Team Name: Regional Infection Prevention and Control Team Team Lead: Regional Director Staff Development / Infection Prevention and Control Approved by: VP – Planning, Innovation, Quality, Safety and Risk	Reference Number: CLI.8011.PL.003 Program Area: Infection Prevention and Control Policy Section: Infection Prevention and Control
Issue Date: June 16, 2016 Review Date: Revision Date:	Subject: Administration of Tuberculin Skin Test (TST)

POLICY SUBJECT:

Administration of Tuberculin Skin Test (TST)

PURPOSE:

Southern Health-Santé Sud will support the goals of Manitoba's tuberculosis (TB) prevention and management program through timely and appropriate administration of the Tuberculin Skin Test (TST) to high risk populations.

Residents in Long Term Care facilities in Manitoba are no longer considered a priority for systemic screening for latent tuberculosis infection (LTBI) and should not be routinely given a TST on or prior to admission

BOARD POLICY REFERENCE:

Executive Limitation (EL-2) Treatment of Clients
Executive Limitation (EL-3) Treatment of Staff
Executive Limitation (EL-7) Corporate Risk

POLICY:

The TST is a screening tool to diagnose TB infection. Infection can usually be identified with a tuberculin skin test two to eight weeks following exposure to the TB bacteria. Accurate administration and reading of the TST can contribute to the early identification of infections, which is a priority in the prevention and control of TB.

The TST is the standard method of detecting *Mycobacterium tuberculosis* infection in Manitoba; however the test is neither 100% sensitive nor 100% specific and TST results must be interpreted carefully, based on individual circumstances.

Who should be screened with TST?

- High risk populations in Manitoba that should be given high priority for systematic screening for latent tuberculosis infection (LTBI) include:
  - Persons with impaired immunity. This includes HIV infection and other immunosuppressing conditions (e.g., diabetes types 1 and 2 and renal failure).
  - Foreign-born persons referred for TB medical surveillance by immigration authorities

- Foreign-born persons from countries of high TB incidence (more than 15 acid fast bacillus [AFB] smear-positive TB cases per 100,000 population) within two years of arrival in Canada.
- Communities with high rates of LTBI or of active TB disease
- Homeless and under-housed persons

- Healthcare workers at high risk of occupational exposure to TB, especially health care workers likely to be exposed to active cases of respiratory TB or who may be at risk of infecting individuals.
  See "Manitoba Tuberculosis Protocol, February 2014, Baseline Tuberculin Skin Testing (Health Care Facilities)" (available from https://www.gov.mb.ca/health/publichealth/cdc/protocol/tb.pdf).

- Contacts of individuals with known or presumptive active TB disease are assessed as part of a TB case investigation. Investigations are conducted by or in conjunction with the regional communicable disease coordinator or the occupational health nurse within a facility and would include symptom review, TST, chest radiography, and/or sputum collection for AFB, as appropriate. See "Canadian Tuberculosis Standards, 7th edition, Chapter 15" (available at: http://www.phac-aspc.gc.ca/tbpc-latb/pubs/tb-canada-7/assets/pdf/tb-standards-tb-normes-ch15-eng.pdf)

- Note: Residents of Long Term Care facilities in Manitoba are no longer considered a priority for systematic screening for LTBI and should not routinely be given a TST on, or prior to admission.

  Due to the decreasing utility of TST to diagnose LTBI after age 65 and the increasing risk of adverse effects from LTBI treatment in this age group, screening with a posterior-anterior and lateral chest x-ray for active TB is preferred upon admission for those over 65 years old. Based on facility risk assessment e.g. were there any active TB cases in the facility in the last 10 years), local epidemiology, and in consultation with the Medical Officer of Health some residents at higher risk may have a baseline TST on admission.

DEFINITIONS:

For the purpose of this policy:

Active tuberculosis (disease): Active clinical disease that is usually symptomatic and for which microbiologic tests are usually positive for *M. tuberculosis* and radiologic tests usually abnormal.

