3. TUBERCULOSIS (TB)

Cause/Epidemiology
Tuberculosis (TB) is an infectious disease caused by the bacteria, *Mycobacterium tuberculosis*. *Mycobacterium tuberculosis* requires special stain techniques to be seen by microscopic examination. The organisms are called acid fast organisms and are rod shaped.

Worldwide, more people die of TB than of any other infectious disease, including malaria and acquired immune deficiency syndrome (AIDS). TB has increased incidence in developing countries.

Some groups at high risk of acquiring TB (randomly listed):
- Persons living with individuals diagnosed with active tuberculosis
- Persons who have previously had active tuberculosis but received inadequate chemotherapy
- Immigrants from countries in Asia, Eastern Europe, Africa, and Latin America where tuberculosis is still common
- The urban poor
- First Nations persons
- Elderly persons
- Immunocompromised patients (e.g., HIV, diabetes, alcoholism, end stage renal disease, patients on immunosuppressive drugs)
- Staff and inmates of correctional institutions
- Pre-school and school children in high-risk communities
- Healthcare workers

Strategies are necessary to prevent the transmission of TB. These include:
- Early identification of infectious cases
- Isolation of infectious cases and use of appropriate Infection Prevention and Control precautions
- Prompt initiation of adequate and appropriate therapy
- Investigation of source case including pediatrics

Manitoba Health Tuberculosis Case Definitions

Laboratory-Confirmed Case
Cases with Mycobacterium tuberculosis complex demonstrated on culture, specifically *M. tuberculosis*, M. africanum, M. canetti, M. caprae, M. microti, M. pinnipedii, or M. bovis (excluding M. bovis BCG strain). Laboratory confirmed cases can be further categorized into new or re-treatment cases (see below).

Clinically Confirmed Case
In the absence of culture proof, cases clinically compatible with active TB disease that have, for example:
- Chest x-ray changes compatible with active TB disease
• Active non-respiratory TB disease (e.g., meningeal, bone, kidney, peripheral lymph nodes, etc.)
• Pathologic or post-mortem evidence of active TB disease
• Favorable response to therapeutic trial of antituberculosis drugs

Clinically confirmed cases can be further categorized into new or re-treatment cases (see below).

**New Case**
No documented evidence or adequate history of previously active TB disease.

**Re-Treatment Case**
1. a) Documented evidence or adequate history of previously active TB disease which was declared “cured” or “treatment completed” by current standards, and
   b) At least six months have passed since the last day of previous treatment*; and
   c) Diagnosed with a subsequent episode of TB which meets the active TB case definition.
   OR
2. a) Documented evidence or adequate history of previously active TB disease which cannot be declared “cured” or “treatment completed” by current standards, and
   b) Inactive** for six months or longer after the last day of previous treatment, and
   c) Diagnosed with a subsequent episode of TB, which meets the active TB case definition.

*If less than six months have passed and the case was not previously reported in Canada, it is reportable as a re-treatment case.

**Inactivity for a respiratory TB case is defined as three respiratory specimens that are smear and culture negative for TB with three month duration of stability in serial chest radiographs or a six month duration of stability in serial chest radiographs. Inactivity for a non-respiratory TB case is to be documented bacteriologically, radiologically, and/or clinically as appropriate to the site of disease.

**Suspect (Probable) Case**
High index of suspicion of TB with commitment to treatment. For the purposes of determining if a TB contact investigation should be considered, a “suspect (probable) case” of TB has been defined in Manitoba as a case where:
• Acid-fast bacilli (AFB) are observed in smear of respiratory or other clinical specimen; and that case is clinically compatible with infectious MTB disease.
   OR
• A physician who has expertise in the diagnosis of TB has concluded that there is reasonable probability the individual has infectious MTB disease.
Clinical Presentation
TB may present as either an infection or as disease. TB disease most commonly presents as a respiratory infection. However, it can also present in any system of the body. Signs and symptoms will depend on the site of the disease.

TB Infection
Latent TB Infection (LTBI)
People who have LTBI do not have active disease, are asymptomatic, and cannot spread TB to other people. In persons with LTBI the chest radiograph is usually normal. These latent infections are not infectious and the organism cannot be transmitted. Approximately 10% of non-immunocompromised individuals with latent infection, if untreated, will progress to active TB disease.

TB Disease
Respiratory TB
Refers to TB disease occurring in the lung parenchyma. Symptoms can include anorexia, chest pain, hoarseness, unexplained weight loss, weakness, cough lasting greater than three weeks, fatigue, malaise, night sweats, and low-grade fever. Cases may have a productive cough. Hemoptysis may occur. However, up to 50% of those with smear negative culture positive respiratory TB have no symptoms. Diagnosis can be confirmed by examination of sputum by microscopy (AFB smear) and culture. However, some cases of TB are diagnosed clinically, in the absence of microbiologic confirmation.

Laryngeal TB
This is a form of respiratory TB that involves the larynx. Ulceration of the vocal cords and laryngeal mucosa occurs. Symptoms commonly include hoarseness, cough, pain on swallowing and hemoptysis. Most commonly, these individuals are smear positive and culture positive, however, they may have sputum that is smear negative and culture positive. Despite the fact their sputum may be smear negative, these individuals are considered highly infectious.

Non-Respiratory Tuberculosis
Refers to TB disease outside the lungs, airway, or larynx. The most common form of non-respiratory TB occurs in the lymph nodes. It can also be found in gastrointestinal, genitourinary, musculoskeletal and CNS systems of the body. People with non-respiratory TB may feel sick or weak, lose weight, and have fever and night sweats. In addition, they may have symptoms related to the affected area.

Patients with non-respiratory TB disease should be considered suspect for respiratory TB and placed on Airborne Precautions until related respiratory disease is excluded using the criteria outlined for discontinuation of Airborne Precautions for suspected infectious TB.

Non-respiratory TB is not usually infectious unless there exists related:
- Respiratory TB
• Non-respiratory TB disease located in the oral cavity
• Non-respiratory TB disease in which aerosolization of fluid from an open abscess, lesion or drainage where the concentration of organisms is high

**Disseminated/Miliary TB (MTB)**
Refers to widespread dissemination of the disease when the MTB bacteria spreads throughout the body by way of the bloodstream and infects two or more sites within the body. Fever, chills, anorexia, weight loss, general discomfort, difficulty breathing and weakness may occur, often leading to delays or difficulty with diagnosis.

**TB Meningitis**
Refers to TB disease in the meninges of the brain. This is extremely serious and may be associated with devastating complications and/or death. The symptoms may include headaches, fever, meningismus, cranial nerve palsies, seizures and coma. The use of diagnostic Magnetic resonance imaging (MRI) is the most effective method of evaluation.

**Human Immunodeficiency Virus (HIV) Patients with MTB**
Refers to individuals co-infected with MTB and HIV. Where the immunity is impaired as in HIV infection; there is higher risk of progression from TB infection to disease. There is a significantly greater risk of developing TB disease when there is co-infection of HIV and MTB.

