose down the feeding tube.

7. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of metoprolol. Administer using the above method. Alternatively, administer using tablets using the method below (see notes above).

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Draw into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma (now Actavis); 21 January 2003.
3. Rosemont. Metoprolol Tartrate Oral Solution-105, www.rosemontphaarma.com/products/cardiovascular-system/metoprolol-tartrate-oral-solution-105. (accessed 18 July 2014).
4. Allen LV, Erickson MA. Stability of labetalol hydrochloride, metoprolol tartrate, verapamil hydrochloride and spironolactone with hydrochlorothiazide in extemporaneously compounded oral liquids. *Am J Health Syst Pharm* 1996; 53: 2304–2309.
5. Lopresor Tablets (Recordati), Summary of Product Characteristics; October 2010.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Metronidazole

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Metronidazole (Teva)	Tablet 200 mg, 400 mg, 500 mg	400 mg tablets do not disperse readily in water. Tablets crush easily using pestle and mortar and mix easily with water to form a milky suspension that flushes easily via an 8Fr NG tube.[2]

Formulations available[1] (*continued*)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Metronidazole (Norton)	Tablet 200 mg, 400 mg	400 mg tablets will disintegrate within 5 minutes if agitated continuously in 10 mL of water to form a fine dispersion, which will flush down an 8Fr NG tube but it requires frequent shaking as particles settle quickly in the syringe.[2]
Metronidazole (Actavis, Aurobindo)	Tablet 200 mg, 400 mg	No specific data on enteral tube administration are available for this preparation.
Metronidazole (Ranbaxy)	Tablet 200 mg, 400 mg	Both 200 mg and 400 mg tablets disintegrate within 2–5 minutes when placed in 10 mL of water. Both form granular dispersions, the granules in the 200 mg tablet being slightly smaller; however, both strengths will block an 8Fr NG tube.[2] When the tablets are crushed effectively using a pestle and mortar, the resulting powder mixes easily with water and flushes readily down a NG tube.[2]
Norzol (Rosemont)	Suspension 200 mg/5 mL	Metronidazole (as benzoate).[3] Cloudy white liquid. Very viscous and difficult to flush. Mixes easily with an equal volume of water.[2] Suspension has a very high viscosity and cannot be administered under gravity.[4] Contains sucrose; contains sorbitol 0.57 g/5 mL dose.[5]
Metronidazole (Zentiva)	Suspension 200 mg/5 mL	Metronidazole (as benzoate).
Flagyl (Zentiva)	Tablet 200 mg, 400 mg Suppositories 500 mg, 1 g	Film-coated tablets.[6] Metronidazole is slightly soluble in water.[7] Metronidazole is rapidly absorbed from the rectal mucosa; peak plasma concentrations occur after approx. 1 hour.[8]
Flagyl (Zentiva)	Suppository 500 mg, 1 g	Rectal administration.
Metrolyl (Sandoz)	Suppository 500 mg, 1 g	Rectal administration.
Metrolyl (Sandoz)	Intravenous infusion 5 mg/mL	For i.v. administration.
Extemporaneous preparation	Suspension 50 mg/mL	*Metronidazole (base) suspension 50 mg/mL*:[9] Metronidazole 200 mg tablet: 25 tablets Cherry syrup to 100 mL Store at room temperature or refrigerate; 60-day expiry. Extemporaneous preparations using crushed tablets must be prepared in facilities with suitable containment equipment.[9]

Site of absorption (oral administration)

Metronidazole (base) is readily absorbed; bioavailability approaches 100%. Peak plasma concentrations occur 1–2 hours post dose. Absorption is delayed but not reduced by food;[7] the recommendation to take after food is to reduce the incidence of gastrointestinal side-effects.[10]

Metronidazole benzoate is hydrolysed in the stomach[7] and has approximately 80% bioavailability, which is reduced by the presence of food; hence the recommendation to take before food.[11]

Alternative routes available

Rectal route is available: usual dose 1 g every 8 hours in adults, reduced to 12-hourly after 3 days.[8] Intravenous route is also available: 500 mg every 8 hours.

Interactions

Food reduces the bioavailability of metronidazole benzoate.[11]

Health and safety

COSHH suggest avoiding third-party contact with crushed tablets.[10]

Suggestions/recommendations

- When possible use the intravenous or rectal route. Use the liquid preparation for intragastric administration. In theory the tablet formulation should be used for jejunal administration; however, this should be considered a last resort and alternative antibiotic therapy should be considered.

Intragastric administration

Use the suspension for nasogastric or gastrostomy administration, diluting the suspension immediately prior to administration.

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Allow a 1 hour break before dose administration, if possible.
4. Shake the medication bottle thoroughly to ensure adequate mixing.
5. Draw the medication suspension into an appropriate size and type of syringe.
6. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
7. Flush the medication dose down the feeding tube.
8. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
9. Finally, flush with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (5) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

A suspension should be made using the tablets[11] (see notes above) if it is necessary to administer via a tube exiting in the jejunum.

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.

6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004/5.
3. Norzol Metronidazole Suspension 200 mg/5 mL (Rosemont), Summary of Product Characteristics; September 2013.
4. BPNG data on file, 2011.
5. Personal communication, Rosemont; 20 January 2005.
6. Flagyl 200 mg Tablets (Zentiva), Summary of Product Characteristics; April 2013.
7. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
8. Flagyl Suppositories (Zentiva), Summary of Product Characteristics; March 2011.
9. Allen LV, Erickson MA. Stability of ketoconazole, metolazone, metronidazole, procainamide hydrochloride and spironolactone in extemporaneously compounded oral liquids. *Am J Health Syst Pharm* 1996; 53: 2073–2078.
10. Personal communication, Alpharma Ltd (now Actavis); 21 January 2003.
11. Personal communication, Hawgreen Ltd; 3 December 2004.

Metyrapone

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Metopirone (HRA Pharma)	Capsule 250 mg	Soft gelatin capsules. Swallow whole, do not chew.[2] Capsules are brittle soft gelatin capsules; the contents cannot be extracted without breaking the capsule shell. The capsules contain a polyethylene-based vehicle which is not miscible with water.

Site of absorption (oral administration)

Specific site of absorption not documented. Peak plasma levels occur 1 hour after an oral dose.[3]

Alternative routes available

None available for metyrapone.

Interactions

No interaction with food documented. SPC recommends taking dose with food or milk to minimise GI side effects of metyrapone.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Not suitable for enteral feeding tube administration.
- Seek specialist advice.

References

1. *BNF* 67, March 2014.
2. Metopirone (HRA Pharma), Summary of Product Characteristics; December 2012.
3. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Mexiletine hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Mexiletine (manufacturer's 'special' or import)	Capsule 250 mg	No specific data on enteral tube administration are available for this preparation.
Mexiletine (extemporaneous preparation)	Suspension 10 mg/mL	*Extemporaneous mexiletine suspension 10 mg/mL:* Mexiletine 200 mg capsules: 5 capsules Sterile water for irrigation to 100 mL Stability data for 90-day expiry when stored in a refrigerator.[2] However, as the preparation does not contain a preservative, it may be appropriate to shorten the expiry on grounds of microbiological stability.

Site of absorption (oral administration)

Mexiletine is absorbed in the upper portion of the small intestine. Peak plasma concentration occurs 2–3 hours after oral administration.[3]

Alternative routes available

Parenteral formulation available.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use alternative therapy where appropriate.
- When continued therapy with mexiletine is indicated, open the capsules and disperse in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Open the capsule and pour the contents into a medicine pot.
4. Add 15 mL of water.
5. Stir to disperse the powder.
6. Draw into an appropriate size and type of syringe and administer via the feeding tube.
7. Add a further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
8. Draw up this dispersion and flush down the tube. This will ensure that the whole dose is given.
9. Flush the tube with the recommended volume of water.
10. Re-start feed, unless a prolonged break is required.

Intrajejunal administration

No specific data are available on jejunal administration. Monitor for increased side-effects or loss of efficacy. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Nahata MC, Morosco RS, Hipple TF. Stability of mexiletine in two extemporaneous liquid formulations stored under refrigeration and at room temperature. *J Am Pharm Assoc* 2000; 40: 257–259.
3. Mexitil Capsules (Boehringer), Summary of Product Characteristics; May 2003.

Midazolam

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Midazolam (special order)	Buccal liquid 10 mg/mL	Buccal liquid (unlicensed).
Buccolam (ViroPharma)	Buccal liquid 5 mg/mL	Pre-filled syringes 0.5 mL (2.5 mg), 1 mL (5 mg), 1.5 mL (7.5 mg), 2 mL (10 mg). No specific data on enteral tube administration are available for this preparation.
Midazolam (Special Products)	Oral liquid 2.5 mg/mL	pH 3.0—3.5,. Can be administered undiluted via nasogastric tube.[2]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Midazolam (Rosemont)	Buccal liquid 10 mg/mL	Manufacturer's 'special'. Slightly thicker than water.[3]
Midazolam (Accord, Amdipharm, Hameln)	Injection 1 mg/mL, 2 mg/mL, 5 mg/mL	For administration by mouth; the injection may be diluted with apple or blackcurrant juice, chocolate sauce or cola.[4]
Hypnovel (Roche)	Injection 5 mg/mL (2 mL)	Injection can be administered rectally; bioavailability is approximately 50%.[5]

Site of absorption (oral administration)

Specific site of absorption is not documented. Extensive first-pass metabolism results in low bioavailability following an oral dose.[6] Peak plasma levels occur 50 minutes following oral administration.[7]

Alternative routes available

Oral, buccal and parenteral formulations are available. Bioavailability differs and dose should be adjusted accordingly.

Interactions

No specific interaction with food documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Administration of midazolam by mouth or buccally is unlicensed in adults, but buccal administration is licensed in children. There is no information on the administration of midazolam via enteral feeding tube.
- Use the buccal route where appropriate.
- If enteral tube administration is indicated, the oral liquid or injection can be used.
- If using the injection enterally, the ampoule contents should be drawn up into the enteral syringe using a filter straw.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the required dose of oral liquid or injection into an appropriate-sized enteral syringe (if using the injection, the solution should be drawn up using a filter straw).
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intragastric administration

There are no data on the jejunal administration of midazolam.

References

1. *BNF* 67, March 2014.
2. Personal communication, Special Products Ltd; January 2003.
3. Rosemont. Midazolam Buccal Liquid-111, www.rosemontpharma.com/products/central-nervous-system/midazolam-buccal-liquid-111 (accessed 18 July 2014).
4. *BNF for Children*, 2014–2015.
5. Hypnovel (Roche), Summary of Product Characteristics; January 2014.
6. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
7. Payne K, Mattheyse FJ, Liebenberg D, Dawes T. The pharmacokinetics of midazolam in paediatric patients. *Eur J ClinPharmacol* 1989; 37: 267–272.

Minoxidil

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Loniten (Pharmacia)	Tablet 2.5 mg, 5 mg, 10 mg	Tablets can be crushed and mixed with water.[2] Tablets disperse in water within 2 minutes to give a fine dispersion that settles quickly but flushes via an 8Fr NG tube without blockage.[3] Contains lactose.[4]

Site of absorption (oral administration)

Specific site is not documented. Minoxidil appears in the blood within 30 minutes of administration.[5] Peak hypotensive effect occurs after 2–3 hours.[4]

Alternative routes available

None available for minoxidil.

Interactions

No specific interaction with food is documented.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.

4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Pharmacia; 11 March 2003.
3. BPNG data on file, 2005.
4. Loniten Tablets 2.5 mg (Pharmacia), Summary of Product Characteristics; April 2014.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Mirtazapine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Mirtazapine (Actavis, Aurobindo, Kent, Niche)	Tablet 15 mg, 30 mg, 45 mg	No specific data on enteral tube administration are available for this preparation.
Mirtazapine (Actavis, Arrow, Sandoz)	Orodispersible tablet 15 mg, 30 mg, 45 mg	No specific data on enteral tube administration are available for this preparation.
Mirtazapine (Rosemont)	Oral solution 15 mg/mL	Sugar-free oral solution, containing ethanol 14 mg/5 mL (0.3% v/v), maltitol 700 mg/5 mL and sodium 1.6 mg/5 mL.[2] The oral solution has a viscosity similar to enteral feed and flushes via 8Fr NG tube with little resistance.[3]
Zispin SolTab (MSD)	Tablet 15 mg, 30 mg, 45 mg	When place in 10 mL of water, microgranules float to top of dispersion and cling to the side of the pot and syringe; they settle quickly and there is risk of tube blockage if they are not redispersed in the syringe prior to administration. It is difficult to give the full dose.[4] Contains aspartame.[1]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 2 hours after oral dosing with the tablets,[5] and 1 hour after the suspension.[3]

Alternative routes available

None available for mirtazapine.

Interactions

Food has no effect on the pharmacokinetics of mirtazapine.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the oral liquid preparation; no further dilution is necessary.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Mirtazipine (Rosemont), Summary of Product Characteristics; March 2014.
3. BPNG data on file, 2011.
4. BPNG data on file, 2004.
5. Zispin (MSD), Summary of Product Characteristics; March 2014.

Misoprostol

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Cytotec (Pharmacia)	Tablet 200 micrograms	Dose two to four times daily. The manufacturer recommends that tablets are not crushed owing to the unstable nature of the drug, but is aware of anecdotal reports of nasogastric administration.[2]

Site of absorption (oral administration)

Absorption is rapid, with peak plasma concentrations occurring after 30 minutes.[3]

Alternative routes available

None available for misoprostol. Parenteral formulations are available for other anti-ulcer therapy.

Interactions

There is no documented interaction with food. Recommended to be taken with food to minimise incidence of diarrhoea.[3]

Health and safety

Because of the exposure risks from inhalation of crushed tablets, they should not be handled by women of childbearing age. Protective clothing should be worn.

Suggestions/recommendations

- Owing to poor stability, an alternative therapy such as a histamine receptor antagonist (ranitidine) or a proton pump inhibitor (lansoprazole) should be considered if clinically appropriate.
- If continued therapy with misoprostol is indicated, the tablets can be crushed and mixed with water immediately prior to administration (see notes above); this should be considered a last resort due to occupational exposure risks and variable dose delivered

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Draw this into an appropriate syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed immediately.

Intrajejunal administration

There are no specific data on the jejunal administration of misoprostol. An alternative therapy known to be absorbed from the jejunum should be used.

References

1. *BNF* 67, March 2014.
2. Personal communication, Pharmacia; 11 March 2003.
3. Cytotec (Pharmacia), Summary of Product Characteristics; March 2014.

Mizolastine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Mizollen (Sanofi-Aventis)	Tablet 10 mg	Modified-release and film-coated tablets. Swallow whole, do not chew. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Specific site not documented. Peak levels occur after 1.5 hours after oral administration.[2]

Alternative routes available

None available for mizolastine or any of the non-sedating antihistamines. Both promethazine and chlorphenamine (see respective monographs) are available in parenteral formulations.

Interactions

No clinically significant interaction with food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Not suitable for enteral tube administration.
- Consider using an alternative non-sedating antihistamine that is available as an oral solution.

References

1. *BNF* 67, March 2014.
2. Mizollen (Sanofi), Summary of Product Characteristics; May 2012.

Moclobemide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Moclobemide (Teva)	Tablet 150 mg, 300 mg	Tablets do not disintegrate readily in water but will disperse in water if shaken for 5 minutes. The resulting fine white dispersion flushes via an 8Fr NG tube without blockage.[2]
Manerix (Meda)	Tablet 150 mg, 300 mg	Film-coated, scored tablets. No specific data on enteral tube administration are available for this preparation. Contains lactose.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–2 hours post oral dose.[4]

Alternative routes available

None available for moclobemide.

Interactions

The rate but not the extent of moclobemide absorption is reduced by food; this is not clinically significant.[4] Moclobemide is a reversible inhibitor of monoamine oxidase type A (RIMA). Dietary restrictions of tyramine are not usually necessary; however patients should be discouraged from consuming large amounts of tyramine-rich food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider changing to an alternative antidepressant available as a liquid preparation. Alternatively, disperse the tablets in water immediately prior to administration.
- A prolonged break is feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There is no specific information on the jejunal administration of moclobemide. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Manerix Tablets 150 mg (Meda), Summary of Product Characteristics; November 2013.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Modafinil

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Modafinil (Aurobindo, Genus)	Tablet 100 mg, 200 mg	No specific data on enteral tube administration are available for this preparation.
Provigil (Teva Pharma B. V.)	Tablet 100 mg, 200 mg	The bioavailability of Provigil tablets is approximately that of an aqueous suspension. Provigil could theoretically be crushed and mixed with water. As there are no stability data to support the storage of such a suspension it should be used immediately.[2] Contains lactose.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 2–4 hours following oral administration.[3]

Alternative routes available

None available for modafinil.

Interactions

Food may delay the peak level of modafinil by approximately 1 hour,[3] but does not affect overall bioavailability.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Crush the tablets and disperse in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Draw this into an appropriate syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There is no specific information relating to jejunal administration of modafinil. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Cephalon; 21 January 2003.
3. Provigil (Teva Pharma), Summary of Product Characteristics; October 2013.

Moexipril hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Perdix (UCB Pharma)	Tablet 7.5 mg, 15 mg	Film-coated, scored tablets.[2] No specific data on enteral tube administration are available for this preparation. Contains 141 mg lactose per tablet.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented.

Alternative routes available

No alternative routes available for any of the ACE inhibitors.

Interactions

Food reduces the absorption of moexipril, although this interaction is of doubtful clinical significance.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- As no data are available for moexipril, conversion to an alternative ACEI should be considered.

References

1. *BNF* 67, March 2014.
2. Perdix 7.5 mg (UCB Pharma), Summary of Product Characteristics; April 2014.
3. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Montelukast

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Montelukast (Accord, Actavis, Aurobindo, Consilient, Dexcel, Sandoz, Torrent))	Chewable tablet 4 mg, 5 mg	Montelukast (as sodium salt). No specific data on enteral tube administration are available for this preparation.
Montelukast (Accord, Actavis, Aurobindo, Consilient, Dexcel, Sandoz, Torrent)	Tablet 10 mg	Montelukast (as sodium salt). Film-coated tablets. No specific data on enteral tube administration are available for this preparation.
Montelukast (Sandoz)	Granule 4 mg	Montelukast (as sodium salt) No specific data on enteral tube administration are available for this preparation. Should not be mixed with liquid.[1]
Singulair (MSD)	Tablet 10 mg	Montelukast (as sodium salt). Film-coated tablets.[2] Tablets disperse if shaken in 10 mL of water for 3 minutes to give a fine cloudy dispersion that flushes via an 8Fr NG tube without blockage.[3] Contains lactose.[2]
Singulair (MSD)	Chewable tablet 4 mg, 5 mg	Montelukast (as sodium salt). Contains aspartame, providing 0.67 mg phenylalanine in 4 mg, and 0.82 mg in 5 mg.[5]
Singulair (MSD)	Granule 4 mg	Montelukast (as sodium salt). Should not be mixed with fluid.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak levels occur 3–4 hours following oral administration of the tablet,[4] this is reduced to 2–2.5 hours following oral administration of the chewable tablet.[5]

Alternative routes available

There are no alternative routes available for montelukast.

Interactions

No reported interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- If being used for asthma, consider reviewing therapy and increasing inhaled corticosteroids.
- Use tablet dispersed in water.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet into the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

No specific data relating to jejunal administration of montelukast. Administer using the above method. Monitor for loss of efficacy or increased side effects.

References

1. *BNF* 67, March 2014.
2. Singulair 10 mg Tablets (MSD), Summary of Product Characteristics; August 2013.
3. BPNG data on file, 2009.
4. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
5. American Society of Health-System Pharmacists. *AHFS Drug Information*. Bethesda, MD: American Society of Health-System Pharmacists; 2014 (*Medicines Complete: AHFS Drug Information* http://www.medicinescomplete.com).

Morphine sulfate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Immediate-release preparations		
Oromorph (Boehringer Ingelheim)	Solution 10 mg/5 mL	Although no specific data are available, the liquid can be administered via the feeding tube.[2] Contains corn syrup and sucrose.
Oromorph Concentrated Oral Solution (Boehringer Ingelheim)	Solution 100 mg/5 mL	Although no specific data are available, the liquid can be administered via the feeding tube.[2]
Sevredol (Napp)	Tablet 10 mg, 20 mg, 50 mg	Immediate-release film-coated tablets. Napp recommends that Sevredol tablets should not be crushed.
Morphine (Aurum, Martindale)	Suppository 10 mg, 15 mg, 20 mg, 30 mg	Morphine (as sulfate hydrochloride). Doses are equivalent to oral administration.
Morphine Sulphate (Aurum, Celltech)	Injection 10 mg/mL, 15 mg/mL, 20 mg/mL, 30 mg/mL	No specific data on enteral tube administration are available for this preparation.
Modified-release preparations		
Filnarine SR (Teva UK)	Tablet 10 mg, 30 mg, 60 mg, 100 mg, 200 mg	Modified-release film-coated tablets; do not crush. Not suitable for enteral tube administration.
Morphgesic MR (Amdipharm)	Tablet 10 mg, 30 mg, 60 mg, 100 mg	Modified-release tablets; do not crush. Not suitable for enteral tube administration.
MST Continus (Napp)	Tablet 5 mg, 10 mg, 15 mg, 30 mg, 60 mg, 100 mg, 200 mg	Modified-release tablets; do not crush. Not suitable for enteral tube administration.
MST Continus (Napp)	Suspension 20 mg, 30 mg, 60 mg, 100 mg, 200 mg	Modified-release granules to mix with water to form a suspension. In an in-house study the granules were mixed with 10 mL of water and passed through 8Fr and 6Fr NG tubes successfully. When the suspensions are given by this route, do not administer with oral rehydration therapies, concentrated lactate solutions or similar treatments.[3]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
MXL (Napp)	Capsule 30 mg, 60 mg, 90 mg, 120 mg, 150 mg, 200 mg	Modified-release capsules. Napp advises not to disperse the capsule contents in water as they are lipophilic, clump together and risk blocking the tube.[3]
Zomorph (Archimedes, previously Link)	Capsule 10 mg, 30 mg, 60 mg, 100 mg, 200 mg	Modified-release granules in hard gelatin capsule. Granules pour easily from the capsule and do not clump together when mixed with water. They can be drawn up into the syringe and flushed via an 8Fr NG tube without blockage; however, the granules settle quickly in the syringe and care must be taken to deliver the complete dose.[4] Link recommends that the tube diameter should be more then 16Fr with an open distal end or lateral pores.[5]

Site of absorption (oral administration)

Morphine is absorbed in the proximal small bowel.[2]

Alternative routes available

Formulations for parenteral (i.v., i.m. and s.c) and rectal routes are available.

Interactions

There is no significant interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- For immediate pain relief use oral solution; no further dilution is necessary.
- The tube must be flushed well following dosing to ensure that the total dose is delivered.
- For sustained pain relief, use MST Continus sachets, dispersed in at least 10 mL of water. Flush the tube well following dosing to ensure that the total dose is delivered. Note that any granules left in the tube will break down over a period of time and a bolus of morphine will be delivered when the tube is next flushed; this has resulted in a reported fatality. Ensure that dose prescribed can be administered using whole sachets.
- For high maintenance doses or for patient with very fine-bore tubes, consider changing to a fentanyl transdermal patch (consult product literature for dose conversion).

Intragastric administration

Immediate-release morphine

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.

3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Modified-release morphine

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure a suitable quantity of water into a measuring pot.
4. Add the contents of the sachet and allow to disperse.
5. Draw into an appropriate size and type of syringe.
6. Flush the medication dose down the feeding tube.
7. Rinse the measure and administer this also to ensure that the total dose is given.
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

For intrajejunal administration dilute the oral liquid with an equal volume of water immediately prior to administration, following the method outlined above.

References

1. *BNF* 67, March 2014.
2. Personal communication, Boehringer Ingelheim; 6 March 2003.
3. Personal communication, Napp; 29 January 2003.
4. BPNG data on file, 2004.
5. Personal communication, Link; 4 February 2003.

Moxonidine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Moxonidine (Teva)	Tablet 200 micrograms, 300 micrograms, 400 micrograms	Film-coated tablets No specific data on enteral tube administration are available for this preparation.
Physiotens (Abbott Healthcare)	Tablet 200 micrograms, 300 micrograms, 400 micrograms	Tablets will disintegrate within 2 minutes at room temperature when placed in 10 mL of water;[2] the resulting dispersion flushes via an 8Fr NG tube without blockage.[3] Contains lactose.[4]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 30–180 minutes following oral dosing.[4]

Alternative routes available

None available for moxonidine.

Interactions

Food reduces and delays peak concentrations slightly; this is not clinically significant.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse tablet in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of moxonidine. Administer using the above method and monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Solvay (previous MA holder for Physiotens); 19 February 2003.
3. BPNG data on file, 2005.
4. Physiotens Tablets 200 micrograms (Abbott Healthcare), Summary of Product Characteristics; August 2013.

Multivitamin preparations

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Vitamins (non-proprietary)	Capsule, see below	No specific data on enteral tube administration available for this preparation.
Abidec (Chefaro)	Drops, see below	Contains peanut oil.[2] Not licensed for use in adults. Drops can be added to water prior to administration.
Dalivit (LPC)	Drops, see below	Drops can be added to water prior to administration.[3]
Forceval (Alliance)	Capsule, see below	Soft gelatin capsules. There are significant anecdotal data advocating piercing the capsule and adding the liquid contents of the capsule to water for administration via enteral feeding tubes. There are no data relating to the accuracy of this method of dosing.
Forceval Soluble (Alliance)	Soluble tablet, see below	Tablet can be dissolved in 50 mL of water for NG administration; this forms a cloudy liquid with some fine sedimentation which can be flushed via an enteral feeding tube without blockage. Adminster after feed. Flush well after administration.
Ketovite (Essential)	Tablet, see below	Licensed dose is 1 tablet three times a day. Tablets disperse in water and can be administered via enteral feeding tubes, but three times daily dosing can be inconvenient.
Ketovite (Essential)	Liquid, see below	Used in combination with Ketovite tablets.

Preparation contents						
Preparation	**Vitamins per capsule**	**Abidec /0.6 mL**	**Dalivit/ 0.6 mL**	**Forceval Soluble**	**Ketovite tablets**	**Ketovite liquid (per 5 mL)**
Ascorbic acid	15 mg	40 mg	50 mg	60 mg	16.6 mg	–
Nicotinamide	7.5 mg	8 mg	5 mg	18 mg	3.3 mg	–
Riboflavin	0.5 mg	0.8 mg	0.4 mg	1.6 mg	1 mg	–
Pyridoxine	–	0.8 mg	0.5 mg	2 mg	0.33 mg	–
Thiamine	1 mg	0.4 mg	1 mg	1.2 mg	1 mg	–
Vitamin A	2500 units	1333 units	5000 units	2500 units	–	2500 units
Vitamin D	300 units	400 units	400 units	400 units	–	400 units
Vitamin E				10 mg	5 mg	–
Other contents	–	–	–	Biotin 0.1 mg, cyanocobalamin 3 microgram, folic acid 0.4 mg, pantothenate 4 mg, trace elements and electrolytes (see *BNF* for full listing)	Pantothenate 1.16 mg, inositol 50 mg, biotin 0.17 mg, folic acid 0.25 mg	Choline 150 mg, cyanocobalamin 12.5 micrograms

Site of absorption (oral administration)

Most vitamins are absorbed in the small bowel; see individual monographs for specific details.

Alternative routes available

Multivitamin and trace element preparations are available for addition to parenteral nutrition solutions. Seek nutrition specialist advice.

Interactions

No specific interaction with food. It is recommended that Forceval Soluble is taken after food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Optimise enteral nutrition to avoid the need to supplement vitamins and trace elements; consider the use of feeds that are nutritionally complete in a low volume.
- Review the need for additional supplementation regularly.
- Use Forceval Soluble (a junior preparation is available for children, consult product literature for contents), dissolved in 50 mL of water.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Add the Forceval Soluble to 50 mL water.
4. Draw the solution into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Abidec Multivitamin Drops (Omega Pharma Chefaro), Summary of Product Characteristics; 30 November 2012.
3. Dalivit, Patient Information Leaflet; 2006.

Mycophenolate mofetil

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Mycophenolate Mofetil (Actavis, Sandoz)	Capsule 250 mg	Mycophenolate is teratogenic, so the capsules should not be opened owing to the risk of operator exposure.[2]
Mycophenolate Mofetil (Wockhart)	Tablet 500 mg	Film-coated tablet. Mycophenolate is teratogenic, so the tablets should not be crushed owing to the risk of operator exposure.[3]
Arzip (Winthrop)	Capsule 250 mg	Mycophenolate is teratogenic, so the capsules should not be opened owing to the risk of operator exposure.[4]
Arzip (Winthrop)	Tablet 500 mg	Mycophenolate is teratogenic, so the tablets should not be crushed owing to the risk of operator exposure.[5]
CellCept (Roche)	Capsule 250 mg	Mycophenolate is teratogenic, so the capsules should not be opened owing to the risk of operator exposure.[6]
CellCept (Roche)	Tablet 500 mg	Mycophenolate is teratogenic, so the tablets should not be crushed owing to the risk of operator exposure.[6]
CellCept (Roche)	Oral suspension 1 g/5 mL	If required, CellCept 1 g/5 mL powder for oral suspension can be administered via a NG tube with a minimum size of 8F (minimum 1.7 mm interior diameter.[7] Contains sorbitol.[7]
CellCept (Roche)	Intravenous infusion 500 mg	No specific data on enteral tube administration are available for this preparation.
Myfortic (Novartis)	Tablet 180 mg, 360 mg	Mycophenolate (as sodium salt). Enteric-coated tablet; do not crush. Not suitable for administration via enteral feeding tube.

Site of absorption (oral administration)

Mycophenolate mofetil dissolves rapidly in the stomach. Absorption may occur through the gastric mucosa, but the main site of absorption is the duodenum and jejunum. Enterohepatic circulation implies that further reabsorption occurs in the third part of the duodenum and the large bowel after

the action of the intestinal flora in converting inactive mycophenolate acid glucuronide back into active mycophenolic acid.[6] Although not quantified, it is expected that a substantial proportion of the dose would be absorbed following jejunal administration.[8]

Alternative routes available

Parenteral route is available and should be used if enteral absorption is compromised.

Interactions

Food decreases peak plasma concentration of mycophenolate; however, total bioavailability is unaffected.[7]

Health and safety

Standard precautions apply when handling the liquid preparation. The tablets should not be crushed and the capsules should not be opened owing to the risks of occupational exposure.

Suggestions/recommendations

- Administer the dose using the liquid preparation; do not dilute further.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

See notes above. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Roche; 6 February 2003.
3. Personal communication, Roche; 15 January 2003.
4. CellCept Suspension (Roche), Summary of Product Characteristics; July 2013.
5. Arzip (Winthrop Pharma), Summary of Product Characteristics; March 2011.
6. Arzip (Winthrop Pharma), Summary of Product Characteristics; November 2010.
7. Mycophenolate Mofetil (Actavis), Summary of Product Characteristics; December 2013.
8. Mycophenolate Mofetil (Wockhart), Summary of Product Characteristics; November 2013.

Nabumetone

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Relifex (Meda)	Tablet 500 mg	Film-coated tablets No specific data on enteral tube administration are available for this preparation.
Relifex (Meda)	Suspension 500 mg/5 mL	Contains sorbitol[2] 1.25 mg/5 mL.[3] pH 3.5–4.5.[3]
Nabumetone (non-proprietary)	Tablet 500 mg	Film-coated tablets. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Nabumetone is absorbed intact through the small intestine and undergoes extensive first-pass metabolism.[3]

Alternative routes available

No alternative route is available for nabumetone. Nabumetone is similar in efficacy to diclofenac, which is available as injection and suppositories.

Interactions

Absorption is not affected by food but is increased when nabumetone is taken with milk;[4] therefore, there is a possibility that enteral feed may increase absorption of nabumetone.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid formulation. There is a possibility that absorption may be increased by enteral feed, so side-effects should be monitored.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw up liquid preparation into an appropriate size and type of syringe.

5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure required dose in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid preparations using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to the jejunal administration of nabumetone. Administer following the method above and monitor for loss of effect or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Relifex Suspension (Meda), Summary of Product Characteristics; 4 July 2013.
3. Personal communication, Meda Pharmaceuticals; 31 January 2005.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Nadolol

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Corgard (Sanofi-Synthelabo)	Tablet 80 mg	Tablets may be crushed.[2] Tablets do not disperse readily but disperse when shaken in 10 mL of water for 5 minutes to give a fine suspension that flushes down an 8Fr tube[3] without blockage.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 3–4 hours after oral dosing.[4]

Alternative routes available

None available for nadolol, other beta-blockers available as parenteral formulations.

Interactions

Rate and extent of absorption of nadolol are not affected by food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Change to an alternative beta-blocker available in liquid formulation where clinically appropriate. Alternatively, disperse tablets in water immediately prior to administration.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking as required.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of nadolol. Monitor for lack of efficacy or increased side-effects. Follow the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Sanofi-Synthelabo; 3 February 2003.
3. BPNG data on file, 2005.
4. Corgard (Sanofi-Synthelabo), Summary of Product Characteristics; 9 January 2013.

Naftidrofuryl oxalate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Naftidrofuryl oxalate (non-proprietary; Actavis)	Capsule 100 mg	Capsule contents can be used.[2]
Praxilene (Merck Serono)	Capsule 100 mg	Opening capsules and swallowing contents can cause irritation to the oesophagus. Contents can be administered via an enteral tube.[3] Sufficient fluid should be taken during treatment to maintain adequate level of diuresis.[4]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 30 minutes following oral dosing.[4]

Alternative routes available

None available for naftidrofuryl oxalate.

Interactions

No specific interaction with food is documented.[4] Advised to take during or after food.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse capsule contents in water immediately prior to administration. Flush the tube well before and after dosing to ensure adequate hydration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Open the capsule and pour the contents into a medicine pot.
4. Add 15 mL of water.
5. Stir to disperse the powder.
6. Draw into an appropriate size and type of syringe and administer via the feeding tube.
7. Add a further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
8. Draw up this dispersion and flush down the tube. This will ensure that the whole dose is given.
9. Flush the tube with the recommended volume of water.
10. Re-start feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to jejunal administration of naftidrofuryl oxalate. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma; 21 January 2003.
3. Personal communication, Merck; 23 January 2003.
4. Praxilene (Merck Sorono), Summary of Product Characteristics; 10 September 2012.
5. Naftidrofuryl Capsules 100 mg (Actavis), Summary of Product Characteristics; 9 September 2010.

Naproxen

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Naprosyn (Roche)	Tablet 250 mg, 500 mg	Crushing the standard tablet preparation prior to administration will not affect efficacy. It can be mixed with water. Naproxen is virtually insoluble at low pH, but increasingly soluble with increasing pH.[2]
Naprosyn EC (Roche)	Tablet 250 mg, 375 mg, 500 mg	Enteric-coated tablets; do not crush.
Naproxen (non-proprietary; Aurobindo-Pharma, Accord, Actavis)	Tablet 250 mg, 500 mg	Accord brand disperse in water and flush via an 8Fr NG without blockage or loss of dose.[3]
Naproxen (non-proprietary)	Tablet 250 mg, 375 mg, 500 mg	Enteric-coated tablets, do not crush. Not suitable for enteral tube administration.
Vimoro (Astra Zeneca)	Tablet 500 mg/20 mg	Contain naproxen 500 mg and esomeprazole (as magnesium trihydrate) 20 mg. Film-coated modified-release tablets. Do not crush. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Absorption is in the upper small bowel. Naproxen sodium peak plasma concentration occurs 1 hour after oral dosing, Naproxen peak plasma concentration occur 2 hours after oral administration in fasted subjects.[4]

Alternative routes available

No alternative routes of administration available for naproxen (suppository and suspension formulation discontinued). Diclofenac possesses similar analgesic properties and is available as suppositories and injection.

Interactions

Absorption is delayed but not reduced by food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider changing to diclofenac dispersible tablets to facilitate enteral administration. If necessary, uncoated tablets can be dispersed in water immediately prior to administration; this should be considered a last resort.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking as required.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush the enteral feeding tube with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Jejunal administration is not expected to affect bioavailability as enteric-coated tablets are available. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Roche; 6 February 2003.
3. BPNG, data on file, 2012.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Naratriptan

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Naratriptan (Actavis, Zentiva)	Tablet 2.5 mg	Naratriptan (as hydrochloride). Film-coated tablets. No specific data on enteral tube administration are available for this preparation. Readily soluble in water. Contains lactose.[2,3]
Naramig (GSK)	Tablet 2.5 mg	Naratriptan (as hydrochloride). Film-coated tablets. No specific data on enteral tube administration are available for this preparation. Readily soluble in water. Contains lactose.[4]

Site of absorption (oral administration)

Naratriptan is rapidly absorbed following oral administration. Peak plasma concentrations occur 2–3 hours following oral administration.[2–4]

Alternative routes available

None for naratriptan, but subcutaneous and intranasal routes are available for sumatriptan and intranasal for zolmitriptan (see individual monographs).

Interactions

No documented interaction with food and can be taken with or without food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Change to sumatriptan/zolmitriptan via an alternative route depending on the severity of the migraine attack and the patient's ability to administer.

References

1. *BNF* 67, March 2014.
2. Naratriptan (Actavis), Summary of Product Characteristics; March 2011.
3. Naratriptan (Zentiva), Summary of Product Chaacteristics; April 2011.
4. Naramig (GSK), Summary of Product Characteristics; July 2013.

