CHAPTER 7: TB SCREENING TESTS

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7.1 Health History and TB Risk Assessment

TB screening should begin with a health history and TB risk assessment. Discussions with the client should specifically include questions on whether s/he:

- Has signs or symptoms of active TB disease.
- Could be immune suppressed due to medical conditions or treatments, such as those listed in Part 2 of the *Tuberculosis Screening Program* form.
- Has a history of Hepatitis B or C, as this could influence treatment recommendations.
- Has received BCG vaccination. **BCG vaccination is not a contraindication to TST**. However, BCG vaccination can cause a false-positive TST (depending on the age of the client when administered and the interval between the BCG and the TST), so should be noted in Part 2 of the *Tuberculosis Screening Program* form.
- Has had prior active TB disease, prior positive TST or interferon gamma release assay (IGRA), prior history of treatment for latent TB infection (LTBI). **NOTE: If any of these conditions apply, the TST should not be repeated because the result would not provide any useful information.**
- Has had known contact with infectious TB disease in the past, particularly within the prior 2 years.

7.1.1 Management of Clients with TB Signs or Symptoms

Airborne isolation precautions should be used for clients with signs or symptoms of active respiratory TB disease that include cough for more than 2-3 weeks and/or chest x-ray abnormalities suggestive of or consistent with active TB disease. This includes masking the client (surgical/procedure mask, see 11.1.1) and ensuring health care providers wear appropriate respiratory protection (fit-tested and fit-checked, disposable N-95 respirators, see 11.1.2).

Consult YCDC TB Control about clients who have signs or symptoms of active TB disease. Typical recommendations for management of symptomatic clients include:

- **Completing a *Tuberculosis Screening Program* form**. Note approximate date of onset of signs/symptoms.

- **Collecting three, sputum specimens for TB testing** (i.e., AFB smear and mycobacterial culture – **NOT** routine C&S)**. Testing of clinical specimens for TB is the most important component of follow-up for symptomatic clients.** Collect one specimen **during the clinic visit** and request client submit two additional specimens as soon as possible. Ideally, additional specimens should be collected once per day, in the morning. Multiple specimens collected on the same day but at least 1 hour apart are also acceptable (refer to 11.1.3 and Appendix E for information on collection and submission of specimens for TB testing).

- **Ordering/taking posterior-anterior (PA) and lateral view chest x-rays** (if not already done). Refer to Section 7.4 for indications, contraindications, and procedures for ordering and sending chest x-rays. **YCDC TB Control should be consulted for guidance on the management of clients who are or might be, pregnant for who chest x-rays are indicated.**

- **Doing a TST** (if not contraindicated, see 7.2.1).

  NOTE: people with active TB disease can have a false-negative TST.

- **Initiating isolation precautions**: acute care or home isolation (refer to Chapter 11).

7.2 Tuberculin Skin Testing (TST)

Refer to Appendix B for information on access to TST in Yukon. Refer to Appendix C for information on giving and measuring (reading) TSTs and two-step TSTs.

TST is used to detect whether a person is infected with TB bacteria. **TST is not used to diagnose or rule out active TB disease.**

Generally, when a person infected with TB bacteria is given a TST, an indurated (raised and firm) area will develop at the site of the injection. The test site must be checked 48 to 72 hours after the injection is given as this is when the size of induration peaks.

It is very important to measure a TST result properly because it influences the screening pathway and follow-up recommendations. Only health care providers with training and experience in measuring TSTs (also called 'reading TSTs') should be responsible for this task. TST self-reading is not acceptable.

The TST is not a fool-proof test. Some factors that can cause false-negative or false-positive TST results are outlined in Table 7-1.

Table 7-1, Potential causes of false-negative and false-positive tuberculin skin tests[1]

