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For more information about administering, interpreting, and managing a Tuberculin Skin Test (TST), contact the Health Unit.


myhealthunit.ca
705-474-1400 or 1-800-563-2808
Active TB:
Tuberculosis (TB) is an infection with *Mycobacterium tuberculosis* acquired by inhalation of bacilli-containing droplet nuclei small enough to reach the alveoli. Most individuals’ immune systems are able to eradicate the bacteria while others replicate it and develop TB infection. Active TB is defined as disease in a person with infection in whom symptoms, signs, and/or radiographic evidence caused by *M. tuberculosis* complex are apparent; disease may be pulmonary, extrapulmonary, or both. Infectious tuberculosis refers to tuberculosis disease of the lungs or larynx in a person who has the potential to transmit the infection to other people.

Transmission of *M. tuberculosis* occurs mostly via droplet nuclei which can then be inhaled by those who are exposed. For this reason, only those with active pulmonary and/or laryngeal TB are likely to be contagious. The probability of transmission increases with bacterial burden, amount and severity of cough in the source case, duration of exposure, proximity to source case, crowding and room ventilation and delays in diagnosis and/or effective treatment.

Symptoms include a chronic cough of at least 2 weeks duration. It is initially dry but after several weeks to months will become productive. Fever and night sweats are common but may be absent from the very young and elderly. Hemoptysis, anorexia, weight loss, chest pain and other symptoms are general manifestations of advanced disease.

Latent Tuberculosis Infection (LTBI):
The bacteria *M. tuberculosis* is present in the lungs, but can survive for years in a dormant state. A person with LTBI does not have active disease, is asymptomatic, and not contagious. LTBI can develop into active disease at any time. Identification and treatment of LTBI can substantially reduce the risk of development of active TB.

There are two acceptable tests for identification of LTBI: the Tuberculin skin test (TST) and the Interferon Gamma Release Assay (IGRA). For specific information on IGRA testing refer to Chapter 4 of the Canadian Tuberculosis Standards, 7th edition (2013) or contact the health unit.

Indications for LTBI Testing
The goal of testing for LTBI is to identify individuals who are at increased risk for the development of active TB and therefore would benefit from treatment of latent TB infection.

Screening for LTBI should be undertaken only when there is a commitment to treat should the test results be positive.
The selection of people for targeted LTBI screening and treatment is based on their risk of prior TB exposure and their risk of reactivation, balanced against the likelihood of safe completion of treatment, including the risk of hepatotoxicity, which increases with age.

The decision to treat LTBI should be individualized, with consideration of the risks of therapy from adverse events, such as hepatotoxicity, balanced against the risk of development of active disease.

Before treatment of LTBI is started, active disease must be carefully excluded by assessment for symptoms suggestive of possible active TB, risk factors for TB such as contact history or other medical illnesses as well as chest radiography. If results are not definitive and/or client is high-risk, consider further testing such as sputum x 3 for acid-fast bacilli (AFB) smear and culture or consultation with a TB specialist. If symptomatic and/or an abnormal chest x-ray, collect sputum x 3 for AFB smear and culture.

A person should have a TST where the test is planned to be repeated later for serial testing (e.g. health care workers or other populations with potential ongoing exposure). Refer to Chapter 13 of the Canadian Tuberculosis Standards, 7th edition (2013), for more specific information on targeted LTBI testing.
Groups with increased risk of TB exposure and LTBI:

- Close contacts of an active case of pulmonary TB
- Immigrants from countries with high TB incidence (Adults who lived >20 years in a country with high TB incidence are at highest risk)
- Travellers to countries with high TB incidence (For international TB rates by country see http://phac-aspc.gc.ca/tbpc-latb/itir-eng.php)
- Injection drug users
- Homeless
- HIV positive persons
- Aboriginal communities (including adults and children)
- Health care workers (refer to organization policy)
- Residents of long-term care facilities (see TB Screening Recommendations for LTCHs at http://myhealthunit.ca)
- Residents of correctional facilities – Refer to Chapter 15 in the Canadian TB Standards, 7th edition (2013) for more detail

Targeted screening is not recommended for Canadian-born, non-Aboriginal children or adults including Canadian-born, non-Aboriginal adults who have or have not had BCG vaccination.
The TST consists of the intradermal injection of a small amount of purified protein derivative (PPD) from *M. tuberculosis* bacteria. In a person who has cell-mediated immunity to these tuberculin antigens, a delayed hypersensitivity reaction will occur within 48 to 72 hours. The reaction will cause localized swelling and will manifest as induration of the skin at the injection site.

The TST is NOT used to diagnose active TB disease in adults.