Nebivolol

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Nebilet (Menarini)	Tablet 5 mg	Nebivolol (as hydrochloride). No specific data on enteral tube administration are available for this preparation. Tablet can be divided into quarters.[2]
Nebivolol (non-proprietary; Actavis, Sandoz, Zentiva)	Tablet 5 mg	Nebivolol (as hydrochloride). No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Site of absorption is not documented; rapid absorption occurs following oral intake.[2]

Alternative routes available

None available for nebivolol; other beta-blockers are available as parenteral formulations.

Interactions

Absorption is unaffected by food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Change to an alternative beta-blocker available as liquid formulation such as atenolol (see monograph).

References

1. *BNF* 67, March 2014.
2. Nebilet (Menarini), Summary of Product Characteristics; 20 May 2011.

Nefopam hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Acupan (Meda)	Tablet 30 mg	Film-coated tablets. Tablets disperse if shaken in 10 mL of water for 3–4 minutes. Dispersion settles very quickly but flushes via tube without blockage, though there is risk of leaving some of the dose in the container if it is not adequately rinsed.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–3 hours following oral administration.[3]

Alternative routes available

Parenteral formulation is available (unlicensed product). 20 mg i.m. = 60 mg orally.[1]

Interactions

There are no specific documented interactions with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use tablets dispersed in water immediately prior to administration. Consider changing to an alternative opiate available in more suitable formulation. Oral nefopam 30 mg is ~10 mg oral morphine.[4]
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Follow the guidance above. There are no specific data relating to the administration of nefopam via the jejunum. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Acupan Tablets (3M), Summary of Product Characteristics; 25 February 2013.
4. Twycross R, Wilcock A (eds). PCF2 Palliative Care Formulary, 3rd edn. Nottingham: Palliative-drugs.com; 2007.

Neomycin sulfate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Neomycin (non-proprietary; Amdipharm, Sovereign)	Tablet 500 mg	Sovereign brand tablets disintegrate when shaken in 10 mL of water for 10 minutes to give a very fine dispersion that flushes via an 6Fr NG tube without blockage.[2]

Site of absorption (oral administration)

Absorption of neomycin sulfate is minimal following oral dosing. See SPC for further details.

Alternative routes available

Not applicable. Neomycin is too toxic for systemic use.

Interactions

No interaction with food is documented.[3] There is no evidence to suggest that food reduces the efficacy of neomycin locally in the bowel.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Therapeutic effect is topical only. Action will only be from point of administration.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2014.
3. Nivemycin 500 mg Tablets (Amdipharm), Summary of Product Characteristics; February 2014.

Neostigmine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Neostigmine (non-proprietary)	Tablet 15 mg	Neostigmine (as bromide). Neostigmine bromide is very soluble in water.[2]
Neostigmine (Alliance)	Tablet 15 mg	Neostigmine (as bromide). Tablets disperse within 1 minute in 10 mL of water if shaken in the barrel of a syringe, to give a fine dispersion which flushes easily via a feeding tube without risk of blockage.[3]
Neostigmine (non-proprietary)	Injection 2.5 mg/mL (1 mL)	Neostigmine (as metisulfate). Neostigmine metisulfate is very soluble in water.[2]

Site of absorption (oral administration)

Neostigmine bromine is poorly absorbed orally and specific site of absorption is not known. Limited pharmacokinetic data are available.[2]

Alternative routes available

Can be given by i.v, i.m. or s.c. injection; 500 micrograms i.v. is equivalent in effect to 1–1.5 mg by i.m. or s.c. injection, or 15 mg oral neostigmine bromide.[2]

Interactions

Limited pharmacokinetic data are available, but no reports of interactions with food are documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablet in water and administer immediately.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet into the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and shake to disperse the tablet.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

- There are no data on jejunal administration of neostigmine.
- If clinically indicated, administer using the above method and monitor closely for clinical effect and signs of toxicity.

References

1. *BNF* 67, March 2014.
2. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
3. BPNG data on file, 2011.

Nevirapine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Viramune (Boehringer Ingelheim)	Tablet 200 mg	Nevirapine (as anhydrate). Tablets can be crushed but produce a 'slurry' if mixed with water; use of the suspension is likely to be preferable.[2]
Viramune (Boehringer Ingelheim)	Tablet 400 mg	Modified-release tablets; do not crush. Not suitable for enteral tube administration.
Viramune (Boehringer Ingelheim)	Suspension 50 mg/5 mL	Nevirapine (as hemihydrate). Off-white homogeneous suspension. Contains sorbitol[3] 1.156 g/5 mL dose.[4]
Nevirapine (non-proprietary; Sandoz)	Tablet 200 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site is not documented. Nevirapine is well absorbed following oral administration, with peak plasma concentration occurring 4 hours post dose.[3]

Alternative routes available

None available for nevirapine.

Interactions

The absorption of nevirapine is not affected by food, antacids or alkaline-buffered formulations (e.g. didanosine).[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid formulation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There is no specific information on jejunal administration. Administer using the above method. Plasma concentration can be measured (see www.hiv-druginteractions.org).

References

1. *BNF* 67, March 2014.
2. Personal communication, Boehringer Ingelheim; 6 March 2003.
3. Viramune 50 mg/5 mL Oral Suspension (Boehringer Ingelheim), Summary of Product Characteristics; November 2013.
4. Personal communication, Boehringer Ingelheim; August 2005.

Nicardipine hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Cardene (Astellas)	Capsule 20 mg, 30 mg	No specific data on enteral tube administration are available for this preparation.
Nicardipine (non-proprietary)	Capsule 20 mg, 30 mg	No specific data on enteral tube administration are available for this preparation.
Cardene SR (Astellas)	Capsule 30 mg, 45 mg	Modified-release capsules. Not suitable for administration via feeding tube.

Site of absorption (oral administration)

Specific site of absorption is not documented. Plasma levels are detectable within 20 minutes, peak plasma concentration occurs 0.5–2 hours post dose.[2]

Alternative routes available

None available for nicardipine.

Interactions

When given with a high-fat meal peak plasma concentrations are reduced by 30%.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to the lack of data consider changing to alternative therapy. Consider changing to once-daily amlodipine (see monograph) if clinically appropriate.
- It may be possible to administer the immediate-release capsules, but specific data are lacking; the three-times-daily dosing is a disadvantage.

References

1. *BNF* 67, March 2014.
2. Cardene (Astellas), Summary of Product Characteristics; 17 September 2012.

Nicorandil

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Ikorel (Sanofi Aventis)	Tablet 10 mg, 20 mg	Ikorel tablets are hygroscopic and readily absorb water. The manufacturer has anecdotal reports of the tablets being crushed and administered via feeding tubes.[2] Tablets disperse within 5 minutes when placed in 10 mL of water. This results in a fine suspension that flushes via an 8Fr NG tube without blockage.[3]
Nicorandil (non-proprietary; Dexcel)	Tablet 10 mg, 20 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Nicorandil is absorbed well from the small intestine, with the peak plasma concentration occurring 30–60 minutes following oral dosing.[4]

Alternative routes available

None available for nicorandil.

Interactions

Food decreases the rate but not the extent of absorption.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific reports relating to jejunal administration of nicorandil; however, nicorandil is well absorbed from the small intestine. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Aventis; 13 February 2003.
3. BPNG data on file, 2004.
4. Ikorel 10 mg Tablets (Sanofi), Summary of Product Characteristics; 22 January 2013.

Nifedipine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Nifedipine (non-proprietary)	Capsule 5 mg, 10 mg	Internal volumes and, therefore, concentrations of extracted liquid vary between manufacturers; accurate dosing of paediatric doses is problematic. Consult the manufacturer at time of use for clarification of internal volume, as generic suppliers change manufacturer.
Adalat (Bayer)	Capsule 5 mg, 10 mg	5 mg capsule is 0.17 mL.[2] 10 mg capsule is 0.34 mL.[2]
Adalat LA (Bayer)	M/R tablet 20 mg, 30 mg, 60 mg	Once-daily dosed modified-release tablets. Tablets should not be crushed and are unsuitable for enteral tube administration.[3]
Adalat Retard (Bayer)	M/R tablet 10 mg, 20 mg	Modified-release tablets. Licensed recommendation is to swallow whole; the tablets can be crushed and dispersed in water, but the modified-release properties will be lost and dose frequency will need to be adjusted to reflect this. The tablets should be crushed immediately prior to administration, as nifedipine is light sensitive.[2] Although crushing the M/R tablets results in statistically significant differences in AUC and C_{max}, there is no statistical or clinical difference in blood pressure reduction.[4]
Adipine MR (Chiesi)	M/R tablet 10 mg, 20 mg	Modified-release preparation; do not crush. Not suitable for enteral tube administration.
Adipine XL (Chiesi)	M/R tablet 30 mg, 60 mg	Modified-release preparation; do not crush. Not suitable for enteral tube administration.
Coracten SR (UCB, previously Celltech)	M/R capsule 10 mg, 20 mg	The capsules contain mini-tablets. These should not be crushed.
Coracten XL (UCB, previously Celltech)	M/R capsule 30 mg, 60 mg	The capsules contain mini-tablets; do not crush these mini-tablets.[5] 30 mg tablet contains 4 mini-tablets; 60 mg tablet contains 8 mini-tablets.
Fortipine LA 40 (AMG)	M/R tablet 40 mg	Modified-release preparation; do not crush. Not suitable for enteral tube administration.
Nifedipress MR (Dexcel)	M/R tablet 10 mg	Modified-release preparation; do not crush. Not suitable for enteral tube administration.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Tensipine MR (Genus)	M/R tablet 10 mg, 20 mg	Modified-release preparation; do not crush. Not suitable for enteral tube administration.
Valni XL (Winthrop)	M/R tablet 30 mg, 60 mg	Prolonged release,; do not crush. Not suitable for enteral tube administration.
With atenolol		See atenolol monograph

Site of absorption (oral administration)

Nifedipine is absorbed primarily via the gastric mucosa.[2] It is poorly absorbed by the buccal mucosa, and absorption from 'sublingual' administration is likely to be the result of swallowing the contents of the nifedipine capsules.[6]

Alternative routes available

None available for nifedipine.

Interactions

Absorption is not significantly affected by food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- The most practical solution is to consider changing to once-daily amlodipine (see monograph) if clinically appropriate.
- Extraction of the contents of the capsules requires a degree of manual dexterity and complete dosing cannot be guaranteed.
- Adalat Retard tablets can be crushed and dispersed in water and must be given immediately.
- Immediate-release nifedipine should be administered three times a day. Rapid fall in blood pressure and rebound tachycardia can occur when the immediate-release preparations are used.

Intragastric administration

Administration of Adalat Retard tablets (see notes above)

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There is no information relating to the jejunal administration of nifedipine via a jejunostomy tube; as the primary site of nifedipine absorption is the gastric mucosa, the amount absorbed in the jejunum is unknown. See notes above.

References

1. *BNF* 67, March 2014.
2. Personal communication, Bayer; 28 November 2002.
3. Adalat LA 20 mg Prolonged Release Tablets (Bayer), Summary of Product Characteristics; 22 January 2014.
4. Lepage R, Walker SE, Paradiso-Hardy F, Myers M. Pharmacokinetics and pharmacodynamics of intact and crushed nifedipine prolonged action (PA) tablets. *Can J Cardiol* 2000; 16 (Suppl F): 106F [abstract 56].
5. Personal communication, Celltech; 31 March 2003.
6. van Harten J, Burggraaf K, Danhof M, van Brummelen P, Breimer DD. Negligible sublingual absorption of nifedipine. *Lancet* 1987; 12(8572): 1363–1365.

Nimodipine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Nimotop (Bayer)	Tablet 30 mg	Film-coated tablets.[2] Nimodipine is extremely light sensitive.[3] Nimotop tablets have been crushed and administered via enteral feeding tubes as part of clinical trials; the subgroup of patients receiving their dose via this route were not analysed separately.[4]
Nimotop (Bayer)	i.v. infusion 200 micrograms/mL	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 30–60 minutes after oral dosing.[2]

Alternative routes available

Parenteral route is available.

Interactions

There is no documented interaction with food.[2,5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Tablets should be crushed at the bedside and administered immediately.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

If using a jejunal tube, consider using the parenteral route owing to the lack of data relating to jejunal administration.

References

1. *BNF 67*, March 2014.
2. Nimotop 30 mg Tablets (Bayer), Summary of Product Characteristics; 10 October 2012.
3. Personal communication, Bayer; 28 November 2002.
4. Pichard JD, Murray GD, Illingworth R *et al*. Effect of oral nimodipine on cerebral infarction and outcome after subarachnoid haemorrhage: British aneurysm nimodipine trial. *BMJ* 1989; 298: 636–642.
5. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

Nitrazepam

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Nitrazepam (non-proprietary; Meda, Actavis)	Tablet 5 mg	Brands include Mogadon.
Nitrazepam (Norgine)	Oral suspension 2.5 mg/5 mL	Sucrose-based syrup.[2]
Nitrazepam (Rosemont)	Oral suspension 5 mg/5 mL	Manufactured 'special'. Contains 0.45 g sorbitol/5 mL.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 2–3 hours following oral dose.[2]

Alternative routes available

None available.

Interactions

No specific interaction with food is documented.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid formulation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Administer as above.

References

1. *BNF* 67, March 2014.
2. Mogadon 5 mg Tablets (Meda), Summary of Product Characteristics; February 2013.
3. Personal communication, Rosemont; 20 January 2005.

Nitrofurantoin

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Nitrofurantoin (non-proprietary)	Tablet 50 mg, 100 mg	Tablets do not disperse readily but will disintegrate if shaken in 10 mL of water for 5 minutes to give a bright yellow, fine dispersion that flushes easily without blockage.[2]
Nitrofurantoin (AMCo)	Oral suspension 25 mg/5 mL	Bright yellow, slightly viscous liquid, resistant to flushing via an 8Fr NG tube. Mixes well with an equal volume of water, which reduces resistance to flushing.[2]
Furadantin (AMCo)	Tablet 50 mg, 100 mg	No specific data on enteral tube administration are available for this preparation.
Macrobid (AMCo)	Capsule 100 mg	Modified-release capsule. Not suitable for administration via the feeding tube.
Macrodantin (AMCo)	Capsule 50 mg, 100 mg	Capsule can be opened and contents mixed with water. There are some larger granules, which settle quickly and may block finer tubes.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–4 hours following oral dosing in fasted subjects.[3]

Alternative routes available

None available.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Liquid preparation is very expensive, in excess of £6.50 per 50 mg dose. Therefore consider using alternative liquid antibiotic.
- If therapy with nitrofurantoin is essential, use the liquid preparation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004/05.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Nizatidine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Nizatidine (Flynn)	Capsule 150 mg, 300 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs within 2 hours of oral administration.[2]

Alternative routes available

Parenteral route is available.

Interactions

No interaction with food is documented.[2]

Health and safety

Standard precautions apply

Suggestions/recommendations

- As no liquid formulation of nizatidine is available, use ranitidine (see monograph); oral doses are identical.

References

1. *BNF* 67, March 2014.
2. Nizatidine Capsules (Flynn), Summary of Product Characteristics; October 2008.

Norethisterone

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Norethisterone (Actavis, CP, Sandoz)	Tablet 5 mg	Tablets can be crushed, although precautions should be taken to avoid operator exposure.[2] CP brand tablets disperse when shaken in 10 mL of water for 5 minutes to give a fine dispersion, with some visible particles, that flushes via an 8Fr NG tube without blockage.[3]
Primulut N (Bayer Schering)	Tablet 5 mg	No specific data on enteral tube administration are available for this preparation.
Utovlan (Pharmacia)	Tablet 5 mg	Tablets can be crushed; owing to lack of stability data, this should be done immediately prior to administration.[4]
Noriday (Pfizer)	Tablet 250 micrograms	No data are available on administration via enteral feeding tubes for this preparation. Consider using alternative forms of contraception.
Micronor (Janssen)	Tablet 350 micrograms	No data are available on administration via enteral feeding tubes for this preparation. Consider using alternative forms of contraception.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 1–3 hours following oral dosing.[5]

Alternative routes available

None available.

Interactions

No specific interaction with food is documented.[5,6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration of norethisterone. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma; 21 January 2003.
3. BPNG data on file, 2005.
4. Personal communication, Pharmacia; 11 March 2003.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
6. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Ofloxacin

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Ofloxacin (non-proprietary)	Tablet 200 mg, 400 mg	No specific data on enteral tube administration are available for this preparation.
Ofloxacin (Mylan)	Tablet 200 mg, 400 mg	Tablet disperses slowly in water (5–6 minutes) to give a dispersion which settles very slowly; the dispersion flushes via a 6Fr tube without blockage.[2]
Tarivid (Sanofi)	Tablet 200 mg, 400 mg	Film-coated tablets. Tablets do not disperse readily in water. The tablet can be crushed, but the flaky coating makes crushing difficult. When mixed with water, the coating takes a few minutes to dissolve; then the contents form a milky dispersion that flushes via an 8Fr NG tube without blockage.[3]
Tarivid (Sanofi)	Infusion 2 mg/mL (50 mL, 100 mL)	Ofloxacin (as hydrochloride). No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–3 hours following oral dosing.[4]

Alternative routes available

Parenteral route is available.

Interactions

There is a significant interaction when ofloxacin is mixed directly with Ensure.[5] Reducing the available concentration by 46%; co-administration in patients reduced bioavailability by 10%, although peak plasma concentration was reduced by 36%; however, this was not substantiated by another study using a similar method.[6] The absorption of ofloxacin is not affected by food and the mechanism of the interaction with enteral feed is unknown.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- For serious infections use the parenteral formulation.

- As tablets do not disperse readily in water, consider changing to an alternative antibiotic available in a liquid or dispersible tablet formulation.
- When oral therapy with ofloxacin is indicated, disperse the tablet in water using the method below, consider using the higher end of the dose range.
- Stop feed 1 hour pre-dose and re-start feed 2 hours post-dose.

Intragastric administration

1. See notes above. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Wait for at least 1 hour.
4. Place the tablet in the barrel of an appropriate size and type of syringe.
5. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking as required.
6. Flush the medication dose down the feeding tube.
7. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
8. Finally, flush with the recommended volume of water.
9. Wait for at least 2 hours before re-starting the feed.

Intrajejunal administration

There are no specific data on jejunal administration of ofloxacin. Consider an alternative antibiotic. Administer using the above method; use the higher end of the dose range. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2014.
3. BPNG data on file, 2005.
4. Tarivid 200 mg Tablets (Sanofi), Summary of Product Characteristics; 12 December 2013.
5. Wright DH, Pietz SL, Konstantinides FN, Rotschafer JC. Decreased in vitro fluoroquinolone concentrations after admixture with an enteral feeding formulation. *JPEN J Parenter Enteral Nutr* 2000; 24(1): 42–48.
6. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Olanzapine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Zyprexa (Lilly)	Tablet 2.5 mg, 5 mg, 7.5 mg, 10 mg, 15 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]
Zyprexa Velotab (Lilly)	Orodispersible tablet 5 mg, 10 mg, 15 mg	Tablet can be dispersed in water.[2]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
ZypAdhera (Lilly)	Injection 210 mg, 300 mg, 405 mg	Olanzapine (as embonate). This preparation is not suitable for enteral tube administration.
Olanzapine (Accord, Actavis, Aurobindo Pharma-Milpharm, Consilient, Sandoz, Teva, Zentiva)	Tablets 2.5 mg, 5 mg, 7.5 mg, 10 mg, 15 mg, 20 mg	Film-coated tablet. No specific data on enteral tube administration are available for this preparation. Contain lactose.[3–7] Brands include Zalasta.
Olanzapine (Actavis, Aurobindo-Milpharm, Consilient, Sandoz, Teva, Zentiva)	Orodispersible tablet 5 mg, 10 mg, 15 mg, 20 mg	May be dispersed in water,[5] orange juice, apple juice, milk or coffee.[1]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 5–8 hours following oral dosing.[2]

Alternative routes available

Parenteral formulation available; suitable for long term maintenance therapy in patients tolerant to olanzapine.

Interactions

Absorption is not affected by food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use orodispersible tablets, no dose adjustment is necessary. Disperse in water immediately prior to administration.[8,9]
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking as required.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific reports of jejunal administration of olanzapine. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Zyprexa (Lilly), Summary of Product Characteristics; 27 May 2013.
3. Olanzapine 10 mg Film-coated Tablets (Accord), Summary of Product Characteristics; 22 October 2012.
4. Olanzapine 5 mg Film-coated Tablets (Actavis), Summary of Product Characteristics; 23 February 2013.
5. Zalasta 5 mg Oro-dispersible Tablets (Consilient), Summary of Product Characteristics; 27 September 2007.
6. Olanzapine Tablets (Sandoz), Summary of Product Characteristics; 17 December 2012.
7. Olanzapine (Zentiva), Summary of Product Characteristics; 21 March 2013.
8. Olanzapine 10 mg Orodispersible Tablets (Actavis), Summary of Product Characteristics; 6 September 2013.
9. Olanzapine Orodispersible (Sandoz), Summary of Product Characteristics; 9 November 2012.

Olmesartan medoxomil

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Olmetec (Daiichi Sankyo)	Tablet 10 mg, 20 mg, 40 mg	Film coated;[2] tablets should not be chewed.[2] No specific data on enteral tube administration are available for this preparation. Contains lactose.[2]
Olmetec Plus (Daiichi Sankyo)	Tablet 20 mg/12.5 mg, 20 mg/25 mg, 40 mg/12.5 mg	Tablets contain olmesartan medoxonil 20 mg and hydrochlorothiazide 12.5 mg; olmesartan medoxonil 20 mg and hydrochlorothiazide 25 mg; olmesartan medoxonil 40 mg and hydrochlorothiazide 12.5 mg. Film-coated tablets. No specific data on enteral tube administration are available for this preparation.
Sevikar (Daiichi Sankyo)	Tablet 20 mg/5 mg, 40 mg/5 mg, 40 mg/10 mg	Olmesartan medoxonil 20 mg and amlodipine (as besilate) 5 mg; olmesartan medoxonil 40 mg and amlodipine (as besilate) 5 mg; olmesartan medoxonil 40 mg and amlodipine (as besilate) 10 mg. Film-coated tablets. No specific data on enteral tube administration are available for this preparation.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Sevikar HCT (Daiichi Sankyo)	Tablet 20 mg/5 mg/12.5 mg, 40 mg/5 mg/12.5 mg, 40 mg/10 mg/12.5 mg, 40 mg/5 mg/25 mg, 40 mg/10 mg/25 mg	Tablets contain a combination of olmesartan, amlodipine (as besilate) and hydrochlorothiazide. Film-coated tablets. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is unknown. Olmesartan medoxonil is a prodrug; it is rapidly converted to the pharmacologically active metabolite by esterases in the gut mucosa and in portal blood during absorption from the GI tract.[2] Peak plasma concentrations of the active drug occur in the plasma within 2 hours of oral dosing.[2]

Alternative routes available

No other routes of administration are available for any of the angiotensin II antagonists.

Interactions

Food has minimal effect on absorption of olmesartan medoxomil.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to lack of data, consider changing to an alternative angiotensin II receptor antagonist.
- For combination products consider giving individual components separately.

References

1. *BNF* 67, March 2014.
2. Olmetec Film-coated Tablets (Daiichi Sankyo), Summary of Product Characteristics; 18 April 2013.

Olsalazine sodium

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Dipentum (UCB Pharma)	Capsule 250 mg	No specific data on enteral administration are available for this preparation.
Dipentum (UCB Pharma)	Tablet 500 mg	Tablets will disperse in 10 mL of water if shaken for at least 8 minutes. The dispersion is bright orange and will stain, but flushes down 8Fr NG tube without blockage.[2]

Site of absorption (oral administration)

Olsalazine is not absorbed; the azo bond is cleaved in the colon by bacteria, releasing the mesalazine as the active component.[3]

Alternative routes available

No alternative routes are available for olsalazine; other 5-ASA preparations are available as suppositories and enemas.

Interactions

There is no documented interaction with food. Manufacturers recommend taking with food.[3]

Health and safety

Standard precautions apply. Capsule contents and dispersed tablets will stain.

Suggestions/recommendations

- Tablets can be dispersed in water in the barrel of a syringe to minimise exposure to the dispersion, which stains porous surfaces orange. Use alternative topical preparations where clinically appropriate.
- Consider changing to sulfasalazine liquid preparation or using alternative therapy such as steroids.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking as required.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Jejunal administration will not affect the efficacy of the drug as the active compound in released in the colon. Administer as above.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Dipentum Tablets (UCB Pharma), Summary of Product Characteristics; July 2011.

Omeprazole

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Losec (AstraZeneca)	MUPS (dispersible tablet) 10 mg, 20 mg, 40 mg	Omeprazole (as magnesium salt). Tablet disintegrates to give a dispersion of small granules. The granules settle quickly and have a tendency to block fine-bore feeding tubes (less than 8Fr).[2] The tablets may be dispersed in water or suspended in a small amount of fruit juice or yogurt after gentle mixing. It is important that the tablets should not be crushed or chewed.[3] 10 mg and 20 mg tablets contain 19–20 mg sucrose 40 mg tablet contains 39-41 mg sucrose.[3]
Losec (AstraZeneca)	Capsule 10 mg, 20 mg, 40 mg	Enteric-coated granules within hard gelatin capsule. *Extemporaneous preparation:* 20 mg capsule contents can be dissolved in 10 mL of 8.4% sodium bicarbonate to give a 2 mg/mL solution; this is stable for 14 days at room temperature and for 45 days when refrigerated.[4,5] This solution can be administered via NG, duodenal or jejunal tube without risk of blockage or reduced efficacy.[6,7] 10 mg capsule contains 4 mg lactose 20 mg capsule contains 8 mg lactose 40 mg capsule contains 9 mg lactose.[8]
Losec (AstraZeneca)	Intravenous infusion 40 mg	Omeprazole (as sodium salt). Injection can be administered via gastrostomy or jejunostomy tube; further information can be obtained from AstraZeneca.[9]
Losec (AstraZeneca)	Intravenous injection 40 mg	Omeprazole (as sodium salt). See above.
Omeprazole (Actavis, APS, Aurobindo, Dexcal, Discovery, Generics, Kent, PLIVA, Sandoz, Winthrop)	Capsule 10 mg, 20 mg, 40 mg	See as for Losec capsules.
Omeprazole (Alpharma, Boots, Dexcel, GSK)	Tablet 10 mg, 20 mg, 40 mg	Both Alpharma and Dexcel brands are manufactured by Dexcel. The tablets disintegrate within 5 minutes when agitated in 10 mL of water to form a pink, milky dispersion that flushes down an 8Fr NG tube without blockage.[2]
Mezzopram (Sandoz)	Dispersible gastroresistant tablet 10 mg, 20 mg	Omeprazole (as magnesium salt). Tablets can be dispersed in a small amount of water, and mixed with fruit juice or applesauce. The mixture should be taken within 15 minutes. The gastroresistant pellets should not be chewed.[10]

Site of absorption (oral administration)

Absorption takes place in the small intestine and is usually complete within 3–6 hours.[3] Bioavailability of omeprazole is increased from 40–50% to 65% by enteric coating; this reflects the instability of the drug in gastric acid.[11]

Alternative routes available

Parenteral route is available.[4]

Interactions

Food may delay peak plasma concentration but does not affect the total absorption of omeprazole.[3,10]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider changing to esomeprazole sachets which are licensed for enteral tube administration (see monograph).
- For large-bore tubes the dispersible tablet preparations can be used, providing the tube is flushed well before and after administration.
- The liquid special or extemporaneous preparation detailed above should be used for fine-bore tubes (less than 12Fr). If excessive sodium bicarbonate intake is clinically inappropriate, the Dexcel brand tablets can be dispersed in water. The clinical effectiveness of the dispersed Dexcel brand tablets is unknown; however, as the enteroresistant coating has been removed, slightly larger doses may need to be given intragastrically to compensate for the reduced bioavailability.
- For jejunal administration, the extemporaneous solution or dispersed Dexcel brand tablets can be used.
- If intestinal absorptive capacity is unknown, consider using injection or infusion.

Intragastric administration

Liquid special or extemporaneous omeprazole solution

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Dispersible tablets

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 20 mL of water into the syringe and allow the tablet to disperse, shaking as required.
5. Flush the medication dose down the feeding tube.

6. Draw another 20 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 20 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Omeprazole is absorbed when administered into the jejunum with no reduction in bioavailability. Choice of formulation depends on the size of tube. See notes above.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Losec MUPS (AstraZeneca), Summary of Product Characteristics; 21 May 2013.
4. Quercia RA, Fan C, Liu X, *et al*. Stability of omeprazole in an extemporaneously prepared oral liquid. *Am J Health Syst Pharm* 1997; 54: 1833–1836.
5. DiGiacinto JL, Olsen KM, Bergman KL, *et al*. Stability of suspension formulations of lansoprazole and omeprazole stored in amber-coloured plastic oral syringes. *Ann Pharmacother* 2000; 34: 600–604.
6. Phillips JP, Metzler MH, Palmieri TL, *et al*. *A* prospective study of simplified omeprazole suspension for the prophylaxis of stress-related mucosal damage. *Crit Care Med* 1996; 24(11): 1793–1800.
7. Phillips JP, Olsen KM, Rebuck JA, *et al*. A randomised, pharmacokinetic and pharmacodynamic, cross-over study of duodenal or jejunal administration compared to nasogastric administration of omeprazole suspension in patients at risk for stress ulcers. *Am J Gastroenterol* 2001; 96(2): 367–372.
8. Losec Capsules (AstraZeneca), Summary of Product Characteristics; January 2012.
9. Personal communication, AstraZeneca, 26 March 2014.
10. Mezzopram 10 mg Dispersible Gastroresistant Tablets (Sandoz), Summary of Product Characteristics; 22 January 2013.
11. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Ondansetron

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Ondansetron (non-proprietary; Aurobindo Pharma-Milpharm, Wockhardt, Pliva)	Tablet 4 mg, 8 mg	Ondansetron (as hydrochloride). No specific data on enteral tube administration are available for this preparation.

Formulations available[1] (*continued*)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Ondansetron (non-proprietary; Hameln, Accord)	Injection 2 mg/mL (2 mL, 4 mL)	Ondansetron (as hydrochloride). No specific data on enteral tube administration are available for this preparation.
Ondansetron (Focus Pharmaceuticals)	Oral liquid 4 mg/5 mL	Clear strawberry flavoured liquid. Shelf life is 28 days once opened.[2] Does not contain sorbitol; contains xylitol 210 mg/mL.[3]
Ondemet (Alliance)	Tablet 4 mg, 8 mg	Ondansetron (as hydrochloride dihydrate).[4] 4 mg tablet contains 84.5 mg lactose. 8 g tablet contains 169 mg lactose. No specific data on enteral tube administration are available for this preparation.
Setofilm (Norgine)	Orodispersible film 4 mg, 8 mg	Ondansetron (as hydrochloride). No specific data on enteral tube administration are available for this preparation.
Zofran (GSK)	Tablet 4 mg, 8 mg	Ondansetron (as hydrochloride). No specific data on enteral tube administration are available for this preparation.
Zofran Melt (GSK)	Oral lyophilisate 4 mg, 8 mg	No specific data on enteral tube administration are available for this preparation.
Zofran (GSK)	Syrup 4 mg/5 mL	Ondansetron (as hydrochloride). Sugar-free; contains sorbitol[5] 3 g/5 mL dose.[6]
Zofran (GSK)	Injection 2 mg/mL (2 mL, 4 mL)	Ondansetron (as hydrochloride). No specific data on enteral tube administration are available for this preparation.
Zofran (GSK)	Suppository 16 mg	Rectal administration. Plasma levels are detectable 15–60 minutes following administration; peak plasma concentration occurs at 6 hours.[7]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentrations occur 1–1.5 hours following oral dosing.[8]

Alternative routes available

Parenteral formulation is available. Can be administered by i.v. or i.m. injection. Rectal formulation is available; once-daily dosing.

Interactions

Bioavailability of ondansetron is slightly enhanced by food.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider suppository formulation for rectal administration.
- Use a liquid formulation for administration via the feeding tube; consider the total sorbitol dose administered for high-dose regimens.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data on jejunal administration. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Ondansetron 4 mg/5 mL Oral Liquid (Focus), Summary of Product Characteristics; 30 May 2013.
3. Personal communication, Focus Pharmaceuticals; 17 March 2014.
4. Ondemet 4 mg Tablets (Alliance), Summary of Product Characteristics; 6 April 2012.
5. Zofran Syrup (GSK), Summary of Product Characteristics; 5 December 2013.
6. Personal communication, GlaxoSmithKline; February 2005.
7. Zofran Suppositories (GSK), Summary of Product Characteristics; 20 September 2013.
8. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

Orlistat

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Xenical (Roche)	Capsule 120 mg	No specific data on enteral tube administration are available for this preparation.
Beacita (Actavis)	Capsule 120 mg	No specific data on enteral tube administration are available for this preparation.
Orlistat (non-proprietary)	Capsule 120 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Orlistat is not absorbed. It inhibits gut lipases to reduce fat absorption.[2]

Alternative routes available

None.

Interactions

Reduces absorption of fat and fat-soluble vitamins.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Not appropriate for use in patients on enteral feed as calorie and fat content of intake can be controlled through manipulation and alteration of feed type and quantity. Seek specialist dietetic advice.

References

1. *BNF* 67, March 2014.
2. Xenical (Roche), Summary of Product Characteristics; 21 August 2013.

Orphenadrine hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Orphenadrine (non-proprietary)	Tablet 50 mg	No specific data on enteral tube administration are available for this preparation.
Orphenadrine (non-proprietary)	Oral solution 50 mg/5 mL	No specific data on enteral tube administration are available for this preparation.
Orphenadrine (Rosemont)	Oral solution 50 mg/5 mL	Orphenadrine (as hydrochloride). Viscosity slightly thicker than water.[2] Contains 0.45 g sorbitol/5 mL;[3] contains maltitol.[4]
Biorphen (Alliance)	Liquid 25 mg/5 mL	Product discontinued May 2013.
Disipal (Astellas Pharma)	Tablet 50 mg	Sugar-coated tablet.[5] No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Orphenadrine is readily absorbed from the GI tract, but the specific site of absorption is unknown.[5]

Alternative routes available

None.

Interactions

There is no documented interaction with food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation; if using Biorphen consider the sorbitol content.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There is no specific information on the jejunal administration of orphenadrine hydrochloride. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Rosemont. Orphenadrine Hydrochloride Oral Solution-24, http://www.rosemontpharma.com/products/central-nervous-system/orphenadrine-hydrochloride-oral-solution-24 (accessed 12 September 2014).
3. Personal communication, Rosemont; 20 January 2005.
4. Orphenadrine Oral Solution (Rosemont), Summary of Product Characteristics; 29 July 2013.
5. Disipal (Astellas Pharma), Summary of Product Characteristics; 12 September 2012.

Oseltamivir

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Tamiflu (Roche)	Capsule 30 mg, 45 mg, 75 mg	Oseltamivir (as phosphate). Hard gelatin capsule. Contents of capsule can be opened and mixed with chocolate syrup, honey, sugar dissolved in water, dessert toppings, sweetened condensed milk, apple sauce or yoghurt.[2] The contents of the capsule pour easily, but are granular in nature. Once dispersed in water, care must be taken to draw up the entire dose and administer and flush well. Although small particles are visible in the dispersion, this flushes via an 8Fr NG tube without blockage.[3] For patients with swallowing difficulties or paediatric patients, mix the contents of the capsule with one of the food stuffs listed above. For patients where this is not appropriate, correct strength of capsules is not available or the commercial suspension is not available, an extemporaneous product can be produced using the formulation and method detailed at the bottom of this monograph.[4] Based on pharmaceutical profile of the excipients in the commercial suspension and the suspending agents used below, Diluent A (Nova Labs) would be an appropriate alternative.[5]
Tamiflu (Roche)	Suspension 6 mg/mL	Oseltamivir (as phosphate). 5 mL dose contains 0.9 g sorbitol.[6]

Site of absorption (oral administration)

No specific site documented. Absorption is rapid following oral administration,[2] with peak levels occurring between 1 and 4 hours.[7,8]

Alternative routes available

None available for oseltamivir. Zanamivir (Ralenza) is available as a powder for inhalation.

Interactions

There is no significant interaction between oseltamivir and magnesium, aluminium or calcium-containing antacids.[2] Absorption is not affected by food.[2] Absorption is highly unlikely to be affected by enteral feed.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Enteral administration achieves satisfactory levels. However as both oseltamivir and zanamivir are recommended by NICE,[9,10] seek specialist advice regarding the use of zanamivir as an alternative.
- For enteral tube administration. Disperse capsule contents in water and administer using the method below.

Intragastric administration

1. Stop enteral feed.
2. Flush enteral feeding tube with the recommended volume of water.
3. Empty the contents of the capsule into a medicine pot.
4. Add 5 mL of water and stir to mix thoroughly.
5. Draw the dispersion into an appropriate enteral syringe taking care to draw up all particles.
6. Flush this via the feeding tube.
7. Add another 5 mL of water to the medicine pot, stir and draw into the syringe. This will ensure no residual dose remains in the pot.
8. Flush this via the feeding tube.
9. Finally, flush with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

No specific data relating to jejunal administration of oseltamivir. Seek specialist advice and consider use of zanamivir inhalation.

Extemporaneous preparation

See notes above regarding alternative suspending agents.

This compounding procedure results in a 15 mg/mL suspension, which differs from the commercially available Tamiflu for Oral Suspension, which has a concentration of 6 mg/mL.