Potential causes of false-negative results
Technical (potentially avoidable)
• **Testing Solution**
- Improper storage of PPD (e.g., exposure to light or heat)
- Contamination, improper dilution, or chemical denaturation
• **Administration**
- Injection of too little testing solution or injection made too deeply (should be intradermal)
- Administration more than 20 minutes after drawing testing solution into the syringe
• **Measuring (reading)**
- Bias or inexperience
- Error in recording
Biologic (not avoidable)
• **Infections:**
- Active TB disease (especially if advanced) or other bacterial infection (e.g., typhoid fever, brucellosis, typhus, leprosy, pertussis)
- HIV infection (especially if CD4 count is less than 200 x 10^6/L) or other viral infection (e.g., measles, mumps, rubella)
- Fungal infection (e.g., South American blastomycosis)
• **Live viral vaccination: (e.g., mumps, rubella, varicella [chickenpox], yellow fever)**
• **Immunosuppressive drugs: corticosteroids, tumour necrosis factor (TNF) inhibitors, and others**
• **Metabolic disease: chronic renal failure, severe malnutrition, stress (e.g., surgery, burns)**
• **Diseases of lymphoid organs: lymphoma, chronic lymphocytic leukemia, sarcoidosis**
• **Age: infants less than 6 months of age, the elderly**
Potential causes of false-positive results
Technical (potentially avoidable)
• **Testing Solution**
- Use of PPD other than 5 TU
• **Administration**
- Injection of too much testing solution (should be 0.1 mL)
• **Measuring (reading)**
- Bias or inexperience (e.g., measuring redness instead of induration)
- Error in recording (e.g., recording in centimeters instead of millimeters)
Biologic (not avoidable)
• Infection with non-tuberculous mycobacteria (NTM)
• Prior BCG vaccination*

**** BCG can be ignored as a cause of a positive TST if: the vaccination was given in infancy and the person tested is now 10 years of age or older, there is a high probability of TB infection (e.g., TB contacts, Aboriginal Canadians from high-risk communities, immigrants/visitors from countries with high TB incidence), there is a high risk of progression from TB infection to active TB disease.***

Table 7-2 outlines TST result cut-points for various groups. Clients whose TST reaction sizes meet the criteria for potential consideration of treatment for latent TB infection (LTBI) need additional tests to rule out active TB disease (see 7.2.6).

Table 7-2, Tuberculin skin test cut-points in various risk groups[2]

TST result	Situation in which treatment for LTBI might be considered
0-4 mm	In general this is considered negative, and no treatment is indicated **unless HIV+ contact**
	Child under 5 years of age and high risk of TB infection
≥5 mm	HIV infection **(without known recent contact)**
	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	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)

When interpreting TST results and determining follow-up recommendations for clients, BCCDC TB Services physician specialist considers:

- **How likely it is that a positive TST result represents true TB infection** (also known as 'positive predictive value')

  Positive predictive value is low in populations at low risk for TB infection and in those where cross-reactivity to the testing solution can cause false-positive TST reactions (see Table 7-1).

- **How likely it is that the person has or will develop, active TB disease**

  Risk factors such as recent infection with TB bacteria (e.g., TB contacts), HIV infection, and others listed in Chapter 4, Table 4-3 are considered.

It is very important that *Tuberculosis Screening Program* forms are completely as accurately and fully as possible. The information provided on these forms are crucial to interpret TST results and make appropriate follow-up recommendations and are data entered into Panorama by YCDC staff.

7.2.1 Indications and Contraindications

A 'risk-based' approach to determining when to include TST in TB screening is in effect in Yukon. Complete details are available in the *Interim Guidelines for Tuberculosis (TB) Screening* (April, 2014) document included in Appendix B.

In general, TST should be included in initial TB testing pathways **unless there is a contraindication or a reason to defer the test** for:

- People with or soon to have, immune suppression due to disease or treatment.

  NOTE: People with HIV infection **AND** CD4 cell counts less than 200 x 10^6/L **AND** initial TST results of 0 to 4 mm induration should have two-step TSTs (see 7.2.4)

- Current type 1 (high priority) or type 2 (medium priority) contacts of active pulmonary TB (infectious TB disease).

Due to the epidemiology of TB in Yukon (such as the incidence, pulmonary versus non-pulmonary TB and geographic distribution of disease) the Chief Medical Officer of Health for Yukon and YCDC TB Program classify the risk of TB transmission within health care settings to be low. This includes the risk of transmission to health care workers, providing care in Yukon. As a result, TSTs and 2-step of health care workers in Yukon is not recommended in the absence of other indications. As always, whenever possible historical TST records for health care workers should be obtained upon employment and entered into the client's electronic public health record (IPHIS/Panorama).

Consult YCDC TB Control if it is unclear whether a client should have a TST: (867) 667-8323 or toll-free within Yukon: 1-800-661-0408, ext. 8323.