**Multidrug-Resistant (MDR) MTB**
A patient with multidrug-resistant MTB bacteria is resistant to at least Isoniazid (INH) and Rifampin, with or without resistance to other first or second-line anti-tuberculosis drugs considered the most effective drugs in the treatment of TB. There are three types of drug resistance: primary, acquired and initial.

- **Primary drug resistance:** when previously untreated patients are found to have drug-resistant organisms, presumably because they have been infected from an outside source of resistant bacilli.
- **Acquired drug resistance:** when patients who initially have drug susceptible tubercle bacilli later become drug-resistant as a result of inadequate, inappropriate, or irregular treatment. Non-adherence to drug regimen is a common cause.
- **Initial drug resistance:** when drug resistance occurs in patients who deny previous chemotherapy but whose prior drug use history cannot be verified. It consists of true primary resistance and an unknown amount of undisclosed acquired resistance.

Any case of TB can become resistant by misuse of the drugs. These cases present a problem in management, therefore early suspicion of this possibility is important.

**Extensive Drug Resistant TB (XDR-TB)**
A patient with Extensive or Extreme Drug Resistance; is described as having TB resistant to INH and Rifampin, as well as any fluoroquinolone (e.g., moxifloxacin) and at least one of the three injectable second-line drugs (e.g., Amikacin).
Patients with XDR-TB or MDR-TB must remain on Airborne Precautions during their entire hospitalization or until three negative sputum cultures have been obtained because of potential severity of consequences of transmission.

Incubation Period and Period of Communicability
The incubation period for infection is 4 to 12 weeks. The risk of progression to TB disease is greatest within the first two years after infection. TB may exist for an individual’s lifetime as a latent infection (LTBI).

TB is infectious as long as live tubercle bacilli are being dispersed in the sputum or aerosolized fluid. Untreated or inadequately treated persons may be infectious for a prolonged period of time. In general, non-respiratory TB is not communicable. Young children, under 10 years, with active respiratory TB are often not infectious because their cough is inefficient in expelling bacilli.

A number of variables influence the length of time an individual remains infectious:
- Initial level of infectivity
- Level of competence of the patient’s immune response
- Duration and efficacy of, and adherence to TB therapy

Transmission
*Mycobacterium tuberculosis* is carried in airborne particles, called ‘droplet nuclei’. Droplet nuclei are microscopic particles dispersed when a person with respiratory TB sneezes, coughs, speaks, shouts, or sings. For persons with non-respiratory TB, droplet nuclei can be expelled when aerosol generating procedures are done such as irrigation of an abscess containing *M. tuberculosis*. Droplet nuclei are so small (1 – 5 microns), normal air currents keep them airborne and can spread them throughout a building. Droplet nuclei containing *M. tuberculosis* settle slowly and may remain suspended in the air for hours, particularly in locations without proper negative pressure ventilation. Fomites, e.g., furniture, food utensils, contaminated with MTB bacteria do not constitute an infection risk.

Acquisition of *M. tuberculosis* is most likely to result from exposure to persons who have:
- Unsuspected/undiagnosed respiratory TB disease and are not receiving anti-TB therapy
- Diagnosed TB disease receiving inadequate therapy, or
- Diagnosed TB disease early in the course of effective therapy

Patients who have sputum that is AFB smear positive and MTB culture positive are most infectious. Patients who have sputum that is AFB smear negative culture positive are still infectious to others. Respiratory TB should be carefully considered in a patient with negative smear results who presents with highly suspicious clinical findings and chest x-ray results. These patients must be assessed on a case-by-case basis.
Transmission of respiratory tuberculosis is mainly by inhalation (airborne) of *Mycobacterium tuberculosis* bacteria. Transmission usually requires close, frequent and prolonged exposure to a person with active respiratory TB.

Transmission may also occur from non-respiratory TB when infected fluid, e.g., fluid from draining abscesses, becomes aerosolized, such as during wound/abscess irrigation. Patients with non-respiratory TB with no evidence of respiratory disease are rarely infectious.

The absolute risk of TB transmission occurring under any given circumstance is impossible to predict. However, there are some factors that appear to increase the likelihood of transmission from person-to-person. These include:

- Infectiousness of the case
  - Respiratory tract disease with involvement of the lung, or airway including larynx
  - Cavitary lesions on chest x-ray
  - Number of acid-fast bacilli in sputum (positive AFB smear)
  - Frequency and strength of cough
  - Undergoing cough – inducing or aerosol-generating procedures (e.g., sputum induction, bronchoscopy, airway suction)

- Virulence of the strain of *M. tuberculosis* involved

- Environmental factors
  - Dilution effect (volume of air)
  - Ventilation air exchanges in room per hour
  - Proximity of person who is exposed
  - Duration and frequency of exposure to the infectious particles

- Susceptibility of the person who is exposed
  - Innate/genetic resistance or susceptibility to *M. tuberculosis* infection, disease, or both

Once an individual has become infected, factors influencing the risk of progression from infection to disease include:

1. Host characteristics – Susceptibility/resistance due to genetic factors, disease states, chemotherapy, age, behavioral factors, immune competence and lifestyle.
2. Organism Characteristics – The number of organisms transmitted and the virulence of the strain.

A high index of suspicion for active TB and rapid implementation of Airborne Precautions are essential to preventing and interrupting transmission.
Airborne Precautions

Notification of Infection Prevention and Control
TB Infection Prevention and Control (pager # 932-1172) is to be notified by Physician/Bed Utilization/Unit Staff of:

- Any patients placed on Airborne Precautions
- Any patients admitted for investigation of tuberculosis
- Any patients admitted for treatment of tuberculosis
- Any discontinuation of Airborne Precautions

Screening and Initiation of Airborne Precautions
A major risk of TB transmission involves undiagnosed or unsuspected patients with infectious TB. A high index of suspicion for active TB and rapid implementation of Airborne Precautions are essential to preventing and interrupting transmission.

Place all patients with suspected or confirmed infectious active TB on Airborne Precautions until they are determined to be non-infectious.

Prompt identification, isolation, and management of persons with suspected or confirmed infectious TB should be implemented and enforced. This will reduce the risk of transmission of TB to healthcare workers, patients, visitors, volunteers, and others in the facility.

The presence of any (or all) of the following signs/symptoms should prompt consideration of a diagnosis of active respiratory TB disease:

- Cough for $\geq 3$ weeks
- Unexplained weight loss
- Night sweats
- Bloody sputum or hemoptysis
- Unexplained loss of appetite
- Hoarseness
- Fever
- Fatigue
- Chest pain

Discontinuation of Airborne Precautions
Airborne Precautions may only be discontinued by the attending Physician and/or Infection Prevention and Control.

Criteria for Discontinuation of Airborne Precautions for:

- Low index of suspicion for Infectious Tuberculosis:
  Airborne Precautions may be discontinued when the diagnosis of active respiratory TB is considered unlikely and where a minimum of two of the following three apply:
  1. There are no findings on the patient’s chest x-ray indicating active respiratory TB.
2. The patient has two negative AFB sputum smear results where the specimens were collected at least 8 – 24 hours apart with at least one specimen obtained in the early morning.

3. An alternative diagnosis has been made by a physician who has expertise in the diagnosis of TB and has concluded that there is reasonable probability the patient DOES NOT have infectious MTB disease.