Total volume of compounded oral suspension needed to be prepared	30 mL	40 mL	50 mL	60 mL
Required number of Tamiflu 75 mg capsules	6 capsules (450 mg oseltamivir)	8 capsules (600 mg oseltamivir)	10 capsules (750 mg oseltamivir)	12 capsules (900 mg oseltamivir)
Required volume of vehicle Cherry Syrup (Humco) *or* Ora-Sweet SF (Paddock Labs)	29 mL	38.5 mL	48 mL	57 mL

1. Carefully separate the capsule body and cap and transfer the contents of the required number of Tamiflu 75 mg capsules into a clean mortar.
2. Grind the granules to a fine powder.
3. Add one-third (1/3) of the specified amount of vehicle and mix with the powder until a uniform suspension is achieved.
4. Transfer the suspension to an amber glass or amber polyethyleneterephthalate (PET) bottle.

5. Add another one-third (1/3) of the vehicle to the mortar, mix with any remaining residue in the mortar and transfer the vehicle into the bottle.
6. Repeat the rinsing (step 5) with the remainder of the vehicle.
7. Close the bottle using a child-resistant cap.
8. Shake well to completely dissolve the active drug and to ensure homogeneous distribution of the dissolved drug in the resulting suspension. (Note: the active drug, oseltamivir phosphate, readily dissolves in the specified vehicles. The suspension is caused by some of the inert ingredients of Tamiflu capsules which are insoluble in these vehicles.)
9. Put an ancillary label on the bottle indicating 'Shake gently before use'. (This compounded suspension should be gently shaken prior to administration to minimise the tendency for air entrapment, particularly with the Ora-Sweet SF preparation.)
10. Instruct the parent or guardian that any remaining material following completion of therapy must be discarded.
11. Place an appropriate expiration date label according to storage condition (see below).

Storage

- Refrigeration: stable for 5 weeks (35 days) when stored in a refrigerator at 2 to 8 degrees C (36 to 46 degrees F).
- Room temperature: stable for five days (5 days) when stored at room temperature, 25 degrees C (77 degrees F).

Note: The storage conditions are based on stability studies of compounded oral suspensions, using the above mentioned vehicles, which were placed in amber glass and amber polyethyleneterephthalate (PET) bottles. Stability studies have not been conducted with other vehicles or bottle types.

Dosing chart for pharmacy-compounded suspension from Tamiflu capsules 75 mg

Body weight (kg)	Body weight (lbs)	Dose (mg)	Volume (mL) per dose 15 mg/mL	Treatment dose (for 5 days)	Prophylaxis dose (for 10 days)
≤15	≤33	30	2	2 mL twice daily	2 mL once daily
16–23	34–51	45	3	3 mL twice daily	3 mL once daily
24–40	52–88	60	4	4 mL twice daily	4 mL once daily
≥41	≥89	75	5	5 mL twice daily	5 mL once daily

The dosing device dispensed with the commercially available Tamiflu for oral suspension should **not** be used with the compounded suspension since they have different concentrations.

References

1. *BNF* 67, March 2014.
2. Tamiflu 75 mg Capsule (Roche), Summary of Product Characteristics; 24 October 2013.
3. BPNG data on file 2009.

4. Winiarski AP, Tscherne R, Bachynsky M, Rucki R, Nagano-Mate K. Preparation and stability of extemporaneous oral liquid formulations of oseltamivir using commercially available capsules. *J Am Pharm Assoc* 2007; 47(6): 747–755.
5. Personal communication, Nova Labs; 1 May 2009.
6. Tamiflu 6 mg/mL Powder for Oral Suspension (Roche), Summary of Product Characteristics; 24 October 2013.
7. Abe M, Smith J, Urae A, Barrett J, Kinoshita H, Rayner CR Pharmacokinetics of oseltamivir in young and very old subjects. *Ann Pharmacother* 2006; 40: 1724–1730.
8. Robson R, Buttimorey A, Lynn K, Brewster M, Ward P. The pharmacokinetics and tolerability of oseltamivir suspension in patients on haemodialysis and continuous ambulatory peritoneal dialysis. *Nephrol Dial Transplant* 2006; 21: 2556–2562.
9. Giraud C, Manceau S, Oualha M *et al*. High levels and safety of oseltamivir carboxylate plasma concentrations after nasogastric administration in critically ill children in a pediatric intensive care unit. *Antimicrob. Agents Chemother* 2011; 55(1): 433–435.
10. NICE. *Technology Appraisal 158: Oseltamivir, Amantadine (review) and Zanamivir for the Prophylaxis of Influenza*. London: NICE; September 2008, http://www.nice.org.uk/guidance/ta158 (accessed 12 September 2014).

Oxazepam

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Oxazepam (available from most generic manufacturers)	Tablet 10 mg, 15 mg, 30 mg	Uncoated tablets.[2,3] Actavis (previously Alpharma) tablets disperse rapidly in 10 mL of water to give a fine dispersion that flushes via an 8Fr NG tube without blockage.[4]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–5 hours following oral dosing.[5]

Alternative routes available

None available for oxazepam. Rectal route is available for diazepam; parenteral route is available for lorazepam.

Interactions

Food intake has no effect on bioavailability.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider changing to an alternative therapy available in liquid formulation.
- If continued therapy with oxazepam is indicated, disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of oxazepam. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Oxazepam Tablets BP 10 mg (Actavis), Summary of Product Characteristics; 20 January 2014.
3. Oxazepam 15 mg Tablets (Genus), Summary of Product Characteristics; 6 March 2014.
4. BPNG data on file, 2004.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Oxcarbazepine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Trileptal (Novartis)	Tablet 150 mg, 300 mg, 600 mg	Film coated.[2] Tablets do not disperse readily in water due to coating. Will disperse if shaken in water for 5 minutes to form a cloudy dispersion which flushes via an 8Fr NG tube without blockage.[3]
Trileptal (Novartis)	Oral suspension 300 mg/5 mL	Off white to slightly reddish-brown, sugar-free suspension. Can be mixed with water immediately before administration.[4] Contains sorbitol and ethanol. Sugar-free.
Oxcarbazepine (non-proprietary)	Tablet 150 mg, 300 mg, 600 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site not documented. Peak levels occur 4.5 hours following oral tablet dose[2] and 6 hours following oral suspension.[4]

Alternative routes available

None available for oxcarbazepine. Alternative routes are available for other antiepileptics.

Interactions

Food has no effect on the rate and extent of absorption, therefore oxcarbazepine can be taken with or without food. A prolonged break in feeding is not required.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the oral suspension, if administering via a fine bore tube dilute with water immediately prior to administration.
- Owing to lack of specific data on enteral tube administration of oxcarbazepine, consider alternative therapy for long-term therapy.

Intragastric administration

1. Stop enteral feed.
2. Flush enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw required dose into the appropriate size and type of syringe.
5. Dilute with recommended amount of water.
6. Flush medication dose down feeding tube.
7. Draw another 10 mL of water into the syringe and also flush this via feeding tube (this will rinse syringe and ensure total dose is administered).
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Specific data on jejunal administration is not available. Administer using the above method and monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Trileptal 150 mg, 300 mg, 600 mg Film-coated Tablets (Novartis), Summary of Product Characteristics; 17 April 2013.
3. BPNG data on file, 2009.
4. Trileptal Oral Suspension (Novartis), Summary of Product Characteristics; 17 April 2013.

Oxprenolol hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Oxprenolol (Amdipharm)	Tablet 20 mg, 40 mg, 80 mg	Film-coated tablets. 20 mg and 40 mg tablets will disperse in 10 mL of water if shaken for 5 minutes; this results in a very fine dispersion that flushes via an 8Fr NG tube without blockage.[2]
Slow-Trasicor (Amdipharm)	M/R tablet 160 mg	Modified-release preparation; do not crush. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Peak plasma concentration occurs 0.5–1.5 hours after an oral dose.[3] There are data demonstrating oxprenolol hydrochloride is also absorbed in the colon and therefore jejunal administration would be expected to produce a similar bioavailability to oral administration.[4]

Alternative routes available

None available for oxprenolol hydrochloride; other beta-blockers are available as parenteral formulations.

Interactions

There is no documented interaction with food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Conventional-release tablet requires two to three times daily dosing.
- Consider changing to an alternative once-daily beta-blocker such as atenolol (see monograph). If changing therapy is not appropriate, tablets can be dispersed in water immediately prior to administration, and can be administered via a gastrostomy or jejunostomy. A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.

4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking as required.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to dissolve. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

The bioavailability of oxprenolol hydrochloride is unlikely to be affected by jejunal administration. The above method of administration can be followed.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
4. Adams D. Administration of drugs through a jejunostomy tube. *Br J Intensive Care* 1994; 4(1): 10–17.

Oxybutynin hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Oxybutynin hydrochloride (various manufacturers)	Tablet 2.5 mg, 3 mg, 5 mg	Tillomed brand tablets disperse readily when placed in 10 mL of water to give a fine dispersion that flushes easily via an 8Fr tube without blockage.[2]
Cystrin (Zentiva)	Tablet 3 mg	Tablets do not disperse readily in water but will disintegrate if shaken in water for 5 minutes; this gives a fine dispersion with some visible particles that stick to side of syringe; ensure that the syringe is rinsed well. Does not block tube.[2] Tablets may be crushed.[3]
Ditropan (Sanofi)	Tablet 2.5 mg, 5 mg	Tablets can be crushed.[3]
Ditropan (Sanofi-Synthelabo)	Elixir 2.5 mg/5 mL	Contains sucrose (1.3 g/5 mL) and sorbitol.[4]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Lyrinel XL (Janssen-Cilag)	M/R tablet 5 mg, 10 mg	Modified release preparation; do not crush. Not suitable for enteral tube administration.
Oxybutynin chloride(Rosemont)	Oral solution 5 mg/5 mL	Manufactured 'special' preparation. Contains 1.36 g sorbitol/5 mL.[5] Sugar-free.
Kentera (UCB Pharma)	Patch 36 mg	One patch to be applied twice weekly.

Site of absorption (oral administration)

Specific site of absorption is not documented. However, the availability of modified-release products would indicate that oxybutynin hydrochloride is absorbed throughout the small bowel. Oxybutynin hydrochloride is poorly absorbed from the GI tract. Peak plasma concentration occurs 0.5–1 hour following oral administration.[4]

Alternative routes available

Transdermal patches are available. Intravesical installation is available on a named-patient basis.

Interactions

There are no documented interactions with food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use transdermal patch where clinically appropriate. Use a liquid preparation for use via enteral feeding tube, although daily dosing regimen of two to four times a day should be considered.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication suspension into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into the syringe with an appropriate adapter for the tube connector. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of oxybutynin. Administer as above. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Personal communication, Sanofi-Synthelabo; 3 February 2004.
4. Ditropan Elixir (Sanofi-Synthelabo), Summary of Product Characteristics; 15 March 2013.
5. Personal communication, Rosemont; 20 January 2005.

Oxycodone hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Oxycodone (non-proprietary)	Capsule 5 mg, 10 mg, 20 mg	No specific data on enteral tube administration are available for this preparation. Brands include Lynlor, Shorttec.
Oxycodone (non-proprietary)	Oral solution 5 mg/5 mL	No specific data on enteral tube administration are available for this preparation.
Oxycodone (non-proprietary)	Concentrated oral solution 10 mg/mL	No specific data on enteral tube administration are available for this preparation.
Oxycodone (non-proprietary)	Injection 10 mg/mL (1 mL, 2 mL)	No specific data on enteral tube administration are available for this preparation.
OxyNorm (Napp)	Capsule 5 mg, 10 mg, 20 mg	No specific data on enteral tube administration are available for this preparation.
OxyNorm (Napp)	Liquid 5 mg/5 mL	There is no theoretical reason why OxyNorm should not be administered via an enteral feeding tube, although the manufacturer has no data to support this.[2] Does not contain sorbitol;[3] sugar free.
OxyNorm Concentrate (Napp)	Oral solution 10 mg/ mL	Can be mixed with a soft drink to increase palatability.[3] Does not contain sorbitol;[3] sugar free.
OxyNorm (Napp)	Injection 10 mg/ mL (1 mL, 2 mL), 50 mg/mL (1 mL)	No specific data on enteral tube administration are available for this preparation.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
OxyContin (Napp)	Tablet 5 mg, 10 mg, 15 mg, 20 mg, 30 mg, 40 mg, 60 mg, 80 mg, 120 mg	Modified-release tablets; do not crush. Not suitable for enteral tube administration.
Dolocodon PR (Zentiva)	M/R tablet 5 mg, 10 mg, 20 mg, 40 mg	Modified-release tablets; do not crush. Not suitable for enteral tube administration.
Longtec (QDem)	M/R tablet 5 mg, 10 mg, 20 mg, 40 mg, 80 mg	Modified-release tablets; do not crush. Not suitable for enteral tube administration.
Zonestine (Accord)	M/R capsule 5 mg, 10 mg, 20 mg, 40 mg, 80 mg	Modified-release capsules; do not crush. Not suitable for enteral tube administration.
Targinact (Napp)	Tablet 5 mg/2.5 mg, 10 mg/5 mg, 20 mg/10 mg, 40 mg/20 mg.	5 mg/2.5 mg tablet contains 5 mg oxycodone hydrochloride (equivalent to 4.5 mg oxycodone) and 2.73 mg naloxone hydrochloride dihydrate (equivalent to 2.5 mg naloxone hydrochloride and 2.25 mg naloxone); 10 mg/5 mg contains 10 mg oxycodone hydrochloride (equivalent to 9.0 mg oxycodone) and 5.45 mg naloxone hydrochloride dihydrate (equivalent to 5.0 mg naloxone hydrochloride and 4.5 mg naloxone); 20 mg/10 mg tablet contains 20 mg oxycodone hydrochloride (equivalent to 18.0 mg oxycodone) and 10.9 mg naloxone hydrochloride dihydrate (equivalent to 10.0 mg naloxone hydrochloride and 9.0 mg naloxone); 40 mg/20 mg tablet contains 40 mg oxycodone hydrochloride (equivalent to 36.0 mg oxycodone) and 21.8 mg naloxone hydrochloride dihydrate (equivalent to 20.0 mg naloxone hydrochloride and 18.0 mg naloxone). Modified-release tablets; do not crush. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs within 1 hour following oral dosing using liquid formulations.[3]

Alternative routes available

Parenteral formulation is available for oxycodone hydrochloride. Rectal, transdermal and parenteral formulations are available for alternative opiates.

Interactions

There is no documented interaction with food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid formulation for administration via the feeding tube. When transferring from sustained-release preparation, divide the total daily dose by 6 and give 4-hourly using the liquid preparation.
- A prolonged break in feeding is not required.
- If a sustained opiate effect is required and 4-hourly dosing is not practical, consider using fentanyl or buprenorphine patches; seek advice for dose conversion.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication liquid into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration. Administer using the above method. Monitor for lack of efficacy or side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Napp; 29 January 2003.
3. OxyNorm Liquid (Napp), Summary of Product Characteristics; April 2011.

Oxytetracycline

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Oxytetracycline (Actavis, Teva, Intrapharm)	Tablet 250 mg	Oxytetracycline (as dihydrate). Coated tablets; crushing of tablets is not recommended.[2]

Site of absorption (oral administration)

Absorption of oxytetracycline occurs in the stomach and duodenum.[3] Absorption is incomplete and irregular.[4]

Alternative routes available

None available for oxytetracycline.

Interactions

Food, milk and some dairy products reduce absorption (by up to 65%)[5]. Tetracyclines should be given 1 hour before or 2 hours after meals.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to the necessary break in feeding, the frequency of dosing and a lack of suitable formulation, consider changing to once-daily doxycycline (see monograph). Seek microbiological advice.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma (now Actavis); 21 January 2003.
3. Personal communication, Pfizer; 23 June 2003.
4. Oxytetracycline Tablets BP 250 mg (Intrapharm); Summary of Product Characteristics; December 2012.
5. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Paliperidone

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Invega (Janssen-Cilag)	Tablet 1.5 mg, 3 mg, 6 mg, 9 mg, 12 mg	Prolonged release preparation; do not crush. Not suitable for administration via an enteral feeding tube. Contains lactose 13.2 mg/tablet.[2]
Xeplion (Janssen)	Tablet 50 mg, 75 mg, 100 mg, 150 mg	Paliperidone (as palmitate). Depot injection.

Site of absorption (oral administration)

Specific site of absorption is not documented. Following a single dose, a gradual ascending release rate occurs allowing a steady rise in the plasma concentration.[2]

Alternative routes available

A prolonged release injection preparation is available. As paliperidone is the active metabolite of risperidone, risperidone can be used as an alternative (see monograph).

Interactions

Administration following a standard high fat/high calorific meal increases the C_{max} and AUC by up to 50–60%.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use an alternative route or preparation.

Intrajejunal administration

There are no data on the jejunal administration of paliperidone.

References

1. *BNF* 67, March 2014.
2. Invega (Janssen-Cilag), Summary of Product Characteristics; 26 August 2013.

Pancreatin supplements

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Creon 10,000 (Abbott)	Capsule	Protease 600 units, lipase 10 000 units, amylase 8000 units. Capsules containing enteric-coated granules. Capsules can be opened, but the granules must not be crushed.
Creon 25,000 (Abbott)	Capsule	Protease 1000 units, lipase 25 000 units, amylase 18 000 units. Capsules containing enteric-coated granules. Capsules can be opened, but the granules must not be crushed.
Creon 40,000 (Abbott)	Capsule	Protease 1600 units, lipase 40 000 units, amylase 25 000 units. Capsules containing enteric-coated granules. Capsules can be opened, but the granules must not be crushed.
Creon Micro (Abbott)	Gastroresistant granule	Protease 200 units, lipase 5000 units, amylase 3600 units/100 mg of granules. Granules may be mixed with food and swallowed whole. Not suitable for enteral tube administration.
Nutrizym 22 (Serono)	Capsule	Protease 1100 units, lipase 22 000 units, amylase 19 800 units. The pellets within the capsules are enteric coated and can be swallowed with water. They may get stuck within the tube, especially smaller-sized tubes.[2]
Pancrease HL (Janssen-Cilag)	Capsule	Protease 1250 units, lipase 25 000 units, amylase 22 500 units. The intact beads can be administered via an NG tube in water or in milk.[3] There is no comment on the risk of tube blockage.
Pancrex (Essential)	Granule	Protease 300 units, lipase 5000 units, amylase 4000 units/g. Granules can be mixed with milk or water.[4]
Pancrex V (Essential)	Capsule	Protease 430 units, lipase 8000 units, amylase 9000 units. The capsules contents can be mixed with feeds; the resulting mixture should be used within 1 hour.[5]

Formulations available[1] (*continued*)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Pancrex V '125' (Essential)	Capsule	Protease 160 units, lipase 2950 units, amylase 3300 units. The capsules contents can be mixed with feeds. The resulting mixture should be used within 1 hour.[6]
Pancrex V Tablets (Essential)	Tablet	Protease 110 units, lipase 1900 units, amylase 1700 units. Enteric-coated, sugar-coated tablets; must be swallowed whole.[7]
Pancrex V Tablets Forte (Essential)	Tablet	Protease 330 units, lipase 5600 units, amylase 5000 units. Enteric-coated, sugar-coated tablets; must be swallowed whole.[8]
Pancrex V (Essential)	Powder	Protease 1400 units, lipase 25 000 units, amylase 30 000 units/g. Mix appropriate quantity of powder with water or milk prior to administration.[9]

Site of absorption (oral administration)

Pancreatic enzymes are not absorbed; they act locally in the proximal small bowel. Peak enzyme activity occurs 30 minutes after activation and decreases after 2 hours.

Alternative routes available

Alternative routes of administration are not appropriate.

Interactions

The pharmacological response is based on the interaction with food.

Health and safety

Standard precautions apply. Avoid handling or inhaling the capsule contents and dry powder preparations. Allergic reactions have been reported.[6]

Suggestions/recommendations[10]

Feed type	Enzyme dose
Standard whole-protein feed	Equivalent to that required for a similar volume of full-cream milk
Peptide feed	50% of that required for a similar volume of full-cream milk
Elemental feed	25% or less of that required for a similar volume of full-cream milk (dependent on percentage of MCT fat in feed)

- If transferring from oral diet and pancreatic enzyme supplements to complete enteral feed, consider a trial without supplements, especially if on a low dose of enzyme supplements. If the patient does not tolerate standard feed, consider a trial of peptide-based feed.

- For patients with wide-bore enteral feeding tubes, the granules can be used, dispersed in water immediately prior to administration. A dose should be given before and immediately after each feed if bolus feeding. If on a continuous feed, a dose should be given at the start of the feed and then at regular intervals throughout; these doses should be titrated to response and practicality. A method has been described for suspending the capsule contents to facilitate administration via tubes of 10Fr or greater.[11]
- For fine-bore feeding tubes the capsules containing powder or the loose powder can be used. The dose of powder can be mixed with a small volume of water (10–20 mL) immediately prior to administration. The timing of doses can be given as above.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Open the capsule and pour the contents into a medicine pot.
4. Add 15 mL of water.
5. Stir to disperse the powder or granules (depending on bore size of tube).
6. Draw into an appropriate type and size of syringe and administer via the feeding tube.
7. Add a further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
8. Draw up this dispersion and flush down the tube. This will ensure that the whole dose is given.
9. Flush the tube with water.
10. Re-start feed immediately.

Intrajejunal administration

There are no specific data relating to jejunal administration of pancreatic supplements. There is no theoretical reason why the enzymes should be ineffective. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Merck; 23 January 2003.
3. Personal communication, Janssen-Cilag; 22 January 2003.
4. Pancrex Granules, Patient Information Leaflet; May 2012.
5. Pancrex V Capsules, Patient Information Leaflet; May 2012.
6. Pancrex V Capsules 125 mg, Patient Information Leaflet; May 2012.
7. Pancrex V Tablets (Essential), Summary of Product Characteristics; May 2012.
8. Pancrex V Forte Tablets (Essential), Summary of Product Characteristics; May 2012.
9. Pancrex V Powder, Patient Information Leaflet; May 2012.
10. Personal communication, Solvay (previous MA holder for Creon); 19 February 2003.
11. Ferrie S, Graham C, Hoyle M Pancreatic enzyme supplementation for patients receiving enteral feeds. *Nutr Clin Pract* 2011; 26: 349–351.

Pantoprazole

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Pantoprazole (non-proprietary)	Tablet 20 mg, 40 mg	Pantoprazole (as sodium sesquihydrate). Gastroresistant coated tablet.[2–5] Tablet can be crushed and dissolved in 10 mL of 8.4% sodium bicarbonate for administration via a NG tube; this solution is stable for 2 weeks at 5°C. The peak plasma concentration is the same as the tablet administered orally, but bioavailability is reduced to 75% of oral equivalent.[6]
Pantoprazole (non-proprietary)	Injection 40 mg	Pantoprazole (as sodium sesquihydrate). No data on enteral administration for this preparation.
Protium (Takeda)	Injection 40 mg	Pantoprazole (as sodium sesquihydrate). No data on enteral administration for this preparation.
Pantaloc Control (Novartis)	Tablet 20 mg	Pantoprazole (as sodium sesquihydrate). Gastroresistant-coated tablets.[7] No data on enteral administration for this preparation.

Site of absorption (oral administration)

Peak concentrations occur after 2–2.5 hours. Pantoprazole is absorbed in the small bowel; the formulation is enteric coated.[2]

Alternative routes available

Parenteral route is available.[8]

Interactions

Absorption is unaffected by food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Although it is possible to administer pantoprazole via a nasogastric tube following the method above, it would be appropriate to consider using the parenteral route or changing therapy to esomeprazole, lansoprazole or omeprazole for ease of administration (see monographs). Alternatively, ranitidine may be used if a step-down approach is appropriate (see monograph).

References

1. *BNF* 67, March 2014.
2. Pantoprazole Tablets (Takeda), Summary of Product Characteristics; 30 November 2011.

3. Pantoprazole Tablets (Wockhardt), Summary of Product Characteristics; 29 June 2012.
4. Pantoprazole Tablets (Sandoz), Summary of Product Characteristics; 6 September 2013.
5. Pantoprazole (Actavis), Summary of Product Characteristics; 30 July 2012.
6. Ferron GM, Ku S, Abell M, *et al.* Oral bioavailability of pantoprazole suspended in sodium bicarbonate solution. *Am J Health Syst Pharm* 2003; 60(13): 1324–1329.
7. Pantaloc Control (Novartis), Summary of Product Characteristics; 21 February 2011.
8. Protium 40 mg i.v. (Takeda), Summary of Product Characteristics; 13 October 2014.

Paracetamol

Formulations available[1]
(Owing to the large number of formulations available, only those that might be considered suitable are included below)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Paracetamol (non-proprietary)	Soluble tablet 500 mg	Sterwin brand contains 388 mg sodium (17 mmol) per tablet.[2] Sterwin brand tablets effervesce in 10 mL of water to give a milky dispersion that flushes via an 8Fr NG tube without blockage.[3] Sterling Health brand contains 427 mg sodium (18.6 mmol) per tablet.[4] Boots brand contains 438 mg (19.2 mmol) sodium/tablet.[5] Accord brand contains 503 mg (22 mmol) sodium/tablet.[6]
Paracetamol (non-proprietary)	Paediatric soluble tablet 120 mg	No specific data on enteral tube administration are available for this preparation. Brands include Disprol.
Paracetamol (non-proprietary)	Oral suspension 120 mg/5 mL	Rosemont suspension contains 0.68 g sorbitol/5 mL dose.[7] The viscosity of the paediatric liquid preparations is very high; it is difficult to administer these suspensions via a fine bore tube without dilution.[8]
Paracetamol (non-proprietary)	Oral suspension 250 mg/5 mL	Rosemont suspension contains 0.68 g sorbitol/5 mL dose.[8]
Paracetamol (non-proprietary)	Oral suspension 500 mg/5 mL	No specific data on enteral tube administration are available for this preparation.
Paracetamol (AstraZeneca, Arum)	Suppository 60 mg, 120 mg, 125 mg, 240 mg, 250 mg, 500 mg	Rectal use only. Bioavailability 40–60%. Time to peak plasma concentration is 2–3 hours.
Perfalgan (Bristol-Myers Squibb)	Infusion 10 mg/mL (50 mL and 100 mL)	Not suitable for enteral administration.

Site of absorption (oral administration)

Paracetamol is absorbed rapidly following oral administration. Administration into the jejunum achieves similar plasma concentration to oral administration.[9]

Alternative routes available

Rectal and parenteral routes are available.

Interactions

No interaction with food or enteral feed is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use tablets dispersed in 50 mL of water (for adults) for intragastric or intrajejunal administration. If the sodium content is problematic, use the liquid formulation. This can be used undiluted for intragastric administration; however, see note above regarding viscosity and fine bore tubes. If administering intrajejunally, dilute with at least an equal quantity of water to reduce osmolarity and viscosity.
- Suppositories or injection can be considered useful alternatives, although cost may be considered prohibitive.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure 50 mL of water into a measuring pot.
4. Add the effervescent tablet and allow to dissolve.
5. Draw into an appropriate size and type of syringe.
6. Flush the medication dose down the feeding tube.
7. Rinse the measure with 10–20 mL of water and administer this also to ensure that the total dose is given.
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Administration into the jejunum does not affect bioavailability. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Sterwin; July 2005.
3. BPNG data on file, 2005.
4. Personal communication, Sterling Health; July 2005.
5. Boots Paracetamol Soluble 500 mg (Boots) Summary of Product Characteristics; 22 November 2011.
6. Paracetamol Soluble (Accord) Summary of Product Characteristics; 16 April 2014.
7. Personal communication, Rosemont; 20 January 2005.
8. BPNG data on file, 2011.
9. Adams D. Administration of drugs through a jejunostomy tube. *Br J Intensive Care* 1994; 4(1): 10–17.

Paroxetine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Paroxetine (Actavis, Aurobindo-Milpharm, Generics, Norton, Sandoz, Zentiva)	Tablet 20 mg, 30 mg	Paroxetine (as hydrochloride). No specific data on enteral tube administration are available for this preparation.
Seroxat (GSK)	Tablet 20 mg, 30 mg	Paroxetine (as hydrochloride). Film-coated, scored tablets. No specific data on enteral tube administration are available for this preparation.
Seroxat (GSK)	Liquid 10 mg/5 mL	Paroxetine (as hydrochloride). Orange liquid; viscous but flushes with only a slight resistance. Mixes with an equal volume of water, which reduces resistance to flushing.[2] Sugar-free, contains sorbitol.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented.

Alternative routes available

Not applicable.

Interactions

The absorption of paroxetine is not affected by food or antacids.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid preparation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to

ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of paroxetine. Administer using the method above. Consider dilution of the dose immediately prior to administration to reduce osmolarity. Monitor for side-effects and loss of efficacy.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Seroxat (GSK), Summary of Product Characteristics; 18 November 2013.

Pentoxifylline (Oxpentifylline)

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Trental (Sanofi-Aventis)	M/R tablet 400 mg	Modified-release tablet; do not crush. The SPC recommends that the tablets be swallowed whole.[2] A preparation for extemporaneous preparation is available using the modified-release tablets;[3] however, administration of immediate-release pentoxifylline results in a significant increase in side-effects due to an earlier and higher peak in plasma levels.[4]

Site of absorption (oral administration)

No specific data on site of absorption. Peak levels occur 4–6 hours following oral administration of the modified-release tablets. Peak levels occur within 1 hour of administration of the crushed tablets and result in a significant increase in bioavailability compared to the modified-release preparation.

Alternative routes available

None available for pentoxifylline.[5]

Interactions

No specific data on interaction with food. SPC recommends taking tablets with or after food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Avoid administration of pentoxifylline via feeding tube.
- If administration via this route is considered essential then the extemporaneous preparation should be used, reduction of the dose should be considered in view of increased side-effects and relative bioavailability.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the extemporaneous preparation into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Draw a further 10 mL of water into the syringe and also flush this via feeding tube (this will rinse the syringe and ensure the total dose is given).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Administer extemporaneous preparation using the above method. Monitor for increased GI side-effects.

References

1. *BNF* 67, March 2014.
2. Trental (Sanofi-Aventis), Summary of Product Characteristics; 27 September 2013.
3. Abdel-Rahman SM, Nahata MC. Stability of pentoxifylline in an extemporaneously prepared oral suspension. *Am J Health Syst Pharm* 1997; 54: 1301–1303.
4. Cleary JD, Evans PC, Hikal AH, Chapman SW. Administration of crushed extended-release pentoxifylline tablets: bioavailability and adverse effects. *Am J Health Syst Pharm* 1999; 56(15): 1529–1534.
5. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

Perindopril erbumine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Coversyl Arginine (Servier)	Tablet 2.5 mg, 5 mg, 10 mg	Perindopril (as arginine). No specific data on enteral tube administration are available for this preparation.
Coversyl Arginine Plus (Servier)	Tablet 5 mg/1.25 mg	Perindopril arginine 5 mg and indapamide 1.25 mg.[2] No specific data on enteral tube administration are available for this preparation.
Perindopril Erbumine (Actavis, Accord)	Tablet 2 mg, 4 mg, 8 mg	No specific data on enteral tube administration are available for this preparation.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs within 1 hour of oral dosing.[4]

Alternative routes available

No alternative route is available for any of the ACE inhibitors.

Interactions

Conversion of perindopril arginine and erbumine to perindoprilat, and thereby bioavailability, is reduced by the ingestion of food; therefore, perindopril erbumine should be taken before food.[4,5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to the lack of data consider using another ACE inhibitor where data are available for administration via an enteral feeding tube.
- If on continuous feeding, an ACE inhibitor unaffected by food and available as a liquid formulation, such as lisinopril (see monograph), could be substituted.

References

1. *BNF* 67, March 2014.
2. Coversyl Arginine Plus (Servier), Summary of Product Characteristics; August 2012.
3. Perindopril Erbumine (Actavis), Sumary of Product Characteristics; 9 September 2013.
4. Coversyl Arginine (Servier), Summary of Product Characteristics; August 2013.
5. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Phenelzine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Nardil (Archimedes)	Tablet 15 mg	Phenelzine (as sulfate). Film-coated tablets. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 2 hours following oral dosing.[2]

Alternative routes available

None available.

Interactions

Phenelzine causes an increased sensitivity to foods high in tryptophan; however, there is no specific pharmacokinetic interaction with food documented.[2] Enteral feed does not contain tryptophan.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to lack of specific data, consider changing to an alternative antidepressant. Seek specialist advice.
- If alternative therapy is not appropriate, crush the tablets and disperse in water immediately prior to administration; this should be considered a last resort.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly ensuring that there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure that the total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to jejunal administration of phenelzine. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Phenobarbital (Phenobarbitone)

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Phenobarbital (various manufacturers)	Tablet 15 mg, 30 mg, 60 mg	No specific data on enteral tube administration are available for this preparation.
Phenobarbital (various manufacturers)	Elixir 15 mg/5 mL	Contains alcohol 38%.[2]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Phenobarbital sodium (Concord, Martindale)	Injection 200 mg/mL	i.m. route used for control of acute seizures. i.v. route used for status epilepticus.
Specials (various specials manufacturers)	Oral liquid various strengths	Alcohol-free liquid. Available on request only.

Site of absorption (oral administration)

No specific site of absorption is documented. Peak plasma concentration occurs 6–18 hours following oral intake; peak plasma concentration occur 2–3 hours after i.m. dosing.[3]

Alternative routes available

Parenteral route is available, although usually reserved for acute treatment.

Interactions

There is no documented interaction with food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation.
- Note the very high alcohol concentration.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication suspension into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration. Administer as above; consider diluting the liquid formulation immediately prior to administration to reduce osmolarity. Monitor for loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Phenobarbital 15 mg/5 mL Elixir (Thornton & Ross), Summary of Product Characteristics; 17 January 2014.
3. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

Phenoxybenzamine hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Phenoxybenzamine (Mercury)	Injection concentrate 50 mg/mL (2 mL)	Risk of contact sensitisation; healthcare professionals should avoid contamination of hands.[2]
Dibenyline (Mercury)	Capsule 10 mg	Hard gelatin capsules. Contents pour easily from capsule; however, they do not mix well with water, settle and adhere to container.[3] High risk of inaccurate dosing. Phenoxybenzamine is only sparingly soluble in water.[4] A 2 mg/mL solution of phenoxybenzamine in 1% propylene glycol and 0.15% citric acid in distilled water is stable for 7 day if stored in the refrigerator.[5] There are no data on enteral tube administration of this preparation.

Site of absorption (oral administration)

Specific site of absorption is not known. Absorption from the GI tract is variable. Following oral administration onset of action is gradual.[2]

Alternative routes available

Parenteral route can be used if GI absorption is impaired or rapid dose titration required.

Interactions

No documented interaction with food. GI side effects may be reduced by giving the dose with milk.

Health and safety

Standard precautions apply. Risk of contact sensitisation, gloves must be worn.

Suggestions/recommendations

- Phenoxybenzamine capsules are not suitable for enteral tube administration.
- Alternative therapy such as doxazosin or prazosin (see monographs) should be considered. Doxazosin is preferred owing to the possibility for once daily dosing.[6]

References

1. *BNF* 67, March 2014.
2. Dibenyline (Amdipharm-Mercury), Summary of Product Characteristics; April 2012.
3. BPNG data on file, 2011.
4. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
5. Lim LY, Tan LL, Chan EW, *et al*. Stability of phenoxybenzamine hydrochloride in various vehicles. *Am J Health Syst Pharm* 1997; 54(18): 2073–2078.
6. Horst-Schrivers ANA, Kerstens MN, Wolffenbuttel BHR. Preoperative pharmacological management of phaeochromocytoma. *Neth J Med* 2006; 64(8): 290–295.

Phenoxymethylpenicillin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Phenoxymethylpenicillin (Actavis, Teva, Arrow, Berk, Generics, Kent, Sovereign)	Tablet 250 mg	Phenoxymethylpenicillin (as potassium salt). Avoid crushing the tablets owing to the risk of sensitisation to penicillin.
Phenoxymethylpenicillin (Actavis, Teva, Arrow, Generics, Kent, Sandoz, Sovereign)	Oral solution 125 mg/5 mL, 250 mg/5 mL	Phenoxymethylpenicillin (as potassium salt). Oral solution draws up easily and flushes via fine-bore tube without resistance or blockage.[2]
Benzylpenicillin Sodium Crystapen (Britannia)	Injection 600 mg, 1.2 g	Phenoxymethylpenicillin (as sodium salt). Not suitable for enteral administration. Salt form is acid labile.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs within 30 minutes of oral dosing.[3]

Alternative routes available

Benzylpenicillin sodium available in injection only. See SPC for dosing information.

Interactions

Phenoxymethylpenicillin is affected by food and gastric acid (although less than benzylpenicillin sodium). To optimise absorption, it is recommended that oral doses be taken 1 hour before food or on an empty stomach.[3]

Health and safety

Do not crush the tablets owing to the risk of contact sensitisation.

Suggestions/recommendations

- Consider using an alternative antibiotic unaffected by food, to avoid interruptions in the feeding regimen.
- If continuing therapy with phenoxymethylpenicillin, use the liquid formulation for enteral administration.
- Stop feed at least 2 hours before the dose; do not re-start feed for 1 hour after dose.
- Parenteral therapy with benzylpenicillin sodium should be considered for serious infections.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Wait for 2 hours.
4. Draw the medication solution into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Wait for at least 1 hour before re-starting the feed.

