Section 4: Tuberculin Skin Testing (TST)

Table of Contents

Background **2**

Steps in Tuberculin Skin Testing **2**

Step 1: Prepare to give the TST *2*

Step 2: Give the TST *5*

Step 3: Provide aftercare information *7*

Step 4: Read the TST and document the result *7*

Step 5: Follow-up the TST result *9*

Two-Step Tuberculin Skin Testing **11**

Background

The Tuberculin Skin Test (TST), using Purified Protein Derivative (PPD) is the only approved method of tuberculin skin testing in the province. Other tests, such as multiple puncture tests are not as accurate and are not acceptable.

The TST is used in contact screening in order to rule out infection in persons who have been in contact with someone who has active tuberculosis. It is also used to establish baseline sensitivity for health care workers and travelers considered at increased risk for exposure to TB.

The tuberculin skin test quantifies the body's response to a specific tubercle protein that has been introduced into the body via intradermal injection. The protein, PPD (purified protein derivative), is a solution derived from a component of the *Mycobacterium tuberculosis* bacterium. The test is called TST and is also referred to as a PPD test or a Mantoux test. The preparation used is 5 TU (tuberculin units) purified protein derivative.

The body's response to this foreign protein is measured visually by observation and assessment of the degree of induration at the site of intradermal injection. Induration refers to swelling and hardening of the injected intradermal tissue. Induration is always measured and recorded in millimeters (mm).

Steps in Tuberculin Skin Testing

Acute allergic reactions, including anaphylaxis, angioedema, urticaria and/or dyspnea, have been very rarely reported following skin testing with Tubersol®. Health care providers administering tuberculin skin tests (TSTs) should be familiar with the initial management of anaphylaxis in non-hospital settings (see the NL Immunization Manual).

Recipients of TST should remain under supervision for at least 15 minutes after the injection; regardless of whether or not they have had the particular product previously. Epinephrine hydrochloride solution (1 mg/mL) and other appropriate agents should be available for immediate use in case an anaphylactic or other acute hypersensitivity reaction occurs.

Step 1: Prepare to give the TST

- Prepare the client:

- Seat the client comfortably, explain the procedure and review the **Fact Sheet on the Tuberculin Skin Test (TST) in Appendix E.**

- Ensure the risks and benefits of the test are understood.

- Obtain written consent from the client or guardian on the **Tuberculosis Assessment Form (TBAF). See Appendix D and Section 3.**

- Confirm the client is able to stay for 15 minutes after the injection and return to have the test site checked by a health care provider 48 to 72 hours later.

- **DO NOT** apply EMLA® cream (or similar local anesthetic cream) to the test site. Reactions to these products can make the test results difficult to measure.

Ensure there are no contraindications to TST. Refer to **Table 4.1** for the **contraindications** and when to **defer** TST.

Table 4.1: TST Contraindications, when to defer TST and Not Contraindications

Adapted from Menzies R, Wong T. *Canadian Tuberculosis Standards*. 7th ed. Canadian Thoracic Society and the Public Health Agency of Canada; 2014.