Latent tuberculosis infection (LTBI): The presence of latent or dormant infection with *M. tuberculosis.* Individuals with LTBI have no evidence of clinically active disease, meaning that they have no symptoms, no evidence of radiographic changes that suggest active disease and negative microbiologic tests; they are non-infectious. The goal of testing for LTBI is to identify individuals who are at increased risk for the development of active tuberculosis TB and therefore would benefit from treatment of LTBI.

Infectious tuberculosis: The condition whereby the individual can transmit infection to others by virtue of the production of aerosols containing TB bacteria. Individuals with smear-positive, cavitary and laryngeal disease are usually the most infectious.

Tuberculin skin test: The intradermal administration of tuberculin purified protein derivative (PPD) to test for a cell mediated reaction to tuberculosis antigens within 48 to 72 hours. In Manitoba, the tuberculin purified protein product used is called Tubersol®.

Positive Reactions: A TST is considered positive based on the size, the positive predictive value, and risk of disease if the individual is infected.

False Positive Reactions: A TST result that is reactive, even though the individual is not infected with *M. tuberculosis*. The causes of a false positive reaction may include, but is not limited to, the following:

- Inaccurate interpretation of reaction;
- Infection with nontuberculosis mycobacterium (NTM). In Canada reactions greater than 10mm of induration are rarely caused by NTM;
- Vaccination with Bacille Calmette-Guerin (BCG) vaccine after infancy (administered at age 1 or older).

False Negative Reactions: A TST result is non-reactive even though the individual is infected with *M. tuberculosis.* The cause of a false negative reaction may include, but is not limited to, the following technical and biologic factors:

- Incorrect TST administration, including incorrect antigen used;
- Immune suppression associated with age;
- Corticosteroid therapy (minimum 15 mg/day of prednisone for at least one month);
- Cancer treatments;
- HIV infection (especially with CD4 cell count less than 500 x 10^6 /L);
- Use of tumor necrosis factor alpha inhibitors medications;
- Malnutrition, especially with weight loss;
- Severe illness (including active TB disease);
- Major viral illness (e.g., mumps, measles, mononucleosis; does NOT include a common cold);
- Immunization with live virus vaccines (measles, mumps, rubella, varicella, or yellow fever) in previous four weeks;
- Infants less than six months of age – validity of TST is not known;
- Poor injection technique.

Anamnestic Immune Response: Renewed rapid production of antibody on the second (or subsequent) encounter with the same antigen.

Induration: A localized reaction to the tuberculin purified protein derivative (PPD) that results in a raised, firm area with clearly defined margins around the TST injection site. Induration must be differentiated from erythema, which is not measured as a reaction to the PPD.

Erythema: Reddening of the skin.

PROCEDURE:

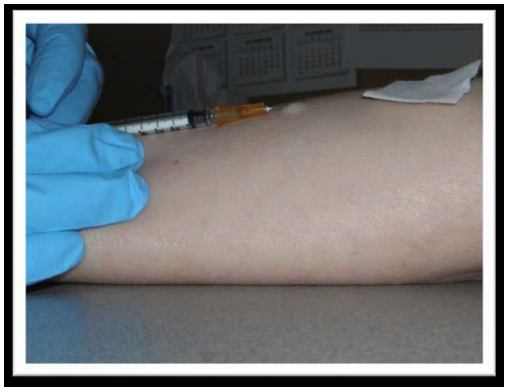
Administration

- **Handling the tuberculin solution**
  - Tubersol® 5 tuberculin units (5-TU) of PPD-S (purified protein derivative – standard) is recommended in Canada.
  - Store at 2^o to 8^o C, but do not freeze. Discard the solution if frozen.
  - Remove the tuberculin solution from the vial under aseptic conditions. A little more than 0.1 mL of PPD solution should be drawn into the TB syringe. Hold the syringe upright and lightly tap out the air, then expel one drop. Check that a full 0.1 mL remains in the syringe.
  - Do not transfer the solution from one container to another (the potency of the PPD may be diminished).
  - Draw up the solution just before injecting it. Do not preload syringes for later use as the potency of the PPD may be diminished.
  - The solution can be adversely affected by exposure to light. PPD should be stored in the dark except when doses are actually being withdrawn from the vial.
  - Discard the solution if the vial has been in use for longer than 1 month or for an undetermined amount of time (the potency of the solution may be diminished).
  - Use the solution within 1 month after opening. Label each bottle with the discard date when it is opened.