Alternatively, at step (4) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There is no specific information on jejunal administration of phenoxymethylpenicillin. In theory, bioavailability would be increased, as the drug is not exposed to gastric acid. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Phenytoin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Epanutin (Pfizer)	Capsule 25 mg, 50 mg, 100 mg, 300 mg	Phenytoin sodium. The powder can be poured from the capsules and mixed with 10 mL of water. The powder does not mix initially but if left for 5 minutes and then stirred it forms a fine dispersion that flushes down an 8Fr NG tube without blockage.[2]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Epanutin (Pfizer)	Infatab 50 mg	Phenytoin base. Chewable tablets. No specific data on enteral tube administration are available for this preparation.
Epanutin (Pfizer)	Suspension 30 mg/5 mL	Phenytoin base. 90 mg/15 mL of suspension is approximately equivalent to 100 mg of phenytoin sodium. Epanutin suspension is thixotropic and cannot be administered under gravity; it has a viscosity over 40 times greater than standard enteral feed.[3]
Epanutin (Pfizer)	Injection 50 mg/mL (5 mL)	Phenytoin sodium. Intravenous doses are given 6–8 hourly, as the half-life varies from 7 to 42 hours.[4] Epanutin can be given i.m. for short periods, but absorption is variable. See SPC for further guidance.
Phenytoin (Hospira, AMCo)	Injection 50 mg/mL (5 mL)	Phenytoin sodium. No specific data on enteral tube administration are available for this preparation.
Phenytoin (Flynn)	Capsule 25 mg, 50 mg, 100 mg, 300 mg	Phenytoin sodium. No specific data on enteral tube administration are available for this preparation.
Phenytoin (Teva)	Tablet 50 mg, 100 mg	Phenytoin sodium. Tablets do not disperse readily in water, and are difficult to crush owing to the coating.[5]
Phenytoin (Rosemont)	Suspension 90 mg/5 mL	Phenytoin base. Sugar-free: unlicensed product.

Site of absorption (oral administration)

Phenytoin is absorbed from the small intestine after oral administration.[5] Peak plasma concentration occurs 2–4 hours and 10–12 hours post oral dosing.[6]

Alternative routes available

Parenteral route is available for phenytoin. See dosing guidance above.

Interactions

Bauer[7] established the interaction between phenytoin and enteral feeding, demonstrating that concurrent administration of enteral feed to patients established on phenytoin caused a significant drop in phenytoin plasma concentration. This paper was also the first to suggest that a 2-hour break either side of the dose could minimise this interaction; however, even when this method was used, doses of up to 1600 mg/day were required to achieve therapeutic concentrations. Ozuna and Friel[8] demonstrated that allowing a break in feeding did not significantly improve phenytoin absorption. Doak

et al[9] compared nasogastric administration of phenytoin base with the phenytoin salt and found no difference in total bioavailability, although there was a difference in pharmacokinetic profile, with the sodium salt giving an earlier peak. Rodman et al.[10] report a dramatic drop in phenytoin plasma concentration when a patient was transferred from i.v. phenytoin to an equivalent dose of suspension given via the jejunostomy tube, and suggest that jejunal administration may further reduce the absorption of phenytoin. The data are reviewed in *Stockley's Drug Interactions*[11] and recommendations for management are made. Although the data are inconclusive, a general recommendation of a 2-hour break either side of the dose is made.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Convert the dose from the usual preparation using the formula:
  100 mg phenytoin sodium = 90 mg phenytoin base.
- Stop the enteral feed and flush the tube 2 hours before dosing.[5,12,13]
- Do not re-start feed for at least two hours after dosing.[5,12,13]
- Phenytoin plasma concentration should be checked and the dose adjusted until therapeutic plasma concentrations are achieved; this may require very high doses.
- Steps should be taken to ensure that the same protocol and timetable are followed each day to optimise dosing consistency. Plasma concentration should be checked if the feeding schedule is changed or stopped.
- If the volume of the suspension or dilution is too large, a concentrated suspension is available from Rosemont as a special product (unlicensed).

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with recommended volume of water.
3. Allow a 2-hour break without feed.
4. Shake the medication bottle thoroughly to ensure adequate mixing.
5. Measure the required volume of suspension and mix with an equal volume of water (this may be a large volume) in a suitable container.
6. Draw the medication into an appropriate size and type of syringe (may need to dose in portions owing to the large volume).
7. Add another 10–15 mL of water to the container to rinse, ensuring any remaining suspension is rinsed from the container.
8. Draw this into the syringe and flush this via the feeding tube (ensuring the total dose is administered).
9. Finally, flush the tube with the recommended volume of water.
10. Do not re-start feed for at least 2 hours.

Jejunal administration

Absorption is exceptionally poor via the jejunal route; plasma concentration should be monitored closely if this route is used.

Follow the procedure above for administration; dilution of the suspension is important as phenytoin suspension is hyperosmolar and may cause diarrhoea when administered into the jejunum.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.

3. BPNG data on file, 2011.
4. Epanutin Ready Mixed Parenteral (Pfizer), Summary of Product Characteristics; September 2012.
5. Epanutin Suspension (Pfizer), Summary of Product Characteristics; December 2012.
6. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
7. Bauer LA. Interference of oral phenytoin absorption by continuous nasogastric feedings. *Neurology* 1982; 32: 570–572.
8. Ozuna J, Friel P. Effect of enteral tube feeding on serum phenytoin levels. *Neurosurg Nurs* 1984; 16(6): 289–291.
9. Doak KK, Haas CE, Dunnigan KJ, *et al*. Bioavailability of phenytoin acid and phenytoin sodium with enteral feedings. *Pharmacotherapy* 1998; 18(31): 637–645.
10. Rodman DP, Stevenson TL, Ray TR. Phenytoin malabsorption after jejunostomy tube delivery. *Pharmacotherapy* 1995; 15(6): 801–805.
11. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).
12. BPNG data on file, 2005.
13. Boullata JI, Armenti VT. *Handbook of Drug–Nutrient Interactions*, 2nd edn. Totowa, NJ: Humana Press; 2010.

Phosphates

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Phosphate-Sandoz (HK Pharma)	Effervescent tablet 16.1 mmol	Contains 16.1 mmol phosphate, 20.4 mmol sodium and 3.1 mmol potassium per tablet.[2] Tablet will dissolve in 20 mL of water and flush via a 6Fr NG tube with little resistance.[3]
Phosphates Polyfusor (Fresenius Kabi)	Infusion 50 mmol/500 mL	500 mL contains phosphate 50 mmol, sodium 81 mmol and potassium 9.5 mmol.[1]
Glycophos Sterile Concentrate (Fresenius Kabi)	Concentrate for infusion 20 mmol/20 mL	20 mL contains phosphate 20 mmol and sodium 40 mmol.[1] Licensed for addition to glucose i.v. infusions.

Site of absorption (oral administration)

Specific site of absorption is not documented. Approximately two-thirds (2/3) of oral phosphate is absorbed.[2] Phosphate is absorbed when delivered via nasogastric tube.[4]

Alternative routes available

Parenteral supplementation can be used. Levels should be monitored carefully.

Interactions

Phosphate absorption is reduced by calcium, however there are no reports of chronic phosphate depletion as a result of enteral feeding. Most enteral feeds contain phosphate. A break in feeding is not required.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use Phosphate-Sandoz effervescent tablets dissolved in an appropriate volume of water.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure an appropriate volume of water (20–50 mL) into a measuring pot.
4. Add the effervescent tablet(s) and allow to dissolve.
5. Draw into an appropriate size and type of syringe.
6. Flush the medication dose down the feeding tube.
7. Rinse the measure and administer this also to ensure that the total dose is given.
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Administer effervescent tablets using the above method. Monitor for increased gastrointestinal side-effects.

References

1. *BNF* 67, March 2014.
2. Phosphate-Sandoz (HK Pharma), Summary of Product Characteristics; September 2013.
3. BPNG data on file, 2007.
4. Koo WW, Antony G, Stevens LH. Continuous nasogastric phosphorus infusion in hypophosphatemic rickets of prematurity. *Am J Dis Child* 1984; 138(2): 172–175.

Piroxicam

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Brexidol (Chiesi)	Tablet 20 mg	Piroxicam (as betadex). No specific data on enteral tube administration are available for this preparation.
Piroxicam (various manufacturers)	Capsule 10 mg, 20 mg	Alpharma (now Actavis) recommends that the capsules are not opened.[2]
Piroxicam (generics)	Dispersible tablet 10 mg	No specific data on enteral tube administration are available for this preparation.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Feldene (Pfizer)	Melt 20 mg	Orodispersible tablets. No specific data on enteral tube administration are available for this preparation.
Feldene (Pfizer)	Capsule 10 mg, 20 mg	No specific data on enteral tube administration are available for this preparation.
Feldene (Pfizer)	Gel 5 mg/g	For topical administration only.

Site of absorption (oral administration)

Specific site of absorption is not documented. Piroxicam is readily absorbed following oral or rectal absorption.[3]

Alternative routes available

Topical route available for mild–moderate localised pain; consider using another NSAID for enteral administration.

Interactions

Absorption is unaffected by food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- In view of CHMP recommendations and lack of data, consider using alternative therapy.
- If continued therapy is required, use Feldene Melts for enteral administration.
- A prolonged break in feeding is not required.
- CHMP recommend concomitant administration of a gastroprotective agent (see specific monographs).[1]

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate type of 50 mL syringe.
4. Draw 50 mL of water into the syringe and allow the tablet to disperse.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of piroxicam. Administer the dose as above. Monitor for loss of efficacy or side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma; 21 January 2003.
3. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

Pizotifen

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Pizotifen (Actavis, Kent)	Tablet 500 micrograms, 1.5 mg	As the hydrogen malate. Sugar coated to mask taste; liquid preparation recommended.[2]
Sanomigran (Novartis)	Tablet 500 micrograms, 1.5 mg	As the hydrogen malate. Sugar-coated tablets. No specific data on enteral tube administration are available for this preparation.
Sanomigran (Novartis)	Elixir 250 micrograms/5 mL	As the hydrogen malate. Does not contain sorbitol.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Absorption following oral administration is rapid.[3]

Alternative routes available

None available for pizotifen.

Interactions

There is no documented interaction with food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation via enteral feeding tube.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.

3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There is no specific information on jejunal administration. Administer as above and monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma; 21 January 2003.
3. Sanomigran Elixir 25 mg/5 mL(Novartis), Summary of Product Characteristics; 14 January 2014.

Polystyrene sulfonate resins

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Calcium Resonium (Sanofi-Aventis)	Powder	Calcium polystyrene sulfonate. Oral adult dose 15 g three times daily. Rectal adult dose 30 g.[2] The recommended dilution for oral use is 3–4 mL/g resin; Sanofi-Aventis do not recommend dilution in a larger volume.[3]
Resonium A (Sanofi-Aventis)	Powder	Sodium polystyrene sulfonate. No specific data on enteral tube administration are available for this preparation.
Sorbisterit (Stanningley)	Powder	Calicum polystyrene sulfonate. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

These products are ion exchange resins and are not absorbed.[2]

Alternative routes available

Use the rectal route.

Interactions

Designed to reduce intestinal absorption of potassium; no other documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- When mixed with water, the resulting pastes are too thick to administer via a feeding tube.
- The rectal route should be used.

References

1. *BNF* 67, March 2014.
2. Calcium Resonium (Sanofi-Aventis), Summary of Product Characteristics; January 2014.
3. Personal communication, Sanofi-Aventis; 13 September 2012.

Posaconazole

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Noxafil (MSD)	Suspension 200 mg/5 mL	Cherry flavoured suspension. Administration via NG tube has been shown to be safe and effective; however, therapeutic monitoring is recommended.[2] Contains 1.75 g/5 mL glucose.[2]
Noxafil (MSD)	Tablet 100 mg	Gastroresistant coating. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Peak levels occur 3 hours after an oral dose in fed patients.[3]

Alternative routes available

None available for posaconazole. Alternative routes available for other antifungals; however, posaconazole is only indicated in patients intolerant to, or resistant to, other therapies. Expert advice should be sought.

Interactions

A high-fat meal increases the absorption of posaconazole fourfold; nutritional supplements increase absorption 2.6-fold.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use suspension.
- Give immediately after feed or during a feed infusion.
- Consider therapeutic drug monitoring to determine adequate absorption.[4]

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw required dose into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed immediately.

Intrajejunal administration

No specific information available on jejunal administration of posaconazole. As acid-suppressive therapy may reduce absorption, it is possible that jejunal administration of posaconazole may be ineffective.

References

1. *BNF* 67, March 2014.
2. Dodds Ashley ES, Varkey JB, Krishna G, *et al*. Pharmacokinetics of posaconazole adminsitered orally or by nasogastric tube in healthy volunteers. *Antimicrob Agent Chemother* 2009; 53: 2960–2964.
3. Noxafil 40 mg/mL Oral Suspension (Merck Sharp and Dohme), Summary of Product Characteristics; 23 April 2014.
4. Andes D, Pascual A, Marchetti O. Antifungal therapeutic drug monitoring: established and emerging indications. *Antimicrob Agents Chemother* 2009; 53: 24–34.

Potassium chloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Kay-Cee-L (Geistlich)	Syrup 1 mmol/mL	Potassium chloride. Jejunal administration of Kay-Cee-L has been reported to cause diarrhoea.[2] Contains sorbitol.[3] 2 g/5 mL dose.
Sando K (HK Pharma)	Tablet 12 mmol	Effervescent tablets. 12 mmol potassium; 8 mmol chloride.
Slow-K (Alliance)	Tablet 8 mmol	Modified-release preparation. Do not crush. Not suitable for administration via enteral feeding tube.

Site of absorption (oral administration)

Potassium chloride is readily absorbed from the GI tract and rapidly distributed.

Alternative routes available

Parenteral potassium can be used for acute replacement. Concentration and infusion rate should be according to local practice.

Interactions

There is the potential for a physical interaction between the potassium supplement and the enteral feed if the supplement is not sufficiently dilute. This may result in coagulation of the feed. Ensure that the tube is flushed well before and after dosing to ensure that feed does not come into contact with the supplement.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Sando K tablets and Kloref tablets can be used via feeding tubes. They should be dissolved in a sufficient volume of water to reduce osmotic and irritant effects (50–100 mL).
- Kay-Cee-L liquid can be used but must be diluted with 50–100 mL of water as it is very concentrated. Kay-Cee-L also contains sorbitol: large doses may exacerbate diarrhoea.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure 50 mL of water into a measuring pot (a smaller volume may be used in fluid-restricted patients).
4. Add the effervescent tablet and allow to dissolve.
5. Draw into an appropriate size and type of syringe.
6. Flush the medication dose down the feeding tube.
7. Rinse the measure and administer this also to ensure that the total dose is given.
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

See note above regarding use of Kay-Cee-L syrup. Administer dispersible tablets using the above method. Monitor for increased gastrointestinal side-effects.

References

1. *BNF* 67, March 2014.
2. Adams D. Administration of drugs through a jejunostomy tube. *Br J Intensive Care* 1994; 4(1): 10–17.
3. Personal communication, Geistlich; July 2005.

Pravastatin sodium

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Lipostat (Squibb)	Tablet 10 mg, 20 mg, 40 mg	Uncoated tablets.[2] Pravastatin is very soluble in water (1:3).[3] All strengths of tablets do not disperse readily in water, but do disperse within 5 minutes if shaken in 10 mL of water to give a very fine, pale yellow dispersion that flushes easily down an 8Fr NG tube.[4]
Pravastatin (Aurobindo, Accord)	Tablet 10 mg, 20 mg, 40 mg	No specific data relating to the enteral tube administration of these preparations.

Site of absorption (oral administration)

Specific site of absorption is not documented. Absorption is rapid with peak plasma concentrations occurring 1–1.5 hours after dosing.[2]

Alternative routes available

No alternative routes are available for any of the 'statins'.

Interactions

Food reduces the systemic bioavailability of the drug by 35–40%;[5] however, the lipid-lowering effect is unaffected.[2] Peak cholesterol synthesis is influenced by meal intake, hence the recommendation that pravastatin sodium be taken in the evening to coincide with peak cholesterol synthesis activity.[6] However, if patients are on an overnight feed it may be prudent to dose in the morning at the end of the feed regimen.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse tablet in water immediately before administration. No prolonged break in feeding is required. The dose is usually administered at bedtime;[2] see note above.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).

7. Finally, flush with the recommended volume of water.
8. Re-start the feed if necessary.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

No specific data are available, so monitor cholesterol levels and titrate to effect. Administer as above.

References

1. *BNF* 67, March 2014.
2. Lipostat (Bristol-Myers Squibb), Summary of Product Characteristics; April 2013.
3. Personal communication, Bristol-Myers Squibb; 24 January 2003.
4. BPNG data on file, 2004.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
6. Cella LK, Cauter E, Schoeller DA. Effect of meal timing on diurnal rhythm of human cholesterol synthesis. *Am J Physiol* 1995; 269(32): E878–E883.

Prazosin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Prazosin (Teva)	Tablet 500 micrograms, 1 mg, 2 mg, 5 mg	Prazosin (as hydrochloride). No specific data on enteral administration are available.
Hypovase (Pfizer)	Tablet 500 micrograms, 1 mg	Prazosin (as hydrochloride); prazosin hydrochloride is poorly soluble. There are anecdotal reports of tablets being crushed to make a suspension.[2] 1 mg tablets disperse in water if shaken for 3 minutes, to give a coarse dispersion which settles quickly; however this flushes via an 8Fr NG tube without blockage.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak levels occur 1–3 hours following oral administration,[4] suggesting absorption in the proximal small bowel.

Alternative routes available

None.

Interactions

Absorption is not affected by food.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to limited data consider changing to doxazosin (see monograph).
- Disperse tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.
- Owing to the lack of data, the patient should be monitored closely for enhanced or reduced hypotensive effect.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet into the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There is no specific information on the jejunal administration of prazosin. Administer using the above method and monitor blood pressure closely.

References

1. *BNF* 67, March 2014.
2. Personal communication, Pfizer; 23 June 2003.
3. BPNG data on file, 2009.
4. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
5. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

Prednisolone

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Prednisolone (Actavis, Zentiva, Allergan, Wockhardt)	Tablet 1 mg, 5 mg, 25 mg	No specific data on enteral tube administration are available for this preparation.[2]
Prednisolone (Actavis)	E/C tablet 2.5 mg, 5 mg	Enteric-coated tablets; do not crush. Not suitable for administration via the feeding tube.
Prednisolone (AMCo)	Soluble tablet 5 mg	Prednisolone (as sodium phosphate). Tablet dissolves within 2 minutes to give a clear pink solution.[2]
Delacortril (Alliance)	E/C tablet 5 mg	Enteric-coated tablets; do not crush. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Specific site of absorption is not documented. Prednisolone is rapidly absorbed with peak plasma concentrations occurring within 1–2 hours.[3]

Alternative routes available

Parenteral prednisolone acetate i.m. injection is available for once- or twice-weekly use. Parenteral hydrocortisone can also be used. Suppositories and enemas are available for treatment of local disease only; although there may be some systemic effect, it is not predictable enough for use as an alternative route.

Interactions

No specific interaction with food is documented.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use soluble tablets for enteral tube administration. For doses below 5 mg, dissolve one soluble tablet in 5 mL of water (1 mg/mL) and give the appropriate volume.
- For high doses (> 50 mg), use the 25 mg tablets dispersed in water immediately prior to administration.
- A prolonged break in feeding is not required.
- Prednisolone sodium phosphate is less likely to cause local gastric irritation than is prednisolone alcohol.[3]

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure a suitable quantity of water into a measuring pot; 20–30 mL should be sufficient for most doses.
4. Add the soluble tablet and allow to dissolve.
5. Draw into an appropriate size and type of syringe.
6. Flush the medication dose down the feeding tube.
7. Rinse the measure and administer this also to ensure that the total dose is given.
8. Finally, flush the enteral feeding tube with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to jejunal administration of prednisolone but, as there is an enteric-coated formulation, it can be assumed that sufficient absorption occurs beyond the stomach, and therefore bioavailability will not be significantly affected by jejunal administration. Follow the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Soluble Prednisolone Tablets 5 mg (AMCo), Summary of Product Characteristics; 9 December 2013.

Pregabalin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Lyrica (Pfizer)	Capsule 25 mg, 50 mg, 75 mg, 100 mg, 150 mg, 200 mg, 225 mg, 300 mg	Pregabalin is soluble in water.[2] An oral solution of the active drug was used in early product development and therefore opening the capsules and dissolving the contents in water immediately prior to administration is not considered to have any stability issues. The capsule contents pour easily from the capsule and disperse in water to give a fine dispersion which flushes via an 8Fr NG tube without blockage.[3]
Lyrica (Pfizer)	Oral suspension 20 mg/mL	Does not contain sorbitol.

Site of absorption (oral administration)

Specific site of absorption not documented, peak levels occur 1 hour following oral dose in the fasted state.[4]

Alternative routes available

None.

Interactions

The rate and peak concentration of pregabalin is reduced when co-administered with food; however, the total bioavailability is unaffected. Pregabalin may be taken with or without food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Pregabalin should not be discontinued abruptly.
- Use liquid preparation.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication liquid into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data on the jejunal administration of pregabalin. Administer using the above method and monitor for loss of effect or increase in side-effects.

References

1. *BNF* 67, March 2014.
2. O'Neil MJ. *Merck Index*.15th edn. London: RSC Publishing; 2013 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
3. BPNG data on file, 2009.
4. Lyrica (Pfizer), Summary of Product Characteristics; May 2014.

Primidone

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Primidone (SERB)	Tablet 50 mg, 250 mg	Scored tablets. Primidone is poorly soluble in water.[2] Tablets disperse rapidly when placed in 10 mL of water to form a milky dispersion that flushes via an 8Fr NG tube without blockage.[3]
Primidone (specials manufacturers)	Suspension 250 mg/5 mL	Available on request only.

Site of absorption (oral administration)

No specific site is documented. Peak plasma concentration occurs 0.5–7 hours following oral dose.[2,4]

Alternative routes available

No alternative routes available for primidone. Parenteral route is available for phenobarbital sodium.

Interactions

No specific interaction with food is documented.[2,4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- There are reports in the literature of primidone being administered via enteral feeding tubes in neonates, with no reports of treatment failure.
- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data on jejunal administration. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
3. BPNG data on file, 2005 (MA changed in 2013, no change to formulation).
4. Primidone (SERB), Summary of Product Characteristics; 18 August 2014.

Prochlorperazine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Prochlorperazine (Actavis, Ashbourne, Generics, Hillcross, Teva)	Tablet 5 mg	Prochlorperazine maleate. APS and Meridian brands of tablets disperse in 10 mL of water within 5 minutes; the resulting fine dispersion flushes via an 8Fr NG tube without blockage.[2]
Stemetil (Sanofi)	Tablet 5 mg, 25 mg	Prochlorperazine maleate. No specific data on enteral tube administration are available for this preparation.
Stemetil (Sanofi)	Syrup 5 mg/mL	Prochlorperazine (as mesilate). Contains sucrose; does not contain sorbitol.[3] Orange, slightly viscous liquid; some resistance to flushing, mixes well with an equal volume of water.[4]
Stemetil (Sanofi)	Injection 12.5 mg/mL (1 mL)	Prochlorperazine (as mesilate). Deep i.m. injection only. No specific data on enteral tube administration are available for this preparation.
Stemetil (Sanofi)	Suppository 5 mg, 25 mg	Prochlorperazine (as maleate). Rectal administration.
Buccastem M(Alliance)	Buccal tablet 3 mg	Prochlorperazine (as maleate). Buccal administration only.

Site of absorption (oral administration)

Site of absorption is unknown; peak plasma concentration occurs 1.8 hours following oral dosing of Stemetil syrup.[3]

Alternative routes available

Parenteral (i.m.), buccal and rectal routes are available.

Interactions

No interaction with food has been identified, although pharmacokinetic data on prochlorperazine are lacking.[3,5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use buccal tablets or suppositories rectally where clinically practical.
- Syrup can be used via the feeding tube. Effervescent sachets can also be used. If administering via jejunostomy, use tablets dispersed in water or effervescent sachets as these have a lower osmolarity.
- A prolonged break in feeding is not required.

Intragastric administration

Liquid preparation

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication liquid into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Tablets

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Stemetil Syrup (Sanofi), Summary of Product Characteristics; 6 August 2013.
4. BPNG data on file, 2005.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Procyclidine hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Procyclidine (non-proprietary)	Tablet 5 mg	No specific data on enteral tube administration are available for this preparation.
Arpicolin (Rosemont)	Syrup 2.5 mg/5 mL, 5 mg/5 mL	Does not contain sorbitol.[2] Clear non-viscous liquid. Flushes easily via tube without further dilution. Mixes with water if needed.[3]
Kemadrin (Aspen)	Tablet 5 mg	Scored. GSK has no information relating to the administration of Kemadrin via enteral feeding tubes.[4]
Kemadrin (Auden McKenzie)	Injection 5 mg/mL (2 mL)	Administered via i.v. or i.m. routes. Rapid onset of action; licensed for acute dystonic reactions.

Site of absorption (oral administration)

No documented site of absorption.[4] Peak plasma concentration occurs 1–2 hours following oral administration in fasted subjects.[5]

Alternative routes available

Parenteral route is available. Only licensed for acute dystonic reactions.

Interactions

There is no documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

No specific data are available relating to jejunal administration. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Arpicolin 2.5 mg/5 mL (Rosemont) Summary of Product Characteristics, 27 November 2013.
3. BPNG data on file, 2005.
4. Personal communication, GSK; 22 January 2003.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Promethazine hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Phenergan (Sanofi-Aventis)	Tablet 10 mg, 25 mg	Tablets do not disperse readily in water, but will disintegrate if shaken in water for 5 minutes; the resulting dispersion flushes via an 8Fr NG tube without blockage.[2] Contains lactose.[3]
Phenergan (Sanofi-Aventis, previously Rhône-Poulenc Rorer)	Elixir 5 mg/5 mL	Pale orange liquid, slightly viscous with some resistance to flushing. Mixes easily with an equal volume of water to reduce viscosity and resistance to flushing.[2] Contains glucose syrup 5 g/25 mL; does not contain sorbitol, but contains maltitol.[4]
Sominex (Actavis)	Tablet 20 mg	No data available for administration via enteral feeding tubes for this preparation. Contains lactose.[5]
Phenergan (Sanofi-Aventis)	Injection 25 mg/mL (1 mL)	For use as slow i.v. infusion or deep i.m. injection.
Promethazine (Mercury Pharma)	Injection 2.5% w/v	For use as slow i.v. infusion or deep i.m. injection.

Site of absorption (oral administration)

No specific site is documented.[6] Peak plasma concentration occurs 2–3 hours following oral administration.[7]

Alternative routes available

Injection is available for parenteral administration.

Interactions

No specific interaction with food is documented.[7]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation; no further dilution is necessary for intragastric administration.
- Dilute the liquid with at least an equal volume of water prior to intrajejunal administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication liquid into an appropriate size and type of syringe.
4. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Phenergan 10 mg Tablet (Sanofi-Aventis), Summary of Product Characteristics; 18 November 2013.
4. Phenergan Elixir (Sanofi-Aventis), Summary of Product Characteristics; 2 January 2013.
5. Sominex (Actavis), Summary of Product Characteristics; September 2010.
6. Personal communication, Aventis Pharma; 13 February 2003.
7. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

Propranolol hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Syprol (Rosemont)	Oral solution 5 mg/5 mL, 10 mg/5 mL, 40 mg/5 mL, 50 mg/5 mL	5 mg/5 mL and 10 mg/5 mL are clear liquids; 50 mg/5 mL is an orange liquid. Does not contain sorbitol. Contains maltitol.[2] 50 mg/5 mL is a slightly viscous liquid; there is some resistance when flushed via an 8Fr NG tube; the liquid mixes well with an equal volume of water and this reduces the osmolarity and viscosity.[3] The 5 mg/5 mL oral solution has a viscosity lower than standard enteral feed and flushes via 8Fr NG tube with little resistance.[4]
Propranolol (non-proprietary)	Tablet 10 mg, 40 mg, 80 mg, 160 mg	No specific data on enteral tube administration are available for this preparation.
Half-Inderal LA (AstraZeneca)	M/R capsule 80 mg	Modified-release capsule to swallow whole; do not crush or chew.[1]
Inderal-LA (AstraZeneca)	M/R capsule 160 mg	Modified-release capsule to swallow whole; do not crush or chew.[1]
Propranolol (non-proprietary)	M/R capsule 80 mg, 160 mg	Modified-release capsule to swallow whole; do not crush or chew.[1] (Not all manufacturers make all strengths.)
Bedramol (Sandoz)	M/R capsule 80 mg, 160 mg	Modified-release capsule to swallow whole; do not crush or chew.[1]

Site of absorption (oral administration)

Specific site of absorption is not documented. Propranolol is rapidly absorbed with the peak plasma concentration occurring within 1–2 hours.[5]

Alternative routes available

Parenteral route can be used, but is usually reserved for conditions requiring acute beta-blockade. Consult SPC for dosing information.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- As the conventional-release tablets and oral solution of propranolol require twice- to four-times daily administration (depending on indication), consider changing to atenolol (see monograph) to simplify the regimen, if clinically appropriate.
- If continued therapy with propranolol via the feeding tube is indicated, use the appropriate strength of the oral solution; consider mixing with an equal volume of water immediately prior to dosing to reduce viscosity. Flush well before and after dosing.
- If converting from modified-release capsules, give the total daily dose in two to three divided doses.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

No specific data are available relating to the jejunal administration of propranolol. Monitor for loss of efficacy. Administer as above.

References

1. *BNF* 67, March 2014.
2. Syprol (Rosemont), Summary of Product Characteristics; 25 October 2013.
3. BPNG data on file, 2005.
4. BPNG data on file, 2011.
5. Propranolol 40 mg Tablets (Actavis), Summary of Product Characteristics; 1 February 2012.

Pyrazinamide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Pyrazinamide (available from IDIS)	Tablet 500 mg	Pharma Wernigerode brand tested. Tablets do not disperse readily in water; can be crushed and mixed with water.[2]
Pyrazinamide (extemporaneous preparation)	Suspension 100 mg/mL	*Extemporaneous pyrazinamide suspension 100 mg/mL:* Pyrazinamide 500 mg tablets 24 tablets Simple syrup to 120 mL Expiry 60 days at room temperature or refrigerated.[3]
Zinamide (Genus)	Tablet 500 mg	No specific data on enteral tube administration available for this preparation.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 1–2 hours following oral administration.[4]

Alternative routes available

No parenteral route is available for pyrazinamide. Other tuberculosis therapy is available in parenteral form; seek microbiological advice.

Interactions

No interaction documented.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Obtain a manufactured 'special' or make an extemporaneous suspension. Seek microbiological advice regarding alternative therapy.
- A prolonged break in feeding is not required.

Intragastric administration

Liquid preparation

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw medication liquid into appropriate size and type of syringe.

5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Tablet administration (crushing tablets should be considered a last resort)

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix until the coating dissolves, to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure that the total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Nahata MC, Morosco RS, Peritore SP. Stability of pyrazinamide in two suspensions. *Am J Health Syst Pharm* 1995; 52: 1558–1560.
4. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Pyridostigmine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Mestinon (Meda)	Tablet 60 mg	Pyridostigmine (as bromide). Tablets can be halved or quartered to administer paediatric doses. Pyridostigmine bromide is highly soluble in water (>1 in 1).[2] Pyridostigmine bromide tablets do not disperse well in water and give a coarse dispersion that may block fine-bore feeding tubes; however, the tablets crush to a fine powder which suspends in water to give an even dispersion which flushes via an 8Fr NG tube without blockage.[3] Contains lactose.[3]

Site of absorption (oral administration)

Specific site of absorption not documented, peak plasma levels occur 1–2 hours following oral administration.[4]

Alternative routes available

Pyridostigmine bromide is not available via any other route. Neostigmine is available for parenteral use but has more muscarinic side-effects and a shorter duration of action.[4]

Interactions

Co-administration with food delays peak levels of pyridostigmine bromide by up to 90 minutes, the total bioavailability is unaffected.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Crush tablets using a crushing syringe (or suitable alternative device) and suspend in at least 10 mL of water.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a crushing syringe and grind to a fine powder.
4. Draw at least 10 mL of water into the syringe and shake to form a suspension.
5. Flush the medication dose down the feeding tube.
6. Draw a further 10-20 mL of water into the syringe and flush via the tube, to rinse the syringe.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed if required.

Intrajejunal administration

There is no published data on the jejunal administration of pyridostigmine. Administer using the above method, monitor closely for increased side-effects and adjust dose and frequency as necessary.

References

1. *BNF* 67, March 2014.
2. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.
3. BPNG data on file, 2009.
4. Mestinon (Meda), Summary of Product Characteristics; 23 June 2014.

Pyridoxine hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Pyridoxine (Wockhardt)	Tablet 10 mg, 20 mg, 50 mg	CP (now Wockhardt) brand tablets disintegrate within 5 minutes when placed in 10 mL of water but give a very coarse dispersion that is difficult to draw up. When crushed, the powder mixes with water but settles quickly, with risk of leaving some of the dose in the container if it is not rinsed thoroughly.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Pyridoxine is readily absorbed from the GI tract.[3]

Alternative routes available

Pabrinex injection contains 50 mg pyridoxine (see Thiamine monograph).

Interactions

No specific interaction.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Nutritionally complete enteral feeds will contain some pyridoxine. Additional doses should only be used when additional supplementation is required.
- The tablets can be crushed and mixed with water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly ensuring that there are no large particles of tablet.
6. Draw this into an appropriate syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure that the total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Intrajejunal administration should not reduce the bioavailability of pyridoxine. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Pyrimethamine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Daraprim (GSK)	Tablet 25 mg	GSK has no data to support the administration of Daraprim via enteral feeding tubes.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 2–4 hours following oral administration.[3]

Alternative routes available

None available for pyrimethamine.

Interactions

No specific interaction with food is documented. *In-vitro* data suggest that absorption may be decreased by antacid salts.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Seek specialist advice concerning alternative therapy.

References

1. *BNF* 67, March 2014.
2. Personal communication, GSK; 22 January 2003.
3. Daraprim (GSK), Summary of Product Characteristics; July 2003.

Quinapril

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Accupro (Parke-Davis)	Tablet 5 mg, 10 mg, 20 mg, 40 mg	Quinapril (as hydrochloride). Film-coated tablets.[1] Solubility in water >1:10.[2] No specific data on enteral tube administration are available for this preparation.
Accuretic (Parke-Davis)	Tablet 10 mg/12.5 mg	Quinapril (as hydrochloride). Each tablet contains quinapril hydrochloride 10 mg and hydrochlorothiazide 12.5 mg. Film-coated tablets.[1] No specific data on enteral tube administration are available for this preparation.
Quinapril (non-proprietary)	Tablet 5 mg, 10 mg, 20 mg, 40 mg	Quinapril (as hydrochloride). No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentrations occur within 1 hour.[3]

Alternative routes available

None available.

Interactions

The extent of absorption is not influenced by food,[2] but peak plasma concentration may be delayed by approximately 30 minutes.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to lack of data, consider changing to an alternative ACE inhibitor for administration via an enteral feeding tube.

References

1. *BNF* 67, March 2014.
2. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
3. Accupro (Pfizer), Summary of Product Characteristics; August 2012.

Rabeprazole sodium

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Pariet (Eisai)	Tablet 10 mg, 20 mg	Gastroresistant coating.[2] Rabeprazole is acid-labile and therefore tablets should not be crushed.[3]
Rabeprazole (non-proprietary; Accord, Actavis, Consilient, Milpharm, Zentiva)	E/C tablet 10 mg, 20 mg	Enteric coated preparation; do not crush. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Rabeprazole absorption occurs in the small bowel, the formulation is enteric coated.[2] Peak plasma concentration occurs 3.5 hours after oral dosing.[2]

Alternative routes available

Parenteral route is not available for rabeprazole, parenteral route is available for esomeprazole, omeprazole and pantoprazole.

Interactions

Absorption is unaffected by food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- No suitable formulation is available for administration via an enteral feeding tube; consider using omeprazole or pantoprazole parenterally or use esomeprazole, lansoprazole or omeprazole enterally (see monographs).
- Alternatively, ranitidine may be used if a step-down approach is appropriate (see monograph).

References

1. *BNF* 67, March 2014.
2. Pariet 10 mg and 20 mg (Eisai), Summary of Product Characteristics; 21 March 2013.
3. Personal communication, Eisai; 15 January 2003.

Ramipril

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Tritace (Sanofi)	Tablet 1.25 mg, 2.5 mg, 5 mg, 10 mg	Tablets disperse quickly (2–5 minutes) in water to give a fine dispersion that settles quickly but draws up and flushes easily down an 8Fr NG tube without significant loss of dose.[2] Ramipril has poor solubility in water.[3]
Tritace Titration Pack (Sanofi)	Tablet 2.5 mg, 5 mg, 10 mg	
Ramipril (non-proprietary)	Capsule 1.25 mg, 2.5 mg, 5 mg, 10 mg	No specific data on enteral tube administration are available for this preparation.
Ramipril (Rosemont)	Oral solution 2.5 mg/5 mL	Clear colourless solution, containing sodium 0.5 mg/5 mL sodium.[4] Sorbitol, lactose and sugar free. No specific data on enteral administration are available for this preparation, but solution is a watery liquid.
Triapin (Sanofi)	M/R tablet 2.5 mg/2.5 mg, 5 mg/5 mg	Ramipril 2.5 mg and felodipine 2.5 mg; ramipril 5 mg and felodipine 5 mg. Modified release; tablets must not be divided, crushed or chewed.[5] Not suitable for enteral tube administration. Contains lactose.[5]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration of ramipril occurs within 1 hour of oral dosing.[6]

Alternative routes available

No alternative route is available for any of the ACE inhibitors.

