

ALBERTA HEALTH AND WELLNESS

**TUBERCULOSIS PREVENTION AND CONTROL
GUIDELINES FOR ALBERTA**

JUNE 2010

Government of Alberta ■

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Linette McElroy, Tuberculosis Educator and Practice Consultant

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1. Introduction

Herein is the latest (2010) version of the Tuberculosis (TB) Prevention and Control Guidelines for Alberta (previously referred to as 'the manual'). For the first time this document was prepared by a contracted writer, Linette McElroy, RN, TB Educator and Practice Consultant, working in close collaboration with Alberta Health and Wellness (AHW) staff and the staff of the Capital and Calgary TB Clinics. Together Linette and these staff have done an outstanding job!

As custodians of the TB notification registry of Alberta and the provincial program, AHW took the initiative, provided the leadership, and sponsored the production of this document. They timed it to follow in close succession with the 2007 6th Edition of the Canadian TB Standards. In contrast to standards which provide the foundations on which TB care can be based, presenting what should be done, guidelines describe how an action is to be accomplished in any given jurisdiction and frame the structure of care (International Standards of TB Care).

Through AHW, TB prevention and control in Alberta is connected to federal governmental ministries and agencies involved in national TB prevention and control; the Public Health Agency of Canada (PHAC), Citizenship and Immigration Canada (CIC), and First Nations and Inuit Health (FNIH). These connections are critically important to TB control in Alberta given the current and likely (for the foreseeable future) to be ongoing epidemiology of TB in Alberta (90% or more of the cases are in the foreign-born and Aboriginal populations of the province). All CIC referrals for post-landing medical surveillance of TB are channeled through AHW; a formal contract for ancillary TB services to on-reserve communities exists between FNIH and AHW and as of April 1, 2010, Alberta Health Services. All mycobacteriology in the province is performed in the Provincial Laboratory for Public Health. All antituberculosis drugs are publically funded, centrally distributed and properly and discriminately used out of the provincial drug depot.

The management of TB and latent TB infection is also centralized in Alberta out of AHW until March 31, 2010 and Alberta Health Services (AHS) as of April 1, 2010. AHW has the virtual clinic that services rural Alberta, including reserve communities. Two superbly run, dedicated public health TB clinics in Capital (Edmonton) and Calgary, service the two major cities and anyone from outside the cities that needs 'hands-on' attention. All TB prevention control activity is administered by a splendid public health nursing network which takes direction from a small cadre of dedicated university-based (Universities of Alberta and Calgary) pulmonary and infectious disease physicians, one of whom functions as the Medical Officer of Health for TB in Alberta (Dr. Geetika Verma). A TB in-patient unit at (University of Alberta) and a TB Program Evaluation and Research Unit (University of Alberta) support the program. All treatment of TB disease is directly observed therapy (DOT).

This important document, along with the Public Health Act, the TB Control Committee of Alberta and the TB Nurses Working Group of Alberta, bind together all

of the above pieces of the TB Control Program of Alberta. They position the province, its regions and cities to face the medical and public health reality of a communicable disease spread by the aerosol route, and to meet the special challenge of outbreaks, drug resistance and HIV-TB interaction.

The staff of the TB program and government, whether provincial or local, is to be commended for this outstanding document and their continued support of TB prevention and control in Alberta.

Richard Long, MD
Immediate past MOH for TB in Alberta

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1.1 Tuberculosis clients' rights and responsibilities

The Public Health Agency of Canada, the Canadian Thoracic Society, the Canadian Tuberculosis Committee and the TB Control Program of Alberta endorse both the *International Standards for Tuberculosis Care (ISTC)* and the *Patients' Charter for Tuberculosis Care*.

These documents are available online at:

<http://www.nationaltbcenter.edu/international/>

<http://www.who.int/tb/publications/2006/istc/en/index.html>

The purpose of the *International Standards for Tuberculosis Care* is to describe a widely accepted level of care that all practitioners (public and private) should seek to achieve in managing people who have or are suspected of having, TB.

A companion to the *ISTC*, the *Patients' Charter for Tuberculosis Care (the Charter)* outlines the rights and responsibilities of people with TB. *The Charter* describes the ways in which clients, communities, health care providers, and governments can work as partners in a mutually beneficial, open relationship toward improving TB care and enhancing the effectiveness of the healthcare process. It enables all parties to be held more accountable to each other, fosters mutual interaction and otherwise promotes positive partnerships between these stakeholders.

The Charter bears in mind the principles on health and human rights of the United Nations, UNESCO, WHO, Council of Europe, as well as other local and national charters and conventions including the United Nations CESCRC General Comment 14 on the right to health, WHO Ottawa Charter on health promotion, The Council of Europe Convention for the Protection of Human Rights and Dignity (biology and medicine), and the UNESCO Universal Draft Declaration on Bioethics and Human Rights.

Practitioners are encouraged to familiarize themselves with *the Charter*, embrace and promote the values described within in, and share it with their clients and others. Additional copies of *the Charter* can be downloaded and printed from the link provided above.

1.1.1 Role of the Tuberculosis Prevention and Control Guidelines for Alberta and associated resources

This manual was written as a reference guide for TB screening, diagnosis, prevention, treatment and community follow-up. It describes Alberta's tuberculosis control program and protocols, standards and recommendations for the management of TB in Alberta, as required under the *Alberta Public Health Act, Communicable Diseases Regulation*.

These protocols are based on the recommendations of the Tuberculosis Committee of the Canadian Thoracic Society in the 6th edition of the *Canadian Tuberculosis Standards* and the opinions of local and national experts in TB diagnosis, treatment and control.

Although an attempt has been made to address all relevant TB issues in some detail, the manual will not duplicate information readily available in other publications such as the *Canadian Tuberculosis Standards*. Rather, as appropriate, reference will be made to such documents and direction provided as to how to access them.

While protocols cannot and should not substitute for clinical judgment, adherence to these clinical protocols will, in most instances, result in improved patient care and the consequent control and prevention of TB in Alberta.

The co-operation of all those involved in the management of TB is critical to the success of the provincial program.

1.2 Understanding tuberculosis (TB)

1.2.1 Etiology

TB is a disease caused by mycobacteria belonging to the *Mycobacterium tuberculosis complex* (MTBC). The MTBC includes *M. tuberculosis*, *M. bovis*, *M. bovis BCG*, *M. africanum*, *M. caprae*, *M. microti*, and *M. pinnipedii*.

Through the ages, tuberculosis (TB) has also been known as:

- consumption (or galloping consumption, in advance disease)
- phthisis (Greek for consumption)
- scrofula (TB disease in the lymph nodes of the neck)
- the White Plague

The primary reservoir for *M. tuberculosis* (MTB) is humans. Although animals may be infected with MTB, they are rarely a source of infection.

1.2.2 Transmission

Humans usually become infected through the inhalation of droplet nuclei (aerosols) that contain MTB. Droplet nuclei are generally created by forceful expiration such as coughing, sneezing, singing and playing wind instruments. Certain medical procedures such as bronchoscopy, sputum induction, autopsy, and irrigation or manipulation of TB abscesses may also cause aerosolization of droplet nuclei containing MTB (infectious aerosols).

Fomites (linen, furniture, books, floors) are not a significant source of infection as mycobacteria on these surfaces will die quickly as a result of drying, heat or sunlight (ultraviolet light).

Droplet nuclei may be as small as one (1) to five (5) microns in size, which enables them:

- to remain suspended within an airspace for long periods of time
- to travel on air currents, through duct systems and elevators shafts, etc (some distances from the infectious source case).

Larger infectious aerosols may become trapped in mucus of the upper airway. Those reaching the trachea or bronchi may be swept back to the larynx by ciliary action and cough, and then swallowed (preventing infection). Aerosols that reach the alveoli are most likely responsible for establishing infection; it is believed that as little as one droplet nuclei (containing as few as one (1) to ten (10) mycobacteria) is required.

In addition to droplet nuclei size, there are a variety of factors that influence whether or not transmission of MTB will occur. These factors are presented in detail in *Section 4.4, Determinants of TB Transmission*.

The most important measures in preventing transmission of TB are:

- early diagnosis of disease;
- prompt initiation of effective treatment*; and
- isolation of cases when necessary and to the degree appropriate (see *Section 3.2, Prevention of TB transmission – airborne precautions and isolation*)

* *Level of infectiousness (related to bacillary count and frequency of cough) rapidly reduces after effective treatment is initiated, and MTB present aerosols produced by the case are thought to be less capable of establishing infection, if transmitted.*

Other measures to interrupt transmission are presented in detail in *Section 4.5, Measures to Interrupt TB Transmission*.

1.2.3 Pathogenesis

Infection with MTB usually goes unnoticed by the host however a relatively small proportion (~5%) of those infected will progress directly to active TB disease. TB disease that occurs soon after infection is acquired is referred to as “primary” disease (e.g., primary TB disease or primary progressive TB disease).

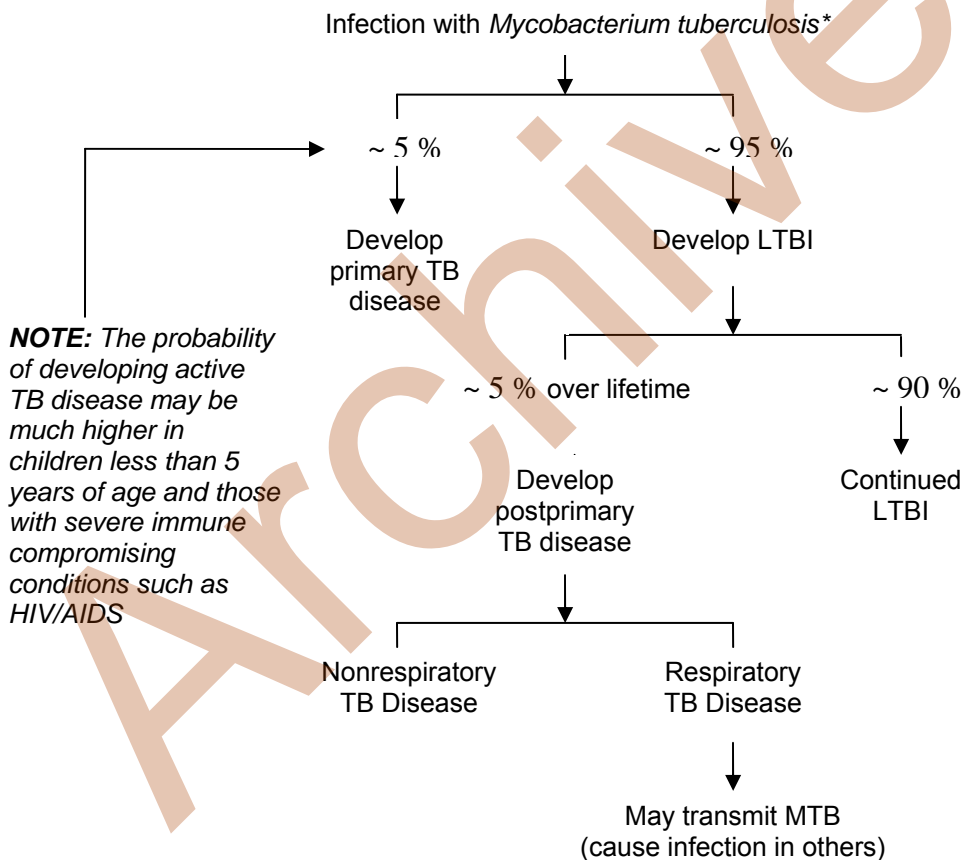
In the majority of infected individuals (~95%), infection is followed by a period of mycobacterial latency. This condition is referred to as “latent TB infection”, or “LTBI”. Latency is believed to occur as a result the host’s immune system, which

limits the organisms' ability to replicate and disseminate within the host. TB infection can remain latent for years, sometimes for the lifetime of the host.

About 10% of immune competent hosts with LTBI will eventually go on to develop active TB disease (postprimary TB disease). This figure can be significantly higher if the host is under five years of age or immune suppressed.

Some individuals that develop active TB disease will be capable of transmitting MTB infection. Generally speaking, potential for transmission is limited to cases with respiratory forms of TB disease (see *Figure 1-1, The pathogenesis of Mycobacterium tuberculosis in the infected host*).

Figure 1-1: The pathogenesis of *Mycobacterium tuberculosis* in the infected host¹



* Development of cell-mediated immunity to tuberculin antigens (used in tuberculin skin testing [TST]) typically does not occur until three to eight weeks after infection with MTB has occurred. Therefore, infection with MTB cannot be reliably ruled out after exposure to an infectious case until at least eight weeks afterward.

¹ Adapted from Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition, Canadian Lung Association, Canadian Thoracic Association, Public Health Agency of Canada, 2007, p. 45.

1.2.4 Diagnosis of LTBI or active TB disease

A variety of methods are used, usually in combination, to identify or rule out the presence of active TB disease or LTBI. The sequence and components of these methods are iterative and dependent upon:

- the reason investigations are being undertaken
- whether or not the client is experiencing symptoms or displaying signs suggestive of active TB disease
- findings of investigations as they become available
- individual program requirements, e.g., some programs may require chest radiography and/or sputum examinations be included in TB assessment, irrespective of other findings.

TB case detection and LTBI screening methodology is presented in detail in *Section 2.2, Case detection and LTBI screening methodology*.

1.2.5 Treatment

Evidence of TB disease has been found in human remains dating back to as early as 1550–1080 BC. It was not until German scientist Dr. Robert Koch (1843–1910) developed a method for identifying *Mycobacterium tuberculosis* (proving it was bacterial in origin) in 1882, that work could begin toward developing effective treatment.

Koch received a Nobel Prize (1905) for his discovery, as did Dr. Selman Waksman (1888–1973) in 1952, when he was credited with the discovery of the first antibiotic effective against TB, streptomycin, five decades later.

A few additional antibiotics for TB treatment ensued:

- para-amino-salicylic acid (PAS) in 1950
- isoniazid (INH) in 1953
- rifampin (RMP) in 1965

Ethambutol (EMB) and pyrazinamide (PZA) followed.

Currently, INH, RMP, EMB and PZA are classified as “first-line” antituberculosis drugs in Canada. “Second-line” drugs include streptomycin, rifabutin, some fluoroquinolones (e.g., Levofloxacin, Moxifloxacin).

Detailed information about first-line and second-line TB medications commonly used in Alberta is presented in *Section 3.3.2*, and *Appendices C through F*.

Drugs for the treatment of active TB disease or LTBI are available for no cost to clients through the Alberta's Tuberculosis Control Program.

1.2.5.1 Treatment of active TB disease

Detailed information about the treatment of active TB disease is presented in *Section 3.3*.

Historically, treatment of active TB disease has included:

- bed rest
- dietary improvements/supplementation
- heliotherapy (exposure to sunlight)
- surgical intervention to remove diseased tissue, e.g., lobectomy (removal of disease portions [lobes] of the lung)
- mechanical (surgical) interventions aimed at collapsing areas of the lung, such as
 - phrenectomy (paralysis of diaphragm muscle)
 - thoracoplasty (surgical removal of ribs)
 - pneumothorax (lung collapse through placement of air, oil, lucite balls)

None of these pre-medication regimes could be relied upon to cure TB. Today, treatment of active TB disease is primarily through the use of antituberculosis medications. The objective of treatment for active TB disease is to achieve lifetime cure while preventing development of drug resistance. Multi-drug regimens, taken for an extended period of time (e.g., six to nine months or longer) are required. Treatment of disease caused by drug-resistant isolates can be extremely complex, costly, and poorly-tolerated. Effective treatment multi-drug resistant TB (MDR-TB) and extensively drug-resistant TB (X-DRTB) remains challenging.

Determination as to the length of treatment required includes consideration of:

- medication(s) used;
- isolate drug susceptibility (known or presumed);
- site(s) of disease;
- co-morbidities;
- response to treatment;
- compliance.

The most common cause of treatment failure is poor compliance to therapy. Directly observed therapy (DOT) is the most effective strategy available for assuring compliance to treatment, and is the standard of medication delivery in Alberta for all cases of active TB disease.

Aspects of management of active TB disease (including evaluation, isolation, and treatment) may be enforced through legislation (see *Section 3.6, Management of recalcitrant persons*).

1.2.5.2 Treatment of LTBI

Detailed information about the treatment of LTBI is presented in *Section 5.1*.

The objective of treatment for LTBI is to prevent development of active TB disease. Currently, efforts to prevent TB disease after infection with MTB revolve around the use of antituberculosis drugs, namely isoniazid (INH).

Although treatment of LTBI has been shown to be a reliable way to prevent TB disease, it is not offered to every person who is infected with MTB, rather it is targeted at particular populations (see *Section 5.1.1, Indications for treatment of LTBI*).

Length of treatment is dependant upon medication(s) used and compliance.

Some regimens for treatment of LTBI may be given intermittently (i.e., twice a week instead of daily). Directly observed preventive therapy (DOPT) is the standard of care in Alberta for intermittent treatment of LTBI. DOPT may also be considered in other select circumstances (see *Section 5.1.2 Process for initiation of LTBI treatment*)

Treatment for LTBI is not mandatory and individuals have the right to refuse treatment.

1.2.6 TB prevention and control in Alberta

Three priority strategies have been established for the prevention and control of TB in Alberta;

1. Identification of individuals with active TB disease and treatment completion (see *Section 2.1, Case detection and latent TB infection (LTBI) screening programs, Section 2.2, Case detection and LTBI screening methodology, and Section 3.3, Treatment of active TB disease*);
2. Investigation of contacts of infectious TB (see *Section 4, Contact investigation and outbreak management*)
3. Investigation of populations at risk for LTBI and progression to active TB disease² (see *Section 2.1, Case detection and latent TB infection (LTBI) screening programs*)

²
Adapted from Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition, Canadian Lung Association, Canadian Thoracic Association, Public Health Agency of Canada, 2007, p. 276.

The targeted administration of Bacille Calmette Guerin (BCG) vaccine in select Canadian Aboriginal populations could be considered a fourth prevention strategy (see *Section 5.2, Bacille Calmette-Guerin (BCG)*). This practice is in the process of being phased out in Alberta.

1.3 Epidemiology of TB

1.3.1 Global³

The World Health Organization (WHO) estimates that one third of the world's population is infected with *Mycobacterium tuberculosis*. In 2007, there were an estimated 9.27 million new cases of active TB disease and an estimated 1.32 million HIV negative people (19.7 per 100,000 population) died from TB and an additional 456,000 TB deaths among HIV positive people.

The global TB incidence rate in 2007 was 139 cases per 100,000 population. The African Region has the highest incidence rate per capita globally, at 363 per 100,000 population.

In order, the five countries with the highest absolute numbers of cases in 2007 were:

1. India
2. China
3. Indonesia
4. Nigeria
5. South Africa

The challenges of spread of HIV and emergence of drug-resistance strains of TB continue to influence the global picture. Of the new active cases in 2007, 1.37 million (14.8 per cent of all cases) were in HIV-positive people and approximately 0.5 million of all cases had multi-drug resistant TB (MDR-TB).

The most current statistics from the World Health Organization are available at: <http://www.who.int/tb/en/>

1.3.2 National⁴

Pre-release data from the Public Health Agency of Canada (PHAC) indicates that 1,600 new active and re-treatment cases of TB disease were reported to the Canadian Tuberculosis Reporting System (CTBRS) in 2008. This translates into a case rate of 4.8 per 100,000 population.

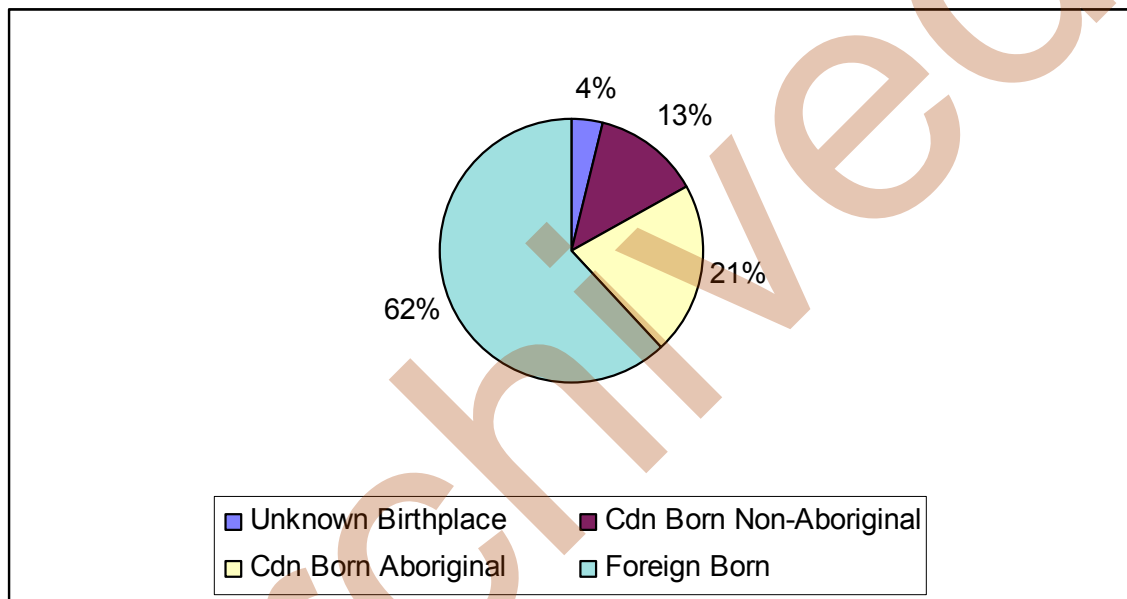
³ http://www.who.int/tb/publications/global_report/en/index.html, accessed Feb18.09

⁴ Tuberculosis in Canada 2007 – Pre-release, available online at: <http://www.publichealth.gc.ca/tuberculosis>, accessed Feb17.09

Together, the provinces with the highest populations (British Columbia, Ontario and Quebec) reported the majority of active cases (69%) in 2008. The highest case rate (184.4 per 100,000 population) was reported in Nunavut. The lowest was from Prince Edward Island, where no cases were reported that year.

Foreign-born individuals accounted for 62% of cases (985 cases) reported in Canada in 2008. Canadian-born Aboriginal cases accounted for 21% (341 cases), and Canadian-born non-Aboriginal 13% (209 cases). Of these groups, Canadian-born Aboriginals had the highest rate of TB disease (28.2 per 100,000).

Figure 1-2: Reported new active and re-treatment tuberculosis cases by origin – Canada by provinces/territories: 2008 (pre-release data)



Respiratory TB accounted for 76% of all cases that year, with pulmonary TB being the most frequently reported main diagnostic site (65%).

By age group, those between the ages of 25 and 34 years made up the largest number of reported cases (18%) with a corresponding case rate of 6.5 per 100,000 population. Individuals aged 65-74 years had a case rate of 6.9 per 100,000 population. Those aged 74 years or more had a case rate of 9.1 per 100,000 population.

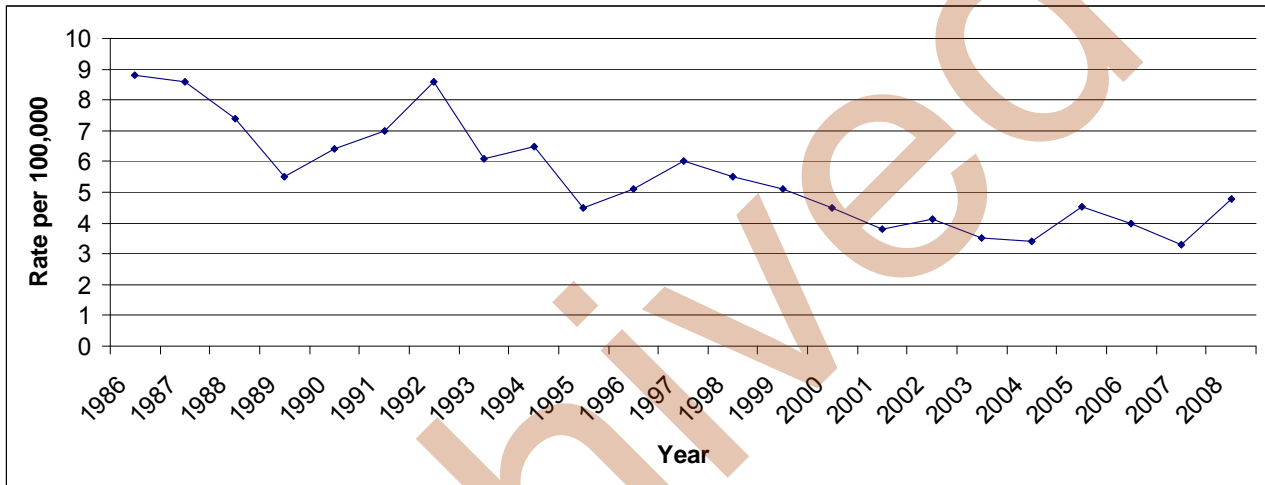
The latest TB reports for Canada are available at:
<http://www.publichealth.gc.ca/tuberculosis>

1.3.3 Alberta

TB was once a major cause of death in Alberta. Diligent contact tracing, treatment protocols, and monitoring have largely controlled the disease.

Pre-release data from the Public Health Agency of Canada (PHAC) indicates that 167 new active and re-treatment cases of TB disease were reported to the Canadian Tuberculosis Reporting System (CTBRS) by Alberta in 2008. This translates into a case rate of 4.8 per 100,000 population.

Figure 1-3: Incidence of tuberculosis in Alberta, 1986 - 2008

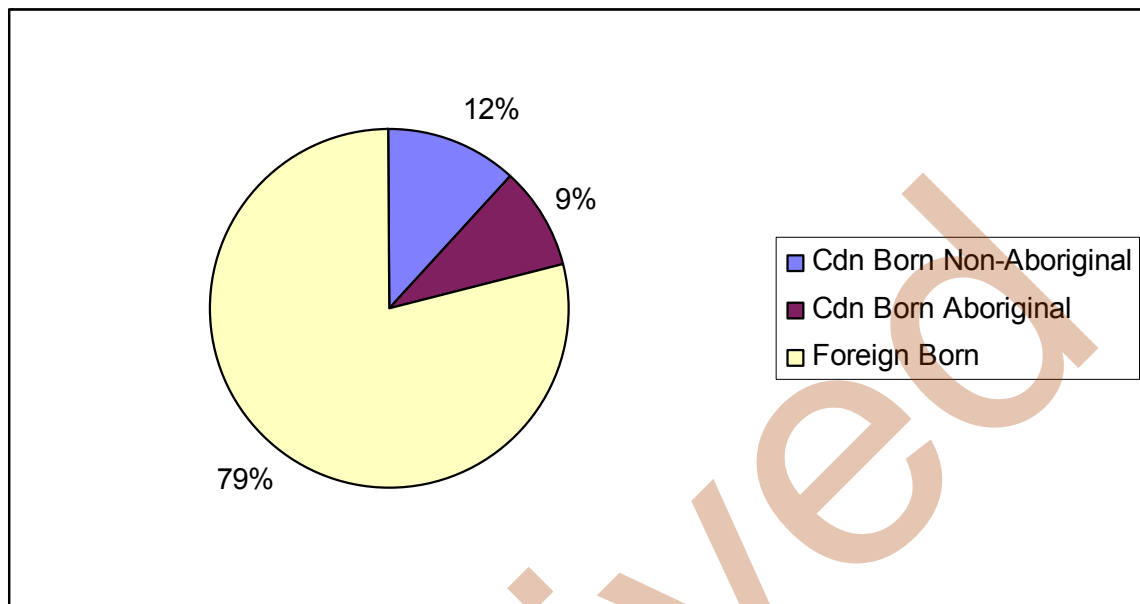


Source: Tuberculosis Database, Alberta Health and Wellness 1986 – 2008

Together, Calgary and Edmonton health regions (includes First Nations) reported the majority of active cases 143 in 2008. The health region with the highest case rate (6.84 per 100,000 population) was Calgary. The lowest was Aspen with one case (.54 per 100,000 population) reported.

Foreign-born individuals accounted for 79% of cases (132 cases) reported in Alberta in 2008. Canadian-born Aboriginal cases accounted for 9% (15 cases), and Canadian-born non-Aboriginal 12% (20 cases).

Figure 1-4: Reported new active and re-treatment tuberculosis cases by origin – Alberta: 2008 (pre-release data)



In Alberta, respiratory TB accounted for 63.5% of cases (106 cases) in 2008.

By age group, those between the ages of 25 and 34 made up the largest number of reported cases in 2008 (21.5%) with a corresponding case rate of 6.87 per 100,000 population. Individuals aged 35–44 had a case rate of 5.02 per 100,000 population. Individuals aged 65–74 years had a case rate of 9.43 per 100,000 population. Those aged 75 years or more had a case rate of 12.04 per 100,000 population.

1.4 Public health targets for TB in Alberta⁵

The Public Health Agency of Canada (PHAC) has committed to reducing the incidence rate of TB in Canada to 3.6 per 100,000 population by 2015. This supports the target set in the Global Plan to Stop TB 2006–2015 to reduce the burden of the disease by 50 per cent compared to 1990 rates.

Through leadership and in collaboration with its partners, the Alberta Tuberculosis Control Program will continue to contribute toward this goal in the years to come.

⁵ Public Health Agency of Canada Mission Statement. Available online at: <http://www.phac-aspc.gc.ca/tbpc-latb/intro-eng.php> : retrieved Feb 19.09

1.5 Indications and processes for TB follow-up referrals

In Alberta there are essentially two distinct processes for follow-up of clients related to TB; referral to one of the two AHS TB Services outpatient TB clinics or to AHS central TB Services. Which process should be used is determined according to where in the province the client resides.

Clients residing within the Calgary or Edmonton areas should be referred to the local outpatient TB clinic.

Specifically,

- Clients whose primary residence is in the Edmonton area should be referred to Alberta Health Services, Edmonton Area - TB Clinic
- Clients whose primary residence is in the Calgary area should be referred to Tuberculosis Services (the outpatient TB clinic in Calgary)
- Clients residing outside of the Calgary or Edmonton areas and/or on a First Nations reserve in Alberta are followed through AHS central TB Services , located in Edmonton at 100 Avenue and 107 Street.

Unlike referrals to the outpatient TB clinics (whereby clients are physically referred for services), referrals to AHS central TB Services involves the referral of *information* pertaining to individuals at risk for TB, or suspected of having TB – not clients themselves.

Referrals to AHS central TB Services may be made by physicians or PHNs. Ideally, physicians should work with public health in this process.

Sections 1.5.1 and 1.5.2 describe the indications and processes generally undertaken for:

- Referral to an outpatient TB clinic
- Referral to AHS central TB Services
- Referral to physicians in the community

Information about referral for uninsured persons is presented in *Section 1.5.3*.

1.5.1 Indications for referral to AHS TB Services or to an outpatient TB clinic

The following clients (or their information, as in the case of referrals to AHS central TB Services) should be referred:

- Individuals who have signs/symptoms, or other findings (e.g., laboratory, radiology, histopathology) suggestive of active TB disease, *regardless of TST result*;

NOTE: Immediate and follow-up management of individuals with symptoms or signs suggestive of active TB disease should proceed as described in *Section 2.2.1.3 and/or Section 2.2.1.4* (depending whether or not symptoms are suggestive of active *respiratory* TB).

AHS central TB Services (**780-735-1464**) should be notified immediately when clinicians in communities outside of Calgary or Edmonton (or on First Nations reserves) suspect a case of active TB disease. Notification should proceed the next business day in the case of evenings, weekends or holidays.

- Individuals who require evaluation as a result of exposure to an active case of TB disease (TB contacts), *regardless of initial TST result and/or X-ray findings*

NOTE: Evaluation and referral of TB contacts should proceed according to the priorities established for individual contact investigations. See Chapter 4.0, TB contact investigation and outbreak management for additional important information regarding management of TB contacts.

- Individuals found to have a history of prior active TB disease for whom it has not already been determined that no further TB follow-up is required
- Individuals whose radiology findings contain any of the following descriptors (which may be suggestive of prior, inactive or active TB disease) *regardless of TST result*,
 - suspicion of current active TB disease (e.g., upper lung zone pneumonic process, particularly if cavitating or if associated with the acinar shadows of endobronchial spread)
 - upper lobe fibronodular abnormality
 - old granulomatous disease or old tuberculosis (does not include single, isolated granuloma)
 - thoracoplasty
 - intrathoracic adenopathy with or without a lung parenchymal abnormality in an immune compromised person
 - pleural calcification or fibrocalcification
 - unilateral apical pleural thickening or bilateral but unequal apical pleural thickening, particularly if irregular or calcified

NOTE: If any of the above are reported as findings, three (3) sputum samples should be submitted for AFB smear and culture (see *Appendix B, Respiratory specimen collection*).

- Individuals who appear to be candidates for treatment of latent TB infection (LTBI) (based on criteria presented in *Section 5.1, Treatment of Latent TB Infection [LTBI]*).
- Individuals who are severely immune compromised due to HIV and have not already been screened for active TB or latent TB infection.
- Residents of continuing care facilities with a positive tuberculin skin test and risk factors for progression to active TB disease (as described in *Section 2.1.2, Individuals with medical conditions/therapies that increase risk of progression from LTBI to active TB disease*) regardless of radiographic findings.

NOTE: See *Section 1.5.2.3, Referral to a physician in the community* for direction regarding management of individuals residing outside of the Calgary or Edmonton areas that are found to have a positive tuberculin skin test (TST) but do not meet any of the above criteria for referral.

1.5.2 Process for referral

1.5.2.1 Referral to an outpatient TB clinic

Referral to either AHS outpatient TB clinic should be managed according to zonal operational policy and procedure.

Clinicians uncertain of these processes/procedures are encouraged to contact the appropriate TB clinic for direction. Contact information for the outpatient TB clinics is provided in *Contacts – TB Coordinators*.

1.5.2.2 Referral to AHS central TB Services

Communication with AHS central TB Services about a client should begin with the completion of a *Tuberculosis Referral Form* (see *Appendix G*), unless the client is symptomatic for active TB disease (see above regarding suspected active cases).

The *Tuberculosis Referral Form* serves as a data collection tool on which to record pertinent information related to client demographics and reasons for the referral. This form should also be used as a requisition to order radiographs intended to be forwarded (along with the form and findings) to AHS central TB Services.

NOTE: It may be useful to maintain a copy of the completed *Tuberculosis Referral Form* on the client record within the public health office to ensure a replacement is available should the original form not be forwarded with the X-Ray.

1.5.2.3 Referral to a physician in the community

Individuals residing outside of the Calgary or Edmonton areas that are found to have a positive TST but do not meet any of the criteria for referral to AHS central TB Services should be referred to a local physician for assessment to rule out active TB disease. This assessment should include a chest X-ray.

When individuals do not have a family physician, referral for assessment becomes more difficult. Ideally, the individual should be assisted to find a family physician. If this is not possible, the zonal MOH should be consulted regarding the ordering of the chest X-ray and ensuring there is reading and reporting of radiographic findings.

NOTE: Referral to AHS central TB Services may be indicated following the radiography and/or physician assessment, e.g., if radiologic descriptors suggestive of TB are noted on the chest X-ray or a significant risk factor for progression to active TB disease is identified. Therefore, the results from radiography and assessment of such clients should always be requested by the individual who initiated the referral.

The following information should be made available to the physician performing the assessment:

- the reason TB screening was initiated (e.g., recent contact of an active TB case)
- the purpose of the referral
- applicable history (e.g., prior treatment for TB or LTBI)
- results of screening completed to date, such as:
 - findings from signs/symptoms inquiry
 - findings (reports) of any recently completed chest X-rays
 - sputum for AFB smear/culture

Provincial TB Medical Consultants are available for physician consultation when necessary at **780-735-1464**. If there is a need to contact a TB physician after hours or on weekends regarding **clients in Edmonton or outside of Calgary or Edmonton**, call the University of Alberta Hospital at **780-407-8822**, ask to speak to the TB physician on call. After hours or weekends calls regarding **clients in Calgary** should be directed to the Calgary TB paging system at **403-212-8223**, **pager #00514**, or the Foothills Hospital Operator at **403-944-1110**; ask to speak to the TB physician on call.

1.5.3 Referral of uninsured persons

Alberta Health Services (AHS) carries the financial responsibility in the case of an individual who does not have health care coverage.

Uninsured clients who are permanent residents of Alberta should be advised to apply immediately for Alberta Health Care Insurance Plan (AHCIP) coverage. Information about AHCIP and application forms are available online at: <http://www.health.alberta.ca/health-care-insurance-plan.html>

AHCIP may also be reached **toll-free** in Alberta by dialing **310-0000** followed by **780-427-1432**.

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2. CASE DETECTION AND LTBI SCREENING

2.1 Case detection and Latent TB Infection (LTBI) screening programs

The primary goals of TB screening programs are to identify:

- Individuals with active TB disease (cases of TB), or
- Individuals who have become infected with *Mycobacterium tuberculosis* (MTB) but have not yet developed active TB disease (those with LTBI).

The purpose of identifying individuals with LTBI is so that treatment of the infection can be offered, thereby reducing their risk of developing active TB disease in future. This is particularly important for individuals such as those dually-infected with MTB and HIV, as they are at significant risk of developing active TB disease.

TB screening programs also:

- establish baseline MTB infection status for individuals who will require periodic re-testing, such as health care workers and others who have an ongoing (usually occupational) risk of exposure to TB.
- provide a mechanism for monitoring the occurrence/prevalence of MTB infection within specific populations, such as inmates of correctional facilities.

In keeping with these goals, TB case detection and LTBI screening programs in Alberta focus on groups:

- for which rates of TB disease and MTB infection are higher than the general population, and/or
- are at increased risk for exposure to and infection with MTB, and/or
- are at increased risk of progression to active TB disease once/if infected with MTB.

Case finding and LTBI screening activities are recommended in Alberta for the following population groups. Individual subsections should be reviewed for background information and population-specific recommendations.

- Individuals at increased risk for recent infection with MTB, e.g., TB contacts and travelers to TB endemic countries
- Individuals with medical conditions/therapies that increase risk of progression from infection with MTB to development of active TB disease. For both patient and public health (infection control) reasons, particular attention is given to:
 - HIV/AIDS programs
 - dialysis programs

- transplant programs
- TNF inhibitor programs

These are largely hospital-based programs. It is recommended that symptomatic screening of these clients be incorporated into these programs (if this has not already been done) and that AHS central TB Services and the outpatient TB clinics assist in this.

- Individuals with a history of untreated or inadequately treated TB disease
- Foreign-born individuals who are referred for medical surveillance
- Individuals in health professions and others who work or volunteer with populations at increased risk for TB
- Residents of congregate living settings such as correctional institutions, substance abuse/mis-use rehabilitation centres, and continuing care facilities
- Preschool and school-aged children living in First Nations communities
- Clients of shelters and drop-in centres for the homeless/under-housed

Detailed information outlining the methods employed in case detection and LTBI screening is provided in *Section 2.2, Case detection and LTBI screening methodology*.

Direction as to the immediate management and follow-up of individuals suspected of having active TB disease is provided in *Sections 2.2.1.3 and 2.2.1.4*.

Specific procedures/forms to support referral of clients to AHS central TB Services or an outpatient TB clinic are provided in *Section 1.5, Indications and processes for TB follow-up referrals*.

2.1.1 Individuals at increased risk for recent infection with MTB, e.g., TB contacts and travelers to TB endemic countries

Background

People who have had contact with infectious TB disease and travelers to countries that have high rates of TB are at risk of infection with MTB and subsequent development of active TB disease.

2.1.1.1 TB contacts

Recommendations with regard to management of TB contacts are provided in *Section 4, TB contact investigation and outbreak management in Alberta*.

2.1.1.2 Travelers to TB endemic countries⁶

Background

Pre-travel TB assessment allows for client education about TB and to establish baseline TST or IGRA test results. The aim of post-travel TB assessment is to identify if the individual has become infected with MTB and/or developed active TB disease.

The assessment of travelers for TB is a controversial area. Currently, recommendations as to which individuals should undergo travel-related TB assessment are based on the likelihood of exposure to infectious TB while outside of Canada.

The major determinants of an individual's risk of significant exposure to TB while traveling are generally accepted to be:

- the prevalence of smear-positive pulmonary TB in the destination country or countries;
- duration of stay in areas that have a high prevalence of TB
- nature and frequency of contact with local people in areas with a high prevalence of TB

Estimates of international TB incidence rates are available from the Public Health Agency of Canada website at: http://www.phac-aspc.gc.ca/tbpc-latb/itir_e.html

Recommendations

i. Travelers to low TB incidence areas

In general, countries with health standards similar to Canada (e.g., the United States, Britain, Australia) are considered low TB incidence countries. TB assessment is not usually recommended for travelers to these countries regardless of age, contact with local residents, or duration of stay.

ii. Short stay travelers to areas of increased TB incidence

TB assessment prior to travel is not routinely recommended for short-stay tourists (< 3 months) of any age who plan to have little or no contact with local residents.

If it is anticipated that a short stay traveler will spend significant amounts of time with local residents, TB assessment prior to travel is recommended particularly if the individual is a child and/or anticipates being involved in activities and/or

⁶ Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition. Canadian Lung Association and Public Health Agency of Canada, 2007, p.283-4.

environments that may expose them to exceptionally high rates of infectious TB (see *Special considerations*, which follows).

Pre-travel TB assessment

Pre-travel TB assessment should include a symptom inquiry and, ideally, baseline evaluation of MTB infection status (e.g., TST or IGRA testing if available/appropriate).

Two-step, pre-travel TST is recommended for individuals without a history of prior active TB disease, previous positive TST, or prior documented two-step TST who:

- anticipate entering a serial TST program for occupational health reasons (e.g., health care workers)
- would **not** be candidates for treatment of LTBI unless TST conversion is documented after the travel event, such as healthy individuals at low risk for progression to active TB disease or those at risk for TST boosting (e.g., 55 years of age or older, history of BCG vaccination – see *Section 2.2.5.5 Two-step TST and the booster phenomenon*)

Post-travel TB assessment

An eight-week post-travel TB assessment (symptom inquiry and single-step TST*) is recommended for:

- individuals for whom two-step pre-travel TST was indicated and found to be negative;
- children traveling or residing for three months or longer in an area with increased TB incidence⁷;
- other travelers who had regular contact with the general population of the country visited, as recommended according to *Table 2-1, Indication for tuberculosis screening relative to incidence rate and duration of stay*.

* *Travelers with a history of prior active TB disease or previous positive TST should not undergo TST or IGRA testing; they should have a symptom inquiry and be followed accordingly.*

⁷
Ibid, p.191.

Table 2-1: Indication for tuberculosis screening relative to incidence rate and duration of stay

AFB smear-positive pulmonary TB incidence rate*	Duration of stay	Post travel TB assessment recommended
At least 200 per 100,000	3 months or longer	yes
100 to 199 per 100,000	6 months or longer	yes
50 to 99 per 100,000	12 months or longer	yes

* Estimates of international TB incidence rates are available from the Public Health Agency of Canada website at: http://www.phac-aspc.gc.ca/tbpc-latb/itir_e.html

iii. Follow-up of travelers found to be TST positive

TST-positive travelers should be followed up as described in *Section 2.2.5.7, Follow-up of individuals found to have a positive TST result* regardless of whether the positive TST is identified before or after travel has occurred.

Initiation of treatment for LTBI may need to be deferred until after return from travel depending on the individual's travel schedule (e.g., where they are going, how long they will be out of the country).

Follow-up recommendations for TST-positive travelers who decline treatment for LTBI will vary according to the individual's risk for progression from LTBI to active TB disease.

iv. Special considerations

a. Travelers to settings with potentially exceptionally high rates of infectious TB

Travelers who intend to work/volunteer or otherwise spend time in settings where they may be at exceptionally high risk of exposure to infectious TB should undergo a pre-travel two-step TST unless they have a history of prior active TB disease or previous positive TST or prior documented two-step TST. An IGRA test, if available, may be indicated if there is reason to think the pre-travel TST was falsely positive.

Such settings include:

- health care facilities or correctional institutions
- refugee camps

- inner city slums
- homeless shelters

Follow-up TB assessment should occur eight weeks or more after the assignment concludes if the placement is short-term (less than one year), or annually if the placement is for a longer term (≥ 1 year). The assessment should include symptom inquiry and, if appropriate for the client, single-step TST (or IGRA testing).

Immediate and follow-up management of symptomatic individuals should proceed as described in *Section 2.2.1.3 and/or Section 2.2.1.4* (depending whether or not symptoms are suggestive of active respiratory TB).

b. Infants, young children, and immune-suppressed travelers

Infants, children less than five years of age, and individuals immune suppressed due to HIV, cancer therapy or other factors are at increased risk of progression to active TB disease if they become infected with MTB.

Parents or caregivers of children, and immune suppressed individuals who are considering travel to areas of increased TB incidence should be informed of:

- the serious risks associated with TB exposure
- the fact that BCG vaccination is not an option
- the fact that a preventive strategy based on TST (or IGRA testing) will have major limitations for them (e.g., availability, reliability)

Particular emphasis should be placed on the importance of:

- early identification and follow-up of symptoms/signs suggestive of active TB disease
- completion of post-travel TB assessment

v. TB education and awareness for travelers

Travelers to TB endemic countries should be provided with information about minimizing risk of TB exposure during travel and to avoid consumption of unpasteurized milk as it may contain *Mycobacterium bovis* or other pathogens.

Travelers should also be advised of the signs and symptoms of TB and the importance of reporting to a physician for assessment should any develop during their travels or after returning to Canada.

Information about TB for travelers can be obtained from the Public Health Agency of Canada website at: http://www.phac-aspc.gc.ca/tbpc-latb/faq_e.html

2.1.2 Individuals with medical conditions/therapies that increase risk of progression from LTBI to active TB disease

Background:

Risk of progression from infection with MTB to development of active TB disease is related to depressed cell-mediated immunity (CMI). Several medical conditions and therapies can depress CMI and increase the risk a person who is infected with MTB will develop active TB disease, including:

High risk

- HIV infection/AIDS
- transplantation (related to immunosuppressant therapy)
- silicosis
- chronic renal failure requiring dialysis
- carcinoma of the head or neck
- recent infection with MTB (≤ 2 years)
- abnormal radiograph – e.g., fibronodular or other changes suggesting prior TB disease
- Hematological malignancies (although hematologic malignancies are not listed as high category in the *Canadian Tuberculosis Standards, 6th edition*, we would for the purposes of this manual and TB control in Alberta list them as such.)

Increased risk

- treatment with glucocorticoids (i.e., prednisone [or equivalent] of >15 mg/day for one month or more) or tumor necrosis factor (TNF) inhibitors
- diabetes mellitus (all types)
- less than ideal body weight ($< 90\%$ ideal body weight; for most persons this is a body mass index of < 20 kg/m²)
- young age when infected (0 – 4 years)

Many other risk factors are known to increase risk for development of TB disease to some degree, including use of some immune function altering treatments and medications, and T-cell lymphomas. Daily alcohol intake and/or intravenous use of illicit drugs may also increase the risk of acquiring MTB infection or developing active TB disease.

Some individuals with depressed CMI will also be at risk of having been infected with MTB by virtue of belonging to one or more of the following groups:

- those 65 years of age or older
- Aboriginal peoples from communities with high rates of TB
- homeless or other inner-city residents

- foreign-born persons from TB endemic countries
- travelers to TB endemic countries
- health professionals and others who work closely with populations at increased risk for TB

In addition to increasing risk for active TB disease, depressed CMI may also impair an individual's ability to respond reliably to the TST (making detection of infection with MTB problematic) and/or affect the presentation of active TB disease, possibly causing delay in diagnosis of TB.

Sputum (or other respiratory sample) examination for AFB is extremely important to identify or rule out active respiratory TB disease in immune suppressed individuals. Predisposition to non-respiratory forms of disease in this population may necessitate the submission of tissue samples, lymph node aspirations/biopsies, or blood for AFB exam.

A high index of suspicion for TB must be maintained for individuals with immune suppression, *regardless of TST result*. Cough of more than three weeks' duration, with or without any other symptoms suggestive of TB should be followed up promptly and thoroughly; see *Sections 2.2.1.3 and 2.2.1.4*.

Recommendations

Recommendations regarding TB screening for individuals who have risk factors for infection with MTB or for progression to TB disease will vary depending upon the risk factor(s). For the purposes of this manual, recommendations for TB screening and ongoing surveillance of immune suppressed individuals have been divided into two categories.

- Individuals with immune suppression related to HIV infection and/or AIDS
- Individuals with other immune suppression

2.1.2.1 **Individuals with immune suppression related to HIV infection and/or AIDS**

Of all of the risk factors for progression from infection with MTB to active TB disease, infection with HIV is the most important. HIV infection affects the function of the two immune cells most important to the containment of *Mycobacterium tuberculosis* bacilli; the macrophages and CD4 receptor-bearing lymphocytes.

Active TB disease occurs with increasing frequency once the CD 4 count falls below $500 \times 10^6/L$ and is an AIDS-defining illness when it does. Treatment of HIV infection with effective antiretroviral therapy may reduce the TB reactivation risk by up to

80%, but even in this group the risk of reactivation is still twice that of persons without HIV infection⁸.

TB can be a life-threatening illness for people who are infected with HIV. HIV-related immune suppression may lead to unusual presentations of TB disease (e.g., miliary TB disease or TB meningitis), resulting in delay in diagnosis, severe disease at time of diagnosis and prolonged potential for transmission.