- **Preparing the person to be tested**
  - Seat the person comfortably, and explain the procedure
  - Use the inner aspect of the forearm, preferably the nondominant arm (where administration and reading of the reaction is easiest), about 10cm (4 inches) below the elbow; avoid areas with abrasions, swelling, visible veins or lesions. If there is a localized rash, a burn or localized eczema, avoid the area.
  - If neither forearm is suitable, use the outside of the forearm or the upper arm. In this case mark the location clearly in the record.
  - Cleanse the area to be injected with an alcohol swab and let it dry
  - Do not use EMLA® cream (or similar local anesthetic cream), as application of this cream has been reported to cause localized edema, which could easily be confused with a positive TST result.

- **Injecting the PPD tuberculin solution**
  - Use a 0.6 to 1.3 cm (¼ to ½ inch) 26- or 27- gauge needle with a disposable plastic tuberculin syringe.
  - Position the bevel of the needle so that it opens facing up
  - While holding the skin of the inner aspect of the forearm taut, insert the needle at a 5^0 - 15^0 angle to the skin without aspirating. The tip of the needle will be visible just below the surface of the skin. The needle is inserted until the entire bevel is covered (see Figure 1)
  - Administer the PPD by the slow intradermal injection of 0.1 mL of 5-TU.
  - A discrete, pale elevation of the skin (a wheal) 6-10 mm in diameter should appear. The wheal will typically disappear in 10-15 minutes. The size of the wheal is not completely reliable, but if a lot of liquid runs out at the time of injection and there is no wheal, then repeat the injection on the opposite forearm, or on the same forearm as before, but at least 5 cm from the previous injection site.
  - A drop of blood may be seen – this is normal. The person tested should be offered gauze to remove the blood but should be advised not to massage the site in order to avoid squeezing out the PPD and disrupting the test.
  - Do not cover the site with a bandage
  - Tell the individual that he or she should not scratch the site but may perform all normal activities, including showering or bathing.
  - Place uncapped disposable needles and syringes in appropriate puncture-resistant containers immediately after use.
  - If the TST is accidentally given as a subcutaneous or an intramuscular injection, this should not pose a serious problem. It is possible that tuberculin-sensitive people would have localized inflammation, which should be self-limited. It would not be possible to take a measurement of or clinically interpret any such reaction, so the TST should be administered again *but using proper intradermal technique* on the volar surface of the forearm. This should be done immediately (as soon as it is realized that the injection was too deep).

Figure 1 – Technique of administration of TST



- **Record the following:**
  - Date of injection;
  - Dose of PPD (5 TU, 0.1 mL);
  - PPD manufacturer;
  - PPD lot number;
  - Expiration date of the PPD reagent;
  - Site of injection;
  - Person administering the TST.

Precautions

- Acute allergic reactions, including anaphylaxis, angioedema, uricaria and/or dyspnea, have been very rarely reported following skin testing with Tubersol®, see "Risk of Serious Allergic Reactions Following Tubersol®[Tuberculin Purified Protein Derivative (Mantoux)] Administration" (available from: http://www.healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2005/14373a-eng.php).

- These reactions may occur in people without a history of a TST.

- Epinephrine hydrochloride solution (1:1000) and other appropriate agents should be routinely available for immediate use in case an anaphylactic or other acute hypersensitivity reaction occurs. Health care providers should be familiar with the current recommendations of MB Health Communicable Disease Control Protocol on Management of Suspected Anaphylactic Shock and the National Advisory Committee on Immunization on monitoring the individual for immediate reactions over a period of at least 15 minutes after inoculation and for the initial management of anaphylaxis in non-hospital settings (available from https://www.gov.mb.ca/health/publichealth/cdc/protocol/anaphylactic.pdf, http://www.phac-aspc.gc.ca/publicat/cig-gci/p02-03-eng.php).