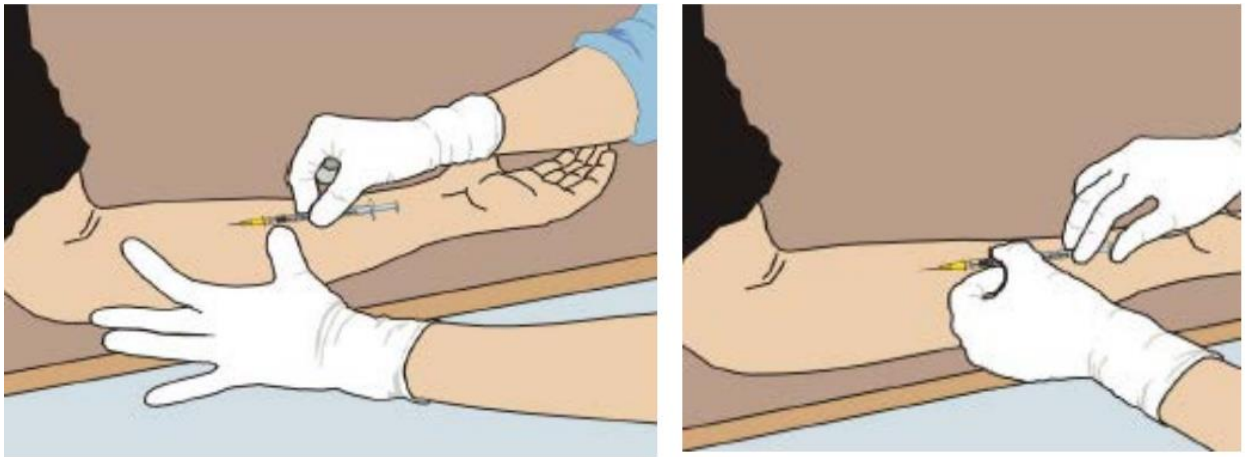
Contraindications to TST	Situations When TST Should Generally be Deferred	Not Contraindications
○ Allergy to any component of Tubersol® (Tuberculin Purified Protein Derivative [Mantoux]) or its container, or an anaphylactic or other allergic response to a previous TST ○ Previous active TB or LTBI ○ Documented prior positive TST or IGRA result ○ Prior blistered TST reaction	○ Measles or other live virus immunization within past four weeks. Note that TST may be given before or on the same day as live virus vaccines <u>but at a different site</u> ○ TST should be deferred until the client reaches six months of age	○ Pregnancy or breastfeeding ○ Past history of BCG vaccination ○ Vaccination with a non-live vaccine in the past 4 weeks, or ○ Treatment with low-dose steroids ○ A mild viral illness, such as a common cold, in the past month

- Prepare the Tubersol for injection:
    - Wash your hands.
    - Tubersol® 5 tuberculin units (5-TU) of purified protein derivative – standard (PPD-S) is the recommended testing solution for TST in Canada. Refer to the product insert for information on handling of Tubersol®.
    - Examine the vial of Tubersol®. The testing solution should be colourless and clear. Discard the solution if it is discoloured or contains any particulate matter.
    - Check the expiry date and the date of first puncture on the vial of Tubersol® to ensure it has not expired and that it has been in use for **less than** 30 days. When opening a new vial of Tubersol®, label it with the date of first puncture.
    - **DO NOT** preload syringes; draw up Tubersol® just before injecting it.
    - Clean the stopper of the vial with an alcohol swab. Allow to air dry.
    - **DO NOT** inject air into the vial.
    - Remove the Tubersol® from the vial under aseptic conditions using a ¼ to ½ inch (0.6 to 1.3 cm) length, 26 or 27 gauge needle with a disposable plastic syringe.
    - Withdraw a little more than **0.1 mL** of Tubersol® in to the syringe. **Change needle to 26 gauge, ⅜ inch length**. Hold the syringe upright and lightly tap out the air, then expel one drop. Ensure that a full **0.1 mL** of Tubersol® remains in the syringe.
    - Choose a test site. **The preferred test site is the inner aspect of the forearm, about 10 cm below the elbow**. Avoid areas with abrasions, swelling, visible veins, scars, or lesions; these can make the test results difficult to measure. If neither forearm is suitable, use the outside of the forearm or the upper arm.
    - Clean the test site with an alcohol swab. Allow to air dry.

Step 2: Give the TST

- Inject the Tubersol® **INTRADERMALLY**. To do this:
    - Use the fingers of your non-dominant hand to gently pull the skin near the test site taut (see **Figure 4.1**).
    - Position the opening of the needle (the bevel) so that it is facing upward.
    - Insert the needle at a 5° to 15° angle to the skin, just to the point where the entire **bevel** (not the entire needle) is underneath the skin (see **Figure 4.1**). Once the bevel is in place, allow the skin to loosen.
    - **DO NOT ASPIRATE**. Slowly depress the plunger of the syringe. A pale bump (a wheal) should appear at the site of the injection while the Tubersol® is injected (see **Figure 4.2**). Withdraw the needle quickly once the full dose has been administered.

Figure 4.1: **Correct method for intradermal injection on the forearm**



Gently pull the skin near the test site taut.