TST is **CONTRAINDICATED** for**:**

- People with allergies to any component of Tubersol® (Tuberculin Purified Protein Derivative [Mantoux]) or its container, or an anaphylactic or other allergic response to a previous TST
- Known tuberculin positive reactors because of the severity of reactions (vesiculation, ulceration or necrosis) that may occur at the test site

- People with severe blistering TST reactions in the past
- People with documented active TB or a clear history of treatment for TB infection or disease. (TST result is of no clinical value for people already known to be infected with TB bacteria)
- People with extensive burns or eczema at the injection/read site and surrounding area (see Appendix C for alternate TST sites)

TST should be generally be deferred for clients with major viral infections or live virus vaccinations in the past 4 weeks (e.g., mumps, rubella, varicella [chickenpox], yellow fever), due to risk for false-negative TST results. **In some circumstances it may be important to provide the TST anyway; please consult YCDC TB Control for recommendations.** When there has been a recent viral illness or live virus vaccination, document this history on the client record.

NOTE: TST may be administered before or on the same day as the immunizations but at a different site.

Unless contraindicated or there is a reason to defer, TST **CAN** be given to[3]:

- People with a history of Bacille Calmette-Guérin (BCG) vaccination(s)
- People with a common cold
- Women who are pregnant or breastfeeding
- People immunized with any vaccine on the **same day**
- People immunized within the previous 4 weeks with any inactivated vaccine
- People who give a history of a positive TST reaction (other than blistering) that is **NOT** documented
- People taking systemic corticosteroids

7.2.2 Precautions

Acute allergic reactions, including anaphylaxis, angioedema, urticaria and/or dyspnea, have been very rarely reported following skin testing with Tubersol®, see "Risk of Serious Allergic Reactions Following Tubersol® [Tuberculin Purified Protein Derivative (Mantoux)] Administration", available from http://www.healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2005/14373a-eng.php. **These reactions can occur in people without a history of a TST.**

Health care providers who administer TSTs should be familiar with protocols for the management of anaphylaxis, described in the Yukon Immunization Manual, Section 12 – Anaphylaxis, available from http://www.hss.gov.yk.ca/pdf/im_manual_section12.pdf.

Epinephrine hydrochloride solution (1:1000) and other appropriate agents should be available for immediate use in case an anaphylactic or other acute hypersensitivity reaction occurs.

Clients should remain under observation for at least 15 minutes after the TST, regardless of whether or not they have had a TST previously. During observation, clients should remain within a short distance of the person who administered the test, and be told to ask for assistance immediately they feel unwell. The risk of fainting is the more common reason to keep clients under observation after receiving a TST.

When clients choose not to remain under observation after a TST, inform them (or their parents/guardians) of the signs/symptoms of anaphylaxis and tell them to seek medical attention immediately should signs/symptoms develop.

7.2.3 Testing Solution

In Canada, Tubersol® 5 tuberculin units (5-TU) of purified protein derivative – standard (PPD-S) is recommended for TST.

Handling of Tubersol®

- Store at 2° to 8° C, but do not freeze. Discard the solution if frozen.
- Store the vial in the dark except when doses are actually being withdrawn from it (the testing solution can be adversely affected by exposure to light).
- Draw up the testing solution just before injecting it. Do not preload syringes for later use this can reduce the potency of the solution.
- Use the testing solution within 30 days of first puncture of the vial. The date of first puncture must be written clearly on the vial.
- Discard vials 30 days after date of first puncture, and document as directed by the Yukon Immunization Program.

- Discard vials that have been punctured but not dated.

For general information on the storage and handling of **Tubersol®**, see the Yukon Immunization Program Manual, Section 7 – Storage & Handling of Immunization Agents, available from: http://www.hss.gov.yk.ca/pdf/im_manual_section7.pdf.

7.2.4 Two-Step Tuberculin Skin Testing

Two-step TSTs are used to establish accurate baseline TST results for people who have TSTs done at regular intervals (for example, health care workers who work in high risk TB facilities).

Two-step TSTs help reduce the chance that people who were infected with TB bacteria many years earlier, who had BCG vaccine, or who have been exposed to non-tuberculous mycobacteria will have a boosted (false-positive) response to the testing solution when they have two TSTs within a year or so of each other. This is important because boosted responses could be misinterpreted as TST conversions (new TB infections), and could result in people being referred for additional tests (e.g., chest x-rays) or treatments that they do not need.

After a two-step TST result is documented for a client, future TSTs can be single-step (just one TST) regardless of how long ago the two-step TST was done.

In Yukon, two-step TST is recommended for HIV-positive clients with CD4 counts of less than 200 x 10^6/L.

Refer to Appendix C for information on giving and measuring two-step TSTs.