**Two-step tuberculin skin testing**

A 2-step skin test is performing two TSTs, one to four weeks apart, when there is no previously documented 2-step TST. In some people infected with *M. tuberculosis*, the reaction to the tuberculin may wane over time. In those cases, a one-step TST may produce a false negative result. However, the first TST can stimulate the immune system, resulting in a positive or “boosted” reaction to subsequent tests. A second TST, performed one to four weeks later, will reduce the chance that a “boosted” reaction will be misinterpreted as a recent infection, if exposure occurs at a later date.

The 2-step TST needs to be performed only ONCE if properly documented. Any subsequent TST can be one-step, regardless of how long it has been since the last TST.

A second test should be performed 1 – 4 weeks after the first test using the same materials and techniques to administer and read the TST.

**Indications for a 2-step TST**

A 2-step TST should be performed if subsequent TSTs will be conducted at regular intervals or after exposure to an infectious TB case (i.e. health care or correctional employees).
Tuberculin Skin Testing

Do NOT give a TST to someone who has:

- Previous positive TST
- Severe blistering TST reactions in the past
- Extensive burns or eczema present over TST testing sites
- Documented active TB or a well-documented history of adequate treatment for TB infection or disease in the past

Defer a TST when someone has:

- A current major viral infection (e.g. measles, mumps, varicella) until resolved
- Received live virus immunization within the past 4 weeks (e.g. measles, mumps, rubella, varicella, yellow fever, cholera, typhus)

NOTE: If the opportunity to perform TST might be missed, TST should not be delayed for live virus vaccines. TST may be administered before or on the same day as the immunizations but at a different site.

If administering a 2-step TST and a live vaccine, the live vaccine must be given at the time of the second step.

There is no contraindication for those who:

- Are pregnant or breastfeeding
- Have history of receiving a Bacille Calmette-Guerin (BCG) vaccine
- Have undocumented history of past positive TST
- Are taking low doses of systemic corticosteroids (<15 mg prednisone or equivalent daily)
- Have a common cold
- Are immunized with any vaccine on the same day
- Were immunized within the previous 4 weeks with vaccines other than live virus vaccines

Steps to conducting a TST:

1. Administer
2. Read
3A. Interpret a Negative TST
3B. Interpret and Manage a Positive TST
Step 1: Administer

**LOCATE & CLEAN**
- Use inner aspect of forearm, 10 cm (4 inches) below elbow preferably on the non-dominant arm
- Avoid areas with abrasions, swelling, visible veins, lesions, rash, eczema or tattoos
- Clean area with alcohol and air dry
- Do not use EMLA® or other local anesthetic cream on area being tested

**PREPARE**
- Tubersol® 5 tuberculin units (5-TU) of PPD-S (purified protein derivative-standard) is recommended in Canada. An open vial of Tubersol® should be labelled with the date it is opened and discarded after 30 days
- Check expiry date
- Use a tuberculin syringe with a 0.6 - 1.3 cm (1/4 - 1/2 inch) 26 or 27 gauge needle
- Draw up solution just prior to injecting it. Do not preload syringes
- Withdraw a little more than 0.1 mL of tuberculin solution from vial under aseptic conditions. Expel one drop and ensure that 0.1 mL remains in syringe
- PPD should be stored in the dark except when doses are actually being withdrawn from the vial.

**INJECT**
- Hold skin taut. With bevel up, insert needle intradermally at a 5 - 15 degree angle to the skin. The tip of the needle will be visible just below the surface of the skin. Insert the needle until the entire bevel is covered. Do not aspirate
- Inject tuberculin slowly
- A 6 - 10 mm wheal (small, bubbled area) will form
- The size of the wheal is not completely reliable, but if a lot of liquid runs out and there is no wheal, then repeat the injection on the opposite forearm or 5 cm away from the initial injection site on the same forearm
- A drop of blood is normal. Do not massage area

**TEACH CLIENT**
- Do not cover with bandage
- Do not scratch site
- Perform all normal activities including showering/bathing but do not scrub area
- Wheal often disappears within 15 minutes
- Client must return 48 - 72 hours after administration for reading by a health care professional

**The TST will have to be repeated if not read within 48 - 72 hours after administration.**

**DOCUMENT**
- Date and time test administered
- Specific location of injection
- Tuberculin lot number, dose, route, and expiry date
- Signature of health care professional
- Next appointment for client (48 - 72 hours)

Monitor client for 15 minutes post-injection in case of allergic reaction.