Once diagnosed, treatment of TB disease in the HIV-infected can be difficult. Drug interactions, untoward responses to treatment, and potential for development of TB drug resistance are common challenges⁹.

i. TB screening recommendations for clients living with HIV

Individuals newly diagnosed with HIV infection should undergo the following assessments as soon as possible:

a. TB history and symptom inquiry

Symptoms that should alert the practitioner to the possibility of active TB disease include:

- cough of at least three weeks' duration, particularly if productive and associated with hemoptysis
- fever (often low grade)
- unexplained weight loss
- night sweats (may be absent in the very young or elderly)
- fatigue
- anorexia (loss of appetite)

NOTE: Clinicians should be aware that HIV-infected individuals may be more likely to have active respiratory TB disease in the absence of typical clinical or radiologic findings (e.g., cough, chest X-ray abnormalities).

Immediate and follow-up management of HIV positive individuals with symptoms or signs suggestive of active TB disease should proceed as described in *Section 2.2.1.3 and/or Section 2.2.1.4* (depending whether or not symptoms are suggestive of active respiratory TB). Particular emphasis should be placed on the collection of sputum (and/or other specimens, if indicated) for AFB smear and culture from such clients.

⁸ HIV Pos 2 (3) doc. From Denise Whittaker Nov25.08

⁹ CDC, Notice to Readers: Acquired Rifamycin Resistance in Persons with Advanced HIV Disease Being Treated for Active Tuberculosis with Intermittent Rifamycin-Based Regimens, MMWR 2002; 51(10);214-5.

b. Chest radiograph

Posterior-anterior (PA) and lateral view chest X-rays should be taken unless the client is pregnant – see *Section 2.2.2.2, Special considerations in chest radiography*.

c. Tuberculin skin testing (TST) (unless there is a prior diagnosis of active TB or documented prior positive TST result)

NOTE: HIV infection is not, in itself, an indication for two-step TST (see *Section 2.2.5.5, Two-step TST and the booster phenomenon*).

A TST reaction of <5 mm (i.e., 0 to 4 mm) might still be considered “positive” for HIV positive individuals for whom the expected likelihood of TB infection is high (e.g., the client is from a population with a high prevalence of TB infection, is a close contact of an active, infectious case, or has an abnormal chest radiograph).

A TST reaction of 5 mm or greater is considered “positive” for all other HIV infected individuals.

For additional information about TST result interpretation, see *Section 2.2.5.4, Administration, reading, and interpretation of TST* and *Table 2-2, Interpretation of TST measurement based on induration size*.

NOTE: Submission of three sputum samples (or other specimens, if appropriate) for AFB smear and culture examination may be indicated, based on degree of immune suppression and TB history/symptom inquiry/chest x-ray findings.

ii. Follow-up recommendations for clients living with HIV

Clients living with HIV who meet any of the following criteria should be referred to either AHS central TB Services or one of the outpatient TB clinics (see *Section 1.5, Indications and processes for TB follow-up referrals*):

- those with a positive TST result;
- those with a negative TST result if severely immune compromised **and** at high risk for infection with MTB (e.g., the client is from a population with a high prevalence of TB infection, is a close contact of an active, infectious case, or has an abnormal chest radiograph);
- those suspected of having active TB disease (manage as described below)

Individualized follow-up recommendations will be made for HIV positive clients referred to the outpatient TB clinics or AHS central TB Services.

HIV positive, TST negative clients should undergo annual TST if at risk for ongoing exposure to TB¹⁰, e.g., if they reside in a community that has high rates of TB, or are employed/volunteer regularly in environments that provide services to individuals at increased risk for TB (see *Section 2.1.5, Individuals in health professions and others who work or volunteer with populations at increased risk for TB*).

If *at any time* an HIV-positive client develops symptoms suggestive of active TB disease, they should be managed as described in *Sections 2.2.1.3 and/or 2.2.1.4* (depending on whether or not symptoms are suggestive of active *respiratory TB*), regardless of TST result.

2.1.2.2 Individuals with other immune suppression

All individuals who are known to be immune suppressed or who are anticipated to become immune suppressed (e.g., following organ transplantation) should be screened for TB.

Ideally, evaluation for TB in this population should be completed:

- at the time of diagnosis of an immune suppressing illness or condition (e.g., renal failure)
- prior to receiving immune suppressive drugs (e.g., anti-rejection medications, TNF-alpha inhibitor therapy)
- prior to entering, working or volunteering in chronic care facilities or programs (e.g., dialysis units) where there is potential for transmission of MTB to/from other immune compromised clients/staff

i. TB screening recommendations for clients with other immune suppression

TB evaluation for immune suppressed individuals should consist of:

a. TB history and symptom inquiry

Symptoms that should alert the practitioner to the possibility of active TB disease include:

- cough of at least three weeks' duration, particularly if productive and associated with hemoptysis
- fever (often low grade)
- unexplained weight loss
- night sweats (may be absent in the very young or elderly)
- fatigue
- anorexia (loss of appetite)

¹⁰ Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition, Canadian Lung Association and Public Health Agency of Canada, 2007, p.203.

Immediate and follow-up management of immune suppressed individuals with symptoms or signs suggestive of active TB disease should proceed as described in *Section 2.2.1.3 and/or Section 2.2.1.4* (depending whether or not symptoms are suggestive of active respiratory TB). Particular emphasis should be placed on the collection of sputum (and/or other specimens, if indicated) for AFB smear and culture from such clients.

b. Chest radiograph

Posterior-anterior (PA) **and** lateral view chest X-rays should be taken unless the client is pregnant – see *Section 2.2.2.2, Special considerations in chest radiography*.

- c. Submission of three sputum (or other specimens, if appropriate) for AFB smear and culture examination, if possible (see *Appendix B, Respiratory specimen collection*)
- d. Tuberculin Skin Testing (TST) (unless prior TB disease or documentation of prior positive TST)

NOTE: Immune suppression is not, in itself, an indication for two-step TST (see *Section 2.2.5.5, Two-step TST and the booster phenomenon*).

TST results of immune suppressed individuals should be interpreted as described in *Section 2.2.5.4, Administration, reading, and interpretation of TST* and *Table 2-2, Interpretation of TST measurement based on induration size*.

ii. Follow-up of new positive TST or TST conversion in clients with immune suppression

Asymptomatic, immune suppressed clients found to have a new positive TST or TST conversion should submit three sputum samples for AFB smear and culture (see *Appendix B, Respiratory specimen collection*) and be referred to AHS central TB Services or the outpatient TB clinic (see *Section 1.5, Indications and processes for TB follow-up referrals*).

Symptomatic clients should be managed as described in *Sections 2.2.1.3 and/or 2.2.1.4* (depending on whether or not symptoms are suggestive of active respiratory TB).

New positive TST or TST conversion in renal dialysis unit clients

Given the degree of risk for transmission of MTB in dialysis units, and for progression to active TB disease among clients undergoing dialysis, consideration should be given to conducting an investigation to determine the source of the client's MTB infection in consultation with AHS central TB Services or the outpatient TB clinic (see *Section 4, TB contact investigation and outbreak management in Alberta.*)

iii. Special considerations

It is essential that clients with any of the conditions described below understand the significance of TB screening findings (e.g., positive TST) and the importance of completing an adequate course of treatment for LTBI (if indicated) in order to prevent development of active TB disease.

a. Renal insufficiency/chronic renal failure

Clients with chronic renal failure undergoing hemodialysis are at 10 to 25 fold increased risk of developing active TB once infected compared to the general population.

TST, if indicated, should be completed as early on as possible. Clients with renal insufficiency should be tested before the patient's glomerular filtration rate (GFR) drops below 30 ml/min. due to potential for cutaneous anergy (falsely negative TST results – see *Section 2.2.5.4, Administration, reading and interpretation of TST*).

Clients and health care providers should be aware that fever, weight loss, and malaise are the most common symptoms of active TB disease in clients with renal insufficiency¹¹. Persistent pleural effusions should be followed up with additional evaluation including sputum samples for AFB smear and culture.

b. Organ transplant candidates or recipients

Candidates for organ transplantation may be immune suppressed by virtue of pre-transplant organ dysfunction (e.g., end stage renal disease) or pre-transplant use of immunosuppressive drugs to treat organ dysfunction (e.g., idiopathic pulmonary fibrosis). Immune suppressive drug therapy will be required following organ transplantation to prevent rejection.

Identification and treatment of LTBI in these individuals is extremely important to prevent development of active TB disease.

¹¹ California Tuberculosis Controllers Association, Guidelines for Tuberculosis (TB) Screening and Treatment of Patients with Chronic Kidney Dialysis (CKD), Patients Receiving Hemodialysis (HD), Patients Receiving Peritoneal Dialysis (PD), Patients Undergoing Renal Transplantation and Employees of Dialysis Facilities, May 2007, p. 7. Available online at: http://www.ctca.org/guidelines/New_Renal_Dialysis_Guidelines_02_22_08.pdf

c. Clients undergoing treatment with tumor necrosis factor (TNF) inhibiting medications (infliximab [Remicade®], adalimumab [Humera®] or etanercept [Enbrel®])

Clients undergoing treatment with TNF inhibitors are at a 1.5 to 4 fold increased risk of developing active TB once infected compared to the general population.

It is recommended that clients be screened for TB prior to initiation of TNF inhibitor therapy. Clients found to have LTBI should complete at least one month of treatment for LTBI before beginning TNF inhibitor medications.

NOTE: Referrals for LTBI treatment for these clients are managed on a high priority basis (fast-tracked) in order to avoid any unnecessary delay in TNF therapy initiation.

2.1.3 Individuals with a history of untreated or inadequately treated TB disease

Background:

These individuals may be identified in a variety of ways, some of which are not related to TB screening, per se.

Inadequate TB treatment may occur for a number of reasons, including having TB prior to the discovery of curative medications. Regardless of the reason, individuals with untreated or inadequately treated TB remain at risk for relapse of disease particularly if they develop medical conditions or begin medical therapies that can depress cell mediated immunity (as described in *Section 2.1.2, Individuals with medical conditions/therapies that increase risk of progression from LTBI to active TB disease*).

Recommendations:

Individuals with a history of untreated or inadequately treated TB should be assessed for symptoms of active TB disease.

If active TB disease is suspected, the individual should be managed as described in *Sections 2.2.1.3 and/or 2.2.1.4* (depending on whether or not symptoms are suggestive of active *respiratory TB*).

If the individual is asymptomatic three sputum samples should be submitted for AFB smear and culture (see *Appendix B, Respiratory specimen collection*) and

arrangements made for a chest X-ray. The individual should then be referred to AHS central TB Services or the outpatient TB clinic (see *Section 1.5, Indications and processes for TB follow-up referrals*). Details regarding prior TB treatment (if any) should be included on the *Tuberculosis Referral Form*.

NOTE: If an individual is unable to produce spontaneous sputum samples, follow-up recommendations may, at the discretion of the TB consultant, include sputum induction or bronchoscopy.

2.1.4 Foreign-born individuals

Background

People from countries with high rates of TB disease are at risk of being infected with MTB and possibly, developing active TB disease.

The proportion of foreign-born TB cases reported in Canada has risen from under 20% in 1970 to nearly 70% in 2004. Between 1994 and 2004, 60% of Alberta's TB cases were foreign-born¹². Therefore, the foreign-born represent a population that could benefit significantly from TB prevention programs.

It is important that ALL health professionals seeing newcomers to Canada, particularly those from high TB prevalence* countries, maintain a high index of suspicion for TB. Foreign-born individuals who are infected with MTB are most likely to progress to active TB disease within the first five years after arrival in Canada. The risk of disease persists, dropping about 10% per year after the initial five years.

* *Estimates of international TB incidence rates are available from the Public Health Agency of Canada website at: http://www.phac-aspc.gc.ca/tbpc-latb/itir_e.html*

Not all foreign-born individuals and populations are at equal risk of being infected with MTB or progressing to active TB disease; rates of TB disease among the newly-arrived foreign-born in Canada tend to mirror the rate of TB in the countries they originate from. The foreign-born may also have a history of inadequately treated prior TB disease or medical or other risk factors that compound their risk for progressing from infection with MTB to development of active TB disease.

¹² Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition, Canadian Lung Association and Public Health Agency of Canada, 2007, p.5.

Recommendations

The following sections identify foreign-born populations that have been recommended for TB screening based on CIC requirements and epidemiologic TB profiles in Alberta.

NOTE: Information about interpretation and translation services is available through informAlberta, online at: <http://www.informalberta.ca/public/common/search.do>

2.1.4.1 Immigrants and refugees

Every year, more than 200,000 immigrants and refugees come to Canada, the majority of them from countries with high rates of TB¹³.

All individuals applying for permanent residency and some individuals applying for temporary residency require an immigration medical examination (IME). The IME includes a physical and mental examination, age-related laboratory tests, and a chest radiograph for individuals aged 11 years and over¹⁴.

The IME for children less than 11 years of age includes chest radiography *only if* risk factors or clinical findings (other than would be found by radiography) indicating the possibility of TB or some other respiratory condition are identified. The rationale for this recommendation is that young children pose significantly less risk of transmission of TB should they have active respiratory TB¹⁵.

Immigrants that make application from outside of the country generally have their IME done in the country they are emigrating from. Immigration medical examinations for refugees or immigrants applying for permanent residency from within Canada are conducted by physicians designated by CIC to provide this service. Medical surveillance may be required by CIC, based on the results of the IME.

The purposes of CIC medical surveillance¹⁶ are to assess individuals for:

- the presence of current active TB disease
- candidacy for treatment of latent TB infection
- need for continued (on-going) TB follow-up

Types of CIC medical surveillance

Individuals may be referred for “urgent medical surveillance” or “regular medical surveillance” as a condition of entry to Canada due to a history of active TB disease or because of a chest radiograph finding suggestive of inactive (previous) TB.

¹³ Ibid, p.4.

¹⁴ Correspondence between Gwen Kerr and Anne Scully et al dated Mar 4.08, as forwarded to Lisa Eisenbeis, Dr. Long et al.

¹⁵ Ibid.

¹⁶ Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition, Canadian Lung Association and Public Health Agency of Canada, 2007, Appendix I.

Urgent medical surveillance referrals are to be assessed within seven days of arrival by a Canadian public health authority. Generally, urgent medical surveillance is recommended for individuals:

- with specific chest x-ray findings
- at high risk of progression from MTB infection to active TB disease (e.g., a chest X-ray suggestive of old, healed or inactive TB along with HIV/AIDs)
- known to have current, active, non-respiratory TB disease
- with history of repeated and/or unconventional prior TB treatment
- known to have had contact with or treatment for, multi or extensively drug-resistant TB (MDR or XDR-TB)

Regular medical surveillance referrals are to report to, or be contacted by, a public health authority within 30 days of arrival. Generally, regular medical surveillance is recommended for individuals with:

- certain (lower risk than those identified above) chest radiography findings
- history of prior respiratory or non-respiratory TB disease **not** known to be multi-drug resistant (MDR-TB) or extensively-drug resistant (XDR-TB)

Additional information regarding criteria used to determine whether an individual is placed on urgent or regular surveillance may be found in the *Canadian Tuberculosis Standards* 6th Edition, Appendix I, available online at:

http://www.phac-aspc.gc.ca/tbpc-latb/pubs/pdf/tbstand07_e.pdf

Process for CIC medical surveillance in Alberta

CIC (Ottawa) notifies AHS central TB Services of individuals requiring CIC Medical Surveillance. This information is processed and a notice is sent to the individual from AHS central TB Services or the outpatient TB clinic (according to the location of the client's primary residence) advising them of the need for assessment. If the patient resides outside of Calgary or Edmonton, a copy of the letter is forwarded to Public Health where the individual resides, along with directions for any follow-up needed at the local level.

NOTE: Public Health staff may need to assist clients with booking appointments for CIC medical surveillance assessments.

In Alberta, the public health designated specialists who assess clients referred by CIC for Medical Surveillance are based out of AHS central TB Services and the Calgary and Edmonton outpatient TB clinics. Findings are reported back to CIC.

CIC medical surveillance assessment typically includes the following:

- comprehensive history
- targeted physical examination (guided by history and other available information, e.g., laboratory, radiography findings)
- other relevant investigations as indicated, e.g., additional radiography, sputum for AFB smear and culture

NOTE: Testing for infection with MTB (e.g., TB skin testing or IGRA testing) is not a required component of the CIC medical surveillance assessment, but may be requested by the public health designated specialist after a review of initial assessment findings.

Individuals who reside or settle in the Calgary or Edmonton areas will generally be seen at the local outpatient TB clinic for their medical surveillance assessment. Individuals living outside of these areas usually have their assessment (TB history/symptom inquiry, sputum sample submission for AFB smear and culture, and chest radiography) done by local Public Health. The results of assessments done by Public Health are forwarded to AHS central TB Services for review by a public health designated specialist.

Based on findings of the medical surveillance assessment, the individual may be recommended for **one** of the following:

- Further investigation for active TB disease and treatment if disease is found
- Treatment for latent TB infection (LTBI) after active TB disease has been excluded
- Ongoing follow-up (surveillance). Follow-up may be for up to three to five years if treatment of LTBI is recommended but declined, or if previous TB treatment is considered to have been inadequate
- Discharge from further, routine follow-up

Compliance with CIC Medical Surveillance Requirements and Follow-up Recommendations

For the purposes of CIC medical surveillance requirement, “compliance” is defined as keeping the first appointment with a public health designated specialist. This definition should not be confused with compliance with TB evaluation/treatment according to *The Public Health Act* of Alberta.

Monitoring and enforcement of compliance with treatment and follow-up (surveillance) is done in accordance with the *Public Health Act* of Alberta and is the responsibility of AHS TB Services and Public Health where the individual resides.

2.1.4.2 Other foreign-born individuals recommended for screening (e.g., visitors, students, temporary working visa holders)

Immigration medical examinations are required for two types of visitors:

- Visitors who have lived in a *designated country** for six or more consecutive months in the year preceding the date of seeking entry to Canada and who are intending to stay for at least six or more consecutive months.
- Visitors intending to work in an occupation where protection of public health is essential (e.g., teachers, physicians), regardless of their country of origin or anticipated length of stay in Canada.

* *The World Health Organization's estimated incidence rates of TB (available at www.phac-aspc.gc.ca/tbpc-latb/itir-eng.php) are used to determine which countries are "designated countries" for the purpose of visitor medical examinations.*

Visitors to Canada who do not meet these criteria are not normally included in the pre-immigration screening process (i.e., the IME). AHS central TB Services will seldom receive notification of arrival of such individuals. As a result, no follow-up recommendations for these individuals can be made.

Depending upon the circumstances (e.g., age, time of arrival, country of birth, length of stay, etc) it may be appropriate to screen such individuals for active TB disease (symptom review) and/or infection with MTB (e.g., TST).

Such individuals found to be symptomatic for active TB disease should be managed as described in *Section 2.2.1.3 and/or Section 2.2.1.4* (depending whether or not symptoms are suggestive of active *respiratory* TB), regardless of TST result.

Asymptomatic individuals within this category found to have a history of prior active TB disease or positive TST (or IGRA test) should submit three sputum samples for AFB smear and culture (see *Appendix B, Respiratory specimen collection*). Referral to AHS central TB Services or the local outpatient TB clinic should proceed according to the location of the client's residence (see *Section 1.5, Indications and processes for TB follow-up referrals*). Details of previous TB treatment, if any, should be included on the *Tuberculosis Referral Form*.

2.1.4.3 Special considerations

i. Foreign-born children less than 15 years of age

*The Canadian Tuberculosis Standards 6th Edition*¹⁷ recommends testing for infection with MTB (e.g., TST) for children less than 15 years of age who have

¹⁷ Long, R. Ellis, E. Editors, *Canadian Tuberculosis Standards. 6th Edition*. Canadian Lung Association and Public Health Agency of Canada, 2007, p.281.

lived in a country with high TB incidence and have immigrated within the past two years.

ii. International adoptees

Adoptive parents and their province or territory of residence have a joint responsibility to ensure that the adoptee undergoes thorough in-country screening for a variety of conditions endemic to their country of birth, including TB¹⁸

The IME is not intended to replace the responsibility of adoptive parents or guardians in seeking medical information about a child or asking for medical examination beyond that undertaken as part of the IME. Adoptive parents or guardians should seek testing for infection with MTB (e.g., TST), particularly if the child is from a country with high rates of TB and/or has medical or other risk factors that increase risk of progression from infection with MTB to active TB disease (see *Section 2.1.2, Individuals with medical conditions/therapies that increase risk of progression from LTBI to active TB disease*).

2.1.5 Individuals in health professions and others who work or volunteer with populations at increased risk for TB

Background

Individuals in health professions and others who work or volunteer in programs, facilities or institutions that provide services to populations at increased risk for TB disease are at risk of exposure to, and infection with, MTB. Therefore, it is recommended these individuals undergo TB screening.

Populations at increased risk for TB disease in Alberta include:

- people with risk factors for development of TB related to medical conditions or treatments
- the elderly
- the homeless/under-housed (i.e., individuals who access homeless shelters)
- people who reside in congregate living settings such as correctional facilities or substance abuse rehabilitation centres
- substance abusers
- foreign-born individuals from TB endemic countries; especially those with a history of medical surveillance (for TB)
- Aboriginal Canadians (including status and non-status Indians, Inuit and Métis) from communities with high rates of TB
- People with a past history of TB

¹⁸ CMAJ 2007;177: 172-3.

Recommendations

NOTE: If *at any time* active TB disease is suspected in an employee or volunteer, the individual should be excluded from the worksite *regardless of TST result*. Immediate and follow-up management of such individuals should proceed as described in *Section 2.2.1.3 and/or Section 2.2.1.4* (depending whether or not symptoms are suggestive of active respiratory TB).

2.1.5.1 Baseline TB screening for health professions and others who work or volunteer with populations at increased risk for TB

i. Health professions

All health professions should complete TB screening through the facility's Occupational Health program prior to commencement of employment. This screening should include the following:

a. TB history and symptom inquiry

TB history

Information obtained through a TB history inquiry assists in determining appropriate further assessment. For example, documentation of prior positive TST or a reliable history of prior TB disease (treated or untreated) indicates TST should **not** be done.

New Employees with a History of Active TB Disease or Prior Positive TST

Baseline PA and lateral chest X-ray should be arranged (unless the employee is pregnant – see *Section 2.2.2.2, Special considerations in chest radiography*) and, if possible, three sputum samples should be submitted for AFB smear and culture (see *Appendix B, Respiratory specimen collection*).

Chest radiographs taken within the previous 12 month may be accepted as baseline results provided that:

- both PA and lateral view X-rays were taken, and
- the results are available and were reported as “normal” (i.e., do not include any findings suggestive of TB – see *Section 2.2.2.1, Radiologic descriptors of TB*), and
- the individual has no signs/symptoms of active TB disease, and
- the individual is not known to be immune suppressed.

If PA and lateral chest X-rays have not been done within 12 months of employment start or the above criteria for exemption are not met, the chest X-rays should be arranged through the Occupational Health Program (unless the employee is pregnant, see above).

Referral to AHS central TB Services or the local outpatient TB clinic should proceed if indicated (see *Section 1.5.1, Indications for referral to AHS central TB Services or to an outpatient TB clinic*). Details of previous TB treatment (if any) should be included on the *Tuberculosis Referral Form*.

Symptom inquiry

Symptoms that should alert the practitioner to the possibility of active TB disease include:

- cough of at least three weeks' duration, particularly if productive and associated with hemoptysis
- fever (often low grade)
- unexplained weight loss
- night sweats (may be absent in the very young or elderly)
- fatigue
- anorexia (loss of appetite)

NOTE: If a new employee is suspected of having active TB disease, commencement of employment should not proceed until approved by AHS central TB Services or the local outpatient TB clinic.

b. TB risk factor evaluation

Individuals should be assessed for the presence of the following risk factors associated with progression from infection with MTB to active TB disease. Individuals found to have ANY of these risk factors should undergo TB screening as outlined in *Section 2.1.2, Individuals with medical conditions/therapies that increase risk of progression from LTBI to active TB disease*.

High risk

- HIV infection/AIDS
- transplantation (related to immunosuppressant therapy)
- silicosis
- chronic renal failure requiring dialysis
- carcinoma of the head or neck
- recent infection with MTB (≤ 2 years)
- prior abnormal radiograph – e.g., fibronodular or other changes suggesting prior TB disease

- Hematological malignancies (although hematologic malignancies are not listed as high category in the *Canadian Tuberculosis Standards, 6th edition*, we would for the purposes of this manual and AHS TB Services and Alberta Health and Wellness list them as such.)

Increased risk

- treatment with glucocorticoids (i.e., prednisone [or equivalent] of ≥ 15 mg/day for one month or more) or tumor necrosis factor (TNF) inhibitors
- diabetes mellitus (all types)
- less than ideal body weight ($< 90\%$ ideal body weight; for most persons this is a body mass index of ≤ 20 kg/m²)

Many other risk factors are known to increase risk for development of TB disease to some degree, including use of some immune function altering treatments and medications, and T-cell lymphomas. Daily alcohol intake and/or intravenous use of illicit drugs may also increase the risk of acquiring MTB infection or developing active TB disease.

c. Tuberculin skin test (TST)

The purpose of TST prior to commencement of employment (at baseline) is to document whether or not the individual was infected with MTB at that time. Access to this information enables accurate assessment and appropriate follow-up for the individual should they be exposed to an infectious case at a later date.

The following employees should undergo TST prior to commencement of employment (unless there is a history of active TB disease or documentation of a prior positive TST):

- those with undocumented prior TST results
- those with documentation of a prior negative TST
- those without history of prior TST (i.e., do not recall having received a TST before)

If TST is indicated, two-step TST is recommended (regardless of age or BCG vaccination history) for **all employees** of:

- health care facilities
- communal/congregate living environments such as substance abuse/misuse rehabilitation programs, long term care facilities (e.g., continuing care facilities, homes for the aged, nursing homes, chronic care facilities, retirement homes)

- shelters and drop-in centres for the homeless/under-housed
- home care programs

Baseline two-step TST is also recommended if:

- it is anticipated that an individual will be undergoing repeated screening with TSTs at regular intervals, especially if the individual has a history of a BCG vaccine in the past, and/or
- the individual is over 55 years of age.

NOTE: If documentation of a valid, prior two-step TST exists, only a single-step TST is necessary. This documentation should be placed or transcribed into the employee's health record for future reference.

Follow-up of baseline TST results

Negative baseline TST result

If the baseline TST results are negative, no further baseline investigation is needed unless the individual has developed symptoms/signs suggestive of active TB disease or is known to be HIV positive or severely immune suppressed (refer to *Section 2.1.2, Individuals with medical conditions/therapies that increase risk of progression from LTBI to active TB disease*).

Positive baseline TST (single or two-step) result

If a positive baseline TST reaction is identified in an individual who has never had a TST before or whose previous TST was negative, the individual should undergo further assessment prior to commencement of employment.

A chest X-ray should be performed (unless the client is pregnant, see *Section 2.2.2.2, Special considerations in chest radiography*) and, if possible, three sputum samples should be submitted for AFB smear and culture (see *Appendix B, Respiratory specimen collection*).

Referral to AHS central TB Services or the local outpatient TB clinic for follow-up evaluation and (if appropriate) consideration for treatment of LTBI should proceed if indicated (see *Section 1.5.1, Indications for referral to AHS central TB Services or to an outpatient TB clinic*).

ii. Volunteers who work with populations at increased risk for TB

NOTE: Some programs may not have the capacity to offer TB screening services to volunteers. Under such circumstances, these individuals should seek

screening through local Public Health or an outpatient TB clinic (for clients living in the Calgary or Edmonton areas).

The majority of volunteer activities involve some level of contact with the population being served by the agency. Therefore, individuals that spend a significant amount of time volunteering in programs, facilities, or institutions that provide service to populations at increased risk for TB disease should complete TB screening prior to commencement of volunteering. Volunteers that have additional risk factors for infection with MTB and/or risk factors for progression to active TB disease should undergo TB screening regardless of anticipated volunteer hours.

As with employees, if indicated, the purpose of TST prior to commencement of volunteer activities is to document whether or not the individual was infected with MTB at that time; doing so ensures that appropriate follow-up can occur if there is subsequent exposure to an infectious case.

For the purposes of determining which volunteers in Alberta should undergo TB screening, this group has been divided into two categories: “regular volunteers” and “other volunteers”, based on anticipated time to be spent volunteering.

Regular volunteers

“Regular volunteers” are defined as those who anticipate volunteering for 150 or more hours (i.e., approximately one-half day per week) in a year.

Regular volunteers should be screened in accordance with TB screening recommendations for employees (see above).

NOTE: In select circumstances, screening may be indicated for individuals with shorter anticipated periods of volunteering, e.g., if a high rate of TST conversions is documented at a particular facility.

Other volunteers

“Other volunteers” are those anticipated to volunteer less than 150 hours in a year.

Generally, screening for such volunteers should include a TB history and symptom inquiry and TB risk factor evaluation. However, “other volunteers” found to have a history of prior TB disease *as well as* those from the following population groups (at increased risk for TB) should be screened in accordance with recommendations for employees:

- people with risk factors for development of TB related to medical conditions or treatments

- the elderly
- the homeless/under-housed (i.e., individuals who access homeless shelters)
- people who reside in congregate living settings such as correctional facilities or substance abuse rehabilitation centres
- substance abusers
- foreign-born individuals from TB endemic countries; especially those with a history of medical surveillance (for TB)
- Aboriginal Canadians (including status and non-status Indians, Inuit and Métis) from communities with high rates of TB
- People with a past history of TB

2.1.5.2 Ongoing surveillance for health professions and others who work or volunteer with populations at increased risk for TB

The *Canadian Tuberculosis Standards*, 6th Edition should be followed in the development of policies with regard to need for, and timing of, ongoing (e.g., annual) TB surveillance programs for employees and volunteers. This document is available online at: <http://www.phac-aspc.gc.ca/tbpc-latb/index.html>

The following recommendations relate to management of employees/volunteers where a need for ongoing surveillance has been established.

i. Health professions and others who work or are “regular” volunteers with populations at increased risk for TB

a. Negative baseline two-step TST

Repeat TST according to risk of exposure to TB (i.e., facility TB risk, determined per *Canadian Tuberculosis Standards* recommendations), or in accordance with post-exposure TB screening protocol if there is contact with an infectious case.

HIV positive, TST-negative employees or volunteers at risk of ongoing TB exposure should have a TST repeated annually. If TST conversion is noted, PA and lateral chest radiographs should be arranged (unless the individual is pregnant, *Section 2.2.2.2, Special considerations in chest radiography*) and, if possible, three sputum samples should be submitted for AFB smear and culture (see *Appendix B, Respiratory specimen collection*). Referral to AHS central TB Services or the local outpatient TB clinic for follow-up evaluation and (if appropriate) consideration for treatment of LTBI should proceed as described in *Section 1.5, Indications and processes for TB follow-up referrals*.

HIV-negative employees or volunteers whose TST (or IGRA test) is found to have converted during routine surveillance testing (i.e., as opposed to testing done following known exposure to TB) should be managed according to *Section 2.2.5.7, Follow-up of individuals found to have a positive TST result*.

b. History of active TB disease, prior positive TST, or positive baseline TST (single or two-step)

In general, annual chest X-ray screening of asymptomatic, immune competent, TST-positive employees or volunteers is not recommended; education should be provided to ensure these individuals are aware of symptoms suggestive of active TB disease and to report promptly to a physician should any develop.

Generally, ongoing surveillance is only recommended if the individual:

- is known to be HIV positive or severely immune compromised **and** declines treatment for LTBI, or
- is a recent TST converter (within 2 years) **and** declines treatment for LTBI, or
- has a history of previous, inadequately treated active TB disease.

If surveillance is indicated, TB evaluation should, at minimum, occur in one year (earlier if symptomatic) and include the following:

- symptom inquiry
- sputum for AFB smear and culture
- PA and lateral chest X-ray (unless the client is pregnant, see above)

Further re-evaluation of such individuals is discretionary, up to a point, as there are degrees of risk. Risks may also change over time, e.g., immune reconstitution of an HIV positive client. Re-evaluation should occur as recommended during the individual's baseline evaluation, ideally annually, for as long as the risk applies.

Employees/volunteers with a history of active TB disease or positive TST that have contact with an infectious case should be followed up in accordance with established policy and procedures of the facility and as recommended by AHS central TB Services or the local outpatient TB clinic.

NOTE: In the future, individuals with baseline positive TSTs may be referred for interferon gamma release assay (IGRA) testing to further document the specificity of their baseline status (see *Section 2.2.5.1, Interferon Gamma Release Assay [IGRA] testing*). If IGRA testing is found to be negative at baseline, then IGRA could be performed as a post-exposure test in the future.

ii. "Other" volunteers

Repeat symptom inquiry and TB risk factor re-evaluation should be scheduled for "other volunteers" in accordance with facility TB risk (e.g., annually for high-risk

facilities), unless they meet the criteria to be evaluated as employees (described in *Section 2.1.5.1*).

2.1.5.3 Special considerations

i. Employees, contractors, and volunteers of federal or provincial correctional institutions

Employees, contractors, and volunteers of federal and provincial correctional institutions should be screened in accordance with the recommendations of those programs. Typically this will include a two-step baseline TST at hire (unless there is a history of active TB disease or prior positive TST or IGRA test or a documented prior two-step TST) followed by annual symptom inquiry and re-testing (if appropriate).

Post-exposure TB screening and/or TST conversions among employees, contractors or volunteers of correctional institutions should be managed in accordance with established policy and procedures of these programs and as recommended by AHS central TB Services or the local outpatient TB clinic.

2.1.6 Residents of congregate living settings

Background

Congregate living settings such as correctional facilities, substance abuse/misuse rehabilitation centres, and continuing care facilities can be conducive to TB transmission due to:

- environmental considerations (e.g., volume of air space relative to concentration of people, potential for inadequate ventilation);
- increased prevalence of infection with MTB and risk factors for progression from infection to active TB disease among these populations. For example, elderly residents of continuing care facilities are at risk of having been infected with MTB by virtue of having lived at a time when TB was very common. With the waning of immunity and/or co-morbidities that come with aging, there is increased risk for dormant (latent) TB bacteria to awaken and cause active TB disease;
- potential delays in diagnosis of TB related to lack, or poor use of medical services and/or frequent transfers/discharges of residents.

TB screening in this population is generally aimed at prompt identification of new cases (preferably before they are admitted to the facility) thereby preventing transmission of TB and new cases of disease within the facility. Identification and/or treatment of LTBI in this population may not be appropriate due to a variety of factors such as anticipated length of stay in the facility and competing health issues.

A high index of suspicion for TB must be maintained for residents of congregate living settings, *regardless of TST result*. Cough of more than three weeks' duration, with or without any other symptoms suggestive of TB should be followed up promptly and thoroughly.

Management of residents of congregate living settings suspected of having active TB disease

If at any time active TB disease is suspected in a resident of a congregate living setting, the individual should be isolated immediately (see *Section 3.2, Prevention of TB transmission – airborne precautions and isolation*). In some facilities, this may mean placing the resident in a single room, keeping the door closed, and limiting interactions to staff and adult visitors wearing appropriate personal respiratory protection.

Immediate and follow-up management of such individuals should proceed as described in *Section 2.2.1.3 and/or Section 2.2.1.4* (depending whether or not symptoms are suggestive of active respiratory TB), regardless of TST result.

2.1.6.1 Inmates of correctional institutions

Recommendation

Inmates of federal and provincial correctional institutions should receive TB screening in accordance with the recommendations of those programs.

Symptom investigation, post-exposure TB screening, and/or TST conversions among inmates of correctional institutions should be managed in accordance with established policy and procedures of these programs and as recommended by AHS central TB Services or the local outpatient TB clinic.

2.1.6.2 Residents of long term (> 3 Months) substance abuse/misuse rehabilitation centres

Recommendations

i. Admission TB evaluation

If possible, evaluation for TB should occur immediately prior to admission. Otherwise, it should occur at the time of admission or as soon afterward as is feasible.

Admission TB evaluation should include the following:

a. TB history and symptom inquiry

TB history

Information obtained through a TB history inquiry assists in determining appropriate further assessment.

Baseline PA and lateral chest X-ray should be arranged for individuals found to have a history of prior active TB disease (unless pregnant, see *Section 2.2.2.2, Special considerations in chest radiography*) and, if possible, three sputum samples should be submitted for AFB smear and culture (see *Appendix B, Respiratory specimen collection*).

Referral to AHS central TB Services or the local outpatient TB clinic for follow-up evaluation should proceed if indicated (see *Section 1.5.1, Indications for referral to AHS central TB Services or to an outpatient TB clinic*). Details of previous TB treatment (if any) should be included on the *Tuberculosis Referral Form*.

NOTE: The medical records of residents known to have had prior active TB disease, contact with infectious TB disease, and/or a prior positive TST should be flagged such that should symptoms suggestive of active TB disease develop, prompt action may be taken. This is especially important for residents with history of inadequately treated active disease or those with risk factors for progression to active disease who have not completed a course of treatment for LTBI.

Symptom inquiry

Symptoms that should alert the practitioner to the possibility of active TB disease include:

- cough of at least three weeks' duration, particularly if productive and associated with hemoptysis
- fever (often low grade)
- unexplained weight loss
- night sweats (may be absent in the very young or elderly)
- fatigue
- anorexia (loss of appetite)

Immediate and follow-up management of symptomatic individuals should proceed as described at the beginning of *Section 2.1.6*, regardless of TST result.

b. TB risk factor evaluation

Individuals should be assessed for the presence of the following risk factors associated with progression from infection with MTB to active TB disease. Individuals identified as having ANY of these risk factors should undergo TB screening as outlined in *Section 2.1.2, Individuals with medical conditions/therapies that increase risk of progression from LTBI to active TB disease.*

High risk

- HIV infection/AIDS
- transplantation (related to immunosuppressant therapy)
- silicosis
- chronic renal failure requiring dialysis
- carcinoma of the head or neck
- recent infection with MTB (≤ 2 years)
- prior abnormal radiograph – e.g., fibronodular or other changes suggesting prior TB disease
- Hematological malignancies (although hematologic malignancies are not listed as high category in the *Canadian Tuberculosis Standards, 6th edition*, we would for the purposes of this manual and TB control in Alberta list them as such.)

Increased risk

- treatment with glucocorticoids (i.e., prednisone [or equivalent] of ≥ 15 mg/day for one month or more) or tumor necrosis factor (TNF) inhibitors
- diabetes mellitus (all types)
- less than ideal body weight ($< 90\%$ ideal body weight; for most persons this is a body mass index of ≤ 20 kg/m²)
- young age when infected (0 – 4 years)

Many other risk factors are known to increase risk for development of TB disease to some degree, including use of some immune function altering treatments and medications and T-cell lymphomas. Daily alcohol intake and/or intravenous use of illicit drugs may also increase the risk of acquiring MTB infection or developing active TB disease.

NOTE: There is very high risk that individuals who are infected with both HIV and MTB will develop active TB disease. Residents who are found to be at risk for HIV should receive counseling regarding HIV risk reduction and offered HIV testing, if possible. Documentation of current HIV status helps to ensure appropriate baseline TB evaluations and ongoing TB surveillance are undertaken.

ii. Ongoing TB surveillance

Ongoing TB surveillance recommendations for residents of long term (≥ 3 months) alcohol and drug rehabilitation centres are individualized according to baseline TB evaluation findings and HIV status (if known).

2.1.6.3 Admissions to short term (< 3 Months) substance abuse/misuse rehabilitation or detox centres

Recommendation

Screening for infection with MTB (i.e., TST or IGRA testing) in this population is not usually appropriate.

Individuals entering facilities that serve as short stay (< 3 months) centres for the control or rehabilitation of substance abuse/mis-use should be screened to rule out active respiratory TB disease on admission to the facility. At minimum, this assessment should include a symptom inquiry.

Immediate management of symptomatic individuals should proceed as described at the beginning of *Section 2.1.6*.

2.1.6.4 Residents of continuing care facilities

The elderly are at risk of being infected with MTB by virtue of having lived at a time when TB was very common. With the waning of immunity and/or co-morbidities that come with aging, dormant (latent) TB bacteria may awaken and cause disease in someone infected decades earlier.

Recommendations

TB screening protocols are recommended as part of the pre-admission assessment and at the time of admission to the facility. Ongoing TB surveillance may be recommended for selected residents based on these findings.

i. Pre-admission TB screening

a. PA and lateral chest x-rays

These must be performed within six months of application for admission as part of the pre-placement exam. The x-rays should be ordered by the family physician and reviewed by the placement review committee and the receiving facility.

Referral to AHS central TB Services or the local outpatient TB clinic should proceed if indicated (see *Section 1.5.1, Indications for referral to AHS central TB Services or to an outpatient TB clinic*).

NOTE: If admission occurs 12 months or more from the date the radiograph is taken, a new radiograph must be performed at the time of admission.

b. TB history and symptom inquiry

TB history

Individuals found to have a history of prior active TB disease should have both PA and lateral chest X-rays taken. Three sputum samples should be submitted for AFB smear and culture (see *Appendix B, Respiratory specimen collection*) and referral to AHS central TB Services or the local outpatient TB clinic should proceed as described in *Section 1.5, Indications and processes for TB follow-up referrals*. Details of prior treatment (if any) should be included on the *Tuberculosis Referral Form*.

Symptom inquiry

Symptoms that should alert the practitioner to the possibility of active TB disease include:

- cough of at least three weeks' duration, particularly if productive and associated with hemoptysis
- fever (often low grade)
- unexplained weight loss
- night sweats (may be absent in the very young or elderly)
- fatigue
- anorexia (loss of appetite)

Immediate and follow-up management of symptomatic individuals should proceed as described in *Section 2.2.1.3 and/or Section 2.2.1.4* (depending whether or not symptoms are suggestive of active respiratory TB).

ii. Admission protocol

a. TB symptom inquiry

A symptom inquiry should be repeated at the time of admission; individuals found to be symptomatic for active TB disease should be managed as described at the beginning of *Section 2.1.6*.

b. Chest radiograph

Residents should undergo repeat chest radiography if more than 12 months have passed since application (pre-admission) radiography was performed (or if symptoms suggestive of active TB disease are noted, see above).

c. Tuberculin skin test (TST)

Baseline TST should only be performed if the resident has no documentation of previous TB disease (treated or untreated) or previous positive TST **AND** is at increased risk of progressing to active TB disease related to any of the following:

- HIV infection/AIDS
- transplantation (related to immunosuppressant therapy)
- silicosis
- chronic renal failure requiring dialysis
- carcinoma of the head or neck
- recent infection with MTB (≤ 2 years)
- abnormal radiograph – e.g., fibronodular or other changes suggesting prior TB disease
- treatment with glucocorticoids (i.e., prednisone [or equivalent] of ≥ 15 mg/day for one month or more) or tumor necrosis factor (TNF) inhibitors
- diabetes mellitus (all types)
- less than ideal body weight ($< 90\%$ ideal body weight; for most persons this is a body mass index of ≤ 20 kg/m²)

Many other risk factors are known to increase risk for development of TB disease to some degree, including use of some immune function altering treatments and medications, and T-cell lymphomas. Daily alcohol intake and/or intravenous use of illicit drugs may also increase the risk of acquiring MTB infection or developing active TB disease.

NOTE: Due to potential for the booster effect in older individuals¹⁹ (i.e., those who may have acquired infection with MTB many years prior), if TST is indicated a two-step TST should be done if the initial TST is negative unless there is documentation of a valid, prior two-step TST (see *Section 2.2.5.5, Two-step TST and the booster phenomenon*).

¹⁹ Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition. Canadian Lung Association and Public Health Agency of Canada, 2007, p.67.

iii. Follow-up of admission protocol findings

Referral of a resident to AHS central TB Services or the local outpatient TB clinic should proceed if indicated (see *Section 1.5.1, Indications for referral to AHS central TB Services or to an outpatient TB clinic*).

Residents whose chest X-ray was repeated prior to admission to the facility and findings were suggestive of TB (see *Section 2.2.2.1, Radiologic descriptors of TB*) should also be referred to AHS central TB Services or the local outpatient TB clinic.

NOTE: The medical records of continuing care facility residents known to have had prior active TB disease, contact with infectious TB disease, and/or a prior positive TST should be **flagged** such that should symptoms suggestive of active TB disease develop, prompt action may be taken. This is especially important for residents with history of inadequately treated active TB disease or those with risk factors for progression to active TB disease who have not completed a course of treatment for LTBI. These residents may, at the discretion of the public health TB specialist, be placed on annual follow-up.

iv. Ongoing TB surveillance

Residents will fall into one of the following categories based on findings from their pre-admission and/or admission TB screening:

a. Normal pre-admission chest x-ray AND

- **Negative baseline two-step TST or no baseline TST indicated**

No further follow-up is necessary unless:

required by institutional policy, **or**
the resident is in contact with active TB disease (follow-up as directed by AHS central TB Services), **or**
the resident develops symptoms/signs suggestive of active TB disease (manage as described at the beginning of *Section 2.1.6*)

- **Positive TST (by history or if baseline TST was indicated)**

Individualized recommendations will be made by AHS central TB Services or the outpatient TB clinic that reviewed the pre-admission and/or admission results of the resident.

b. History of prior active TB disease and/or pre-admission chest radiograph abnormal and consistent with old, healed or inactive TB

Individualized follow-up recommendations will be made by AHS central TB Services or the outpatient TB clinic that reviewed the pre-admission and/or admission results of the resident.

Follow-up recommendations usually include submission of three sputum samples for AFB smear and culture. Two-step TST may be requested for residents without history of prior active TB disease or prior positive TST.

2.1.6.5 Admissions to acute care facilities

Recommendations from the *Canadian Tuberculosis Standards*, 6th Edition should be followed in the development of policies addressing TB screening programs within acute care facilities. This document is available online at: <http://www.phac-aspc.gc.ca/tbpc-latb/index.html>

In general, admission history for elective or emergency admissions should specifically identify symptoms/signs suggestive of active TB disease.

The presence of cough of more than three weeks' duration with or without weight loss and fever should prompt investigation to rule out active TB disease particularly for:

- individuals from countries with high TB incidence
- Aboriginal Canadians from communities with high rates of TB
- individuals aged 65 years or older (Canadian or foreign-born)
- homeless/under-housed individuals
- individuals infected with HIV

If a patient has symptoms that suggest active TB disease, PA and lateral chest X-rays should be taken (unless the patient is pregnant, see *Section 2.2.2.2, Special considerations in chest radiography*) and three sputum samples for AFB smear and culture should be collected (see *Appendix B, Respiratory specimen collection*). If the level of suspicion is high, particularly after reviewing the chest X-ray, the patient should be immediately isolated in the most appropriate on-site room until sputum results are obtained. Interactions should be limited to health care providers and adult visitors wearing appropriate personal respiratory protection.

Assessment of TST status in symptomatic individuals should be done at the discretion of the attending physician. However clinicians are cautioned that a positive TST does NOT confirm the diagnosis of active TB disease. Similarly, a negative TST should not be interpreted as evidence that the individual does not

have MTB infection or active TB disease, as up to 30% of individuals with active TB disease will demonstrate a falsely-negative TST at the time of initial diagnosis²⁰.

If any admission is suspected to have active TB disease, AHS central TB Services should be notified for direction of further follow-up and continued management.

Confirmed AFB sputum (or other respiratory sample) smear- positive clients must be isolated in a room with proper engineering controls to prevent the potential for spread of TB.

2.1.7 Preschool and school-aged children living in First Nations communities in Alberta

Screening of children in Grades one and six is done in all First Nation communities in Alberta. Preschool TB screening is implemented based on individual community risk. TB preschool screening program is a reflection of the relatively higher rates of infection with MTB and active TB disease in some First Nation communities in Alberta.

When TB disease or infection is identified in a child, it is likely that there was recent exposure to an active case of TB disease. In this way, the program protects not only the health of the children who receive screening it also helps to identify the existence of an infectious case or cases in the community.

This program is presently under review.

2.1.8 Clients of shelters and drop-in centres for the homeless/under-housed

Background

Individuals who are homeless/under-housed are at increased risk of being infected with MTB and possibly, developing active TB disease.

Potential for transmission of TB among homeless/under-housed (and the individuals serving this population) is enhanced by the crowded conditions and/or inadequate ventilation that many shelter and drop-in programs operate within. Further, delay in diagnosis of active TB disease in marginalized populations such as the homeless/under-housed, and delays and difficulties identifying and evaluating their contacts may lead to outbreaks of TB involving shelters and/or drop-in programs frequented by these individuals.

It is important that ALL health professionals maintain a high index of suspicion for TB in this population. Ideally, employees and volunteers of shelters and drop-in centres should be educated about signs/symptoms suggestive of active TB disease and the

²⁰ Ibid, p.78.

procedure for referral of clients for medical evaluation should any be noted (see below).

Recommendations

Clients of shelters or drop-in programs for the homeless/under-housed should undergo medical evaluation for TB promptly if they are noted to have any signs or symptoms suggestive of active TB disease.

Signs/symptoms suggestive of active TB disease include:

- cough of at least three weeks' duration, particularly if productive and associated with hemoptysis
- fever (often low grade);
- unexplained weight loss;
- night sweats (may be absent in the very young or elderly);
- fatigue;
- anorexia (loss of appetite).

NOTE: Clinicians should be aware that HIV-infected individuals may be more likely to have active respiratory TB disease in the absence of typical clinical or radiographic findings (e.g., cough, chest X-ray abnormalities).