- **The following people should not receive a TST:**
  - Healthcare workers with a previous positive TST documented by a healthcare professional.
  - Those with positive, severe blistering TST reactions in the past or with extensive burns or eczema present over TST testing sites, because of the greater likelihood of adverse reactions or severe reactions.
  - Those with documented active TB or a well-documented history of adequate treatment for TB infection or disease in the past. In such individuals, the test is of no clinical utility.
  - Those with current major viral infections (e.g. measles, mumps, varicella).
  - Those who have received measles or other live virus immunization within the past 4 weeks, as this has been shown to increase the likelihood of false-negative TST results. Note that only measles vaccination has been shown to cause false-negative TST results, but it would seem prudent to follow the same 4-week guideline for other live virus immunizations – mumps, rubella, varicella and yellow fever. However, if the opportunity to perform the TST might be missed, the TST should not be delayed for live virus vaccines since these are theoretical considerations.

- **The following people can receive a TST:**
  - Those with a history of receiving BCG vaccination(s);
  - Those with a common cold;
  - Those who are pregnant or are breastfeeding;
  - Those immunized with any vaccine on the same day;
  - Those immunized within the previous 4 weeks with vaccines other than those listed above;
  - Those who give a history of a positive TST reaction (other than blistering) that is not documented;
  - Those taking low doses of systematic corticosteroids, less than 15 mg prednisone (or equivalent) daily. It generally takes a steroid dose equivalent to or more than 15 mg prednisone daily for 2-4 weeks to suppress tuberculin reactivity.

Measuring Induration

- The TST should be read by a trained health professional. Individuals without experience in reading a TST may not feel the slight induration, and the TST would be mistakenly recorded as 0 mm.

- Self-reading is very inaccurate and is strongly discouraged.

- Reading should be performed 48 to 72 hours after administration, as maximum induration can take up to 48 hours to develop, but after 72 hours it is difficult to interpret a reaction. Reactions may persist for up to 1 week, but for as many as 21% of individuals with a positive reaction at 48 to 72 hours the reaction will be negative after a week. If the TST cannot be read within 72 hours because of unforeseen circumstances, it should be repeated at an injection site far enough from that of the previous test that the reactions do not overlap. No minimum wait is required before the repeat test.

- The forearm should be supported on a firm surface and slightly flexed at the elbow. Induration is not always visible. Palpate with fingertips to check whether induration is present. If there is induration, mark the border of induration by moving the tip of a pen at a 45^{o} angle laterally toward the site of the injection (Figure 2). The tip will stop at the edge of the induration, if present. Repeat the process on the opposite side of the induration. This pen method has the advantage of being as reliable as the traditional palpation method (which relies entirely on fingertips) among experienced readers and of being easier for new readers to learn and use.

- Using a caliper, measure the distance between the pen marks, which reflects the diameter of the induration at its widest transverse diameter (at a right angle to the long axis of the forearm). A caliper is recommended because readings will be more precise and, most important, if the reader has to set the caliper and then read the diameter the rounding error is reduced. If a caliper cannot be found a flexible ruler could be used.

- Disregard and do not record erythema (redness). Approximately 2% - 3% of people tested will have localized redness or rash (without induration) that occurs within the first 12 hours. These are minor allergic reactions, are not serious and do not indicate TB infection. They are not a contraindication to future TSTs.

- Blistering, which can occur in 3% to 4% of subjects with positive tests, should be recorded.