Although very rare, be prepared to manage anaphylaxis.
Step 2: Read

- A health care professional trained to read TSTs should read the test within 48 - 72 hours after administration
- If not read within 48 - 72 hours, repeat TST at an injection site far enough from that of the previous test that the reactions do not overlap or on the opposite arm. No minimum wait is required
- Do not allow reading by client or family member

**INSPECT**
- Look for induration - a hard, dense, raised formation

**PALPATE**
- Use fingertips to feel the margins of the induration, if present

**MARK**
- To mark the border of the induration, move the tip of a pen at a 45 degree angle laterally toward the site of the injection

- The tip will stop at the edge of the induration, if present
- Repeat this on the opposite side of the induration

**MEASURE**
- Use a caliper (TB ruler) to measure the distance between the pen marks at the widest transverse diameter (at a right angle to the long axis of the forearm)

- Measure induration in millimetres (mm)
- If the measurement falls between demarcations on the ruler, record the lower measurement
- Do not round off the diameter of the induration to the nearest 5 mm
- If no induration, record “0 mm”
- **Do NOT measure erythema.** Redness does not indicate TB infection and is not a contraindication to future TSTs

**RECORD**
- Date induration is read
- Measurement of the induration, if any, in millimetres (mm)
- Do not record only as “positive” or “negative” or “reactive” or “non-reactive” – induration in mm must be documented
- Document any adverse reactions (e.g. blistering)
- Signature of the health care professional reading the test
- Provide a record of TST result to individual tested
False-negative reactions can be caused by technical or biologic reasons. Consider the following:

TECHNICAL
Improper storage (exposure to light or heat), contamination of Tubersol®, improper administration of TST, and inexperienced/biased reading or recording error.

BIOLOGIC
Infections:
- Active TB (especially if advanced)
- Other bacterial infection (typhoid fever, brucellosis, typhus, leprosy, pertussis)
- HIV infection (especially if CD4 count <200)
- Other viral infection (measles, mumps, varicella)
- Fungal infection (South American blastomycosis)

Live virus vaccination:
- e.g. measles, mumps, rubella, varicella, yellow fever, cholera, typhus

Immunosuppressive drugs:
- corticosteroids, tumour necrosis factor (TNF) alpha inhibitors, and others

Metabolic disease:
- chronic renal failure, severe malnutrition, stress (surgery, burns)

Diseases of lymphoid organs:
- lymphoma, chronic lymphocytic leukemia, sarcoidosis

Age:
- infants <6 months, the elderly

Management of a positive TST should occur in 2 distinct steps:

1. **DECIDE THAT A TST IS POSITIVE**
   - Decide whether TST is positive by using criteria in Table 1 (located under the “Dimension 1” tab)
   - If a TST is considered positive, the individual should be referred for medical evaluation

2. **MEDICAL EVALUATION**
   - Include assessment for symptoms suggestive of possible active TB, risk factors for TB such as contact history or other medical illnesses as well as chest radiography. If results are not definitive and/or client is high-risk, consider further testing such as sputum x 3 for AFB smear and culture or consultation with a TB specialist. If symptomatic and/or an abnormal chest x-ray, collect sputum x 3 for AFB smear and culture
   - In those without evidence of active TB, a recommendation should be made regarding therapy for LTBI, based on interpretation of the TST (see interpreting the TST tab)

**INTERPRETATION OF A POSITIVE TST**
Interpreting a positive TST must take into account the following three dimensions:
1. Size of induration
2. Positive predictive value
3. Risk of disease if the person is truly infected

**LTBI and active/suspect cases of TB are reportable to the health unit.**
For more information about administering, interpreting and managing a Tuberculin Skin Test (TST) contact the Health Unit.
### Table 1

**Interpretation of TST results**

<table>
<thead>
<tr>
<th>TST result</th>
<th>Situation in which reaction is considered positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 mm</td>
<td>Child under 5 years of age and high risk of TB infection</td>
</tr>
<tr>
<td>≥5 mm</td>
<td>HIV infection</td>
</tr>
<tr>
<td></td>
<td>Contact with infectious TB case within past 2 years</td>
</tr>
<tr>
<td></td>
<td>Presence of Fibronodular disease on chest x-ray (healed TB, and not previously treated)</td>
</tr>
<tr>
<td></td>
<td>Organ transplantation (related to immune suppressant therapy)</td>
</tr>
<tr>
<td></td>
<td>Tumour Necrosis Factor (TNF) alpha inhibitors</td>
</tr>
<tr>
<td></td>
<td>Other immunosuppressive drugs, e.g. corticosteroids (equivalent of &gt;15 mg/day of prednisone for 1 month or more; risk of TB disease increases with higher dose and longer duration)</td>
</tr>
<tr>
<td></td>
<td>End-stage renal disease</td>
</tr>
<tr>
<td>≥10 mm</td>
<td>TST conversion (within 2 years)</td>
</tr>
<tr>
<td></td>
<td>Diabetes, malnutrition (&lt;90% ideal body weight), cigarette smoking, daily alcohol consumption (≥3 drinks/day)</td>
</tr>
<tr>
<td></td>
<td>Silicosis</td>
</tr>
<tr>
<td></td>
<td>Hematologic malignancies (leukemia, lymphoma) and certain carcinomas (e.g. head and neck)</td>
</tr>
</tbody>
</table>
Second Dimension: Positive Predictive Value