Management of Shelter/Drop in Centre Clients with Symptoms Suggestive of Active TB Disease

Any client displaying symptoms suggestive of active TB disease should be immediately isolated. In a shelter or drop-in program, "isolating a client" may mean placing the client in a single room (away from other clients), keeping the door closed, and limiting interactions to staff wearing appropriate personal respiratory protection (i.e., fitted N95 respirators). Arrangements should be made for the urgent collection of sputum for AFB smear and culture and performance of PA and lateral view chest X-rays, as follows:

- **The client should be immediately referred to a physician for assessment.** In the Calgary or Edmonton areas, this assessment could be performed at an inner city clinic.
- **The individual should wear a surgical mask en route to the assessment and until the health care provider indicates this is no longer necessary.** If the individual is accompanied by a staff member, that individual should wear appropriate personal respiratory protection (i.e., fitted N95 respirator). If the

client requires ambulance transport, the paramedics should be informed that the client may have TB so that appropriate precautions can be taken.

- **The clinic, emergency room or health care provider to which the client is referred should be alerted that someone suspected of having TB is en route so appropriate precautions can be put into place.** Assessment of such clients should include three sputum samples (or other specimens, as appropriate) for AFB smear and culture and PA and lateral chest radiographs (unless the client is pregnant, see *Section 2.2.2.2, Special considerations in chest radiography*).

NOTE: If a client with signs/symptoms suggestive of active TB disease refuses care (i.e., will not go to a health care provider for assessment) they should be encouraged to remain and be available to speak to the staff of the public health department. AHS central TB Services or the local outpatient TB clinic should be contacted.

If there is a need to contact a TB physician after hours or on weekends regarding **clients in Edmonton or outside of Calgary or Edmonton**, call the University of Alberta Hospital at **780-407-8222**, ask to speak to the TB physician on call. After hours or weekends calls regarding **clients in Calgary** should be directed to the Calgary TB paging system at **403-212-8223, pager #0514**, or the Foothills Hospital Operator at **403-944-1110**; ask to speak to the TB physician on call.

2.2 Case detection and LTBI screening methodology

A variety of methods are used, usually in combination, to identify or rule out the presence of active TB disease or latent TB infection. The sequence and components of these methods are iterative and dependent upon:

- the reason investigations are being undertaken
- whether or not the client is experiencing symptoms or displaying signs suggestive of active TB disease
- findings of investigations as they become available
- individual program requirements, e.g., some programs may require chest radiography and/or sputum examinations be included in TB assessment, irrespective of other findings.

For example, individuals applying for continuing care placement must complete a TB history and symptom inquiry and have a chest radiograph. If any of these examinations suggests the possibility of active TB disease, sputum samples for AFB smear and culture are then submitted. A tuberculin skin test (TST), of limited value for active case finding, is required as part of the admission protocol only if the applicant had risk factors for progression from MTB infection to active TB disease (e.g., was immune suppressed).

The following activities may be used for case detection/LTBI screening:

- TB history and symptom inquiry
- Chest radiography if TB history, symptom inquiry, and/or TST result indicates necessity
- Examination of samples (e.g., sputum) for acid fast bacilli (AFB) if TB history, symptom inquiry, chest radiograph and/or TST result indicates necessity
- Testing to determine if an individual has been infected with MTB (e.g., tuberculin skin testing [TST]). However, by itself, TST has limited value in the diagnosis of active TB disease (see *Section 2.2.5, Testing to identify infection with Mycobacterium tuberculosis*).

2.2.1 TB history and symptom inquiry

Information obtained through TB history and symptom inquiry assists in determining the need for further assessment. For example, documentation of prior positive TST or a reliable history of prior TB disease (treated or untreated) indicates TST should **not** be done. This information is also integral to ensuring appropriate referral for chest X-ray and/or to a TB specialist.

2.2.1.1 TB history

Important areas to explore with clients include:

- previous active TB disease and treatment history, if any
- country of birth
- Aboriginal ancestry
- risk factors for progression from MTB infection to active TB disease (see *Section 2.1.2, Individuals with medical conditions/therapies that increase the risk of progression from LTBI to active TB disease*)
- prior chest X-ray results
- known exposure to TB (remote past or recent)
- travel to countries that have a high incidence of TB*
- time spent in a correctional facility
- other risk factors for infection with MTB, e.g., elderly (particularly male), homeless, health care worker
- BCG vaccination history (year of vaccination, presence/location of BCG scar)
- previous TST results
- previous treatment for latent TB infection
- general health status

* *Estimates of international TB incidence rates are available from the Public Health Agency of Canada website at: http://www.phac-aspc.gc.ca/tbpc-latb/itir_e.html*

2.2.1.2 Symptom inquiry

Information gathered by way of symptom inquiry assists with interpretation of other components of the assessment, and may indicate a need for more immediate referral.

Active TB disease is usually described as either respiratory or nonrespiratory. Definitions for respiratory and nonrespiratory TB disease and descriptions of symptoms/signs typical to each follow. It is important to note that individuals may have concomitant respiratory and nonrespiratory forms of TB disease.

Respiratory TB disease

The *Canadian Tuberculosis Standards*²¹ defines respiratory forms of TB disease to include the following sites of disease:

- primary TB (which includes primary respiratory TB and TB pleurisy related to primary progressive TB)
- pulmonary TB (disease of the lungs and conducting airways including the larynx [laryngeal TB])
- TB pleurisy (non-primary)
- TB of the intrathoracic lymph nodes, mediastinum, nasopharynx, nose (septum) and sinus (any nasal)

Respiratory forms of TB disease are generally considered to be potentially communicable (infectious).

Nonrespiratory TB disease

TB can involve any organ. It may also involve multiple organs simultaneously, as is seen with disseminated TB.

The *Canadian Tuberculosis Standards*²² defines nonrespiratory forms of TB disease to include the following sites of disease:

- bone and joints
- bone marrow
- peripheral lymph nodes
- genitourinary and abdominal organs
- pericardium
- central nervous system (e.g., tuberculous meningitis, tuberculous myelitis, brain and/or meningeal tuberculoma)

²¹ Long, R. Ellis, E. Editors, *Canadian Tuberculosis Standards*. 6th Edition, Canadian Lung Association and Public Health Agency of Canada, 2007, p. 93.

²² *Ibid*, p.93.

Nonrespiratory sites of TB disease may also include any organ or organ system of the body, such as:

- skin
- non-nodal glandular tissue (e.g., breast)
- great vessels

In the absence of concomitant respiratory TB disease, nonrespiratory TB is not considered potentially communicable (infectious). Although the affected individual may be ill and require treatment, he or she does not as a rule, pose a public health threat. However, contact investigation is generally undertaken with household/close contacts in these cases mainly for the purpose of identifying a source case. This so-called 'reverse' contact tracing is particularly important if the index (first) case is a child. Children, particularly those under the age of ten are rarely infectious and their incident episode usually reflects recent transmission from an infectious adolescent or adult.

Nonrespiratory forms of TB disease can be very difficult to diagnose, and some are associated with high rates of mortality and morbidity such as TB meningitis. Practitioners should be particularly observant for signs/symptoms of active nonrespiratory TB disease in clients at increased risk for these forms of TB such as infants and young children, and the immune suppressed.

Symptoms/signs of active TB disease

Symptoms/signs that should alert the practitioner to the possibility of active TB disease (respiratory or nonrespiratory) include:

- cough of at least three weeks' duration, particularly if productive and associated with hemoptysis
- fever (often low grade)
- unexplained weight loss
- night sweats (may be absent in the very young or elderly)
- fatigue
- anorexia (loss of appetite)

In addition to the symptoms listed above, signs/symptoms suggestive of active respiratory forms of TB disease may also include:

- hemoptysis
- hoarse voice (may be present with laryngeal TB disease)
- chest pain

Signs/symptoms suggestive of active nonrespiratory TB (also referred to as extra-pulmonary TB) generally include the systemic symptoms listed previously as well as

symptoms specific to the area(s) involved. For example, TB lymphadenitis may present as an isolated, unilateral, non tender neck mass. TB of the kidney may cause frequency, dysuria, flank pain, and hematuria. TB of the spine may cause back pain.

2.2.1.3 Management of individuals with symptoms/signs suggestive of active respiratory forms of TB disease

NOTE: The following guidelines are meant to assist in the management of individuals who are in transit or passing through a health care facility to an isolation room or for an investigation/procedure.

Individuals who have symptoms/signs suggestive of active respiratory forms of TB disease should be given a surgical (procedure) mask and instructed to wear it regardless of whether or not they are coughing. If a client cannot tolerate a mask or if masks are not readily available, the client should be provided with tissues and instructed to cover their mouth when coughing.

The individual must be isolated from others while awaiting clinical and diagnostic evaluation and/or referral. In some circumstances “isolating a client” may mean placing the client in a single room (away from other clients), keeping the door closed, and limiting interactions to staff wearing appropriate personal respiratory protection (i.e., fitted N95 respirator).

The individual should wear a surgical mask en route and until the health care provider indicates this is no longer necessary. If the individual is accompanied by a staff member, that individual should wear appropriate personal respiratory protection (see above). If the client requires ambulance transport, the paramedics should be informed that the client may have TB so that appropriate precautions can be taken.

The clinic, emergency room or health care provider to which the client is referred should be alerted that someone suspected of having active TB disease is en route so appropriate precautions can be put into place.²³

2.2.1.4 Follow-up of individuals with signs/symptoms suggestive of active TB disease

Generally speaking, if active TB disease is suspected (respiratory or non-respiratory), three sputum samples should be collected for AFB smear and culture (see *Appendix B, Respiratory specimen collection*).

Initiation of follow-up for individuals with signs/symptoms suggestive of active TB disease is dependant upon the location of the client’s residence. Individuals residing within the Calgary or Edmonton areas should be immediately referred to the local

²³
Adapted from New York City Bureau of Tuberculosis Control Clinical Policies and Protocols, Fourth Edition, March 2008, p. 131, accessed Dec10.08 at <http://www.nyc.gov/html/doh/downloads/pdf/tb/tb-protocol.pdf>.

outpatient TB clinic for assessment. Assessment could also be performed at an inner city clinic in these cities.

Symptomatic individuals residing outside of the Calgary or Edmonton areas (or on a First Nations reserve) should be referred to a local physician (e.g., their family physician) for assessment including PA and lateral chest X-ray unless the client is pregnant (see *Section 2.2.2.2, Special considerations in chest radiography*).

NOTE: AHS central TB Services (780-735-1464) should be immediately notified when clinicians in communities outside of Calgary or Edmonton (or on a First Nations reserve) suspect a case of active TB disease. Notification should proceed the next business day in the case of evenings, weekends or holidays.

Assessment of TST status should be done at the discretion of the attending physician. However clinicians are cautioned that a positive TST does NOT confirm the diagnosis of active TB disease. Similarly, a negative TST should not be interpreted as evidence that the individual does not have MTB infection or active TB disease, as up to 30% of individuals with active TB disease will demonstrate a falsely-negative TST at the time of initial diagnosis²⁴.

NOTE: Referral to a physician *should not* be delayed until the reading of the TST.

Referral of the individual's information (including details of prior TB and/or treatment, if any) to AHS central TB Services may be warranted, depending on physician and radiography findings, e.g., if the individual appears to have active TB disease or may be a candidate for treatment of latent TB infection (see *Section 5.1, Treatment of latent TB infection [LTBI]*). Treatment should not be initiated on these individuals prior to communication with a TB physician.

2.2.2 Chest radiography

Chest radiography in itself is not diagnostic for latent TB infection or active TB disease. However certain findings may assist clinicians in determining what, if any, further investigations may be appropriate to rule out or confirm LTBI or active TB disease.

²⁴ Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition, Canadian Lung Association and Public Health Agency of Canada, 2007, p.78.

Chest radiography **should always be included** in the assessment of individuals who:

- have signs/symptoms suggestive of active TB disease (respiratory or non-respiratory)
- have a history of prior TB disease (treated or untreated)
- have a history of previous positive TST (as an alternative to TST)
- are at high risk for development of active TB disease (e.g., are HIV infected), regardless of TST result

Both posterior-anterior (PA) and lateral chest X-ray views are always required particularly if:

- the client is under 15 years of age, and/or
- symptomatic for active TB disease, and/or
- immune suppressed (e.g., HIV infected), and/or
- has a history of prior TB disease *unless the client is pregnant* (see Section 2.2.2.2, *Special considerations in chest radiography*).

2.2.2.1 Radiologic descriptors of TB

The following descriptors may appear in radiography reports, and may suggest prior, inactive, or active TB disease:

- suspicion of current active TB disease (e.g., upper lung zone pneumonic process, particularly if cavitating or if associated with the acinar shadows of endobronchial spread)
- upper lobe fibronodular abnormality
- old granulomatous disease or old tuberculosis (does not include single, isolated granuloma)
- thoracoplasty
- intrathoracic adenopathy with or without a lung parenchymal abnormality in an immune compromised person
- pleural calcification or fibrocalcification
- unilateral apical pleural thickening or bilateral but unequal apical pleural thickening, particularly if irregular or calcified

If any of the radiologic descriptors of TB are reported as findings, three sputum samples should be submitted for AFB smear and culture (see *Appendix B, Respiratory specimen collection*). The individual should then be referred to AHS central TB Services or the local outpatient TB clinic (see *Section 1.5, Indications and processes for TB follow-up referrals*). Details regarding prior TB treatment (if any) should be included on the *Tuberculosis Referral Form*.

Practitioners should follow jurisdictional practices to ensure current and previous radiographs (along with the radiology report(s) and a *Tuberculosis Referral Form*)

are forwarded to AHS central TB Services, or the local outpatient TB clinic (as appropriate depending upon the location of the individual's residence (see *Section 1.5, Indications and processes for TB follow-up referrals*).

2.2.2.2 Special considerations in chest radiography

i. Pregnancy ²⁵

Pregnant women who are symptomatic for active TB disease or who are contacts to infectious TB and found to have a new positive TST or a TST conversion should undergo a single view (PA) chest X-ray with double (front and back) shielding of the abdomen. Radiologic investigation of other pregnant clients, such as TST converters without known history of contact, should be at the discretion of the TB Services physician (i.e., the client should be referred to AHS central TB Services or local outpatient TB clinic as described in *Section 1.5, Indications and processes for TB follow-up referrals*, prior to having a chest X-ray taken).

If possible, especially if the client is asymptomatic and the period of deferral would be only a few weeks, the X-ray should be deferred until after the first trimester.

ii. Infants and young children

Chest radiographs of infants and children may be difficult to interpret due to physiology (e.g., enlarged thymus), inadequate inspiration (due to crying), or over penetration. Pediatric X-rays should be reviewed by a radiologist experienced in reading such films.

iii. Immune suppression

Typical radiographic features of active TB disease may be absent in clients with immune suppressing conditions such as HIV infection, diabetes, renal failure, or corticosteroid use. Hilar and mediastinal lymphadenopathy, non-cavitary infiltrates, lower lobe involvement, and/or disseminated disease may be more common in this population. Chest X-rays may also appear "normal" despite the presence of disease, particularly in clients with advanced HIV/AIDS.

2.2.3 Examination of samples for acid fast bacilli (AFB)

Mycobacterial culturing of AFB is considered the "gold standard" for diagnosis of active TB disease. Examination of samples for AFB (i.e., AFB smear and culture) also enables the following:

²⁵ Ibid, p. 259.

- **Prompt diagnosis;** if the airway secretion sample is AFB smear positive (1+ or more), a probe test (PCR) is performed. PCR testing allows for the identification of *Mycobacterium tuberculosis* in a sample, allowing one to establish a diagnosis of TB on the basis of the smear (versus culturing of the organism, which can take several weeks).
- **Estimation of the degree of infectiousness** of individuals found to have active respiratory TB disease.
- **Performance of drug susceptibility tests** that will, in turn guide treatment.
- **DNA fingerprinting** of the TB organism for epidemiological purposes

Detailed information about the collection of specimens for AFB smear and culture are provided in *Appendix B, Respiratory specimen collection*. Multiple samples, collected on different days are preferable to single samples or multiple samples collected on the same day. Whenever possible, three samples should be submitted for the best balance between high sensitivity and efficiency^{26,27}.

Examination of respiratory samples (usually sputum) should be included in the assessment of individuals who:

- have symptoms/signs suggestive of active TB disease
- have a history of prior TB disease (treated or untreated)
- have a history of previous positive TST, and are at increased risk for developing active TB disease
- are at high risk for development of active TB disease (e.g., are HIV infected), regardless of history, TST, or chest radiography result
- are being considered for treatment of LTBI

Sputum sample examination may also be recommended for:

- individuals awaiting chest X-ray (e.g., women in the first trimester of pregnancy)
- contacts of active TB disease (see *Section 4, TB contact investigation and outbreak management in Alberta*.)

2.2.3.1 AFB examination resulting

Results of AFB smear examinations should be available to the specimen submitter within 24 hours of receipt by the laboratory. Results of AFB culture examination and other confirmatory tests may take several days to several weeks. Culture positive specimens will automatically be tested for susceptibilities to first-line antituberculosis medications.

²⁶ Ibid, p. 76.

²⁷ Ibid, p. 78.

2.2.3.2 Special considerations in AFB examination

i. Infants and young children

The collection of spontaneous sputum samples from infants and young children is problematic. Nevertheless mycobacterial confirmation of the diagnosis of pediatric TB should be sought when²⁸:

- an isolate from a source case is not available
- the source case has drug-resistant TB
- the child is immune compromised
- the child is thought to have extrapulmonary (nonrespiratory) TB disease

Collection of early morning specimen through gastric aspiration/lavage may necessitate overnight admission to a health care facility.

Additional information about collection of specimens through gastric aspiration/lavage is presented in *Appendix B, Respiratory specimen collection*.

ii. Immune suppression

Clinical presentation of TB may be unusual in clients with immune suppressing conditions such as HIV infection, diabetes, renal failure, or corticosteroid use. Sputum (or other respiratory sample) examination for AFB is extremely important to identify or rule out active TB disease in immune suppressed individuals.

Predisposition to non-respiratory forms of disease in this population may necessitate the submission of tissue samples, lymph node aspirations/biopsies, or blood for AFB exam.

iii. Nonrespiratory TB disease

When appropriate, (e.g., the possibility of concomitant respiratory and nonrespiratory TB disease) sputum examination for AFB should always be done in conjunction with the examination of nonrespiratory samples for AFB.

Samples should be obtained prior to the initiation of antituberculosis medications in order to assess the potential infectivity to others and should be repeated at treatment completion for individuals determined to have active TB disease (see *Section 3.8, Follow-up of individuals who complete TB treatment*).

²⁸ Ibid, p.186.

2.2.3.3 Follow-up of positive AFB smear and/or culture results

All new positive AFB smears and cultures are reported immediately to the ordering physician, the zonal MOH (or their designate), and AHS central TB Services by the Provincial Laboratory.

All new AFB-positive (1+ or more) samples are further tested to determine whether the AFB is *M. tuberculosis* complex or non-tuberculous mycobacteria (NTM). Drug susceptibility testing and DNA fingerprint analysis is also done on the initial specimens from each active case identified in Alberta.

2.2.4 TB histopathology examination

Tissue, bone, exudates and/or other types of samples may be examined for TB. If TB is part of the differential diagnosis, ideally two samples should be submitted; one fixed in a preservative (e.g., formalin) for histopathology examination and AFB staining and another collected in a sterile specimen container (without preservative) for AFB smear and culture.

Histopathology findings suggestive of active TB disease include:

- varying numbers of AFB;
- necrotizing and non-necrotizing granulomatous inflammation;
- giant cells;
- epithelioid cells;
- the absence of other pathology.

2.2.4.1 Follow-up of Individuals with histopathology examination suggestive of TB

Individuals found to have histopathology findings suggestive of TB disease should submit three sputum samples for AFB smear and culture if possible (see *Appendix B, Respiratory specimen collection*).

Individuals residing within the Calgary or Edmonton areas should be referred to the local outpatient TB clinic for further assessment.

PA and lateral view chest X-rays should be arranged for clients living outside of the Calgary or Edmonton areas (or on a First Nations reserve), if not already done unless the client is pregnant (see *Section 2.2.2.2, Special considerations – pregnancy*).

NOTE: The *Tuberculosis Referral Form* (see *Appendix G*) should be used as a requisition for the X-rays; doing so will ensure the films are forwarded to AHS central TB Services.

2.2.5 Testing to identify infection with *Mycobacterium tuberculosis*

Until recently, the only method for identifying infection with MTB (in the absence of active TB disease) was the tuberculin skin test (TST). New methods to identify infection with MTB have been developed in recent years that measure cell-mediated reactions to tuberculin antigens *in vitro*; interferon-gamma release assay (IGRA) tests.

2.2.5.1 Interferon Gamma Release Assay (IGRA) testing

The usefulness and limitations of IGRA testing for MTB infection continue to be studied. IGRA testing is available in Alberta in select circumstances in accordance with Alberta Health and Wellness guidelines. As the utility of this tool becomes more clearly established, its implementation in Alberta may increase.

IGRA testing is a rapidly changing area, and regular updates to National guidelines for the use of IGRA occur frequently. Readers are encouraged to refer to the Guidelines and Standards section of the Public Health Agency of Canada website, located at: <http://www.phac-aspc.gc.ca/tbpc-latb/pubs-eng.php>

2.2.5.2 Tuberculin skin testing (TST)

By itself, TST has limited value in the diagnosis of active TB disease. The value of the TST lies primarily in its ability to identify infection with *M. tuberculosis*. However, TST results, considered in combination with other information (e.g., clinical picture, radiography/laboratory results) can contribute to a diagnosis of disease activity, particularly in children.

Healthy individuals usually develop cell-mediated reactivity to tuberculin antigen (PPD) three to eight weeks after having become infected with MTB. If given a TST after reactivity has developed, a delayed hypersensitivity reaction (induration at the TST site) will typically occur 48 to 72 hours later. If tested before reactivity to PPD has developed, for example, only one week after contact with infectious TB, the TST will almost certainly not accurately reflect the true status of the client. For this reason, contacts determined to require follow-up often require both a baseline TST and a repeat TST, eight weeks after last contact with the case.

2.2.5.3 Access to tuberculin

PPD is supplied by Alberta Health and Wellness to Alberta Health Services at no cost for:

- Organized province-wide TST programs that are the responsibility of Public Health such as:

- screening of health care workers on employment and if recommended because of high risk of exposure (but not for routine screening of staff unless the workplace has been assessed as a high-risk facility; see *Canadian Tuberculosis Standards*, 6th Edition, Chapter 16, Tuberculosis Control Within Institutions for information about health care facility risk classification)

NOTE: The term “health care workers” includes students and volunteers.

- screening of clients in continuing care facilities as part of the admission screening process
 - screening of contacts to cases of active TB disease
 - screening of inmates and staff in correctional institutions
- AHS zone programs that reflect public health practice, approved by the AHS MOH to address specific demographics. For example, screening of grade one children in northern off-reserve communities and newcomer’s clinics held to address medical needs of immigrants.

PPD is not currently supplied for travelers, occupational health programs outside of those described above, or diagnostic purposes (either in facilities or physician offices)

NOTE: It is anticipated that as the role of the IGRA is better defined it will eventually replace the TST and will be available for some or all of the indications for TST.

2.2.5.4 Administration, reading and interpretation of TST

The Mantoux method of TST, using Protein Purified Derivative (PPD) is the only TST approved for use in Alberta.

Tuberculin skin tests should only be administered and read by health care professionals who:

- are knowledgeable in the TB Control Program of Alberta referral and/or follow-up processes, **and**
- have training and experience in the technique of intradermal injections, TST reading, and TST interpretation

i. Precautions and adverse events following TST

Severe allergic events following PPD are very rare. However, clients should be monitored for at least 15 minutes after injection. Providers administering PPD must maintain protocols that specify the necessary emergency equipment, drugs (including dosage), and personnel required to manage any medical emergency arising after administration.

NOTE: Allergic reactions to PPD may occur in persons without a prior history of TST.

All individuals receiving a TST should be given instructions for reporting adverse events following administration. Recommendations regarding further TST after an adverse event are dependent upon the nature of the event and are determined on a case by cases basis in consultation with the attending physician/MOH. The PHO may also be consulted as required.

Localized reactions

Localized reactions to TST include injection site pain, pruritis and discomfort at the test site and should be treated with the use of cold compresses. Bleeding at the site after the needle is withdrawn and/or hematoma/bruising at the site may also occur. Two to three percent of individuals will have localized redness or rash (without induration) occur within 12 hours of testing. These reactions do not indicate a positive TST result.

Very rarely, blistering, ulceration and/or necrosis may appear at the test site, and may result in scarring.²⁹

Systemic reactions

Systemic hypersensitivity reactions have been reported within 24 hours of administration but are rare.

Additional information regarding risk of allergic response to PPD is available from the Health Canada website at:

http://www.hc-sc.gc.ca/dhp-mps/medeff/advisories-avis/prof/2005/tubersol_hpc-cps-eng.php

Reporting of adverse reactions to TST

Adverse events following TST should be reported to Alberta Health and Wellness using the Surveillance of Adverse Reactions to Immunizing Agents guidelines.

²⁹
sanofi pasteur product monograph for Tubersol, January 2007, p. 6. Accessed online 2008.12.15 at http://www.vaxserve.com/views/PDF/Tubersol_R7-0107_1.07.pdf

Report details of the adverse event, attaching or submitting medical summaries when appropriate. Severe events such as anaphylaxis or death must be reported within 24 hours (or the next working day if a weekend or holiday).³⁰

ii. Handling of PPD solution

- PPD solution should be stored between 2° and 8° C.
- The potency of PPD solution may be adversely affected by exposure to light. PPD should be stored in the dark except when doses are actually being removed from the vial.
- The solution must be used within 30 days³¹ of first puncture of the vial. PPD vials should be clearly labeled with the date of first puncture.
- Do not inject air into the vial. Injection of excess air with removal of each dose may over pressurize the vial and cause possible seepage at the puncture site³².
- Draw up the solution just before injecting it. Do not preload syringes for later use as the potency of PPD may be diminished.

iii. Client preparation

- Ensure that arrangements can be made for the test to be read 48 to 72 hours later. If such assurances can not be obtained, the test should be rescheduled until such time as it is likely the test reading can occur within the recommended timeframe.
- Ensure that the PPD solution has been properly stored and has not expired. Discard the solution if it has been in use for longer than 30 days or for an undetermined amount of time (e.g., the date of first puncture has not been noted on the vial).
- Seat the person comfortably with the arm extended and with the inner aspect of the forearm facing upward.

NOTE: Due to potential for localized edema caused by anesthetic creams such as EMLA[®] such products should not be applied prior to TST.

iv. Method of injection

- Use a quarter- to half-inch, 26- or 27-gauge needle on a disposable plastic tuberculin syringe.
- Identify a site for the tuberculin skin test (TST) that is approximately 10 cm (4 inches) below the elbow, being careful to avoid areas with abrasions, swelling, visible veins, or lesions that make TST results difficult to read.

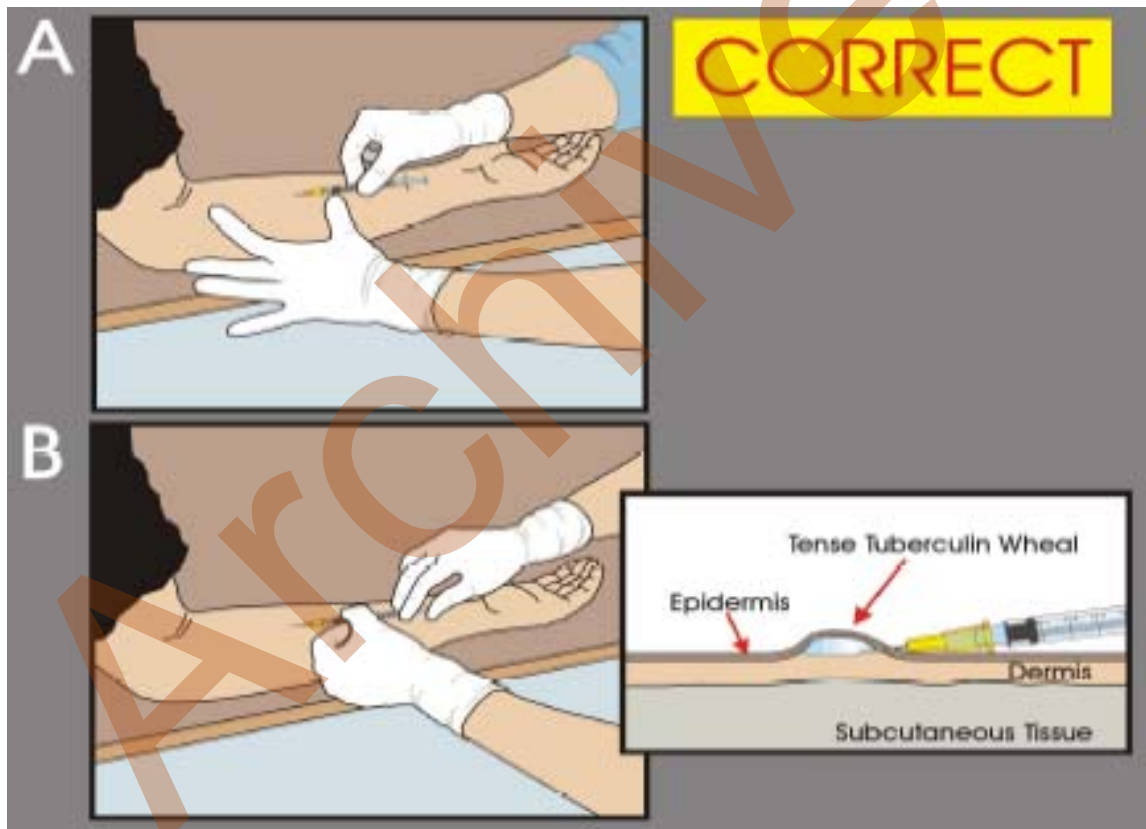
^{30[2]} Surveillance of Adverse Reactions to Immunizing Agents: Program Guide for Public Health Professionals. Alberta Health and Wellness, Population Health Disease Control and Prevention; 32, *Other Severe or Unusual Events*. August 2003.

³¹ sanofi pasteur product monograph for Tubersol, January 2007, p. 6. Accessed online 2008.12.15 at http://www.vaxserve.com/views/PDF/Tubersol_R7-0107_1.07.pdf

³² Ibid, Accessed online 2008.11.12 at http://www.vaxserve.com/views/PDF/Tubersol_R7-0107_1.07.pdf

- Areas with localized rash, burns or eczema should not be used. If neither forearm is suitable, the outside of the forearm or upper arm may be used.
- Cleanse the injection site with an alcohol swab and allow it to dry to reduce irritation from the alcohol at the site.
 - While holding the skin over the injection site taut, insert needle at a 10° to 15° angle (bevel facing upward) just far enough under the skin to cover the bevel of the needle. The tip of the needle should be visible just below the surface of the skin. (See Figure 2-1)
 - Without aspirating, administer a slow intradermal injection of 0.1 milliliter (ml) of 5TU (tuberculin units) of purified protein derivative (PPD). A discrete, pale elevation of the skin at the injection site (a wheal) should appear. The wheal should be six to 10 mm in diameter. Typically, the wheal will disappear within 10–15 minutes.

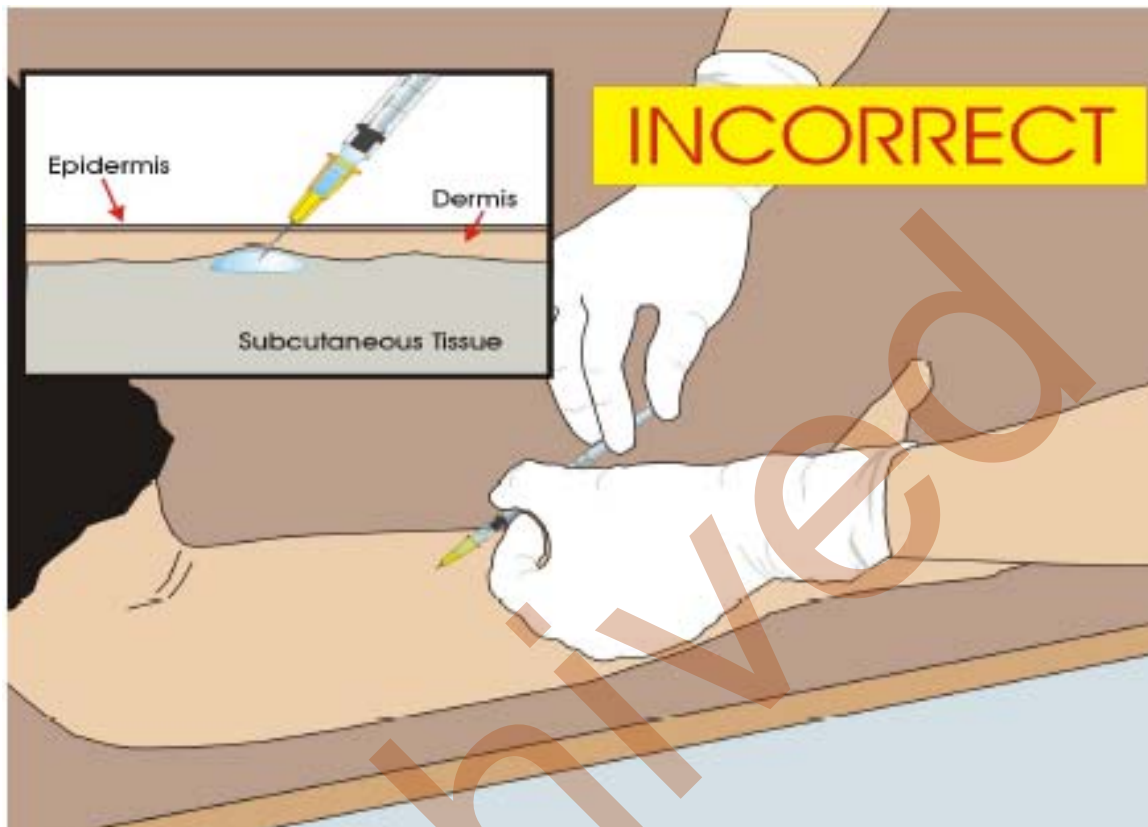
Figure 2-1: Correct method of injection for tuberculin skin testing³³



Note: The needle should be inserted (bevel facing upward) at a 10° to 15° angle to the surface of the client's forearm. If inserted correctly, a discrete, pale elevation of the skin (a wheal) should appear at the injection site as the antigen is injected.

³³ Francis J. Curry National Tuberculosis Center, *TB Control Frequently Asked Questions; How should a Mantoux tuberculin skin test be applied?* March 2004. Retrieved 2008.08.27 from http://www.nationaltbcenter.ucsf.edu/abouttb/tbcontrol_faqs/16_Mantoux_tst_apply.pdf

Figure 2-2: Incorrect method of injection for tuberculin skin testing³⁴



Note: If the needle insertion angle is greater than 10° to 15°, the injection will be *subcutaneous* instead of *intra-dermal*, and no wheal will appear.

Troubleshooting

If the needle is not inserted far enough under the skin, leakage will occur at the site. If the needle is angled too deeply into the skin, the wheal will not appear.

In either case, the results of the TST will be inaccurate and the TST should be repeated immediately on another site at least two inches from the first TST or on the other forearm.

v. Aftercare of the site

- **Do not massage the site or cover the site with a bandage after injection.** Doing either may change the results of the TST.
- Advise the client not to scratch the site afterward. The area may be washed but should not be scrubbed.

³⁴ Ibid.

- Pain, itchiness, discomfort at the site may occur, and should be treated with the use of cold compresses.

vi. Documentation of TST administration

TST administration should be documented, and information such as:

- Date TST was administered
- Lot number and expiry date of Tubersol® (PPD) used
- Dose administered (i.e., 5-TU, 0.1 ml)
- Injection site (i.e., arm used; left or right)
- Signature or initials of individual who administered the TST

NOTE: Repeated testing (either single TST or two-step TST) cannot cause an uninfected individual to develop a positive TST response.

vii. Timeframe for TST reading

Reading should be done 48 to 72 hours after administration. If, due to unforeseen circumstances, the TST cannot be read within 72 hours, the test should be repeated at a site far enough from the original test that the reactions do not overlap. No minimum wait time is required before the test may be repeated.

viii. Method of TST reading

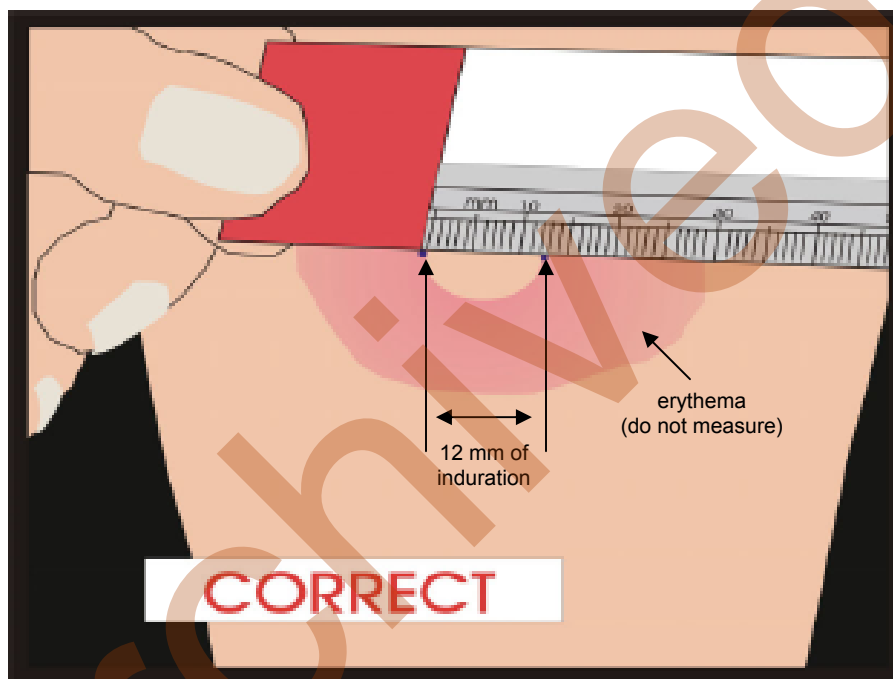
If operational requirements are such that the health professional administering the TST has not been consistently reading TSTs, all positive TST reactions must be confirmed by an experienced PHN before referral to AHS central TB Services or local outpatient TB clinic. Self-reading of TSTs is not an acceptable practice, and should not be allowed under **any** circumstances.

- Inspect the TST site in good light with the forearm supported on a firm surface and the elbow slightly flexed.
- Palpate the injection site for the presence or absence of induration (swelling). Erythema (redness) is to be ignored when assessing induration.
- Alternatively, induration can be identified by moving the tip of a ballpoint pen, held at a 45° angle, laterally from the outside of the arm toward the injection site. The tip will stop at the edge of the induration (if present). Repeat the process on the opposite site of the indurated area.
- Using a caliper, measure the diameter of induration at the widest part transversely to the long axis of the forearm (i.e., from side-to-side, *across* the forearm) **only**; do not measure the width of induration from the wrist to elbow (see *Figure 2-3, Correct method for measuring a tuberculin skin test*).

NOTE: A caliper is the preferred method of measurement because it is more precise. If a caliper is not available, a flexible ruler may be used.

Do not round off the diameter of induration. If the measurement falls between demarcations on the ruler, the smaller of the two results should be used.

Figure 2-3: Correct method for measuring a tuberculin skin test³⁵



Note: Measure the diameter of induration at the widest part transversely to the long axis of the forearm (i.e., from side-to-side, *across* the forearm). The area of erythema (redness) surrounding the induration is not to be included in the measurement.

ix. Documentation of TST results

TST results should be documented, and include information such as:

- Date the TST site was inspected (read)
- Measurement of the diameter of induration, if any, in millimeters (mm). The use of words such as “negative”, “doubtful”, “positive”, “significant”, or “insignificant” should not be used when recording TST results.

³⁵ Adapted from Francis J. Curry National Tuberculosis Center, *TB Control Frequently Asked Questions: [How should a Mantoux tuberculin skin test be read?](#)* March 2004. Retrieved 2008.08.27 from http://www.nationaltbcenter.ucsf.edu/abouttb/tbcontrol_faqs/17_Mantoux_tst_read.pdf

- Record one measurement for the induration only; *results such as 10 mm x 12 mm are not acceptable.*
- If no induration is present, record the result as “0 mm”. Erythema (redness) is not to be recorded.
- Any adverse reactions, such as blistering, ulceration, severe pain or necrosis, at the test³⁶ site (see *Section 2.2.5.4 - (i) Precautions and adverse events following TST*)
- Signature or initials of individual who read the TST

x. Interpretation of TST results

The interpretation of TST results must take into consideration the size of induration noted, the likely validity of the test result (positive predictive value), and the risk of development of TB disease if the person is truly infected with MTB. Recommendations for follow-up (e.g., treatment of latent TB infection) are based upon these considerations:

1. Induration size
2. Positive predictive value
3. Risk of development of active TB disease

1. Induration size

Table 2-2: Interpretation of TST measurement based on induration size³⁷

TST reaction size (mm of induration)	Situation in which reaction is considered “positive”
0 – 4 mm	HIV AND the expected likelihood of TB infection is high (e.g., the client is from a population with a high prevalence of TB infection, is a close contact of an active, infectious case, or has an abnormal x-ray)
5 – 9 mm	HIV infection Close contact of an active, infectious case Children suspected of having tuberculosis disease Abnormal chest x-ray with fibronodular disease Other immune suppression: TNF inhibitors, chemotherapy, dialysis Transplant candidates (if pre-transplant and relatively immune competent)
≥ 10 mm	All others including individuals who are anticipated to become immune suppressed as a result of treatments or medications yet to begin (e.g., TNF inhibitors, chemotherapy, radiation therapy, post-transplant rejection medications)

³⁶ “Adverse Reactions to TST” as defined in *Section 32, Other Severe and Unusual Events*, of Surveillance of Adverse Reactions to Immunizing Agents, Program Guide for Public Health Professionals, Alberta Health and Wellness Population Health Disease Control and Prevention, August 2003. Provided by Debbie Lawrence, RN BScN.

³⁷ Adapted from: Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition, Canadian Lung Association and Public Health Agency of Canada, 2007, p. 63.

NOTE: Further information about interpretation of TST induration size in the context of contact evaluation is presented in *Table 4-2, Contact investigation and outbreak management*.

A “positive” TST reaction does not, by itself, indicate that treatment for latent TB infection or active TB disease is necessary. The finding of a new positive TST in some individuals does necessitate referral to an outpatient TB clinic or AHS central TB Services (depending upon the client’s health zone of residence), for consideration of treatment for LTBI (see *Table 5-2, Tuberculin skin test cut points for referral to AHS central TB Services or an outpatient TB clinic for consideration of treatment for latent TB infection*).

2. Positive predictive value

The positive predictive value of the TST refers to the probability that a “positive” test result reflects the presence of infection with MTB in the individual being tested.

TST conversion

TST conversion describes the situation whereby an individual who has previously demonstrated a negative TST is subsequently found to have a positive TST. In Alberta, conversion is considered to have happened if the negative TST was within the two years prior to the positive TST being identified.

Infection with MTB is most likely to be the cause of a TST conversion if there has been contact with infectious TB in the interim between the two TSTs. For example, a contact to an infectious case of TB is given a TST before they have developed cell mediated reactivity to tuberculin (i.e., less than three to eight weeks have passed since their exposure to the case). The result of this TST is 0 mm of induration (negative). When they are re-tested 10 weeks after their last exposure to the case, the second TST result is found to be 12 mm of induration (positive). The change from negative to positive is considered a TST conversion.

The increase in size of induration that constitutes a TST conversion is somewhat controversial, and ultimately will depend upon criteria individualized to the circumstances. In most situations, for a healthy individual who is **not** a known close contact of a case of active TB, TST conversion is defined as a TST reaction of 10 mm or more when an earlier TST reaction was less than 5 mm.

If a healthy individual’s prior TST result was between 5 and 9 mm, the definition of conversion becomes more difficult. For these individuals, an

increase of 6 mm or more may be considered a conversion under the following circumstances:

- close or prolonged contact with infectious TB
- contact with a highly infectious case (e.g., laryngeal TB)
- if the contact is under five years of age
- if the contact has impaired immunity (e.g., HIV infection)

Otherwise, an increase of 10 mm or more is considered evidence of TST conversion; for example, an increase from 7 mm to 17 mm. Generally, the larger the increase in TST induration size the more likely it represents a true conversion.

Individuals whose TST convert from negative to positive are at highest risk of developing active TB disease within the two years following, and therefore may benefit from treatment of latent TB infection during this time.

Note: Pregnant women who convert their TST should undergo further investigation at the discretion of a TB Consultant.

False positive TST reactions

Not all reactions to PPD are due to infection with MTB. One of the limitations of TST as a method for identification of MTB infection is its lack of specificity. Previous exposure to nontuberculous mycobacteria (NTM) or prior vaccination with BCG can reduce the specificity of TST and the likelihood that responses to PPD antigen are due to infection with MTB.

Sensitivity to NTM antigens is uncommon in the Canadian-born, however it may be quite common in those from tropical, subtropical or warm, temperate climates where NTMs may be found in the soil and water. Sensitivity to NTM antigens may cause cross-reactivity to PPD, resulting in small TST reactions (generally between 5 and 9 mm).

Cross reactivity to PPD related to BCG vaccination is more likely a cause of “false positive” TST results in Canadian born individuals than NTM exposure. Population groups in Canada that may have received BCG vaccination include:

- Immigrants from western Europe, eastern Europe, and most developing countries
- Aboriginal Canadians

- Canadians born in Quebec and Newfoundland-Labrador between the 1940's and 1980's
- Health care providers trained prior to and during the 1970s

NOTE: Additional information about BCG vaccine usage in Canada (current and historical) is presented in Appendix F of the *Canadian Tuberculosis Standards*, 6th Edition, available online at:

<http://www.phac-aspc.gc.ca/tbpc-latb/pubs/tbstand07-eng.php>

In general, if the BCG vaccination occurred after the individual reached 12 months of age, it may cause a false-positive TST reaction particularly in populations where expected prevalence of infection with MTB is low (i.e., less than 10%) such as Canadian born non-Aboriginals not involved in high TB risk lifestyles or employment (e.g., within a health care or correctional facility).

False-Negative TST results

Individuals may also have “false-negative” TST reactions. These can occur due to technical and/or biological reasons, such as:

- Issues related to the antigen (e.g., expired or improperly stored solution)
- Issues related to the client (i.e., biologic reasons), for example:
 - Immune suppression due to HIV, advanced age, treatment with immune suppressive medications or therapies
 - Severe illness (which may include active TB disease)
 - Major viral illness (e.g., mononucleosis, mumps, measles but **NOT** the common cold)
 - Immunization with mumps, measles, rubella, varicella (chickenpox) or yellow fever vaccine within the previous four weeks
 - Very young age (less than six months). The validity of TST in infants less than six months of age is unknown.

NOTE: Two-step tuberculin skin testing may be beneficial in reducing the likelihood of false-positive and false-negative TST results in some individuals (see *Section 2.2.5.5, Two-step TST and the booster phenomenon*).

3. Risk of development of active TB disease

The third consideration when interpreting TST results is the individual's risk of development of active TB disease if they have been infected with MTB.

Generally speaking, the lifetime cumulative risk for development of active TB disease after infection with MTB is estimated to be 10%. Approximately one-half of these cases will occur within the first two years after infection occurs.

However, a number of risk factors may increase the risk of development of disease. The relative risk for some of these conditions/considerations has been determined (see *Table 2-3: Risk factors for the development of active tuberculosis among persons infected with Mycobacterium tuberculosis*). The relative risk of others (e.g., alcohol use/misuse, IV drug use, lymphoma, leukemia, end-stage renal disease) while known to increase the risk for progression to active disease, remain unknown.

Archived

Table 2-3: Risk factors for the development of active tuberculosis among persons infected with *Mycobacterium tuberculosis*³⁸

Risk Factor	Estimated risk of TB relative to Persons with no known risk factors
HIGH RISK	
Acquired immunodeficiency syndrome (AIDS)	110–170
Human immunodeficiency virus (HIV) infection	50–110
Transplantation (related to immunosuppressant therapy)	20–74
Silicosis	30
Chronic renal failure requiring hemodialysis	10–25
Carcinoma of head and neck	16
Recent TB infection (≤ 2 years)	15
Fibronodular disease on chest radiograph	6–19
INCREASED RISK	
Treatment with glucocorticoids*	4.9
Tumor necrosis factor (TNF) inhibitor medication	1.5–4
Diabetes mellitus (all types)	2.0–3.6
Underweight ($< 90\%$ ideal body weight; for most persons this is a body mass index ≤ 20)	2–3
Young age when infected (0–4 years)	2.2–5.0
Granuloma on chest radiograph	2
LOW RISK	
Infected person, no known risk factor, normal chest radiograph (“low risk reactor”)	1

* Equivalent of ≥ 15 mg/day of prednisone for one month or more; risk of TB disease increases with higher dose and longer duration

³⁸ Adapted from Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition, Canadian Lung Association and Public Health Agency of Canada, 2007, p. 65.

2.2.5.5 Two-step TST and the booster phenomenon

In some individuals who are infected with MTB, sensitivity to PPD may wane over time causing them to demonstrate negative or slight reactions to a TST. It has been demonstrated that by providing two exposures to PPD within a relatively short period of time, waned immune response can be reconstituted or “boosted”.