Criteria for Discontinuation of Airborne Precautions for:
- Suspected Active Respiratory Tuberculosis
- Confirmed Active Respiratory Tuberculosis
- Clinically Confirmed Case

If the patient diagnosed with suspected or confirmed active respiratory TB was AFB sputum smear positive on admission to facility, Airborne Precautions may be discontinued when all of the following criteria are met:
- Three sputum specimens obtained on consecutive days (at least one must be an early morning specimen) are negative for AFB
- The patient has had a minimum of 14 days of anti-tuberculin treatment
- There is evidence of clinical improvement
- The prescribed medication regimen was appropriate
- There is reasonable evidence of adherence to the treatment regimen

If the patient diagnosed with suspected or confirmed active respiratory TB was AFB sputum smear negative with MTB culture pending or positive via three sputum samples on admission to facility, Airborne Precautions may be discontinued when all of the following criteria are met:
- There is evidence of clinical improvement
- The patient has had a minimum of 14 days of anti-tuberculin treatment
- The prescribed medication regimen was appropriate
- There is reasonable evidence of adherence to the treatment regimen

The prescribed medication regimen is considered appropriate when drug susceptibility tests have determined the treatment is the appropriate regimen, or in the event drug susceptibility tests are not yet available, the risk of drug resistance is considered to be very low.

Confirmed Multidrug-resistant or Extensive Drug Resistant Tuberculosis
Multidrug-resistant TB (MDR-TB) is defined by Manitoba Health as strains resistant to both Isoniazid and Rifampin. Extensively drug resistant TB (XDR-TB) is defined by Manitoba Health as TB resistant to Isoniazid and Rifampin as well as some “second-line” TB medications, specifically any fluoroquinolone and at least one of three injectable “second-line” medications for the treatment of TB (e.g., Amikacin).

Patients with MDR-TB or XDR-TB remain on Airborne Precautions their entire hospitalization or until three negative sputum cultures have been obtained.
Non-Respiratory Tuberculosis
Non-Respiratory TB refers to TB disease outside the lungs, airway, or larynx. Non-respiratory TB is not usually infectious unless there exists related:
- Respiratory TB
- Non-respiratory TB disease located in the oral cavity
- Non-respiratory TB disease in which aerosolization of fluid from an open abscess, lesion or drainage where the concentration of organisms is high

Patients diagnosed with suspected or active non-respiratory TB are to remain on Airborne Precautions until:
- Respiratory TB has been excluded; AND
- There are no open lesions/abscess within the oral cavity
- The affected site has no drains in situ
- There is no risk of aerosolization of affected site drainage

Diagnosis of Tuberculosis Disease
The approach to the diagnosis of TB disease depends on several factors:
1. The site of the infection (respiratory or non-respiratory)
2. Differentiating active disease versus latent infection
3. Host characteristics
4. Host environment
5. Available resources (knowledgeable personnel and physical resources)

Patients whose clinical picture is suspicious of TB disease should be evaluated with appropriate clinical tests.

A diagnosis of confirmed TB disease will be based on the following factors:
- Epidemiological information
- Patient history
- Clinical presentation
- Radiological findings
- Microbiological results

The tuberculin skin test (TST) is not indicated as a diagnostic tool for active TB disease in adults.

Chest radiograph (chest x-ray)
The chest radiograph is one of the first steps in the evaluation of an individual with respiratory symptoms who is suspected of having respiratory TB disease.

Typical findings seen in adults who are not immunocompromised and who have respiratory TB disease include:
- **Location** – in 90% of adults with abnormal chest radiographs, the diseased portion of the lung is found in the apical posterior or superior segment of the lung. TB disease
can also present as pleural effusions and/or lower or middle lobe infiltrates and hilar lymphadenopathy.

- **Volume loss** – a classic finding in tuberculosis disease because of the destructive and fibrotic nature of the infection.
- **Cavitation** – seen at a later stage in the disease process and depends upon the host’s ability to mount a vigorous immune response. Therefore, cavitation may not be seen in immunocompromised individuals.

Other possible features: hilar and mediastinal lymphadenopathy (common in individuals with HIV). Additionally, non-cavitary infiltrates and lower lobe involvement may be seen in the immunocompromised (e.g., renal failure, diabetes, HIV).

Radiographic findings associated with complications of the disease:

- Endobronchial spread, pleural effusion and pneumothorax may be seen individually or together in some patients.

The chest x-ray has limitations for the diagnosis of respiratory disease and is not conclusive for diagnosis. Other entities can produce abnormal chest x-rays such as pneumonia, lung cancer, or other respiratory conditions. Up to 10% of people with active respiratory TB disease have normal chest x-rays. Chest x-rays can also be difficult to interpret in children.

**Specimens**

It is important to obtain the appropriate specimens as soon as possible. All specimens should be collected in sterile leak-proof containers. Diagnostic specimens should be collected **before** anti-TB therapy has been initiated. The requisition must accompany the specimen and provide the patient’s demographic information, physician’s name, date and time of collection, and specimen number (i.e., sputum #1), type and site. If the patient is on anti-tuberculin medication this should also be indicated on the requisition.

**Specimen results must be evaluated in conjunction with all available patient data.**

**Sputum**

1. Three sputum specimens collected on consecutive days 8 – 24 hours apart is the standard.
2. Sputum specimens should contain 5 – 10ml of material.
3. Sputum should ideally be collected in the early morning, when the individual first awakens.
4. Immediate delivery to the lab is required to prevent bacterial overgrowth of the specimen.
5. Must be collected in an Airborne Infection Isolation room/negative pressure room or sputum induction booth with appropriate PPE.
6. State on the requisition the sputum is spontaneous, if the patient is on any medication and if this specimen is an initial or follow up sputum.
**Induced Sputum**
1. Induced sputum (usually performed by respiratory therapists) must be collected in an Airborne Infection Isolation room/negative pressure room or sputum induction booth with appropriate PPE.
2. The patient must stay in the Airborne Infection Isolation room/negative pressure room or sputum induction booth until most of the coughing has ceased (usually 20 – 30 minutes post saline administration).
3. Induced sputum is collected using large volumes of aerosolized hypertonic saline (30 – 40ml).
4. State on the requisition the sputum is induced, if the patient is on any medication and if this specimen is an initial or follow up sputum.
5. The patient is NOT required to be Nothing by Mouth (NPO) prior to this procedure.

**Bronchoscopy**
Bronchoscopy may be used to obtain respiratory specimens when patients are unable to spontaneously produce reliable sputum or induced sputum is unavailable. It is also used to rule out other diagnoses, e.g., cancer.

When mycobacteria are found in the bronchoscopy specimen it means the patient is infected with a mycobacterium; further testing is needed to identify whether it is MTB. If no mycobacteria are seen on the bronchoscopy specimen, it does not necessarily mean mycobacterial infection has been ruled out. Bronchoscopy procedures are only successful at identifying approximately 77% of patients who actually have respiratory mycobacterial infection. It is not recommended to rely on the result of one bronchoscopy procedure. When performing bronchoscopy, additional specimens must be collected. A minimum of three separate specimens (any combination of: induced sputum, spontaneous sputum, bronchoscopy, post bronchoscopy sputum, or gastric aspirate) must be obtained. The results of bronchoscopy must be evaluated in conjunction with all available patient data.