The positive predictive value of the TST is the probability that a positive test result represents the true presence of TB infection. Consider the following factors:

- Low risk of TB infection e.g. no known exposure to active TB, no other risk factors, Canadian-born non-aboriginal, or immigrant/visitor from a country with low TB incidence
- Previous exposure to nontuberculosis mycobacteria (NTM), frequently found in parts of the world with tropical, subtropical or warm, temperate climates. The antigens of NTM are similar to those of *M. tuberculosis* and may cause small tuberculin reactions, most of 5 - 9 mm and some of 10 - 14 mm, although almost none of 15+ mm. In most of Canada, sensitivity to NTM antigens is uncommon and is not an important cause of TST reactions of 10 mm or greater
- Previous BCG vaccine

BCG vaccination can be ignored as a cause of a positive TST under the following circumstances:
- BCG vaccination was given in infancy and the person tested is now 10 years or older
- there is a high probability of TB infection: close contact of an infectious case, Aboriginal Canadians from a high-risk community or immigrants/visitors from a country with a high TB incidence
- there is a high risk of progression from TB infection to disease

BCG should be considered the likely cause of a positive TST under the following circumstances:
- BCG vaccine was given after 12 months of age AND
- there has been no known exposure to active TB disease or other risk factors AND
- the person is either Canadian-born non-aboriginal OR
- an immigrant/visitor from a country with a low TB incidence

Adapted from Canadian Tuberculosis Standards 7th ed., 2013.

Third Dimension: Risk Factors for Development of Active TB Disease

After primary TB infection, the lifetime cumulative risk for the development of active TB is generally estimated to be 10%. Half of these cases will occur in the first 2 years after infection. Those at increased risk of reactivation are listed in Table 2.

Table 2
Risk factors for developing active TB for those infected with *Mycobacterium tuberculosis*

<table>
<thead>
<tr>
<th>High Risk</th>
<th>Moderate Risk</th>
<th>Slightly Increased Risk</th>
<th>Low Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquired immunodeficiency syndrome</td>
<td>Tumour necrosis factor alpha inhibitors</td>
<td>Heavy alcohol consumption (≥3 drinks/day)</td>
<td>Person with positive TST, no known risk factor, normal chest x-ray (“low risk reactor”)</td>
</tr>
<tr>
<td>Human immunodeficiency virus infection</td>
<td>Diabetes mellitus (all types)</td>
<td>Underweight (&lt;90% ideal body weight; for most people, this is a body mass index &lt;20)</td>
<td>Person with positive two-step TST (booster), no other known risk factor and normal chest x-ray</td>
</tr>
<tr>
<td>Transplantation (related to immune suppressant therapy)</td>
<td>Treatment with glucocorticoids (≥15 mg/day prednisone)</td>
<td>Cigarette smoker (1 pack/day)</td>
<td></td>
</tr>
<tr>
<td>Silicosis</td>
<td>Young age when infected (0 - 4 years)</td>
<td>Abnormal chest x-ray-granuloma</td>
<td></td>
</tr>
<tr>
<td>Chronic renal failure requiring hemodialysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carcinoma of head and neck</td>
<td></td>
<td></td>
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<tr>
<td>Recent TB infection (&lt;2 years)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Abnormal chest x-ray-Fibronodular disease</td>
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</tbody>
</table>

The online TST/IGRA Interpreter interactive algorithm tstin3d.com/index.html incorporates all three dimensions discussed above. *Its use is highly recommended when deciding on LTBI treatment.*
Resources

Canadian Sources

Canadian Lung Association: http://lung.ca/home-accueil_e.php


Public Health Agency of Canada: http://publichealth.gc.ca/tuberculosis


Stop TB Canada: http://stoptb.ca/index.shtml

The Online TST/IGRA Interpreter: http://tstin3d.com/index.html

U.S. Sources

Centers for Disease Control and Prevention: http://cdc.gov/tb/


International Sources

Stop TB Partnership/World Health Organization (WHO): http://stoptb.org/


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