Insert the needle at a 5° to 15° angle to the skin, just to the point where the entire **bevel** (not the entire needle) is underneath the skin.

Image adopted from: http://www.currytbcenter.ucsf.edu/abouttb/tb_control_faq.cfm

Figure 4.2: Tuberculin skin testing wheal

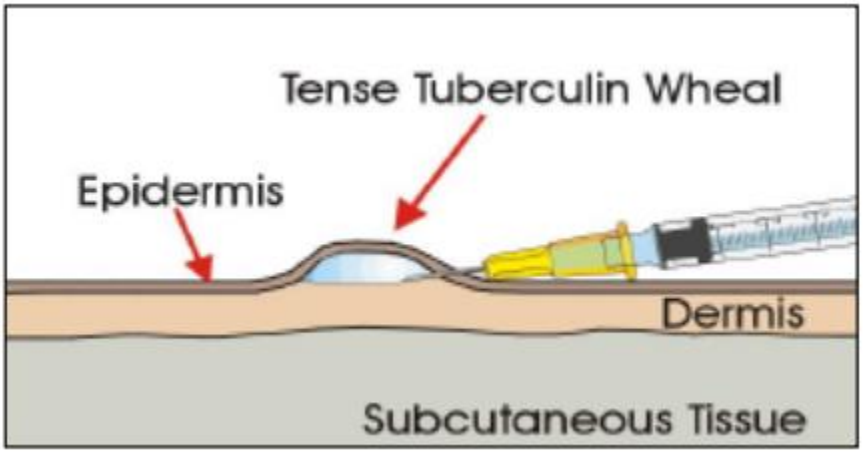


Image adopted from: http://www.currytbcenter.ucsf.edu/abouttb/tb_control_faq.cfm

- Sponge the test site lightly with dry gauze to remove any blood or leaked Tubersol®. **DO NOT** press on or massage the site. **DO NOT** cover the site with a bandage.

- Provide aftercare information (see **Step 3**). Remind the client (and/or the parent/guardian) to stay for 15 minutes after the injection, and to return 48 to 72 hours later to have the test site checked by a health care provider.

- Document on the immunization record, consent form and/or in Part 6 of the **Tuberculosis Assessment Form (TBAF)** that a TST was given.

Notes:

- **Leakage**: Watch for Tubersol® leaking from the site during the injection, which can happen if the bevel is not inserted far enough under the skin**. If there is leakage**:
  - Stop pressing on the plunger.
  - Slide the bevel of the needle slightly further under the skin, and resume pressing on the plunger until the full dose has been administered.
  - Withdraw the needle quickly.

- **Wheal**: If no wheal appears, or if Tubersol® leaks from the site during the injection AND the wheal measures **LESS THAN 6 mm**, repeat the TST.[1]

[1] The New York City Department of Health and Mental Hygiene. *Mantoux Tuberculin Skin Test: A Guide for Providers.* Accessed Mar25.14 from: http://www.nyc.gov/html/doh/downloads/pdf/tb/tb-hcp-tst-guide.pdf

- TSTs can be repeated immediately, at least 5 cm away from the site of the previous injection, or on the opposite forearm.

Step 3: Provide aftercare information

- Aftercare information points to share with the client (and/or the parent/guardian):
    - The wheal usually disappears within a few minutes after the TST is given.
    - The test site **DOES NOT** have to be kept dry. Bathing, showering and swimming will not affect the test result.
    - The test site should not be scratched. A cold compress (e.g. cold, wet washcloth) can be used to reduce discomfort. **DO NOT** apply topical anti-itch creams (e.g. Benadryl® or similar local anesthetic creams) to the test site. Reactions to these products can interfere with test results.
    - Redness or rash might develop at the test site within the first few hours of having a TST. This is a minor allergic reaction and does not indicate infection with TB bacteria.
    - A blister might develop at the test site, although this is relatively rare.

Step 4: Read the TST and document the result

- After 48 to 72 hours, inspect the test site for induration (read the test):
    - Examine the test site in good lighting.
    - If the test was done on the forearm, have the client place his/her forearm on a firm surface with the elbow slightly flexed.
    - Run your fingers lightly over the test site to feel for swelling or hardness (induration). **Ignore redness (also known as 'erythema') and bruising**.
- If there is no induration, record the TST result as '0 mm'.
- If you feel any induration:

- Use a fine tip ballpoint pen held at a 45° angle to draw a line from the outer edge of the forearm inward toward the edge of the induration. Mark where the pen stops. This is the border of the induration.