Two-step TSTs may assist practitioners to distinguish between a boosted response related to long-standing MTB infection and TST conversion caused by recent infection. This distinction is important because it may impact on decision making with regard to treatment for latent TB infection and possibly, expansion of contact investigation activities.

Clients should be assured that repeated testing (either single TST or two-step TST) cannot cause an uninfected individual to become infected with MTB or develop a positive TST.

i. Indications for two-step TST

Two-step TST should be performed if:

- it is anticipated that an individual will be undergoing repeated screening with TST at regular intervals especially if the individual has a history of a BCG vaccine in the past, and/or
- if the individual is over 55 years of age.

In Alberta, two-step TST is recommended at the time of hire for the following groups unless they have documented results of a prior two-step TST:

- all employees and “regular” volunteers* of health care facilities
- all employees and “regular” volunteers* of long-term care institutions (e.g., homes for the aged, nursing homes, chronic care facilities, retirement homes or any other collective living centre)
- all employees and “regular” volunteers* of homeless shelters
- all employees of home care programs
- correctional facility inmates anticipated to remain in the facility for one year or longer
- all employees and “regular” volunteers* of correctional facilities

* See Section 2.1.5.1, *Baseline TB screening for employees and volunteers for definition of “regular” volunteers*

Two-step TST is also recommended in Alberta for:

- certain “other” volunteers at increased risk for TB, as defined in Section 2.1.5.1, *Baseline TB screening for health professions and others who work or volunteer with populations at increased risk for TB*
- certain residents of continuing care facilities (see Section 2.1.6.4, *Residents of continuing care facilities*)
- certain travelers (see Section 2.1.1.2, *Travelers to TB endemic countries*)

NOTE: Immune suppression (whether related to HIV or other factors) is not, in itself, an indication for two-step TST.

Two-step TST should not be used in the context of a TB contact investigation because conversion of TST may occur as early as three weeks after infection with MTB. A change in TST reactivity following exposure to TB should almost always be considered a TST conversion because it is generally not possible to differentiate between conversion and TST boosting¹.

If completed and documented, the two-step TST protocol need not be repeated. If the two-step TST result was negative, subsequent TSTs can be single step (one TST only) regardless of how long it has been since the last TST or two-step TST.

iii. Administration, reading, and interpretation of two-step TST

Administration

The first TST of a two-step TST is administered in the same manner as single-step TST. If the initial TST is positive, the second TST should not be done. If the initial TST result is negative, a second TST should be administered, at a different injection site.

The second TST should be given no sooner than one week after the first TST and no later than four weeks after the first TST.

Repeating the TST sooner than one week later may not allow enough time to stimulate the necessary immune response; delaying the repeat test for longer than four weeks may allow for the possibility of TST conversion to occur (i.e., infection with MTB through exposure to an active case).

Reading

Both TSTs should be read in the same manner as a single-step TST, i.e., palpated, measured, and recorded 48 to 72 hours after administration.

Interpretation

Two-step TSTs are interpreted in the same manner as single TSTs. If the second TST result is 10 mm or more induration, the TST should be considered “positive” and individual should be followed up as described in *Section 2.2.5.7, Follow-up of individuals found to have a positive TST result.*

2.2.5.6 Special considerations for TST

i. Pregnancy

Although pregnancy is not a contraindication to administration of TST, testing in the absence of symptoms, HIV infection, or recent contact is usually deferred until after delivery.

ii. Infants less than six months of age

The validity of TST results in infants less than six months of age remains controversial. A negative TST in a child of this age may not be reliable due to possible delay in development of cell-mediated immune responses required to demonstrate PPD reactivity.

Generally, a positive TST in an infant should be considered evidence of MTB infection unless the child has received BCG vaccination.

BCG should be ignored as a possible cause for the positive TST in an infant who:

- is likely to have been exposed to active TB disease (i.e., is named as a TB contact, or resides or has resided in a country or community with high TB incidence)
- has symptoms/signs or radiographic abnormalities suggestive of active TB disease

iii. Immune suppressed clients

The reliability of a negative TST result may be compromised in individuals who are immune suppressed due to:

- advanced age
- medical conditions (including active TB disease and other severe illnesses)
- medical treatments (e.g., post organ transplant, cancer therapy agents, treatment with corticosteroids, tumor necrosis factor (TNF) inhibitors)
- malnutrition

NOTE: By itself, immune suppression is not an indication for two-step TST.

iv. History of BCG vaccination

Prior BCG vaccination is NOT a contraindication to TST (single or two-step TST).

v. Major viral illness

The reliability of the TST may be affected in individuals with major viral infections, e.g., measles, mumps, chickenpox, and HIV³⁹.

vi. Recent or concurrent live virus immunization

TST may be unreliable (falsely-negative) for individuals who have received measles immunization within the previous four weeks.

The effect on TST from other live virus immunizations (e.g., measles, mumps, rubella, varicella, yellow fever) is not known. The *Canadian Tuberculosis Standards*⁴⁰ recommends following the four week guideline used for measles vaccination **unless** the opportunity to perform the TST might be missed as a result of the delay.

NOTE: TST can be performed before or on the same day as live virus immunizations, but at a different site or wait four weeks.

vii. Contacts to infectious TB

The timing, frequency, and interpretation of TSTs for individuals who have been in contact with infectious TB should be carried out in accordance with direction provided by AHS central TB Services or the outpatient TB clinic managing the case (see *Section 4, TB contact investigation and outbreak management in Alberta.*)

2.2.5.7 Follow-up of individuals found to have a positive TST result

NOTE: In order to ensure appropriate and timely referrals for follow-up investigations are made, all positive TST results should be reported to the designated person or persons responsible for TB management according to AHS protocol.

Individuals found to have a positive TST result should be considered potentially infected with MTB, and additional investigation is indicated to rule out or identify the

³⁹ sanofi pasteur product monograph for Tubersol, January 2007, p. 5. Accessed online 2008.08.26 from http://www.vaxserve.com/views/PDF/Tubersol_R7-0107_1.07.pdf

⁴⁰ Long, R. Ellis, E. Editors, *Canadian Tuberculosis Standards*. 6th Edition, Canadian Lung Association and Public Health Agency of Canada, 2007, p. 56.

presence of active TB disease. If a history and symptom inquiry has not already been completed, this should be done.

i. Symptomatic TST reactors

NOTE: The immediate management of TST positive individuals found to have symptoms/signs suggestive of active respiratory forms of TB disease is described in Section 2.2.1.3, *Management of individuals with symptoms/signs suggestive of active respiratory forms of TB disease*.

Three sputum samples should be submitted for AFB smear and culture if possible (see *Appendix B, Respiratory specimen collection*).

Individuals residing within the Calgary or Edmonton areas should be referred to the local outpatient TB clinic for further assessment.

PA and lateral chest radiography should be arranged for clients living outside of the Calgary or Edmonton areas (or on a First Nations reserve), if not already done unless the client is pregnant (see *Section 2.2.2.2, Special considerations in chest radiography*).

NOTE: The *Tuberculosis Referral Form* (see *Appendix I*) should be used as a requisition for the radiographs; doing so will ensure the films are forwarded to AHS central TB Services.

If either radiograph report includes any radiologic descriptors of TB (see *Section 2.2.2.1, Radiologic descriptors of tuberculosis*), the individual should be assessed by a local physician. Referral of information (including the TST result, radiology report(s) and details of prior TB treatment, if any) to AHS central TB Services may be warranted, depending on physician and radiography findings, e.g., if the resident appears to have active TB disease or may be a candidate for treatment of LTBI.

ii. Asymptomatic TST reactors

Asymptomatic TST reactors should be referred to a local physician for assessment to rule out active TB disease. This assessment should include a chest X-ray (if one has not been done in the preceding six months) unless the client is pregnant (see *Section 2.2.2.2, Special considerations in chest radiography*).

Referral of asymptomatic TST reactors to AHS central TB Services or a local outpatient TB clinic may be appropriate, depending upon whether or not the

individual appears to have active TB disease (based on laboratory and/or radiograph findings) or be a candidate for treatment of LTBI (see *Section 1.5, Indications and processes for TB follow-up referrals*).

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3. Management of active TB disease in Alberta

Management of active TB disease in Alberta involves a partnership between the patient, their family (or attending) physician, the zonal MOH and/or First Nations and Inuit Health of Health Canada, AHS central TB Services and/or the outpatient TB clinic managing the patient's care, if one is involved. It is essential for the control of this disease that each of the partners takes responsibility for their role in the partnership.

TB management activities are aimed at:

- preventing ongoing transmission of TB;
- preventing the acquisition of drug resistance;
- supporting and ensuring successful completion of adequate treatment regimens (cure) for cases of active TB disease
- identification, evaluation and follow-up of contacts to active cases of TB (contact investigation)

NOTE: Contact investigation is reviewed in *Section 4, TB contact investigation and outbreak management in Alberta.*

Each patient with active TB is understood to have one or more PHN managers who take direction from the TB Control physicians.

3.1 Roles and responsibilities

Roles and responsibilities for the management of active TB disease in Alberta are described in *Section 1.1, Alberta's Tuberculosis Control Program.*

Specific roles and responsibilities related to the management of active TB disease are presented in Table 1-1.

3.2 Prevention of TB transmission – airborne precautions and isolation

The most important measures in preventing transmission of TB are:

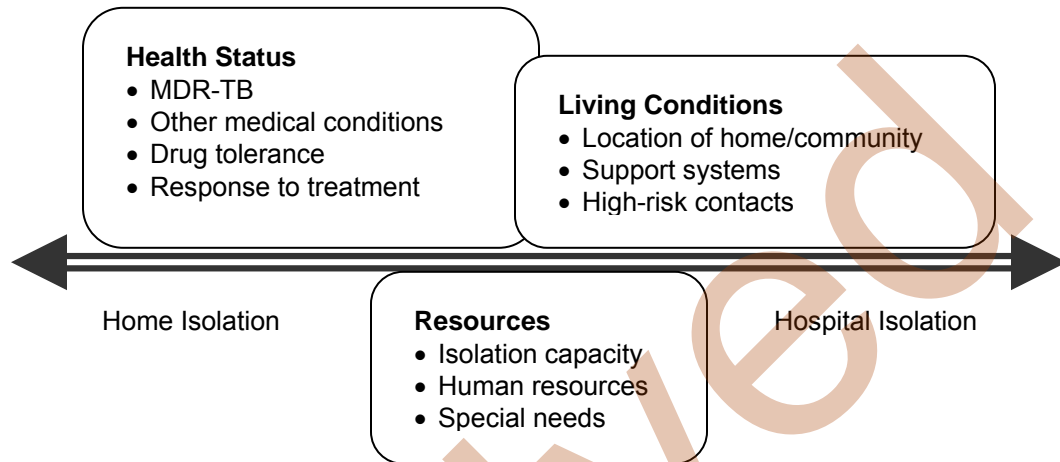
- early diagnosis of disease;
- prompt initiation of effective treatment; and
- isolation of the patient when necessary and to the degree appropriate⁴¹.

Recognizing that each individual and situation is unique, determining where isolation is best carried out involves careful consideration of the complex interaction between health status, living conditions, and available resources.

⁴¹ Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition, Canadian Lung Association and Public Health Agency of Canada, 2007, p.43.

Isolation should be viewed as a continuum. Where an individual is on the continuum at any give time during treatment is dependent upon the availability and optimization of (or limitations imposed by) individual and health system resources (see *Figure 3-1*, below).

Figure 3-1: The continuum of isolation ⁴²



AHS central TB Services and the outpatient TB clinics will work closely with local public health to determine the need for airborne isolation precautions and isolation of individuals with suspect or confirmed infectious TB. Further collaboration will ensure appropriate isolation and management of TB disease in an environment most suited to achieving the desired outcome, while at the same time causing the least disruption to the individual and the health system.

If individuals with infectious TB can be safely managed in their home environment without danger to themselves, their family, or the general public, AHS central TB Services and/or the local outpatient TB clinic, will encourage and support this. If isolation in the community is not appropriate or feasible, hospitalization may be required.

3.2.1 General principles

The purpose of isolation is to ensure that further transmission of MTB does not occur once an individual is suspected or known to have infectious tuberculosis.

3.2.1.1 Health care facilities and other institutional settings

The *Canadian Tuberculosis Standards*, 6th Edition includes guidelines in Chapter 16 to assist clinicians, infection control practitioners, and facilities to establish and implement appropriate administrative, environmental engineering, and personal controls to prevent transmission of TB within institutions.

⁴² Alberta Health and Wellness Tuberculosis Control Manual, January 2006. Appendix 15, p. 6-52.

General principles of isolation with respect to TB include the following:

- All individuals who are admitted to active treatment facilities (e.g., acute care hospitals) with suspected or confirmed infectious TB must be isolated until proven to be noninfectious.
- If no isolation room meeting the criteria for airborne isolation is available, arrangements should be made to transfer the patient to a facility that has rooms that meet such criteria (for airborne isolation room criteria, see *The Canadian Tuberculosis Standards*, 6th Edition, pages 333–4).
- Infection prevention and control personnel should be notified of all clients with confirmed TB who are in the facility, and of all clients who are placed in airborne isolation related to suspicion of TB.
- Visitors and staff members entering the isolation room should wear appropriate respirators; visits by children (those under the age of 15 years) should be discouraged because of their increased susceptibility.
- Movement out of isolation rooms by TB clients should be limited. If the patient is going to another facility or department, that facility/department should be notified. If transportation between facilities is required, public transportation should not be used.
- Clients leaving an isolation room should wear a *surgical or procedure mask* when doing so; these masks are effective in trapping the large infectious particles exhaled by TB clients⁴³.
- Attendants involved in the transport of suspected or known infectious clients should wear appropriate personal respiratory protection, e.g., fitted N95 respirators.
- Isolation precautions should be continued until the patient is highly likely to be noninfectious⁴⁴ unless the patient has multi-drug resistant TB (MDR-TB) or extensively drug resistant TB (XDR-TB); these clients must remain in airborne isolation for the duration of their hospital stay or until three consecutive sputum cultures are negative after six or seven weeks of incubation.
- Infectious clients may be allowed to ambulate outdoors without wearing a mask provided they are not in close contact with susceptible individuals for prolonged periods of time during this activity.
- Under specific circumstances, clients may be discharged to the community while still potentially infectious; see the *Canadian Tuberculosis Standards* 6th Edition, pg. 330–1. See also, *Isolation in the community*, below.

Release from isolation - health care facilities and other institutional settings

Criteria for discontinuing TB isolation precautions in clients with suspected or confirmed infectious TB confined to health care facilities or other institutional settings are quite explicit. These may be found in the *Canadian Tuberculosis Standards* 6th Edition, pg. 329–331.

⁴³ Ibid, p.337.

⁴⁴ Ibid, p. 330.

3.2.1.2 Isolation in the community

A written plan for airborne precautions/isolation should be developed for each patient isolated in the community. A verbal or written contract for adherence to the behaviors and actions required in the plan may help the person and the family to understand what is expected and may help the public health staff as well (see *Appendix G, Home isolation package*).

Individuals isolated in the community are not to return to work, school, or usual social activities, nor have visitors and they must wear a *surgical (or procedure) mask* if attending out-patient follow-up services at health care facilities until such time as they have been proved noninfectious.

Home care or other personnel visiting the patient in the community should wear appropriate personal respiratory protection (e.g., fitted N95 respirators).

The PHN (liaising as necessary with the TB Services physician, the MOH, and the attending physician) has immediate responsibility for ensuring adherence with the plan for airborne precautions/isolation (the TB program may wish to establish a minimum visit frequency).

PHNs should review and re-emphasize the importance of adherence to treatment, and the plan for airborne precautions/isolation. Indications that an individual may be having difficulty coping with isolation and/or visitor restrictions should be noted and followed up on with the patient.

The plan for airborne precautions/isolation should be regularly revisited, in consultation with AHS central TB Services, the outpatient TB clinic (if involved), and others (as above) to ensure that it is the least disruptive to the individual's life while still supporting the goals of optimal treatment and protection of others.

Release from isolation in the community

The following guidelines are recommended:

Clients whose airway secretions have been determined at the outset to be smear-positive:

It is recommended that release from respiratory isolation (back into the community at large or workplace) should not occur until the patient has completed a minimum of two weeks of effective treatment (see definition, above) AND at least three consecutive spontaneously produced sputum samples are acid-fast bacilli (AFB) smear negative. The smears should be collected eight to 24 hours apart and at least one should be an early morning specimen. Release from isolation in the community (home isolation) may proceed without smear conversion if the patient

has had at least two weeks of effective therapy and it can be said with reasonable certainty that the patient is not returning to a setting:

- where transmission to new previously unexposed contacts is possible (e.g., crowded living quarters, low air exchange rates, longer duration of contact), or
- where there may be exposure to new contacts who are at high risk to progress to active TB disease were they to become infected (e.g., children, the immune compromised).

Initially smear-positive clients who, although cooperative, cannot subsequently produce sputum spontaneously or clients whose airway secretions were smear-negative at the outset:

It is recommended that release from respiratory isolation not occur until the patient has completed a minimum of two weeks of effective treatment (see definition in *Section 6, Glossary*).

3.2.2 Legislation with regard to isolation

The *Public Health Act* and the *Communicable Diseases Regulation* of the *Public Health Act* are the Provincial legislative instruments that govern the handling of suspect or confirmed infectious TB. AHS central TB Services and the outpatient TB clinics (if involved) have a responsibility to ensure that isolation is provided when deemed necessary for all individuals who have suspect or confirmed infectious TB in order to prevent and control the transmission of *Mycobacterium tuberculosis* (MTB).

Key aspects of the *Public Health Act* and *Communicable Diseases Regulation* are summarized in *Appendix A: The Alberta Public Health Act and Communicable Diseases Regulation for Tuberculosis*.

In summary, if an individual refuses or neglects to comply with conditions that have been prescribed by a physician as necessary to mitigate TB or limit its spread to others, a certificate may be issued by a MOH to apprehend and detain the person for that purpose. Legal confinement, however, is used as a last resort.

The Provincial Medical Consultant for Tuberculosis, Chief Medical Officer of Health, AHS MOH or MOH for First Nations and Inuit Health may issue such a certificate whenever indicated. A person in respect of whom a certificate is issued may apply at any time for cancellation of the certificate. Recalcitrant clients may also be held under an "Isolation Order" (Section 44 of the *Public Health Act*).

3.3 Treatment of active TB disease

The goals for treatment of active TB disease benefit the person with TB and the community in which they live by:

- relieving symptoms
- preventing further transmission of TB
- preventing development of drug resistance
- achieving lifetime cure of the disease for the patient

Cure of TB can be achieved in a variety of ways, all of which require the use of medications to which the organism is susceptible. Collaboration between AHS central TB Services, the outpatient TB clinic (if involved), the patient, patient's family physician, and local public health services will determine the best mode of treatment.

Several factors must be taken into account in determining which antituberculosis medications should be used and for how long. These include:

- the type (site) of TB disease being treated
- the patient's age
- the medications that are available for treatment (cases with drug-resistant strains of TB may have limited options for treatment)
- patient adherence
- patient tolerance (related to co-morbidities and/or potential drug interactions)

3.3.1 Phases of treatment

Tuberculosis treatment is usually divided into two phases; the *initial (intensive) phase* and the *continuation phase*.

Initial (intensive) phase (also called “front-end loading”)

During the initial phase, three or four antituberculosis medications are used in combination to:

- relieve symptoms
- rapidly reduce the number of MTB organism present and interrupt transmission
- prevent the development of drug resistance

Note: The treatment of active TB disease *always* requires that antituberculosis medication be used in combination, i.e., single drug regimens (mono-therapy) are *never* to be used.

The choice of medications used is determined by the results of drug susceptibility testing done on the patient's MTB isolate. If drug susceptibilities are not known at the onset of treatment, four drugs (isoniazid, rifampin, pyrazinamide, and ethambutol) are usually prescribed, and adjustments are made once the susceptibility results become available.

Treatment is given on a daily basis during the initial phase of treatment, although some regimens may switch to intermittent therapy after a period of daily treatment. The initial phase of treatment usually continues for approximately two months.

Adherence to treatment during this phase is critical in order to:

- Reduce morbidity and mortality from the disease
- Ensure rapid symptom relief for the patient
- Ensure rapid reduction of infectiousness

Continuation phase

The continuation phase immediately follows the initial phase of treatment and is aimed at eliminating any remaining MTB organisms and ensuring lifetime cure (no relapse). The continuation phase typically includes fewer medications than the initial phase (e.g., isoniazid and rifampin only), and is usually given on an intermittent (twice-weekly) basis for an additional four to seven months. Longer courses of treatment may be required for some forms of TB disease, such as those involving the central nervous system, miliary or disseminated TB, and bone and joint TB or if standard first-line TB medication can not be used.

If treatment is not continued for an adequate period of time (i.e., enough doses are not completed), the patient may not be cured (treatment failure) or may develop TB again later (relapse).

3.3.2 Medications used in the treatment of active TB disease in Alberta

All medications prescribed for the treatment of TB are provided without cost to the patient through TB Services in Alberta. Physicians should never write prescriptions to local pharmacies for medications to treat or prevent TB, nor should a pharmacy ever fill a prescription for TB treatment or prevention.

Antituberculosis medication should not be used indiscriminately. If a person is infected with TB that is resistant to these drugs (primary resistance) or develops resistance during treatment (acquired resistance), treatment will be more complicated, more expensive, longer, more toxic to the patient, and may ultimately be less effective.

There are four medications classified in Canada as “first-line” drugs for the treatment of TB:

- isoniazid (INH)
- rifampin (RMP)
- pyrazinamide (PZA)
- and ethambutol (EMB)

These are the most effective antituberculosis medication available. Several additional medications have been classified in Canada as “second-line” TB treatment drugs, including streptomycin (SM), fluoroquinolones antibiotics, and rifabutin.

Important additional information about first-line and some more commonly used second-line antituberculosis medications, including formulations and common side effects, is presented in *Appendix C, Drug Information Reference Tables* and *Appendix D, Common Adverse Reactions to Antituberculosis Medications*.

3.3.2.1 First-line antituberculosis medication

NOTE: Recommendations regarding baseline and ongoing monitoring for each of these medications is provided in *Section 3.4, Baseline and ongoing monitoring*.

i. Isoniazid (INH)

Isoniazid has been in use for the treatment of TB since 1952, however its mode of action is still not completely understood. It is rapidly and almost completely absorbed, and peak blood levels are reached within 30 to 60 minutes after ingestion. Absorption is inhibited by the presence of food in the stomach.

Vitamin B6 (pyridoxine) is routinely included in treatment regimens that use INH because INH may deplete body stores of Vitamin B6, producing peripheral neuropathy and other potentially significant reactions (e.g., psychotic episodes). Depletion of Vitamin B6 can be very serious, and overdose of INH can be fatal (See *Section 5.1.6.1*).

INH can be hepatotoxic, therefore baseline and routine monitoring of liver function is recommended during treatment with this drug (see *Section 3.4, Baseline and ongoing monitoring*). Increased serum levels may occur in the presence of liver disease or dysfunction therefore clinical and laboratory monitoring should occur more frequently.

INH can interfere with metabolism of phenytoin (Dilantin®) and carbamazepine (Tegretol®). Monitoring and dosage adjustment of these medications may be required during treatment with INH.

ii. Rifampin (RMP)

Rifampin has been in use for the treatment of TB since 1970. It is effective against mycobacterium and some gram positive and gram negative organisms. It is readily absorbed and reaches peak blood concentration levels two to four hours after ingestion. Absorption is inhibited by the presence of food in the stomach.

When given intermittently (e.g., twice a week), usual daily doses are used because intermittent high dose administration is likely to cause hypersensitivity reactions, including thrombocytopenia and anaphylaxis.

Clients receiving RMP should be advised that their urine and body secretions (tears, saliva, perspiration) may become orange-red in colour, and soft contact lenses may permanently discolour.

RMP may induce hepatic enzymes and accelerate clearance of estrogens (e.g., birth control pills), cyclosporins, coumadin, glucocorticoids, and sulfonylureas. Dosage adjustment may be required. Alternative forms of contraception are necessary when RMP is prescribed.

RMP can be hepatotoxic, therefore baseline and routine monitoring of liver function is recommended during treatment with this drug (see *Section 3.4, Baseline and ongoing monitoring*). Increased serum levels may occur in the presence of liver disease or dysfunction therefore clinical and laboratory monitoring should occur more frequently.

iii. Pyrazinamide (PZA)

Pyrazinamide has been used in the treatment of TB since 1952. Its mechanism of action is unknown, but it is active only at acid pH. PZA is well absorbed orally and absorption is not influenced by the presence of food in the stomach⁴⁵.

PZA is typically included only in the initial (intensive) phase of treatment. Treatment regimens that do not include PZA throughout the initial phase are generally lengthened. PZA inhibits the renal secretion of urates, and will often lead to high levels of uric acid in the blood. This is usually of no consequence and routine monitoring is not required. Rarely, it may lead to acute episodes of gout in persons predisposed to gout, in which case the drug may need to be discontinued. Arthralgias may occur, as well as hypersensitivity reactions and gastrointestinal upset.

⁴⁵ Ontario Ministry of Health and Long-Term Care Tuberculosis Protocol Version 1.0 (Sept 2006), p. 138. available online at: www.halton.ca/health/documents/information_for_physicians/tuberculosis_protocol_sept06.pdf

PZA can be hepatotoxic, therefore baseline and routine monitoring of liver function is recommended during treatment with this drug (see *Section 3.4, Baseline and ongoing monitoring*). Clinical and laboratory monitoring should occur more frequently in the presence of liver disease or dysfunction.

iv. Ethambutol (EMB)

Ethambutol is a bacteriostatic antituberculosis drug. It is active only against mycobacterium organisms and works by inhibiting cell metabolism, causing cell death. It is about 70–80% absorbed after an oral dose, and reaches peak blood concentration levels two to four hours after ingestion. Absorption does not seem to be affected by food in the stomach.

EMB may cause optic neuritis, with decreased visual acuity and loss of red-green colour discrimination (colour blindness) particularly in those with impaired renal function. Clients should be advised to immediately report any changes in their vision. Clients with pre-existing ophthalmologic problems or clients anticipated to require ethambutol throughout the course of treatment should be referred to an ophthalmologist at the beginning of treatment with EMB for an accurate baseline assessment of visual acuity, colour vision, and visual fields.

Optic neuritis related to EMB use is uncommon at the lower dosage (15 mg/kg), and for this reason, dosages are usually calculated at the lower range if EMB is to be continued after the initial phase of treatment has been completed (e.g., for treatment of drug-resistant TB).

EMB is excreted from the body via the kidneys. In individuals with impaired renal function, there is marked accumulation of EMB in the system. For this reason, renal function (serum creatinine) should be measured before beginning treatment (see *Section 3.4, Baseline and ongoing monitoring*).

3.3.2.2 Second-line antituberculosis medication used in Alberta

The three most commonly used second-line antituberculosis medications used in Alberta are amikacin, fluoroquinolone antibiotics, and rifabutin. Information about additional second-line antituberculosis medications is available in the *Canadian Tuberculosis Standards*, Chapter 7: Drug Resistant Tuberculosis.

i. Amikacin⁴⁶

Amikacin is an injectable agent generally used in the treatment of drug-resistant cases of TB confirmed or presumed to be susceptible to it.

⁴⁶ ATS, Treatment of TB, <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5211a1.htm>, retrieved Nov5.08

Amikacin is usually given as a single daily dose, five to seven days a week initially and then reduced to two or three times a week dosing. A reduced dose is recommended for people over the age of 59 years.

Amikacin is cleared primarily through the kidneys therefore renal function (serum creatinine) should be measured before beginning treatment. Serum drug levels should be monitored to avoid toxicity. Serum potassium and magnesium concentrations should also be measured at baseline and at least at monthly intervals (see *Section 3.4, Baseline and ongoing monitoring*).

Dosing adjustments are essential in clients with underlying renal insufficiency, including the elderly (as described above) and those receiving hemodialysis. Amikacin should be administered after dialysis to avoid premature removal of the drug.

Risk of nephrotoxicity is increased among individuals with initially increased creatinine levels, larger total doses, and those receiving other nephrotoxic agents. Due to predisposition to hepato-renal syndrome, clients with severe hepatic disease receiving amikacin should have renal function monitored closely as there is increased risk for nephrotoxicity.

Risk of ototoxicity (vestibular dysfunction and deafness) increases with concurrent use of diuretics and/or impaired renal function.

Amikacin is contraindicated during pregnancy due to risk of fetal nephrotoxicity and congenital hearing loss.

ii. Fluoroquinolones antibiotics

The fluoroquinolones are a relatively new class of antibiotics that have shown good activity against *M. tuberculosis*. Among second-line antituberculosis medication, they have emerged as the most important because they:

- are relatively free of hepatotoxicity
- have high levels of oral bio-availability
- are well-tolerated by clients
- may be effective against strains resistant to first-line antituberculosis medication

Two fluoroquinolones are especially useful for the treatment of TB; levofloxacin (Levaquin®) and moxifloxacin (Avelox®). Of these, Levaquin® is the preferred oral agent for treating drug-resistant TB caused by organisms known or presumed to be sensitive to this class of drugs or when first-line agents cannot be used due to intolerance, etc.

NOTE: The type and dose of fluoroquinolone used to treat active TB should be determined by a TB Control physician.

Fluoroquinolones should be used with caution in clients with a known or suspected CNS disorder that may predispose to seizures or lower the seizure threshold.

The safety and efficacy of Levaquin® in children, adolescents (under the age of 18 years), pregnant women, and nursing mothers has not been established. Levaquin® is contraindicated in persons with a history of hypersensitivity to fluoroquinolones. It is also contraindicated in persons with a history of tendonitis or tendon rupture associated with the use of fluoroquinolones. Dose adjustment is recommended for clients with impaired renal function.

Antacids and other medications (e.g., supplements) that contain divalent cations (calcium, iron, zinc) significantly decrease absorption of fluoroquinolones so fluoroquinolones should not be administered within two hours of such medications.

iii. Rifabutin

Although classified in Canada as a second-line antituberculosis medication, rifabutin is used as a substitute for rifampin in the treatment of TB when clients are receiving medications, especially antiretroviral drugs, that have unacceptable drug interactions with rifampin and/or are unable to tolerate rifampin.

As with rifampin, dose reduction and increased clinical and laboratory monitoring may be necessary in clients with severe hepatic dysfunction.

At the time this manual was prepared, the appropriate dose for children was unknown and there was insufficient data available to recommend the use of rifabutin in pregnant women.

Rifabutin may cause ophthalmologic problems if taken in combination with anti-retrovirals for HIV, and in this regard the same precautions that apply to ethambutol should be applied to rifabutin.

3.3.3 Routes of administration

Tuberculosis treatment regimens are usually administered orally. INH, RMP, injectable agents (e.g., amikacin) and fluoroquinolones are also available in parenteral form.

Tablet formulations can be crushed, made into suspensions, or administered via nasogastric or feeding tube⁴⁷. Rifampin capsules can be opened and contents added to puddings, etc. (See *Appendix E, Tips for administering TB medications*).

⁴⁷ Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition, Canadian Lung Association and Public Health Agency of Canada, 2007, p.125.

3.3.4 Treatment regimens

Treatment regimens are individually determined by the TB Services physician, based on current recommendations of the Canadian Tuberculosis Committee and American Thoracic Society. Adjustments to the regimen are made as necessary throughout the course of treatment as directed by the TB Services physician.

As new information emerges, and new studies are completed, modifications to standard treatment regimens may be made by the TB Services physicians, in conjunction with the Tuberculosis Control Committee of Alberta.

3.3.5 Initiation of treatment for active TB disease

NOTE: Initiation of treatment must be done in consultation with the Provincial TB Medical Consultant or an outpatient TB clinic physician.

Treatment of active TB disease in the Province of Alberta is overseen by AHS central TB Services and by extension, the outpatient TB clinics. The process undertaken for initiation of active TB treatment is variable, and dependant upon several factors including:

- where the treatment is being started (e.g., within an acute care facility or in the community);
- who is managing the treatment (e.g., AHS central TB Services or an outpatient TB clinic);
- the treatment that is prescribed and, to a degree,
- the type and severity of TB disease at the time of diagnosis.

Treatment for active TB disease in Alberta is usually initiated in one of two ways:

1. **Within an acute care facility.** TB treatment will be managed by the prescribing physician in consultation with the Provincial TB Medical Consultant or an outpatient TB Clinic physician until such time as the patient is discharged from that facility. Upon discharge, responsibility for management of treatment is transferred to AHS central TB Services or the local outpatient TB clinic.
2. **In the community (i.e., outside of acute care facilities).** Clients residing in the Calgary or Edmonton areas will be managed by the local outpatient TB clinic. Clients residing outside of Calgary or Edmonton areas and/or on a First Nations reserve will be managed by AHS central TB Services. Provision of TB care (e.g., clinical monitoring, DOT) at the field level is done in partnership with local public health and/or the patient's family physician.

All clients (and/or their parents/guardians) should receive information and education about their diagnosis, prognosis and treatment as part of the treatment initiation process. This should include:

- the reason(s) TB treatment is recommended
- the likely duration of treatment
- the benefits of treatment
- the importance of adherence and completion of treatment
- possible side-effects of the medication(s) and potential drug interactions
- what to expect in regards to follow-up during treatment (e.g., clinical and blood work monitoring)

The importance of contact investigation should be explained to clients with infectious forms of disease, and to those cases for which a source case investigation is indicated (see *Section 4, TB contact investigation and outbreak management in Alberta*).

Female clients of childbearing age should generally be advised to avoid pregnancy during treatment. Alternative forms of contraception are necessary when RMP is prescribed to women taking estrogens (e.g., birth control pills) for this purpose.

Taking the time to provide clients with this information will lead to improved compliance and adherence to treatment.

3.3.6 Compliance

Brief periods of non-compliance are usually unavoidable.

NOTE: Interruption in treatment may require changes to the regimen (treatment plan) and/or legal intervention. Should a patient with active disease miss more than two doses of medication (i.e., DOT doses) in a row, the family physician and AHS central TB Services or the outpatient TB clinic managing that patient's treatment must be notified.

See also, *Section 3.6, Management of recalcitrant persons*

3.3.7 Completion of TB treatment

Recommended maximum time intervals for completion of various TB treatment regimens have been established, however, in Alberta, completion of treatment is determined by the TB Services physicians after consideration of the total number of doses taken and the clinical response to treatment (see *Section 3.8.1, End of treatment evaluation*).

3.4 Baseline and ongoing monitoring

NOTE: The family physician and AHS central TB Services (or the outpatient TB clinic managing the patient's treatment) should be advised if:

- abnormal blood work results are found (baseline or routine monitoring)
- the patient reports symptoms such as stomach upset, nausea, vomiting, anorexia (loss of appetite), dark urine, or scleral icterus⁴⁸
- the patient believes she may be, or is, pregnant
- the patient moves or is lost to follow-up
- the patient misses more than two doses of medication in a row or refuses to continue treatment

3.4.1 Before beginning treatment (baseline)

The following baseline measurements are necessary to properly prescribe treatment and allow for subsequent documentation of adverse events, should any occur:

- weight
- hepatic enzymes (ALT or AST, and bilirubin)
- CBC, WBC and platelet count
- serum creatinine
- serum glucose
- blood urea nitrogen (BUN)
- uric acid
- urinalysis
- visual acuity and red-green colour discrimination if ethambutol (EMB) or rifabutin is prescribed
- audiometry if amikacin or another injectable agent is prescribed
- HIV serology: all clients with newly diagnosed TB should be strongly encouraged to undergo informed HIV serologic testing⁴⁹. Ideally, HIV testing should be performed at the time of diagnosis of TB or during the period of activity of TB.

NOTE: Female clients of childbearing age should be assessed for the possibility of pregnancy. TB disease is not an indication for termination of pregnancy however alterations to the prescribed regimen may be required.

⁴⁸ Ibid, p.136.

⁴⁹ Ibid, p. 202

3.4.2 Routine monitoring once treatment has begun

NOTE: Any abnormal blood work and/or symptoms suggestive of drug toxicity must be reported immediately to the family physician and AHS central TB Services (or the outpatient TB clinic managing the patient's treatment).

3.4.2.1 Signs/symptoms suggestive of adverse effects

Routine monitoring to assess for symptoms related to adverse effects is required for all clients taking antituberculosis medications. Assessment should occur with each dose of medication provided.

Adverse effects and resulting symptoms may vary, depending upon the severity of the reaction and which medications are being used (see *Appendix C, Drug information reference tables* and *Appendix D, Common adverse reactions to antituberculosis medications*).

i. Hepatotoxicity

Many antituberculosis medications are potentially hepatotoxic. Symptoms suggestive of hepatotoxicity may include:

- unexplained loss of appetite
- nausea with or without vomiting;
- dark urine;
- jaundice;
- rash;
- persistent fatigue, weakness or fever lasting three days or more;
- abdominal tenderness (especially right upper quadrant discomfort);
- easy bruising or bleeding;
- arthralgia

ii. Visual impairment

Ethambutol and rifabutin may cause visual impairment.

Visual acuity and red-green colour discrimination should be tested monthly while EMB and/or rifabutin are being taken. A Snellen chart may be used for testing visual acuity and Ishihara tests for testing of colour discrimination. Changes may occur unilaterally or bilaterally, so eyes must be tested separately and together.

Recommendations regarding the timing of specific adverse effect monitoring (e.g., vision testing) will be specified in the "action column" of the *Tuberculosis Update Form* (see *Appendix G*) that accompanies the patient's medication to the health centre.

3.4.2.2 Laboratory monitoring

Blood work and other laboratory monitoring requirements vary, depending on which medications are being used and individual clients' risk factors for adverse effects (e.g., hepatotoxicity) to treatment. Recommendations regarding laboratory monitoring will be specified in the "action column" of the *Tuberculosis Update Form*.

In older clients or clients with underlying liver disease, more frequent monitoring of blood work (e.g., testing every two weeks) may be necessary, at the discretion of the TB Services physician.

3.4.2.3 Pregnancy

Women of childbearing age should be assessed monthly for possibility of pregnancy. Should pregnancy occur during treatment of TB, alterations to therapy may be required.

3.4.2.4 Clinical response to treatment

i. Resolution or recurrence of signs/symptoms suggestive of active TB disease

Assessment for signs/symptoms suggestive of active TB disease must be carried out regularly on any individual being treated for TB. Although most clients will have an excellent response to treatment and will become asymptomatic within a few weeks, ongoing or especially, recurring signs or symptoms may be indicative of non-adherence or resistance to one or more of the antituberculosis medications being used.

ii. Weight

Patient's weight should be monitored monthly throughout treatment. Failure to gain weight adequately or weight loss instead of anticipated weight gain may be indicative of poor response to treatment. It is especially important to monitor the weight of pediatric clients in order to ensure appropriate dosing of antituberculosis medication (see *Section 3.7.3, Pediatric TB disease*).

NOTE: If an individual remains symptomatic or symptoms recur after a period of improvement, or if a patient loses weight or fails to gain weight as anticipated, this should be reported promptly to the family physician and AHW central TB Services (or the outpatient TB clinic managing the patient's treatment).

3.4.2.5 Bacterial and radiological response to treatment

The following are *general* guidelines for determining response to TB treatment. Depending on individual circumstances, patient-specific recommendations for monitoring may be provided by AHS central TB Services or the outpatient TB clinic managing the patient's treatment. Cases known or presumed to have drug-resistant TB will usually require more frequent monitoring, as will those noted to have suboptimal clinical or radiographic response to treatment.

i. Respiratory cases

Sputum

If the case is smear-positive at the outset, two or three samples should be submitted each week until three consecutive negative smears from three separate days have been documented. An additional sample should be submitted after two months of treatment have been completed.

If, after the collection of three sputum samples at the outset, the case is determined to be smear-negative, one sputum sample should be collected at one, two, and three months after initiation of treatment.

Cases whose cultures are still positive after two months of treatment have been completed should have samples repeated after four months of treatment⁵⁰.

If possible, a sputum sample should be collected at the completion of the continuation phase, i.e., at the end of treatment in order to document cure.

Chest radiography

The interval between radiographs is dependant upon the site of disease and clinical circumstances and is determined by the TB Control physician. In general, respiratory cases are recommended for repeat radiography one and two months after initiation of treatment and again at completion of treatment.

ii. Nonrespiratory cases

Response to treatment for nonrespiratory cases is usually limited to clinical assessment, but may include radiologic or other studies.

End of treatment evaluation typically includes chest radiography and, if possible, a respiratory sputum sample for AFB smear and culture.

Up to 30% of cases with peripheral TB lymphadenitis may experience new or enlarging nodes during treatment, possibly because of immune response. This

⁵⁰ Ibid, p.128.

usually resolves, but 10% may have residual nodes and/or may note enlarged or recurrent nodes. This does not necessarily indicate relapse of disease⁵¹.

Clinicians should consult with a TB Services physician if they have any concerns about response to treatment in nonrespiratory cases.

Archived

⁵¹
ibid, p. 98.

Table 3-1: Standard Monitoring Schedule for Clients Receiving Treatment for Active TB Disease

Additional and/or more frequent monitoring may be required in selected cases. For example, those with a history of alcohol abuse or liver disease; those with abnormal baseline blood work and those with a past history of antituberculosis drug toxicity. Patient-specific requirements for monitoring will be provided in the bottom left hand corner of the *Tuberculosis Update Form*.

Pregnancy			
Follow-up as per non pregnant clients, except under <i>Response to treatment</i> , where the chest x-ray should be limited to a PA view at baseline, 2 months and completion of treatment.			
Laboratory monitoring			
Baseline	ALT (or AST), bilirubin, CBC, WBC, platelet count, creatinine, BUN, uric acid, glucose, HIV serology, urinalysis		
Ongoing	ALT (or AST), CBC, WBC, and platelet count two weeks and four weeks after start of treatment and monthly thereafter; AHS central TB Services or the outpatient TB clinic managing the treatment, and the family physician should be notified if a patient's laboratory values are found to be abnormal.		
Adverse effects			
Monitoring for adverse effects from antituberculosis medications should occur with each dose of treatment provided (see <i>Appendix D, Common adverse reactions to antituberculosis medications</i>). AHS central TB Services or the outpatient TB clinic managing the treatment, and the family physician should be notified if a patient develops signs/symptoms of adverse effects during treatment.			
Hepatotoxicity	Assess for signs/symptoms of hepatotoxicity with each dose of treatment provided; monitor laboratory values as identified on the patient's <i>Tuberculosis Update Form</i> .		
Visual impairment	Visual acuity and red-green colour discrimination should be tested at baseline and monthly thereafter for clients receiving ethambutol or rifabutin .		
Response to treatment			
Weight	At baseline and monthly thereafter; AHS central TB Services or the outpatient TB Clinic managing the treatment and the family physician should be notified if a patient fails to gain weight adequately or if weight loss is noted. It is especially important to monitor the weight of pediatric clients closely to ensure appropriate dosing.		
Symptoms (resolution or recurrence of)	At baseline and regularly thereafter; AHS central TB Services or the outpatient TB clinic managing the treatment and the family physician should be notified if a patient remains symptomatic or if symptoms recur after a period of improvement.		
Sputum	Respiratory TB disease: smear positive at diagnosis	Respiratory TB disease: smear negative at diagnosis	Nonrespiratory TB disease
	Two or three samples weekly until three consecutive negative smears on three separate days. Submit one sample after two months of treatment have been completed and again at end of treatment	One sample monthly for three months and at completion of treatment	
	Cases that remain culture positive after two months of treatment should submit three samples at the end of four months of treatment		
Chest x-ray	At baseline and again after one and two months of treatment; repeat at completion of treatment.	At baseline and again after one and two months of treatment; repeat at completion of treatment	At baseline (to rule out concurrent respiratory disease); repeat at completion of treatment or if respiratory symptoms develop at any time during treatment.

3.5 Role of directly observed therapy (DOT)

The most common cause of treatment failure is poor compliance to therapy.

DOT is the most effective strategy available for assuring compliance to treatment, and is the **standard of medication delivery in Alberta for all cases of active TB disease.**

DOT involves:

- making sure that **each dose** of TB medication is taken (swallowed) in the presence of a trained observer
- documenting that each dose has been taken, and recording any side-effects noted

Recommendations for DOT are not based on the assumption that any particular patient may be non-compliant with treatment; even the most motivated individual will have difficulty completing a full course of treatment for TB. Compared to treatment for other infectious diseases, TB treatment regimens are longer and require the use of more medications. TB treatment must also continue long after the patient is feeling well again. Sometimes the treatment may even cause clients to feel unwell.

When needed, incentives and enablers should be considered to further support clients to successfully complete treatment. Examples of incentives include food or restaurant coupons. Enablers are things that make it easier for the patient to receive treatment, such as bus tokens or taxi vouchers to get to the DOT location.

The benefits of DOT

When explaining the benefits of DOT to clients, the following points should be emphasized:

- DOT encourages successful completion of treatment by providing assistance with taking the medication as prescribed, which may result in fewer adverse effects and a shorter duration of treatment
- DOT reduces the risk of developing drug resistance during treatment
- Through the use of DOT, most clients will only need to take their medicine two times each week once the initial phase of treatment has been completed
- The person providing the DOT can regularly assess the client for side effects from the treatment and provide support to ensure all follow-up appointments and tests are done on time
- DOT helps clients and caregivers identify and address barriers to successful completion of TB treatment

- DOT provides the patient more opportunities to ask questions and reduce fears about TB and TB treatment

Program considerations

Treatment regimens are always long and often place some restrictions on individuals' lifestyles and sometimes, even work life. Because of the importance of compliance with treatment, it is imperative that those delivering DOT be flexible, and negotiate with clients to achieve the best outcome. Issues such as where and when medications will be delivered are important. Sometimes it is best for the patient to present to the health centre, sometimes home visits work best, and sometimes a local park or coffee shop is the best solution. Decisions must be made taking both the patient's and the DOT provider's needs into account.

Initially the PHN, Community Health Nurse (CHN), or DOT worker always provide for the delivery of medication to the patient and watches him/her swallow them. Once a patient is established on DOT, another responsible person in the community (teacher, CHR), often can be trained to supervise the taking of medication. Care must be taken in the selection of such individuals to ensure that they are:

- **Acceptable** to the patient, but not in a position to be influenced by the patient (e.g., family member, employee)
- **Responsible**, and will deliver and observe the swallowing of each dose
- **Capable** of monitoring, documenting, and reporting potential side-effects to the PHN or CHN

When DOT is delegated (e.g., to a DOT worker), the nurse retains the ultimate responsibility for ensuring:

- Doses are correctly packaged
- The treatment regimen is being followed
- Monitoring for response to treatment and adverse reactions is being done
- Necessary lab work and other follow-up is being completed.

To support this, frequent (e.g., every two weeks) meetings with the individual dispensing the medications and at least monthly meetings with the patient are recommended.

3.6 Management of recalcitrant persons

Recalcitrant persons are defined as those individuals who are unwilling or unable to take appropriate precautions to prevent transmission of diseases listed in Schedule 3 of the "*Communicable Diseases Regulation*". This includes those with a diagnosis of active TB.

A stepped (progressive) intervention must be used in responding to recalcitrant persons. Issuing orders under the *Public Health Act* should be considered as a last resort, and only when all other attempts to address recalcitrance have failed.

For the purposes of ensuring adequate treatment of TB disease and protecting the public, the following steps apply:

Step 1: If the patient misses two consecutive doses of medication while on twice-weekly treatment (i.e., one week of treatment) or the equivalent if on daily treatment, AHS central TB Services or the outpatient TB clinic managing the patient's treatment and the zonal MOH or designate (e.g., TB co-ordinator) will be notified.

Step 2: The TB program staff and zonal MOH (or designate) will attempt to determine if the patient is unwilling or unable to comply with treatment

Step 3: Through negotiation with the patient, the zonal MOH (or designate) will attempt to re-establish the treatment regimen

Step 4: If these steps fail, the Provincial TB Consultant in consultation with the zonal MOH, will issue an order for detention under the *Public Health Act* (see *Appendix A - The Public Health Act – Section 49[2]*). Detention should be viewed as a step of last resort, to be used only when all other options fail. This is necessary not because of the individual's medical condition per se, but because they pose a risk to public safety.

Terms of "detention" are decided on an individual basis, and may constitute placement in the designated TB isolation unit (5C3) at University Hospital in Edmonton.

3.7 Special considerations in TB treatment

There are some instances where different considerations need to be taken into account while the client is undergoing TB treatment.

3.7.1 Pregnancy

Treatment of active TB disease in pregnant women should not be delayed as untreated TB poses a greater risk to the woman and the fetus than risks associated with antituberculosis medications.

Isoniazid, rifampin, and ethambutol are considered safe for use during pregnancy and should constitute the initial treatment regimen when the woman is suspected to have drug-susceptible TB disease or the prevailing rate of primary INH resistance is known to be less than 4%. Aminoglycosides (streptomycin, amikacin, kanamycin) are contraindicated⁵². The use of PZA and second-line antituberculosis medication

⁵² Ibid, p. 127.

in a pregnant woman should only be done in consultation with a TB Control physician.

Pyridoxine (Vitamin B6) supplementation should be given to pregnant women receiving isoniazid⁵³.

3.7.2 Breastfeeding

Concentration of INH, RMP, PZA and EMB in breast milk do not produce toxic effects for the newborn, therefore breastfeeding women receiving treatment with first-line antituberculosis medication should not be discouraged from breastfeeding unless they are HIV-infected. Women on second-line antituberculosis drugs who want to breast feed should undergo consultation with a TB specialist.