**Gastric Aspirate**
This technique may be used to collect a specimen for Mycobacterium analysis in patients who cannot expectorate sputum but can swallow. The likelihood of a positive test result is higher in children less than two years old than in children between the ages of 2 – 12 years. In adults, studies show 36 – 80% of gastric aspirate results are smear positive, and 12 – 50% are culture positive. Gastric aspirates are known to be low yielding specimens and although widely used in children should only be used for adults when there are no other viable options.

1. Must be performed immediately upon the patient awakening from a long sleep, at least six hours after ingestion of food or liquid, and before the stomach has emptied. Avoid exposure to the sight and/or smell of food as this may encourage gastric emptying.
2. Three early morning specimens on three consecutive days are required.
3. A nasogastric tube is inserted into the stomach and the contents are aspirated into a sterile specimen collection container. If there are no returns then small quantities of sterile water (20 – 50ml) can be instilled and aspirated after at least 10 – 15 minutes. The specimen cannot wait for processing for more than four hours because acid damages the mycobacteria. Upon collection the specimen must arrive at the laboratory within one hour to allow sufficient time for the lab to buffer the specimen, thereby mitigating any acid damage. Refer to your facility procedure guideline prior to performing a gastric aspirate.

4. State on the requisition the specimen is a gastric aspirate, if the patient is on any medication and if this specimen is an initial or a follow up.

Urine
When urine for mycobacterium is ordered three consecutive early morning (first voiding) 40ml specimens are required. Samples should be collected in a sterile specimen container using a mid-stream urine technique. Twenty-four hour urine collections are not suitable for culture because of the presence of overgrowth of other organisms making it difficult to identify *Mycobacterium tuberculosis*.

Body Fluids
Most normally sterile body fluids, e.g., cerebrospinal, pleural, peritoneal, pericardial, contain only small numbers of mycobacteria even in patients with symptomatic disease. As much fluid as possible should be collected to increase the likelihood of detection and decrease the possibility of having to recollect the specimens. For CSF, at least 5 – 10mls is preferred. Specimens should be delivered to the lab as soon as possible after collection.

Blood
The Quantiferon-TB Gold test (QFT) is a whole-blood test for detection of MTB infection, as occurs in active tuberculosis (TB) and latent tuberculosis (TB) infection (LTBI). The QFT measures the patient’s immune reactivity to MTB. This test offers an alternative to the tuberculin skin test. This test is not currently available in Manitoba.

Biopsies
Biopsy of infected tissue is often the most sensitive diagnostic procedure in non-respiratory TB disease. Specimens for *Mycobacterium tuberculosis* examination must **not** be placed in formalin. Biopsy tissue should be placed in a dry, sterile container without saline or with a very small amount of saline (less than 5ml), as large volumes of saline dilute the sample and make it more difficult to recover the mycobacteria.

**Microbiological Testing and Interpreting Results**
Mycobacteria are referred to as acid fast bacilli. The term acid fast comes from the special staining techniques (fluorochrome and carbol fuchsin) used in laboratories. The specimen is stained and washed with an alcohol-acid solution. Due to the unique chemical properties of mycobacteria, the original stain is retained by the organism, hence the term acid fast.
Success of identifying mycobacteria in the laboratory depends on several factors:
- Quality of the specimen (deep cough versus saliva)
- Handling and transport of the specimen to the laboratory
- Laboratory experience with working with mycobacteria

**Smear (Microscopic Examination)**
A positive AFB smear almost always means mycobacteria, but not necessarily MTB as other mycobacteria are also acid fast. Additional tests must be done to differentiate MTB from other non-tuberculosis mycobacteria. Even with these special staining techniques, microscopic examination may fail to identify between 20 – 80% of patients who have MTB disease.

The microbiology report reflects the number of AFB seen on examination of the stained smear. The more organisms seen the higher the number on the report and the more infectious the patient. For instance:
- >9 per field is 4+
- 1-9 per field is 3+
- 1-9 per 10 fields is 2+, and
- 1-9 per 100 fields is 1+

**Culture**
Presently, culturing mycobacteria is the most reliable method to identify patients with active MTB disease. In most situations a single positive culture for *M. tuberculosis* means a patient has active disease. Although the yield is high with culturing, mycobacteria grow slowly and can be difficult to grow. Detection of positive cultures can vary from 11 – 21 days or longer, depending on the organism load. Respiratory specimen (e.g., sputum, bronchoscopy) cultures are held for 6 weeks before identified/reported as negative for mycobacteria. Fluid and tissue specimen (e.g., lungs, pleural fluid) cultures are held for eight weeks, skin specimens are held for 12 weeks. Antimicrobial susceptibility testing is done on all *M. tuberculosis* cultures.

**Tuberculin Skin Test (TST)**
The standard for identifying *M. tuberculosis* infection is the tuberculin skin test (TST, Mantoux test) with tuberculin purified protein derivative (PPD). **This test is not helpful in the diagnosis of active TB** and can have a false negative result in advanced active disease and/or immunocompromised patients. Up to 25% of people with active TB disease will have an insignificant TST. Timing of the skin test is important and should allow for the incubation period of 4 – 12 weeks. In immunocompetent persons, an immune response is usually evident within eight weeks. A positive skin test does not prove the presence of active disease. A negative skin test does not prove the absence of active disease. A positive skin test indicates the patient was infected with TB at some time in the past. Further investigation is recommended for all individuals with a positive skin test (chest radiograph and three sputa) to rule out active TB disease.

The tuberculin skin test (TST) is performed to diagnose TB infection. Instances in which a TST is performed include:
- When in contact with a recently diagnosed patient with active infectious TB.
- For Occupational Health purposes (e.g., upon hire, contact tracing).

The two-step skin test should not be used as the baseline test for people who are recent contacts of an infectious active TB case. For post-exposure follow up of recent contacts, only one TST is required.

In contacts, any change from negative to positive must be considered a conversion and further investigation and treatment is required.

**TST Interpretation**

<table>
<thead>
<tr>
<th>TST size (mm)</th>
<th>Situations Where Reaction Size is Considered Significant</th>
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<tbody>
<tr>
<td>0-4</td>
<td>HIV infection, particularly those with immunosuppression AND expected likelihood of TB infection is high (e.g., client is from a population with a high prevalence of TB infection, is a close contact of an active contagious case, or has an abnormal chest x-ray)</td>
</tr>
<tr>
<td>5-9</td>
<td>HIV infection Close contact of an active infectious case Children suspected to have tuberculosis disease Abnormal chest x-ray with fibronodular disease ** Other immune suppression present (e.g., immunosuppressive medications)</td>
</tr>
<tr>
<td>(\geq 10)</td>
<td>All others</td>
</tr>
</tbody>
</table>

** If a previous chest x-ray is available and shows fibronodular disease, a TST of 5 – 9mm is considered significant. If no previous chest x-ray exists, a TST of 5 – 9mm would not prompt a chest x-ray on its own. Contacts should be informed there are different TST cut-offs, depending on past medical history and previous exposures; contacts may not wish to disclose the presence of a condition that would indicate a significant TST result.