7.2.5 Bacille Calmette-Guérin (BCG) Vaccine

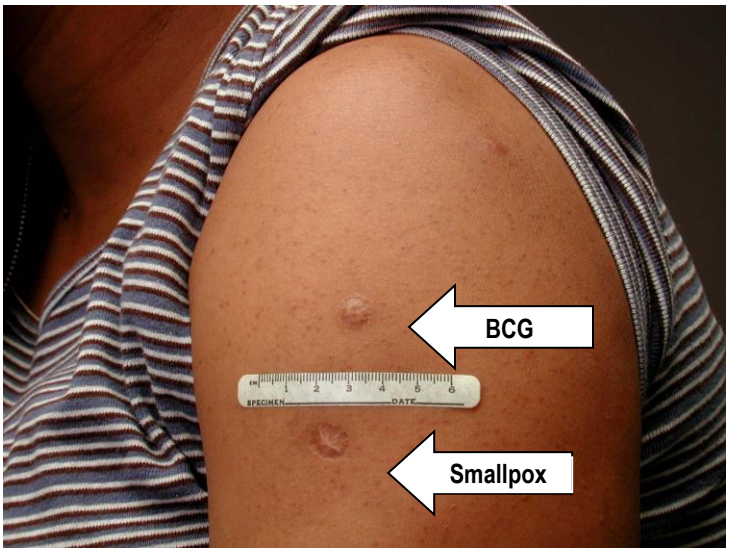
BCG is a live, attenuated vaccine derived from *Mycobacterium bovis* (part of the *Mycobacterium tuberculosis* complex). BCG can control multiplication of TB bacteria and prevent development of disseminated TB disease (e.g., TB meningitis, miliary TB) in people who become infected with TB bacteria after they receive the vaccine. The efficacy and duration of protection is variable, so people who have had BCG should still be considered at risk for developing TB disease.[4]

BCG vaccine has been used extensively around the world, in countries and populations with high rates of TB disease. BCG vaccination policies in different countries can be found in the *BCG World Atlas* at http://www.bcgatlas.org. A summary of current and historical BCG use in Canada can be found at http://www.phac-aspc.gc.ca/tbpc-latb/bcgvac_1206-eng.php.
People in Canada likely to have had BCG include:

- Immigrants from many European countries and most developing countries
- Aboriginal Canadians from communities with newborn BCG vaccination programs
- People born in Quebec, Newfoundland and Labrador between the 1940s and the 1970s

BCG scars are often found on the upper left deltoid, near where a smallpox scar might be. If both scars are present, the BCG scar is usually the smaller of the two, dimpled and shiny, with a keloid look (Figure 7-1). In some jurisdictions (e.g., Quebec, Newfoundland), BCG was administered on the lower back ("back scratches"), and might appear as parallel scratch lines.

Figure 7-1, Recognition of BCG Scars



Source: *Recognition of BCG (Versus Smallpox) Scars*, http://www.phac-aspc.gc.ca/tbpc-latb/pdf/recognition-bcg-scars_e.ppt

For tips on identifying BCG scars, refer to *Recognition of BCG (Versus Smallpox) Scars* at http://www.phac-aspc.gc.ca/tbpc-latb/pdf/recognition-bcg-scars_e.ppt.

BCG vaccine can be the cause of a false positive TST result, if:

- Given after 12 months of age **AND**
- There has been no known exposure to active TB disease **AND**
- The person is either Canadian-born non-Aboriginal **OR** is an immigrant/visitor from a country with low TB incidence.

Record BCG vaccination history in Part 2 of the *Tuberculosis Screening Program* form as this information in needed to accurately interpret TST results.

7.2.6 Management of Clients with Positive TST Results

Clients with positive TST results (see Table 7-2) should have chest x-rays done.

HIV-positive clients with TST results of 5 mm or more induration should have PA **and** lateral chest x-rays done, **and** submit three sputum specimens for TB testing[5] (i.e., AFB smear and mycobacterial culture – **NOT** routine C&S)**.** Collect one specimen **during the clinic visit** and request that client submit two additional specimens as soon as possible. Ideally, additional specimens should be collected once per day, in the morning. Multiple specimens collected on the same day but at least 1 hour apart are also acceptable (refer to Appendix E for information on collection and submission of specimens for TB testing).

Refer to Section 7.4 for indications, contraindications, and procedures for ordering and sending chest x-rays. **YCDC TB Control should be consulted for guidance on the management of clients who are or might be, pregnant for who chest x-rays are indicated.**

7.3 Interferon Gamma Release Assay (IGRA)

IGRAs are a relatively new test to detect infection with TB bacteria. As with TSTs, IGRAs cannot differentiate between LTBI and active TB disease.