It should be noted that the concentration of antituberculosis medication in breastmilk is not sufficient to treat or prevent TB in a nursing infant.

Pyridoxine (Vitamin B6) supplementation should be given to breastfeeding women receiving INH⁵⁴. Breastfed children of women taking INH should also receive pyridoxine supplementation, in a dose determined in accordance with the child's weight and in consultation with the child's pediatrician⁵⁵.

3.7.3 Pediatric TB disease

The World Health Organization (WHO) defines pediatric TB as TB in a person less than 15 years of age⁵⁶.

Diagnosis of TB in the pediatric population can be very challenging for the following reasons:

- Children, especially those under five years of age, frequently have nonspecific signs/symptoms and a paucity of mycobacteria.

It may not be possible to confirm the diagnosis through mycobacterial culture so diagnosis is often based on a clinical case definition that includes the following triad of findings:

1. a positive tuberculin skin test (TST)
2. abnormal chest radiograph and/or physical examination
3. discovery of a link to a known or suspected case of infectious TB

⁵³ Ibid.

⁵⁴ Ibid.

⁵⁵ Ibid, p. 192.

⁵⁶ Ibid, p. 183.

NOTE: Older children and adolescents are more likely to present with the classic triad of symptoms; fever, night sweats, and weight loss. Lung infiltrates, with or without cavities, may be found on radiography exam.

- TB disease is usually a result of recent transmission from a source case that may not have been identified yet. This may further contribute to the chances that TB may not be considered in the child's differential diagnosis.
- Children, especially infants, have a significantly increased risk of rapidly progressing from infection with MTB to active TB disease, and to severe forms of the disease (e.g., TB meningitis).

It is important to note that children less than 10 years of age are generally considered less infectious than older children or adults unless they present with adult-type TB disease (e.g., cough, smear positive sputum, cavitation on chest radiograph⁵⁷).

Management of pediatric TB can also be very challenging. Pediatric clients can be difficult to dose, may not tolerate the number of pills necessary, and/or may not adapt to the existing formulations of antituberculosis medications. Information to support administration of antituberculosis medications is provided in *Appendix E, Tips for Administering TB Medications*.

Recommended regimens for children are similar to those used in adults however due to concerns about monitoring for/identifying retrobulbar neuritis, EMB may not be included in the regimen of young children unless there is concern that the child may have primary resistance to INH.

Nonrespiratory TB in children is treated with the same regimens as is used for respiratory TB with the following exceptions, in which cases the duration of treatment may be extended:

- central nervous system (CNS) TB
- disseminated/miliary TB
- bone and joint TB

As with adults, choice of drugs is guided by drug susceptibility testing of the isolate. If an isolate is not available (i.e., could not be cultured) choice of drugs is guided by the susceptibility patterns of the source case (known or presumed).

Monthly monitoring of weight for pediatric clients is especially important to ensure appropriate dosing of antituberculosis medication and to identify potential treatment failure (i.e., failure to gain weight adequately or weight loss instead of anticipated weight gain).

⁵⁷ Ibid, p. 255.

3.7.4 People living with HIV

TB is a frequent cause of death among individuals infected with HIV worldwide, particularly in countries where HIV and TB are prevalent infections. However, with appropriate, consistent treatment, cure rates for HIV infected individuals with drug-susceptible TB disease have been shown to be similar to those for individuals not infected with HIV.

Mortality for HIV-infected TB clients is higher than for non-HIV infected TB clients, but is mostly due to HIV-related co-morbidities, which underscores the importance of identifying and appropriately treating HIV infection as part of a holistic approach to TB care.

Collaboration between the HIV care provider and the TB Services physician is essential for the treatment of TB in HIV infected clients. Management of TB disease in the HIV-infected can be complicated due to:

- drug interactions, particularly between rifamycin antituberculosis drugs (rifampin, rifabutin) and many antiretroviral drugs (ARVs)
- paradoxical reactions [immune reconstitution inflammatory syndrome (IRIS)] may occur during TB treatment following initiation of effective antiretroviral therapy, particularly in clients with low initial CD4 cell counts
- potential for acquired rifamycin mono-resistance in those with low CD4 cell counts ($< 100 \times 10^6/L$) during intermittent (twice weekly) TB treatment regimens
- potential for sub-optimal antituberculosis drug levels as a result of:
 - chronic diarrhea
 - advanced HIV disease
 - malabsorption
 - drug interactions

NOTE: Close monitoring of response to treatment is essential to ensure this is identified promptly if it occurs.

- increased potential for side effects from TB treatment, such as INH-induced neuropathy; pyridoxine (Vitamin B6) supplementation should be given to HIV-infected TB clients receiving isoniazid⁵⁸.
- difficulties associated with taking numerous medications (i.e., concurrent TB and HIV treatment).

⁵⁸ Ibid, p. 211.

Additional information regarding the treatment of TB in HIV infected clients is presented in the *Canadian Tuberculosis Standards*, available online at: <http://www.phac-aspc.gc.ca/tbpc-latb/pubs/tbstand07-eng.php>

3.7.5 Renal failure

The standard regimens for TB treatment may be used for clients with renal failure or who are undergoing dialysis, however, cautions are advised when using PZA, EMB, injectable agents, or fluoroquinolones in this population.

Metabolites of PZA may accumulate in clients with renal insufficiency, therefore, this drug should be administered at a reduced dose (25–35 mg/kg) and given three times a week (after dialysis) in clients with end-stage renal disease.

EMB is excreted from the body via the kidneys. In individuals with impaired renal function, there is marked accumulation of EMB in the system. If possible, use of EMB should be avoided in the presence of impaired renal function. If used, it should be given at a dose of 15–20 mg/kg, three times a week after dialysis and careful monitoring (at least monthly) of visual acuity and red-green colour vision should be done.

Individuals with renal impairment need to be monitored very closely if treated with an injectable agent. Dosing frequency should be reduced and the agent should be given after dialysis to avoid premature removal. Serum drug concentrations should be monitored to avoid toxicity.

Fluoroquinolones are cleared primarily by the kidneys, therefore dosage adjustment may be recommended if creatinine clearance is less than 50 ml/minute.

3.7.6 Concurrent hepatic disease/risk

The use of hepatotoxic antituberculosis medication such as INH, RMP and PZA in individuals with concurrent (non-TB) hepatic disease or those at increased risk for development of hepatic disease during treatment for TB (e.g., those at risk for viral forms of hepatitis and/or taking other hepatotoxic treatments) must be done with caution.

Depending on the severity of the individuals TB and/or liver impairment, treatment regimens may be altered to include fewer hepatotoxic TB drugs. However, it is important to include either INH or RMP in the regimen (in combination with other, non-hepatotoxic agents) if at all possible.

Close monitoring for indications of liver toxicity and patient education about signs/symptoms suggestive of liver toxicity is essential.

3.7.7 Nonrespiratory TB disease

There are a multitude of forms of nonrespiratory TB disease, some of which may be immediately life-threatening (e.g., central nervous system TB, disseminated TB, or TB pericarditis).

In general, the same regimens are used to treat nonrespiratory TB disease as are used for respiratory TB. However, longer courses of therapy are recommended for CNS TB, disseminated TB, and bone and joint TB especially in children.

In some circumstances, such as TB meningitis or pericarditis, adjunctive therapy with corticosteroids may be indicated to reduce inflammatory response and improve outcomes.

3.7.8 Drug Resistant TB (DR-TB)

In Canada, drug resistance in TB is categorized into three types⁵⁹:

- **Primary drug resistance:** previously untreated clients are found to have drug-resistant TB organisms, presumably because they were infected with drug-resistant TB bacteria.
- **Acquired drug resistance:** clients who initially had drug-susceptible TB and later become drug-resistant as a result of inadequate, inappropriate, or irregular treatment (e.g., due to non-compliance)
- **Initial drug resistance:** clients found to have drug resistant organisms who deny previous treatment but whose prior drug use history cannot be verified. Drug resistant TB (DR-TB) in the foreign-born may be best classified as initial drug resistance. Primary and acquired drug resistance is uncommon in Canadian-born cases that have not traveled to high-incidence TB countries abroad.

Regardless of the type of drug resistance a patient has, the resulting disease is generally more difficult and expensive to treat, takes longer, and holds greater risk of adverse events, including mortality, for the patient.

TB drug resistance descriptions

TB isolates may be resistant to a single first-line antituberculosis drug or to a combination of first and/or second-line antituberculosis medication.

Mono-resistance describes isolates resistant to a single drug. Most often the resistance will be to isoniazid (INH). There are effective alternatives for the treatment of these cases.

⁵⁹ Ibid, p. 157-8.

Multi-drug resistant TB (MDR-TB) refers to resistance to at least INH and rifampin (RMP). The treatment of MDR-TB usually requires the use of second-line antituberculosis medications, which are generally less effective, more expensive, and may have more adverse reactions than the first-line drugs. Treatment of MDR-TB usually involves the use of four to six drugs (given as DOT) over an extended period of time. MDR-TB is associated with reduced rates of cure and treatment adherence, and increased rates of fatality and disease relapse.

Poly-resistant TB refers to resistance to two or more *other* first-line drugs (i.e., not INH and RMP). For example, resistance to INH and ethambutol (EMB) or RMP and pyrazinamide (PZA) would be described as poly-resistant TB. A variety of treatment options for poly-resistant TB have been described.

Extensively drug-resistant TB (XDR-TB) is the most recent addition to TB drug resistance terminology. These isolates show resistance to INH, RMP, any fluoroquinolones and at least one of the three injectable second-line drugs (capreomycin, kanamycin, amikacin). XDR-TB carries a very poor prognosis.

3.7.8.1 Risk factors for DR-TB

Resistance to antituberculosis medication should be considered when treating the following individuals:

- Those who originate from, have a history of residence in, or have frequent or extended (one month or more) travel to a country/region with high rates of drug resistance
- Anyone who has previously been treated for TB or received treatment for latent TB infection, even if that treatment lasted for only one month⁶⁰
- Contacts of an individual who is known to have (or thought to have) drug resistant TB or who has had prior treatment for TB resulting in treatment failure or relapse and whose susceptibility results are not known
- Clients with cavitory pulmonary TB; these clients are thought to be more prone to drug resistance because they harbour greater numbers of MTB bacilli
- Clients who intermittently or erratically ingest TB treatment (i.e., are non-compliant)
- Clients whose treatment is failing, including:
 - Clients who, while on treatment, remain smear positive after the fifth month of therapy
 - Clients who are initially smear-negative and become smear positive after the second month of treatment
 - Clients whose cultures remain positive after the fourth month of treatment

⁶⁰ Ibid. p. 159.

- Clients who malabsorb one or more drugs, or absorb all drugs but one or more fails to penetrate the site of disease because the disease is sequestered, e.g., TB empyema.

3.7.8.2 Preventing DR-TB in Alberta

The prevention of drug resistance must be given the highest priority when treating TB. Strategies implemented in Alberta to prevent the development of TB drug resistance include:

- Central co-ordination of the TB program, including monitoring and provision of antituberculosis medication
- Directly observed therapy to ensure adherence to the prescribed regimen
- Drug-susceptibility testing on all initial isolates of MTB
- Treatment of TB disease with at least two (and preferably, three) drugs to which the organism has been demonstrated to be susceptible
- Never introducing a single drug to a failing regimen
- TB treatment monitoring recommendations aimed at early identification of responses to treatment that may indicate the presence or development of TB drug resistance (e.g., monitoring for recurrence/worsening of symptoms during treatment)

3.8 Follow-up of individuals who complete TB treatment

The following are *general* guidelines for the surveillance of individuals who complete TB treatment. Depending on individual circumstances, patient-specific surveillance recommendations may be provided by AHS central TB Services or the outpatient TB clinic that managed the treatment.

3.8.1 End of treatment evaluation

Following completion of the recommended doses in a treatment regimen, all clients should undergo the following evaluations to determine response to treatment:

- PA and lateral chest radiographs (unless the patient is pregnant – see *Section 2.2.2.2, Special considerations in chest radiography*);
- a sputum sample for AFB smear and culture; and
- a targeted physical examination.

3.8.2 Ongoing evaluation (surveillance)

The timing of ongoing evaluation (surveillance) for recurrence of TB varies, depending upon the site of disease and susceptibility pattern of the patient's isolate.

If a physician has any concern about the possibility of relapse of TB disease, or any question of the reliability of history of adequate treatment, referral to a TB Services

physician (i.e., AHS central TB Services or the local outpatient TB clinic) should be made (see *Section 1.5, Indications and processes for TB follow-up referrals*).

3.8.2.1 Respiratory cases

At six and 12 months following the end of treatment, the patient should be re-evaluated by a TB Services physician to ensure there has been no relapse of disease. This re-evaluation should consist of:

- PA and lateral view chest X-rays (unless the patient is pregnant – see *Section 2.2.2.2, Special considerations in chest radiography*);
- a sputum sample for AFB smear and culture; and
- a targeted physical examination

3.8.2.2 Nonrespiratory cases

Twelve months following the end of treatment, the patient should be re-evaluated by the family physician to ensure there has been no relapse of disease. This re-evaluation should consist of, at minimum a physical examination of the site of disease.

3.8.2.3 Drug resistant cases

Mono-resistant TB or poly-resistant TB

Direction regarding frequency and timing of clinical, radiologic, and mycobacteriologic re-evaluation will be made on an individual patient basis, based on the resistance pattern of the isolate and risk for relapse.

MDR-TB and XDR-TB

Clinical, radiologic, and mycobacteriologic evaluation should be repeated at six month intervals for a minimum of two years⁶¹ for MDR-TB and five years for XDR-TB⁶².

3.9 Nontuberculous mycobacterial disease

Infection with a number of bacteria in the same genus as *Mycobacterium tuberculosis*, known as nontuberculous mycobacteria or NTM, can be acquired through contact with various environmental sources such as soil, water, and animals. Some NTM may cause opportunistic infections in humans, particularly those with localized or systemic immune suppression. The prevalence and pathogenicity of NTM varies from one geographic region to another.

⁶¹ Ibid. p. 171.

⁶² Dr. Long, chapter notes rec'd Nov4.08

NTM disease is often difficult to diagnose, and concomitant NTM and TB disease is possible. Generally, AFB in secretions or tissues should be interpreted to mean the presence of MTB until proved otherwise.

Common clinical syndromes associated with NTM disease are lymphadenopathy, chronic pulmonary disease, skin and soft tissue infections, and disseminated disease. Disease caused by infection with NTM may result in the same radiological appearance as found with MTB. Samples that are smear-positive for AFB that are NTM cannot be distinguished from smears that are positive for AFB that are MTB, therefore species identification through polymerase chain reaction (PCR) assays and mycobacteriology (culture) is very important. Infection with NTM may also cause false-positive tuberculin skin test reactions due to cross-reactivity.

NTM infection is not acquired through person to person contact therefore investigation and follow-up of contacts is not necessary.

Clients found to have NTM infection or disease are not followed or treated by AHS central TB Services (unless the patient has concomitant TB disease). Consultation with a pulmonologist or infectious disease specialist is recommended.

NOTE: Some medications used to treat NTM disease are only accessible through the provincial pharmacy. AHS central TB Services may be of assistance in arranging access to these medications.

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4. TB CONTACT INVESTIGATION AND OUTBREAK MANAGEMENT IN ALBERTA

TB contact investigation is a procedure for identifying and evaluating people exposed to someone with active TB disease, and providing appropriate treatment to prevent or treat TB, if indicated. Similarly, management of a TB outbreak is intended to interrupt and prevent ongoing transmission of MTB, but on a larger scale (e.g., involving two or more cases, instead of a single case).

In order to appreciate the importance of effective contact investigation and outbreak management in the prevention and control of TB, it is necessary to have an understanding of the factors that influence likelihood of transmission (determinants of transmission) and how the organism interacts with the host once transmission has occurred (pathogenesis).

The content of this chapter includes an **overview** of:

- roles and responsibilities for management of TB contact investigation and outbreak management in Alberta;
- fundamentals of TB pathogenesis, determinants of transmission, and measures to interrupt transmission;
- principles of TB contact investigation and outbreak management.

The systematic approach to TB contact investigation is reviewed in some detail, however it should be understood that TB contact investigation and outbreak management are areas of practice that can require years of learning and experience to master, if ever. Practitioners involved in TB contact investigation are encouraged to seek education and training opportunities to enhance their knowledge and skills in these areas. To this end, a listing of recommended supplemental resources is included at the end of this chapter; *Section 4.13, Recommended resources for contact investigation.*

4.1 Roles and Responsibilities

In order to effectively participate in contact investigation and outbreak management activities in Alberta, it is essential to have an awareness of not only the indications for and essential components of these activities, but also how they align with the organization and assignment of roles and responsibilities for TB prevention and control in the province.

Contact investigation and outbreak management is the responsibility, under the *Public Health Act*, of local public health staff who work collaboratively with AHS central TB Services or the local outpatient TB clinic and co-ordinate staff in local settings as appropriate.

Local public health staff and either the outpatient TB clinic or AHS central TB Services are legally responsible for ensuring the completeness of contact investigations in their jurisdictions, which includes:

- identifying and evaluating contacts
- providing treatment to contacts found to have active TB disease
- offering treatment to contacts found to have LTBI
- monitoring adherence to prescribed treatment
- ensuring a system is in place to assess completion of treatment⁶³

Clinicians are encouraged to familiarize themselves with this information and any related local jurisdictional protocols and practices.

4.2 Consultation and Communication During TB Contact Investigation

AHS central TB Services or the outpatient TB clinic in Calgary or Edmonton, should be consulted when planning a contact investigation. Consultation ensures the contact evaluations are carried out in a targeted manner, beginning with those at highest risk for infection and highest risk for progression to active disease. Ongoing communication and ongoing consultation ensures investigations proceed appropriately and efficiently.

Most of the time, a case's contacts will live in more than one city or community, which can make coordination of contact assessments and evaluation of the spread of infection difficult. The provincial TB Contact Investigation Coordinator has access to the "broad picture" provincially and can assist with contact investigation activities by compiling information from around the province (and beyond) and by providing a cross-jurisdictional perspective of the ongoing evaluation of contacts.

The local investigation coordinator(s) should provide the provincial TB Contact Investigation Coordinator with the following:

- information about the whereabouts of named contacts who have moved or live in a different jurisdiction than the case;
- outcomes of all investigation activities as they are completed; evidence of transmission (e.g., identification of additional active cases and/or TST (or IGRA) converters) will necessitate the expansion of the contact investigation;
- reports of compliance with recommendations for contact follow-up and/or treatment.

⁶³ Adapted from CDC, Self Study Modules on Tuberculosis, Contact Investigation for Tuberculosis (1999) p. 16.

4.3 TB Pathogenesis as it Relates to Transmission of Infection

TB disease is caused by mycobacteria belonging to the *Mycobacterium tuberculosis complex* (MTBC). The MTBC includes *M. tuberculosis*, *M. bovis*, *M. bovis BCG*, *M. africanum*, *M. caprae*, *M. microti*, and *M. pinnipedii*. All of these species except *M. bovis BCG* are included in the Canadian case definition of TB.

Transmission of as few as one to 10 mycobacteria can result in infection. Infection with MTBC is usually acquired through inhalation of droplet nuclei containing viable mycobacteria. MTBC may also be acquired through:

- ingestion of infected (and unpasteurized) milk products infected with *M. bovis* (not uncommon in areas without effective cattle screening and milk pasteurization programs);
- handling of infected animals (abattoir workers, veterinarians, and wild game handlers);
- percutaneous inoculation (e.g., puncture accident during a laboratory or hospital procedure involving fluids/tissues containing viable mycobacteria).

NOTE: Fomites (linen, furniture, books, floors) are not a significant source of infection as mycobacteria on these surfaces will die quickly as a result of drying, heat or sunlight (ultraviolet light).

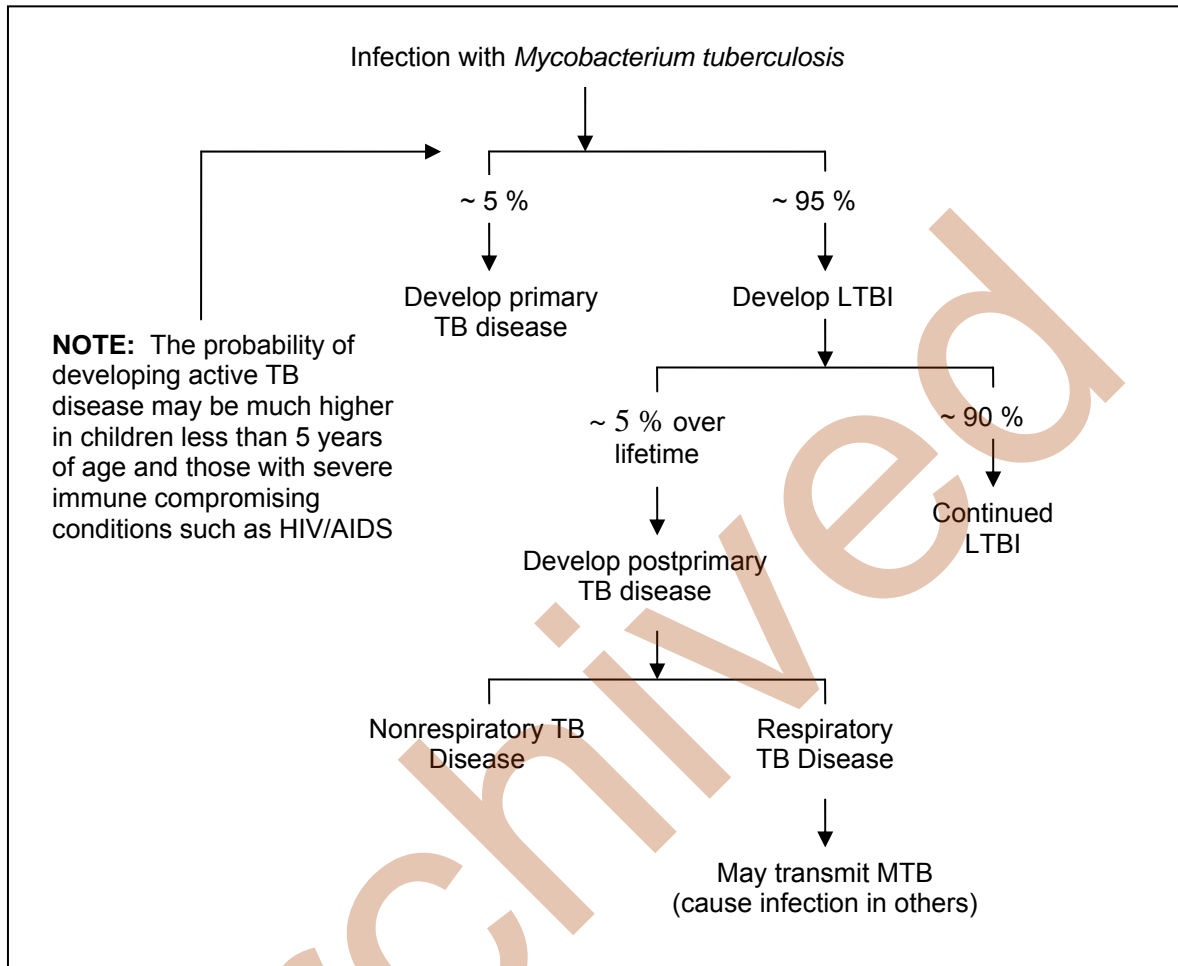
Infection with MTB usually goes unnoticed by the host however a relatively small proportion (~5%) of those infected will progress usually over a period of weeks or months, directly to active TB disease. TB disease that occurs soon after infection is acquired is referred to as “primary” disease (e.g., primary TB disease or primary progressive TB disease).

In the majority of infected individuals (~95%), infection is followed by a period of mycobacterial latency. This condition is referred to as “latent TB infection”, or “LTBI”. Latency is believed to occur as a result of the host’s immune system, which limits the organisms’ ability to replicate and disseminate within the host. TB infection can remain latent for years, sometimes for the lifetime of the host.

About five to 10% of immune competent hosts with LTBI will eventually go on to develop active TB disease (postprimary TB disease). This figure can be significantly higher if the host is under five years of age or immune suppressed.

Some individuals that develop active TB disease will be capable of transmitting MTB infection. Generally speaking, potential for transmission is limited to cases with respiratory forms of TB disease (see *Figure 4-1, The pathogenesis of Mycobacterium tuberculosis in the infected host*).

Figure 4-1: The pathogenesis of *Mycobacterium tuberculosis* in the infected host⁶⁴



4.4 Determinants of TB Transmission

Exposure to an infectious case (or to infectious aerosols) does not guarantee transmission will occur. Likelihood of transmission is primarily dependant upon the:

- Number of viable mycobacteria per volume of air (infectious particle density)
- Physical proximity of the contact to the source case
- Length of time a susceptible person spends breathing the contaminated air (duration of exposure)
- Susceptibility of exposed individuals to infection with MTB
- Factors related to the strain of MTB involved

As well, the longer a case is infectious and undiagnosed, the more likely that transmission has occurred.

⁶⁴ Adapted from Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition, Canadian Lung Association, Canadian Thoracic Association, Public Health Agency of Canada, 2007, p. 45.

4.4.1 Infectious Particle Density

Variables that influence infectious particle density include the degree of infectiousness of the active case and certain environmental factors.

4.4.1.1 Degree of Infectiousness of the Active Case

Individual cases are more or less infectious than others related to:

- **Site and extent of disease;** differing forms of TB disease are considered more or less potentially infectious than others. Laryngeal TB and pulmonary TB (particularly if cavitary) are considered the most infectious forms of TB. Cases with a higher number of viable MTB bacteria in their respiratory samples (usually sputum) are generally more likely to transmit infection than those with less (e.g., AFB smear positive versus AFB smear negative). Contacts infected by smear positive cases may also be more likely to develop active TB disease than those infected by a smear negative case⁶⁵.
- **Age;** active TB disease in children less than 10 years of age is rarely infectious, but it does imply recent infection and indicates the probability of an undiagnosed infectious case amongst the child's close contacts.

Contact investigation is not usually indicated for cases less than 10 years of age unless they present with cough and adult-type pulmonary disease⁶⁶ (see also *Section 4.10.8, Special considerations in evaluation and management of TB contacts*).

Older children, adolescents and children of any age that present with cavitary pulmonary TB disease and/or cough should have respiratory specimens (usually sputum) submitted in order to evaluate degree of infectiousness (see *Appendix B, Respiratory specimen collection*).

A reverse contact investigation (to identify the source of the child's infection) is usually recommended for pediatric cases as the individual who transmitted MTB to the child may still be undiagnosed and infectious (see *Section 4.11, Reverse contact investigation [source case investigation]*).

- **Presence/frequency/strength of cough or other aerosol-producing behaviors (e.g., sneezing, singing);** infection occurs primarily through the inhalation of aerosols containing MTB exhaled by the source case. Aerosols may remain in the air for a significant period of time, enabling transport of mycobacteria away from the source by air currents, duct systems, elevator shafts, etc.

⁶⁵ Ibid, p. 39.

⁶⁶ Ibid, p. 255.

Wearing of a procedure mask by infectious cases (when not in an airborne isolation environment) reduces aerosol dissemination. Fitted N95 respirators worn by those exposed to an infectious case reduce likelihood of aerosol inhalation. Institution of airborne isolation precautions reduces risk of TB transmission by reducing particle density containing and controlling movement of infectious aerosols.

HIV status does not appear to affect level of infectivity. However delay in diagnosis related to unusual presentation of disease in the immune suppressed may lead to more advanced disease at diagnosis and a corresponding longer period of infectiousness (see *Section 4.10.8, Special considerations in the evaluation and management of TB contacts*).

4.4.1.2 Environmental Factors

Air circulation and ventilation are environmental factors that influence the number of infectious aerosols (droplet nuclei containing MTB) in a given airspace.

High concentrations of infectious aerosols are more likely to occur in environments that are:

- indoors;
- poorly ventilated (or where there is recirculation of contaminated air);
- damp;
- and/or which have poor access to sunlight (ultraviolet light);
- contain a small volume of air (e.g., the interior of a vehicle).

4.4.2 Physical Proximity to the Source Case

Contacts in close physical proximity to the source case (or to exhausted or ducted air from the room in which the source case is/was located) are more likely to become infected than those further away. Crowding, as may be found in some congregate living or shelter environments, can significantly increase risk of transmission.

4.4.3 Duration of Exposure

There is a strong correlation between the duration of time spent with an infectious case (and/or in a contaminated environment) and likelihood of transmission. Prolonged exposure is usually, but not always, required. Infectious particle density significantly influences risk. In general, the higher the density, the shorter the duration of exposure likely required.

4.4.4 Susceptibility of the Exposed Individual to Becoming Infected with MTB

Individuals not already infected with MTB are at risk of becoming infected if exposed. Previously infected individuals are somewhat (but not completely) protected from re-infection during subsequent exposures. However, re-infection has been documented, particularly in the setting of HIV or others with immune compromising status.⁶⁷

Vaccination with bacilli Calmette-Guérin (BCG) does not reliably prevent infection with MTB. However, BCG may limit multiplication and dissemination of the organism and development of lesions in those who become infected with MTB⁶⁸.

4.4.5 Factors Related to Strain of MTB Involved

Data suggests that some strains of MTB may be more virulent than others, making them more likely to be successfully transmitted⁶⁹.

NOTE: Drug resistant strains of TB should be considered no more or no less transmissible than drug-susceptible strains, but their presence may influence the extent of contact investigation for other reasons (see *Section 4.10.8, Special considerations in the evaluation and management of TB contacts*).

4.5 Measures to Interrupt TB Transmission

The most important measures in preventing transmission of TB are:

- early diagnosis of disease;
- prompt initiation of effective treatment*;
- and isolation of cases when necessary and to the degree appropriate⁷⁰ (see *Section 3.2, Prevention of TB transmission – airborne precautions and isolation*)

* *Level of infectiousness (related to bacillary count and frequency of cough) rapidly reduces after effective treatment is initiated, and MTB present in aerosols produced by the case are thought to be less capable of establishing infection, if transmitted.*

⁶⁷ Ibid, p.42.

⁶⁸ Ibid, p.42-3.

⁶⁹ Ibid, p.48.

⁷⁰ Ibid.

Other measures to interrupt transmission include:

- Reduction of aerosol dissemination; infectious cases should be encouraged to cover their mouths and noses whenever they cough or sneeze. Cases requiring institutional or home-based isolation should wear a surgical (or procedure) mask whenever they leave the airborne isolation environment or homes to attend out-patient follow-up services at health care facilities (see *Section 3.2, Prevention of TB transmission – airborne precautions and isolation*)
- Use of engineering controls to sterilize and/or control movement of infectious aerosols (e.g., room ventilation devices, ultraviolet light fixtures)
- Use of personal controls (e.g., fitted N95 respirators) by health care providers and others during exposure to infectious cases reduces likelihood of aerosol inhalation.

4.6 Objectives of TB contact investigation

A successful contact investigation not only identifies and screens contacts for MTB infection and disease; it interrupts transmission of infection and prevents future cases of active disease. Therefore, the three main objectives to TB contact investigation activities are:

1. **The identification of additional cases of active TB disease** among contacts of an index case (source and/or secondary cases), and prompt initiation of treatment for such cases (in order to interrupt further transmission).
2. **The identification and screening of individuals (contacts) who may be newly infected with MTB**, and prevention of active TB disease in these individuals. Without intervention, approximately 5% of newly-infected individuals will develop active TB disease within 2 years. If the newly-infected are children and/or are immune suppressed, this percentage is much greater; for such contacts, treatment for presumed LTBI (primary prophylaxis) may be necessary until infection with MTB can reliably be ruled out.
3. **The identification of the source case who infected the index case particularly if the index case is a child, has primary TB or has nonrespiratory TB disease.** This activity is referred to as reverse contact investigation or source case investigation; see *Section 4.11, Reverse contact investigation (source case investigation)*.

4.7 Indications for TB contact investigation

Whenever a case of active TB disease is strongly suspected or diagnosed (either clinically or with laboratory confirmation) a decision must be made as to whether or not contact investigation is indicated. If investigation is indicated, a determination

will be made as to who should be included in the initial round of screening (scope) as well as what priority should be assigned to the investigation overall (see *Section 4.10.5, Prioritization of contacts*, which follows).

Initial decision-making is guided by the site of disease and radiology/bacteriology findings at the time of presentation of the index case. The investigation plan may change as additional information becomes available, e.g., through interviews with the case and/or findings from initial round of contact evaluations. For example, if mycobacteriology cultures indicate the case does not have TB, the investigation may be discontinued. Or, if TST conversions or an additional case of active TB disease is found among initial contacts screened, the scope of the investigation may be broadened to include contacts with lesser durations of exposure.

Infectious forms of TB disease

Generally speaking, only respiratory forms of TB disease are considered potentially communicable (infectious).

In Canada, respiratory forms of TB disease include the following sites of disease:

- primary TB (which includes primary respiratory TB and TB pleurisy related to primary progressive TB)
- pulmonary TB (disease of the lungs and conducting airways including the larynx [laryngeal TB])
- TB pleurisy (non-primary)
- TB of the intrathoracic lymph nodes, mediastinum, nasopharynx, nose (septum) and sinus (any nasal)

When a patient is found to have (or is suspected of having) a potentially active form of TB disease, consultation with AHS central TB Services or the outpatient TB clinic managing the index case should occur to determine if contact investigation is indicated, and if so, what the initial scope of the investigation should be.

NOTE: Infants and young children with active TB disease rarely transmit infection to others however they are likely to have been recently infected. Investigation of contacts to these cases is aimed at identifying the source of their infection (see *Section 4.11, Reverse contact investigation [source case investigation]*). If assessment of the child indicates potential to transmit, a broader contact investigation may be necessary.

Non-infectious forms of TB disease

Investigation of contacts to non-infectious forms of TB disease may be recommended in select circumstances, particularly if the index case is a child or an individual thought to have become infected with MTB very recently (see *Section 4.11, Reverse contact investigation [source case investigation]*).

4.8 Prioritization of initiation of TB contact investigation in Alberta

TB contact investigations can require a significant amount of resources, especially for cases that are highly infectious and/or may have been infectious for a long period of time prior to diagnosis. Prioritization of investigation should be done in consultation with AHS central TB Services or the outpatient TB clinic managing the case.

The purpose of prioritizing investigations is to ensure that resources are available (or made available) and targeted toward investigations most likely to result in the identification of secondary cases and prevention of ongoing TB transmission.

Establishing the priority of the investigation is especially important in areas (e.g., municipalities, regions) where there may be multiple investigations occurring simultaneously or where limited investigation resources exist.

There are two major considerations in prioritization of contact investigations.

- likelihood of transmission from the index case (based on determinants described in *Section 4.4*, above), and
- susceptibility of contacts for rapid progression to active TB disease if transmission has occurred

Other factors that may influence prioritization include:

- index case drug resistance (especially multi-drug or extensively drug-resistant isolates) due to concern about identifying/preventing additional cases of DR-TB
- number/availability of contacts requiring evaluation at the outset of the investigation (e.g., cases with high numbers of close contacts)
- Public Health response capacity

Prioritization for initiation of TB contact investigation related to source case determinants, and required actions are described in *Table 4-1*, which follows.

Table 4-1: Source case-related determinants of prioritization of initiation of TB contact investigation in Alberta

Site	Bacteriology (respiratory sample – usually sputum)	Priority	Action
Cavitary or non-cavitary respiratory disease, with or without laryngeal involvement	smear positive* for AFB, PCR positive for MTB complex	HIGH	Investigation of contacts virtually always indicated. Scope of investigation to be determined in consultation with AHS central TB Services or the outpatient TB clinic managing the case.
Cavitary or non-cavitary respiratory disease	smear negative* for AFB, culture positive for MTB	LOWER priority than smear positive case	Conduct investigation of household and other close contacts, and casual contacts at risk for rapid progression to active TB disease (e.g., children less than five years of age, HIV positive, severely immune-suppressed)
Respiratory disease	smear negative* for AFB, culture pending or culture negative for MTB <i>(i.e., clinical diagnosis of TB disease)</i>	LOW priority unless results from repeated cultures are positive for MTB	Commence investigation as and if recommended by AHS central TB Services or the outpatient TB clinic managing the case. If clinical TB is ruled out, investigation may be discontinued after consultation with AHS central TB Services or the outpatient TB clinic managing the case. Other factors that may determine prioritization include duration of symptoms, environmental circumstances, and contact vulnerability.
Nonrespiratory disease**	smear negative for AFB, culture results pending or negative for MTB	USUALLY LOW	Commence investigation of close, household contacts. Investigate other contacts only if recommended by AHS central TB Services or the outpatient TB clinic managing the case.

* Smear status to be based, with few exceptions, on three consecutive airway secretion specimens

** Three respiratory samples (usually sputum) should be collected not only from all cases presenting with symptoms suggestive of respiratory TB disease but also from cases presenting with symptoms suggestive of non-respiratory TB disease; the latter to rule out concomitant respiratory TB (see Section 2.2.3.2, *Special considerations in AFB examination*). Decision making regarding contact investigation for nonrespiratory cases found to have bacteriology results suggestive of respiratory TB disease should be managed as per respiratory case recommendations.

NOTE: Prioritization of contacts to case of drug resistant (DR) TB is variable and based on a number of considerations.

4.9 TB contact definitions⁷¹

TB contact definitions are generally used to describe the level of risk that a particular contact or group of contacts (cohort) has for acquiring MTB infection. Differentiation is based on **duration** and **frequency** of exposure to the active case (or the infectious aerosols).

The following standard contact definitions are used in Alberta.

Close household contacts: those who live in the same household as the infectious case. Household contacts are considered by definition to share breathing space on a daily basis with the presumed source case.

Close nonhousehold contacts: those who have regular, prolonged contact with the presumed source case and share breathing space daily but do not live in the same household. These include regular sexual partners and close friends.

Casual contacts: those who spend time less frequently with the infectious case. These may include classmates, colleagues at work or members of a club or team.

Community contacts: those living in the same community or attending the same school or workplace as the infectious case.

Generally speaking, close contacts (household or nonhousehold) are considered at highest risk for infection, casual contacts are considered at less risk for infection than close contacts, and community contacts are considered at lowest risk.

Although these definitions are helpful during initial prioritization activities, it is important to remember that risk for infection (transmission) may be influenced by other factors (e.g., infectious particle density). Further, consideration must be given to contacts' risk for progression to active TB disease if infection has occurred. Prioritization of contact evaluations should proceed according to consideration of **BOTH** risk for infection **and** risk for progression (see *Section 4.10.6, Evaluation of TB contacts*).

4.10 Systematic approach to TB contact investigation

Any successful investigation requires careful attention to detail in the gathering and evaluation of information. While contact investigation does not always follow this order, the steps outlined below should assist local TB program staff to ensure the necessary information is gathered.

1. Index case medical information review
2. Index case interview
3. Field investigation

⁷¹ Ibid, p. 253.

4. MTB transmission risk assessment
5. Prioritization of contacts
6. Evaluation of contacts
7. Repeat index case interview if necessary
8. Follow-up of contacts
9. Review of contact investigation findings
10. Evaluation of contact investigation activities

The process of contact investigation should begin as soon as a case is strongly suspected or diagnosed. An initial list of known contacts should be submitted to AHS central TB Services or the local outpatient TB clinic on the *Tuberculosis Contact List* (see *Appendix G*) within seven days (one calendar week) of notification of the case.

NOTE: The *Tuberculosis Contact List* form is used to track and coordinate follow-up, and therefore it is imperative that information be as complete as possible, including the names, date of birth and whereabouts of contacts that live in a different jurisdiction than the case.

4.10.1 Index case medical information review

Review of medical information pertaining to the index case is crucial to determining which contacts are at risk of infection with MTB. Doing so allows for probability of infectiousness to be established and the period of infectiousness to be estimated.

Determinations about probability of infectiousness are dependant upon:

- age of the case
- site of TB disease (respiratory versus nonrespiratory)
- presence and approximate onset of symptoms, particularly cough
- AFB smear and culture results, including specimen type and date(s) of submission
- chest radiography findings and date(s)
- TB treatment history (medications, dosage, dates of treatment, method of administration [self administered or directly observed], etc)

Cases are more likely to be infectious if they:

- are 10 years of age or older
- have pulmonary or laryngeal TB
- are coughing (especially if a lot of sputum is being produced)
- have AFB smear positive respiratory samples (e.g., sputum)
- have cavities visible on their chest radiography
- have not started (or only recently started) TB treatment

Estimating the start of the period of infectiousness is a somewhat controversial activity. Guidelines have been published by the U.S Centers for Disease Control, but these are based on expert opinion rather than controlled trials. Canadian guidelines⁷² suggest the period of infectiousness for pulmonary cases may begin with the onset of cough. If it is not possible to identify this with reasonable reliability, other symptoms suggestive of TB disease may be used (e.g., onset of fever, night sweats, weight loss). Priority should always be given to contacts exposed during the period the case was symptomatic.

For the purposes of contact investigation, the period of infectiousness closes (ends) once the case can no longer transmit infection, e.g., has been appropriately isolated or has expired.

NOTE: Determination of period of infectiousness and determination of discontinuation of airborne isolation precautions are not the same activity (see *Section 3.2, Prevention of TB transmission – airborne precautions and isolation*)

This information is usually gathered by AHS central TB Services or the outpatient TB clinic treating the case through discussion with the zonal MOH, the provincial laboratory, the case's physician(s), and/or the admitting hospital.

4.10.2 Index case interview

NOTE: Appropriate respiratory protection should always be used when interviewing an infectious or potentially infectious, patient.

The index case interview is a critical step in contact investigation and should be conducted by experienced TB program staff. It is strongly recommended that individuals responsible for conducting index case interviews complete training in this skill; see *Section 4.13, Recommended resources for contact investigation* for information about education and training opportunities.

The purpose of the index case interview is to collect information to assist in the investigation. The interview also offers an opportunity to:

- build trust and rapport with the patient
- provide TB education
- engage the patient in the contact investigation process, and
- address the patient's questions and concerns.

The initial index case interview should occur as soon as possible after the case is reported. Multiple interviews are usually necessary to ensure complete information is obtained.

⁷² Ibid, p. 255.

Interpreters may be needed if there are language barriers. Care must be taken in the choice of interpreters, being sensitive to issues of confidentiality; a family member or close friend may not be the best choice.

NOTE: Information about interpretation and translation services is available through informAlberta, online at: <http://www.informalberta.ca/public/common/search.do>

Specifically, information about the following areas should be collected:

- **the approximate onset of symptoms, in particular the time of onset of cough** (to help identify or confirm the beginning of their period of infectiousness); difficulty recalling onset of symptoms may be helped by asking the patient to relate symptoms to events such as birthdays, holidays or major news events.
- **places where the patient spent time** in the period they were likely to be infectious; asking the patient to review their usual daily, weekly and monthly routines for home, work, school and leisure activities. Information about less routine and/or unusual events such as parties, family gatherings and meetings should also be listed. Whenever possible, details about the environment of these settings should be collected such as room size, time spent, general ventilation characteristics (i.e., indoors versus outdoors), and whether or not the event was crowded. Activities closest to the date of diagnosis (the start date of treatment) are the most important.
- **names and possible whereabouts of contacts**; every case has at least one contact and some may have hundreds. Ask the patient to provide the names, approximate age, addresses and telephone numbers of any individuals they identify as contacts, especially those they had daily contact with. Interviewers should be aware that clients may forget some contacts and/or be reluctant to identify others. Special emphasis should be placed on collecting information about immune suppressed contacts, those less than five years of age and those with symptoms suggestive of active TB disease (potential source or secondary cases).

The use of an interview checklist is recommended to assist the interviewer in collecting all of the necessary information. A sample interview checklist can be found in *Appendix G*.

Some strategies that may assist practitioners to effectively interview cases include:

- Having a clear understanding of the objectives of the interview
- Planning the interview so that each objective is given adequate time
- Ensuring the interview takes place under conditions that encourage effective communication and ensure confidentiality
- Establishing the foundation for a good relationship with the client, based on mutual trust and understanding

- Beginning with an assessment of the client's knowledge, feelings, and beliefs about TB. Provide information/education as opportunities arise.
- Asking open-ended questions (see *Appendix G, Sample open-ended questions for index case interviews*)
- Listening to the client's concerns about TB and its treatment, and providing information and education if and when, appropriate

Ideally, the initial interview should conclude with a determination about who will notify contacts about the need for follow-up and how to reach the interviewer about any additional contacts.

The patient may wish to notify contacts themselves, especially those who are family or close friends. If notification is to be done by the patient, they should be informed that follow-up notification will be made to contacts who do not present for evaluation in a timely fashion. If TB Services staff are to make the notifications, the patient should be reassured that notification will be done in accordance with strict guidelines intended to protect confidentiality; contacts will not be told the identity of the case.

Special consideration - proxy interviews

It may not always be possible to interview the index case. The case may have died, been diagnosed postmortem. It may not be possible to locate some cases, or, they may be too young or ill to participate in an interview.

It is still important to identify and evaluate contacts of such cases. Under these circumstances it may be necessary to interview a person in the place of an index case (a proxy). Proxy interviews should not be used simply because a patient is unwilling to be interviewed or does not speak the same language as the interviewer. Jurisdictional confidentiality policy and protocol should be followed when a proxy interview is necessary.

4.10.3 Field investigation

Field investigation is the practice of visiting the case's home or shelter, workplace (if any), and the other places where the case said he or she spent time while infectious. The purpose of the field investigation is to identify contacts and evaluate the environmental characteristics of the place(s) in which exposure occurred⁷³.

During the field investigation, the practitioners should:

- Observe and record environmental characteristics of the space (size, crowding, ventilation)
- Identify additional contacts (especially children) and obtain their addresses and phone numbers, if possible

⁷³ CDC, Self Study Modules on Tuberculosis, Contact Investigation for Tuberculosis (1999) p. 3.

- Look for evidence of other contacts who may not be present at the time of the visit, and who the patient has not previously identified. Pictures or belongings of others (clothing, toys) may help identify others who live in or visit the location frequently
- Interview and TST close contacts who are present and arrange for reading of TST results, collection of sputum samples, etc.
- Refer contacts at high risk for progression to active disease and those with symptoms suggestive of active TB disease for further evaluation (see *Section 1.5, Indications and processes for TB follow-up referrals*)
- Educate contacts about the importance of testing, treatment and follow-up for identification and prevention of active TB disease

4.10.4 MTB transmission risk assessment

Assessing the risk of transmission helps determine which contacts should be given high priority for evaluation. Information gathered during the medical information review, the index case interview, and the field investigation is used during this assessment; see *Section 4.4, Determinants of TB transmission*.

4.10.5 Prioritization of contacts

Effective and efficient contact investigation requires that initial efforts be targeted toward those individuals most at risk of acquiring TB infection and progressing to active TB disease if infection has occurred.

Concentric circle approach to TB contact investigation

The concentric circle approach is the traditional method used to prioritize contacts for evaluation and to determine the limits of an investigation.

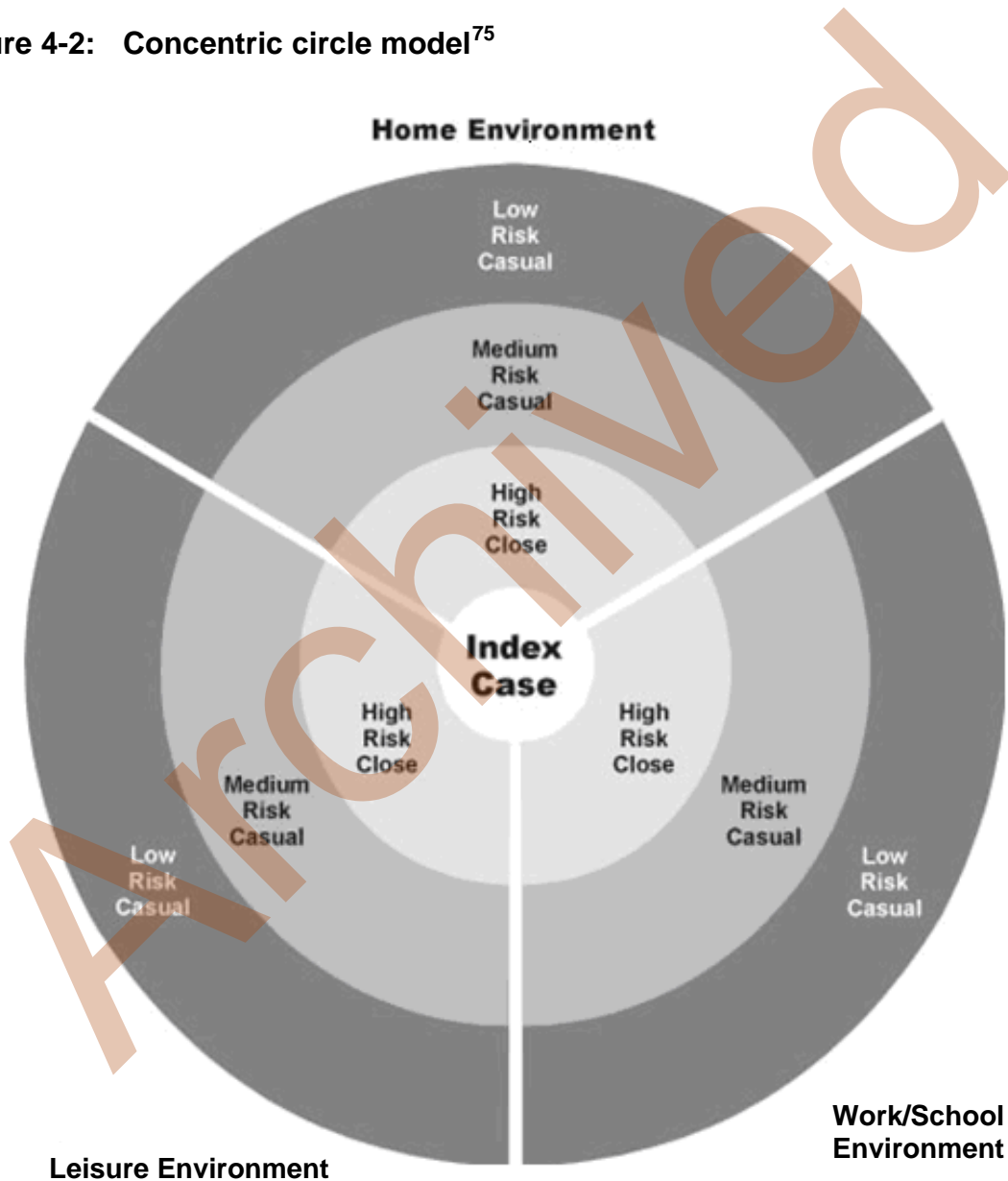
Using this method, contacts are prioritized based for evaluation based on consideration of the duration and frequency of their exposure(s) and individual contacts' risk for development of active TB disease if infection has occurred. The limits of the investigation are based on the presence or absence of evidence of transmission demonstrated within cohorts of contacts (contact circles); (see *Figure 4-2, Concentric circle model*).