**Conversion**

Defined as an induration of 10mm or greater when an earlier test resulted in a reaction of less than 5mm. If the earlier result was between 5 and 9mm, there are two criteria:
1. An increase of 6mm or more – For those who are immune compromised with increased risk of disease or for an outbreak.
2. An increase of 10mm or more – Following the principle the larger the increase the more likely it is due to true conversion.

**Cdn TB standards 6th edn**
Special Considerations

Maternal and Newborn

When patients with:

- suspected or confirmed active tuberculosis (TB) disease
- recent close contact to an infectious case of active TB disease;

are admitted as a perinatal inpatient or have scheduled outpatient appointments notify TB Infection Prevention and Control - pager # 932-1172.

Infants born to mothers:

- under investigation as a contact to a case of active TB disease; OR
- under investigation for probable (suspect) TB disease; OR
- under investigation for active TB disease

need to be managed according to one of the following categorization:

- Mother with low index of suspicion for TB disease and no abnormality on chest x-ray
- Mother with a chest x-ray abnormality consistent with active TB
- Mother with abnormal chest x-ray but no evidence of active disease
- Mother with confirmed or suspected active TB disease at or close to the time of delivery

1. **Mother with low index of suspicion for TB disease and no abnormality on chest x-ray:**
   - No special isolation precautions needed for mother
   - No special investigation or therapy for newborn required
   - Mother and newborn do not need to be separated
   - Mother may be offered treatment for LTBI if appropriate (e.g., recently infected; human immunodeficiency virus [HIV] co-infected)

2. **Mother with a chest x-ray abnormality consistent with active TB:**
   Infectious TB should be ruled out prior to delivery;
   - Obtain sputum for acid fast bacilli (AFB) X three samples prior to delivery, ideally three consecutive morning specimens 24 hours apart
   - Refer mother to Respirologist or Infectious disease Specialist with expertise in Tuberculosis prior to delivery
   - Refer newborn to Pediatric Respirologist prior to and upon delivery
   - If infectious TB is ruled out, delivery can occur as per routine

If chest x-ray abnormality is considered to be secondary to old, healed TB and mother not previously treated refer client for assessment to a Respirologist or Infectious Disease Specialist with expertise in Tuberculosis. Suggest priority screening of household members for active disease prior to delivery or as timely as possible.
If unable to rule out infectious TB prior to delivery, mother should be considered infectious, and care managed as outlined below in section 4 - “Mother with confirmed or suspected active TB disease at or close to the time of delivery.”

3. **Mother with abnormal chest x-ray but no evidence of active disease:**
   - Infectious TB should be ruled out prior to delivery;
   - Obtain sputum for acid fast bacilli (AFB) X three samples prior to delivery, ideally three consecutive morning specimens 24 hours apart
   - Refer mother to Respirologist or Infectious Disease Specialist with expertise in Tuberculosis prior to delivery
   - Refer newborn to Pediatric Respirologist prior to and upon delivery

If infectious TB is ruled out, delivery can occur as per routine.

If chest x-ray abnormality considered to be secondary to old, healed TB and mother not previously treated refer client for assessment to a Respirologist or Infectious Disease Specialist with expertise in Tuberculosis.

Suggest priority screening of household members for active disease prior to delivery or as timely as possible.

If unable to rule out infectious TB prior to delivery, mother should be considered infectious and care managed as outlined below in Section 4 - “Mother with confirmed or suspected active TB disease at or close to the time of delivery.”

4. **Mother with confirmed or suspected active TB disease at or close to the time of delivery:**
   - If the mother is considered infectious or potentially infectious:
     - The mother should be placed on Airborne Precautions, in an airborne infection isolation room (AIIR)
     - Upon delivery, there should be immediate separation of mother and infant
     - Mother is to remain in AIIR as per discontinuation of Airborne Precautions
     - Newborn is to go to nursery – there is no requirement for Airborne Precautions for newborn

If mother has suspected or confirmed active TB disease (infectious or non-infectious) at the time of delivery, the newborn should be evaluated for congenital TB.

The care of the newborn should include the following:
- Notify Pediatric Respirology of impending delivery
- Notify Neonatology of impending delivery
- Placenta to be sent for physical examination and AFB
- Amniotic fluid (if available) to be sent for AFB
- Gastric aspirates for AFB X three (one upon delivery followed by two more on separate consecutive days)
- Chest x-ray (PA/LAT)
• CBC, Sed rate (ESR)
• Urine and stool for AFB
• Consider lumbar puncture
• Consider abdominal ultrasound

If the mother is not considered infectious, the mother and child do not require separation.

Offer HIV serologic testing of mother if not already done.

Suggest priority screening of household members for active disease prior to delivery or as timely as possible.

All visitors (both Mother and newborn) are to follow the WRHA “Cover your Cough” Protocol.

In the event of fetal demise the presence of congenital TB should be evaluated post mortem.

Special Considerations:
Administration of first-line TB medications INH, Rifampin and Ethambutol is considered safe during pregnancy and not an indication for termination of pregnancy. Recommendations for the general use of Pyrazinamide (PZA) during pregnancy cannot be made because of inadequate teratogenicity data.

Little is known about the safety of second-line agents during pregnancy. These drugs should only be considered for use in specific instances.

The advice of a TB expert should be sought in the diagnosis, treatment and management of active TB disease during pregnancy.

**Breast-Feeding**
• Mother may choose to use a breast pump until breastfeeding is deemed safe, consider referral to a lactation consultant. Pumped breast milk is safe to feed newborn.
• Mother should be encouraged to breastfeed; breastfeeding is not contraindicated once the mother is deemed no longer infectious, women receiving first-line TB drugs, including INH and Rifampin, may continue to breastfeed (Note – concentrations of drugs in breast milk are insufficient to protect fetus).
• Give supplementary pyridoxine (vitamin B6) to nursing mother receiving INH and to her child to prevent peripheral neuropathy.
**Children**

Airborne Precautions are required for suspected and confirmed cases of respiratory TB disease for:
- Age of 10 years and older
- Cough
- Cavitary respiratory TB
- Positive sputum AFB smears
- Laryngeal involvement

Maternal/child rooming in is not allowed if mother is the individual with active respiratory TB or caregivers have not been ruled out as having active TB disease. Parental rooming in is allowed if child has non-infectious MTB provided the parents/caregivers do not have MTB disease.