Interactions

Delay in absorption by food is small and clinically unimportant.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Reduce dosing frequency to once daily where possible. Ramipril is licensed for once-daily dosing for all indications with the exception of prophylaxis after myocardial infarction.[1]
- Use the oral solution if available.
- If the oral solution is not available, disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

For the suspension

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication suspension into an appropriate size and type of syringe.
4. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

For the tablet

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There is no specific information relating to jejunal administration. Monitor for loss of therapeutic effect. Administer as above.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2012.
3. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.
4. Ramipril Oral Solution (Rosemont), Summary of Product Characteristics; August 2012.
5. Triapin and Triapin Mite (Sanofi-Aventis), Summary of Product Characteristics; 30 May 2013.
6. Tritace Tablets (Sanofi-Aventis), Summary of Product Characteristics; 3 April 2013.

Ranitidine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Zantac (GSK)	Tablet 150 mg, 300 mg	Ranitidine (as hydrochloride). Tablets do not disperse readily in water.[2]
Zantac (GSK)	Syrup 75 mg/5 mL	Ranitidine (as hydrochloride). Contains alcohol 8%. Contains sorbitol 700 mg/10 mL.[3]
Zantac (GSK)	Injection 25 mg/mL	Ranitidine (as hydrochloride). Can be administered enterally.[4]
Ranitidine (Rosemont)	Oral solution 75 mg/5 mL	Ranitidine (as hydrochloride). Contains alcohol 8%; contains sorbitol 0.7 g/5 mL and sodium 11 mg/5 mL.[5] Clear, non-viscous liquid; flushes easily via a fine-bore tube without resistance.[2] Slightly more viscous than water, significantly less viscous than standard enteral feed.[6]
Ranitidine (Lagap)	Effervescent tablet 150 mg, 300 mg	Ranitidine (as hydrochloride). Dissolves completely in 10 mL of water. Contains 5 mmol (120 mg) sodium in 150 mg tablet.[2]
Ranitidine (Accord)	Effervescent tablet 150 mg, 300 mg	Contains 23 mmol (533 mg) sodium per tablet.[7]
Ranitidine (Ratiopharm)	Effervescent tablet 150 mg, 300 mg	Ranitidine (as hydrochloride). Ratiopharm brand contains 5 mmol (120 mg) sodium in 150 mg tablet and 10 mmol (240 mg) sodium in 300 mg tablet.[8,9]
Ranitidine (Actavis, Ashbourne, Berk, Genus, Goldshield, Hillcross, PLIVA, Ranbaxy, Sovereign, Sterwin, Teva, Tillomed)	Tablet 150 mg, 300 mg	Ranitidine (as hydrochloride). No specific data on enteral tube administration are available for these preparations.

Site of absorption (oral administration)

There is minimal absorption of ranitidine from the stomach; it is predominantly absorbed in the duodenojejunal and distal jejunal areas.[4]

Alternative routes available

Injection is available for parenteral administration.

Interactions

Bioavailability of ranitidine is not affected by food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use ranitidine effervescent tablets as first choice, unless sodium restriction is necessary.
- Liquid preparation can also be used for gastric administration, but be aware of alcohol, sorbitol and sodium content.

Intragastric administration

Effervescent tablets

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure 20–30 mL of water into a suitable container.
4. Add the effervescent tablet and allow to dissolve.
5. Draw into an appropriate size and type of syringe.
6. Flush the medication dose down the feeding tube.
7. Rinse the measure and administer this also to ensure that the total dose is given.
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Liquid preparation

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Ranitidine is well absorbed following jejunal administration; however, the effervescent tablets or injection should be used for this route as the osmolarity of the liquid preparation is likely to be too high.[4,10] Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004/5.
3. Zantac Syrup (GSK), Summary of Product Characteristics; 11 March 2014.
4. Personal communication, GSK; 22 January 2003.
5. Ranitidine Oral Solution (Rosemont), Summary of Product Characteristics; 23 April 2013.
6. BPNG data on file, 2011.

7. Ranitidine Effervescent Tablets 150 mg and 300 mg (Accord), Summary of Product Characteristics, 7 March 2012.
8. Ranitidine 150 mg Effervescent Tablets (Ratiopharm), Summary of Product Characteristics, 14 January, 2011.
9. Ranitidine 300 mg Effervescent Tablets (Ratiopharm), Summary of Product Characteristics, 14 Janury 2014.
10. Adams D. Administration of drugs through a jejunostomy tube. *Br J Intensive Care* 1994; 4(1): 10–17.

Ranolazine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Ranexa (Menarini)	Tablet 375 mg, 500 mg, 750 mg	Modified-release preparation; do not crush. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Peak plasma levels occur 2–6 hours following an oral dose of the modified-release preparation.[2]

Alternative routes available

None available for ranolazine.

Interactions

Food does not affect the rate or extent of ranolazine absorption.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

As there is no alternative preparation, ongoing management of angina should be discussed with initiating clinician.

References

1. *BNF* 67, March 2014.
2. Ranexa Prolonged Release Tablets (Menarini), Summary of Product Characteristics; 13 November 2013.

Reboxetine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Edronax (Pfizer)	Tablet 4 mg	Reboxetine (as mesilate).[2] Scored. Tablets can be crushed and dispersed in water. There are no stability data and therefore this should be done immediately prior to dosing.[3]

Site of absorption (oral administration)

Site of absorption is not documented. Peak plasma concentration occurs 2 hours following oral dosing.[2]

Alternative routes available

None available for reboxetine.

Interactions

Food intake delayed the absorption of reboxetine but did not significantly influence the extent of absorption.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to the limited amount of data, consideration should be given to alternative therapy.
- If continued therapy with reboxetine is indicated, the tablets can be crushed and suspended in water immediately prior to dosing.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of reboxetine. Administer as above and monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Edronax 4 mg Tablets (Pfizer), Summary of Product Characteristics; July 2013.
3. Personal communication, Pharmacia (previous MA holder); 11 March 2003.

Rifabutin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Mycobutin (Pfizer)	Capsule 150 mg	Pharmacia has anecdotal reports of the capsules being opened and mixed with a small quantity of water immediately prior to administration.[2]
Mycobutin (extemporaneous preparation)	Suspension	*Extemporaneous rifabutin solution 20 mg/mL:* Rifabutin 150 mg capsules 16 capsules Cherry syrup to120 mL Store in a refrigerator; shelf life of 84 days.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 2–4 hours following oral dosing.[4]

Alternative routes available

No alternative available for rifabutin.

Interactions

There is no specific documented interaction with food.

Health and safety

Minimise exposure to drug powder. Protective clothing should be worn.

Suggestions/recommendations

- Disperse the contents of the capsules in water immediately prior to administration.
- Alternatively, an extemporaneous suspension can be prepared.
- A prolonged break in feeding is not required.

Intragastric administration

Where possible use extemporaneous preparation to minimise operator exposure to antibiotic powder.

Suspension

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Capsule contents dispersed in water have a lower osmolarity than the syrup formulation. However, the practicalities of opening the capsules should be borne in mind.

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Open the capsule and pour the contents into a medicine pot.
4. Add 15 mL of water.
5. Stir to disperse the powder.
6. Draw into an appropriate syringe and administer via the feeding tube.
7. Add a further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
8. Draw up this dispersion and flush down the tube. This will ensure that the whole dose is given.
9. Flush the tube with water.

References

1. *BNF* 67, March 2014.
2. Personal communication, Pharmacia (previous MA holder); 11 March 2003.
3. Haslam JL, Egodage KL, Chen Y, Rajewski RA, Stella V. Stability of rifabutin in two extemporaneously compounded oral liquids. *Am J Health Syst Pharm* 1999; 56: 333–336.
4. Mycobutin (Pfizer), Summary of Product Characteristics; December 2013.

Rifampicin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Rifampicin (non-proprietary)	Capsule 150 mg, 300 mg	Do not open, see below.
Rifadin (Sanofi-Aventis)	Capsule 150 mg, 300 mg	Do not open, see below.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Rifadin (Sanofi-Aventis)	Syrup 100 mg/5 mL	pH 4.5–4.8.[2] Syrup contains sucrose; does not contain sorbitol.[3] Dark red opaque liquid. Some resistance to flushing via an 8Fr NG tube; mixes easily with water.[4]
Rifadin (Sanofi-Aventis)	Infusion 600 mg	Not suitable for enteral tube administration.
Rimactane (Sandoz)	Capsule 150 mg, 300 mg	Do not open, see below.

Site of absorption (oral administration)

Peak plasma serum concentration occurs 2-4 hours following oral dosing on an empty stomach.[3]

Alternative routes available

Rifampicin can be given parenterally as an i.v infusion. The dose remains the same. Serum concentrations following infusion are comparable to those achieved following oral administration of the same dose.[5]

Interactions

Optimal absorption of rifampicin is achieved if the dose is given 30 minutes before food or 2 hours after.[3]

Health and safety

Do not open capsules owing to the risk of contact sensitisation.

Suggestions/recommendations

- Use the liquid preparation.
- Stop feed at least 2 hours before the dose; do not re-start feed for 30 minutes after dose.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Wait for 2 hours before administering dose.
4. Shake the medication bottle thoroughly to ensure adequate mixing.
5. Draw the medication suspension into an appropriate size and type of syringe.
6. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
7. Flush the medication dose down the feeding tube.
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Jejunal administration

Administer using the above method. Monitor for decreased plasma concentration.

References

1. *BNF* 67, March 2014.
2. Personal communication, Aventis; 2 January 2003.
3. Rifadin Syrup 100 mg/5 mL (Aventis), Summary of Product Characteristics; 28 August 2013.
4. BPNG data on file, 2005.
5. Rifadin for Infusion (Sanofi), Summary of Product Characteristics; 27 January 2014.

Rifaximin

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Targaxan (Norgine)	Tablet 550 mg	Nasogastric administration of rifaximin has been shown not to effect the therapeutic effect of the drug.[2]
Xifaxanta (Norgine)	Tablet 200 mg	Film-coated tablet.

Site of absorption (oral administration)

Rifaximin is minimally absorbed from the GI tract and it is used as an intestinal topical antibacterial.

Alternative routes available

None available for rifaximin. Depending on indication for rifaximin, an alternative antibacterial available as a parenteral product may be appropriate. Advice should be sought from a microbiologist.

Interactions

A high-fat breakfast produced a clinically irrelevant increase in absorption.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

Use the tablets via the method below.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.

6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed unless a prolonged break is required.

Intrajejunal administration

There are no data on the jejunal administration of rifaximin, but as the antibiotic is not absorbed this route of administration should not affect the therapeutic effect.

References

1. *BNF* 67, March 2014.
2. Targaxan (Norgine), Summary of Product Characteristics; 10 January 2013.
3. Alvisi V, D'Ambrosi A, Loponte A *et al*. Rifaximin, a rifamycin derivative for use in the treatment of intestinal bacterial infections in seriously disabled patients. *J Int Med Res* 1987; 15(1): 49–56 .

Riluzole

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Rilutek (Sanofi-Aventis)	Tablet 50 mg	Film-coated tablets. The manufacturer has anecdotal reports that the tablets can be crushed and mixed with water. The 'suspension' should be administered within 15 minutes.[2]
Riluzole (non-proprietary; Actavis, Sun Pharmaceuticals)	Tablet 50 mg	Film coated tablets[3,4] No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is unknown. Peak plasma concentration occurs 60–90 minutes following an oral dose.[5]

Alternative routes available

None available for riluzole.

Interactions

Specific interactions with enteral feeds are unknown. The rate and extent of absorption are reduced when riluzole is administered with a high-fat meal, with a decrease in C_{max} of 44% and decrease in AUC of 17%.[6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to the limited data available, consider alternative therapy.
- If enteral administration of riluzole is indicated, crush the tablets and disperse in water immediately prior to administration.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to jejunal administration of riluzole. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Sanofi, 15 April 2014.
3. Riluzole 50 mg Film-coated Tablets (Actavis), Summary of Product Characteristics; 1 March 2012.
4. Riluzole 50 mg Film-coated Tablets (Sun) Summary of Product Characteristics, 7 March 2011.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
6. Rilutek 50 mg Film-coated Tablets (Sanofi-Aventis), Summary of Product Characteristics; 18 December 2013.

Risedronate sodium

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Risedronate (Aurobindo-Milpharm, Winthrop, Zentiva)	Tablet 5 mg, 35 mg	No specific data on enteral tube administration are available for this preparation. Milpharm, and Zentiva tablets contain lactose.[2,3]
Risedronate (Beacon)	Tablet 30 mg	No specific data on enteral tube administration are available for this preparation.

Formulations available[1] (*continued*)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Actonel (Warner Chilcott, previously Procter & Gamble)	Tablet 5 mg, 30 mg	The manufacturers advise that risedronate should not be administered via a feeding tube owing to the risk of interaction with the feed and the tube.[4] The 30 mg tablets disperse in 10 mL of water within 2 minutes to give a fine dispersion that flushes down an 8Fr NG tube without blockage.[5]
Actonel Once a Week (Warner Chilcott)	Tablet 35 mg	The 35 mg tablets disperse in 10 mL of water within 5 minutes (the coating takes a few minutes to dissolve) to give a very fine dispersion that flushes down an 8Fr NG tube without blockage.[5] In a small retrospective chart review (4 patients), 35 mg risedronate was administered via feeding tubes for an average of 18 months; a reduction in bone turnover markers was noted and there were no reported adverse effects. The authors conclude that alendronate and risedronate delivered through feeding tubes in developmentally disabled patients appear to be well tolerated.[6]

Site of absorption (oral administration)

The site of absorption is mainly the duodenum, jejunum and ileum, although there is some absorption in the stomach.[4] Maximum concentrations occur within 1 hour after oral dosing.[7]

Alternative routes available

None available for risedronate sodium. Alternative bisphosphonates are available in parenteral formulations.

Interactions

Bioavailability is decreased when risedronate sodium is administered with food.[7]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Seek specialist advice and consider annual zoledronate injection.[8]
- Risedronate sodium tablets have been dispersed in water and successfully administered via enteral feeding tubes with no loss of drug.[9]
- Risedronate sodium should be used with caution in patients with oesophageal disease. Owing to the risks of oesophageal damage, risedronate sodium should be used with caution via an enteral feeding tube, especially in patients with delayed gastric emptying at risk of oesophageal reflux and in those patients unable to sit or stand upright.
- If risedronate sodium is administered via a feeding tube, the once-weekly preparation should be used, owing to the lower incidence of GI related side-effects.[10] The tablet should be dispersed in 10 mL of water and administered immediately, then flushed with at least 50 mL of water. This

should be administered first thing in the morning after rising and the patient should remain sitting upright or standing for 30 minutes after the dose is given. Enteral feed should be stopped 2 hours prior to administration, and should not be re-started for at least 2 hours after the dose.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Wait 2 hours.
4. Place the tablet in the barrel of an appropriate size and type of syringe.
5. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
6. Flush the medication dose down the feeding tube.
7. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
8. Finally, flush with at least 50 mL of water.
9. Ensure that the patient is sitting upright or standing.
10. Re-start the feed after at least 2 hours.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration of risedronate sodium. The drug is absorbed throughout the small bowel. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Risedronate (Aurobindo-Pharma-Milpharm), Summary of Product Characteristics; 20 December 2012.
3. Risedronate (Zentiva), Summary of Product Characteristics; 5 September 2011.
4. Personal communication, Procter & Gamble; 22 January 2003.
5. BPNG data on file, 2004.
6. Tanner S, Taylor HM. Feeding tube administration of bisphosphonates for treating osteoporosis in institutionalised patients with developmental disabilities. *Bone* 2004; 34(Suppl 1): S97–S98.
7. Actonel 5 mg Film-coated Tablets (Warner Chilcott), Summary of Product Characteristics; 18 May 2013.
8. SMC. *Advice 447/08: Zoledronic Acid (Aclasta).*Glasgow: Scottish Medicines Consortium; 2008, https://www.scottishmedicines.org.uk/SMC_Advice/Advice/447_08_zoledronic_acid__5mg_solution__Aclasta_/zoledronic_acid__Aclasta_ (accessed 15 September 2014).
9. Dansereau RJ, Crail DJ. Extemporaneous procedures for dissolving risedronate tablets for oral administration and for feeding tubes. *Ann Pharmacother* 2005; 39: 63–67.
10. Actonel Once a Week (Warner Chilcott), Summary of Product Characteristics; May 2010.

Risperidone

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Risperidone (non-proprietary; Accord, Actavis, Aurobindo-Milpharm, Consilient, Sandoz, Wockhardt)	Tablet 500 micrograms, 1 mg, 2 mg, 4 mg, 6 mg	No specific data on enteral tube administration are available for this preparation. Contains lactose.[2–4]
Risperidone (non-proprietary; Sandoz)	Orodispersible tablet 0.5 mg, 1 mg, 2 mg, 3 mg, 4 mg, 6 mg	No specific data on enteral tube administration are available for this preparation. Contains sorbitol.[5]
Risperidone (non-proprietary; Sandoz, Wockhardt)	Liquid 1 mg/mL	No specific data on enteral tube administration are available for this preparation. May be diluted with any non-alcoholic drink except tea.[6,7]
Risperdal (Janssen-Cilag)	Tablet 500 micrograms, 1 mg, 2 mg, 3 mg, 4 mg, 6 mg	Film coated and scored. Tablets disintegrate within 5 minutes when placed in water. The resulting dispersion flushes easily via an 8Fr NG tube without blockage.[8] Tablets contain lactose.[9]
Risperdal Quicklet (Janssen-Cilag)	Orodispersible tablet 0.5 mg, 1 mg, 2 mg	No specific data on enteral tube administration are available for this preparation. Contains mannitol.[9]
Risperdal (Janssen-Cilag)	Liquid 1 mg/mL	Clear liquid; draws up and flushes easily down the tube without further dilution.[8] The liquid can be diluted with water immediately prior to administration.[10]
Risperdal Consta (Janssen-Cilag)	Injection 25 mg, 37.5 mg, 50 mg	Deep i.m. injection; injection at 2-week intervals.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 1–2 hours following oral administration.[9]

Alternative routes available

Depot injection is suitable for use in patients on doses above 4 mg daily (see SPC).

Interactions

Absorption is unaffected by food.[9]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation; no further dilution is necessary.
- A prolonged break in feeding is not required.
- Consider changing to depot injection for patients on high doses.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of risperidone. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Risperidone Tablets (Accord), Summary of Product Characteristics; 16 January 2012.
3. Risperidone Tablets (Actavis), Summary of Product Characteristics; 8 July 2013.
4. Risperidone Tablets (Sandoz), Summary of Product Characteristics; October 2013.
5. Risperidone Orodispersible Tablets (Sandoz), Summary of Product Characteristics; 20 March 2014.
6. Risperidone 1 mg/mL Oral Suspension (Sandoz), Summary of Product Characetertics; October 2013.
7. Risperidone 1 mg/mL Oral Solution (Wockhardt) Summary of Product Characteristics, 5 August 2011.
8. BPNG data on file, 2004.
9. Risperdal (Janssen-Cilag), Summary of Product Characteristics; December 2013.
10. Personal communication, Janssen-Cilag; 22 January 2003.

Rivastigmine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Rivastigmine (non-proprietary; Actavis, Sandoz)	Capsule 1.5 mg, 3 mg, 4.5 mg, 6 mg	No specific data on enteral tube administration are available for this preparation.
Exelon (Novartis)	Capsule 1.5 mg, 3 mg, 4.5 mg, 6 mg	Rivastigmine (as hydrogen tartrate). Hard gelatin capsules. There is a single case report of the use of capsule contents dispersed in water and administered via nasogastric tube.[2]
Exelon (Novartis)	Oral solution 2 mg/mL	Rivastigmine (as hydrogen tartrate). Clear yellow aqueous solution.[3]
Exelon (Novartis)	Patch 4.6 mg/24 h, 9.5 mg/24 h	Transdermal patch, 24-hourly.[4]
Nimvastid (Consilient Health)	Capsule 1.5 mg, 3 mg, 4.5 mg, 6 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Rapidly and completely absorbed for the gastrointestinal tract; peak levels occur within 1 hour of oral administration.

Alternative routes available

Transdermal patch available.

Interactions

Food delays absorption and reduces peak plasma levels; however, AUC is slightly increased.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

1. Use transdermal patch (see SPC for dosing).
2. If low-dose titration is required, use oral solution, allowing a 1 hour feed break before and after dose.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Allow 1-hour break.
4. Draw oral solution into appropriate enteral syringe.

5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Allow 1 hour before re-starting the feed.

Intrajejunal administration

There are no specific data relating to jejunal administration. Use patch when possible. If liquid is administered via jejunal tube, monitor closely for increased side-effects.

References

1. *BNF* 67, March 2014.
2. Erbay H, Gonullu M. A new anticholinesterase agent: rivastigmine in treatment of tricyclic antidepressant poisoning. *Internet J Emerg Intensive Care Med* 2000; 4(No2):.
3. Exelon (Novartis), Summary of Product Characteristics, 8 April 2013.
4. Exelon 4.6 mg/24 h and 9.5 mg/24 h Transdermal Patch (Novartis), Summary of Product Characteristics, 16 May 2013.

Rizatriptan

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Rizatriptan (Aspire)	Tablet 5 mg, 10 mg	No specific data on enteral tube administration are available for this preparation.
Rizatriptan (Actavis, Aspire, Aurobindo, Mylan, Sandoz, Zentiva)	Orodispersible tablet 10 mg	Rizatriptan (as benzoate). Tablets dissolve on the tongue and are swallowed with saliva. This may not be an appropriate method of administration for patients with enteral feeding tubes. The Actavis, Aurobindo and Sandoz brands contain aspartame.[2–4] The Zentiva brand contains lactose 98.6 mg/tablet.[5]
Maxalt (MSD)	Tablet 5 mg, 10mg	Rizatriptan (as benzoate). Merck has not conducted studies on the impact of crushing/feeding tube administration on the safety and efficacy of Maxalt tablets. Therefore Merck cannot recommend crushing the tablet formulation prior to administration.[6] Contains lactose 30.25 mg/5 mg tablet and 60.5 mg/10 mg tablet.[7]
Maxalt Melt (MSD)	Tablet 10 mg	Rizatriptan (as benzoate). Tablets dissolve on the tongue and are swallowed with saliva. This may not be an appropriate method of administration for patients with enteral feeding tubes. Contains aspartame 3.75 mg/tablet.[8]

Site of absorption (oral administration)

Rizatriptan is rapidly and completely absorbed following oral administration. Peak plasma concentration varies depending on the preparation and manufacturer but occurs between 1 and 2.5 hours following oral administration.[2–4]

Alternative routes available

None for rizatriptan, but subcutaneous and intranasal routes are available for sumatriptan and intranasal for zolmitriptan (see individual monographs).

Interactions

High-fat meals do not affect the extent of absorption of rizatriptan but delay absorption by 1 hour.[7]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Change to sumatriptan/zolmitriptan via an alternative route depending on the severity of the migraine attack and the patient's ability to administer.

References

1. *BNF* 67, March 2014.
2. Rizatriptan Orodispersible (Actavis), Summary of Product Characteristics; March 2014.
3. Rizatriptan Orodispersible (Aurobindo), Summary of Product Characteristics; September 2012.
4. Rizatriptan Orodispersible (Sandoz), Summary of Product Characteristics; December 2011.
5. Rizatriptan Orodispersible (Zentiva), Summary of Product Chaacteristics; November 2011.
6. Personal communication, Merck; June 2014.
7. Maxalt Tablets (MSD), Summary of Product Characteristics; February 2014.
8. Maxalt Melt (MSD), Summary of Product Characteristics; February 2014.

Ropinirole

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Ropinirole (non-proprietary)	Tablet 0.25 mg, 0.5 mg, 1 mg, 2 mg	No data available on administration via enteral feeding tubes. Winthrop brands contain lactose (101.85 mg in 0.25 mg tablet and 101.58 mg in 0.5 mg tablet).[2]
Ropinirole (non-proprietary)	M/R tablet 2 mg, 4 mg, 8 mg	Modified-release preparation; do not crush. Brands include Ralnea XL, Repinex XL, Spiroco XL. Not suitable for administration via enteral feeding tubes.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Adartrel (GSK)	Tablet 0.25 mg, 0.5 mg, 2 mg	No data on administration via enteral feeding tubes. Contains lactose (45.3 mg in 0.25 mg tablet, 45 mg in 0.5 mg tablet, 44.5 mg in 2 mg tablet).[3]
Requip (GSK)	Tablet 0.25 mg, 0.5 mg, 1 mg, 2 mg, 5 mg	Ropinirole (as hydrochloride). Tablets disintegrate rapidly when placed in 10 mL of water to give fine dispersion that flushes via an 8Fr NG tube without blockage.[4]
Requip XL (GSK)	M/R tablet 2 mg, 4 mg, 8 mg	Modified-release preparation; do not crush. Not suitable for administration via enteral feeding tubes.[5]

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 1.5 hours after oral dosing.[6]

Alternative routes available

No alternative route available.

Interactions

No specific interaction with food is documented; however, high-fat meals reduce the adsorption rate.[2,3] It is recommended that ropinirole be taken with food to improve gastrointestinal tolerability.

Health and safety

Standard precautions apply

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration. A prolonged break in feeding is not required.
- Where practical, administer the dose after feed.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration of ropinirole. Administer using the above method and monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Ropinirole (Winthrop), Summary of Product Characteristics; 21 November 2008.
3. Adartrel (GSK), Summary of Product Characteristics; 28 November 2014.
4. BPNG data on file, 2004.
5. Requip XL (GSK), Summary of Product Characteristics; 13 March 2014.
6. Requip (GSK), Summary of Product Characteristics; 21 February 2014.

Rosuvastatin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Crestor (AstraZeneca)	Tablet 10 mg, 20 mg, 40 mg	Rosuvastatin (as calcium salt). Film-coated tablets; contain lactose.[2] 10 mg tablets disperse in water within 5 minutes to give pale pink, milky dispersion; small white particles are visible but the dispersion flushes down an 8Fr NG tube without blockage.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentrations occur 5 hours after dosing.[2]

Alternative routes available

No alternative route of administration is available for any of the 'statins'.

Interactions

No specific interaction with food is noted in the SPC.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- As limited data are available, consider changing to an alternative statin with more data, e.g. atorvastatin (see monograph).
- Alternatively, if continued treatment with rosuvastatin is considered appropriate, disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration of rosuvastatin. Monitor cholesterol levels for loss of efficacy of rosuvastatin. Administer using the method detailed above.

References

1. *BNF* 67, March 2014.
2. Crestor 5 mg, 10 mg, 20 mg, 40 mg Film-coated Tablets (AstraZeneca), Summary of Product Characteristics; 13 December 2013.
3. BPNG data on file, 2004.

Saquinavir

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Invirase (Roche)	Tablet 200 mg	Saquinavir (as mesilate). Contains lactose 38.5 mg. Tablets should be swallowed whole and taken at the same time as ritonavir with or after food.[2]

Site of absorption (oral administration)

Saquinavir is absorbed in the proximal small bowel.[3]

Alternative routes available

No alternative route available. Saquinavir is very poorly absorbed rectally.[3]

Interactions

Food increases the bioavailability of saquinavir. It should be taken within 2 hours of a meal. The difference in AUC between fed and fasted state is fivefold to tenfold, whereas the difference between a low-calorie, low-fat meal and a high-calorie, high-fat meal is only twofold.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider changing to protease inhibitor available as liquid preparation, e.g. amprenavir, lopinavir, nelfinavir or ritonavir. Seek specialist advice.

References

1. *BNF* 67, March 2014.
2. Invirase 500 mg Film-coated Tablets (Roche), Summary of Product Characteristics; 18 October 2013.
3. Personal communication, Roche; 6 February 2003.

Selegiline hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Selegiline (non-proprietary)	Tablet 5 mg, 10 mg	No specific data on enteral tube administration are available for this preparation.
Eldepryl (Orion)	Tablet 5 mg, 10 mg	No specific data on enteral tube administration are available for this preparation.
Eldepryl (Orion)	Oral liquid 10 mg/5 mL	Clear, slightly viscous liquid. Some resistance on flushing via an 8Fr NG tube. Mixes easily with an equal volume of water.[2] Does not contain sorbitol.[3]
Zelapar (Cephalon)	Oral lyophilisate 1.25 mg	Pre-gastric absorption.[4] 1.25 mg lyophilisate = 10 mg oral. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Selegiline is absorbed through the buccal mucosa (Zelapar) and via GI tract. Following oral administration, peak plasma concentration occurs within 30 minutes; bioavailability is low (10%).

Alternative routes available

Buccal route is available.

Interactions

No specific interaction with food is documented.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Where clinically possible, use oral lyophilisates. This may not be appropriate for patients with reduced buccal blood flow (extensive maxillofacial surgery) or for patients who cannot hold the tablet in their mouth, e.g. following severe stroke.
- For enteral tube administration, the liquid preparation should be used.
- A prolonged break in feed is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication liquid into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.

5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Administer as above

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Eldepryl 10 mg/5 mL Syrup (Orion), Summary of Product Characteristics; August 2013.
4. Zelepar (Cephalon), Summary of Product Characteristics; 21 October 2013.

Senna

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Senna (Alpharma, APS, Reckitt Benckiser)	Tablet 7.5 mg	Senna (as sennoside B). No specific data on enteral tube administration are available for this preparation.
Senokot (Reckitt Benckiser)	Syrup 7.5 mg/5 mL	Senna (as sennoside B). Brown, slightly viscous liquid. Flushes down a fine-bore tube with little resistance and no risk of blockage. Mixes with water if further dilution is required.[2] Liquid is slightly more viscous than standard enteral feed and can be adminsitered via gravity.[3]
Manevac (HFA Healthcare)	Granule	Not suitable for administration via the feeding tube. Contains senna and ispaghula.

Site of absorption (oral administration)

Senna is not absorbed and the action of the sennasides is colon-specific.[4]

Alternative routes available

Not applicable.

Interactions

No significant interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use a liquid preparation; flush well before and after dose. A prolonged break in feeding is not required.
- Administration into the jejunum will not affect pharmacological response.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Therapeutic effect will be unaffected by jejunal administration. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. BPNG data on file, 2011.
4. Senna Tablets (Boots), Summary of Product Characteristics; August 2010.

Sertraline

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Lustral (Pfizer)	Tablet 50 mg, 100 mg	Sertraline (as hydrochloride).[2] Film-coated tablets.[2] Sertraline is poorly soluble. For administration via a NG or PEG tube, Lustral tablets may be crushed, suspended in sterile water and administered using a suitable syringe. Pfizer does not have any stability data, so this must be done immediately prior to administration.[3] Tablets do not disperse readily in water but do disintegrate if shaken in 10 mL of water for a few minutes; this gives a dispersion with some visible particles that flushes via an 8Fr NG tube without blockage.[4]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Sertraline (non-proprietary)	Tablet 50 mg, 100 mg	Sertraline (as hydrochloride). No specific data available for these products.
Sertraline (Rosemont)	Oral suspension 50 mg/5 mL	Manufactured 'special'; thick liquid.[5] Alcohol 0.4 mg/5mL; sorbitol free; sugar free.[5]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 4.5–8.4 hours following oral dosing.[2]

Alternative routes available

None available.

Interactions

Food does not significantly affect the bioavailability of Lustral tablets.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider changing to an alternative SSRI available as a liquid preparation.
- If continued therapy with sertraline is indicated, use the oral suspension or disperse the tablets in water immediately prior to administration; flush well after administration.
- A prolonged break in feeding is not required.

Intragastric administration

For suspension

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Measure the correct volume of suspension for dose in an appropriate size and type of syringe.
5. Flush the dose down the enteral feeding tube.
6. Finally, flush the enteral feeding tube with the recommended volume of water.
7. Re-start enteral feed, unless a prolonged break is required.

For tablets

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of sertraline. Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Lustral 50 mg Film-coated Tablets (Pfizer), Summary of Product Characteristics; March 2014.
3. Personal communication, Pfizer; 23 June 2003.
4. BPNG data on file, 2004.
5. Rosemont. Sertraline Oral Suspension-72, http://www.rosemontpharma.com/products/central-nervous-system/sertraline-oral-suspension-72 (accessed 21 September 2014).

Sildenafil

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Viagra (Pfizer)	Tablet 25 mg, 50 mg, 100 mg	Sildenafil (as citrate). Tablets can be crushed and dispersed in water to facilitate administration.
Revatio (Pfizer)	Oral suspension 10 mg/mL	Contains sorbitol 250 mg/mL.[2] Shake well before use.
Revatio (Pfizer)	Tablet 20 mg	Sildenafil (as citrate). Film-coated tablets.[3] No specific data on enteral tube administration are available for this preparation.
Revatio (Pfizer)	Injection 800 micrograms/mL	No data are available for administration via enteral feeding tubes. However the only excipients in the injection are glucose and water; therefore, depending on the viscosity of the solution tube administration may be possible.
Nipatra (AMCo)	Chewable tablet 25 mg, 50 mg, 100 mg	Sildenafil (as citrate). Contains aspartame.[4] No specific data on enteral tube administration are available for this preparation.
Sildenafil (non-proprietary)	Tablet 25 mg, 50 mg, 100 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

The specific site of absorption is not documented. Peak plasma concentration occurs 30–120 minutes following oral administration.[5]

Alternative routes available

Parenteral route available.

Interactions

The rate but not the extent of absorption of sildenafil is reduced by food. Peak plasma concentrations are reduced by 29% and peak plasma concentrations are delayed by 1 hour following a high-fat meal.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Measure the correct volume of suspension for dose in an appropriate size and type of syringe.
5. Flush the dose down the enteral feeding tube.
6. Finally, flush the enteral feeding tube with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to jejunal administration of sildenafil. Administer as above and monitor for loss of effect and increased side-effects.

References

1. *BNF* 67, March 2014.
2. Revatio 10 mg/mL Powder for Oral Suspension (Pfizer), Summary of Product Characteristics; December 2013.
3. Revatio 20 mg Film-coated Tablet (Pfizer), Summary of Product Characteristics; December 2013.
4. Nipatra (AMCo), Summary of Product Characteristics; 9 January 2014.
5. Viagra 25 mg, 50 mg, 100 mg Tablets (Pfizer), Summary of Product Characteristics; March 2013.

Simvastatin

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Zocor (MSD)	Tablet 10 mg, 20 mg, 40 mg, 80 mg	Film-coated tablets[2] Simvastatin is almost insoluble in water.[3] 10 mg tablets (other strengths not tested) disperse in 10 mL of water and flush via an 8Fr NG tube.[4]
Simzal (APS)	Tablet 10 mg, 20 mg, 40 mg, 80 mg	Only 40 mg tested. Tablets do not readily disperse in water, but crush and mix with water to form a dispersion that flushes via an 8Fr NG tube.[4]
Simvastatin (CP Pharma)	Tablet 10 mg, 20 mg, 40 mg, 80 mg	Film-coated tablets. 40 mg strength (other strengths not tested) disperses in 10 mL of water within 5 minutes to give very coarse dispersion that breaks up when drawn into the syringe; this then flushes easily down an 8Fr Ng tube without blockage.[4]
Simvastatin (Dexcel)	Tablet 10 mg, 20 mg, 40 mg, 80 mg	Both 20 mg and 40 mg strength tablets disperse in 10 mL of water within 5 minutes when agitated to form fine dispersion that flushes via an 8Fr NG tube without blockage.[4] Other strengths not tested.
Simvador (Discovery, Generics)	Tablet 10 mg, 20 mg, 40 mg, 80 mg	Film-coated tablets.[5] No specific data on enteral tube administration are available for this preparation.
Simvastatin (Ratiopharm)	Tablet 10 mg, 20 mg, 40 mg, 80 mg	10 mg strength takes almost 5 minutes to disperse in 10 mL water when agitated but the dispersion flushes down an 8Fr NG tube. 20 mg strength does not disintegrate within 5 minutes, but crushes and mixes with water. Other strengths not tested.[4]
Simvastatin (Ranbaxy)	Tablet 10 mg, 20 mg, 40 mg, 80 mg	10 mg, 20 mg and 40 mg (80 mg not tested) strengths of tablets disperse in 10 mL of water, with the length of time and amount of agitation increasing as the strength increases. All produce a dispersion that can be flushed down an 8Fr NG tube, although care should be taken with the 40 mg strength as some of the particles may block a finer tube.[4]
Simvastatin (Rosemont)	Oral suspension 20 mg/5 mL, 40 mg/5 mL	Sugar-free. Does not contain sorbitol or maltitol.[6,7] Viscosity slightly thicker than water.[6]
Inegy (MSD)	Tablet 20 mg/10 mg, 40 mg/10 mg, 80 mg/10 mg	Each tablet contains 20 mg, 40 mg, or 80 mg simvastatin with 10 mg ezetimibe.[8] No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentrations of active metabolite are reached 1–2 hours after administration.[5]

Alternative routes available

No alternative route is available for any of the statins.

Interactions

Food intake does not affect absorption of simvastatin.[5] Peak cholesterol synthesis is influenced by meal intake, hence the recommendation that simvastatin be taken in the evening to coincide with peak cholesterol synthesis activity.[9] However, if patients are on an overnight feed it may be prudent to dose in the morning at the end of the feed regimen.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the suspension.
- See note above regarding timing of dosage.

Intragastic administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Measure the correct volume for dose of suspension in an appropriate size and type of syringe.
5. Flush the dose down the enteral feeding tube.
6. Finally, flush the enteral feeding tube with the recommended volume of water.
7. Re-start the enteral feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the administration of simvastatin via jejunal tubes, so cholesterol levels should be monitored and dose titrated to effect. Use the above method for administration.