In a concentric circle model, contacts found to be at high risk for infection (e.g., close household contacts) and/or at high risk for progression to disease (e.g., children less than five years of age, immune-suppressed contacts) are prioritized for evaluation over contacts considered to be at lesser risk based on criteria established for that investigation. Such contacts are considered to be in the first circle.

If evidence of transmission is found within the initial circle (or circles) of contacts evaluated, the investigation is usually expanded to include contacts in an outer more circle (or circles), i.e., contacts considered to be at lesser risk⁷⁴.

The investigation is typically not expanded beyond the first circle in which no evidence of transmission is found. For example, if no evidence of transmission is found among first circle contacts, the investigation would not normally be expanded to include contacts in the second or third circles.

Figure 4-2: Concentric circle model⁷⁵



⁷⁴ Ibid.

⁷⁵ Alberta Tuberculosis Control Manual, May 2002, p 4-16.

Limitations to the concentric circle approach to TB contact investigation have been demonstrated. Social, cultural, and other factors related to the case and/or their contacts (e.g., homelessness, illicit behaviors, high background rates of LTBI) may make it difficult or impossible to adequately assess risk of transmission, progression to disease, or to reliably identify or rule out evidence of transmission.

It may be more appropriate to utilize other methods for contact prioritization and investigation management (such as social network analysis or community-wide active case finding initiatives) in some investigation scenarios such as those involving congregate living settings, immune suppressed contacts, and remote communities.

Regardless of which method of prioritization is used, the highest priority for evaluation should be given to those contacts most likely to be infected, especially those who at high risk for developing disease such as children under five years of age and individuals who are severely immune compromised such as contacts infected with HIV.

Further evaluation of any contact found to have symptoms suggestive of active TB disease should be given priority over all other contact investigation activities.

4.10.6 Evaluation of TB contacts

Contact investigation is essentially a case finding and LTBI screening activity. As such it relies on the same evaluation methodologies, specifically:

- TB history and symptom inquiry
- chest radiography, if indicated
- examination of samples (e.g., sputum) for acid fast bacilli (AFB), if indicated
- testing to determine if an individual has been infected with *Mycobacterium tuberculosis* (e.g., TST or IGRA testing)

Detailed information about each of the above methodologies is provided in *Chapter 2.2, Case detection and LTBI screening methodology*. Additional information relating to the use of these methodologies in the context of contact investigation is presented in the sections which follow.

The process for evaluation of contacts is iterative, and dependant upon factors related to the case (e.g., level of infectivity), the contact (e.g., risk for rapid progression to active TB disease), and the overall investigation (e.g., number of contacts to be screened). **It is essential that evaluation of contacts be carried out in an orderly manner, beginning with those at highest risk.**

i. TB history and symptom inquiry

This activity should proceed as described in *Section 2.2.1, TB history and symptom inquiry*.

Contacts noted to have symptoms suggestive of active TB disease should be managed as described in *Sections 2.2.1.3 and/or 2.2.1.4*.

Asymptomatic contacts found to have a prior history of active TB disease or prior positive TST (or IGRA test) should undergo chest radiography and be asked to submit three (3) sputum samples for AFB smear and culture. TST (or IGRA testing) should not be done.

ii. Chest radiography

The chest radiograph can be an important tool in the contact investigation protocol. When used in conjunction with the TST (or IGRA test) result, it is of great assistance to the TB physician in the assessment of an individual for infection with MTB and/or active TB disease.

Chest X-rays for contacts should be requisitioned using the *Tuberculosis Referral Form* (see *Appendix G*) to ensure they are forwarded to AHS central TB Services or the local outpatient TB clinic for interpretation.

Chest X-rays should be ordered for contacts that are:

- found to have a TST result of ≥ 5 mm or a positive IGRA test
- at high risk for development of active TB disease (e.g., are HIV positive, severely immune-suppressed, less than five years of age). Posterior-anterior (PA) and lateral X-ray views should be taken *regardless of TST or IGRA test result*.

Posterior-anterior and lateral views are recommended for contacts under the age of 15 years (unless pregnant, see below).

NOTE: See *Section 2.2.2.2, Special considerations in chest radiography* for direction regarding management of contacts who are pregnant.

iii. Examination of samples for acid fast bacilli (AFB)

The examination of sputum for AFB is the most effective tool for identification of cases of active TB disease. Not only are the results available within a very short time, most of the time, specimens can be collected on the spot.

Examination of respiratory samples (usually sputum) should be included in the assessment of contacts that:

- have symptoms suggestive of active TB disease
- are found to have a TST result of ≥ 5 mm or positive IGRA test
- have a history of prior TB disease (treated or untreated)
- have a history of previous positive TST, and are at increased risk for developing active TB disease
- are at high risk for development of active TB disease (e.g., are HIV infected) *regardless of TB history, TST or IGRA test result, or chest radiography findings*

Sputum induction or gastric aspirates may be necessary for contacts that have difficulty producing sputum, particularly if they are suspected of having active TB disease.

See *Appendix B, Respiratory specimen collection*, for additional information.

iv. Testing to identify infection with *Mycobacterium tuberculosis* (MTB)

Testing to identify infection with MTB can be very useful in the context of contact investigation.

The purposes of detecting infection with MTB in contacts are to:

- identify individuals who should undergo additional investigation(s) for example; chest radiography and sputum sample examinations to identify or rule out active TB disease
- identify individuals who may have been recently infected so that they may be offered treatment to prevent future development of active TB disease
- be able to manage the contact investigation according to evidence of transmission to contacts

Limitations of current methods of testing apply to their use in contact investigation, including:

- neither tuberculin skin test (TST) or interferon gamma release assay (IGRA) testing can indicate whether or not the infection was acquired recently or remotely (in years past);
- these tests are not capable of identifying the presence of active TB disease;
- these tests may not be able to reliably demonstrate whether infection has occurred until three to eight weeks afterward.

TST (or IGRA testing, if available and appropriate) should be performed on contacts determined to be at risk, who have no documentation or description of a previously positive test reaction. If TST is used, a single TST should be

administered. There are almost no indications for two-step TST in the setting of a contact investigation (see *Section 2.2.5.5, Two-step TST and the booster phenomenon*).

The results of the initial testing will assist in the determination of need for further screening activities (e.g., chest radiography). TST results should be interpreted according to *Table 4-2* which follows.

Conversion of TST (or IGRA test) from negative to positive can take up to eight weeks after infection occurred. If an initial test is performed within eight weeks of last exposure to an infectious case, and is not found to be positive, a second test should be performed at least eight weeks after the last exposure occurred.

NOTE: BCG vaccination status should not be considered during the interpretation of a contact's TST result.

Table 4-2: Guidelines for tuberculin skin testing in the context of a contact investigation, according to previous TST results⁷⁶

<p>No documented previous TST result</p> <p>In this case, a TST result of 5 mm or more on the first test or on the test at least eight weeks after the last exposure is considered positive.</p>
<p>Documented previous TST result less than 5 mm</p> <p>In this case, the TST result of 10 mm or more on the first test or on the test at least eight weeks after the last exposure is usually considered positive. However the circumstances of the contact must be taken into account. For example, if the source case is highly infectious, if there was close or prolonged contact, if the contact is under age 5 or if the contact has impaired immunity, then an increase of 6 mm from the previous TST result may be considered a conversion. Decisions in this regard need to be individualized.</p>
<p>Documented previous TST result between 5 and 9 mm, no history of treatment of active TB disease or LTBI</p> <p>In this case, the TST should be repeated. An increase of at least 6 mm is considered a positive result, either on the initial TST or on the second test done at least eight weeks after the last contact.</p>
<p>Documented previous TST result of 10 mm or greater or history of treatment for TB disease or LTBI</p> <p>Contacts who have a documented prior positive TST or history of treatment for active TB disease or LTBI should not undergo post-exposure TST. Evaluation of these contacts should include assessment for signs/symptoms of active TB disease and additional investigations (e.g., chest radiography, sputum examination) as deemed necessary. Clinical history and results of clinical investigations should guide treatment decisions.</p> <p>Very high-risk, severely immunocompromised persons (e.g., those who are HIV coinfecting) who are re-exposed to infectious TB after having already completed a satisfactory course of treatment for TB disease or LTBI in the past should be considered for a repeat course of treatment for LTBI.</p>

⁷⁶ Adapted from Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition, Canadian Lung Association, Canadian Thoracic Association, Public Health Agency of Canada, 2007, p. 260.

4.10.7 Management of TB contacts

Management of individuals found to have active TB disease is described in *Chapter 3, Management of active TB disease*.

Treatment of LTBI is generally recommended for contacts who meet the following criteria:

- Positive initial TST (see *Table 4-2*, above) or IGRA test, or TST/IGRA test converter with a normal chest radiograph and no symptoms suggestive of active TB disease
- TST < 5 mm if there is HIV infection or other immune suppression **and** high risk of TB infection
- TST < 5 mm in a child less than five years of age until the repeat TST is negative at least eight weeks after last exposure **and** the child is at least six months of age at the time of repeat testing (see *Pediatric contacts*, which follows)

Management of individuals recommended for treatment of LTBI is described in *Chapter 5.1, Treatment of latent TB infection (LTBI)*.

Individualized recommendations will be made for follow-up of contacts that do not complete treatment for LTBI (if indicated).

4.10.8 Special considerations in evaluation and management of TB contacts

Information regarding special considerations in the management of individuals undergoing treatment for active TB disease is presented in *Chapter 3, Management of Active TB Disease*. Special considerations in the management of LTBI treatment are presented in *Chapter 5.1, Treatment of latent TB infection (LTBI)*.

i. Pregnant contacts

Pregnancy is not a contraindication to TST.

See *Section 2.2.2.2, Special considerations in chest radiography* for direction regarding management of contacts who are pregnant.

ii. Pediatric contacts

The most effective way to prevent cases of pediatric TB disease is to evaluate and treat children exposed to an infectious source case⁷⁷.

⁷⁷ Ibid, p. 190.

All children identified as contacts to infectious cases should undergo a symptom inquiry and be evaluated for infection with MTB (e.g., TST). Children under five years of age should also undergo a physical examination and chest radiography (PA and lateral views) because most children at this age with active TB disease are asymptomatic at presentation.

Young children are particularly susceptible to morbidity and mortality associated with TB disease. It is imperative that children found to have active TB disease or LTBI begin treatment as soon as possible. Children less than five years of age who do not appear to have active TB disease or LTBI should begin primary prophylaxis to ensure that active TB disease does not develop before MTB infection status can reliably be determined.

Primary prophylaxis is generally discontinued for healthy, asymptomatic children six months of age or older if repeat testing eight weeks after last contact with the infectious case remains negative. Primary prophylaxis should continue for children less than six months of age until repeat testing after they have reached six months of age proves to be negative.

If repeat testing is found to be positive, the child should continue on treatment until a full course of treatment for LTBI has been completed.

NOTE: In order to ensure primary prophylaxis is made available to children in non-metro areas of the province, a guideline for rapid initiation of primary prophylaxis has been developed; see *Appendix H, Primary Prophylaxis Guideline for Outside of Calgary and Edmonton*.

iii. Contacts to HIV-infected cases

Close contacts to HIV-infected cases are more likely to be HIV-infected themselves than other contacts⁷⁸. As such, these contacts should be evaluated promptly. HIV counseling and testing should be offered to any contacts of an HIV positive case, and especially if those contacts are found to have risk factors for HIV.

iv. Immune suppressed contacts

Contacts with immune suppression are also at increased risk for morbidity and mortality associated with TB disease. Such individuals should begin treatment as soon as possible if found to have active TB disease or LTBI.

⁷⁸ Ibid, p. 259.

Presumptive treatment for LTBI may be recommended for HIV infected and/or severely immune suppressed contacts at high risk for MTB infection after active TB disease has been ruled out as it may not be possible to reliably determine whether or not infection with MTB has occurred.

Re-infection with MTB has been demonstrated in this population. Re-treatment for LTBI may be recommended for severely immune suppressed contacts previously treated for TB or LTBI that subsequently have a significant exposure to an infectious case.

v. Contacts to cases with drug resistant TB (DR-TB)

Contacts to cases with drug resistant TB (especially if multi-drug resistant [MDR]), should be evaluated promptly, especially if the source case is considered to be highly infectious (e.g., has cavitory pulmonary TB or laryngeal TB).

Treatment and follow-up recommendations for contacts to DR-TB cases will be made on an individual basis, based on the resistance pattern of the isolate, availability of effective treatment of LTBI, and the contact's risk for development of active TB disease.

4.10.9 Repeat index case interview

It is often helpful to re-interview the index case at some point after the initial interview. Additional contact names and/or places where the index case spent time prior to being diagnosed (and started on treatment) may be remembered and/or shared once the case is feeling better particularly if a trusting relationship has been established.

4.10.10 Follow-up of contacts

The risk of progression from infection to active TB disease is highest in the first two years after infection occurs. Therefore, recommendations with regard to contact follow-up are generally limited to this time period.

4.10.10.1 Contacts that complete treatment for LTBI

Contacts that complete an adequate course of treatment for LTBI are not usually re-evaluated unless they develop symptoms suggestive of active TB disease or they are re-exposed to infectious TB. Periodic medical and radiologic evaluation **may** be recommended for contacts presumed to be infected with an MDR strain for the two years immediately following infection⁷⁹.

⁷⁹ Ibid, p. 173.

4.10.10.2 Contacts that do not complete treatment for LTBI

i. TST converters

If treatment of LTBI is indicated but not accepted or completed for TST converters, re-evaluation (repeat symptom inquiry, chest radiography and sputum sample examination for AFB smear and culture) is required at **6, 12, and 24 months** post-exposure.

ii. TST positive, baseline TST status unknown

Contacts found to have a positive TST on initial post-exposure testing for whom baseline (pre-exposure) TST results are not known require re-evaluation (repeat symptom inquiry, chest radiography and sputum sample examination for AFB smear and culture) at **12 months** post-exposure if treatment of LTBI is indicated but not accepted or completed.

NOTE: Re-evaluation may be recommended sooner and/or more frequently for some contacts, e.g., those at high risk for progression to active TB disease.

4.10.11 Review of TB contact investigation findings

Contact investigation findings should be reviewed periodically in order to identify evidence of transmission. Ideally, findings should be reviewed as they occur. In practice, this is not always possible.

At minimum, individuals responsible for managing the investigation at the local and provincial level should be advised immediately if any of the following evidence of transmission is found:

- if a secondary case is identified among contacts
- if TST or IGRA test conversions are identified among contacts
- if a contact under five years of age is found to have a positive TST or IGRA test without another probable source for the infection

Investigation managers should also be advised if an unexpectedly high infection rate is found in a contact cohort. This information is often identified as the evaluations of a cohort (or “circle”) of contacts is nearing completion. The term “infection rate” refers to the percentage of contacts with a similar degree of exposure that have a newly identified positive TST or IGRA test. Contacts with prior documentation of positive TST or IGRA should not be included in this calculation.

Infection rates in excess of the expected prevalence rate for similar populations without recent exposure are suggestive of transmission of infection. Expected prevalence of TST results of ≥ 10 mm in various Canadian populations are presented on page 257 of the *Canadian Tuberculosis Standards*, 6th Edition, available online at:

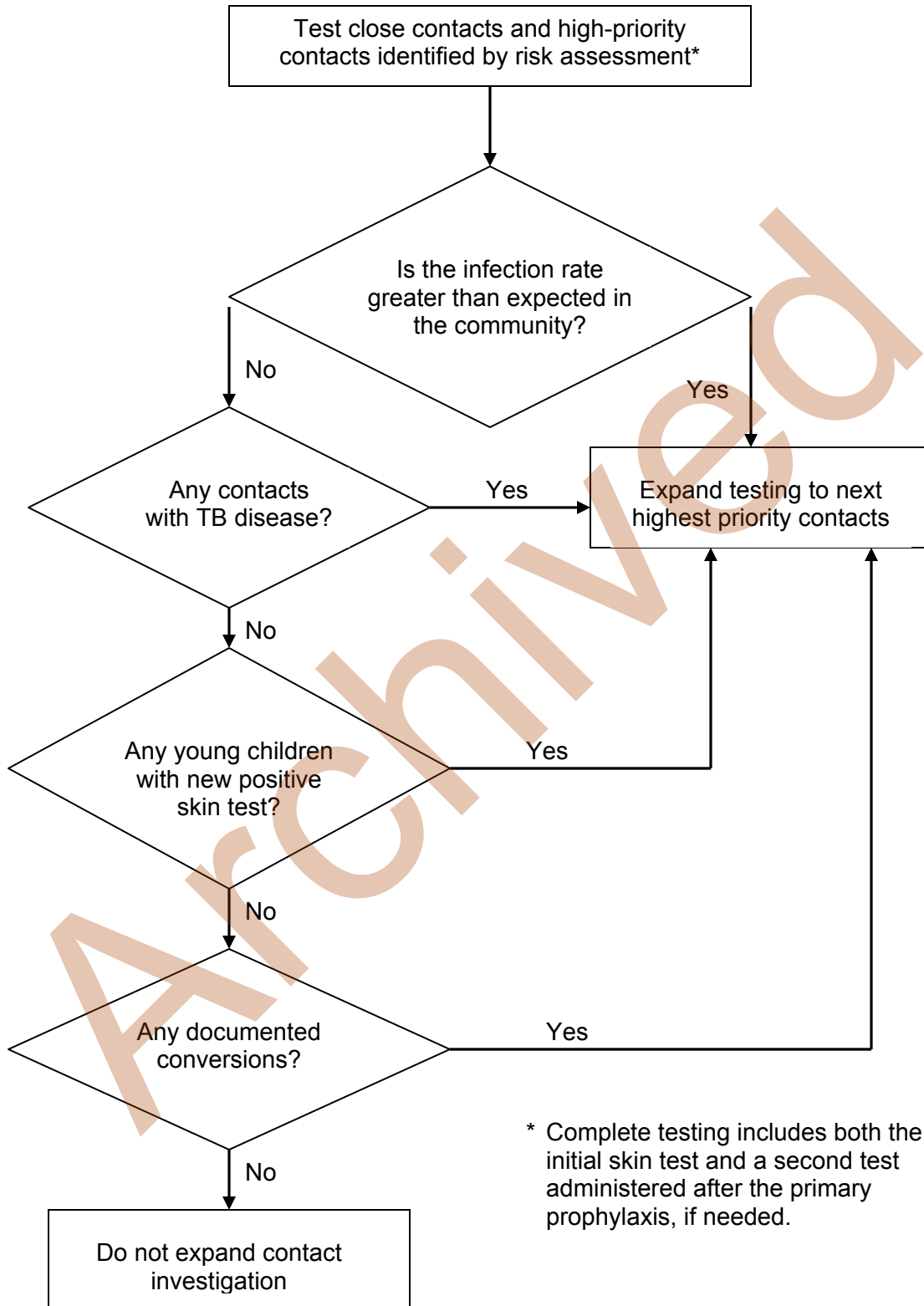
<http://www.phac-aspc.gc.ca/tbpc-latb/pubs/tbstand07-eng.php>

If no evidence of transmission is found among the initial cohorts prioritized for evaluation, the investigation is not usually expanded.

If evidence of transmission is found, the likelihood increases that MTB was also transmitted to contacts that had less exposure than the initial cohorts (“circles”) prioritized for evaluation. Expansion of the investigation to include contacts with less exposure may be warranted. Usually this will mean evaluating contacts in the next-highest priority group (see *Figure 4-3, Expansion of contact investigation activities*).

Because it may take time to process information from the first circle of contacts, it is usually wise to construct lists of contacts in the next circle.

Figure 4-3: Expansion of contact investigation activities⁸⁰



⁸⁰ CDC Self Study Modules on Tuberculosis, Contact Investigation for Tuberculosis, (1999) p. 89.

4.10.12 Evaluation of contact investigation activities

A successful contact investigation not only identifies and screens contacts for MTB infection and disease; it interrupts transmission of infection and prevents future cases of active disease.

Evaluation of activities should be an integral part of completing an investigation, and will assist in determining the extent to which available program resources are adequate as well as how effectively they can be used.

Evaluation of contact activities should be done collaboratively with the provincial TB Contact Coordinator (and the local outpatient TB clinic, if appropriate).

The following criteria should be assessed:

- Were an appropriate number of contacts identified?
- Were the highest-priority contacts located and tested?
- Was contact investigation performed in all settings, e.g., residence, work or school, and leisure or recreational environments?
- Was the investigation expanded appropriately?
- Were contacts completely evaluated and given appropriate treatment if they had TB infection or disease?
- How many infected contacts completed treatment for LTBI?
- Did all identified cases complete an adequate treatment regimen?

The answers to these questions can help to determine not only how successful the investigation has been, but also where additional efforts and/or resources should be directed in future.

4.11 Reverse contact investigation (source case investigation)

Reverse contact investigation, also known as “source case investigation”, is a systematic process similar to contact investigation. The purpose of a reverse contact investigation is to identify the source of MTB infection (i.e., the source case) for an individual who has been diagnosed with active TB disease or found to have recently acquired MTB infection. Reverse contact investigation contributes to TB prevention and control efforts by identifying previously undiagnosed cases of disease.

Reverse contact investigation is most often initiated in response to pediatric cases of active TB disease or MTB infection identified in a child not known to have been in contact with an infectious case. Most source cases are found among the child’s adolescent or adult household contact or caregivers.

Reverse contact investigation may also be initiated if TST (or IGRA) conversions are documented in select congregate living environments, such as correctional institutions.

4.12 TB outbreak management

An outbreak of TB is considered to have occurred if a situation meets either of the following working definitions recently proposed by U.S. Centers for Disease Control and Prevention:

- During (and because of) a contact investigation, two or more contacts are identified as having active TB, regardless of their assigned (contact investigation) priority; or
- Any two or more cases occurring (within) ≤ 1 year of each other are discovered to be linked, and the linkage is established outside of a contact investigation (e.g., two clients who received a diagnosis of TB outside of a contact investigation are found to work in the same office, and only one or neither of the persons was listed as a contact to the other). The linkage between cases should be confirmed by genotyping results if isolates have been obtained.

The identification of a TB outbreak is a critical incident and should be reported immediately to AHS central TB Services or the local outpatient TB clinic and the zonal MOH.

The goals of outbreak management are the same as those for routine contact investigation. The process used to meet the goals is somewhat more complex because outbreak investigations typically require multiple contact investigations to occur simultaneously.

Management of a TB outbreak requires intense collaboration between partners and jurisdictions to ensure:

- roles and responsibilities are clearly defined;
- adequate staffing and resources are maintained or made available;
- staff are adequately trained;
- appropriate investigation and management of cases and contacts;
- appropriate and effective communication and reporting occurs.

As with evaluation of routine contact investigation, evaluation of both the process and outcomes of an outbreak investigation is crucial.

4.13 Recommended resources for contact investigation

Canadian Tuberculosis Standards, 6th Edition, Chapter 12 .

Available online from:

http://www.phac-aspc.gc.ca/tbpc-latb/pubs/pdf/tbstand07_e.pdf

Effective TB interviewing for contact investigations, self study modules (2006)

Available online from:

http://www.cdc.gov/tb/publications/guidestoolkits/Interviewing/selfstudy/pdf/tbinterviewing_ssmodules.pdf

Guidelines for the investigation of contacts of persons with infectious tuberculosis (2005)

Available online from:

<http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5415a1.htm>

Self-study modules on tuberculosis, module 6, contact investigations for tuberculosis (1999)

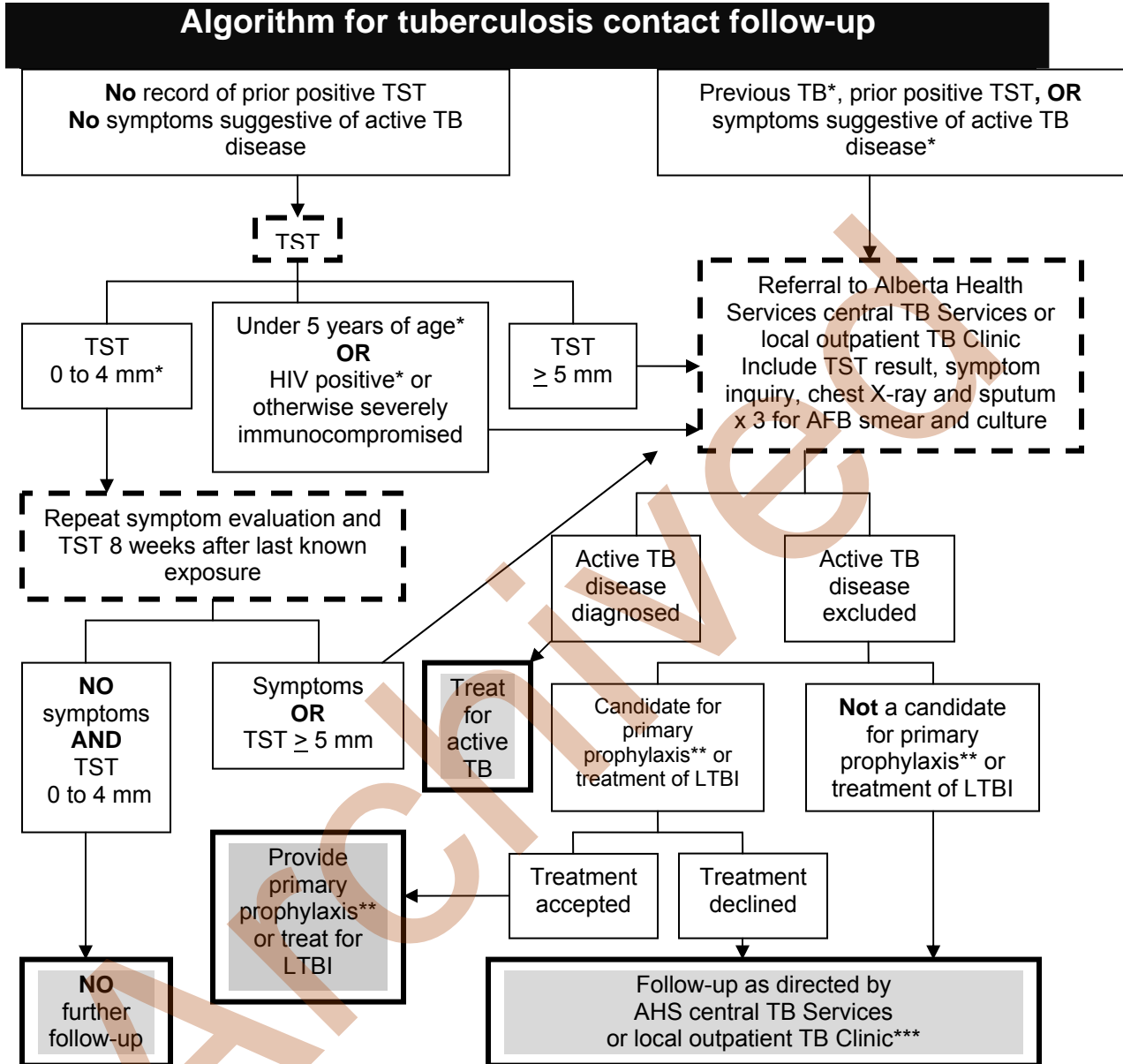
Available online from:

www.cdc.gov/tb/education/ssmodules/pdfs/6.pdf

TB education and training resources website

<http://www.findtbresources.org>

Figure 4-4: Algorithm for tuberculosis contact follow-up



* Both posterior-anterior (PA) and lateral chest X-ray views are required if the contact is under 15 years of age, and/or symptomatic for active TB disease, and/or immune suppressed (e.g., HIV infected), and/or has a history of prior TB disease *unless the client is pregnant* (see Section 2.2.2.2, *Special considerations in chest radiography*). Contacts with X-ray findings that include radiologic descriptors of TB (see Section 2.2.2.1), should be referred to AHS central TB Services or the local outpatient TB clinic, regardless of TST result.

** Primary prophylaxis (see Section 4.10.8 *Special considerations in evaluation and management of TB contacts*)

*** TST converters who decline treatment for LTBI are followed with symptom inquiry, chest X-ray and sputum for AFB smear and culture at 6, 12, and 24 months post exposure. Follow-up for other contacts for whom treatment of LTBI is indicated but declined or not completed should include repeat symptom inquiry, chest radiography and sputum sample examination for AFB smear and culture) at 12 months post-exposure.

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5. Tuberculosis prevention programs

5.1 Treatment of latent TB infection (LTBI)

It is not possible to prevent infection with *Mycobacterium tuberculosis* (MTB) through vaccination. Although BCG vaccine may prevent progression from infection to disease in some individuals, its ability to do so is variable and unreliable. Currently, efforts to prevent TB disease after infection with MTB revolve around the use of antituberculosis drugs, primarily, isoniazid (INH).

This strategy was referred to as “chemoprophylaxis” or “preventive therapy” in the past. In keeping with the terminology of the *Canadian Tuberculosis Standards*, it will be referred to as “treatment of latent TB infection” (LTBI) throughout this manual. Although the terminology may have changed, the principles of this approach to TB prevention have remained the same; use antituberculosis drugs to treat infection with MTB before active disease develops.

Treatment for LTBI is not mandatory and individuals have the right to refuse treatment. If treatment is indicated but not taken, follow-up may be recommended (see *Section 5.1.7, Follow-up of individuals who do not complete LTBI treatment*).

5.1.1 Indications for treatment of LTBI

Although treatment of LTBI has been shown to be a reliable way to prevent TB disease, it is not offered to every person who is infected with MTB. LTBI treatment is targeted primarily at populations and individuals most likely to:

- **Be infected with MTB.** Testing methods to identify infection with MTB are not infallible; tuberculin skin testing (TST) cannot differentiate between infection with MTB, or cross-reactivity to tuberculin caused by prior BCG vaccination or infection with other (nontuberculous) mycobacteria. Interferon Gamma Release Assay (IGRA) testing, while more specific, may not be available or appropriate for use with all individuals.
- **Progress from infection to active disease.** Age (advanced or very young) and other factors can influence the risk of progression to active disease.

The relative risk for some conditions/considerations has been determined (see *Table 2-3: Risk factors for the development of active tuberculosis among persons infected with Mycobacterium tuberculosis*). The relative risk of others (e.g., alcohol use/misuse, IV drug use, lymphoma, leukemia) while known to increase the risk for progression to active disease, remain unknown.

- **Tolerate treatment.** The probability of drug tolerance/intolerance can often be predicted based on:
 - Liver health. Individuals with a history of liver disease or alcohol overuse may have difficulty tolerating medications typically used to treat LTBI.
 - Potential for interaction between TB medications and others that the person may already be taking.
 - Age. Older people are more likely to develop adverse reactions to TB medications than younger ones.

NOTE: Age alone (e.g., ≥ 35 years) is not a contraindication to treatment of LTBI if the risk of progression to active disease is greater than the risk of serious adverse reactions to treatment⁸¹.

- **Cause major public health consequences were they to develop infectious TB disease.** Some individuals may pose an increased risk to public health by virtue of who they might infect. For example, day care workers, kindergarten and elementary school teachers, health care workers attending immune compromised clients, etc.
- **Comply with treatment recommendations.** Some individuals may be unable to reliably make arrangements to access treatment such as those with unstable housing or active substance abuse. Others may have demonstrated poor adherence to treatment regimens in the past. Short-stay, foreign-born students may not remain in Canada long enough to complete an adequate course of treatment.

Individuals should be referred as outlined in *Table 5-1, Tuberculin skin test (TST) cut points for referral to AHS central TB Services or an outpatient TB clinic for consideration of treatment for latent TB infection*, which follows. .

⁸¹ Ibid, p.132.

Table 5-1: Tuberculin skin test (TST) cut points for referral to AHS central TB Services or an outpatient TB clinic for consideration of treatment for latent TB infection

TST result (induration size)	Refer for consideration of treatment for LTBI if:
< 5 mm	<ul style="list-style-type: none"> • HIV infected OR otherwise severely immune suppressed AND at HIGH risk for infection with MTB (e.g., contact with infectious TB, from a high TB incidence country, or abnormal chest radiograph) • Less than five years of age AND at HIGH risk of infection with MTB (e.g., contact with infectious TB, time spent in a refugee camp)
≥ 5 mm	<ul style="list-style-type: none"> • HIV infection • Recent contact with infectious TB • Fibronodular disease on chest radiograph (healed TB but not previously treated, or if treated, not adequately treated) • Organ transplantation (related to immune suppressant therapy) • Other immune suppressive drugs, e.g., corticosteroids (equivalent of > 15 mg/day of prednisone for one month or more; risk of TB disease increases with higher dose and longer duration)
≥ 10 mm	<ul style="list-style-type: none"> • TST converters (within prior two years) • Other immune suppression • Silicosis • End-stage renal disease • Carcinoma of the head and neck* • Consider treatment for those who have resided or traveled in a high TB incidence country (see Canadian Tuberculosis Standards 6th Edition, Chapter 13, Surveillance and Screening in Tuberculosis Control) or Canadian Aboriginal community within the past two years, are HIV-seronegative injection drug users (current or past use), are workers or residents in a health care facility or correctional facility, or are homeless and can be treated with directly observed preventive therapy** • Others, not listed above, may, at the discretion of the treating physician, also be considered for treatment; for example, those identified as being at “increased risk”

* Other tumours, such as T-cell lymphomas, may also increase the risk of progression to active TB disease

** Age alone (e.g., ≥ 35 years) is not a contraindication to treatment of LTBI if the risk of progression to active TB disease is greater than the risk of serious adverse reactions to treatment.

5.1.2 Process for initiation of LTBI treatment

Treatment of LTBI in the Province of Alberta is overseen by AHS central TB Services and by extension, the outpatient TB clinics.

Other than *Client Education*, the following sections describe the process undertaken for initiation of LTBI treatment when it is recommended *for clients referred to AHS central TB Services*. The processes for initiation of LTBI treatment through the

outpatient TB clinics may differ from what is described here; practitioners seeking information about those processes should consult with the appropriate outpatient TB clinic.

Client education

Clients whose TST (or IGRA test) results are such that referral for consideration of treatment for LTBI is indicated should be provided information regarding the following:

- the reason(s) LTBI treatment is recommended for them
- the likely duration of treatment
- the benefits of treatment if it is completed
- possible side-effects of the medication(s) and potential drug interactions
- what to expect in regards to follow-up should they decline treatment

All clients who begin treatment for LTBI should be provided information about:

- possible adverse effects of the medications they are prescribed and what to do in the event that side effects occur;
- factors that may increase their risk for adverse effects (e.g., use of alcohol, use of some over-the-counter medications);
- importance of compliance with treatment.

Female clients of childbearing age should generally be advised to avoid pregnancy during treatment of LTBI. Clients who are already pregnant are not usually recommended treatment of LTBI; two exceptions to this general rule are recent TST converters and clients with HIV co-infection.

Taking the time to provide clients with this information will assist them to make an informed decision about whether or not to agree to treatment if it is recommended for them. Ultimately, this will lead to improved compliance and adherence if treatment is undertaken.

Referral of client to AHS central TB Services

Referral to AHS central TB Services should be made as described in *Section 1.5, Indications and processes for TB follow-up referrals using a Tuberculosis Referral Form (Appendix G)*.

Information about any client meeting the criteria for LTBI treatment should be referred, even if the client has indicated they do not wish to undergo treatment for LTBI. If a client indicates they do not wish to undergo treatment for LTBI, this should

be noted on the referral form. Referral of such clients ensures that follow-up recommendations, if appropriate, can be made by the TB Consultant. If the client is at particularly high risk then they may be asked to reconsider their decision not to take preventive therapy.

A thorough TB history and symptom inquiry should be conducted and reported on the *Tuberculosis Referral Form*. In addition, referred information should include a recent chest X-ray.

Radiographs taken more than six months prior to the date of the referral will not be accepted; in selected individuals (e.g., HIV-infected persons) a very recent (e.g., within the past one to three months) X-ray may be requested.

If no recent chest X-ray is available, the referral form should be used as a requisition to order a radiograph; doing so will ensure the X-ray is forwarded to AHS central TB Services.

Three sputum samples for AFB smear and culture should be submitted for clients able to provide them. This is especially important for those clients at high risk for progression to active TB disease and/or those noted to have symptoms or signs suggestive of active TB disease at the time of evaluation. If sputa have been submitted, this should be indicated on the form. If the client is asymptomatic, has a lung scar consistent with old, healed TB, it is recommended that they submit one, preferably two, induced sputa for AFB smear and culture (see *Appendix B Respiratory specimen collection*).

Notification of family physician

Referrals for consideration of treatment of LTBI are reviewed by a TB Nurse Consultant, along with chest X-ray(s) and other relevant reports (e.g., AFB smear/culture reports) prior to treatment and/or follow-up recommendations being made. Once this information has been considered, a *Tuberculosis Update Form* (*Appendix G*) and, if treatment is recommended, a *Recommendation for Preventive Therapy* form (*Appendix G*) will be sent to the family physician and a copy forwarded to the zonal TB Coordinator(s) or CHN (First Nations communities).

If LTBI treatment is recommended, the family physician will be directed to review and sign the *Recommendation for Preventive Therapy* form if in agreement and then forward it to the nearest local public health office. A copy of this form will also be sent by AHS central TB Services to the zonal TB Coordinator(s) (or CHN) so he or she is aware of the recommendations.

If LTBI treatment is recommended but declined in advance by the client, recommendations for follow-up (if appropriate) will be made by the TB Nurse Consultant and forwarded to the zonal TB Coordinator(s) (or CHN) and the family physician by AHS central TB Services.

Consultation between public health nurse/community health nurse, family physician and client

Upon receipt of the signed form from the family physician, the zonal TB Coordinator(s) (PHN or CHN) should consult with the family physician to clarify who will contact the client to discuss the treatment and/or follow-up recommendations.

The CHN or PHN must also co-sign the *Recommendation for Preventive Therapy* form and return it to AHS central TB Services.

NOTE: Medication dose is weight-dependent, so the client's weight must be recorded on the form prior to it being returned to AHW central TB Services.

Obtaining medication supply

Drugs for the treatment of LTBI are provided at no cost to clients through AHS central TB Services.

Upon receipt of a completed (co-signed) *Recommendation for Preventive Therapy* form at AHS central TB Services, an initial supply of medications will be sent by mail or courier to the zonal TB Coordinator(s) PHN or CHN. Accompanying the medication will be a detailed summary of the monitoring requirements and potential toxicity/drug interactions.

Distribution of medication to clients

Directly observed preventive treatment (DOPT)

In accordance with the *Canadian Tuberculosis Standards*, 6th Edition (2007), directly observed preventive treatment (DOPT) is the standard of care in Alberta for intermittent treatment of LTBI. In Alberta all First Nation communities receive DOPT.

In Alberta, DOPT should be seriously considered:

- whenever directly observed therapy is being administered to an active case in the same home
- in very high risk situations or communal settings (e.g., converters (especially if they are children, HIV positive individuals, or residents of a correctional facility)
- when treating clients attending Methadone clinics
- when treating clients with a history of depression or other serious psychiatric illness
- when treating clients on dialysis

Treatment arrangements (e.g., scheduling of doses) for clients receiving DOPT should be negotiated between the client and provider.

Self administered preventive treatment

Clients who are self-administering preventive treatment should be assessed in person by the PHN (or equivalent, e.g., CHN) at least once per month throughout treatment.

No more than a one month supply of medication should be provided to a client at any time (the remainder of the medications should be retained at the public health unit for monthly distribution to the client). Any exceptions to this recommendation must be discussed in advance with the TB Control physician involved.

Baseline and ongoing monitoring of clients undertaking treatment for LTBI should be done in accordance with *Section 5.1.4, Baseline and ongoing monitoring*, which follows.

5.1.3 Medications and regimens for treatment of LTBI

5.1.3.1 Medications

Isoniazid (INH) and/or rifampin (RMP) are the medications most frequently used to treat LTBI. These medications are also used to treat active TB disease, as part of multi-drug regimens. Under extraordinary circumstances, a fluoroquinolone might be considered to treat LTBI.

Additional information about INH and RMP, including common side effects, is presented in *Appendix C, Drug information reference tables* and *Appendix D, Common adverse reactions to antituberculosis medications*.

NOTE: Consultation with both the client's family physician and a pharmacist is recommended prior to initiation of treatment to identify potential drug-drug interactions.

i. Isoniazid (INH)

INH is the drug primarily used in Alberta for treatment of LTBI. The use of INH for this purpose has been widely-researched and found to be safe, well-tolerated, and effective when taken with reasonable adherence ($\geq 80\%$ doses taken) for an appropriate duration of time.

INH can be hepatotoxic, therefore baseline liver function evaluation is required. Ongoing monitoring of liver function is recommended for individuals ≥ 20 years of age during treatment with this drug and those with abnormal baseline findings

and/or considered to be at increased risk for hepatotoxicity (see *Section 5.1.4, Baseline and ongoing monitoring*).

Overdose of INH can be fatal (See *Section 5.1.6.1*)

INH can interfere with metabolism of phenytoin (Dilantin®) and carbamazepine (Tegretol®). Monitoring and dosage adjustment of these medications may be required during treatment with INH.

ii. Pyridoxine (Vitamin B6)

Pyridoxine has no antibacterial properties; the addition of pyridoxine is commonly recommended for regimens containing INH due to potential for development of neuropathy.

NOTE: Breastfed children of women taking INH should also receive pyridoxine supplementation, in a dose determined in accordance with the child's weight and in consultation with the child's pediatrician.

iii. Rifampin (RMP)

RMP-containing regimens may also be used to treat LTBI. It may be used by itself (e.g., if INH is inappropriate or contraindicated) or in combination with INH.

Although less so than INH, RMP can be hepatotoxic, therefore baseline liver function evaluation is required. Baseline evaluation of CBC, WBC, and platelet count is also required. Ongoing monitoring is recommended for individuals ≥ 20 years of age during treatment with this drug and those with abnormal baseline findings and/or considered to be at increased risk for hepatotoxicity (See *Section 5.1.4, Baseline and ongoing monitoring*).

RMP may induce hepatic enzymes and accelerate clearance of estrogens (e.g., birth control pills), cyclosporins, coumadin, glucocorticoids, and sulfonylureas. Dosage adjustment may be required. Alternative forms of contraception are necessary when RMP is prescribed.

Clients receiving RMP should be advised that their urine and body secretions (tears, saliva, perspiration) may become orange-red in colour, and soft contact lenses may permanently discolour.

NOTE: Rifabutin may be used instead of RMP for individuals on particular antiretroviral therapy regimens. See *Appendix C, Drug information reference tables* and *Appendix D, Common adverse reactions to antituberculosis medications* for information about rifabutin.

5.1.3.2 Regimens

i. Isoniazid (INH)

Used alone, INH can be administered daily or intermittently (i.e., twice or thrice-weekly). Intermittent therapy must be directly observed. Completion of INH therapy is determined by total number of doses taken within a set period of time (see *Table 5-2, Standard regimens for treatment of latent TB infection*, which follows).

ii. Rifampin (RMP)

Used alone, RMP must be taken daily. Completion of RMP therapy is determined by total number of doses taken within a set period of time (see *Table 5-2, Standard regimens for treatment of latent TB infection*, which follows).

iii. INH and RMP

A regimen which includes both INH and RMP has also been proven suitable treatment for LTBI.

In Alberta, this regimen is most often used for LTBI treatment in high-risk contacts residing in First Nations communities and in select congregate living environments (e.g., correctional institutions).

Table 5-2: Standard regimens for treatment of latent TB infection (LTBI)

Drug(s)	Dosing interval	Mode of treatment	Duration of therapy	Doses required to complete	Maximum time interval to complete
INH	daily	self administered	9 months	270	12 months
INH	2x/wk	directly observed	9 months	78	12 months
RMP	daily	self administered	4 months	120	6 months
RMP	daily	directly observed *	4 months	120	6 months
INH & RMP	2x/wk	directly observed	6 months	52	9 months

* In general, "daily" DOT for LTBI is meant to describe treatment that is observed seven days a week. If DOT for LTBI is provided five days a week (i.e., Monday through Friday), treatment should continue until the total number of required doses have been *observed*, e.g., the 4-month daily DOT RMP regimen for treatment of LTBI may be considered complete once 120 directly observed doses have been taken (provided this occurs within six months of beginning treatment).

iv. Compliance and completion of LTBI treatment

Brief periods of non-compliance are usually unavoidable. Maximum time intervals for completion of the various LTBI treatment regimens are provided in *Table 5-3*, above. All extended interruptions should be discussed with AHS central TB Services or the outpatient TB clinic managing the client's treatment prior to continuing/restarting treatment.

Completion of treatment is determined by review of the compliance information provided by Public Health. Recommendations regarding discontinuation of treatment and post-treatment follow-up (if indicated) are communicated to Public Health by AHS central TB Services by way of the *Preventive Therapy Form* (see *Appendix G*).

NOTE: In general, follow-up of clients who are determined to have completed an adequate course of treatment is not required.

5.1.4 Baseline and ongoing monitoring

See the worksheet entitled, *Standard monitoring schedule for clients receiving treatment for latent TB infection (LTBI)*, which follows.

NOTE: The family physician and AHS central TB Services or the outpatient TB clinic managing the client's treatment should be advised if:

- abnormal blood work results are found (at baseline or in the course of routine monitoring)
- the client reports symptoms such as stomach upset, nausea, vomiting, anorexia (loss of appetite), dark urine, or scleral icterus⁸² - under these circumstances treatment should be withheld and blood work repeated
- the medication is put "on hold" or discontinued
- the client believes she may be, or is, pregnant
- the client moves or is lost to follow-up

5.1.4.1 Blood work

Both INH and RMP may be hepatotoxic, therefore baseline liver function testing (ALT or AST) is required before treatment for LTBI is initiated. Additional tests are required if RMP (or rifabutin) is included in the regimen, i.e., WBC, CBC, platelets.

Specific test and timing requirements for baseline and ongoing blood work monitoring for clients recommended for treatment of LTBI will be provided in the bottom left hand corner of their *Preventive Therapy Form*. Frequency of monitoring may be increased for clients at greater risk for adverse effects.

⁸² Ibid, p.136.

5.1.4.2 Ongoing clinical evaluation

Clients who are self-administering preventive treatment should be assessed in person by the PHN (or equivalent, e.g., CHN) at least once per month throughout treatment.

The purpose of ongoing clinical monitoring is to identify promptly any signs/symptoms of drug toxicity (or other adverse effects of treatment) or progression to active TB disease. Clinical monitoring also provides an opportunity to:

- lend ongoing support to clients/caregivers
- provide education about TB and LTBI treatment to clients and families
- refill medication supplies
- monitor for and encourage, compliance to treatment
- identify and overcome any possible challenges to compliance

NOTE: Clients receiving a self-administered regimen of INH, RMP or both, should be instructed to discontinue their medication on their own should they develop symptoms that suggest hepatotoxicity. They should then contact their PHN to let them know that they have done this.

5.1.4.3 Documentation and communication with AHS central TB Services

PHNs should record test results, findings from clinical evaluation visits with the client, and compliance information (the number of doses that should have been taken since last contact with the client and the actual number of doses reported taken by the client) on a *Preventive Therapy Form*.

The *Preventive Therapy Form* should be submitted to AHS central TB Services at the end of every second month (or as requested by AHS central TB Services to ensure the TB Registry is able to provide public health staff with up-to-date information regarding clients' treatment and monitoring. This practice also allows AHS central TB Services to maintain and provide accurate compliance records and ensures a consistent supply of medications (see *Section 5.1.5*, below).

For clients on directly observed treatment of LTBI, both the *Preventive Therapy Form* and a *Directly Observed Therapy Record (Appendix G)* should be completed and submitted to AHS central TB Services. These records must also be submitted to AHS central TB Services at the end of every second month.

5.1.5 Medication supply

Additional supplies of medication can be obtained as needed by completing the appropriate data field on the *Preventive Therapy Form*. Additional drug supplies **ARE NOT** sent out automatically; they must be requested using the *Preventive Therapy Form*.