**Renal Insufficiency and End-Stage Renal Failure**

In patients with renal insufficiency and end-stage renal failure special consideration should be given to the following areas:
- Dosing of medications
- Drug interactions
- Drug side effects
- Difficulty with medication absorption
- Dialysis – timing of dosing

Patients with renal insufficiency and end-stage renal failure diagnosed with infectious respiratory TB will be placed on a medication regime which coincides with their hemodialysis schedule. Both Rifampin and INH are metabolized by the liver and are not dialyzed, dose adjustments are not necessary for either of these medications. The other two first-line medications, Ethambutol and Pyrazinamide (PZA) are dialyzed out so must be given following hemodialysis treatment. Patients on this anti-tuberculin regime are to follow the criteria for discontinuation for Airborne Precaution

**Persons with HIV infection**

1. Patient care should be provided in collaboration with an Infectious Diseases specialist with expertise in both tuberculosis and HIV management.
2. The patient should be asked about:
   - Which anti-retrovirals if any he or she is presently taking. The medications should be documented in the patient’s chart.
   - History of clinical care – clinicians involved in care, any medications presently being taken, recent blood work (e.g., CD4 cell count and viral load)
   - A Drug Program Information Network (DPIN) printout should be ordered to obtain a current listing of medications.
3. Special emphasis should be given to excluding non-respiratory TB, as this presentation is more common in cases of TB co-infected with HIV. Patients with HIV and respiratory TB may present with a normal chest x-ray and little or no cough.
Operating Room
Patients with suspected or confirmed tuberculosis deemed infectious require Airborne Precautions.

Only emergency or medically necessary surgery is performed on a patient with suspected or confirmed infectious tuberculosis disease. Elective operative procedures on patients with tuberculosis should be delayed until the patient is no longer infectious.

If at all possible, patients with infectious tuberculosis should be scheduled at the end of the day to limit risk to other patients and healthcare workers. Perform the procedure with a minimal number of personnel.

HEPA respirators or N95 respirators are indicated for all persons entering the OR room for respiratory protection.

The doors to the OR will be kept closed and the number of personnel allowed in the OR will be kept to a minimum.

Tuberculosis patients must be recovered in a negative pressure ventilation room and personnel will follow Airborne Precautions and wear N95 respirators. Patients should then be transported to a negative pressure ventilation room as soon as possible. The patient will have both nose and mouth covered with a regular surgical mask during transport.

Personnel performing environmental cleaning and disinfection in the room of a patient who has an infectious airborne disease must use a properly fit tested N95 mask complete air exchange has been achieved.

The period of time required for the ventilation system to achieve a 99.9% air exchange should be noted, for example 21 minutes for a 20 air exchanges per hour cycle. Access to the room should be restricted until the 99.9% air exchange has been completed.

Diseases Due to Other Mycobacteria
Mycobacterium other than *M. tuberculosis* may produce disease in humans and is usually non-infectious from person to person; therefore these types do not require Airborne Precautions.

These organisms are acid-fast bacilli like *M. tuberculosis* but are described as atypical, unclassified mycobacteria, non-tuberculosis mycobacteria (NTM) or mycobacteria other than tuberculosis (MOTT).

Clinical syndromes associated with the pathogenic species of mycobacteria include the following:
- Disseminated disease in the presence of severe immunodeficiency such as AIDS: *M. avium complex, M. kansasii, M. haemophilum, M. chelonae*
- Pulmonary disease resembling tuberculosis: *M. kansasii, M. avium complex, M. abscessus, M. xenopi, M. simiae*
- Lymphadenitis (primarily cervical): *M. avium complex, M. scrofulaceum, M. kansasii*
- Skin ulcers: M. ulcerans
- Post traumatic wound infections: M. fortuitum, M. chelonae, M. abscessus, M. marinum, M. avium complex
- Nosocomial disease: surgical wound infections (following cardiac surgery, mammoplasty wounds), catheter-related infection bacteraemia, peritonitis, post-injection abscesses: M. fortuitum, M. chelonae, M. abscessus
- Crohn’s Disease: M. paratuberculosis

The epidemiology of these diseases has not been well defined but the organisms have been found in soil, milk and water. Other factors, such as host tissue damage and immunodeficiency predispose the individual to infection. There is no evidence of transmission through person-to-person contact.

The diagnosis of disease requiring treatment is based on repeated positive cultures from symptomatic individuals with illness. Where human infections with non-tuberculous Disseminated Mycobacterium avium complex (MAC) infection is a major problem in HIV-infected individuals
1. Confirmed or Suspected Infectious Respiratory Tuberculosis

Accommodation/Placement of patient
- Single negative pressure room with dedicated bathroom facilities in room.
- Door closed.
- Place Airborne Precautions sign on door.
- Patients restricted to room except for medically necessary tests and treatments.
- Door closed after discharge/discontinuation of Airborne Precautions until air deemed cleared.

Ambulatory Care
- Unit/clinic booking the appointment must notify Ambulatory Care of the Additional Precautions required.
- Single room, door remains closed after appointment until air deemed cleared.
- Place patient directly in examination room.
- Patient performs hand hygiene on arrival and continues to wear a surgical mask.

Code Blue
- Unit staff should inform code team of patient’s status and provide N95 respirators.

Laboratory/Diagnostic Imaging in Facility
- Bedside testing preferred.
- Unit/clinic booking appointment must notify DI department in advance of the Additional Precautions required.
- Follow Airborne Precautions.
- Patient performs hand hygiene on arrival.
- Patient wears a procedure/surgical mask during transport and at all times when not in a negative pressure room.

Discharge/Transfer between Facilities
- Unit informs receiving facility in advance of patient’s TB status and document on Transfer/Referral Form.
- Unit notifies Transport Service that Airborne Precautions are required.
- Patient performs hand hygiene on leaving room.
- Patient wears a procedure/surgical mask during transport between facilities.

Dishes/Meal Tray
- Routine Practices, no special precautions required.
- Perform hand hygiene after handling dishes.
Duration of Precautions
• Refer to “Discontinuation of Airborne Precautions” page 7.4.7

Environment/Housekeeping/Terminal Cleaning
If patient has been discharged/transferred:
• Leave door closed for one hour if patient was on Airborne Precautions
• Housekeeping staff to follow Airborne Precautions in addition to Routine Practices if room requires cleaning prior to one hour of room being vacated
• Routine Practices
If patient remains in room and is on Airborne Precautions:
• Housekeeping staff to follow Airborne Precautions in addition to Routine Practices

Family/Visitor
• Instruct about the proper use of PPE
• Perform hand hygiene when entering and leaving patient room

Hand Hygiene
• Routine Practices
• Before entering the room
• Before leaving the room
• After removal of N95 respirator

Laboratory Specimens
• Routine Practices

Linen
• Routine Practices

Notification of Airborne Precautions
TB Infection Prevention and Control (pager # 932-1172) is to be notified by Physician/Bed Utilization/Unit Staff of:
• Any patients placed on Airborne Precautions
• Any patients admitted for investigation of tuberculosis
• Any patients admitted for treatment of tuberculosis
• Any discontinuation of Airborne Precautions

Initiation of Airborne Precautions
• Discuss Airborne Precautions with patient and family and provide educational material that is included in the Appendix of the WRHA Infection Prevention and Control Manual.
• Place a procedure/surgical mask on patient until placed into a negative pressure room.
• Place patient in private room with negative pressure ventilation.
• Set up isolation cart/supplies outside of room.
• Place Airborne Precautions sign on door.
• Notify Housekeeping to provide dedicated cleaning equipment.
• Inform patient’s physician.