IGRAs work by measuring the level of interferon-gamma in a client's blood sample after it is exposed to antigens specific to *M. tuberculosis*. Because the antigens used are specific to *M. tuberculosis,* IGRA results are not influenced by prior BCG vaccination or exposure to most non-tuberculous mycobacteria. This means that IGRAs can be more reliable for detecting TB infection than TSTs in some circumstances. Specifically those with a prior history of a BCG, a positive TST but with a low risk of any prior TB exposure.

In Canada, IGRAs are used in specific circumstances where additional information (beyond a TST result) is needed to determine if someone is infected with TB bacteria. See Appendix D Table 1 for comparison of sensitivity and specificity of IGRAs versus TSTs.

IGRA testing is currently available in Yukon Territory only in consultation with YCDC TB Control. See Appendix D Table 2 for testing indication in Yukon.

All referrals for IGRA will be facilitated by the TB nurses at YCDC. Ultimately, final decisions related to IGRA testing eligibility rest with the Clinical Manager at YCDC. When considering eligibility, YCDC may take into consideration recommendations from BCCDC TB Services, YCDC TB Control, Yukon's CMOH, references such as the *Canadian Tuberculosis Committee Recommendations on Interferon Gamma*

Release Assays for the Diagnosis of Latent Tuberculosis Infection-2010 Update, and available funding.

Whitehorse General Hospital laboratory will only accept samples sent for IGRA testing that are authorized by YCDC. Refer to Appendix D for additional information on IGRA testing.

7.4 Chest X-Rays

Chest x-rays (CXRs) are used to identify abnormalities that **could be** related to TB infection or TB disease, such as:

- Infiltrates in the upper lobes or in the superior segments of lower lobes
- Cavities, cavitary disease
- Granulomas
- Hilar and/or mediastinal lymphadenopathy

When CXR abnormalities like these are identified, follow-up tests should be done to confirm or exclude active TB disease (see 7.4.4).

For most clients, a single PA view CXR is sufficient. A lateral view CXR may be requested at discretion of the health care provider.

PA **and** lateral view CXRs should be done for clients who are:

- Symptomatic **OR**
- Less than 5 years of age **OR**
- HIV-positive.

If client is or might be **pregnant**, CXRs must be shielded. **Consult with YCDC TB Control prior to ordering/arranging CXRs for pregnant contacts.**

7.4.1 Indications and Contraindications

CXRs should be included in the **initial** TB testing pathway when:

- TST is contraindicated (see 7.2.1).
- Clients have signs or symptoms of active TB disease (any site).

- Clients are at high risk for development of active TB disease, specifically, clients with HIV infection and contacts who are less than 5 years of age.

- Clients are referred for TB screening by Citizenship and Immigration Canada (CIC) for medical surveillance.

In accordance with Yukon *Interim Guidelines for Tuberculosis (TB) Screening* (April, 2014), CXR (**NOT TST**) should be included in the initial TB testing pathway for clients:

- With risk factors for developing TB (identified on the *Tuberculosis Screening Program* form) – other than those who qualify for TST (refer to Appendix B).

- That immigrated to Canada within the past 5 years from a country with an annual TB incidence greater than or equal to 30 cases/100 000 population. TB incidence rates are available at: http://www.phac-aspc.gc.ca/tbpc-latb/itir-eng.php.

For other clients, CXRs should be included in the TB testing pathway when TST results are positive (see Table 7-2) or IGRA results are reactive.

7.4.2 Use of Pre-Existing Chest X-Rays

In most circumstances, CXRs for the purpose of general TB screening taken within the prior 6 months can be used if there has been no change in symptoms or risk factors within this time. If there have been new/worsening symptoms, the CXRs should be repeated and both PA and lateral views should be done.

New CXRs should be taken for symptomatic clients.