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Table 5-3: Standard monitoring schedule for clients receiving treatment for latent TB infection (LTBI)

NOTE: A full assessment to exclude active TB disease (i.e., signs/symptom review, sputum for AFB) and baseline evaluation of liver function (ALT or AST for INH, ALT or AST and CBC/WBC/platelets for clients taking RMP) is required for all clients prior to initiation of LBTI treatment*.

Regimen	Age	ALT or AST	CBC platelets WBC	Assessment for signs/symptoms of TB disease and/or drug toxicity **
Isoniazid (INH)	< 20 years	not routinely required after baseline	not routinely required after baseline	Monthly
	≥ 20 to 35 years	1, 2 and 3 months after treatment start	not routinely required	Monthly
	> 35 years	1, 2, 3, and 6 months after treatment start	not routinely required	Monthly
INH & Rifampin	< 20 years	not routinely required after baseline	not routinely required after baseline	Monthly
	≥ 20 to 35 years	1, 2 and 3 months after treatment start	1, 2 and 3 months after treatment start	Monthly
	> 35 years	1, 2, 3, and 4 months after treatment start	1, 2, 3, and 4 months after treatment start	Monthly
Rifampin (RMP)	< 20 years	not routinely required after baseline	not routinely required after baseline	Monthly
	≥ 20 years	1, 2, and 3 months after treatment start	1, 2, and 3 months after treatment start	Monthly
<p>* Client-specific requirements for monitoring will be provided in the bottom left hand corner of the client's TB Update Form. Additional and/or more frequent monitoring may be required, depending on individual clients' risk factors for TB disease and/or development of drug toxicity. Blood work may be repeated at the end of treatment (i.e., after the final month of medications have been completed) at the discretion of the physician managing the treatment, e.g., for clients with known liver disease and abnormal baseline aminotransferase.</p> <p>** The family physician and AHS central TB Services or the outpatient TB Clinic managing the client's care should be contacted if a client is found to have signs/symptoms suggestive of active TB disease and/or drug toxicity.</p>				

5.1.6 Special considerations

Some clients on LTBI medication may require special considerations. The following items discuss these considerations in detail.

5.1.6.1 INH overdose

Overdose of INH can be fatal. Immediate medical assessment and intervention is required.

The risk of overdose must always be considered in clients provided a one month supply of INH (the equivalent of 150 mg/kg if taken all at once) for self-administration.

Peak blood concentrations of INH are usually reached within 30 to 90 minutes after ingestion. In the blood, INH combines with Vitamin B6 (pyridoxine). High doses of INH can result in depleted body stores of pyridoxine and have potentially fatal effects.

Symptoms of INH overdose include:

- nausea;
- vomiting;
- dizziness;
- slurred speech;
- blurred vision;
- dilated pupils;
- tachycardia; and sometimes
- retention of urine.

Stupor, coma and seizures may then follow. These seizures, if not controlled, may lead to death from brain damage, aspiration or hypoxia.

Management of INH overdose

Treatment of INH overdose usually requires the administration of intravenous pyridoxine. The nearest emergency treatment provider should be accessed in the event of a suspected INH overdose.

5.1.6.2 Pregnancy and breastfeeding

i. Pregnancy

Although INH and RMP are considered safe for use during pregnancy, treatment of LTBI during pregnancy is generally not recommended except for women who are coinfecting with HIV and/or those with recently-acquired MTB infection.

If treatment is deferred until after the postpartum period, active TB disease should be ruled out before initiation of therapy.

Vitamin B6 (pyridoxine) should be included in the treatment regimen for pregnant women and women in the first postpartum year who undergo LTBI treatment. These women should receive careful clinical and laboratory monitoring for INH-induced hepatitis. This should involve strict adherence to the recommended monitoring protocol and an increased willingness on the part of the family physician to monitor beyond the protocol in the event of any evidence (clinical or laboratory) of toxicity.

ii. Breastfeeding

Breastfeeding during INH or RMP-based treatment for LTBI is not contraindicated unless the mother is coinfecting with HIV. These drugs appear in very small concentrations in breast milk and do not produce toxic effects in newborns. Consequently, the amount of medication in breast milk should be considered inadequate for treatment of LTBI in the child.

Breastfeeding women who undergo LTBI treatment with INH should receive supplemental Vitamin B6 and have careful clinical and laboratory monitoring. Supplemental Vitamin B6 should be given to infants of breastfeeding mothers receiving INH⁸³ in a dosage as determined by a pediatrician.

5.1.6.3 Infants and young children

Infants and young children are at significant risk of rapid progression to serious and potentially life-threatening forms of active TB disease if infected with MTB, therefore treatment of LTBI in this population is very important.

In general, INH-based or combination (INH and RMP) LTBI treatment will be recommended, unless the child is believed to be infected with an INH-resistant strain.

⁸³ Ibid, p.192.

Ongoing laboratory monitoring of liver function (beyond baselines assessment) in children is not routinely required unless the child:

- has symptoms suggestive of liver dysfunction (e.g., malaise, nausea, icterus);
- is taking other hepatotoxic medications;
- is known to have underlying liver disease; or
- is known to have other risk factors for development of hepatotoxicity

Exceptional care must be taken to ensure infants and young children are given the correct dose of medication. Families and/or caregivers must be advised that accidental overdose of INH can be **fatal** and **immediate** medical intervention is necessary should this occur (see *Section 5.1.6.1*, above). They should also be educated about the symptoms of drug toxicity, hepatotoxicity, and active TB disease, and aware that therapy should be discontinued and the child assessed promptly by family physician should any be noted. AHS central TB Services or the outpatient TB clinic managing the child's treatment should be notified.

Administration of medications to infants and young children can be very challenging. It is important to note that care must be taken in the preparation of medications into forms other than the way they were originally dispensed from pharmacy services (e.g., cut, crushed, opened, or dissolved). Suggestions to assist health care providers and caregivers with this task are provided in *Appendix E Tips for administering TB medications*.

5.1.6.4 People living with HIV

Individuals coinfecting with HIV and MTB are the group at highest risk for progression to active TB. The importance of treatment of LTBI in this population can not be overemphasized.

Whenever possible, directly observed treatment should be provided unless directly observed therapy would be an impediment to successful LTBI treatment.

Daily or twice-weekly INH-based treatment is generally recommended, unless the individual has been exposed to an INH-resistant case, in which case daily RMP may be recommended. Rifabutin may be used instead of RMP for individuals on particular antiretroviral therapy regimens⁸⁴. Collaboration with other care providers (i.e., HIV clinics) is essential to ensure appropriate care of these clients.

⁸⁴ Ibid, p.205.

5.1.6.5 Renal failure

Both INH and RMP are metabolized by the liver, therefore serum drug concentrations are not affected by renal failure and doses need not be adjusted. Additional clinical or laboratory monitoring is not usually required.

Although neither drug is affected by dialysis, directly observed therapy for LTBI is ideal in this high risk group to ensure adherence and close monitoring of side effects. Renal dialysis staff can be an integral part of the directly observed therapy, utilizing the dialysis schedule.

5.1.6.6 Concurrent hepatic disease/risk

The use of INH and/or RMP to treat LTBI in individuals with concurrent hepatic disease (or risk for same) requires close clinical and laboratory monitoring be done throughout treatment. This should involve strict adherence to the recommended monitoring protocol and an increased willingness on the part of the family physician to monitor beyond the protocol in the event of any evidence (clinical or laboratory) of toxicity.

Liver toxicity should be monitored weekly during the first month of treatment and then every two weeks during the second month of treatment and as recommended thereafter.

It is imperative that these individuals be well-aware of the symptoms of hepatotoxicity and that treatment should be discontinued and clinician assessment sought if symptoms occur.

5.1.6.7 Drug resistance

LTBI treatment regimens for individuals who are suspected to have acquired MTB from a drug resistant source can be complex. If TB infection from a drug-resistant source case is suspected, a suitable regimen will be individually determined by the TB Consultant.

5.1.7 Follow-up of individuals who do not complete LTBI treatment

Although it may be indicated, LTBI treatment may not be initiated, or if initiated, may not be completed. This can occur for several reasons, including:

- contraindications, e.g., prior adverse reactions to INH and/or RMP
- adverse reactions that develop during treatment
- client refusal to begin or complete treatment

Regardless of the reason, if treatment is indicated but not completed, follow-up is usually recommended. This recommendation will be included on the *Recommendation for Preventive Therapy* form.

The purpose of the follow-up is to ensure that active TB disease is identified promptly should it develop. The type and frequency of follow-up recommended will vary according to clients' risk of progression to active TB disease, and to some degree, their availability to be followed.

In general, individuals at high risk of progression will be followed more closely (frequently) than those at lesser risk.

Recent TST converters (i.e., those whose TST has converted from negative to positive within the prior two years) will be recommended for follow-up for the two years following the identification of the conversion. This evaluation should be completed 6, 12, and 24 months following identification of TST conversion, and should include:

- symptom inquiry
NOTE: Immediate and follow-up management of such individuals should proceed as described in *Section 2.2.1.3 and/or Section 2.2.1.4* (depending whether or not symptoms are suggestive of active respiratory TB), *regardless of TST result.*
- three sputum samples for AFB smear and culture, if possible
- chest radiography

5.2 Bacille Calmette-Guérin (BCG)

5.2.1 Indications for use

In Alberta, BCG is only offered to children born into selected First Nations communities, specifically those communities determined by First Nations Inuit Health, Alberta Region, to have a high incidence of TB and a high acceptance of BCG.

BCG is no longer available in Alberta to travelers or individuals studying abroad.

Those anticipating an extended stay in areas of high TB incidence should discuss the risk of travel to such an area with their physician and determine an appropriate means of TB prevention and follow-up upon return. The information provided in *Section 2.1.1.2, Travelers to TB endemic countries*, may be of some assistance in this regard.

5.2.2 About the vaccine

BCG is a live attenuated vaccine derived from *Mycobacterium bovis*. It is the only vaccine currently available against TB. BCG is also used as immuno-modulatory therapy in the treatment of urinary bladder cancer.

BCG vaccine does not provide absolute protection against TB; the efficacy and duration of protection offered by BCG is variable. Therefore, TB disease should be considered possible in individuals with symptoms or signs suggestive of active TB disease, regardless of BCG vaccination history.

BCG has not been shown to reliably prevent infection with MTB or prevent the development of active TB disease in those already infected with MTB. However, if infection after vaccination does occur, BCG may interfere with bacterial multiplication and dissemination, thereby preventing the development of disseminated forms of TB disease such as miliary TB and TB meningitis. BCG vaccination has been found to confer significant protection against TB meningitis (64% [95% CI 30%-82]) and disseminated TB disease (78% [95% CI 58%-88%]) in newborns when compared to unvaccinated children.⁸⁵ The efficacy of BCG in adults is likely less than that in children⁸⁶.

Revaccination is not recommended. Tuberculin skin testing (TST) should not be considered a reliable method for evaluating immunogenicity after vaccination nor should TST be deferred because of history of BCG immunization.

⁸⁵ Canadian Immunization Guide, 2006.

⁸⁶ Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition, Canadian Lung Association and Public Health Agency of Canada, 2007, p.350.

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6. Glossary

Aboriginal peoples: Descendants of the original inhabitants of North America. The *Constitution Act* of 1982 recognizes three major groups of Aboriginal people in Canada: Indians (Status and non-Status North American Indians), Métis, and Inuit.

Acid-fast bacteria (bacilli): Microorganisms that are distinguished by their retention of specific stains even after being rinsed with an acid solution. The majority of acid-fast bacilli (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.

Active disease: This denotes the presence of current active tuberculosis, most often on the basis of positive bacteriology but in approximately 10% to 20% 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 an individual with respiratory tuberculosis, aerosols may contain *Mycobacterium tuberculosis* bacteria. Droplets usually evaporate down to a very small size (droplet nuclei), remain suspended in the air, and lead to the spread of infection. Cases with cavitary pulmonary disease or laryngeal TB are generally considered to produce the largest number of infectious aerosols.

Air changes per hour (ACH): The number of air changes per hour in a room; one air change being the 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 and visitors, of personal protective wear (respirators that filter 95% of particles one micron or larger and have less than 10% leak).

Airborne precautions: Measures designed to reduce the risk of airborne transmission of infectious agents such as *Mycobacterium tuberculosis* (MTB). See also *Airborne isolation*.

Bacille Calmette-Guérin (BCG): A live attenuated vaccine derived from *Mycobacterium bovis* used to prevent or moderate tuberculosis disease. See also *Section 5.2, Bacille Calmette-Guérin (BCG)*.

Booster phenomenon: The presence of an initially negative tuberculin skin test (TST) response followed by a positive response when the test is repeated any time from one week to three weeks later. The phenomenon often occurs many years after infection, most notably in the elderly. The initial negative response is based on

the subject's initial failure to "recall", immunologically, prior infection. To avoid inadvertent labelling of a positive response as due to TST conversion, especially when serial skin testing is planned, initial two-step skin testing may be recommended. See also *Section 2.2.5.5, Two-step TST and the booster phenomenon*.

Cavitory 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, cases with cavitory disease tend to be highly infectious.

Cluster: Two or more isolates found to share an identical genotype ("fingerprint") using a method such as Mycobacteria Interspersed Repetitive Unit (MIRU) testing, insertion fragment sequence 6110 (IS6110) based restriction fragment length polymorphism (RFLP) testing or spoligotyping.

Compliance: A term that is often used interchangeably with adherence and refers to the patient's and health care provider's ability to follow management guidelines appropriately. It most often refers to the strict adherence by the patient to the prescribed regimen of antituberculosis drug treatment (for active disease or LTBI).

Concentric circle approach: A method of prioritizing contacts for evaluation that takes into consideration both the duration and frequency of exposure (e.g., "close" contacts versus "casual") and individual contacts' risk for development of active TB disease if infection has occurred. Under this approach, contacts found to be at high risk for infection (e.g., close household contacts) and/or at high risk for progression to disease (e.g., children less than five years of age, immune-suppressed contacts) are prioritized for evaluation over contacts considered to be at lesser risk. If evidence of transmission is found within the initial circle (or circles) of contacts evaluated, the investigation is usually expanded to include contacts in an outer more circle or circles (i.e., contacts considered to be at lesser risk)⁸⁷. See also *Section 4.10.5, Prioritization of contacts*.

Contact: A person identified as having been exposed to someone with active TB disease. The degree of exposure is usually further defined, e.g., close contact (household or non-household), casual contact. See also *Section 4.9, TB contact definitions*.

Conversion: The change in the result of a test for *Mycobacterium tuberculosis* infection (e.g., TST or IGRA testing) that is interpreted to indicate a change from uninfected to infected. See also *Section 4.10.6 (iv), Evaluation of TB contacts - Testing to identify infection with Mycobacterium tuberculosis*

Directly observed therapy (DOT): The process whereby a health care worker or pill dispenser watches the patient swallow each dose of medication, helping to

⁸⁷ CDC, Self Study Modules on Tuberculosis, Contact Investigation for Tuberculosis (1999) p. 3.

ensure that higher treatment completion rates are achieved. See also *Section 3.5, Role of directly observed therapy (DOT)*.

Drug resistant TB: A strain of *Mycobacterium tuberculosis* resistant to one or more of the four first-line drugs: isoniazid, rifampin, pyrazinamide, or ethambutol. See also *Section 3.7.8, Drug Resistant TB (DR-TB)*.

Effective treatment:

- There is clinical improvement; AND
- Drug susceptibility testing has determined the patient's isolate is being treated with an adequate regimen, or in the event that drug susceptibility tests are not yet available, the risk of drug resistance is considered to be very low (see *Section 3.7.8.1, Risk factors for DR-TB*); AND
- There is evidence of adherence to the prescribed regimen for a minimum of two weeks (e.g., the delivery of DOT has been successful).

Extensively drug-resistant TB (XDR-TB): The most recent addition to TB drug resistance terminology. These isolates show resistance to INH, RMP, any fluoroquinolone and at least one of the three injectable second-line drugs (capreomycin, kanamycin, amikacin). See also *Section 3.7.8, Drug Resistant TB (DR-TB)*.

Field investigation: Visiting the case's home or shelter, workplace (if any), and the other places where the case said he or she spent time while infectious. The purpose of the field investigation is to identify contacts and evaluate the environmental characteristics of the place(s) in which exposure occurred.⁸⁸ See also *Section 4.10.3, Field investigation*.

First-line antituberculosis medication: Isoniazid, rifampin, pyrazinamide, and ethambutol. Streptomycin was once but is no longer considered a first-line antituberculosis drug in Canada. See also *Section 3.3.2.1, First-line antituberculosis medication*.

First Nations People: Indian people in Canada, both "Status" and "non-Status". Status Indians are registered with the federal government as Indians, according to the terms of the *Indian Act*.

High tuberculosis incidence countries: Countries that have a rate of sputum smear-positive pulmonary tuberculosis (three year average), as estimated by the World Health Organization, of 15 per 100,000 or greater.

Index case: The first or initial active case from which the process of contact investigation begins.

⁸⁸ CDC, Self Study Modules on Tuberculosis, Contact Investigation for Tuberculosis (1999) p. 3.

Induration: The soft tissue swelling that is measured when determining the tuberculin skin test response to purified protein derivative (PPD) tuberculin. It is to be distinguished from *erythema*, which is not measured.

Infectious TB: Active TB disease of the respiratory tract, capable of producing infection or disease in others. The most infectious cases are thought to be those that are smear-positive in spontaneously expectorated sputum. Cases whose respiratory secretions are smear-negative but culture-positive have fewer bacilli and so generate fewer infectious particles. However, it must be understood that the reduced bacillary concentration of their sputum may be offset by other factors, such as more frequent cough. Clients with evidence of cavitation on plain chest radiograph are also more infectious than those without cavitation. In addition, transmission may be enhanced by crowding, low air exchange rates or longer duration of contact.

Intermittent therapy: Therapy administered two or three times a week. This therapy should always be administered in a fully supervised, directly observed fashion and is usually reserved for the period after the initial intensive daily portion of therapy.

Inuit: An Aboriginal people in Northern Canada, who live primarily in Nunavut, Northwest Territories, northern Quebec and northern Labrador.

Isolation: The separation of a person with known or suspect infectious TB in a place and under conditions that will prevent transmission of MTB to other persons.

Latent tuberculosis infection (LTBI): The presence of dormant (latent) infection with *Mycobacterium tuberculosis* with no evidence of clinically active disease. See also *Section 1.2.3, Pathogenesis*.

Métis: People of mixed Aboriginal and European ancestry who identify themselves as Métis and are distinct from First Nations people, Inuit, or non-Aboriginal people.

Multi-drug resistant TB (MDR-TB): A strain of *Mycobacterium tuberculosis* resistant to at least INH and rifampin (RMP). See also *Section 3.7.8, Drug Resistant TB (DR-TB)*.

Nontuberculous mycobacteria (NTM): All mycobacterial species except those that cause tuberculosis (*Mycobacterium tuberculosis* [including subspecies *M. canettii*], *M. bovis*, *M. africanum*, *M. caprae*, *M. microti*, and *M. pinnipedii*) and those that cause leprosy (*M. leprae*). See also *Section 3.9, Nontuberculous mycobacterial disease*.

Outbreak: See *Section 4.12, TB outbreak management* for this definition.

Polymerase chain reaction (PCR): The process whereby genetic material is amplified and subsequently evaluated for the presence of DNA material to identify various mycobacterial species. See also *Section 2.2.3, Examination of samples for Acid Fast Bacilli (AFB)*.

Poly-resistant TB: A strain of *Mycobacterium tuberculosis* resistant to two or more other first-line drugs (i.e., not INH and RMP). For example, resistance to INH and ethambutol (EMB) or RMP and pyrazinamide (PZA) would be described as poly-resistant TB. See also *Section 3.7.8, Drug Resistant TB (DR-TB)*.

Primary prophylaxis: Treatment of contacts at exceptional risk for development of active TB disease from presumed recent infection with MTB during the period of time between exposure to an infectious case and confirmation of whether or not infection with MTB occurred. See *Section 4.10.8, Special considerations in evaluation and management of TB contacts*.

Secondary case: A contact who has developed TB disease as a result of transmission from a source case.⁸⁹

Second-line antituberculosis drug: Antituberculosis medication other than the first-line drugs (isoniazid, rifampin, pyrazinamide, and ethambutol).

Source case: The person who was the original source of infection for secondary case(s) or contacts. The source case can be, but is not necessarily, the index case.

Status Indian: A person who is registered with the federal government as an Indian, according to the terms of the *Indian Act*. Status Indians are also known as Registered Indians.

Suspect active TB: An illness marked by symptoms, laboratory tests, or radiographic findings consistent with, or suggestive of, TB *but not yet confirmed*.

⁸⁹ CDC, Self Study Modules on Tuberculosis, Glossary Modules 6-9, (1999) p. 7.

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Appendix A: Public Health Act and Communicable Diseases Regulation for Tuberculosis (TB)

The legislation supporting the Tuberculosis Control Program in Alberta is found in the Alberta *Public Health Act* and the *Communicable Diseases Regulation*, under which the Act is translated.

Schedule 1 of the *Communicable Diseases Regulation* identifies tuberculosis (TB) as a notifiable communicable disease. Additional key aspects of the *Public Health Act* and *Communicable Diseases Regulation*, as they relate to TB, are summarized in this appendix. Readers are encouraged to familiarize themselves with these documents, and when important, confirm the accuracy of information contained within this appendix as the actual documents may be subject to revision.

Copies of the *Public Health Act* and *Communicable Diseases Regulation* are available from the Alberta Queen's Printer.

Alberta Queen's Printer Bookstore
Main Floor, Park Plaza
10611 - 98 Avenue
Edmonton, AB T5K 2P7
Phone: 780-427-4952
Fax: 780-452-0668

Or online at: <http://www.qp.gov.ab.ca/index.cfm>

Public Health Act

Part 3 of the *Public Health Act* describes the powers of medical officers of health (MOH) and the responsibilities of laboratories, health care workers and others in the identification, prevention and control of communicable diseases, including TB.

Section 29 describes the powers of the MOH to initiate an investigation to determine whether, and which, actions may be necessary to protect public health if a case of communicable disease is known or suspected.

Where the investigation confirms the presence of a communicable disease, these actions may include whatever steps a MOH considers necessary to:

- suppress the disease in those who may already have been infected with it;
- protect those who have not already been exposed to the disease;
- break the chain of transmission and prevent spread of disease; and
- remove the source of infection.

To this end, by order, an MOH may:

- prohibit a person from attending school
- prohibit a person from engaging in the person's occupation
- prohibit a person from having contact with other persons or any class of persons for any period and subject to any conditions that the MOH considers appropriate, where the MOH determines that the person's engagement in that activity could transmit an infectious agent (e.g., *Mycobacterium tuberculosis*).

Sections 29 to 36 describe legislation related to isolation, quarantine, examination, and transportation of known or suspected cases of communicable disease.

Sections 39 to 52 describe the management of recalcitrant persons (cases, contacts, individuals with symptoms suggestive of a communicable disease).

Section 53 relates to the confidentiality of communicable disease information.

Complete *Public Health Act* is located at http://www.qp.alberta.ca/570.cfm?frm_isbn=9780779741113&search_by=link

Communicable Diseases Regulation

The following sections of the *Communicable Diseases Regulation* provide direction with regard to general issues related to communicable diseases, including TB:

Section 3(1): The Minister may provide free of charge drugs for the treatment or modification of communicable diseases.

Section 4: In any dispute as to the diagnosis of a disease in respect of which action may be taken under Section 29(1) of the *Public Health Act*, the medical officer of health's decision as to the diagnosis of the disease is final, subject only to a review by the Chief Medical Officer or their designate (historically the TB Consultant of Alberta, also referred to as the Medical Officer of Health for TB in Alberta).

Section 5: When a person is infected with a communicable disease in respect of which the *Public Health Act* requires that notification be given to a medical officer of health, the notification shall be given to the medical officer of health of the health unit in which the person was located at the time of the onset of symptoms.

Section 7: A medical officer of health may, in exercising his powers and carrying out his duties under the *Public Health Act* and this Regulation, use the assistance of community health nurses and inspectors.

Section 8(1): A medical officer of health shall, in accordance with Schedule 4, investigate all occurrences of notifiable diseases to establish the cause, the mode of transmission and the probable source and to identify others who may be at risk.

Schedule 3 designates tuberculosis as one of the communicable diseases for which warrants for recalcitrant clients may be issued.

Schedule 4 of the *Communicable Diseases Regulation* includes the following content specific to TB:

Reporting requirements:

1. Individual occurrences are reportable by all sources to the medical officer of health within 48 hours (see section 22(1)(b) and 23(a)(ii) of the Act).

Investigation of contacts and source of infection:

2. The medical officer of health shall conduct an investigation of the source of the infection and all contacts in accordance with the directions of the Chief Medical Officer of Health or their designate (historically the TB Consultant of Alberta, also referred to as the Medical Officer of Health for TB in Alberta).

Isolation procedures:

3. (1) In the case of pulmonary TB in an infectious form, modified (respiratory) isolation procedures apply until the person is no longer infectious.
(2) Modified (secretion or contact) isolation procedures apply to a person with cutaneous tuberculosis lesions or discharging sinuses until the lesions or sinuses are shown to be bacteriologically sterile.

Special measures

4. (1) The medical officer of health shall order that all familial contacts and all other contacts he considers to have been sufficiently exposed are tuberculin tested.
(2) Where a person who is tested pursuant to subsection (1) has a positive reaction,
 - (a) the medical officer of health shall order a chest X-ray and any other diagnostic procedures he considers appropriate, and
 - (b) the person is subject to surveillance until the medical officer of health is satisfied that the risk of infection has passed.
5. The medical officer of health shall by order exclude a person with cutaneous tuberculosis in an infectious form from public places and from employment in occupations involving the care of children, close contact with the public or the handling of food until the person is no longer infectious.

Complete *Communicable Diseases Regulation* is located at
http://www.qp.alberta.ca/570.cfm?fm_isbn=9780779731732&search_by=link

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Appendix B: Respiratory specimen collection

Cough-inducing procedures such as those usually required to obtain respiratory specimens (e.g. sputum, gastric aspirates) are considered high TB transmission risk activities. To minimize the risk of transmission of MTB to health care workers and others:

1. Respiratory specimens from clients with suspected active TB should always be collected in an environment separated from other clients (e.g., another room, with air vented to the outside) or in the open air (i.e., outdoors). Sputum induction through ultrasonic nebulization and gastric aspirate collection must only occur in environments approved for this purpose*.
2. While collecting respiratory specimens, the health care worker should wear a mask capable of filtering 95% or more of particles one micron or larger and have less than a 10% leak⁹⁰ (e.g., a NIOSH-designated fitted N95 respirator). If this is not possible, consideration should be given to obtaining the specimens at a centre with the necessary facilities.

* Information regarding recommended ventilation is available from the *Canadian Tuberculosis Standards*, 6th Edition (2007).

In order to identify tuberculin skin test (TST) conversions among health care workers involved in obtaining respiratory specimens, it is recommended that those with a negative baseline TST result undergo annual TST⁹¹. If TST conversion is identified, the individual should be referred to AHS central TB Services or the local outpatient TB clinic depending upon their place of residence (see *Section 1.5, Indications and processes for TB follow-up referrals*).

Respiratory specimens should always be collected by the least invasive means possible. If the client is unable to produce sputum spontaneously, an alternative method to collect a specimen will be necessary. The procedures described in this appendix are set out in order of least invasive to most invasive.

General recommendations in respiratory specimen collection

- Specimens should be collected in sterile, leak-proof, laboratory-approved containers. The container should be appropriately labeled, and accompanied by a requisition form that clearly identifies the following:
 - Client demographic information
 - Ordering physician
 - Date and time the specimen was collected

⁹⁰ Long, R. Ellis, E. Editors, *Canadian Tuberculosis Standards*. 6th Edition. Canadian Lung Association and Public Health Agency of Canada, 2007, p 336

⁹¹ Long, R. Ellis, E. Editors, *Canadian Tuberculosis Standards*. 6th Edition. Canadian Lung Association and Public Health Agency of Canada, 2007, p 339

- Testing requested

If the sample was obtained through the use of ultrasonic nebulization or gastric aspiration, this should be noted on the requisition.

- Ideally, specimens should be obtained before the initiation of antituberculosis treatment⁹².
- Whenever possible, three specimens of 5 to 10 mL each should be collected⁹³, preferably including at least one collected in the early morning (i.e., upon awakening and before eating).
- Once collected, specimens should be transported to the laboratory within one hour. If this is not possible, the sample should be refrigerated at 4°C (not frozen) and protected from light⁹⁴.

Sputum induction without aerosolization

Equipment list:

- Appropriately labeled, sterile specimen containers with secure lids
- Completed laboratory requisition indicating sample is to be tested for AFB (acid-fast bacilli) smear and culture
- Transport containers with sealable plastic (biohazard) bags
- Facial tissues
- Appropriate respiratory protection for the health care worker involved in collection of the specimen (e.g., a NIOSH-designated fitted N95 respirator)

Assessment steps	Rationale
1. Assess level of hydration.	Dry mouth and dehydration can inhibit deep coughing and sputum production. Provide increased fluids the day before specimen collection.
2. Assess client's ability to cough and expectorate.	Pain, weakness, inadequate coughing technique and fear of stress incontinence can inhibit coughing and sputum production.
3. Determine client's need for assistance to cough.	Positioning, postural drainage, chest vibration, support to rib cage and/or inhalation of warm mist may improve ability to cough productively. Sitting on an incontinence pad or toilet may relieve fear of incontinence.
4. Assess client's respiratory status (rate, depth, pattern, skin colour).	Active coughing can cause bronchospasm.

⁹² Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition. Canadian Lung Association and Public Health Agency of Canada, 2007, p 76

⁹³ Ibid.

⁹⁴ Ibid.

Procedure steps	Rationale
1. Plan to collect specimen in the early morning before breakfast, if possible.	Bacteria are concentrated in bronchial secretions that have accumulated overnight. Sputum collected prior to breakfast is less likely to be contaminated with food.
2. Provide privacy.	Procedure may be embarrassing to client and offensive to others.
3. Fit your mask snugly.	Minimizes inhalation of airborne droplets.
4. Describe procedure and explain reason for test. Mucus must come from as deep in the lungs as possible; spit or saliva is not acceptable.	Understanding reduces anxiety and promotes co-operation and the production of a quality specimen.
5. Open sputum container, keep lid and give only the bottom to client, asking client not to touch inside of container.	Minimizes transmission and contamination of specimen container.
6. Instruct client to inhale and exhale deeply three times, then inhale quickly, cough forcefully, and expectorate into sputum container. Demonstrate.	Promotes deep coughing.
7. Check quality and quantity of the sputum. If amount is insufficient, encourage client to repeat procedure.	A specimen of 3 to 5 mL containing solid or purulent material is sufficient. Production of a quality specimen may take a few efforts and up to 15 minutes.
8. Close labeled specimen container securely, wrap in absorbent material and place into a zip-lock plastic (biohazard) bag. Place the bag into a designated transport container.	Minimizes spillage and exposure of health workers during transport.
9. Enclose appropriately labeled requisition in sleeve of bag designed for this purpose (sputum, mycobacteria AFB)	Assures identification and proper testing of specimen.
10. Forward specimen to the laboratory as soon as possible.	Prompt delivery reduces opportunity for normal organisms to contaminate specimen.
11. Consult AHS central TB Services, the appropriate outpatient TB clinic, or the practitioner who requested the specimen if collection of sputum is unsuccessful.	Referral for aerosolization, gastric aspiration or bronchoscopy may be required.

Sputum induction using ultrasonic nebulizer

Note: Sputum induction through ultrasonic nebulization must only occur in environments approved for this purpose*. This procedure may require the assistance of a respiratory therapist.

* Information regarding recommended ventilation is available from the *Canadian Tuberculosis Standards*, 6th Edition (2007).

Equipment list:

- Appropriately labeled, sterile specimen containers with secure lids
- Completed laboratory requisition indicating sample is to be tested for AFB (acid-fast bacilli) smear and culture *and was collected using ultrasonic nebulization*
- Transport containers with sealable plastic (biohazard) bags
- Facial tissues
- Appropriate respiratory protection for the health care worker involved in collection of the specimen (e.g., a NIOSH-designated fitted N95 respirator)
- Emesis basin (for gagging or accidental vomiting)
- High volume ultrasonic nebulizer set-up with cold nebulizer tubing and mask
- Compressed air source with flowmeter and fitting for attachment to the nebulizer set-up
- NaCl solution (hypertonic saline); reliable studies recommend 6 mL/min of 3% hypertonic saline using an ultrasonic nebulizer
- Bronchodilator inhalant in case of bronchospasm

Assessment steps	Rationale
1. Assess client's ability to cough and expectorate.	Pain, weakness, inadequate coughing technique and fear of stress incontinence can inhibit coughing and sputum production.
2. Determine client's need for assistance to cough.	Positioning, postural drainage, chest vibration, support to rib cage may improve ability to cough productively. Sitting on an incontinence pad or toilet may relieve fear of incontinence.
3. Assess client's respiratory status (rate, depth, pattern, skin colour).	Inhaling hypertonic saline can cause irritation leading to bronchospasm. Inhaling bronchodilator will relieve bronchospasm.

Procedure steps	Rationale
1. Prepare to collect specimen in a separate, well-ventilated room.	Minimizes spread of infectious organisms to health care provider and others.
2. Plan to collect specimen in the early morning before breakfast, if possible.	Bacteria are concentrated in bronchial secretions that have accumulated overnight. Sputum collected prior to breakfast is less likely to be contaminated with food.
3. Provide privacy.	Procedure may be embarrassing to client and offensive to others.
4. Assist client to sit in an upright position.	Promotes proper coughing technique.
5. Describe procedure and explain that mist from mask will aid sputum production. Mucus must come from as deep in the lungs as possible; spit or saliva is not acceptable.	Understanding reduces anxiety and promotes co-operation and the production of a quality specimen.

Procedure steps	Rationale
6. Fill nebulizer with 3% hypertonic saline.	Hypertonic saline will cause airway irritation that will induce sputum production and coughing.
7. Attach aerosol mask and nebulizer to air delivery system according to manufacturer's instructions. Set flowmeter to 6 mL/min.	Produces optimal aerosol flow.
8. Open sputum container, keep lid and give only the bottom to client, asking client not to touch inside of container.	Minimizes transmission and contamination of specimen container.
9. Fit your mask snugly.	Minimizes inhalation of airborne droplets.
10. Instruct client to hold the aerosol mask while breathing the mist for 15 minutes (this will take approximately 70 to 90 mL of solution). Then have the client cough forcefully and expectorate into the sputum container.	Promotes deep coughing.
11. Check quality and quantity of the sputum. If amount is insufficient, encourage client to repeat procedure.	A specimen of 3 to 5 mL containing solid or purulent material is sufficient. When aerosolization is used, specimen may appear watery. May take a few efforts to produce quality specimen.
12. Close labeled specimen container securely, wrap in absorbent material and place into a zip-lock plastic (biohazard) bag. Place the bag into a designated transport container.	Minimizes spillage and exposure of health workers during transport.
13. Enclose appropriately labeled requisition in sleeve of bag designed for this purpose (sputum, mycobacteria AFB). Indicate that aerosolization was used.	Assures identification and proper testing of specimen that may appear to be saliva.
14. Forward specimen to the laboratory as soon as possible.	Prompt delivery reduces opportunity for normal organisms to contaminate specimen.
15. Dispose of aerosol mask, hypertonic saline and empty containers used unsuccessfully to collect sputum in agency designated container.	Prevents spread of infectious organisms and contamination of a future specimen.
16. Remove your mask and wash hands (yours and theirs) according to agency policy.	Minimizes spread of infectious organisms.
17. If using ultrasonic light for disinfection, leave on for one hour.	Allows for proper disinfection of collection area.
18. Consult AHS central TB Services, the appropriate outpatient TB clinic, or the practitioner who requested the specimen if collection of sputum is unsuccessful.	Referral for gastric aspiration or bronchoscopy may be required.

Sputum collection using gastric aspiration

Gastric aspiration is an uncomfortable procedure used only for collecting specimens from children and the elderly who cannot produce sputum by expectoration or nebulization. It is necessary to immobilize infants and young children in order to collect the sample safely. Collection of gastric aspirates must only occur in environments approved for this purpose*.

* Information regarding recommended ventilation is available from the *Canadian Tuberculosis Standards*, 6th Edition (2007).

Note: Clients undergoing gastric aspiration should be NPO for at least six hours prior to the procedure.

Equipment list:

- Appropriately labeled, sterile specimen containers with secure lids containing phosphate buffer to neutralize gastric acid (available from Provincial Laboratory of Public Health)
- Completed laboratory requisition indicating sample is a gastric washing to be tested for AFB (acid-fast bacilli) smear and culture
- Transport containers with sealable plastic (biohazard) bags
- Appropriate respiratory protection for the health care worker involved in collection of the specimen (e.g., a NIOSH-designated fitted N95 respirator)
- Nasogastric tubing (size 8F for children, 10–12F for adults)
- Water-based lubricant
- 50 to 60 mL catheter tip syringe for aspiration
- 30 to 50 mL sterile distilled water (to be used if gastric washing is necessary - see procedure description, below)
- Emesis basin (for gagging or accidental vomiting)
- Stethoscope
- Clamp

Assessment steps	Rationale
1. Assess client's ability to understand procedure.	Allows nurse to tailor teaching plan to client's level of understanding.
2. Determine recent history of antimicrobial therapy.	Antimicrobial drugs can weaken bacilli and cause false negative results. Procedure should be performed prior to antimicrobial therapy.

Procedure steps	Rationale
1. Plan to collect specimen in the early morning before breakfast, if possible. For very young children the procedure should be performed immediately after awakening.	Food may cause digestion, thereby removing stomach contents and decreasing the amount of sputum and number of bacteria available for collection.
2. Plan to collect specimen in the early morning before breakfast, if possible.	Bacteria are concentrated in bronchial secretions that have accumulated overnight. Sputum collected prior to breakfast is less likely to be contaminated with food.
3. Provide privacy.	Procedure may be embarrassing to client.
4. Obtain baseline heart rate and rhythm.	Some individuals develop arrhythmias during this procedure.
5. Fit your mask snugly.	Minimizes inhalation of airborne droplets.
6. Assist client to assume high Fowler's position (if an adult)	Decreases potential for aspiration and promotes entry of tube into stomach.
7. Follow your agency procedure for insertion of nasogastric or orogastric tube and note contraindications.	Assures proper insertion.
8. Aspirate more than 2 mL of stomach contents with syringe. If no aspirate is obtained, instill 30 to 50 mL of sterile distilled water and re-aspirate.	Ensures adequate volume of sample is obtained.
9. Empty contents of syringe into specimen bottle containing phosphate buffer .	Gastric acid can inhibit growth of tubercle bacilli.
10. Close specimen container securely, apply label, wrap in absorbent material and place container into a sealable plastic (biohazard) bag in a designated transport container.	Minimizes spillage and exposure for health care workers during transport.
11. Enclose the appropriately labeled requisition (gastric aspirate, mycobacteria AFB). Note recent antimicrobial therapy.	Assures identification and proper testing of specimen.
12. Clamp and remove tube and offer appropriate comfort measures.	Procedure is uncomfortable.
13. Refrigerate specimen and send to the laboratory as soon as possible.	Prompt delivery reduces opportunity for normal organisms to contaminate specimen.
14. Remove your mask and wash hands according to agency policy.	Minimizes spread of infectious organisms.
15. Consult AHS central TB Services, the appropriate outpatient TB clinic, or the practitioner who requested the specimen if collection of sample is unsuccessful.	Referral for bronchoscopy may be required.

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Appendix C: Drug information reference tables

Isoniazid (INH)			
Tablets: 100 mg, 300 mg Liquid: 10 mg/mL Aqueous solution also available for intramuscular injection			
Administration tips	Principle adverse reactions	Monitoring	Comments
<p>Ideally taken on an empty stomach, but may take with small snack if needed</p> <p>Tablets may be crushed (or fragmented) and mixed with small amounts of food or liquid with immediate administration following</p>	<ul style="list-style-type: none"> asymptomatic elevation of aminotransferases hepatotoxicity Lupus-like syndrome (rare) peripheral neuropathy (often controlled by co-administration of pyridoxine / Vitamin B6) hypersensitivity rash nausea and vomiting fatigue drowsiness headache mild hair loss psychotic episodes 	<p>Signs/symptoms of adverse drug reactions</p> <p>Transaminase levels (ALT or AST); monitoring frequency may vary depending on type of treatment (active or LTBI), age, risk factors for hepatic injury/intolerance</p>	<p>Medication interactions to be excluded by client's pharmacist</p> <p>Interaction between INH and Dilantin® (phenytoin) may cause increase in serum levels of both drugs. Family physician to monitor serum levels of Dilantin® and adjust dosage accordingly. Tegretol® (carbamazapine) levels may also be affected and should be monitored.</p> <p>Use of alcohol and/or Tylenol® may increase risk of hepatotoxicity</p> <p>Consider overdose potential</p>

Rifampin (RMP) Capsules: 150 mg, 300 mg Syrup (formulated from capsules): 10 mg/mL Aqueous solution also available for intravenous injection			
Administration tips	Principle adverse reactions	Monitoring	Comments
<p>Ideally taken on an empty stomach, but may take with small snack if needed</p> <p>Capsules may be opened and contents mixed into small amounts of food or liquid with immediate administration following</p>	<ul style="list-style-type: none"> • drug interactions due to induction of hepatic microsomal enzymes • hepatotoxicity • renal toxicity • hypersensitivity: <ul style="list-style-type: none"> - rash - fever - abdominal pain - thrombocytopenia - hypotensive reaction similar to anaphylactic shock (rare) • cutaneous reactions • memory impairment • altered immune responses • gastrointestinal upset • flu-like illness 	<p>Signs/symptoms of adverse drug reactions</p> <p>Transaminase levels (ALT or AST); monitoring frequency may vary depending on type of treatment (active or LTBI), age, risk factors for hepatic injury/intolerance</p>	<p>Medication interactions to be excluded by client's pharmacist</p> <p>May decrease levels of many drugs including blood thinners, methadone and hormone-based contraceptives</p> <p>Alternative forms of birth control should be used; client to consult with family physician</p> <p>Use of alcohol and/or Tylenol® may increase risk of hepatotoxicity</p> <p>Orange-red discoloration of body fluids, especially urine; tears will stain soft contact lenses and perspiration may stain white clothing.</p>

Pyrazinamide (PZA)	Tablets: 500 mg scored tablet		
Administration tips	Principle adverse reactions	Monitoring	Comments
<p>May be taken with food Does not dissolve well in fluids Tablets may be crushed (or fragmented) and added to small amount of food or liquid with immediate administration following</p>	<ul style="list-style-type: none"> • hepatotoxicity • asymptomatic hyperuricemia • acute gouty arthritis (rare; except in clients with preexisting gout) • non-gouty polyarthralgia • photosensitive dermatitis • gastrointestinal upset • hypersensitivity reactions 	<p>Signs/symptoms of adverse drug reactions</p> <p>Transaminase levels (ALT or AST), uric acid if gout suspected.</p> <p>Monitoring frequency may vary depending on age, risk factors for hepatic injury/intolerance</p>	<p>Medication interactions to be excluded by client's pharmacist</p> <p>Not recommended in Canada for use during pregnancy</p> <p>Dosage adjustment needed if patient is on dialysis</p> <p>Use of alcohol and/or Tylenol® may increase risk of hepatotoxicity</p>

Rifabutin			
Tablets: 150 mg			
Administration tips	Principle Adverse Reactions	Monitoring	Comments
<p>May be taken with or without food</p> <p>Capsules may be opened and contents mixed into small amounts of fluid or food with immediate administration following</p>	<ul style="list-style-type: none"> • hepatotoxicity • gastrointestinal upset • decreased WBC, platelet count • arthralgia • renal impairment • hyperpigmentation • uveitis (if used with antiretrovirals for HIV) • flushing • erythema of head and trunk • ageusia (loss of ability to taste) 	<p>Signs/symptoms of adverse drug reactions</p> <p>Transaminase levels (ALT or AST), CBC, WBC, platelets;</p> <p><i>monitoring frequency may vary depending on type of treatment (active or LTBI), age, risk factors for hepatic injury /intolerance</i></p> <p>Baseline and monthly visual acuity, red-green colour discrimination, and visual fields if taking antiretrovirals for HIV</p>	<p>Medication interactions to be excluded by client's pharmacist</p> <p>May decrease levels of many drugs including blood thinners, methadone and hormone-based contraceptives</p> <p>Alternative forms of birth control should be used; client to consult with family physician</p> <p>Brown-orange discoloration of skin⁹⁵ and body fluids, especially urine; tears will stain soft contact lenses and perspiration may stain white clothing</p> <p>Dosage adjustment needed if patient is on dialysis</p>

⁹⁵ <http://www.rxlist.com/mycobutin-drug.htm> (retrieved Nov3.08)

Moxifloxacin/ Levofloxacin	Moxifloxacin (Avelox®) Tablets: 400 mg Levofloxacin (Levaquin®) Tablets: 250 mg, 500 mg, 750 mg Aqueous solutions available for intravenous injection		
Administration tips	Principle adverse reactions	Monitoring	Comments
<p>May be taken with or without food</p> <p>Take two hours before or after aluminum, magnesium, or calcium containing antacids, iron, vitamins, sucralfate, milk containing products and food supplements</p>	<ul style="list-style-type: none"> • hepatotoxicity • gastrointestinal upset • dizziness • hypersensitivity • tendonitis • insomnia • psychosis • agitation • depression • paranoia • seizures 	<p>Signs/symptoms of adverse drug reactions</p> <p>Transaminase levels (ALT or AST); monitoring frequency may vary depending on age, risk factors for hepatic injury/intolerance</p>	<p>Medication interactions to be excluded by client's pharmacist</p> <p>Safety of use during pregnancy/breastfeeding has not been established</p> <p>Use with caution in clients with known or suspected seizure disorder</p> <p>Dosage adjustment needed if patient is on dialysis</p>

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Appendix D: Common adverse reactions to antituberculosis medications⁹⁶

Adverse reaction	Symptoms & signs	Usual cause
Dermatitis	itching, rash, hives, fever	RMP, PZA, INH, rarely EMB, rifabutin
Hepatitis	anorexia, nausea, vomiting, jaundice	INH, RMP, PZA, rarely EMB or rifabutin
Gastritis	anorexia, nausea, vomiting, epigastric pain	RMP, PZA, rifabutin
Peripheral neuropathy	numbness or parasthesias of feet or hands	INH
Joint manifestations	gout-like manifestations manifestations like systemic lupus erythematosus	PZA, INH
Renal manifestations	hematuria, azotemia	RMP, aminoglycosides, capreomycin
Hematologic manifestations	leukopenia, thrombocytopenia	INH, RMP, PZA, EMB, rifabutin
Visual manifestations	vision loss and colour blindness, uveitis*	EMB *rifabutin if taken in addition to other medications for HIV infection aminoglycosides, capreomycin
Audiovestibular manifestations	hearing loss, vertigo, new-onset tinnitus	aminoglycosides, capreomycin

⁹⁶ Adapted from: Bureau of Tuberculosis Control. New York City Department of Health, Clinical Policies and Protocols, 3rd Ed. June, 1999.

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Appendix E: Tips for administering TB medications

Taking TB medications can be challenging, particularly for clients who have difficulty or are unable to swallow pills and capsules. The following recommendations and guidelines may enable clients and the health care providers responsible for administering their TB medications to overcome these challenges.

General information and recommendations

- Crushed/opened medication should be mixed with food or liquid *immediately* before administering the medication (not in advance). If the medication is not administered within 30 minutes after crushing/opening, it should be discarded and a new dose prepared.
- All standard antituberculosis drugs can be crushed (or fragmented) - INH, ethambutol, pyrazinamide - or opened (rifampin) - and mixed with a small amount of food or liquid.
- Crushed pills have a stronger flavour than pills cut in half or taken as small fragments.
- Crushed tablets or opened capsules, administered with a small amount of food is preferable to using liquid forms of TB medications, especially INH. The syrup form of INH is unlikely to be tolerated in amounts greater than 10–15 ml (i.e., in excess of 100–150 mg INH) because sorbitol used in the preparation of the liquid form of INH may cause abdominal pain, cramping, and/or diarrhea.
- Although INH is best absorbed in an empty stomach, experience has shown that most clients are unable to tolerate INH without food, but can attain adequate drug levels even when it is taken with a small amount of food.
- When mixing medications with a food or liquid, use the smallest quantity/volume possible. Medicated food or liquid should be followed by ingestion of food or liquid without medications.
- Tablets should be crushed and mixed (or layered) with one or two spoonfuls of liquid or soft food (pudding, jelly, applesauce, peanut butter, or another food the client is likely to find acceptable).
- It is better to hide bitter or unpleasant medicines in a food that a child has never eaten before. If a food they have had before is used, they are more likely to notice something has been added to it and may refuse it or spit it out.
- Applesauce works well for administering rifampin that has been removed from its capsule.
- Pyrazinamide, ethambutol, isoniazid and rifampin can be given together, i.e., mixed together in the same small amount of food. However, this amount of medication mixed into a small amount of food may not be well accepted by the client. It may be necessary to mix each medicine with a small amount of food and to then administer each medicine individually, one after another.
- Ethambutol tablets will dissolve in liquid, usually within 10 minutes.
- If appropriate, encourage children, adolescents and adults who are unable to swallow pills to practice swallowing a candy similar in size and shape to the TB pills; this practice will teach this population how to swallow pills and capsules.