References

1. *BNF* 67, March 2014.
2. Zocor (MSD), Summary of Product Characteristics; November 2013.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
4. BPNG data on file, 2004.
5. Simvador (Discovery), Summary of Product Characteristics; 25 June 2012.
6. Rosemont. Simvastatin Oral Suspension-73, http://www.rosemontpharma.com/products/cardiovascular-system/simvastatin-oral-suspension-73 (accessed 21 September 2014).
7. Simvastatin Suspension (Rosemont), Summary of Product Characteristics, 19 June 2012.
8. Inegy Tablets (MSD), Summary of Product Characteristics; November 2013.
9. Cella LK, Cauter E, Schoeller DA. Effect of meal timing on diurnal rhythm of human cholesterol synthesis. *Am J Physiol* 1995; 269(32): E878–E883.

Sodium clodronate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Bonefos (Bayer, previously Boehringer Ingelheim)	Capsule 400 mg	Sodium clodronate (as tetrahydrate). Bonefos capsules and tablets are almost bioequivalent and, therefore, no dosage adjustment is necessary when changing between Bonefos preparations.[2] Capsules can be opened and flushed via enteral feeding tube.[3]
Bonefos (Bayer, previously Boehringer Ingelheim)	Tablet 800 mg	Tablets will disperse in water.[3]
Loron 520 (Intrapharm)	Tablet 520 mg	It is not recommended that the tablets be crushed as the bioavailability is likely to be affected.[4]
Clasteon (Beacon)	Tablet 500 mg	Sodium clodronate (as tetrahydrate).[5]

Site of absorption (oral administration)

Specific site of absorption is not documented.

Alternative routes available

Parenteral route available for acute management of hypercalcaemia of malignancy.

Interactions

Absorption is reduced by calcium ions. Food should be avoided for 1 hour before and 1 hour after dosing.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- It is possible that bioavailability will be adversely affected by administration via enteral feeding tube. The preferred formulation is to open the capsules and mix with water immediately prior to administration.
- Consideration should be given to using alternative therapy such as alendronate or residronate (see monographs) or using maintenance parenteral therapy.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Wait at least 1 hour before administering the dose.
4. Open the capsule and pour the contents into a medicine pot.

5. Add 15 mL of water.
6. Stir to disperse the powder.
7. Draw into an appropriate size and type of syringe and administer via the feeding tube.
8. Add a further 15 mL of water to the medicine pot; stir to ensure that any powder remaining in the pot is mixed with water.
9. Draw up this dispersion and flush down the tube. This will ensure that the whole dose is given.
10. Flush the tube with the recommended volume of water.
11. Wait for at least 1 hour before re-starting the feed.

Jejunal administration

There are no specific data relating to jejunal administration of sodium clodronate. Administer as above. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Bonefos Capsules (Bayer), Summary of Product Characteristics; 26 June 2013.
3. Personal communication, Boehringer Ingelheim; 6 March 2003.
4. Personal communication, Roche (previous MA holder); 6 February 2003.
5. Clasteon (Beacon), Summary of Product Characteristics; 14 December 2012.

Sodium picosulfate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Sodium picosulfate (Boehringer Ingelheim)	Elixir 5 mg/5 mL	Can be diluted with water.[2] Contains alcohol 5.9% vol.[2] (Laxoberal and Dulcolax Pico Liquid). Liquid preparation has a viscosity similar to standard enteral feed and flushes via 8Fr NG tube without resistance. Can be administered under gravity.[3]
Dulcolax Perles (Boehringer Ingelheim)	Capsule 2.5 mg	No specific data on enteral tube administration are available for this preparation.
Picolax (Nordic)	Oral powder 10 mg/sachet	Licensed for bowel cleansing prior to procedures. Contents of one sachet should be reconstituted in approximately 150 mL of water.[4] Contains lactose.[4] Anecdotal evidence supports administration via enteral feeding tubes; however, it should be ensured that the reconstituted solution is stirred well and has cooled before administration.[5]
Citrafleet (Fleet)	Oral powder 10 mg/sachet	Licensed for bowel cleansing prior to procedures. Contents of one sachet should be reconstituted in approximately 150 mL of water.[6]

Site of absorption (oral administration)

Sodium picosulfate reaches the colon without any significant absorption;[2] therefore, the therapeutic response will be unaffected by jejunal administration.

Alternative routes available

Not applicable.

Interactions

No significant interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation; dilute with an equal volume of water prior to administration. No prolonged break in feeding is required.
- See notes above for Picolax administration.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication into an appropriate size and type of syringe.
4. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
5. Flush the medication dose down the feeding tube.
6. Draw another 15 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

The pharmacological affect is unlikely to be affected by jejunal administration. Administer as above.

References

1. *BNF* 67, March 2014.
2. Dulcolax Pico Liquid (Boehringer), Summary of Product Characteristics; June 2013.
3. BPNG data on file, 2011.
4. Picolax (Ferring), Summary of Product Characteristics; October 2012.
5. Personal communication, Ferring Pharmaceuticals; 20 January 2003.
6. Citrafleet Powder (laboratorios Casen Fleet), Summary of Product Characteristics, 20 December 2010.

Sodium valproate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Epilim (Sanofi-Aventis)	Tablet 100 mg	Crushable.[2] Epilim tablets disintegrate if shaken in 10 mL of water for 5 minutes to give a fine dispersion that flushes easily down an 8Fr NG tube.[3]
Epilim (Sanofi-Aventis)	Tablet 200 mg, 500 mg	Enteric coated; do not crush.[2]
Epilim (Sanofi-Aventis)	Liquid 200 mg/5 mL	Sugar free; contains sorbitol.[4] Red, clear liquid; resistant to flushing via an 8Fr NG tube; mixes easily with water, which reduces resistance.[5] Does not flow well under gravity; viscosity approximately 300 cP.[6]
Epilim (Sanofi-Aventis)	Syrup 200 mg/5 mL	Contains sorbitol.[4]
Epilim Chrono (Sanofi-Aventis)	M/R tablet 200 mg, 300 mg, 500 mg	Modified release; do not crush.
Epilim Chronosphere (Sanofi-Aventis)	Sachet 50 mg, 100 mg, 250 mg, 500 mg, 750 mg, 1000 mg	Modified-release granules; do not crush.[7] Chronosphere granules are 350–450 micrometres in diameter for all strengths and pack sizes.[8] These have been successfully administered via 10Fr NG tubes and 9Fr PEG tubes. The spheres were placed in the barrel of a syringe and 10 to 15 mL of cold water was drawn into the syringe to suspend the granules for administration; the tube was then flushed several times with cold water.[9]
Episenta(Destin)	Capsule 150 mg, 300 mg	No available data on administration via enteral feeding tubes.
Episenta (Destin)	Granule 500 mg	No available data on administration via enteral feeding tubes.
Epilim Intravenous (Sanofi-Aventis)	Injection 400 mg	Not suitable for use via NG tube.[2]
Episenta (Destin)	Injection 100 mg/mL (3 mL)	No available data on administration via enteral feeding tubes.
Sodium Valproate (Hillcross)	Tablet 100 mg	Crushable.[1]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Sodium Valproate (APS, CP, Hillcross, Sterwin Winthrop, Wockhardt)	Tablet 200 mg, 500 mg	Enteric coated; do not crush.
Sodium Valproate (Hillcross, Sterwin, Wockhardt, Zentiva)	Oral solution 200 mg/5 mL	Wockhardt brand, Orlept, contains maltitol.[10,11] Zentiva brand contains sorbitol.[12]
Epival (Chanelle)	Tablet 300 mg, 500 mg	Modified release preparation; do not crush. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–2 hours after administration of liquid and immediate-release preparations, and 2–8 hours after enteric-coated or modified-release preparations.[13] Absorption is complete.[13]

Alternative routes available

Parenteral route is available.

Interactions

Food may delay the absorption of valproate.[13]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation and dilute with water immediately prior to administration.
- A prolonged break in feeding is not required.
- There are no specific data on jejunal administration; If use of the liquid is associated with diarrhoea, consider dispersing the tablets in water.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Draw an equivalent volume of water and a little air into the syringe and shake to mix.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to

ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

1. There are no specific data relating to jejunal administration. For liquid administration, administer using the above method; dilute the dose with 3–4 times the volume in water to reduce osmolarity. The 100 mg tablets can be used, although this is only practical for doses at the lower end of the range: Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablets in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water for every tablet into the syringe and allow tablet(s) to disperse; this may take up to 5 minutes with vigorous shaking.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place tablet(s) into medicine pot and add 10 mL of water per tablet and allow tablet(s) to disperse. This may take more than 5 minutes. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

References

1. *BNF* 67, March 2014.
2. Personal communication, Sanofi-Synthelabo; 3 February 2003.
3. BPNG data on file, 2004.
4. Epilim Liquid (Sanofi-Aventis), Summary of Product Characteristics; 27 January 2014.
5. BPNG data on file, 2005.
6. BPNG data on file, 2011.
7. Epilim Chronosphere 100 mg (Sanofi-Aventis), Summary of Product Characteristics; 9 January 2014.
8. Personal communication, Sanofi-Aventis, 24 January 2011.
9. Probst W. Ergenylchromosphere via tubes. *Krankenhauspharmazie* 2006; 27(10): 436–438.
10. Personal communication, CP Pharma; 20 January 2003.
11. Orlept Sugar-free Liquid (Wockhardt), Summary of Product Characteristics; 18 March 2013.
12. Sodium Valproate Liquid (Zentiva), Summary of Product Characteristics; 3 January 2013.
13. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Sotalol hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Beta-Cardone (PharSafer)	Tablet 40 mg, 80 mg, 200 mg	Scored tablets are uncoated and can be crushed.[2] Sotalol tablets have been formulated into an extemporaneous preparation that was stable for 8 weeks;[3] therefore, suspending crushed tablets in water will not cause stability concerns. Tablets do not disintegrate readily but will disperse when shaken in 10 mL of water for 3–5 minutes; this forms a very fine suspension that flushes via an 8Fr NG tube without blockage (colour dependent on strength of tablet).[4]
Sotacor (Bristol-Myers Squibb)	Tablet 80 mg,	Sotalol is freely soluble in water.[5] No specific data on enteral tube administration are available for this preparation.
Sotalol (non-proprietary)	Tablet 40 mg, 80 mg, 160 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 2–3 hours after oral dosing.[6]

Alternative routes available

No alternative available for sotalol. Other beta-blockers are available in injectable form.

Interactions

No documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to dosing.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.

3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration. Monitor for loss of effect. Administer as above.

References

1. *BNF* 67, March 2014.
2. Personal communication, Celltech (previous MA holder); 31 March 2003.
3. Dupis LL, James G, Bacola G. Stability of a sotalol hydrochloride oral liquid formulation. *Can J Hosp Pharm* 1988; 41(3): 121–123.
4. BPNG data on file, 2005.
5. Personal communication, Bristol-Myers Squibb; 24 January 2003.
6. Sotacor Tablets 80 mg (BMS) Summary of Product Characteristics; June 2010.

Spironolactone

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Spironolactone (non-proprietary)	Tablet 25 mg, 50 mg, 100 mg	Most brands of tablets will disperse in water if shaken for 2–5 minutes. The resulting dispersion will flush via an 8Fr NG tube without blockage.[2]
Spironolactone (Rosemont)	Oral suspension 5 mg/5 mL, 10 mg/5 mL, 25 mg/5 mL, 50 mg/5 mL, 100 mg/5 mL	Manufactured 'special'; 12 months' expiry. Contains 0.68 g sorbitol/5 mL dose; contains 1.2 g/5 mL maltitol.[3] Very viscous liquid that is resistant to flushing via fine-bore tubes; however, it mixes with water when shaken vigorously. The diluted liquid is less resistant to flushing.[4]
Aldactone (Pharmacia)	Tablet 25 mg, 50 mg, 100 mg	Film-coated tablets. If necessary a suspension can be prepared by crushing the tablets.[5]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Spironolactone (extemporaneous preparation)	Suspension various strengths	Spironolactone is stable for 28 days when suspended in cherry syrup[6,7] or syrup and carboxymethylcellulose base,[5] at a range of strengths.
With thiazide: see co-flumactone monograph		
With furosemide		
Lasilactone (Sanofi-Aventis)	Capsule 50 mg/20 mg	Spironolactone 50 mg and furosemide 20 mg. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Spironolactone is well absorbed orally,[8] with peak plasma concentrations occurring 2.6 hours after oral administration.

Alternative routes available

None available for spironolactone. Potassium canreonate injection is available as an unlicensed product.

Interactions

No specific interaction with food is documented. The SPC recommends taking the dose with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use suspension formulation for enteral administration; alternatively, disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking as required.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Rosemont. Spironolactone Oral Suspension-74, http://www.rosemontpharma.com/products/cardiovascular-system/spironolactone-oral-suspension-74 (accessed 21 September 2014).
4. BPNG data on file, 2005.
5. Personal communication, Pharmacia; March 11 2003.
6. Mathur LK, Wickman A. Stability of extemporaneously compounded spironolactone suspensions. *Am J Hosp Pharm* 1989; 46: 2040–2042.
7. Allen LV, Erickson MA. Stability of ketoconazole, metolazone, metronidazole, procainamide hydrochloride, and spironolactone in extemporaneously compounded oral liquids. *Am J Health Syst Pharm* 1996; 53: 2073–2078.
8. Aldactone 25 mg Tablets (Pharmacia), Summary of Product Characteristics; November 2012.

Stavudine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Zerit (Bristol-Myers Squibb)	Capsule 20 mg, 30 mg, 40 mg	For optimal absorption stavudine should be administered on an empty stomach; however, if necessary the capsules can be opened and mixed with food.[2] The contents of the capsules pour freely, mix with water when stirred, and flush via an 8Fr NG tube without blockage.[3]
Zerit (Bristol-Myers Squibb)	Oral solution 1 mg/mL	Powder for reconstitution.[4] There is no theoretical reason why this cannot be administered via a feeding tube.

Site of absorption (oral administration)

Specific site of absorption is not documented.

Alternative routes available

None available for stavudine.

Interactions

A high-fat meal reduces and delays peak plasma concentration;[2] there are no reports of this interaction having clinical significance.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the oral solution.
- Where possible allow a break before dosing.
- Flush well after dose and allow break of 30 minutes before restarting feed.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Allow a break prior to dosing if practical.
4. Draw the medication solution into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Wait at least 30 minutes before re-starting the feed.

Alternatively, at step (4) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to the jejunal administration of stavudine. Administer using the above method and monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Zerit Capsules (Bristol-Myers Squibb), Summary of Product Characteristics; March 2014.
3. BPNG data on file, 2005.
4. Zerit Powder for Oral Solution (Bristol-Myers Squibb), Summary of Product Characteristics; March 2014.

Sucralfate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Antepsin (Chugai)	Tablet 1 g	Tablets may be dispersed in 10–15 mL of water.[2] It is not known whether this is suitable for administration via an enteral tube.
Antepsin (Chugai)	Suspension 1 g/5 mL	Viscous white liquid. Viscosity is reduced by mixing with an equal volume of water; as there are no stability data to support dilution, this must be done immediately prior to administration.[4]

Site of absorption (oral administration)

Sucralfate is only minimally absorbed;[2] its mode of action is local. Increased absorption of aluminium may occur in renal patients.

Alternative routes available

None.

Interactions

Bezoar formation: Following reports of bezoar formation associated with sucralfate, the CSM has advised caution in seriously ill patients, especially those receiving concomitant enteral feeds or those with predisposing conditions such as delayed gastric emptying.[1]

Sucralfate forms an insoluble protein–aluminium complex with enteral feeds, resulting in solid or semi-solid agglomerates that can block feeding tubes, or even the stomach or oesophagus.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Enteral feed should be stopped at least 1 hour before dose and not re-started for 1 hour post-dose.[2] A longer break may be prudent in patients with delayed gastric emptying.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Wait for at least 1 hour.
4. Shake the medication bottle thoroughly to ensure adequate mixing.
5. Draw the medication suspension into an appropriate size and type of syringe.
6. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
7. Flush the medication dose down the feeding tube.
8. Finally, flush with the recommended volume of water.
9. Wait at least an hour before re-starting the feed.

Alternatively, at step (5) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Not appropriate for jejunal administration as the site of action is gastric and duodenal.

References

1. *BNF* 67, March 2014.
2. Antepsin Suspension (Chugai), Summary of Product Characteristics; September 2013.
3. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).
4. BPNG data on file, 2004.

Sulfasalazine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Salazopyrin (Pharmacia)	Tablet 500 mg	Tablets can be crushed.[2]
Salazopyrin (Pharmacia)	EN-Tabs 500 mg	EN-Tabs are enteric coated and film coated and cannot be crushed. Not suitable for enteral tube administration.
Salazopyrin (Rosemont)	Suspension 250 mg/5 mL	Suspension does not contain sorbitol, contains less than 100 mg/5 mL alcohol.[3] Viscous orange suspension. Suspension is highly viscous and thixotropic; it cannot be administered under gravity.[4]
Salazopyrin (Pharmacia)	Suppository 500 mg	Effective for topical therapy only.
Sulfasalazine (non-proprietary)	Tablet 500 mg	No specific data on enteral tube administration are available for this preparation.
Sulfasalazine (Alpharma)	E/C tablet 500 mg	Enteric-coated tablets; do not crush. Brands include Sulazine EC. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Approximately 90% of an oral dose of sulfasalazine reaches the colon, where it is cleaved to release mesalazine.[3]

Alternative routes available

Topical therapy using a rectal 5-ASA preparation should be used first line in local rectal disease.

Interactions

There is no documented interaction with food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the suspension and flush the tube well before and after administration.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

As the effect of sulfasalazine is topical within the colon, jejunal administration is not expected to affect therapeutic response to treatment.

References

1. *BNF* 67, March 2014.
2. Personal communication, Pharmacia; 11 March 2003.
3. Sulfasalazine Suspension (Rosemont), Summary of Product Characteristics; 2 October 2012.
4. BPNG data on file, 2011.

Sulpiride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Sulpiride (non-proprietary)	Tablet 200 mg, 400 mg	No specific data on enteral tube administration are available for this preparation.
Dolmatil (Sanofi-Aventis)	Tablet 200 mg, 400 mg	Scored tablets; can be crushed.[2] 200 mg tablets (400 mg not tested) disperse within 2 minutes to form a fine dispersion that settles quickly but that can be drawn up and flushes via an 8Fr NG tube without blockage.[3]
Sulpor (Rosemont)	Oral solution 200 mg/5 mL	Sugar-free; does not contain sorbitol;[4] contains 3.1 g/5 mL maltitol.[5] Sulpor oral solution has a viscosity less than standard enteral feed and flows via 8Fr NG tube under gravity with no resistance, flushes easily via syringe.[4,6]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 3–6 hours following oral dosing.[5]

Alternative routes available

None available for sulpiride.

Interactions

There is no documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation.
- Alternatively, the tablets can be dispersed in 10 mL of water immediately prior to administration. This should be considered for intrajejunal administration owing to its lower osmolarity.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.

6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Use the above method or alternatively disperse tablets in water.

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

References

1. *BNF* 67, March 2014.
2. Personal communication, Sanofi; 3 February 2003.
3. BPNG data on file, 2004.
4. Sulpor (Rosemont), Summary of Product Characteristics; 30 April 2013.
5. Personal communication, Rosemont; 3 September 2008.
6. BPNG data on file, 2011.

Sumatriptan

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Sumatriptan (Accord, Aurobindo, Boots, Forest, Wockhardt)	Tablet 50 mg, 100 mg	Sumatriptan (as succinate). No specific data on enteral tube administration are available for this preparation. Most brands contain lactose, except Aurobindo.[2]
Imigran (GSK)	Tablet 50 mg, 100 mg	Sumatriptan (as succinate). Film-coated tablets. No specific data on enteral tube administration are available for this preparation. Contains lactose.[3]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Imigran Radis (GSK)	Tablet 50 mg, 100 mg	Sumatriptan (as succinate). Film-coated dispersible tablets. The tablets may be dispersed in a small amount of water before administration.[4]
Imigran (GSK)	Injection 12 mg/mL	Sumatriptan (as succinate). For s.c. injection only.
Imigran (GSK)	Nasal spray 10 mg/0.1 mL actuation	Sumatriptan (as succinate). For intranasal administration only.

Site of absorption (oral administration)

Sumatriptan is rapidly absorbed following oral administration. Peak plasma concentrations occur at 45 minutes following oral administration.[2–4]

Alternative routes available

Subcutaneous and intranasal routes are available for sumatriptan.

Interactions

There is no documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the Imigran Radis tablets dispersed in water.
- Change to an alternative route depending on the severity of the migraine attack and the patient's ability to administer.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of sumatriptan. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Sumatriptan Tablets (Aurobindo), Summary of Product Characteristics; June 2010.
3. Imigran Tablets (GSK), Summary of Product Characteristics; July 2013.
4. Imigran Radis Tablets (GSK) Summary of Product Characteristics; July 2013.

Tacrolimus

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Prograf (Astellas)	Capsule 500 micrograms, 1 mg, 5 mg	Contents pour easily from capsule, although they are difficult to open owing to their small size. The powder mixes with water and flushes via an 8Fr nasogastric tube without blockage.[2] The capsule contents can be mixed with water for nasogastric administration.[3]
Advgraf (Astellas)	Capsule M/R 500 micrograms, 1 mg, 5 mg	Not suitable for enteral tube administration.
Prograf (Astellas)	Concentrate for injection 5 mg/ml	Contains polyoxyl castor oil which can cause anaphylactic reactions. Not recommended for oral administration.
Modigraf (Astellas)	Granules for oral suspension 0.2 mg, 1 mg	Contents of sachet should be mixed with water and can be administered orally or via nasogastric tube.[4]
Adoport (Sandoz)	Capsule 500 micrograms, 1 mg, 5 mg	Capsule contents can be suspended in water for NG tube administration.[5]
Capexion (Generics)	Capsule 500 micrograms, 1 mg, 5 mg	No specific data on enteral tube administration are available for this preparation.
Tacni (Teva)	Capsule 500 micrograms, 1 mg, 5 mg	No specific data on enteral tube administration are available for this preparation.
Vivadex (Dexcel)	Capsule 500 micrograms, 1 mg, 5 mg	No specific data on enteral tube administration are available for this preparation.
Perixis (Accord)	Capsule 500 micrograms	No specific data on enteral tube administration are available for this preparation.
Tacrolimus (Nova Laboratories)	Suspension various strengths	Special product[5] – contact Nova laboratories for details.
Tacrolimus	Extemporaneous suspension	The contents of tacrolimus capsules can be mixed with a 1:1 mixture of simple syrup and Ora-Plus. This has a shelf-life of 56 days at room tempterature.[6]

Site of absorption (oral administration)

The absorption of tacrolimus is erratic, but occurs throughout the GI tract. 20-25% of the dose is absorbed.[8] GI transit time may affect absorption, peak levels generally occur 1-3 hours following an oral dose.[2]

Tacrolimus is aborbed when administered by nasogastric tube, and can be administered bucally.[9]

Alternative routes available

Intravenous route is available but carries the risk of anaphylactic reaction. Dose conversion is complicated, levels should be measured, and the patient's condition monitored closely by a specialist.

Interactions

Absorption is decreased by food, mainly high-fat meals, therefore avoid administration with high-fat enteral feeds. Avoid taking with grapefruit or grapefruit juice.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Changing between brands and formulations of tacrolimus should be undertaken with the supervision of a transplant specialist.[10]
- The sachets or the capsules can be opened and the contents mixed with water. Consider the manual dexterity of the patient.
- A prolonged break in feeding is required and to maximize absorption the dose should be administered 1 hour before a feed is commenced or 2–3 hours after stopping a feed.[2]
- Using the injection orally carries the same risk of anaphylaxis as the injection owing to the presence of polyoxyl castor oil and is not recommended.

Intragastric administration

Tacrolimus is not compatible with PVC and therefore any equipment used to manipulate doses (tubing, syringes, etc.) should not contain PVC.

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Wait for 2–3 hours.
4. Empty the sachets or capsule contents into a suitable container and mix with water.
5. Draw up into a suitable size and type of syringe.
6. Flush the medication dose immediately down the enteral feeding tube.
7. Finally, flush with the recommended volume of water.
8. If possible wait for an hour before re-starting the feed.

Intrajejunal administration

There are no specific data relating to jejunal administration of tacrolimus. Administer using the above method. Monitor levels closely.

References

1. *BNF* 67, March 2014.
2. Prograf (Astellas), Summary of Product Characteristics, 23 September 2013.
3. BPNG data on file, 2009.
4. Modigraf 0.2 mg and 1 mg Granules for Oral Suspension (Astellas), Summary of Product Characteristics; 17 February 2014.
5. Adoport Capsules (Sandoz), Summary of Product Characteristics; May 2013.

6. Personal communication, Nova Laboratories, May 2009.
7. Jacobson PA, Johnson CE, West NJ, *et al*. Stability of tacrolimus in an extemporaneously compounded oral liquid. *Am J Health-Syst Pharm* 1997; 54: 178–180.
8. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).
9. Goorhuis JF, Scheenstra R, Peeters PM, Albers MJ. Buccal vs. nasogatric tube administration of tacrolimus after pediatric liver transplantation. *Pediatr Transplant* 2006; 10: 74–77.
10. MHRA. Updated Commission on Human Medicines recommendation for prescribing and dispensing of all oral tacrolimus products. London: Medicines and Healthcare products Regulatory Agency/ Commission on Human Medicines; 24 May 2012, http://www.mhra.gov.uk/Safetyinformation/Safetywarningsalertsandrecalls/Safetywarningsandmessagesformedicines/CON152758 (accessed 15 September 2014).

Tamoxifen

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Tamoxifen (non-proprietary; Teva)	Tablet 10 mg, 20 mg, 40 mg	Tamoxifen (as citrate). No specific data on enteral tube administration are available for this preparation.
Tamoxifen (Rosemont)	Oral solution 10 mg/5 mL	Tamoxifen (as citrate). Contains 0.7 g sorbitol per 5 mL dose;[2] contains 787 mg (0.1 unit) ethanol per 5 mL.[3] Viscosity slightly thicker than water. Brand Soltamox.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 4–7 hours following oral dosing.[3]

Alternative routes available

None available for tamoxifen.

Interactions

There is no documented interaction with food.

Health and safety

Tamoxifen is a non-steroidal anti-oestrogen. Crushing tablets should be avoided to minimise operator exposure.

Suggestions/recommendations

- Use the liquid preparation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to jejunal administration of tamoxifen; however, the late peak plasma concentration indicates that significant gastric absorption is unlikely. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Rosemont Pharmaceuticals Ltd; 20 January 2005.
3. Rosemont. Tamoxifen Oral Solution (Soltamox 10 mg/5 mL), http://www.rosemontpharma.com/products/malignant-disease-a-immunosuppression/tamoxifen-oral-solution-31 (accessed 15 September 2014).
4. Soltamox 10 mg/5 mL Oral Solution (Rosemont), Summary of product Characteristics; 11 June 2013.

Tamsulosin hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Flomax Relief MR (Beohringer-Ingelheim)	M/R capsule 400 micrograms	Modified-release preparation; do not crush. Not suitable for enteral tube administration. Capsule contains small, modified-release granules. These clump together when mixed with water, are very difficult to draw into the syringe, and block feeding tubes.[2]
Flomaxtra XL (Astellas)	M/R tablet 400 micrograms	Modified-release preparation; do not crush. Not suitable for enteral tube administration.
Tamsulosin (Actavis, ProStraken, Wockhardt, Zentiva)	M/R capsule 400 micrograms	Modified-release preparation; do not crush. Not suitable for enteral tube administration. Brands include Bazetham MR, Contiflow XL, Diffundo XL, Losinate MR, Pinexel PR, Prosurin XL, Stronezam MR, Tabphyn MR.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
With dutasteride		
Combodart (GSK)	M/R capsule 400 micrograms/ 500 micrograms	Contains 400 micrograms tamsulosin and 500 micrograms dutasteride. Modified-release preparation; do not crush. Not suitable for enteral tube administration.
With soliphenacin		
Vesomni (Astellas)	M/R capsule 400 micrograms/5 mg	Contains 400 micrograms tamsulosin and 5 mg soliphenacin (as succinate). Modified-release preparation; do not crush. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Tamsulosin is absorbed from the intestine and is almost competely bioavailable. Peak plasma concentration occurs 6 hours following oral administration of the modified-release preparation.[3]

Alternative routes available

None.

Interactions

Absorption of tamsulosin is reduced by a recent meal.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Formulation is unsuitable for administration via the feeding tube; consider changing to an alternative drug such as doxazosin (see monograph).

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Flomax Relief MR (Boehringer-Ingelheim), Summary of Product Characteristics; June 2013.

Telithromycin

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Ketek (Sanofi)	Tablet 400 mg	Film coated.[2] Tablets have been crushed and mixed with either water or enteral feed and shown to be bioequivalent to the tablets taken orally.[3]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma levels occur 1–3 hours following an oral dose.[2]

Alternative routes available

None available for telithromycin. Parenteral route available for erythromycin and clarithromycin.

Interactions

The rate and extent of absorption is unaffected by food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Change to alternative antibiotic available in an appropriate formulation.
- If considered essential therapy, crush the tablets and administer using the method below. NB: crushing tablets in an open device such as a pestle and mortar can result in a loss of up to 25% of the dose.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add a further 20 mL of water and mix thoroughly, ensuring there are no large particles of tablet.
6. Draw this into an appropriate size and type of syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 20 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure the total dose is administered).
9. Finally, flush with the recommended volume of water.
10. Re-start feed if required.

Intrajejunal administration

There are no data on the administration of telithromycin via jejunal tube. Consider alternative antibiotic.

References

1. *BNF* 67, March 2014.
2. Ketek (Sanofi), Summary of Product Characteristics; 19 November 2012.
3. Lippert C, Gbenado S, Qiu C, Lavin B, Kovacs SJ. The bioequivalence of telithromycin administered orally as crushed tablets versus tablets swallowed whole. *J Clin Pharmacol* 2005; 45(9): 1025–1031.

Telmisartan

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Micardis (Boehringer Ingelheim)	Tablet 20 mg, 40 mg, 80 mg	Tablets can be crushed.[2] Tablets contain a small quantity of sorbitol, unlikely to cause GI side-effects.[3] Tablets disperse in water if shaken for 5 minutes to give a very fine dispersion that flushes via an 8Fr NG tube without blockage.[4]
Telmisartan (non-proprietary)	Tablet 20 mg, 40 mg, 80 mg	No specific data are available on enteral tube administration for this preparation. Actavis brand does not contain sorbitol.[5] Teva brand contains sorbitol.[6]
With hydrochlorothiazide		
Micardis Plus (Boehringer Ingelheim)	Tablet 40 mg/12.5 mg, 80 mg/12.5 mg	'40/12.5' tablets contain 40 mg telmisartan and 12.5 mg hydrochlorothiazide; '80/12.5' tablets contain 80 mg telmisartan and 12.5 mg hydrochlorothiazide. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented.

Alternative routes available

No other routes of administration are available for any of the angiotensin II antagonists.

Interactions

Food delays absorption and significantly reduces telmisartan absorption.[2,7]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe, shaking if necessary until the tablet disintegrates.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse; this may take a considerable length of time without agitation. Draw this dispersion into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Micardis (Boehringer Ingelheim), Summary of Product Characteristics; December 2013.
3. Personal communication, Boehringer Ingelheim; 6 March 2003.
4. BPNG data on file, 2005.
5. Telmisartan 20 mg Tablets (Actavis) Summary of Product Characteristics; 30 July 2013.
6. Telmisartan 20 mg, 40 mg and 80 mg Tablets (Teva), Package Leaflet; November 2013.
7. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Temazepam

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Temazepam (non-proprietary)	Tablet 10 mg, 20 mg	No specific data on enteral tube administration are available for this preparation.
Oral solution (Rosemont)	Oral solution 10 mg/5 mL	Rosemont brand contains 0.91 g sorbitol/5 mL dose.[2] Focus Pharmaceuticals brand is manufactured by Rosemont with Focus livery.[3] Sugar-free preparations are available.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs within 50 minutes following oral administration.[3]

Alternative routes available

None available for temazepam. Diazepam (which is metabolised to a number of metabolically active compounds including temazepam) is available as suppositories and injection.

Interactions

There is no documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Administer using the above method. Monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Rosemont; 20 January 2005.
3. Temazepam 10 mg/5 mL Oral Solution (Rosemont), Summary of Product Characteristics; 20 August 2013.

Tenofovir disoproxil

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/ Administration information
Viread (Gilead)	Tablet 245 mg (as fumarate)	Film-coated tablets. For patients with swallowing difficulties, the tablets can be dispersed in 100 mL of water, orange juice or grape juice.[2] Tablets disperse within 5 minutes when placed in 10 mL of water and flush via an 8Fr NG tube without blockage.[3]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/ Administration information**
Viread (Gilead)	Granule 33 mg/g	Tenofovir disoproxil (as fumarate). Granules can be mixed with soft food; do not mix granules with liquids.[4]
With emtricitabine		
Truvada (Gilead)	Tablet 245 mg/200 mg	Contains 245 mg tenofovir disoproxil (as fumarate) and 200 mg emtricitabine. Film coated tablets. Patients with swallowing difficulties may disperse the tablet in half a glass of water.[5]
With efavirenz and emtricitabine		
Atripla (Gilead)	Tablet 600 mg/200 mg/245 mg	Contains 600 mg efavirenz, 200 mg emtricitabine and 245 mg tenofovir. Tablets should be swallowed whole with water.[6] No specific data on enteral tube administration are available for this preparation.
With emtricitabine and rilpivirine		
Eviplera (Gilead)	Tablet 200 mg/25 mg/245 mg	Contains 200 mg emtricitabine, 25 mg rilpivirine and 245 mg tenofivir. Film coated tablet. The Eviplera tablet should not be chewed or crushed as it may impact on absorption.[7]
With cobicistat, elvitegravir and emtricitabine		
Stribild (Gilead)	Tablet 150 mg/150 mg/ 200 mg/245 mg	Contains cobicistat 150 mg, elvitegravir 150 mg, emtricitabine 200 mg and tenofovir 245 mg. Film coated tablet. The tablet should not be crushed or chewed.[8]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentrations of tenofovir disoproxil occur within 1 hour in the fasted state and 2 hours in the fed state.[2]

Alternative routes available

None available for tenofovir disoproxil.

Interactions

Co-administration with food delays the peak plasma concentration by approximately 1 hour. A high-fat meal enhanced tenofovir disoproxil absorption by 40% when compared to the fasted state. A light meal had no significant effect on pharmacokinetics.[2] The SPC recommends that tenofovir disoproxil be taken with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not necessary.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Jejunal administration

There are no specific data relating to the jejunal administration of tenofovir disoproxil. Monitor for loss of efficacy or increased side-effects. Use the same method as for intragastric administration.

References

1. *BNF* 67, March 2014.
2. Viread 245 mg Film-coated Tablets (Gilead), Summary of Product Characteristics; October 2013.
3. BPNG data on file, 2005.
4. Viread Granules (Gilead), Summary of Product Characteristics; October 2013.
5. Truvada Tablets (Gilead), Summary of Product Characteristics; February 2014.
6. Atripla Tablets (Gilead), Summary of Product Characteristics; January 2014.
7. Eviplera Tablets (Gilead), Summary of Product Characteristics; December 2013.
8. Stribild Tablets (Gilead), Summary of Product Characteristics; September 2013.

Terbinafine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Lamisil (Novartis)	Tablet 250 mg	Terbinafine (as hydrochloride). Scored tablets; soluble 1:160 in water.[3] No specific data on enteral tube administration are available for this preparation.
Terbinafine (non-proprietary; Actavis, Kent)	Tablet 250 mg	No specific data on enteral tube administration are available for this preparation.
Terbinafine (Rosemont)	Oral suspension 250 mg/5 mL	No specific data on enteral tube administration are available for this preparation.
Extemporaneous preparation	Suspension 25 mg/mL	*Extemporaneous terbinafine suspension* 25 mg/mL: Terbinafine 250 mg tablets: 10 tablets Ora-Sweet/Ora-Plus (1:1) to 100 mL Store in a refrigerator or at room temperature; 42-day expiry.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 2 hours following oral dosing.[3]

Alternative routes available

Topical terbinafine is only indicated for mild disease.[1]

Interactions

Absorption is unaffected by food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to lack of data, consider alternative therapy.
- Tablets are scored and therefore there is no reason why the tablets cannot be crushed and dispersed in water immediately prior to administration; alternatively, an extemporaneous preparation can be made, although the viscosity and osmolarity of this is likely to be high. NB: Crushing tablets in an open device such as a pestle and mortar can reduce dose delivery by up to 25%.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in a mortar and crush to a fine powder using the pestle.
4. Add a few millilitres of water and mix to form a paste.
5. Add up to 15 mL of water and mix thoroughly, ensuring that there are no large particles of tablet.
6. Draw this into an appropriate syringe.
7. Flush the medication dose down the feeding tube.
8. Add another 15 mL of water to the mortar and stir to ensure that any remaining drug is rinsed from the container. Draw this water into the syringe and also flush this via the feeding tube (this will rinse the mortar and syringe and ensure total dose is administered).
9. Finally, flush the enteral feeding tube with the recommended volume of water.
10. Re-start the feed, unless a prolonged break is necessary.