- Repeat the process on the other side of the indurated area (see **Figure 4.3**).

Figure 4.3: Fine tip ballpoint pen method for identifying and marking induration

Image adopted from:
http://www.respiratoryguidelines.ca/sites/all/files/CTB_Standards_EN_Chapter%204.pdf

- To measure the induration, use a TB ruler with millimeter demarcations.

  - Place the ruler across the **indurated** area (see **Figure 4.4**)

  - Line up the '0' mark on the ruler with the pen mark on left-hand border of the indurated area.

  - Measure the area between the two pen marks (the left-hand and right-hand borders of the indurated area). This is the transverse diameter. Measure only the transverse diameter. **DO NOT measure redness, bruising or blistering**.

  - Once you have recorded the measurement, remove the pen marks by rubbing them lightly with an alcohol swab.

Figure 4.4: Correct and incorrect methods of measuring induration

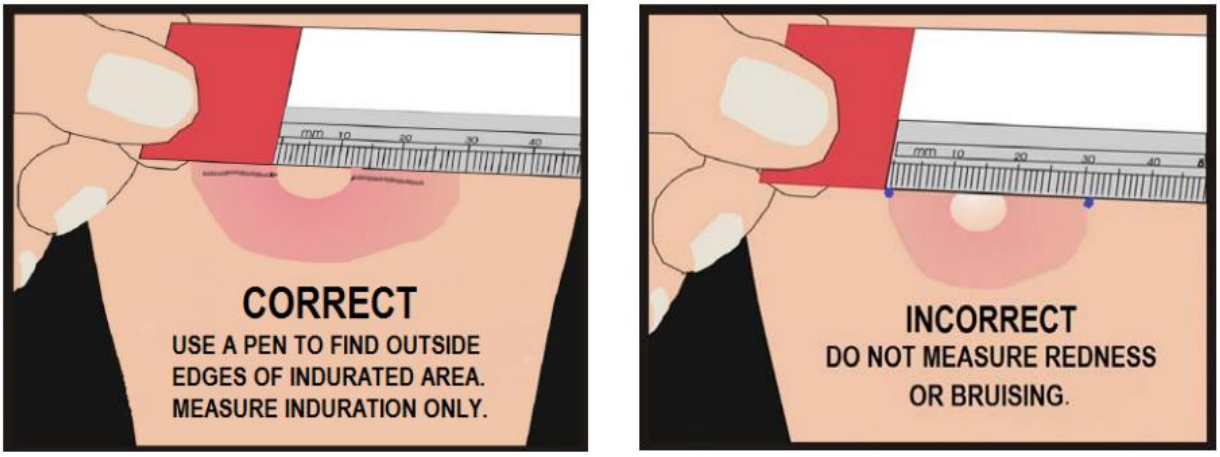


Image adapted from: http://www.currytbcenter.ucsf.edu/abouttb/tb_control_faq.cfm

- Document the TST measurement in millimeters (mm) on the immunization record, consent form and/or in Part 6 of the **TBAF**.
    - Record ONLY the transverse diameter measurement. **DO NOT** record two measurements (e.g. 8 mm x 10 mm).
    - When the measurement falls between demarcations on the ruler, record the smaller of the two numbers. For example, if the measurement falls between 4 mm and 5 mm, record the TST result as 4 mm. **DO NOT** record measurements in centimeters or with decimal points.
    - Note blistering at the test site on the immunization record, consent form and/or in the page margin near **Part 6** on the **TBAF**. Blistering is a contraindication to future TSTs.
    - When documenting a TST measurement on a **TBAF,** include the date the TST was read and your signature.

Refer to the Newfoundland and Labrador Tuberculosis Guidelines, Appendix 6 for more information on TSTs.

Step 5: Follow-up the TST result

Interpretation and follow-up of TST results is client-specific. See **Table 4.2** for a guide to interpreting tuberculin skin test results and cut-points in various risk groups.