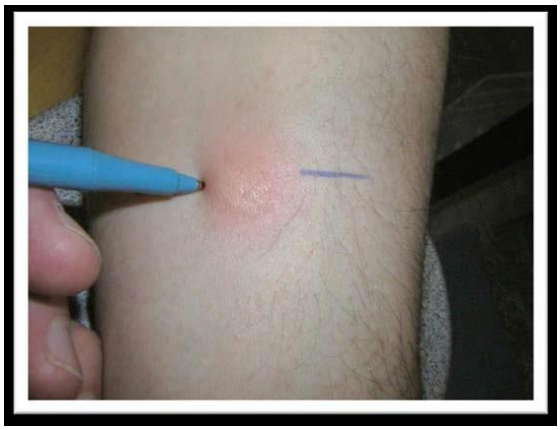
- Record the result in millimetres (mm). Record no induration as “0 mm”. Descriptive recordings of positive, negative, doubtful, significant and non-significant are not recommended.

- Do not round off the diameter of the induration to the nearest 5 mm as this can interfere with determining whether TST conversion has occurred in the event of a future TST. If the measurement falls between demarcations on the rules, the smaller of the two numbers should be recorded.

Record the following:

- Dates the induration was read;
- Measurement of the induration, if any, in millimetres (mm);
- Any adverse reactions, e.g. blistering;
- Name of the individual reading the test.
- Provide a record of the TST result to the individual tested.

Figure 2 - Ball-point method for reading transverse diameter of TST induration.



Interpretation when Serial (repeated) TST is performed

- **Two-step TST and the booster effect**
  A single TST may elicit little response yet simulate an anamnestic immune response, so that a second TST at any time from 1 week to 1 year later will elicit a much greater response. This phenomenon is important to detect, as it could be confused with TST conversion.

- **Indications for 2-step tuberculin testing**
  A two-step TST should be performed if subsequent TSTs will be conducted at regular intervals or after exposure to an infectious TB case, for instance among health care or correctional service workers. This is to reduce the chance of a false-positive TST conversion when the TST is repeated.
  The two-step protocol needs to be performed ONCE only if properly performed and documented. It never needs to be repeated. Any subsequent TST can be one step, regardless of how long it has been since the last TST.
  Repeat TST in a contact investigation: In a contact investigation, a single TST should be performed as soon as possible after the diagnosis has been made in the source case and the contact is identified. If this first TST is negative and it was performed less than 8 weeks after contact with the source case was broken, then a second TST should be performed no sooner than 8 weeks after the contact was broken. This is done to detect very recent infection that occurred just before contact was broken, since it will take anywhere from 3 to 8 weeks for the TST to become positive after new infection.

- **Technique**
  The same material and techniques of administration and reading should be used. The second test should be performed 1 to 4 weeks later. Less than 1 week does not allow enough time to elicit the phenomenon, more than 4 weeks allows the possibility of a true TST conversion to occur. Both tests should be read and recorded at 48 to 72 hours.

- **Interpretation**
  It is generally recommended that a second TST result of 10 mm or more should be considered significant and the client referred for medical evaluation and chest radiography.

Contact Information

- Manitoba Health – for surveillance (reporting of cases and TB registry questions): Phone 204-945-4816; see also http://www.gov.mb.ca/health/publichealth/index.html

- Southern Health-Santé Sud – Each regional health authority (RHA) is responsible for the provision of public health case and contact management for TB. The contact numbers can be found in: http://www.gov.mb.ca/health/publichealth/index.html

- Winnipeg Regional Health Authority – The WRHA will provide consultative service for case and contact identification and management to all RHAs as follows:
  - Providing consultation for identification, medical management, by WRHA Specialist TB Clinicians for adult and pediatric cases of TB disease, LTBI or request admission to a WRHA facility.
    - For clients 17 years of age or older – Adult Chest Medicine Service, the Health Sciences Centre: page 204-787-2071
    - For clients younger than 17 years of age – Pediatric Respiratory Service, Health Sciences Centre: page 204-787-4697
  - Providing consultation for population and public health case and contact management and TB case transfer – RHA Population and Public Health: tel. 204-940-2274.

REFERENCES:

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Winnipeg Regional Health Authority (2015). *Clinical Practice Guideline – Interpretation of TST results*. Available at: http://www.wrha.mb.ca/extranet/publichealth/services-tuberculosis.php