Intrajejunal administration

There are no specific data relating to jejunal administration of terbinafine. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Abdel-Rahman SM, Nahata MC. Stability of terbinafine hydrochloride in an extemporaneously prepared oral suspension at 25 and 4 °C. *Am J Health Syst Pharm* 1999; 56: 243–245.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Theophylline

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Nuelin SA (Meda)	M/R tablet 175 mg, 250 mg	Modified-release tablets; do not crush. Not suitable for enteral tube administration. To convert to liquid, divide the total daily dose by 3 and administer as three-times-daily liquid preparation.
Slo-Phyllin (Merck)	M/R capsule 60 mg, 125 mg, 250 mg	Modified-release capsules containing modified-release pellets; do not crush.[2] Capsule can be opened and pellets could be administered via an enteral tube. Pellets may get stuck within the tube, especially in smaller-sized tubes.[2] To convert to liquid, divide the total daily dose by 3 and administer as three-times-daily liquid preparation.

Formulations available[1] (*continued*)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Uniphyllin Continuous (Napp)	M/R tablet 200 mg, 300 mg, 400 mg	Modified-release tablets; do not crush.[3] Not suitable for enteral tube administration. To convert to liquid, divide the total daily dose by 3 and administer as three-times-daily liquid preparation.
Aminophylline Injection (various manufacturers)	Injection 25 mg/mL (10 mL)	Sterile solution of theophylline 2.11% w/v and ethylenediamine 0.52% w/v in Water for Injection (211 mg theophylline/10 mL). The injection has a pH of 8.6–9 and an osmolality of 170 mOsm/kg.[4] This solution is suitable for oral/enteral administration.

Site of absorption (oral administration)

Specific site of absorption is not documented.

Alternative routes available

Aminophylline injection is available for parenteral use; there are also anecdotal reports of enteral administration of the injection.

Interactions

The effect of food, enteral feed and nutrition per se on the pharmacokinetics of theophylline is complex and largely undefined. A single small study of the co-administration of theophylline with enteral feed reported reduced absorption.[5] There have also been reports of hepatic enzyme induction by high-protein diets.[6] The clinical consequence of the interactions may be variable and therefore close monitoring should be undertaken until plasma concentration and regimen are stabilised.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Seek specialist advice regarding alternative therapy.
- If necessary, aminophylline injection can be given orally/enterally; note the dose as above.
- Despite the lack of consistent data, it is currently recommended[7] to give theophylline during a break in feeding where possible. If this is not practical, ensure that doses are given consistently with respect to feed times.
- Monitor plasma concentration closely during transition to liquid preparation and during any changes in feeding regimens.

Intragastric administration of aminophylline injection

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Give during break in feeding if practical; see notes above.

4. Draw the medication into an appropriate size syringe through a filter straw.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

No specific data are available. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Merck; 23 January 2003.
3. Personal communication, Napp; 29 January 2003.
4. Trissel LA. *Stability of Compounded Formulations,* 5th edn. Washington, DC: American Pharmaceutical Association; 2012.
5. Gal P, Layson R. Interference with oral theophylline absorption by continuous nasogastric feedings. *Ther Drug Monit* 1986; 8: 421–423.
6. Welling PG, Lyons LL, Craig WA, Trochta GA. Influence of diet and fluid on bioavailability of theophylline. *Clin Pharmacol Ther* 1975; 7: 45–480.
7. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).

Thiamine hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Benerva (Bayer)	Tablet 50 mg, 100 mg	Tablets disperse in 10 mL of water within 2 minutes if shaken, fine dispersion flushes via 8Fr feeding tube without blockage.[2]
Tyvera (Auden McKenzie)	Tablet 50 mg, 100 mg	No specific data are available for this preparation.
Thiamine (Zanza Labs)	Tablet 50 mg, 100 mg	Tablets do not disperse readily but do crush. However, dispersion does not mix well with water and is difficult to draw up.[2]
Pabrinex IM (Link)	Injection	Contains ascorbic acid 500 mg, nicotinamide 160 mg, pyridoxine 50 mg, riboflavine 4 mg, thiamine 250 mg in 7 mL
Pabrinex IV (Link)	Injection	Contains ascorbic acid 500 mg, glucose 1 g, nicotinamide 160 mg, pyridoxine 50 mg, riboflavine 4 mg, thiamine 250 mg in 10 mL

Site of absorption (oral administration)

Thiamine absorption is greatest in the jejunum and ileum. Absorption is active at low concentrations and passive at high concentrations. Maximal absorption is approximately 6 mg.[3]

Alternative routes available

Pabrinex injection can be used, however the risk of anaphylaxis should be noted.

Interactions

None.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse tablets in water.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet into the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Administer tablets using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2009.
3. Zempleni J, Suttie JW, Gregory JF III, Stover PJ. *Handbook of Vitamins*, 5th edn. Boca Raton, FL: CRC Press; 2013.

Tiagabine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Gabitril (Cephalon)	Tablet 5 mg, 10 mg, 15 mg	Tiagabine (as hydrochloride). Film-coated, scored tablets. Tablets disintegrate if shaken in 10 mL of water for 7 minutes to give a fine dispersion that flushes down an 8Fr NG tube without blockage. Tablets also crush easily and mix well with water.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented.

Alternative routes available

None available for tiagabine.

Interactions

Administration with food results in a reduced rate but not extent of absorption.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- The tablets can be dispersed in water or crushed and suspended in water immediately prior to administration. A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking vigorously.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to the jejunal administration of tiagabine. For administration via this route, the above method can be used.

References

1. *BNF* 67, March 2014.
2. Gabitril (Cephalon), Summary of Product Characteristics; September 2002.
3. BPNG data on file, 2004.

Timolol maleate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Betim (Meda)	Tablet 10 mg	Scored tablet. Tablets disperse rapidly in 10 mL of water to give a fine, even dispersion that flushes via an 8Fr NG tube without blockage.[2]
Timolol (non-proprietary)	Tablet 10 mg	Beechmere brand disperses within 2 minutes in 10 mL of water to give a coarse dispersion which settles quite quickly but flushes through a 6Fr NG tube without blockage.[3]
With bendroflumethiazide		
Prestim (Meda)	Tablet 10 mg/2.5 mg	Contains 10 mg timolol and 2.5 mg bendroflumethiazide. No specific data on enteral tube administration is available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 1–2 hours after an oral dose;[4] beta-blocking activity is evident within 30 minutes of dosing.[4]

Alternative routes available

None available for timolol; other beta-blockers are available in parenteral form.

Interactions

There is no documented interaction with food.[4,5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to the limited data, consider changing to an alternative beta-blocker available in liquid formulation.
- If continued therapy with timolol is indicated, disperse the tablets in water immediately prior to dosing.

- A prolonged break in feeding is not necessary.
- Owing to the lack of data relating to this route of administration, monitor the patient for signs of loss of efficacy of therapy.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the oral syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration; therefore, patient should be monitored. The above method of administration can be used.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. BPNG data on file, 2014.
4. Betim (ICN), Summary of Product Characteristics; November 2013.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Tipranavir

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Aptivus (Boehringer Ingelheim)	Capsule 250 mg	Capsules contain 100 mg ethanol per capsule. Soft gelatin capsules, do not crush/open.[2]
Aptivus (Boehringer Ingelheim)	Oral solution 100 mg/mL	Toffee and mint flavoured; clear, yellow viscous liquid.[3] Oral solution is prone to crystallisation. Contains vitamin E 78 mg/mL. NB: Bioavailability of oral solution is higher than capsules and, therefore, is not interchangeable with the capsules on a mg/mg basis.

Site of absorption (oral administration)

Specific site of absorption is unknown. Tipranavir must be given with ritonavir to achieve therapeutic concentrations. Peak plasma levels occur 1–5 hours following an oral dose; a high-fat meal increases bioavailabilty.[4]

Alternative routes available

None available for tipranavir.

Interactions

Tolerability of tipranavir is improved by food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Seek specialist advice.
- Owing to lack of data on enteral tube administration, consider alternative therapy.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw up the required dose into an appropriate enteral syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

No data are available on the jejunal administration on tipranavir. If this route is used, administer as above and monitor for loss of efficacy or increased side-effects.

References

1. *BNF* 67, March 2014.
2. Mitchell JF. *Oral dosage forms that should not be crushed*. Horsham, PA: Institute for Safe Medication Practices; 4 January 2011 http://www.ismp.org/tools/donotcrush.pdf (accessed 15 September 2014).
3. Aptivus 100 mg/mL Oral Solution (Boehringer Ingelheim), Summary of Product Characteristics; December 2013.
4. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Tizanidine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Zanaflex (Cephalon)	Tablet 2 mg, 4 mg	Tizanidine (as hydrochloride). Tablets can be crushed and dispersed in water at the time of administration.[2] Tablets do not disperse readily, but will disintegrate if shaken in 10 mL of water for 5 minutes. The resulting dispersion will flush via an 8Fr NG tube without blockage.[3]
Tizanidine (non-proprietary)	Tablet 2 mg, 4 mg	Tizanidine (as hydrochloride). Teva brand tablets disperse in 10 mL of water within 3 minutes to give a fine dispersion which flushes through as 6 Fr tube without blockage.[4]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs within 1 hour following oral dosing.[5]

Alternative routes available

No alternative route available for tizanidine. Diazepam is available in parenteral and rectal formulation.

Interactions

Food has no effect on the pharmacokinetic profile of tizanidine.[5]

Health and safety

Standard precautions apply

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data. Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Elan Pharma; 16 January 2003.
3. BPNG data on file, 2005.
4. BPNG data on file, 2014.
5. Zanaflex (Cephalon), Summary of Product Characteristics; 19 March 2012.

Tolbutamide

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Tolbutamide (Actavis, APS, Kent, Hillcross)	Tablet 500 mg	Actavis (previously Alpharma) brand tablets do not disperse readily and do not mix well with water when crushed.[2] Tablet ingredients vary between manufacturers.[3,4]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 3–4 hours after oral dosing.[5]

Alternative routes available

None available for tolbutamide. Insulin is available for parenteral administration.

Interactions

No specific interaction with food or feed is documented.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to limited data, consider changing to an alternative sulphonylurea. Seek specialist advice.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.

3. Tolbutamide (Kent), Summary of Product Characteristics; 31 May 2012.
4. Tolbutamide (Actavis), Summary of Product Characteristics; 10 November 2009.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Tolterodine tartrate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Detrusitol (Pfizer)	Tablet 1 mg, 2 mg	Film coated. Tablets can be crushed and mixed with water and taken immediately. However, as tolterodine is relatively insoluble in water, the crushed tablets are unlikely to go into solution.[2] Tablets disperse within 1 minute when placed in 10 mL of water to form a fine dispersion that settles quickly but flushes via an 6Fr NG tube without blockage.[3]
Tolterodine (Actavis – Accord livery)	Tablet 1 mg, 2 mg	Tablet disperses very rapidly in 10 mL of water to give a fine dispersion which flushes via a 6Fr tube without blockage.
Tolterodine (non-proprietary)	Tablet 1 mg, 2 mg	No specific data on enteral tube administration are available for this preparation.
Detrusitol XL (Pfizer)	Capsule 4 mg	Modified-release capsules. Capsules contain modified-release granules that do not disperse well in water and do not draw up into a syringe.[3]
Blerone XL (Zentiva)	Capsule 2 mg, 4 mg	Capsules contain modified-release minitablets; do not crush. Not suitable for enteral tube administration.
Inconex XL (Sandoz)	Capsule 2 mg, 4 mg	Capsules contain modified-release minitablets; do not crush. Not suitable for enteral tube administration.
Neditol (Aspire)	Capsule 2 mg, 4 mg	Capsules contain modified-release minitablets; do not crush. Not suitable for enteral tube administration.
Preblacont XL (Actavis)	Capsule 2 mg, 4 mg	Capsules contain modified-release minitablets; do not crush. Not suitable for enteral tube administration.
Santizor (Pfizer)	Capsule 2 mg, 4 mg	Capsules contain modified-release minitablets; do not crush. Not suitable for enteral tube administration.

Site of absorption (oral administration)

Specific site of absorption is not documented; however, as a modified-release preparation is available, significant absorption must occur in the small bowel. Peak plasma concentration occurs 1–3 hours following oral dosing of the immediate-release product.[4]

Alternative routes available

None available for tolterodine.

Interactions

Food does not significantly affect bioavailability.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider an alternative therapy available in a suitable formulation.
- If continued therapy with tolterodine is indicated, disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of tolterodine; however, the modified-release preparation is designed to release the drug through the small bowel and therefore jejunal administration is unlikely to affect bioavailability. Administer as above. Monitor for lack of efficacy and increased side-effects.

References

1. *BNF* 67, March 2014.
2. Personal communication, Pharmacia (previous MA holder); 11 March 2003.
3. BPNG data on file, 2014.
4. Detrusitol 1 mg Film-coated Tablets (Pfizer), Summary of Product Characteristics; March 2013.

Tolvaptan

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Samsca (Otsuka)	Tablet 15 mg, 30 mg	Tablets should be swallowed without chewing.[2] Crushing the tablet and administering through an NG tube may reduce the bioavailability of the drug by 25%;[3] however this only reduces aquaresis by 2.8%; the mechanism for this is not clear and may be due to loss of drug during the crushing process.

Site of absorption (oral administration)

Specific site of absorption not documented. Peak plasma levels occur 2 hours following oral dosing.[2]

Alternative routes available

None.

Interactions

No specific interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

Disperse tablet in water.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet into the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There is no specific information on jejunal administration of tolvaptan.

References

1. *BNF* 67, March 2014.
2. Samsca (Otsuka), Summary of Product Characteristics; March 2014.
3. McNeely EB, Talameh JA, Adams KF Jr *et al*. Relative bioavailability of tolvaptan administered via nasogastric tube and tolvaptan tablets swallowed intact. *Am J Health Syst Pharm* 2013; 70: 1230–1237.

Topiramate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Topamax (Janssen)	Tablet 25 mg, 50 mg, 100 mg, 200 mg	Film coated. The only option for enteral feeding tube administration is to crush the tablets and suspend the fine particles in water, making a slurry and administering immediately.[2] Tablets do not disperse readily in water owing to the coating but will disintegrate if shaken in 10 mL of water for 5 minutes; the resulting dispersion flushes down an 8Fr NG tube without blockage.[3]
Topamax (Janssen)	Sprinkle capsule 15 mg, 25 mg, 50 mg	Contents can be sprinkled onto soft food. Administration of the beads through an enteral feeding tube does not work well as the beads readily stick to the tubing and block the tube.[2]
Topiramate (Accord, Actavis, Sandoz, Winthrop)	Tablet 25 mg, 50 mg, 100 mg, 200 mg	Film coated.[4] Contains lactose (as monohydrate).[4] No data available on administration via enteral feeding tubes for this preparation.
Topiramate (non-proprietary)	Capsule 15 mg, 25 mg, 50 mg	Content must not be chewed.

Site of absorption (oral administration)

Rapidly and well absorbed; no specific site of absorption is documented.[5] Peak plasma concentrations occur 2–3 hours after oral dosing.[4]

Alternative routes available

None for topiramate.

Interactions

There is no clinically significant effect of food on absorption.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Consider changing to an alternative therapy available in a suitable formulation. If continued therapy with topiramate is indicated, disperse the tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking vigorously.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no specific data relating to jejunal administration of topiramate; therefore, monitor for signs of loss of efficacy. Administer by the method detailed above.

References

1. *BNF* 67, March 2014.
2. Personal communication, Janssen-Cilag; 22 January 2003.
3. BPNG data on file, 2004.
4. Topiramate (Sandoz), Summary of Product Characteristics; 29 January 2014.
5. Topamax (Janssen), Summary of Product Characteristics; 25 June 2013.

Tramadol hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Tramadol (APS, Arrow, Galen, Generics, Genus, PLIVA, Sovereign, Sterwin, Tillomed)	Capsule 50 mg	Ranbaxy capsules open easily and the contents mix easily with water to form a fine suspension that flushes easily via an 8Fr NG tube without blockage.[2]
Tramadol (Aurum, Sterwin); Zamadol (Meda); Zydol (Grünenthal)	Injection 50 mg/mL (2 mL)	Sterwin brand licensed for i.v. use only. No specific data on enteral administration are available for this preparation.
Tramadol (non-proprietary)	Orodispersible tablet 50 mg	May also be dispersed in water.
Zamadol (Meda)	Capsule 50 mg	No specific data on enteral tube administration are available for this preparation.
Zamadol Melt (Meda)	Orodispersible tablet 50 mg	May also be dispersed in water.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Zydol (Grünenthal)	Capsule 50 mg	Recommend using soluble tablets; however, if those are unavailable the capsules can be opened and the contents dispersed in water. Care should be taken to avoid alcoholic drinks and foods or drinks at extreme temperature or pH.[3]
Zydol (Grünenthal)	Soluble tablet 50 mg	Tablets disperse in water.[3] Recommended volume is 50 mL.[4] Tablets disintegrate in 10 mL of water to form a dispersion that settles quickly. Care must be taken to administer the complete dose. Flushes via an 8Fr NG tube without blockage, but may block finer tubes.[5]
Tramadol (Mercury Pharma)	Oral drops/ solution 100 mg/mL	Contains sucrose. Dilute with water prior to administration.[6] No specific data on enteral tube administration are available for this preparation.
With paracetamol		
Tramacet (Grunenthal)	Tablet 37.5 mg/325 mg	Contains 37.5 mg tramadol and 325 mg paracetamol. No specific data on enteral tube administration are available for this preparation.
Tramacet (Grunenthal)	Effervescent tablet 37.5 mg/ 325 mg	Contains 37.5 mg tramadol and 325 mg paracetamol. Contains 7.8 mmol sodium/tablet.[7]

Modified-release preparations

Not suitable for administration via enteral feeding tube:
Larapam SR (Sandoz) modified-release tablets
Mabron (Morningside) modified-release tablets
Maxitram SR (Chiesi) modified-release capsules
Tradorec XL (Labopharm) modified-release tablets
Tramequel SR (Beechmere) modified-release capsules
Zamadol SR (MedaViatris) modified-release capsules
Zamadol 24h (Meda) modified-release tablets
Zeridame SR (Actavis) modified-release tablets
Zydol SR (Grünenthal) modified-release tablets
Zydol XL (Grünenthal) modified-released tablets.

Site of absorption (oral administration)

Specific site of absorption is not documented. Tramadol is detectable in the plasma within 15 minutes of oral administration; peak plasma concentrations occur at 1.6–2 hours.[5]

Alternative routes available

Parenteral formulation is available. Orodispersible tablet disintegrates in the mouth but is not absorbed sublingually.

Interactions

Food does not alter absorption of tramadol.[7]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use dispersible/soluble tablets or oral drops
- A prolonged break in feeding is not required.

Intragastric administration

Soluble tablets

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into an appropriate size and type of syringe and allow the tablet to disperse.
5. Flush the medication dose down the feeding tube.
6. Draw an equal volume of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to jejunal administration, but as modified-release preparations are available it is likely that tramadol is absorbed throughout the small bowel. Administer using the above method and monitor for increased side-effects.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Personal communication, Pharmacia; 11 March 2003.
4. Zydol Soluble Tablets (Grünenthal), Summary of Product Characteristics; February 2009.
5. BPNG data on file, 2005.
6. Tramadol Oral Drops/Solution 100 mg/mL (Amdipharm Mercury Pharma), Summary of Product Characteristics; 13 November 2012.
7. Tramacet Effervescent Tablets (Grunenthal), Summary of Product Characteristics; January 2014.

Trandolapril

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Gopten (Abbott)	Capsule 500 micrograms, 1 mg, 2 mg	Capsules are small and would require significant manual dexterity to open. Solubility in water 1:1000.[2] No specific data on enteral tube administration are available for this preparation.
Trandolapril (non-proprietary)	Capsule 500 micrograms, 1 mg, 2 mg, 4 mg	No specific data on enteral tube administration are available for this preparation.
Tarka (Abbott)	Capsule 2 mg/180 mg	Containing trandolapril 2 mg, verapamil 180 mg. Modified release capsules. Tarka capsules should be swallowed whole;[3] owing to the inclusion of M/R verapamil this preparation is unsuitable for administration via an enteral feeding tube.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration of trandolapril is reached within 30 minutes of oral dosing.[4]

Alternative routes available

None available for trandolapril.

Interactions

Food intake delays absorption,[2] but the total absorption of trandolapril and conversion to trandolaprilat are unaffected by food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to lack of data, consider changing to an alternative once-daily ACE inhibitor, for example lisinopril liquid (see monograph) or ramipril tablets (see monograph).
- An appropriate method of administration cannot be recommended owing to the lack of data.

References

1. *BNF* 67, March 2014.
2. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
3. Tarka (Abbott), Summary of Product Characteristics; 17 November 2012.
4. Gopten (Abbott), Summary of Product Characteristics; 14 September 2012.

Tranexamic acid

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Cyklokapron (Pharmacia)	Tablet 500 mg	Film coated, scored. Tablets can be crushed and suspended in water. Tablets disperse in 2–5 minutes when placed in water.[2]
Tranexamic acid (Manx)	Tablet 500 mg	Tablets do not disperse readily but will disintegrate when shaken in 10 mL of water; the resulting milky dispersion flushes via an 8Fr[3] and 6Fr[4] NG tubes without blockage.
Tranexamic acid (Creopharma/ Rivapharma)	Tablet 500 mg	Tablets take 6-8 minutes to disperse in 20 mL of water, forming a cloudy dispersion with some large particles; this dispersion does flush via a 6Fr tube but there may be risk of blockage.[4]
Tranexamic acid (Sandoz)	Tablet 500 mg	Tablets take 6–8 minutes to disperse in 20 mL of water, forming a cloudy dispersion with some large particles; this dispersion flushes via a 6Fr tube without blockage.[4]
Cyklokapron (Pharmacia)	Injection 100 mg/ mL (5 mL)	Injection can be used orally. Keep opened injection refrigerated and for no longer than 24 hours. pH 6.5–8.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented.[5]

Alternative routes available

Parenteral route is available. Injection can be used topically as mouthwash and bladder irrigation (unlicensed indications).

Interactions

Bioavailability is not reduced by food.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablets in water immediately prior to administration.
- For very fine-bore tubes the injection could be used.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Jejunal administration

Administer as above, or use injection formulation.

References

1. *BNF* 67, March 2014.
2. Personal communication, Pharmacia (previous MA holder); 11 March 2003.
3. BPNG data on file, 2005.
4. BPNG data on file, 2014.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Trazodone hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Trazodone (non-proprietary)	Capsule 50 mg, 100 mg	No specific data on enteral tube administration are available for this preparation.
Trazodone (non-proprietary)	Tablet 150 mg	No specific data on enteral tube administration are available for this preparation.
Molipaxin (Zentiva)	Capsule 50 mg, 100 mg	50 mg capsules can be opened and the contents mixed with 10 mL of water; no visible particles; flushes via an 8Fr NG tube without blockage.[2]
Molipaxin (Zentiva)	Tablet 150 mg	Film coated.[3] No specific data on enteral tube administration are available for this preparation.

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Molipaxin (Sanofi-Aventis)	Liquid 50 mg/5 mL	Clear, colourless solution with an orange odour and taste.[4] Sugar free; contains sorbitol 1.5 g/5 mL.[5] Very pale yellow, viscous liquid; some resistance on flushing via a fine-bore NG tube. Mixes easily with an equal volume of water to reduce viscosity and resistance to flushing.[6]

Site of absorption (oral administration)

Specific site of administration is not documented. Peak plasma concentration occurs 1.5 hours after oral administration.[3]

Alternative routes available

None available for trazodone.

Interactions

Absorption is delayed and enhanced slightly by food.[3] Tolerability may be increased by taking with food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation.
- A prolonged break in feeding is not necessary; tolerability may be improved by administering after feed.
- Alternatively, the capsules can be opened and the contents mixed with water immediately prior to administration; however, this should be considered a last resort.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Use the liquid preparation as detailed above.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Molipaxin 150 mg Tablets (Zentiva), Summary of Product Characteristics; 22 August 2013.
4. Molipaxin Liquid 50 mg/5 mL (Zentiva), Summary of Product Characteristics; 17 December 2013.
5. Personal communication, Sanofi; 27 March 2014.
6. BPNG data on file, 2005.

Trifluoperazine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Trifluoperazine (non-proprietary)	Tablet 1 mg, 5 mg	Trifluoperazine (as hydrochloride). Coated tablet. No specific data on enteral tube administration are available for this preparation.
Trifluoperazine (Rosemont)	Oral solution 5 mg/5 mL	Trifluoperazine (as hydrochloride). Sugar-free; contains 0.45 g sorbitol/5 mL;[2] contains 1.7 g/5 mL maltitol.[3]
Stelazine (AMCo)	Tablet 1 mg, 5 mg	Trifluoperazine (as hydrochloride). Film-coated tablets. No specific data on enteral tube administration are available for this preparation.
Stelazine (AMCo)	Syrup 1 mg/5 mL	Trifluoperazine (as hydrochloride). Pale yellow, non-viscous liquid; flushes easily via a fine-bore NG tube with little resistance. Mixes easily with an equal volume of water.[4]
Trifluoperazine (AMCo)	Oral solution 1 mg/5 mL	Formulation as Stelazine, see above.

Site of absorption (oral administration)

Specific site of absorption is not specified. Peak plasma concentration occurs 1–6 hours following oral absorption.[5]

Alternative routes available

No alternative route available for trifluoperazine. Alternative antipsychotic drugs are available in parenteral formulation. Seek specialist advice.

Interactions

No specific interaction with food is documented.[5]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation, no further dilution is necessary for intragastric administration. The liquid can be diluted with at least an equal volume of water prior to administration via jejunal tube to reduce the osmolarity.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Rosemont; 20 January 2005.
3. Personal communication, Rosemont; 3 September 2008.
4. BPNG data on file, 2005.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Trihexyphenidyl (Benzhexol) hydrochloride

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Trihexylphenidyl (non-proprietary)	Syrup 5 mg/5 mL	A blackcurrant-scented and flavoured clear pink syrup.[2] pH 2.45–2.75. Contains ethanol 0.7 mg/5 mL.
Trihexyphenidyl (Biorex, Genus)	Tablet 2 mg, 5 mg	Tablets disintegrate rapidly in water to form a fine dispersion that flushes via an 8Fr NG tube without blockage.[3]

Site of absorption (oral administration)

Trihexyphenidyl is readily absorbed from the GI tract; the exact site of absorption is not documented.[4]

Alternative routes available

None available for trihexyphenidyl hydrochloride. Procyclidine is available in parenteral formulation.

Interactions

No interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation or disperse tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data. Administer using the method above or use tablets dispersed in water. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Trihexyphenidyl (Rosemont), Summary of Product Characteristics; 11 February 2013.
3. BPNG data on file, 2005.
4. Trihexyphenidyl 2 mg Tablets (Genus), Summary of Product Characteristics; May 2011.

Trimethoprim

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Trimethoprim (Accord, Actavis, APS, Berk, Kent)	Tablet 100 mg, 200 mg	Avoid crushing tablets owing to the risk of contact sensitisation.[2]
Trimopan (APS)	Suspension 50 mg/5 mL	White cloudy suspension; some resistance to flushing via a fine-bore tube. Mixes easily with an equal volume of water and this reduces resistance to flushing.[3]
Trimethoprim (Pinewood)	Suspension 50 mg/5 mL	White cloudy, viscous liquid. Flushes through a 6Fr tube with some resistance but without blockage.
Monotrim	Injection 100 mg/5 mL	Discontinued in UK in April 2003. Available through IDIS.

Site of absorption (oral administration)

Specific site is not documented. Peak plasma concentration occurs 1–4 hours following oral dose.[4]

Alternative routes available

Parenteral route is available.

Interactions

Concomitant administration of trimethoprim with food has resulted in reduced absorption; therefore, trimethoprim should be administered during a break in feed for optimal absorption.[5]

Health and safety

Standard precautions apply when handling the liquid. Avoid crushing the tablets.

Suggestions/recommendations

- Use the liquid preparation.
- Give during a break in feed for optimal absorption if practical.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Give the dose during a break in feeding if practical.
4. Shake the medication bottle thoroughly to ensure adequate mixing.
5. Draw the medication suspension into an appropriate size and type of syringe.
6. Flush the medication dose down the feeding tube.

7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (5) measure the medicine in a suitable container. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Lee SW, Cheong SH, Byun JY, Choi YW, Choi HY. Occupational hand excema among nursing staff in Korea: self-reported hand excema and contact sensitization of hospital nursing staff. *J Dermatol* 2013; 40(3): 182–187.
3. BPNG data on file, 2004.
4. BPNG data on file, 2014.
5. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Trimipramine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Surmontil (Sanofi-Aventis)	Capsule 50 mg	White crystalline powder, pours easily from the capsule. Disperses easily in water but settles quickly; care must be taken to ensure that the entire dose is administered. Flushes via an 8Fr NG tube without blockage.[2]
Surmontil (Sanofi-Aventis)	Tablet 10 mg, 25 mg	Trimipramine (as maleate). Tablets do not disperse readily in water, but can be crushed and mixed with water.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented.[3]

Alternative routes available

None available for trimipramine.

Interactions

No interaction with food is documented.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- For long-term therapy, consider changing to an alternative tricyclic antidepressant available as a liquid.
- If continued therapy with trimipramine is indicated, the tablets can be crushed and mixed with water or the capsule contents can be dispersed in water; this should be considered a last resort owing to the significant risk of dose inaccuracy and occupational exposure

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2005.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.

Ursodeoxycholic acid

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Ursodeoxycholic acid (non-proprietary)	Tablet 150 mg, 300 mg Capsule 250 mg	Galen brand 150 mg tablets disperse rapidly when shaken in 10 mL of water to give a cloudy, fine dispersion which settles quite quickly but flushes through a 6Fr NG tube without blockage.[2]
Destolit (Norgine)	Tablet 150 mg	The tablets are not specially coated or slow-release product and in theory can be crushed.[3] Tablets disperse when shaken in 10 mL of water for 4 minutes to give a fine dispersion with some visible particles that flush down an 8Fr tube without blockage.[4]
Urdox (Wockhart)	Tablet 300 mg	Film coated.[5]
Ursofalk (Dr Falk)	Tablet 500 mg	No specific data on enteral tube administration are available for this preparation.
Ursofalk (Dr Falk)	Capsule 250 mg	The capsules can be opened and the contents sprinkled onto food. However, the powder is not very soluble and so the suspension is recommended.[6] The capsule contents do not disperse easily in water, and contain some large granules that settle quickly; there is high risk of tube blockage with administration via fine-bore tubes.[4]
Ursofalk (Dr Falk)	Suspension 250 mg/5 mL (250 mL bottle)	Sugar-free suspension does not contain sorbitol.[7] Creamy white slightly viscous suspension, flushes via a 6Fr NG tube with some resistance owing to viscosity but no risk of blockage.[2]
Ursogal (Galen)	Tablet 150 mg Capsule 250 mg	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Ursodeoxycholic acid is absorbed in the jejunum and ileum, with approximately 20% absorbed in the colon.[4]

Alternative routes available

No alternative route available for ursodeoxycholic acid.

Interactions

There is no specific interaction with food. However, it is recommended that doses be taken after food and/or at night.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the suspension preparation.
- If necessary, tablets can be dispersed in 10 mL of water immediately prior to administration. Administer after feed.
- Jejunal administration should not reduce bioavailability.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication suspension into an appropriate size and type of syringe.
5. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Jejunal administration

Administer as above.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2014.
3. Personal communication, Norgine; 24 January 2003.
4. BPNG data on file, 2004.
5. Urdox (Wockhardt), Summary of Product Characteristics; 2 February 2011.
6. Personal communication, Provalis Healthcare; 5 February 2003.
7. Ursofalk 250 mg/5 mL Suspension (Dr Falk), Summary of Product Characteristics; August 2012.

Valaciclovir

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Valaciclovir (non-proprietary; Aurobindo-Milpharm, Actavis, Pfizer, Sandoz)	Tablet 500 mg	Valaciclovir (as hydrochloride salt).[2] No specific data on administration via enteral feeding tubes are available for this preparation.
Valtrex (GSK)	Tablet 250 mg, 500 mg	Valaciclovir (as hydrochloride). Film-coated tablets. Tablets are very hard and quite difficult to crush. They do not disperse readily in water and the powder does not suspend well and settles quickly; care must be taken to rinse the crushing device to ensure that the full dose is given.[3] If crushed and suspended in water, the dose must be given immediately owing to the rapid rate of hydrolysis of valaciclovir.[4] A suspension formulation with an expiry of 21–35 days, under refrigeration, is available using US suspending agents.[5] *Extemporaneous preparation of valaciclovir suspension* 50 mg/mL:[5] Valaciclovir tablets 500 mg — 18 tablets Ora-Plus — 40 mL Ora-Sweet — to 180 mL Expiry 21 days, refrigerated. (If Syrpalta is used as suspending agent, an expiration of 35 days, refrigerated storage, can be assigned.)

Site of absorption (oral administration)

The specific site of absorption is not documented. After oral administration, valaciclovir is well absorbed and rapidly converted to aciclovir.[6] Peak plasma concentration occurs 30–100 minutes following oral dosing.[2]

Alternative routes available

None available for valaciclovir; parenteral formulation is available for aciclovir.

Interactions

Bioavailability is not affected by food.[2,6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- As no liquid preparation is available and tablets are not dispersible, consider using aciclovir.
- Alternatively, an extemporaneous suspension can be formulated using the formula above. Administer as below.
- A prolonged break in feeding is not required.
- Consider using parenteral aciclovir for severe infections.

Intragastric administration

1. Using extemporaneous preparation.
2. Stop the enteral feed.
3. Flush the enteral feeding tube with the recommended volume of water.
4. Shake the medication bottle thoroughly to ensure adequate mixing.
5. Draw the medication suspension into an appropriate size and type of syringe.
6. Draw an equal volume of water and a little air into the syringe and shake to mix thoroughly.
7. Flush the medication dose down the feeding tube.
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then add an equal volume of water and mix thoroughly. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data relating to the jejunal administration of valaciclovir. Consider changing to parenteral therapy.

References

1. *BNF* 67, March 2014.
2. Valaciclovir 500 mg Film-coated Tablets (Aurobindo), Summary of Product Characteristics; 4 November 2011.
3. BPNG data on file, 2005.
4. Personal communication, GlaxoSmithKline; 22 January 2003.
5. Fish DN, Vidaurri VA, Deeter RG. Stability of valaciclovir hydrochloride in extemporaneously prepared oral liquids. *Am J Health Syst Pharm* 1999; 56: 1957–1960.
6. Valtrex Tablets 250 mg (GSK), Summary of Product Characteristics; April 2013.

Valsartan

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Valsartan (non-proprietary; Actavis, Arrow, Dexcel)	Tablet and capsule 40 mg, 80 mg, 160 mg, 320 mg	Film coated tablets. No specific data on administration via enteral feeding tubes are available for this preparation.
Diovan (Novartis)	Capsule 40 mg, 80 mg, 160 mg	Hard gelatin capsules.[2] Capsules can be opened; the white granular contents pour easily and disperse well in 10 mL of water; granules settle quickly, but the dispersion draws into the syringe and flushes down an 8Fr NG tube without blockage.[3]
Diovan (Novartis)	Oral solution 3 mg/mL	Does not contain sorbitol.[4] Solution pH 5.7–6.2 [5] When converting from tablets to oral solution, halve the tablet dose (see SPC for further information).
Diovan (Novartis)	Tablet 40 mg, 320 mg	Tablet can be divided into equal halves.[6] No specific data on administration via enteral feeding tubes are available for this preparation.
Valsartan with hydrochlorthiazide (non-proprietary)	Tablet 80/12.5, 160/12.5, 160/25	Actavis and Consilient brands are film coated. No specific data on administration via enteral feeding tubes are available for these preparations.
Co-diovan (Novartis)	Tablet 80/12.5, 160/12.5, 160/25	Film coated. No specific data on administration via enteral feeding tubes are available for this preparation.
Amlodipine with Valsartan		See amlodipine monograph

Site of absorption (oral administration)

Specific site of absorption is not documented; however Siddiqui *et al*.[7] suggest that due to its acidic nature valsartan is absorbed in the upper GI tract. Peak plasma levels occur 1–2 hours following oral administration of the solution and 3–4 hours following administration of the tablets.[4,6]

Alternative routes available

No other routes of administration are available for any of the angiotensin II antagonists.

Interactions

Although coadminsitration with food decreases the AUC by 40% and peak levels by 50%, it does not clinically reduce therapeutic effect; therefore valsartan may be given with or without food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the oral solution. See dose conversion in SPC. A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Flush the enteral feeding tube with the recommended volume of water.
6. Re-start the feed.

Intrajejunal administration

There are no specific data relating to jejunal administration of valsartan. The patient should be monitored for lack of therapeutic effect of treatment. The above method of administration can be used.

References

1. *BNF* 67, March 2014.
2. Diovan 40 mg Capsules (Novartis), Summary of Product Characteristics; 2 November 2012.
3. BPNG data on file, 2004.
4. Diovan Oral Solution 3 mg/mL (Novartis), Summary of Product Characteristics; 13 November 2013.
5. Personal communication, Novartis; 27 March 2014.
6. Diovan 40 mg Tablets (Novartis), Summary of Product Characteristics; 2 November 2012.
7. Siddiqui N, Husain A, Chaudhry L, Alam MS, *et al*. Pharmacological and pharmaceutical profile of valsartan: a review. *J Appl Pharmaceutical Sci* 2011; 1(4): 12–19. ISSN 2231–3354.