7.4.3 Procedures for TB Screening Chest X-Rays

Procedure for TB Screening Chest X-Rays: Communities Outside of Whitehorse
• Ensure the information on the *Tuberculosis Screening Program* form is accurate and all required information completed. DO NOT send the form to YCDC until the radiology report is received, unless there is a high suspicion of TB. • **Ask women of childbearing age whether they are or might be, pregnant. YCDC TB Control should be consulted for guidance prior to x-raying clients who are or might be, pregnant.** • A single PA view of the chest is required unless the client meets **any** of the following criteria, in which case **both** PA and lateral view CXRs should be taken: - Symptomatic **OR** - Less than 5 years of age **OR** - HIV-positive. A lateral view CXR may be requested for other clients at discretion of the health care provider. • Check the image to make sure the apices are included and not obscured by markers or artifacts. Send the CXR(s) through the routine process. • **NEGATIVE REPORTS:** Submit (mail) completed WHITE COPY of the TB screening form with the radiology report to YCDC TB Control. Retain a copy for the client file. • **ABNORMAL REPORTS:** Fax *Tuberculosis Screening Program* form and the CXR report to YCDC TB Control **(867) 667-8349**. • YCDC TB Control will enter the information into Panorama and, if necessary, consult BC CDC TB Services. • BCCDC TB Services will document recommendations in Panorama. • YCDC TB Control will send a copy of the correspondence from BCCDC TB Services to the health facility for the client's chart and to any physicians noted on the *Tuberculosis Screening Program* form. • YCDC TB Control will fax correspondence from BCCDC TB Services along with copies of *TB Screening Program* forms to HCPs who refer clients for TB screening. Communication by telephone between YCDC TB Control and referring physicians might also occur.

Procedure for TB Screening Chest X-Rays: Whitehorse

- Ensure the information on the *Tuberculosis Screening Program* form is accurate and all required information completed. DO NOT send the form to YCDC until the radiology report is received, unless there is a high suspicion of TB.

- **Ask women of childbearing age whether they are or might be, pregnant. YCDC TB Control should be consulted for guidance prior to x-raying clients who are or might be, pregnant.**

- A single PA view of the chest is required unless the client meets **any** of the following criteria, in which case **both** PA and lateral view x-rays should be taken:

  - Symptomatic **OR**
  - Less than 5 years of age **OR**
  - HIV-positive.

  A lateral view CXR may be requested for other clients at discretion of the health care provider.

- If the client is referred to the Whitehorse General Hospital for the x-ray(s), a requisition must be completed (refer to Appendix K-2 for a sample x-ray requisition). **The requisition must clearly indicate that the examination is being done for TB screening purposes, and that copies of the report should be faxed to:**

  - The health care agency initiating the CXR(s)
  - Any physician(s) involved in the client's care

- **NEGATIVE REPORTS:** Submit (mail) completed WHITE COPY of the TB screening form with the radiology report to YCDC TB Control. Retain a copy for the client file.

- **ABNORMAL REPORTS:** Fax (do not mail) *Tuberculosis Screening Program* form and the CXR report to YCDC TB Control **(867) 667-8349**.

- YCDC TB Control will enter the information into Panorama and, if necessary, consult BC CDC TB Services.

- BCCDC TB Services will send findings and recommendations to YCDC TB Control. YCDC TB Control will send a copy of the correspondence from BCCDC TB Services to the health facility for the client's chart and to any physicians noted on the *Tuberculosis Screening Program* form.

- YCDC TB Control will fax correspondence from BCCDC TB Services along with copies of *TB Screening Program* forms to physicians who refer clients for TB screening. Communication by telephone between YCDC TB Control and referring physicians might also occur.

7.4.4 Management of Clients with Abnormal Chest X-Ray Results

Refer to Section 7.1.1 for information on management of clients with CXR findings suggestive of or consistent with, active TB disease.

7.5 Laboratory Testing of Specimens for TB

Routine culture and sensitivity (C&S) testing will not detect TB bacteria. Requisitions accompanying specimens for TB testing should clearly indicate that mycobacterial testing (i.e., AFB smear and mycobacterial culture) is required.

Refer to 11.1.3 and Appendix E for provider and client information on collection and submission of specimens for TB testing.

Submission of specimens for laboratory testing is **ESSENTIAL** for providing confirmation (or exclusion) of active TB disease, and for guiding clinical and public health management of TB cases. Whenever possible, clinical specimens originating from the site of suspected TB disease (e.g., sputum for cases with respiratory symptoms) should be collected.

Almost any body fluid or tissue can be tested for TB. Sputum and other respiratory specimens (e.g., bronchial washings, gastric aspirates) are tested most often. Other specimens, such as pleural fluid, CSF, urine, blood, and biopsies are used in the diagnosis of non-respiratory TB disease.