Operating Room
• Notify OR and PACU of positive case prior to procedure.
• Perform procedure in negative pressure ventilation room at end of day/slate.
• Transport patient according to Transport within Facility section.
• Post Airborne Precautions sign on theatre door.
• Recover the patient in the theatre or in a single room with negative pressure ventilation in the Post Anesthetic Care Unit.

Physical Rehabilitation
• Airborne Precautions required during rehabilitation in consultation with Infection Prevention and Control.
• Transport patient according to section “Transport within Facility.”

Post Mortem/Autopsy
• Airborne Precautions.

Supplies/Equipment
• Routine Practices.

Transport within Facility
• Patient transport out of room for medically essential purposes only.
• A minimum of two individuals should be available to transport.
• Healthcare workers wear N95 respirators.
• Transport in an empty elevator is preferred.
• Patient wears a procedure/surgical mask.
• Patient performs hand hygiene prior to leaving the room.

Triage
• Maintain a high index of suspicion for patients that have signs or symptoms of active respiratory TB or documented respiratory TB and not completed treatment.
• If patient is suspected or confirmed active TB, promptly initiate Airborne Precautions.

Waste
• Routine Practices.
• Consult IP&C for biomedical waste.

2. Non-Respiratory Tuberculosis
If the patient is confirmed to have non-respiratory TB, then follow Routine Practices.

If respiratory TB has not been ruled out, or irrigation of TB infected wound is being performed, follow IP&C Practices (Section 1, page 7.4.21) for “Confirmed or suspect Respiratory Tuberculosis.”
3. MDR/XDR Tuberculosis
Patients with MDR/XDR Tuberculosis remain on Airborne Precautions their entire hospitalization or until three negative sputum cultures are obtained.

For IP&C practices, refer to Section 1, page 7.4.21, “Confirmed or suspect respiratory tuberculosis”

4. Maternal and Newborn
Refer to Special Consideration Section under “Maternal and Newborn” page 7.4.15

5. Children with Tuberculosis
Refer to Special Consideration Section under “Children” page 7.4.18

Occupational Environmental Safety and Health (OESH)
At the time of hiring employees should have a two-step TST unless they have documented results of a prior two-step test. If prior results are used, these should be transcribed into the employee’s.

Healthcare workers (HCW) with a reaction of 10mm induration or greater on the first or second test should be considered TST positive. Once a person is TST positive, no further TSTs should be performed even if in contact with an infectious TB case. Performing annual chest radiography of asymptomatic TST positive staff is not recommended.

Workers with reactions of less than 10mm to both tests should be considered TST negative for baseline screening purposes.

Transmission of M. tuberculosis is a recognized risk in healthcare settings. The magnitude of the risk varies by setting, occupational group, and prevalence of TB in the community, patient population, and effectiveness of TB Infection Prevention and Control measures. Nosocomial transmission of M. tuberculosis has been associated with persons who have close contact with persons who have infectious TB and with the performance of certain procedures.

There are certain HCW activities that are more high risk than others. The following are examples of high, intermediate and low risk activities:

HIGH RISK ACTIVITIES
- Cough inducing procedures
- Autopsy
- Morbid anatomy and pathology examination
- Bronchoscopy
- Designated TB laboratory procedures, especially handling of cultures
INTERMEDIATE RISK ACTIVITIES
- Work that entails regular, direct patient contact by nurses, aides, respiratory techs, social workers, doctors, physiotherapists, occupational therapists and housekeeping members if they clean patients’ rooms.

LOW RISK ACTIVITIES
- Minimal direct patient contact such as medical records, administration, and maintenance.

Definition of Occupational Exposure

Any healthcare worker who has unprotected exposure to a patient confirmed to have active, infectious TB (termed an exposure episode) must be considered at risk of infection. This includes situations in which the HCW was not wearing a respirator and the patient’s TB was undiagnosed, the patient was not in isolation and/or was not treated for a sufficient length of time.

If the HCW is wearing a National Institute for Occupational Safety and Health (NIOSH) approved N95 respirator appropriately when in contact with a patient with confirmed active infectious TB disease is not considered exposed.

A Healthcare Worker Exposed to TB
- Annual/Periodic TB Surveillance is performed on HCW employed in designated high risk areas or services.
- Contact investigation may be performed, depending on the risk profile of the case and the nature of the workers exposure, when there is an exposure episode.
- Reporting of communicable disease exposures, such as TB, to Occupational and Environmental Safety and Health (OESH) or Infection Prevention and Control is expected by all staff to ensure proper follow-up and surveillance.

A Healthcare Worker with Latent TB Infection (LTBI):
- A HCW with a positive Mantoux or TB Skin Test (TST) may have LTBI.
- Persons with LTBI cannot transmit TB.
- A HCW with signs and symptoms related to TB may require evaluation for active TB disease.

A Healthcare Worker with Active TB Disease:
- A Physician or a laboratory must provide confirmation of diagnosis.
- HCW with suspect/confirmed active TB disease must inform OESH immediately.
- HCW should see OESH regarding clearance for work appointment prior to first day of back-to-work.
DEFINITIONS

Acid-fast bacteria (bacilli) (AFB)
Microorganisms that are distinguished by their retention of specific stains even after being rinsed with an acid solution. The majority of acid-fast bacteria (AFB) in patient specimens are mycobacteria, including species other than *Mycobacterium tuberculosis* complex. The relative concentration of AFB per unit area on a slide (the smear grade) is associated with infectiousness. A positive culture is required for laboratory confirmation of *M. tuberculosis* complex.

Active disease
This denotes the presence of current active tuberculosis, most often on the basis of positive bacteriology but in approximately 15% – 25% of cases on the basis of appropriate clinical and/or radiological and/or pathological presentation as well as treatment response.

Aerosol
Small droplets of moisture that are exhaled or coughed up. In a patient with pulmonary tuberculosis, aerosols may contain *Mycobacterium tuberculosis* bacteria. Droplets usually evaporate down to a very small size (droplet nuclei) remaining suspended in the air, and lead to the spread of infection. Generation of infectious aerosols is greatest with laryngeal and cavitary pulmonary disease.

Air changes per hour (ACH)
The number of air changes per hour in a room; one air change being a volume of air equal to the room volume.

Airborne isolation
The conditions into which a patient with suspected or proven active tuberculosis may be placed for purposes of preventing transmission to other persons. In most institutional settings airborne isolation is provided by a combination of increased ventilation, (e.g., in the room occupied by the patient) and the use, by staff or visitors, of personal protective wear (respirators that filter 95% of particles of one micron or larger and have less than 10% leak).

Bacillary (bacterial) – positive
This denotes a specimen that is acid-fast smear and/ or culture-positive, with *Mycobacterium tuberculosis* complex being the species isolated on culture.

Bacille Calmette-Guérin (BCG)
A live attenuated vaccine derived from *Mycobacterium bovis* used to prevent or moderate tuberculosis disease.
Cavitary disease
This is a radiologic-pathologic label referring to evidence of lung destruction, i.e.,
evidence on chest x-ray or pathology of cavities or cystic areas that communicate with a
bronchus. Cavities generally harbour large numbers of bacteria and, as a result,
patients with cavitary disease tend to be highly infectious.