Vancomycin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Vancocin (Flynn)	Capsule 125 mg	Vancomycin (as hydrochloride) in Matrigel capsules. Contents are gel-formed and are not suitable for administration via the feeding tube.[2] Capsules are almost impossible to open and the contents are not suitable for use.[3]
Vancomycin (non-proprietary)	Capsule 125 mg, 250 mg	Xellia brand contents are gel-formed and are not suitable for administration via the feeding tube.[4]

Formulations available[1] (*continued*)		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Vancomycin (Actavis)	Injection 500 mg, 1 g	Vancomycin (as hydrochloride). Injection can be reconstituted for use as an oral solution. When used for the oral route, the reconstituted injection can be stored in a fridge for 96 hours. pH of reconstituted injection is 2.8–4.5.[2]
Vancocin (Flynn)	Injection 500 mg, 1 g	Vancomycin (as hydrochloride). Licensed for use via nasogastric tube. Vial contents can be reconstituted and used for oral or enteral use. When used for the oral route, the reconstituted injection can be stored in a fridge for 96 hours. Each dose can be further diluted to 30 mL with water if required.[5]
Vancocin (Wockhardt)	Injection 500 mg, 1 g	Vancomycin (as hydrochloride). Licensed for use via NG tube. Vial contents can be reconstituted and used for oral or enteral use. When used for the oral route, the reconstituted injection can be stored in a fridge for 24 hours (as per SPC). Each dose can be further diluted to 30 mL with water if required.[6]
Vancomycin (non-proprietary)	Injection 500 mg, 1 g	No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Vancomycin is not significantly absorbed from the normal gastrointestinal tract.[2]

Alternative routes available

Oral/enteral administration is used for its topical effect in the gut. Although the parenteral route is available, it is not used for the same indications.

Interactions

There is no documented interaction with food.

Health and safety

Standard precautions apply. Ensure that any unused solution is clearly labelled for oral/enteral use.

Suggestions/recommendations

- Use reconstituted injection for oral use.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Reconstitute injection as directed (the reconstituted solution can be stored in the fridge for 96 hours for enteral use).

4. Draw the medication solution dose into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed.

Intrajejunal administration

Administer as above.

References

1. *BNF* 67, March 2014.
2. Vancomycin Powder for Infusion 1 g (Actavis), Summary of Product Characteristics; 2 July 2013.
3. BPNG data on file, 2004.
4. Vancomycin 125 mg Capsules (Alpharma ApS, MA holder for UK Xellia), Summary of Product Characteristics; 21 November 2013.
5. Vancocin Powder for Solution (Flynn), Summary of Product Characteristics; 23 October 2008.
6. Vancomycin 500 mg Powder for Solution for Infusion (Wockhardt), Summary of Product Characteristics; 19 October 2012.

Vardenafil

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Levitra (Bayer)	Tablet 5 mg, 10 mg, 20 mg	Vadenafil (as hydrochloride). Film-coated tablet. No specific data on enteral tube administration are available for this preparation.
Levitra (Bayer)	Orodispersible tablet 10 mg	Vadenafil (as hydrochloride). No specific data on enteral tube administration are available for this preparation. If tablets are taken orally with water, median t_{max} is shortened by 60 minutes.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented.

Alternative routes available

None available for vardenafil.

Interactions

Onset of effect may be delayed if taken with high-fat meal.

Health and safety

Standard precautions apply.

Suggestions/recommendations

Owing to the lack of data, no recommendation can be made. Specialist advice should be sought for alternative therapy. Sildenafil is available in liquid preparation.

References

1. *BNF* 67, March 2014.
2. Levitra 10 mg Orodispersible Tablets (Bayer) Summary of Product Characteristics; 21 January 2013.

Varenicline

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Champix (Pfizer)	Tablet 500 micrograms, 1 mg	Varenicline (as tartrate). Film-coated tablets. Tablets disperse within 2 minutes to give a dispersion which flushed via an 8Fr NG tube without blockage.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma levels occur 3–4 hours following oral administration.[3]

Alternative routes available

None available for varenicline. Transdermal therapy is available for nicotine replacement therapy.

Interactions

Absorption is unaffected by food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Change to transdermal therapy where appropriate.
- If continued therapy is essential, tablets can be dispersed in water.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.

4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no data on jejunal administration of varenicline. Seek specialist advice.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2013.
3. Champix 0.5 mg Film-coated Tablets (Pfizer), Summary of Product Characteristics; December 2013.

Venlafaxine

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Venlaflaxine (non-proprietary)	Tablet 37.5 mg, 75 mg	Venlafaxine (as hydrochloride). Teva brand tablets do not disperse readily, but will form a very fine dispersion if shaken in 10 mL of water for 6–8 minutes. This flushes through a 6Fr NG tube without risk of blockage.[2] No specific data on enteral tube administration are available for other preparations.
Venlafaxine (Ranbaxy)	Tablet 37.5 mg, 50 mg, 75 mg	Venlafaxine (as hydrochloride). Tablets do not disperse readily in water but will disperse to a fine suspension if shaken in water for several minutes. Tablets do crush easily and disperse in water to give a fine dispersion, which flushes via an 8Fr nasogastric tube without blockage.[3]
Efexor (Pfizer)	Tablet 37.5 mg, 75 mg	Venlafaxine (as hydrochloride). 37.5 mg tablet disperses within 5 minutes when placed in 10 mL of water to give a fine dispersion that settles quickly but flushes through an 8Fr NG tube without blockage. 75 mg tablet requires shaking in 10 mL of water for 5 minutes; the resulting dispersion contains some larger granules that flush via an 8Fr NG tube but may block finer-bore tubes.[4]

Formulations available[1] (*continued*)

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Efexor XL (Wyeth)	M/R capsule 75 mg, 150 mg	Venlafaxine (as hydrochloride). Modified-release capsule contains modified-release spheroids that should not be crushed.[5] Unsuitable for administration via feeding tube. Convert the patient to twice-daily conventional-release tablets.
Foraven XL (Forum)	M/R capsule 75 mg, 150 mg	Venlafaxine (as hydrochloride). Modified-release capsule contains modified-release minitablets,[6] which should not be crushed. Unsuitable for administration via feeding tube. Convert the patient to twice-daily conventional-release tablets.
Venlafaxine MR (non-proprietary)	M/R capsule 75 mg, 150 mg	Venlafaxine (as hydrochloride). Modified-release preparation; unsuitable for administration via feeding tube. Convert the patient to twice-daily conventional-release tablets. Brands include Alventa XL, Bomilux XL, Depefex XL, Politid XL, Ranfaxine XL, Tifaxin XL, Tonpular XL, Venaxx XL, Vensir XL, Winfex XL.
Venlafaxine XL (non-proprietary)	M/R tablet 75 mg, 150 mg, 225 mg	Venlafaxine (as hydrochloride). Modified-release preparation; unsuitable for administration via feeding tube. Convert the patient to twice-daily conventional-release tablets. Brands include Venalic XL, ViePax XL.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 2 hours following oral dosing.[7]

Alternative routes available

None available for venlafaxine.

Interactions

No specific interaction with food is documented; however, it is recommended that venlafaxine be taken with food.[7]

Health and safety

Standard precautions apply.

Suggestions/recommendations

Switch M/R tablets to normal release tablets

- Disperse the tablets in water immediately prior to administration.
- Alternatively consider changing to different therapy.

- Consider obtaining a specially prepared or extemporaneous liquid; a liquid preparation suitable for administration via feeding tubes has been formulated and has a shelf life of 30 days when stored at room temperature.[8]
- Administer after feed.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet in the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

Jejunal administration of venlafaxine would not be expected to affect bioavailability as the modified-released preparation is designed to release drug through the small bowel. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2014.
3. BPNG data on file, 2010.
4. BPNG data on file, 2004.
5. Efexor XL 75 mg Hard Prolonged Release Capsules (Pfizer), Summary of Product Characteristics; December 2013.
6. Foraven XL 75 mg Modified Release Capsules (Forum), Summary of Product Characteristics; 26 May 2011.
7. Venlafaxine 37.5 mg Tablets (Actavis), Summary of Product Characteristics; 2 May 2012.
8. De Rosa NF, Sharley NA. Stability of venlafaxine hydrochloride liquid formulations suitable for administration via enteral feeding tubes. *J Pharm Pract Res* 2008; 38: 212–215.

Verapamil hydrochloride

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Securon (Abbott)	Injection 2.5 mg/mL (2 mL)	Bitter taste.[2] pH 4.0–6.5; osmolality 290 mOsm/kg. The injection is suitable for oral/enteral use.
Cordilox (Dexcel)	Tablet 40 mg, 80 mg, 120 mg, 160 mg	Film-coated tablets No specific data on enteral tube administration are available for this preparation.
Cordilox (Dexcel)	Injection 2.5 mg/mL(2 mL)	No specific data are available for this preparation
Verapamil (non-proprietary)	Tablet 40 mg, 80 mg, 120 mg, 160 mg	Verapamil hydrochloride is soluble 1:20 in water.[3] No specific data on enteral tube administration are available for this preparation.
Zolvera (Rosemont)	Solution 40 mg/5 mL	Contains liquid maltitol, which may cause diarrhoea in high doses.[4]
Half Securon SR (Abbott)	M/R tablet 120 mg	Modified-release preparation; do not crush. Not suitable for enteral tube administration.
Securon SR (Abbott)	M/R tablet 240 mg	Modified-release preparation; do not crush. Not suitable for enteral tube administration.
Univer (Cephalon)	M/R capsule 120 mg, 180 mg, 240 mg	The manufacturers have no data to support opening the capsules for enteral tube administration.[5]
Verapress MR (Dexcel)	M/R tablet 240 mg	Modified-release preparation; do not crush. Not suitable for enteral tube administration.
Vertab SR 240 (Trinity-Chiesi)	M/R tablet 240 mg	Modified-release preparation; do not crush. Not suitable for enteral tube administration.
Tarka (Abbott)	M/R capsule 180 mg/2 mg	Contains 180 mg verapamil and 2 mg trandolapril. Modified-release capsule contains modified-release verapamil tablet; do not crush. Not suitable for enteral tube administration.[6]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs within 1–2 hours of oral dosing.[4,7]

Alternative routes available

Parenteral route is available.

Interactions

No significant interaction with food is documented.[3,4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the oral solution. If changing from a modified-release preparation, divide the daily dose into three equal doses. No prolonged break in feeding is necessary.
- Parenteral route is available; consult the product literature for the dose.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

There are no specific data. Administer as above. Monitor for lack of efficacy and increased side-effects.

References

1. *BNF* 67, March 2014.
2. Trissel LA. *Stability of Compounded Formulations,* 5th edn. Washington, DC: American Pharmacists Association; 2012.
3. Dollery C. *Therapeutic Drugs,* 2nd edn. London: Churchill Livingstone; 1998.
4. Zolvera 40 mg/5 mL Oral Solution (Rosemont), Summary of Product Characteristics; April 2013.
5. Personal communication, Teva; 4 March 2014.
6. Tarka 180 mg/2 mg Modified Release Capsule (Abbott), Summary of Product Characteristics; 17 November 2012.
7. Verapamil Tablet BP 40 mg (Actavis), Summary of Product Characteristics; 10 January 2011.

Vigabatrin

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Sabril (Sanofi-Aventis)	Tablet 500 mg	Film coated, scored. No specific data on enteral tube administration are available for this preparation.
Sabril (Sanofi-Aventis)	Powder 500 mg/sachet	The contents of a sachet should be dissolved in water or a soft drink immediately before taking. Vigabatrin has been administered successfully via a NG tube.[2] Sachet contents dissolve completely in 10 mL of water and flush down an 8Fr NG tube without blockage.[3]

Site of absorption (oral administration)

No specific site is documented. Vigabatrin is rapidly and completely absorbed following oral administration.[4]

Alternative routes available

None available for vigabatrin.

Interactions

Food does not affect the absorption of vigabatrin.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the sachet preparation.
- A prolonged break in feeding is not necessary.

Intragastic administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure 10 mL of water into a measuring pot.
4. Add the sachet contents and allow to dissolve.
5. Draw into an appropriate size and type of syringe.
6. Flush the medication dose down the feeding tube.
7. Rinse the measure and administer this also to ensure that the total dose is given.
8. Finally, flush with the recommended volume of water.
9. Re-start the feed.

Intrajejunal administration

There are no specific data relating to jejunal administration of vigabatrin. The above method can be used for jejunal administration.

References

1. *BNF* 67, March 2014.
2. McCormick J, Jones N, Ramsay R, Sabharwal V. Vigabatrin: A novel approach for treatment of super refractory status epilepticus, a case study of 2 patients. *Neurology* 2012; 78: 1031.
3. BPNG data on file, 2004.
4. Sabril 500 mg Granules for Oral Solution (Sanofi), Summary of Product Characteristics; November 2012.

Vildagliptin

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Galvus (Novartis)	Tablet 50 mg	Uncoated tablet. Novartis have no data to support enteral tube administration.[2]
Eucreas (Novartis)	Tablet 50 mg/850 mg, 50 mg/1000 mg	Contains vildagliptin 50 mg and metformin hydrochloride 850 mg per tablet; vildagliptin 50 mg and metformin hydrochloride 1000 mg per tablet. Film-coated tablet.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma levels occur 1.7 hours after oral administration in the fasted state.

Alternative routes available

None available for vildagliptin. Insulin preparations are available for parenteral use.

Interactions

Food delays the time to peak concentration and decreases the maximal concentration but does not reduce the overall exposure; therefore vildagliptin can be given with or without food.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

Owing to the lack of data, seek specialist advice regarding alternative therapy.

References

1. *BNF* 67, March 2014.
2. Personal communication, Novartis; 19 March 2014.
3. Galvus 50 mg Tablets (Novartis), Summary of Product Characteristics; 31 July 2013.

Vitamin B compound preparations

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Vitamin B tablets, compound (non-proprietary)	Tablet, see below	No specific data on enteral tube administration available.
Vitamin B tablets, compound strong (non-proprietary)	Coated tablet, see below	Film- or sugar-coated tablets are difficult to crush; the resulting powder mixes with water to form a cloudy yellow suspension, which should be stirred for several minutes until the sugar coating has dissolved. There is a high risk of tube blockage if coating has not dissolved prior to administration.[2]
Vigranon B (Wallace Mfg)	Oral solution, see below	Not available on FP10.
Pabrinex i.v. high potency (Link)	Injection, see below	Not suitable for enteral tube administration.
Berocca (Bayer)	Effervescent tablet, see below	Available over the counter, not available on FP10. Dissolves in 50 mL of water to give orange solution that flushes easily via 8Fr nasogastric tube.[2]
Energise (Principle Healthcare)	Effervescent tablet, see below	Available over the counter, not available on FP10. Dissolves in 50 mL of water to give orange solution that flushes easily via 8Fr nasogastric tube.[2]

Site of absorption (oral administration)

The B vitamins are absorbed in the small bowel; see individual monographs for specific details.

Alternative routes available

Pabrinex is available in formulations for i.v. and i.m. use.

Interactions

No specific interaction with food.

Preparation contents						
Preparation	**Vitamin B tablets, compound (per tablet)**	**Vitamin B tablets, compound strong (per tablet)**	**Vigranon B (per 5 mL)**	**Pabrinex i.v. high potency injection (per pair of ampoules)**	**Berocca[3] (per tablet)**	**Energise[4] (per tablet)**
Thiamine	1 mg	5 mg	5 mg	250 mg	10.4 mg	15 mg
Nicotinamide	15 mg	20 mg	20 mg	160 mg	45.3 mg (as niacin)	50 mg (as niacin)
Riboflavin	1 mg	2 mg	2 mg	4 mg	13.6 mg	15 mg
Pyridoxine		2 mg	2 mg	50 mg	7.1 mg	10 mg
Panthenol			3 mg		22.7 mg	22 mg
Also contains:				Ascorbic acid 500 mg	Ascorbic acid 476 mg, folic acid 366 micrograms, vitamin B_{12} 8.6 micrograms, biotin 130 micrograms, calcium 95 mg, magnesium 95 mg, zinc 9 mg	Ascorbic acid 500 mg, biotin 150 micrograms, calcium 120 mg, magnesium 120 mg

Health and safety

Standard precautions apply.

Suggestions/recommendations

Use effervescent or liquid preparation.

Intragastric administration

Liquid preparation

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Effervescent tablet

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet into an appropriate size medicine pot.
4. Add 50 mL of water and allow to effervesce.
5. Draw into an appropriate syringe.
6. Flush the medication dose down the feeding tube.
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

Administer using the above method.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2010.
3. Berocca, www.berocca.co.uk (accessed 15 September 2014).
4. Energise Effervescent Tablets (Principle Healthcare), Product Packaging, 2010.

Vitamin E (Alpha tocopheryl acetate)

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Vitamin E (Alliance)	Suspension 500 mg/5 mL	Alpha-tocopherol acetate 500 mg/5 mL. Contains sucrose, does not contain sorbitol.[2] White cloudy liquid, slightly viscous; some resistance to flushing.[3]

Site of absorption (oral administration)

Vitamin E absorption is dependent on the presence of bile and pancreatic enzymes. It enters the bloodstream via the lymphatic system.[4]

Alternative routes available

Parenteral multivitamin preparations are available: Vitlipid and Cernevit.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid preparation.
- A prolonged break in feed is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Shake the medication bottle thoroughly to ensure adequate mixing.
4. Draw the medication solution into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this results in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Jejunal administration should not affect bioavailability providing the patient has sufficient bile and pancreatic enzyme secretion. Administer as above.

References

1. *BNF* 67, March 2014.
2. Vitamin E Suspension (Alliance), Summary of Product Characteristics; January 2013.
3. BPNG data on file, 2005.
4. Brayfield A. *Martindale: The Complete Drug Reference*, 38th edn. London: Pharmaceutical Press; 2014 (*Medicines Complete: Martindale* http://www.medicinescomplete.com).

Voriconazole

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Vfend (Pfizer)	Tablet 50 mg, 200 mg	Film-coated tablets.[2] Tablets have been crushed and administered orally,[3] via NG tube[4] and via jejunostomy.[5]
Vfend (Pfizer)	Oral suspension 200 mg/5 mL	Dry powder for reconstitution. Contains 0.54 g sucrose/mL. Do not dilute further once reconstituted.[6]
Vfend (Pfizer)	Infusion 200 mg	Not appropriate for enteral tube administration.

Site of absorption (oral administration)

Specific site of absorption not documented. Peak plasma levels occur 1–2 hours following oral administration of tablet formulation.[2] Peak levels following administration of the crushed tablets occur at 30 minutes.[3]

Alternative routes available

Parenteral route available.

Interactions

Voriconazole should be taken 1 hour before food or 2 hours after. Bioavailability is reduced by high-fat meals.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid preparation. Available evidence suggests that no loss of efficacy is expected.
- If liquid preparation is unavailable, disperse tablets for enteral administration; there may be a risk of tube blockage.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Allow 1 hour break before administering dose.
4. Draw the required dose into an appropriate size and type of syringe.
5. Administer the medication dose via enteral tube.
6. Finally, flush the tube with the recommended volume of water.
7. Allow 2 hours before re-starting the feed.

Intrajejunal administration

There are limited data on the administration of voriconazole via jejunal feeding tubes. If considered essential therapy, consider monitoring trough serum levels (assay available from University Hospital, Manchester).

References

1. *BNF* 67, March 2014.
2. Vfend Tablets (Pfizer), Summary of Product Characteristics; June 2013.
3. Dodds Ashley ES, Zaas AK, Fang AF, Damle B, Perfect JR. Comparative pharmacokinetics of voriconazole administered orally as either crushed or whole tablets. *Antimicrob Agents Chemother* 2007; 51(3): 877–880.
4. Mohammedi I, Pins MA, Padoin C, Robert D. Plasma levels of voriconazole administered via a nasogastric tube to critically ill patients. *Eur J Clin Microbiol Infect Dis* 2005; 24: 358–360.
5. Martinez V, Le Guillou J, Lamer C, Le Jouan M, Tod M, Dromer F. Serum voriconazole levels following administration via percutaneous jejunostomy tube. *Antimicrob Agents Chemother* 2003; 47(10): 3375.
6. Vfend 40 mg/mL Powder for Oral Suspension (Pfizer), Package Leaflet; January 2014.

Warfarin sodium

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Warfarin (non-proprietary)	Tablet 0.5 mg, 1 mg, 3 mg, 5 mg	Most brands of tablets will disperse in water within 5 minutes if shaken; the resulting dispersion flushes easily via a fine bore feeding tube without blockage.[2]
Warfarin (Rosemont)	Oral suspension 1 mg/mL	Contains maltitol.[3] Very viscous suspension; does not flow under gravity; thixotropic suspension can be flushed via tube without blockage.[4]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma concentration occurs 3–9 hours after oral dosing.[5]

Alternative routes available

None for warfarin. Anticoagulation can be provided via the parenteral route using heparin.

Interactions

The variable vitamin K content in the diet and enteral feed can result in fluctuations in INR until the dietary regimen is stabilised. There is evidence of a physicochemical interaction between enteral feed and warfarin.[6]

There are also potential interactions with other food components; the clinical significance of this is uncertain.[7]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use liquid preparation where available or disperse the tablets in water immediately prior to administration.
- Where possible give the warfarin dose during a break in the feeding regimen; when this is not possible, ensure that the timing of feed and dose are kept as stable as possible.

Intragastric administration

Liquid administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.

3. Where possible, allow a break before dosing.
4. Draw the required dose into an appropriate size and type of syringe.
5. Flush the medication dose down the feeding tube.
6. Finally, flush with the recommended volume of water.
7. Re-start the feed.

Tablet administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Where possible, allow a break before dosing.
4. Place the tablet in the barrel of an appropriate size and type of syringe.
5. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
6. Flush the medication dose down the feeding tube.
7. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (4) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There are no specific data relating to the jejunal administration of warfarin. Administer using the above method. Monitor INR and titrate dose to effect.

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Warfarin Oral Suspension (Rosemont), Summary of Product Characteristics; 28 March 2012.
4. BPNG data on file, 2011.
5. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.
6. Baxter K, Preston CL. *Stockley's Drug Interactions*, 10th edn. London: Pharmaceutical Press; 2013 (*Medicines Complete: Stockley's Drug Interactions* http://www.medicinescomplete.com).
7. Harris JE. Interaction of dietary factors with oral anticoagulant: review and applications. *J Am Diet Assoc* 95(5): 580–584.

Xipamide

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Diurexan (Meda)	Tablet 20 mg	Scored, uncoated tablets.[2] No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma levels occur within 1 hour of oral administration.

Alternative routes available

None available for xipamide. Furosemide and bumetanide are available in parenteral formulation.

Interactions

No specific interaction with food is documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Owing to lack of data consider alternative therapy.
- Xipamide 20-40 mg daily is comparable to bendroflumethiazide 5 mg, bumetanide 1 mg or hydrochlorothiazide 50 mg.[3] Consider changing to alternative therapy that is available as a liquid, e.g. bumetanide (see monograph).

Intrajejunal administration

No data on jejunal absorption of xipamide are available.

References

1. *BNF* 67, March 2014.
2. Diurexan Tablets (Meda), Summary of Product Characteristics; May 2013.
3. Prichard BN, Brogden RN. Xipamide. A review of its pharmacodynamics and pharmacokinetic properties and therapeutic efficacy. *Drugs* 1985; 30(4): 313–332.

Zafirlukast

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Accolate (AstraZeneca)	Tablet 20 mg	Film coated. There are no specific data on enteral tube administration for this preparation. Contains lactose.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented; however small bowel absorption is likely. Absorption is reduced to 30% if administered directly into the colon.[3] Peak plasma levels occur 3 hours after oral dosing.[2]

Alternative routes available

None available for zafirlukast.

Interactions

Food can reduce the absorption of zafirlukast.[2] Take 1 hour before food or 2 hours after.[1]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Not suitable for enteral tube administration.
- Seek specialist advice for asthma management using alternative therapy (see montelukast monograph).

References

1. *BNF* 67, March 2014.
2. Accolate (AstraZeneca), Summary of Product Characteristics; 23 December 2013.
3. Fischer JD, Song MH, Suttle AB *et al*. Comparison of zafirlukast (Accolate) absorption after oral and colonic administration in humans. *Pharm Res* 2000; 17(2): 154–159.

Zaleplon

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Sonata (Meda)	Capsule 5 mg, 10 mg	No data on enteral tube administration. Contains lactose;[2] contains indigo carmine (intense blue colourant) and titanium dioxide (opacifier). Due to concerns about the possibility of covert administration, Sonata has been formulated so that if the capsule contents are mixed with water the solution changes colour and becomes cloudy.[2]

Site of absorption (oral administration)

Specific site of absorption not documented. Peak plasma levels occur within 1 hour of oral administration.[2]

Alternative routes available

None available for zaleplon.

Interactions

Food delays the absorption of zaleplon; therefore, the dose should be taken on an empty stomach.

Health and safety

Standard precautions apply.

Suggestions/recommendations

Not suitable for enteral tube administration. Consider use of zolpidem or temazepam.

References

1. *BNF* 67, March 2014.
2. Sonata 10 mg Hard Capsules (Meda), Summary of Product Characteristics; February 2009.

Zidovudine

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Retrovir (ViiV)	Capsule 100 mg, 250 mg	No specific data on enteral administration are available for this preparation.
Retrovir (ViiV)	Oral solution 50 mg/5 mL	Sugar-free, sorbital-free oral solution[2] GSK (now ViiV) is aware of anecdotal reports of Retrovir oral solution being successfully administered via an enteral feeding tube.[3] Clear, slightly viscous liquid; flushes via tube with little resistance; mixes with an equal volume of water.[4] This preparation comes with an oral syringe, which is not compatible with enteral feeding tubes.
Retrovir (ViiV)	Injection 10 mg/mL (20 mL)	Licensed for parenteral use in patients unable to take zidovudine by mouth. Injection has been administered orally in the context of clinical trials.[5]
Zidovudine (non-proprietary)	Capsule 100 mg, 250 mg	No specific data on enteral administration are available for this preparation.
Combivir (ViiV)	Tablet 300 mg/150 mg	Contains zidovudine 300 mg and lamivudine 150 mg. Tablets can be crushed and mixed with water immediately prior to administration.[6]
Zidovudine and Lamivudine (non-proprietary)	Tablet 300 mg/150 mg	Contains zidovudine 300 mg and lamivudine 150 mg. For both Aurobindo and Sandoz brands, tablets can be crushed and mixed with water immediately prior to administration.[7,8] Milpharm brand disperses in 20 mL of water within 2 minutes to give a cloudy dispersion which flushes via a 6Fr NG tube without blockage.[9]

With abacavir and lamivudine – see Abacavir monograph.

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma levels occur within 1 hour of oral dosing.[5]

Alternative routes available

Parenteral route is available.

Interactions

There is no documented interaction with food.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Use the liquid preparation.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Draw the medication solution into an appropriate size and type of syringe.
4. Flush the medication dose down the feeding tube.
5. Finally, flush with the recommended volume of water.
6. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) measure the medicine in a suitable container and then draw into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given. **Do not** measure liquid medicines using a catheter-tipped syringe as this will result in excessive dosing owing to the volume of the tip.

Intrajejunal administration

Administer using the above method. Monitor for increased side-effects or loss of efficacy.

References

1. *BNF* 67, March 2014.
2. Retrovir Oral Solution (ViiV), Summary of Product Characteristics; 22 November 2013.
3. Personal communication, GlaxoSmithKline; 22 January 2003.
4. BPNG data on file, 2005 (GSK product tested, ViiV formulation unchanged).
5. Drew RH, Weller S, Gallis HA, Walmer KA, Bartlett JA, Blum MR. Bioequivalence assessment of zidovudine (Retrovir) syrup, solution and capsule formulations in patients infected with human immunodeficiency virus. *Antimicrob Agents Chemother*. 1989; 33(10):1801–1803.
6. Combivir Tablets (ViiV), Summary of Product Characteristics; April 2013.
7. Zidovudine and Lamivudine Tablets (AurobindoPharma–Milpharm), Summary of Product Characteristics; February 2013.
8. Zidovudine and Lamivudine Tablets (Sandoz), Summary of Product Characteristics; January 2012.
9. BPNG data on file, 2014.

Zinc sulfate

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Solvazinc (Galen)	Effervescent tablet 125 mg	125 mg zinc sulfate monohydrate (45 mg zinc, 700 micromol zinc). Tablets effervesce in 10 mL of water to give a clear solution.[2] Contains 115.5 mg sorbitol per tablet.[3]
Zinc sulfate (Aurum)	Injection 14.6 mg/mL	50 micromol/mL. No specific data on enteral tube administration are available for this preparation.

Site of absorption (oral administration)

Zinc is absorbed via active transport mechanisms located in the duodenum and proximal jejunum.[4]

Alternative routes available

Parenteral route is available.

Interactions

The absorption of zinc is reduced by high concentrations of copper in the gut lumen. No other specific interactions are documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse the tablet in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Measure at least 10 mL of water into a measuring pot.
4. Add the effervescent tablet and allow to dissolve.
5. Draw into an appropriate syringe.
6. Flush the medication dose down the feeding tube.
7. Rinse the measure and administer this also to ensure that the total dose is given.
8. Finally, flush with the recommended volume of water.
9. Re-start the feed.

Intrajejunal administration

Intrajejunal administration may reduce the bioavailability of zinc preparations. Administer using the above method and monitor levels

References

1. *BNF* 67, March 2014.
2. BPNG data on file, 2004.
3. Solvazinc Effervescent Tablets (Galen), Summary of Product Characteristics; 16 November 2011.
4. Krebs NF. Overview of zinc absorption and excretion in the human gastrointestinal tract. *J Nutr.* 2000; 130: 1374S–1377S.

Zolmitriptan

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Zolmitriptan (non-proprietary; Actavis – Arrow Livery, Sandoz, Zentiva)	Tablet 2.5 mg	Film-coated tablets. No specific data available on enteral tube administration.
Zolmitriptan (non-proprietary; Actavis, Sandoz, Zentiva)	Orodispersible tablet 2.5 mg, 5 mg	No specific data available on enteral tube administration.
Zomig (AstraZeneca)	Tablet 2.5 mg	Film-coated tablets. No specific data on enteral tube administration are available for this preparation. Contain lactose.[2]
Zomig Rapimelt (AstraZeneca)	Orodispersible tablet 2.5 mg, 5 mg	No specific data on enteral tube administration are available for this preparation. Tablets disperse in the mouth, but absorption takes place in the intestine. Contains aspartame equivalent to phenylalanine 2.8 mg/tablet.
Zomig (AstraZeneca)	Nasal spray 5 mg/0.1 mL actuation (6 doses)	Onset of action is less than 5 minutes, indicating intranasal absorption.[3]

Site of absorption (oral administration)

Zolmitriptan is rapidy and well absorbed, although the specific site of absorption is not documented. The C_{max} is reached by 1 hour and sustained for 4–6 hours.[2]

Alternative routes available

Intranasal route.

Interactions

There is no documented interaction with food.[2]

Health and safety

Standard precautions apply.

Suggestions/recommendations

Use intranasal preparation.

References

1. *BNF* 67, March 2014.
2. Zomig Rapimelt 2.5 mg (AstraZeneca), Summary of Product Characteristics; December 2012.
3. Zomig 5 mg Nasal Spray (AstraZeneca), Summary of Product Characteristics; December 2012.

Zolpidem tartrate

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Zolpidem (Actavis, Generics, Ratiopharm, Teva, Zentiva)	Tablet 5 mg, 10 mg	Actavis brand can be crushed.[2] Ratiopharm brand tablets disperse in water if shaken for 2–3 minutes to give a fine dispersion which flushes via an 8Fr tube without blockage.[3]
Stilnoct (Sanofi-Aventis)	Tablet 5 mg, 10 mg	Film-coated tablets can be crushed.[4] Contains lactose.[5]

Site of absorption (oral administration)

Specific site of absorption is not documented. Onset of action is rapid, peak levels occur 0.5–3 hours following oral absorption,[6] suggesting absorption in the proximal small bowel.

Alternative routes available

None.

Interactions

Co-administration with food reduces C_{max} slightly and delays t_{max}. This has no clinical significance.[6]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Disperse tablets in water immediately prior to administration.
- A prolonged break in feeding is not required.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet into the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

There is no specific information on the jejunal administration of zolpidem. Administer using the above method.

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma (now Actavis); 21 January 2003.
3. BPNG data on file, 2009.
4. Personal communication, Sanofi-Synthelabo (now Sanofi-Aventis); 3 February 2003.
5. Stilnoct 5 mg Film-coated Tablets (Sanofi-Aventis), Summary of Product Characteristics; April 2013.
6. Dollery C. *Therapeutic Drugs*, 2nd edn. London: Churchill Livingstone; 1998.

Zonisamide

Formulations available[1]

Brand name (Manufacturer)	Formulation and strength	Product information/Administration information
Zonegran (Eisai)	Capsule 25 mg, 50 mg, 100 mg	Hard capsules. No specific data on enteral tube administration are available for this preparation. The capsules can be opened and sprinkled onto applesauce, which does not affect the bioavailability.[2]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak plasma levels occur 2–5 hours after oral administration.[3]

Alternative routes available

None available for zonisamide.

Interactions

Oral bioavailability is not affected by food, although peak plasma and serum concentrations may be delayed.[3]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Seek specialist advice regarding alternative therapy.
- If continued therapy is essential, open the capsules and mix with water for administration. Monitor closely for alteration in clinical effect.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Empty the contents of the capsule into a medicine pot and add 10 mL of water.
4. Mix well.
5. Draw the mixture into an appropriate syringe.
6. Flush the medication dose down the feeding tube.
7. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).
8. Finally, flush with the recommended volume of water.
9. Re-start the feed, unless a prolonged break is required.

Intrajejunal administration

There are no data relating to jejunal administration of zonisamide.

References

1. *BNF* 67, March 2014.
2. European Medicines Agency. *Zonegran: European Public Assessment Report – Scientific Discussion*. London: European Medicines Agency; 2008, http://www.ema.europa.eu/docs/en_GB/document_library/EPAR_-_Scientific_Discussion/human/000577/WC500052398.pdf (accessed 22 September 2014).
3. Zonegran 25,50 and 100 mg capsules (Eisai), Summary of Product Characteristics; 2 October 2013.

Zopiclone

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Zopiclone (Actavis, Dominion, Generics UK, Opus, Pliva, Ratiopharm, Teva)	Tablet 3.75 mg, 7.5 mg	Actavis brand tablets are film coated to mask the bitter taste. The company does not recommend crushing the tablets as the coating may block the tube.[2]
Zimovane (Sanofi-Aventis)	Tablet 3.75 mg, 7.5 mg	Aventis recommends that Zimovane tablets are not crushed as the bioavailability may be altered. The tablets are very hard and cannot easily be crushed.[3]

Site of absorption (oral administration)

Specific site is not specified. Peak plasma concentrations occur 1.5–2 hours following oral dosing.[4]

Alternative routes available

None available for zopiclone.

Interactions

Absorption is not affected by food.[4]

Health and safety

Standard precautions apply.

Suggestions/recommendations

- Tablets are not suitable for use. Consider changing to zolpidem or temazepam (see monographs).

References

1. *BNF* 67, March 2014.
2. Personal communication, Alpharma (now Actavis); 21 January 2003.
3. Personal communication, Aventis (now Sanofi-Aventis); 13 February 2003.
4. Zimovane 7.5 mg Film-coated Tablets (Sanofi), Summary of Product Characteristics; July 2013.

Zuclopenthixol

Formulations available[1]		
Brand name (Manufacturer)	**Formulation and strength**	**Product information/Administration information**
Clopixol (Lundbeck)	Tablet 2 mg, 20 mg, 25 mg	Zuclopenthixol (as dihydrochloride). Film-coated tablets.[2] Tablets take 8–10 minutes to disperse but form a very fine dispersion which flushes via a 6Fr NG tube without blockage.[3]
Clopixol (Lundbeck)	Oily injection 200 mg/mL (1 mL)	Zuclopenthixol (as decanoate). Licensed for long-term therapy.[4]
Clopixol Conc. (Lundback)	Oily injection 500 mg/mL (1 mL)	Zuclopenthixol (as decanoate). Licensed for long-term therapy.[4]
Clopixol Acuphase (Lundbeck)	Oily injection 5% w/v (50 mg/mL) (1 mL, 2 mL)	Zuclopenthixol (as acetate). Indicated for acute treatment only, not licensed for maintenance therapy.[5]

Site of absorption (oral administration)

Specific site of absorption is not documented. Peak serum concentrations are reached 3–6 hours following oral administration.[2]

Alternative routes available

A depot injection is available.

Interactions

No specific interaction with food documented.

Health and safety

Standard precautions apply.

Suggestions/recommendations

Seek specialist opinion regarding use of depot injection as alternative therapy.

Intragastric administration

1. Stop the enteral feed.
2. Flush the enteral feeding tube with the recommended volume of water.
3. Place the tablet into the barrel of an appropriate size and type of syringe.
4. Draw 10 mL of water into the syringe and allow the tablet to disperse, shaking if necessary.
5. Flush the medication dose down the feeding tube.
6. Draw another 10 mL of water into the syringe and also flush this via the feeding tube (this will rinse the syringe and ensure that the total dose is administered).

7. Finally, flush with the recommended volume of water.
8. Re-start the feed, unless a prolonged break is required.

Alternatively, at step (3) place the tablet into a medicine pot, add 10 mL of water and allow the tablet to disperse. Draw this into an appropriate syringe. Ensure that the measure is rinsed and that this rinsing water is administered also to ensure that the total dose is given.

Intrajejunal administration

No specific data on jejunal administration. Seek specialist advice.

References

1. *BNF* 67, March 2014.
2. Clopixol Tablets 2, 10 and 25 mg (Lundbeck), Summary of Product Characteristics; 7 January 2012.
3. BPNG data on file, 2014.
4. Clopixol Injection and Conc. Injection (Lundbeck), Summary of Product Characteristics; 5 February 2014.
5. Clopixol Acuphase Injection (Lundbeck), Summary of Product Characteristics; 7 January 2012.`

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