Mycobacterial testing can:

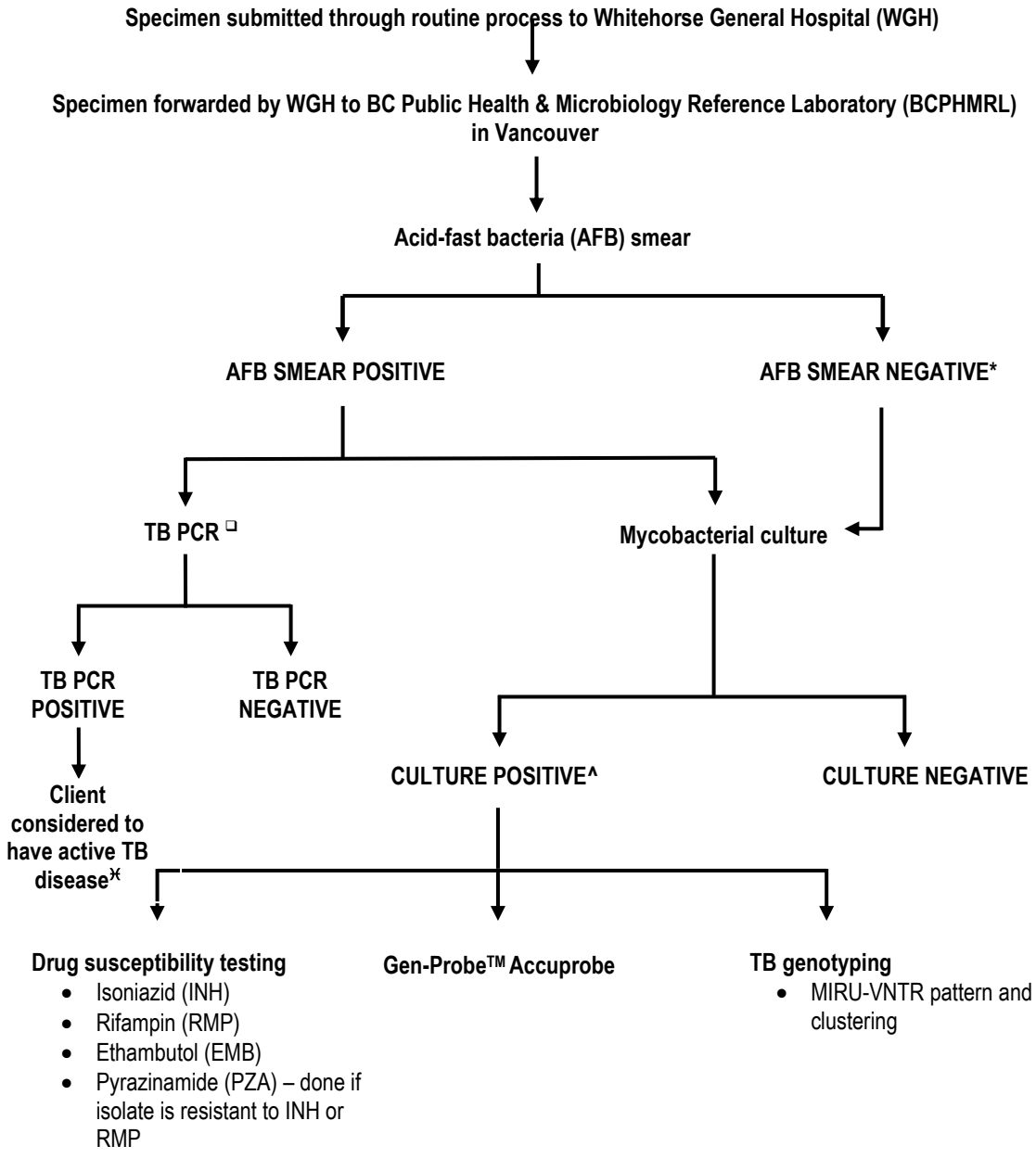
- Detect whether there are mycobacteria in a specimen.
- Inform estimates on how infectious TB cases might be and/or monitor response to treatment, based on the number of TB bacteria seen in AFB smears of respiratory specimens.
- Identify which mycobacteria are present, if any.
- Confirm which medications mycobacteria in the specimen are susceptible to (drug sensitivity testing).

Additional tests on TB isolates (positive cultures) can be used to differentiate between different strains of TB bacteria (TB genotyping). Monitoring TB bacteria strains through TB genotyping is important for identifying clusters of TB cases and detecting TB outbreaks.

Submitting multiple, good-quality specimens is very important for ensuring accurate test results. Accurate test results reduce delays in diagnosing new cases of TB disease and help to stop transmission of TB from infectious cases.

Laboratory processes for testing of specimens originating in Yukon for TB is outlined in Figure 7-2. In Canada, the gold standard for confirmation of active TB disease is a mycobacterial culture that is positive for *M. tuberculosis* complex using both liquid and solid media. Although nucleic acid amplification tests (NAAT) such as polymerase chain reaction (PCR), Gen-Probe AMTD, and Xpert MTB/RIF can provide results much faster than conventional mycobacterial culture, confirmation by mycobacterial culture is still required.