Table 4.2. Interpretation of tuberculin skin test results and cut-points in various risk groups.

(From the Canadian Tuberculosis Standards, 7th Edition, 2014, page 75)

TST result	Situation in which reaction is considered positive*
0-4 mm	In general this is considered negative, and no treatment is indicated.
	Child under 5 years of age and high risk of TB infection
≥5 mm	HIV infection
	Contact with infectious TB case within the past 2 years
	Presence of fibronodular disease on chest x-ray (healed TB, and not previously treated)
	Organ transplantation (related to immune suppressant therapy)
	TNF alpha inhibitors
	Other immunosuppressive drugs, e.g. corticosteroids (equivalent of ≥15 mg/day of prednisone for 1 month or more; risk of TB disease increases with higher dose and longer duration)
	End-stage renal disease
≥10 mm	All others, including the following specific situations: – TST conversion (within 2 years) – Diabetes, malnutrition (<90% ideal body weight), cigarette smoking, daily alcohol consumption (>3 drinks/day) – Silicosis – Hematologic malignancies (leukemia, lymphoma) and certain carcinomas (e.g. head and neck)

Notes for Table 4.2:

Anti-TNF agents currently licensed in Canada include adalimumab (Humira), certolizumab pegol (Cimzia), etanercept (Enbrel), golimumab (Simponi) and infliximab (Remicade). Etanercept is a soluble TNF receptor, which binds competitively with circulating TNF: the other agents are monoclonal anti-TNF antibodies. These agents are used for the treatment of autoimmune, inflammatory conditions, notably rheumatic diseases such as rheumatoid arthritis and inflammatory bowel disease.

TST conversion: There may be differences in the same individual from test to test of as much as 5 mm in reaction size due to differences in the technique of administering or reading the TST or because of biologic differences in immune response. Therefore, 6 mm has been selected as the criterion to distinguish a real increase from nonspecific variation.

- **TST conversion** is an increase in the size of a tuberculin skin test (TST) reaction on repeated testing that reflects new TB infection. It is defined as a reaction of 10 mm or more, when an earlier test (within the previous 2 years) resulted in a reaction of less than 5 mm.

- If a test result within the previous two years was between 5 and 9 mm in a healthy individual, the definition of conversion is an increase of 6 mm or more.

Prior test in last two years:	Current test meets definition of conversion if:
5-9mm induration	Increase of 6mm or more from prior test
Less than 5mm induration	Induration of 10mm or more

Follow-up clients tested as TB **contacts** as per the **TB Contact Testing Flowchart** (see **Section 12: Contact investigation, Window Period Prophylaxis, Source Case Investigation**).

Follow-up clients tested during a **source case investigation** as per the **General TB Testing Flowchart** (see **Section 3: General TB Assessment**).

Follow-up all other clients per the **General TB Testing Flowchart** (see **Section 3: General TB Assessment**).

Two-Step Tuberculin Skin Testing

- **Do not use the two-step TST method for TB contacts.**
- Follow the testing and reading schedule described in **Table 4.3**.
- Use the same procedures as are used to do a routine (single-step) TST.

Table 4.3: Schedule for two-step tuberculin skin testing

Visit	Task
Visit 1	○ Administer first TST.
Visit 2 **48 to 72 hours after first TST**	○ Read, measure and document TST result. ○ **If there is less than 10mm** induration at test site, arrange for client to return in **7 to 28 days** for second TST. ○ **If there is 10mm or more** of induration at test site, follow-up TST result as per **TB Testing Flowchart** (see **Section 3-General TB Assessment**). **DO NOT recall for second TST.**
Visit 3 **7 to 28 days after first TST**	If initial TST result was less than 10mm: ○ Administer TST on arm that was **not used** for first TST. ○ Document which arm should be inspected when client returns to have TST read. **NOTE:** Live virus vaccines can be administered on the **SAME DAY** as the **SECOND** TST (if a live vaccine has not been given in the last four weeks).
Visit 4 **48 to 72 hours after second TST**	○ Read, measure and document the result from the second TST. ○ Follow-up TST result as per **TB Testing Flowchart** (see **Section 3: General TB Assessment**).