Clinically-Confirmed Case
Defined by Manitoba Health as in the absence of culture proof, cases clinically
compatible with active TB that have, for example:
- Chest x-ray changes compatible with active TB
- Active non-respiratory TB (e.g., meningeal, bone, kidney, peripheral lymph nodes,
etc.)
- Pathologic or post-mortem evidence of active TB
- Favorable response to therapeutic trial of anti-tuberculosis drugs

Confirmed Active Respiratory Tuberculosis
Laboratory-Confirmed Case is defined by Manitoba Health as cases with \textit{M. tuberculosis} complex demonstrated on culture, specifically \textit{M. tuberculosis}, \textit{M. africanum}, \textit{M. canetti}, \textit{M. caprae}, \textit{M. microti}, \textit{M. pinnipedii}, or \textit{M. bovis} (excluding \textit{M. bovis} BCG strain).

Contact
A person identified as having come in contact with an active case of disease. The
degree of contact is usually further defined as close household, close non-household,
casual and community contacts. The level and duration of contact usually suggests the
risk of becoming infected.

Culture-positive disease
The isolation of \textit{Mycobacterium tuberculosis} complex (excluding BCG strain) from
sputum, body secretions, or tissue.

Drug resistance
A strain of \textit{Mycobacterium tuberculosis} resistant to one or more of the four \textbf{first-line}
drugs: isoniazid, rifampin, pyrazinamide or ethambutol. Streptomycin was once but is
no longer considered a first-line drug in Canada.

Extensively drug resistant tuberculosis (XDR-TB)
Tuberculosis due to bacteria resistant to at least isoniazid and rifampin from among the
\textbf{first-line} anti-tuberculosis drugs, plus resistance to any fluoroquinolone and to at least
one of three injectable second-line drugs (capreomycin, kanamycin and amikacin).

First-line antituberculosis drug
First-line antibiotics for the treatment of \textbf{active tuberculosis disease}, including
isoniazid, rifampin, ethambutol and pyrazinamide. Streptomycin was once but is no
longer considered a first-line drug in Canada.
Induration
The soft tissue swelling that is measured when determining the tuberculosis skin test response to purified protein derivative (PPD) tuberculin. It is to be distinguished from erythema, which is not measured, i.e., does not constitute a measurable reaction to the antigen.

Infectious
The condition whereby the patient can transmit infection to others by virtue of the production of infectious aerosols. Those with smear-positive cavitary and laryngeal disease are usually the most infectious.

Latent tuberculosis infection (LTBI)
The presence of latent or dormant infection with Mycobacterium tuberculosis with no evidence of clinically active disease. The immunocompetent host generally has a lifetime risk of infection progressing to active disease (reactivation) in the range of 10%. Subjects deemed to have LTBI are by definition non-infectious. Depending on their contact history, age, chest radiographic findings, and associated medical conditions, they may be candidates for treatment of latent tuberculosis infection.

Multidrug-resistant tuberculosis (MDR-TB)
Tuberculosis due to bacteria resistant to isoniazid and rifampin with or without resistance to other first or second-line anti-tuberculosis drugs.

Low Index Suspicion of Active Tuberculosis
A “low index suspect” of active TB disease has a differential diagnosis of two or more diseases with similar symptoms, by systematic comparison and contrasting of the clinical findings the likelihood of the diagnosis being tuberculosis is a low possibility.

Perinatal
Relating to the period shortly before and after birth; from the twentieth to twenty-ninth week of gestation to one to four weeks after birth.

Pulmonary tuberculosis
In Canada, pulmonary tuberculosis includes tuberculosis of the lungs and conducting airways, which includes tuberculous fibrosis of the lung, tuberculous bronchiectasis, tuberculous pneumonia, tuberculous pneumothorax, isolated tracheal or bronchial tuberculosis and tuberculous laryngitis.

Reactivation
The development of active disease after a period of latent tuberculosis infection.

Recent TB Contact
A person identified as having come in contact with an active case of disease within the previous year.
Relapsed case of tuberculosis
Prior to 2008 in Canada: documented evidence or adequate history of previously active tuberculosis that became inactive but now meets the active tuberculosis case definition. Effective 2008 in Canada: re-treatment case of tuberculosis that is understood to be due to the inability to eradicate the previous episode of disease.

Respiratory isolation
See airborne isolation.

Re-treatment case of tuberculosis
1. a) Documented evidence or adequate history of previously active TB which was declared cured or treatment completed by current standards, and
   b) At least six months have passed since the last day of previous treatment*, and
   c) Diagnosed with a subsequent episode of TB which meets the active TB case definition.
OR
2. a) Documented evidence or adequate history of previously active TB which cannot be declared cured or treatment completed by current standards, and
   b) Inactive TB for six months or longer after the last day of previous treatment,* and
   c) Diagnosed with a subsequent episode of TB, which meets the active TB case definition.

Second-line antituberculosis drug
Anti-tuberculosis drugs other than first-line drugs, (isoniazid, rifampin, ethambutol and pyrazinamide) and other than those with unclear efficacy. Second-line drugs consist of (1) aminoglycosides, such as amikacin, kanamycin and streptomycin, (2) cyclic polypeptides, such as capreomycin, (3) analogs of d-alanine, such as cycloserine, (4) fluoroquinolones, such as ciprofloxacin, gatifloxacin, levofloxacin, moxifloxacin, ofloxacin and sparflxacin, (5) rifamycins, other than rifampin, such as rifabutin, (6) salicyclic acid–anti folates, such as para-aminosalicylate (PAS), (7) thioamides, such as ethionamide and prothionamide and (8) phenazine derivatives, such as clofazimine.

Smear
A laboratory technique for preparing a specimen so that bacteria can be visualized microscopically. The results for sputum acid-fast bacteria (AFB) smears typically are reported as numbers of AFB per high-powered microscopy field, or else as a graded result from no AFB to 4+ AFB. The quantity of stained organisms is associated with the degree of infectiousness.

Suspected Active Respiratory Tuberculosis
A “suspect (probable) case” of TB is defined by Manitoba Health as a case where:
- Acid-fast bacilli (AFB) are observed in smear of respiratory secretions or other clinical specimen, AND that case is clinically compatible with infectious Mycobacterium tuberculosis (MTB) disease,
OR
- A physician who has expertise in the diagnosis of TB has concluded that there is reasonable probability the individual has infectious MTB disease.
Patients with non-respiratory TB disease should be considered suspect for respiratory TB and placed on Airborne Precautions until related respiratory disease is excluded as per criteria.

**Treatment failure (active tuberculosis)**
Positive sputum cultures after four or more months of treatment or two positive sputum cultures in different months during the last three months of treatment, even if the final culture is negative. For MDR-TB (resistance to at least isoniazid and rifampin), treatment is considered to have failed if two or more of five cultures recorded in the final 12 months are positive; or any one of the final three cultures is positive; or if a clinical decision has been made to terminate treatment early because of poor response or adverse events.

**Treatment of latent tuberculosis infection (LTBI)**
The provision of preventive therapy, usually in the form of isoniazid (INH), to individuals infected with *M. tuberculosis* but without active disease. This is also known as chemoprophylaxis.
References