Figure 7-2, Standard processes for testing of clinical specimens for tuberculosis



*** TB PCR can be performed for smear-negative respiratory specimens in special circumstances; consult YCDC TB Control**
^ Further testing is automatically performed at BCPHMRL on all positive mycobacterial cultures
❑ TB PCR performed on smear-positive respiratory specimens from all new cases; not routinely repeated on confirmed cases
⁑ Results from mycobacterial culture required to confirm diagnosis

7.5.1 Indications

Three sputum specimens should be collected for TB testing from clients:

- With symptoms consistent with **any site** of active TB disease
- With CXR abnormalities consistent with or suggestive of, active or inactive (old, healed) TB disease
- Who are HIV+ and have a well-documented prior positive TST, or have a new positive TST or reactive IGRA

Testing sputum specimens from clients with non-respiratory TB disease (e.g., TB lymphadenitis) is important because it is possible to have respiratory (infectious) TB disease at the same time.

Sputum specimens might also be recommended by YCDC TB Control instead of CXRs for pregnant women for whom TB screening is indicated.

Collection of specimens other than sputum should be done in consultation with YCDC TB Control.

7.5.2 Interpretation of Laboratory Results

Table 7-3 outlines the potential significance of results from various laboratory TB tests.

Table 7-3, Potential significance of results from various laboratory TB tests

1. Acid-Fast Bacilli (AFB) Smear Results	
AFB smear-positive (respiratory specimen)	• Client might have active (infectious) respiratory TB disease; additional testing on the specimen (e.g., TB PCR, mycobacterial culture) required.
AFB smear-positive (other specimen, e.g., pleural fluid, CSF, tissue biopsy)	• Client might have active TB disease in the site where the specimen came from. ***Note: Three sputum specimens should be collected for AFB smear and mycobacterial culture to test for concurrent active respiratory TB disease***

Continued on next page

2. AFB Smear and TB PCR Results	
AFB smear-positive / TB PCR-negative (respiratory specimen)	• Client **unlikely** to have active respiratory TB disease; mycobacterial culture result required to confirm.
AFB smear-positive / TB PCR-positive (respiratory specimen)	• **Client is considered to have active respiratory TB disease**; **mycobacterial culture result required to confirm.** • Treatment and contact investigation begins prior to culture confirmation.
3. AFB Smear and Mycobacterial Culture Results	
AFB smear-positive / culture positive **OR** **AFB smear-negative / culture-positive (any specimen type)**	• A positive culture indicates the growth of a *Mycobacterium* species that might be *M. tuberculosis* complex or non-tuberculous mycobacteria (NTM). • Gen-Probe™ Accuprobe and other laboratory tests are used to determine whether the isolate is *M. tuberculosis* complex or NTM. - **Negative** result means client is **unlikely** to have active TB disease - **Positive result means the client is considered to have active TB disease**
AFB smear-positive / culture-positive for *M. tuberculosis* complex (any specimen type)	• **Client has laboratory confirmed active TB disease** (i.e., is a laboratory confirmed TB case). • Site specimen came from reflects type of TB disease, e.g., lymph biopsy = TB lymphadenitis, CSF = CNS TB, urine = genitourinary TB.
AFB smear-positive / culture-negative for *M. tuberculosis* complex	• **Respiratory specimens:** Significance depends on clinical context; consult YCDC TB Control. • **Other specimens:** Could reflect active TB disease if specimen type is difficult to culture (e.g., lymph tissue); consult with YCDC TB Control. ***Continued on next page***

3. AFB Smear and Mycobacterial Culture Results (continued)	
AFB smear-negative / culture-positive for *M. tuberculosis* complex (any specimen type)	• **Client has laboratory confirmed active TB disease** (i.e., is a laboratory confirmed TB case). Type of TB disease determined by site specimen came from. ***Notes:*** - ***If specimen was from a non-respiratory site, three sputum specimens should be collected for AFB smear and mycobacterial culture to test for concurrent active respiratory TB disease.*** - ***If specimen was respiratory, collection and testing of additional specimens might be recommended to determine if case became AFB smear-positive (i.e., more infectious) in the interim.***
AFB smear-negative / culture-negative (any specimen type)	• Significance depends on clinical context; consult with YCDC TB Control. ***Note: If clinical suspicion of active TB disease is high, collection and testing of additional specimens might be recommended.***

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