- Tablets tend to SINK; so, instruct clients to tilt their head UP to swallow pills.
- Capsules tend to FLOAT, so instruct the patient to tilt the head DOWN to swallow capsules.

Recommendations for infants (<1 year of age)

- INH suspension (sorbitol based) may be better tolerated by infants than older children
- Liquid medications should be measured and given to an infant using a medicine dropper with a large tip, a medication delivering pacifier (available at most pharmacies) or the nipple of a baby's bottle. The hole may need to be enlarged if a pacifier or bottle nipple is used.
- Medication can be mixed with a small amount of water, juice or other liquid (<1 ounce) and administered in a baby's bottle. Care must be taken to ensure that contents of the bottle are consumed within 30 minutes of preparation. The medication should be administered as soon as it is mixed with food or liquid otherwise it will become unstable. If the medication is not administered within 30 minutes after crushing/opening, it should be discarded and a new dose prepared.

Recommendations for children and adolescents

- DOT providers who encounter difficulties obtaining cooperation with DOT in a child or adolescent should request assistance from an alternate DOT provider if possible.
- Older children may prefer to have rifampin capsules opened and the powder mixed with tangy tart substances or crushed sweet/sour candies.

Troubleshooting

Vomiting

- If the vomiting episode occurs more than 30 minutes after ingesting the medicine, presume that medication absorption has occurred
- If dose is vomited within 30 minutes after ingestion, this should be noted and an additional dose added to the end of the therapy - as it would be if it were missed for any other reason.
- If a client misses two doses per week due to vomiting (i.e., vomiting occurred within 30 minutes of ingestion of medication), contact AHS central TB Services or the outpatient TB clinic managing the client's care to report the missed doses and to obtain guidance about how to proceed.

TB treatment during other illnesses

- Treatment should continue even if the client has a minor illness such as a cold, ear or throat infection. If the client has a gastrointestinal virus, treatment should resume as soon as the client is able to tolerate the medication.

Sources:

Peloquin et al. Stability of Antituberculosis medication Mixed in Food. *Clinical Infectious Diseases* 2007;45:521.

AcidFastBlast (January 2005 (Vol. 4, No. 1), available online at:
<http://www.vdh.virginia.gov/epidemiology/DiseasePrevention/Programs/Tuberculosis/blast/documents/medadmin.pdf>

TBeat (2008, Vol. 3, No. 1), available online at:
<http://www.heartlandntbc.org/newsletters.asp>

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Appendix F: Quick Reference: Two-Step TB Skin Test

Quick Reference: Two-Step TB Skin Test

In some individuals who are infected with *Mycobacterium tuberculosis* (MTB), sensitivity to PPD may wane over time causing them to demonstrate negative or slight reactions to a TB skin test (TST). It has been demonstrated that by providing two exposures to PPD within a relatively short period of time, waned immune response can be reconstituted or “boosted”.

A two-step TST may assist practitioners to distinguish between a boosted response (related to long-standing MTB infection) and TST conversion caused by recent infection. This distinction is important because it may impact decision making with regard to treatment for latent TB infection and possibly, expansion of contact investigation activities.

Clients should be assured that repeated testing (either single TST or two-step TST) cannot cause an uninfected individual to become infected with MTB or develop a positive TST.

When should a two-step TST be done?

Unless there is documentation of a prior two-step TST, a two-step TST should usually be performed if:

- it is anticipated that an individual will be undergoing repeated screening with TSTs at regular intervals*, especially if the individual has a history of BCG vaccination in the past, and/or
- the individual is over 55 years of age.

In Alberta, two-step TST is recommended:

- at the time of hiring individuals who will be employed or volunteering in **select** facilities or programs
- for some residents of continuing care facilities
- for some travelers

See *Section 2.1* for further details.

NOTE: Immune suppression (whether related to HIV or other factors) is not, in itself, an indication for two-step TST.

- * Regular interval is determined based on facility assessment and number of exposures to cases

When should a two-step TST **NOT** be done?

Two-step TST **should not be used** in the context of a TB contact investigation because conversion of TST may occur as early as 3 weeks after infection with MTB. A change in TST reactivity following exposure to TB should almost always be considered a TST conversion because it is generally not possible to differentiate between conversion and TST boosting.

Also, if there is documentation that an individual has already completed a two-step TST, subsequent TSTs can be single step (one TST only) regardless of how long it has been since the last TST or the last two-step TST.

Administration, reading, and interpretation of two-step TST

Administration

The first TST of a two-step TST is administered in the same manner as single-step TST. **If the initial TST is positive, the second TST should not be done.** If the initial TST result is **negative**, a second TST should be administered, at a different injection site.

The second TST should be given **no sooner than 7 days after** the first TST and **no later than 28 days after** the first TST. For example, if the first TST was done on March 1, the soonest the second TST could be placed would be March 8 and the latest date that the second TST could be placed would be March 29.

Repeating the TST sooner than 7 days later may not allow enough time to stimulate the necessary immune response. Delaying the repeat test for longer than 28 days may allow for the possibility of TST conversion to occur (i.e., infection with MTB through exposure to an active case).

Reading

Both TSTs should be read in the same manner as a single-step TST, i.e., palpated, measured, and recorded 48 to 72 hours after administration.

Interpretation

Two-step TSTs are interpreted in the same manner as single TSTs. If the second TST result is 10 mm or more induration, the TST should be considered “positive” and individual should be followed up as described in *Section 2.2.5.7, Follow-up of individuals found to have a positive TST result.*

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Tuberculosis Referral Form

Printable version available from:

<http://www.health.alberta.ca/documents/TB-Referral-Form.pdf>

This form is a sample. The most current version of the form is on the website and should be checked frequently for updates

Government of Alberta		Tuberculosis Referral	
Attention Radiology Department: Forward previous chest x-rays with the current one for comparison.		<input type="checkbox"/> Chest X-Ray PA <input type="checkbox"/> Chest X-Ray PA & Lateral	
		TB Services Alberta Health Services 2nd Floor South Tower 10030 107 Street Edmonton AB, T5J 3E4 Phone: 780-735-1464 Fax: 780-735-1195	
Demographics			
Referral date Y Y Y Y M M D D	Personal health number	Date of birth Y Y Y Y M M D D	Date of death Y Y Y Y M M D D
Zone/Health centre		Zone office	TB number
Name Last	First	Middle	Other name(s) Alias type <input type="checkbox"/> Female <input type="checkbox"/> Male
Home address		City/town	Province Postal code
Phone number	Other phone or cell number	Occupation	
Name of contact person		Phone number	Next of kin Phone number
Family/referring physician		Phone number	
Street address		City/town	Province Postal code
Copy to other		Phone number	
Street address		City/town	Province Postal code
Ethnicity			
<input type="checkbox"/> Canadian-born Aboriginal <input type="checkbox"/> First Nations, registered Band of origin DIAND number <input type="checkbox"/> First Nations, non-registered <input type="checkbox"/> Metis <input type="checkbox"/> Inuit		<input type="checkbox"/> Canadian-born Non-Aboriginal <input type="checkbox"/> Foreign-born Country of birth Date of arrival in Canada Y Y Y Y M M D D	
History			
Tuberculin Tests		Bacille Calmette-Guerin (BCG)	
MM	Date given	BCG History <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown	Previous TB <input type="checkbox"/> Yes <input type="checkbox"/> No
1	Y Y Y Y M M D D	BCG scar <input type="checkbox"/> Yes <input type="checkbox"/> No	Date of previous TB Y Y Y Y M M D D
2	Y Y Y Y M M D D	BCG year Y Y Y Y	Prov./Country of previous TB
3	Y Y Y Y M M D D		Previous TB treatment <input type="checkbox"/> Yes <input type="checkbox"/> No Type of treatment <input type="checkbox"/> Active <input type="checkbox"/> LTBI
Symptoms		High Risk Medical Conditions (Check (✓) all that apply.)	
<input type="checkbox"/> Cough	Duration	<input type="checkbox"/> Diabetes	Insulin dependant: <input type="checkbox"/> Yes <input type="checkbox"/> No
Sputum: <input type="checkbox"/> Yes <input type="checkbox"/> No	Duration	<input type="checkbox"/> End stage renal disease	dialysis dependant: <input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Night sweats	Duration	<input type="checkbox"/> Protein-calorie malnutrition	(less than 90% ideal weight)
<input type="checkbox"/> Weight loss	Kg	<input type="checkbox"/> Other immunosuppressive condition	(specify in comments)
<input type="checkbox"/> Hemoptysis	Duration	<input type="checkbox"/> Radiotherapy	
<input type="checkbox"/> Fever	Duration	<input type="checkbox"/> Alcohol abuse	
<input type="checkbox"/> Other: specify	Duration	<input type="checkbox"/> Chronic corticosteroid use	
		<input type="checkbox"/> Gastrectomy	
		<input type="checkbox"/> HIV/AIDS	
		<input type="checkbox"/> IV drug abuse	
		<input type="checkbox"/> Silicosis	
		<input type="checkbox"/> Organ transplantation	
		<input type="checkbox"/> Leukemia, lymphoma, head and neck cancer	
The Collection Notice should be read by or to the client: Information on this form is collected under the authority of section 20(b) of the Health Information Act (as per section 27(1)(a) and 27(2)) for the purposes of providing a health service, planning and resource allocation, healthsystem management, public health surveillance and health policy development. Questions about the use and collection of this information can be directed to the contact information provided at the top of this form.			
CD2212 (2010/03)		Continued on page 2	

Travel If this person has travelled to a TB endemic country within the past two years, identify the purpose of travel, the country, and provide the "from" and "to" dates. More than one purpose may be identified.

	Country	From date	To date		Country	From date	To date
<input type="checkbox"/> Work in health setting	_____	[Y Y M M]	[Y Y M M]	<input type="checkbox"/> Family visit	_____	[Y Y M M]	[Y Y M M]
<input type="checkbox"/> Work other, specify _____	_____	[Y Y M M]	[Y Y M M]	<input type="checkbox"/> Tourism/recreation	_____	[Y Y M M]	[Y Y M M]

Reason for referral Please check the primary reason for referral if more than one applies.

Immigrant Referral from Citizenship and Immigration Canada:

<input type="checkbox"/> Landed immigrant	<input type="checkbox"/> Landed (external applicant)
<input type="checkbox"/> Refugee	<input type="checkbox"/> Landed status (internal applicant)
<input type="checkbox"/> Visitor/Student/Working Visa	<input type="checkbox"/> Visitor/Student/Working Visa
<input type="checkbox"/> Refugee	<input type="checkbox"/> Refugee

Employment

<input type="checkbox"/> Acute care hospital	<input type="checkbox"/> High risk communal setting	Occupation _____
<input type="checkbox"/> Continuing care facility	<input type="checkbox"/> Other employment *	Place of employment _____
<input type="checkbox"/> Correctional facility		

School screening

<input type="checkbox"/> Grade school	<input type="checkbox"/> Household review of positive reactors *
<input type="checkbox"/> Post secondary	

Institutional living

<input type="checkbox"/> Continuing care facility	<input type="checkbox"/> Residents of other high risk communal setting *
<input type="checkbox"/> Correctional facility	

Symptoms (If this referral reason is checked, ensure the "Symptom" section on page one is completed.)

Contact (If selected, please provide the following)

Contact - Source case name or file number _____	Relationship with source case _____	Contact relation _____
	<input type="checkbox"/> Close	<input type="checkbox"/> Casual low risk
	<input type="checkbox"/> Casual medium risk	<input type="checkbox"/> Unknown
		<input type="checkbox"/> Household
		<input type="checkbox"/> Non-Household

Last contact date [Y|Y|Y|Y|M|M|D|D]

If client has a high risk medical condition, please complete "High Risk Medical Conditions" section on previous page.

Travel (If this referral reason is checked, ensure the "Travel" section above is completed.)

<input type="checkbox"/> Pre-travel
<input type="checkbox"/> Post-travel

Immunosuppressed

<input type="checkbox"/> HIV/AIDS	<input type="checkbox"/> Diabetes mellitus *
<input type="checkbox"/> Organ transplantation	<input type="checkbox"/> < 90% of ideal body weight
<input type="checkbox"/> End stage renal failure	<input type="checkbox"/> Carcinoma of the lung
<input type="checkbox"/> Prolonged corticosteroid use	<input type="checkbox"/> Carcinoma of the head and neck
<input type="checkbox"/> Hematologic malignancies	<input type="checkbox"/> TNF inhibitors
<input type="checkbox"/> Silicosis	

Other, specify: _____

Comments _____

Signature of health nurse _____	Phone number _____	Zone Stamp
X _____		

* Refer to Alberta Tuberculosis Manual

Tuberculosis Referral Form

If the client has never been referred to AHS central TB Services before, all of the fields on the form are to be completed. If the client already has a TB file number, then only required fields are name, date of birth and TB file number, as well as any updated information (i.e., change of address, telephone number).

Family physician: if there is no family physician, provide the name/address of the zonal MOH. College of Physicians and Surgeons www.cpsa.ab.ca/home/home.asp (find a physician) provides online lookup of physicians in the zones, and whether or not they are accepting clients.

Referral process should be complete before forwarding to AHS central TB Services, including chest x-ray and sputum collection if required. Any incomplete referral will be returned after four weeks. Only complete referrals are reviewed by the AHS TB Services physician.

Primary reason for referral: why are they presenting to you today?

Signature of health nurse: Please print name in addition to signature.

Abnormal chest x-ray consistent with TB: refer to Section 2.2.2.1

Freedom of Information Act link
www.health.gov.ab.ca/about/Minister_legislation.html

If symptomatic, collect and submit three sputum specimens.

Reason for referral	Information Required
1. Travel See Section 2.1.1.2	<ul style="list-style-type: none"> ▪ Indicate if pre-travel or post-travel ▪ If post-travel, provide the date the client returned to Canada. The TST should be performed eight to 12 weeks following their date of return. ▪ Information regarding their occupation while traveling should be provided in the Comments section at the bottom of the referral form (if working while traveling, what was their occupation?)
2. Immigrant See Section 2.1.4.1	<ul style="list-style-type: none"> ▪ In the demographics section, provide current occupation in Alberta, if employed. ▪ In the Comments section, include their previous occupation. ▪ If the client spent time in a refugee camp, length of time and the location of the camp should be indicated in the Comments section. ▪ If they arrive from a country other than their country of

Reason for referral	Information Required
	birth, include country arrived from in Comments. <ul style="list-style-type: none"> ▪ Where was their immigration medical performed? ▪ If applicable, attach a photocopy of the client's immigration form ▪ If CXR was taken in Canada within the past six months, provide location and date
3. Employment	<ul style="list-style-type: none"> ▪ Please list any additional risks that may be associated with this employment
4. School screening See Section 2.1.7	<ul style="list-style-type: none"> ▪ If post-secondary, health care training indicate program.
5. Institutional living See Section 2.1.6	<ul style="list-style-type: none"> ▪ Length of incarceration or program ▪ Candidates for PT: will they be incarcerated long enough to complete at least six months of treatment ▪ Continuing care facilities: only residents with high risk medical conditions are screened and referred. (See <i>Canadian Tuberculosis Standards – top five indicators</i>)
6. Symptoms	<ul style="list-style-type: none"> ▪ If there is a cough productive of sputum, three sputum specimens must be collected.
7. Contact	<ul style="list-style-type: none"> ▪ Provide Mantoux results ▪ Complete a referral form for each positive reactor listed on the Contact list and use as an x-ray requisition. ▪ Unknown and negative reactors, use contact list.
8. Immunosuppressed	<ul style="list-style-type: none"> ▪ Check all conditions that apply ▪ Organ transplant – provide information as to what organ and anticipated date of transplant.
9. Other	<ul style="list-style-type: none"> ▪ Organ donor screening ▪ Foreign-born adoptees from TB endemic countries

TB Update Form



TB UPDATE

TB SERVICES
2ND FLOOR SOUTH TOWER
10030 107 ST
EDMONTON AB
T5J 3E4
BUSINESS: (780) 735-1464
FAX: (780) 735-1195

"Freedom of Information and Privacy Legislation" section must be read by, or to the client.

Freedom of Information and Privacy Legislation
Information on this form is collected under the authority of section 20(b) of the Health Information Act (as per section 27(1)(a) and 27(2)) for the purposes of providing a health service, planning and resource allocation, health system management, public health surveillance and health policy development.
Questions about the use and collection of this information can be directed to the contact information provided at the top of this form.

Encounter Date 2009-06-23	PHN	Health Area ASPEN	Branch DEFAULT ASPEN	Birth Date 1981-04-09	Date of Death	TB Number 0202417
Name TEST, DATA			Other Name(s)		Alias Type	Gender MALE
Home Address 2549 118 AVE, EDMONTON, AB, CANADA, T5Y2V3			Phone	Type Home	Other Phone	Type
Contact Person		Contact Phone		Next of Kin		Next of Kin Phone
Ethnicity FOREIGN-BORN	Band of Origin		DIAND No.	Country of Birth	Arrival Date	Occupation
Family / Referring Physician Dr. Basson, Nicol		Address 610-3020 22 ST, RED DEER, ALBERTA, CANADA, T4R3J5				Phone (403) 343-8551
Copy to Other		Address				Phone
Last 3 Tuberculin Tests		QFT Tests		BCG History		Year
12 mm	SIGNIFICANT	2009-07-24	POSITIVE-FINAL	2008-10-09	YES	1988
10 mm	SIGNIFICANT	2008-01-03	POSITIVE-FINAL	2008-01-25		
			NEGATIVE	2008-01-21		
Immunosuppressed		Scar		Client Status REACTOR		Effective Date 2003-11-13
Reason for Referral ORDER - C - ORDER						Referral Date 2003-11-13
Contact Source File Number	Diagnosis	Sputum Smear	Sputum Culture	Association with Source Case	Contact Relationship	
Previous TB Count	Province	Date	TB Diagnosis	Date		
LTBI Therapy Reason		Date Started	Date Stopped	Reason Stopped		
X-Ray Date 2008-08-07	Result NORMAL	Bacteriology Date 2008-01-21	Specimen Type TISSUE	Lab# M08MB001043TESTPROVLAB	Smear Result NEG-P	Culture Result
Current Symptoms						
ORDERS						
HOME ISOLATION			Priority	Date Due 2009-02-27	Comments	
TB Control Consultation		<i>This assessment does not preclude the need for investigation or intervention for disorders other than tuberculosis</i>				
TB Doctor Brown, Neil E.						
				2009-06-23	Date	

Tuberculosis Update Form

This form is initiated at AHS central TB Services and sent to zonal health offices to communicate recommendations, or to request specific follow-up in the community. It is generated using information provided to AHS central TB Services on the TB Referral form, or information received from other sources such as physicians, hospitals where client is a patient, or correctional institutes.

It is only as accurate as the information supplied at the time of referral. If errors are recognized please correct and return to AHS central TB Services.

Additional information found on this form includes:

Client Status / Effective date: indicates client's tuberculosis status as assigned by AHS central TB Services and status date

TB Diagnosis: ICD 9 disease codes assigned by AHS central TB Services for tuberculosis cases and date assigned

LTBI Therapy reason / Date Started / Date Stopped / Reason Stopped: indicates reason LTBI was recommended; date therapy started, date therapy stopped and reason therapy ended. If therapy was refused – "refusal" would print on form.

X-ray date / Result: Indicates client's last chest x-ray received at AHS central TB Services and result of same.

Bacteriology Date / Specimen Type / Lab # / Smear Result / Culture Result: indicates client's most current bacteriological specimen received at AHS central TB Services and result.

Orders: lists follow-up recommendations / date due / comments

TB Control Consultation: This area is for TB physician's dictation of recommendations / findings. As well this space is used by AHS central TB Services to provide further information / instructions regarding client i.e., medication revisions.

Signature / Date: signature of TB physician/nurse and date dictated.

Treatment Record and Follow-up



TREATMENT RECORD AND FOLLOW-UP

TB SERVICES
2ND FLOOR SOUTH TOWER
10030 107 ST
EDMONTON AB
T5J 3E4
BUSINESS: (780) 735-1464
FAX: (780) 735-1195

"Freedom of Information and Privacy Legislation" section must be read by, or to the client.

Freedom of Information and Privacy Legislation Information on this form is collected under the authority of section 20(b) of the Health Information Act (as per section 27(1)(a) and 27(2)) for the purposes of providing a health service, planning and resource allocation, health system management, public health surveillance and health policy development.
Questions about the use and collection of this information can be directed to the contact information provided at the top of this form.

Encounter Date 2009-06-23	PHN	Health Area ASPEN	Branch DEFAULT ASPEN	Birth Date 1961-04-09	Date Of Death	TB Number 0202417
Name TEST, DATA			Home Address 2549 118 AVE, EDMONTON, AB, CANADA, T5Y2V3			
Diagnosis						TBS Doctor
Treatment Start 2008-08-25	Treatment End	Reason Treatment Ended OTHER	Def Specimen	Collected	Smear	Culture

Compliance Period From 2009-01-15 To 2009-02-13

Int	Drug	Dose	Frequency	Required	Taken	%	Start Date	Stop Date	Stop Reason
X	AMI	100 GTTS	1XW	0	0	0.0	2009-01-15		
	EMB	800 MG	2XW	9	6	66.7	2009-01-15		

Weight _____ KG
Color Perception _____
Visual Acuity Right _____
Left _____
Glasses _____

Side Effects and Comments

Compliance Period From 2009-02-14 To 2009-03-15

Int	Drug	Dose	Frequency	Required	Taken	%	Start Date	Stop Date	Stop Reason
X	AMI	100 GTTS	1XW	0	3	100.0	2009-01-15		
	EMB	800 MG	2XW	9	12	100.0	2009-01-15		

Weight _____ KG
Color Perception _____
Visual Acuity Right _____
Left _____
Glasses _____

Side Effects and Comments

Compliance Period From 2009-03-16 To 2009-04-14

Int	Drug	Dose	Frequency	Required	Taken	%	Start Date	Stop Date	Stop Reason
X	AMI	100 GTTS	1XW	2	2	100.0	2009-01-15		
	EMB	800 MG	2XW	9	9	100.0	2009-01-15		

Weight _____ KG
Color Perception _____
Visual Acuity Right _____
Left _____
Glasses _____

Side Effects and Comments

Compliance Period From 2009-04-15 To _____

Int	Drug	Dose	Frequency	Required	Taken	%	Start Date	Stop Date	Stop Reason
	AMI	100 GTTS	1XW				2009-01-15		
	EMB	800 MG	2XW				2009-01-15		

Weight _____ KG
Color Perception _____
Visual Acuity Right _____
Left _____
Glasses _____

TEST. DATA (0202417)

Side Effects and Comments (Local Health Authority)

SEND MORE MEDICATION(S) Yes No Number of Months: _____ Nurse Signature _____

Current Prescription						Treatment to Date as of 2009-04-14			
Drug	Dose	Frequency	Presc. Date	Length	Hold	Drug	Duration in Months	Total Interruptions	Client Compliance
AMI	100 GTTS	1XW	2009-01-16	12 DOSES	X	AMI	1.2	10	100.0%
EMB	800 MG	2XW	2009-01-16	12 DOSES		EMB	3.2	0	100.0%

SAMPLE

Archived

Active Treatment Record and Follow-up

This form is used primarily by public health staff to communicate with AHS central TB Services regarding active treatment activity. It will accompany medication sent to Alberta Health Services for distribution to clients, and is used to:

- Provide a report of drug compliance, possible toxicity and adverse reactions to AHS central TB Services
- Order further medication
- Provide a case summary of the completed treatment regimen

Updated copies of the *Treatment Record and Follow-up form* are forwarded to AHS central TB Services every **month**.

The top portion of the form is filled in by AHS central TB Services – demographic information and information about client's TB diagnosis, treatment start date, treatment end date, reason treatment ended, and the defining specimen is displayed if culture positive case.

If any information is missing, it is because AHS central TB Services has not yet received it.

Compliance Period from date to date: every month the AHS public health staff monitoring medications will provide:

- Initial start date of active treatment and the treatment end date for that compliance period and each one thereafter
- Provide the number of doses **required** to be taken within the compliance period dates
- Provide the number of doses actually taken within the compliance period dates
- Indicate clients current weight in kilograms
- Provide any test / blood work results required within the compliance period dates
- Provide visual acuity and colour perception if client is on Ethambutol
- Indicate pertinent side effects / comments – adverse reactions, concerns, etc.

Send More Medication(s): indicate by checkmark if more Medication(s) required and if yes provide number of months medication(s) required (not more than two). Medication will not be sent if this has not been indicated.

Nurse Signature: signature of public health staff filling in form


Current Prescription: displays for each Medication prescribed: dosage, frequency, prescribed date, length (duration of treatment recommended), and if any medication was placed on hold. Check this against medications on hand as sometimes the prescription changes according to adverse reactions to medications or changes to medication frequencies.

Treatment to date as of: end date of most recent compliance period received at AHS central TB Services. Displays summary to date for each medication

prescribed: duration of treatment in months, total interruptions, and client's compliance calculated in percentage.

Archived

Recommendation for LTBI Therapy

		RECOMMENDATION FOR LTBI THERAPY		TB SERVICES 2ND FLOOR SOUTH TOWER 10030 107 ST EDMONTON AB T5J 3E4 BUSINESS: (780) 735-1464 FAX: (780) 735-1195	
<i>"Freedom of Information and Privacy Legislation" section must be read by, or to the client.</i>					
Freedom of Information and Privacy Legislation		Information on this form is collected under the authority of section 20(b) of the Health Information Act (as per section 27(1)(a) and 27(2)) for the purposes of providing a health service, planning and resource allocation, health system management, public health surveillance and health policy development. Questions about the use and collection of this information can be directed to the contact information provided at the top of this form.			
Recommended Date	PHN	Health Area	Branch	Birth Date	TB Number
		ASPEN	DEFAULT ASPEN	1981-04-09	0202417
Name		Other Name(s)		Alias Type	Gender
TEST, DATA					MALE
Home Address			Phone	Type	Other Phone
2549 118 AVE, EDMONTON, AB, CANADA, T5Y2V3				Home	
Copy to Family Referring Physician		Address		Phone	
Dr. Basson, Nicol		610-3020 22 ST, RED DEER, ALBERTA, CANADA, T4R3J5		(403) 343-8551	
This person has been recommended for LTBI therapy by TBS Doctor					
Reason:					
Hold LTBI Therapy for culture results: <input type="checkbox"/> Yes <input type="checkbox"/> No					
					TBS Doctor Signature
If in agreement with above recommendation,					
Please Sign:		Family Doctor	Signature	Date:	
		Public Health Nurse	Signature		
Pre-Meds AST/ALT		Normal to:	Return to:	TB SERVICES 2ND FLOOR SOUTH TOWER 10030 107 ST EDMONTON AB T5J 3E4	
Symptoms		Yes <input type="checkbox"/>	No <input type="checkbox"/>		
Sputum Submitted:		Yes <input type="checkbox"/>	No <input type="checkbox"/>		
If LTBI therapy is not taken, follow up:					
Current Treatment:					
Date: _____					
Signature: _____					
Original To:		Dr. Basson, Nicol			
Copies To:		File, ASPEN			
Indications for LTBI Therapy					
High Risk <ul style="list-style-type: none"> - HIV/AIDS - Transplantation - Sillcosis - End Stage/Chronic Renal Failure/hemodialysis - Carcinoma of head and neck - Recent infection (2 years or less) - Abnormal Chest Radiograph - Fibronodular Disease - Immunosuppressive drug use including TNF inhibitors 					
Lower Risk <ul style="list-style-type: none"> - Diabetes Mellitus - Underweight (less than 90% ideal weight) - Age when infected (5 years or less) - Abnormal Chest Radiograph - Granuloma - Infected person, no known risk factor 					

Anti-TB drugs are provided free of charge by the Province of Alberta. Attending physicians are not required to write nor pharmacists to fill a prescription for these medications

2004-09

Page 1 of 1

Recommendation for LTBI Therapy Form

This form is used by AHS central TB Services to indicate the recommendation for LTBI therapy for a client.

- This form is sent to the family physician and copied to the local public health office when this recommendation is made.
- It is then up to the family physician, in consultation with the PHN and the client, to decide if the recommendation will be followed.
- Once this decision is made, the form(s) should be returned to AHS central TB Services, indicating whether or not the recommendation for LTBI therapy will be accepted, and if not, the reason for refusal.

This form is generated on the computer with information supplied to AHS central TB Services at the time of referral.

This person has been recommended for LTBI therapy by TB Services

Physician: indicates TB Services Physician making the recommendation and reason for making it.

Hold LTBI therapy for culture results: yes or no - if there is any concern that this client might have active TB, this box will be checked to ensure treatment with one drug is not started prior to ruling out active disease.

Family Doctor Signature: indicates the physician's agreement with the recommendation from AHS central TB Services.

Public Health Nurse Signature: Indicates the PHN has discussed LTBI therapy with the client, the client is aware of the recommendation and has agreed to it.

Pre-meds AST/ALT: if client in agreement send client for AST/ALT blood work prior to starting meds. Indicate result and normal test ranges on form. This is to ensure liver enzymes are normal before initiation of treatment and also serves as a baseline when monitoring for the development of liver toxicity while client is on medication.

Symptoms / Sputum Submitted: indicate by check mark if client has TB symptoms and if sputum for AFB was submitted: Yes/No

Return to: indicates address where the signed form should be sent

If LTBI therapy is not taken, follow-up: indicates what follow-up is recommended if decision is made not to take LTBI therapy.

Current Treatment: This section to be filled in by AHS central TB Services

Indications for LTBI Therapy: List of indications for LTBI therapy

Please note: if LTBI therapy is accepted provide weight as dosages may need to be adjusted.

Information on this form only reflects the information provided to AHS central TB Services by PHN.

Archived

LTBI Therapy Follow-up



LTBI THERAPY FOLLOW-UP

TB SERVICES
2ND FLOOR SOUTH TOWER
10030 107 ST
EDMONTON AB
T5J 3E4
BUSINESS: (780) 735-1464
FAX: (780) 735-1195

"Freedom of Information and Privacy Legislation" section must be read by, or to the client.

Freedom of Information and Privacy Legislation
Information on this form is collected under the authority of section 20(b) of the Health Information Act (as per section 27(1)(a) and 27(2)) for the purposes of providing a health service, planning and resource allocation, health system management, public health surveillance and health policy development.
Questions about the use and collection of this information can be directed to the contact information provided at the top of this form.

Encounter Date 2009-06-23	PHN	Health Area ASPEN	Branch DEFAULT ASPEN	Birth Date 1981-04-09	Date Of Death	TB Number 0202417
Name TEST, DATA			Other Name(s)	Alias Type	Gender MALE	
Home Address 2549 118 AVE, EDMONTON, AB, CANADA, T5Y2V3				Phone	Type Home	Other Phone

LTBI THERAPY
Reason Recommended:
Follow-up if refused:

Recommended By: _____ Date: _____
Agreed To By: _____

Pre Meds _____ Weight(kg): _____ Treatment: Start: 2008-08-25 End: _____ Reason Ended: OTHER

Compliance Period From 2009-01-15 To 2009-02-13

Int	Drug	Dose	Frequency	Required	Taken	%	Start Date	Stop Date	Stop Reason
X	AMI	100 GTTS	1XW	0	0	0.0	2009-01-15		
	EMB	800 MG	2XW	9	6	66.7	2009-01-15		

Weight _____ KG
Color Perception _____
Visual Acuity Right _____
Left _____
Glasses _____

Side Effects and Comment:

Compliance Period From 2009-02-14 To 2009-03-15

Int	Drug	Dose	Frequency	Required	Taken	%	Start Date	Stop Date	Stop Reason
X	AMI	100 GTTS	1XW	0	3	100.0	2009-01-15		
	EMB	800 MG	2XW	9	12	100.0	2009-01-15		

Weight _____ KG
Color Perception _____
Visual Acuity Right _____
Left _____
Glasses _____

Side Effects and Comments

Compliance Period From 2009-03-16 To 2009-04-14

Int	Drug	Dose	Frequency	Required	Taken	%	Start Date	Stop Date	Stop Reason
X	AMI	100 GTTS	1XW	2	2	100.0	2009-01-15		
	EMB	800 MG	2XW	9	9	100.0	2009-01-15		

Weight _____ KG
Color Perception _____
Visual Acuity Right _____
Left _____
Glasses _____

Side Effects and Comments

TEST. DATA (0202417)

Compliance Period From 2009-04-15 To _____

Int	Drug	Dose	Frequency	Required	Taken	%	Start Date	Stop Date	Stop Reason
	AMI	100 GTTS	1XW				2009-01-15		
	EMB	800 MG	2XW				2009-01-15		

Weight: _____ KG
 Color Perception: _____
 Visual Acuity Right: _____
 Left: _____
 Glasses: _____

Side Effects and Comments (Local Health Authority): _____

SEND MORE MEDICATION(S) Yes No Number of Months: _____ Nurse Signature: _____

Current Prescription						Treatment to Date as of 2009-04-14			
Drug	Dose	Frequency	Presc. Date	Length	Hold	Drug	Duration in Months	Total Interruptions	Client Compliance
AMI	100 GTTS	1XW	2009-01-16	12 DOSES	X	AMI	1.2	10	100.0%
EMB	800 MG	2XW	2009-01-16	12 DOSES		EMB	3.2	0	100.0%

2004-09

Page 2 of 2

LTBI Therapy follow-up

This form is used primarily by public health staff to communicate with AHS central TB Services regarding LTBI therapy activity. It will accompany medication sent to Alberta Health Services for distribution to clients, and is used to:

- Provide a report of drug compliance, possible toxicity and adverse reactions to AHS central TB Services
- Order further medication
- Provide a case summary of the completed treatment regimen

Updated copies of the LTBI therapy follow-up form are forwarded to AHS central TB Services every **two months**.

The top portion of the form is filled in by AHS central TB Services – demographic information and information about recommended LTBI therapy obtained from *Recommendation for LTBI Therapy Form*.

If any information is missing, it is because AHS central TB Services has not yet received it.

Pre Meds AST: Medication should not be started until this value is known. If high, consult with AHS central TB Services or the outpatient TB Clinic, and inform the family doctor before having client start on medication.

Weight: weight in kilograms at initiation of treatment

Treatment: indicates start date, end date, reason ended - this information is provided by AHS public health staff monitoring medications

Compliance Period from date to date: every two months the AHS public health staff monitoring medications will provide

- Initial start date of LTBI treatment and the treatment end date for that compliance period and each one thereafter
- Provide the number of doses **required** to be taken within the compliance period dates
- Provide the number of doses actually **taken** within the compliance period dates
- Indicate clients current **weight** in kilograms
- Provide any **test / blood work results** required within the compliance period dates
- Indicate pertinent **side effects / comments** – adverse reactions, concerns, etc.

Send More Medication(s): indicate by checkmark if more Medication(s) required and if yes provide number of months medication(s) required (not more than two or three)

Nurse Signature: signature of public health staff filling in form

Current Prescription: displays for each medication prescribed: dosage, frequency, prescribed date, length (duration of treatment recommended), and if any drug was placed on hold. Check this against medications on hand as sometimes the prescription changes according to adverse reactions to medication(s) or changes in medication(s) frequencies.

Treatment to date as of: end date of most recent compliance period received at AHS central TB Services. Displays summary to date for each medication prescribed: duration of treatment in months, total interruptions, and client's compliance calculated in percentage.

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Tuberculosis Contact List



TUBERCULOSIS CONTACT LIST

TB Services
2nd Floor, South Tower
10030 107 Street
Edmonton AB T5J 3E4
Phone: 780-735-1454
Fax: 780-735-1155

Section should be read by, or to the client.

Information and Privacy Legislation
Information on this form is collected under the authority of section 23(1) of the Health Information Act (as per section 27(1)(a) and 27(2)) for the purposes of providing a health service, planning and resource allocation, health system management, public health surveillance and health policy development.
Questions about the use and collection of this information can be directed to the contact information provided at the top of this form.

CONTACT EVENT
Exposure Category (Please see reverse side for categories) _____ Start Date _____ End Date _____ Case Event/Location _____

SOURCE CASE
TB Number _____ Family Name _____ First Name _____ PHN _____ DIAND Number _____ Health Area/Health Centre _____ Branch _____ Birth Date _____ Treatment Started Date _____ Hospital _____ Admission Date _____ Attending Physician _____
Home Address _____ City _____ Prov. _____ Postal Code _____ Phone () _____ Diagnosis _____ AFB Results: Smear: P N Culture: P N Interviewer _____ Position _____ Date _____

CONTACTS

Contact TB # or PHN	Name	Sex	Birth Date YYYY MM DD	Address	Phone	Last Contact Date	Contact Relation		Tuberculin Tests				BOC Date	Comments/Investigation Inquiry
							Household	Other	MM	Date Given	MM	Date Given		
							<input type="checkbox"/>	<input type="checkbox"/>						
							<input type="checkbox"/>	<input type="checkbox"/>						
							<input type="checkbox"/>	<input type="checkbox"/>						
							<input type="checkbox"/>	<input type="checkbox"/>						
							<input type="checkbox"/>	<input type="checkbox"/>						
							<input type="checkbox"/>	<input type="checkbox"/>						
							<input type="checkbox"/>	<input type="checkbox"/>						

Revised: 2010/05

SAMPLE

EXPOSURE CATEGORY
Please select the exposure category these contacts belong to and enter the code in Exposure Category field on previous page.

01	Acute Care Facility
02	Commercial Setting
03	Continuing Care Facility
04	Correctional Facility
05	Other
06	Rehabilitation Facility
07	School
08	Shelter/Hostel
09	Social Event
10	Travel
11	Workplace

Tuberculosis Contact List

This form is used to:

- initiate follow-up investigation of contacts
- identify those persons who need surveillance because of association with an infectious case of tuberculosis.
- provide information about contacts of active cases of tuberculosis to AHS central TB Services or the outpatient TB Clinics, in order to assist in the co-ordination of contact tracing in the community or an event.

If the client is hospitalized, the form will be initiated by staff in the facility. A copy of the pertinent information will be faxed to all applicable areas as soon as practical.

The form is also used to communicate the results of contact follow-up and any further contact information to AHS central TB Services. Attempts should be made to complete this form and return to AHS central TB Services or the outpatient TB Clinic within **30 days**. **NEW** contact information should be communicated within one week of receipt of the information.

Contact Event: from the reverse side select the exposure category contacts belong to and enter the code. Enter the start date, end date and the case event/location i.e., Social event (code 09), Wedding @ Albert Hall.

Note: Not all cases will have contact events

Source Case: provide as much information as known about the source case: TB File number, Family name, First name, PHN, DIAND Number, Health Area/Health Centre, Branch, Birth Date, Treatment Start Date, Hospital, Admission/Discharge Date, Attending Physician, Home Address, City, Prov., Postal Code, Phone number, TB Diagnosis, AFB Results (smear, culture).

Interviewer: provide your name, your position and date completing the contact list.

Contacts: for each contact listed provide: Contact TB file number if known, Name, PHN, Gender, Birth Date, Address, Phone number, contact date

Contact Relation: select H = Household, NH = Non-household

Association with Source Case: select CL = close, CAS-M = Casual Medium Risk, CAS-L = Casual Low Risk

Duration of Exposure: report in hours, days, weeks, or months

Tuberculin Tests: provide date test given and results read in **mm @ 48–72 hours** post test. If previous significant result is known this should be recorded as well.

BCG date: if contact has ever received a BCG vaccination, enter date

X-ray Required: following contact protocols from *Tuberculosis Prevention and Control Guidelines for Alberta* enter yes or no and date if x-ray required

Comments: space to add any pertinent information

Archived

Standard Data Collection Instrument for New Active and Relapsed cases of Tuberculosis in Alberta



TB Services

STANDARD DATA COLLECTION INSTRUMENT FOR NEW ACTIVE AND RELAPSED CASES OF TUBERCULOSIS IN ALBERTA

The Freedom of Information statement should be read by or to the client:

Information on this form is collected under the authority of section 20(b) of the *Health Information Act* (as per section 27(1)(a) and 27(2)) for the purposes of providing a health service, planning and resource allocation, health system management, public health surveillance and health policy development. Questions about the use and collection of this information can be directed to contact information provided at the top of this form.

2nd Floor South Tower
10030 107 Street
Edmonton AB T5J 3E4
Phone: 780-735-1464
Fax: 780-735-1195

Assessment Date Y Y Y Y M M D D	Personal Health Number (PHN)	Date of birth Y Y Y Y M M D D	Date of death Y Y Y Y M M D D
Health Region/Health Centre		Sub-office	TB Registry Number
Name Last First Middle		Other name(s)	Alias Type <input type="checkbox"/> Female <input type="checkbox"/> Male
Ethnicity <input type="checkbox"/> Canadian-born Aboriginal <input type="checkbox"/> First Nations, registered <input type="checkbox"/> Band of Origin _____ DIAND# _____ <input type="checkbox"/> Lives on Reserve most of the time: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/> Unknown <input type="checkbox"/> First Nations, non-registered <input type="checkbox"/> Métis <input type="checkbox"/> Inuit <input type="checkbox"/> Other Aboriginal (specify) _____ <input type="checkbox"/> Canadian-born Non-Aboriginal <input type="checkbox"/> If less than 15 years of age Birth Country of Father _____ Birth Country of Mother _____		<input type="checkbox"/> Foreign-born * <input type="checkbox"/> Country of Birth _____ <input type="checkbox"/> Date of Arrival in Canada Y Y Y Y M M D D *Immigration Status at time of diagnosis Language: Primary _____ Preferred _____	
Date of Diagnosis (start date of treatment) Y Y Y Y M M D D		Disability	Site(s) of involvement Other _____
Disease Type <input type="checkbox"/> New Active <input type="checkbox"/> Relapse ⇒ Date of prior episode Y Y Y Y M M D D and place of residence at time of prior episode _____ <input type="checkbox"/> Name and duration of previous drugs in use Name _____ duration _____ Name _____ duration _____			
Symptoms at Diagnosis (Check ✓ all that apply) <input type="checkbox"/> Cough _____ duration _____ <input type="checkbox"/> Night Sweats _____ duration _____ <input type="checkbox"/> Weight loss _____ kg Sputum: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Fever _____ duration _____ <input type="checkbox"/> Other: specify _____ duration _____ <input type="checkbox"/> Hemoptysis _____ duration _____			
HIV Risk Assessment (Check ✓ all that apply) History <input type="checkbox"/> IVDU <input type="checkbox"/> Other (specify) _____			
Risk Factors for Reactivation (Check ✓ all that apply OR if none, _____ here) <input type="checkbox"/> NIDDM <input type="checkbox"/> IDDM <input type="checkbox"/> End stage renal disease ⇒ dialysis dependant: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Radiotherapy <input type="checkbox"/> Alcohol Abuse <input type="checkbox"/> Prolonged corticosteroid use <input type="checkbox"/> Gastrectomy <input type="checkbox"/> HIV/AIDS <input type="checkbox"/> Silicosis <input type="checkbox"/> TNF inhibitor use <input type="checkbox"/> Organ Transplantation <input type="checkbox"/> Leukemia, lymphoma, head and neck cancer <input type="checkbox"/> Protein-calorie malnutrition <input type="checkbox"/> Smoker ≥ 1 pack/day <input type="checkbox"/> Other immunosuppressive condition (specify) _____			
Travel-TB endemic country (past 2 years) From date Y Y Y Y M M To date Y Y Y Y M M Country: _____		Incarceration History (past 2 years) From date Y Y Y Y M M To date Y Y Y Y M M	
Homeless History (past 2 years) From date Y Y Y Y M M To date Y Y Y Y M M			

Designated Country List: <http://www.cic.gc.ca/english/information/medical/dcl.asp>

In order to fulfill all the reporting requirements of active tuberculosis cases to the Public Health Agency of Canada (PHAC) we ask your assistance in completing this form.

Please note if none of the risk factors are checked off indicate that the individual has been asked regarding these risks.

A new risk factor not on the form, but required: *is the source case a smoker of greater than or equal to one pack per day YES/NO (circle one)*

Travel to TB endemic countries in the past two years – if more than one please list all on the back of form.

When completed please forward to AHS central TB Services.

Archived

Index Case Interview Checklist⁹⁷

The following information should be collected during the index case interview:

- Client's name, usual home address and phone number (or contact number) or name and location of temporary housing or homeless shelter(s)

NOTE: If a proxy is being interviewed, the name and contact information for that individual should be noted.

- Location and date of the interview, and name of individual conducting the interview
- Name, age, address, phone number, and description of relationship to the client for any contacts present during the interview
- Client's current symptoms and approximate date when each was first noted by the client
- Places client has spent time since the symptoms began, e.g.,:
 - Household or usual residence
 - Other places they have stayed overnight at
 - Work or school
 - Leisure or recreation activities
 - Medical/dental facilities
 - Correctional facilities

Activities closest to the date of diagnosis (the start date of treatment) are the most important.

NOTE: Clients should be asked to describe features of these locations, such as overall room size, degree of air circulation and ventilation. Information about their activities while in these environments, their physical proximity to others, and whether or not the location was crowded should also be elicited.

- Description of client's usual daily routine, e.g.,:
 - Usual daytime, evening, night-time, weekend activities
 - Type/place/frequency of work, school
 - Methods of transportation to and from work, school, etc
- Description of other regular (not daily) activities, e.g.,:

⁹⁷ Adapted from CDC, Self Study Modules on Tuberculosis, Contact Investigation for Tuberculosis (1999) p. 34 and AB TB Control Manual p. 6-48.

- Hobbies
- Leisure and recreation activities/clubs
- Other events/sites attended since symptoms began, e.g.,:
 - Parties
 - Weddings
 - Funerals
 - Vacations
- Details of any air travel and/or other public transportation (e.g., charter bus, train) utilized since symptoms began
- Contacts identified

NOTE: Symptomatic and/or contacts at high risk for progression to active TB disease (e.g., young children, immune suppressed) should be highlighted and prioritized for evaluation.

- **Close household contacts**, especially those who share the same sleeping space
- **Close non-household contacts**; those who have regular, prolonged contact with the client and share breathing space daily but do not live in the same household (regular sexual partners and close friends, guests or visitors to the home [including visitors of other household members], co-workers, classmates, etc.
- **Casual contacts**; contacts who spend time less frequently with the client (classmates, colleagues at work or members of a club or team who are not considered “close” contacts)
- **Community contacts**; contacts living in the same community or attending the same school or workplace as the client but are not considered “close” or “casual” contacts.
- Determination as to who (client or health care provider) will be notifying each contact
- TB information/resources to be provided to the client at a later date
- Date, time, place for follow-up interview (if arranged)

Sample Open-Ended Questions for Index Case Interviews

1. What symptoms do you have?
2. When did your symptoms begin?
3. Who are the people who visit the place where you live?
4. Who are the children you have spent time with since your symptoms started?
5. What places do you go to on a daily basis?
6. What is your daily routine?
7. How do you get to <work/school/home>?
8. Who do you ride to <work/school/home> with?
9. What is the room like where you spend most of your time at <work/school/home>?
10. Who are the people you spend the most time with at <work/school/home>?
11. Who are the people you see every day?
12. What do you do in your spare time?
13. What are your hobbies?
14. Where do you sleep most nights?
15. Where else have you slept since your symptoms started?
16. What other cities/towns/communities/facilities have you been to since your symptoms started?
17. What do you know about TB?
18. What else would you like to know about TB?

Isolation Assessment Form

ISOLATION ASSESSMENT FORM

Date: _____

Client Name: _____ DOB: _____ TB File # _____

Address: _____ Postal Code: _____

Home Phone: _____ Physician name & phone: _____

Contact Person / Next of Kin & phone: _____

Community/Home Environment

1. Community Location (describe): _____

2. Availability of and accessibility to health services (describe): _____

3. Current living situation: Stable Unstable

Type of residence (describe): House _____

Appt/Condo _____

Institution (LTC, correctional, etc.) _____

Drop in Centre / Shelter _____

Homeless _____

Other _____

Number of people sharing residence: _____

High risk contacts (specify): _____

Previously unexposed contacts: Yes No

Private room Yes No

Air circulation adequate Yes No (refer to AHW Guidelines for Prevention Transmission 1998)

4. Transportation (describe): Private transportation available _____

No transportation resources _____

Social Factors / Considerations

1. Support for activities of daily living (describe):

Grocery shopping / meal preparation Yes No

Laundry / housekeeping Yes No

Banking / bill payment Yes No

Medical appointments Yes No

2. Occupation / Employment status (describe): _____

3. Family / Friends involved in care (name): _____

4. Social Services involved / available: No
 Yes Social Worker (name): _____ (ph #): _____
5. Other community support services involved / available (describe): _____

6. Emotional / Spiritual support (describe): _____

7. Family / Friends support (describe): _____

Individual Factors / Considerations

Understanding of TB diagnosis / treatment plan: Yes No
Describe: _____

Acceptance of TB diagnosis / treatment plan: Yes No
Describe: _____

1. Current medication(s) (list) _____

2. Compliance with current medication and follow-up (describe): _____

Prescribed Treatment

1. Diagnosis: _____
2. Drug Resistance: Yes No
3. Current drug regimen: INH RMP PZA EMB Other _____
4. Date medication started: _____
5. DOT provided by: Public Health Nurse Hospital Staff Other _____
6. Location of DOT: Home Hospital Other _____
7. Frequency of DOT Daily 5x week 2x week _____
8. Other medical diagnosis (list): _____
9. Follow-up appointment: TB Clinic (date) _____
10. Other medical appointment(s): where _____ date: _____
11. Blood work: Routine Other (specify): _____
12. Vision screening: Routine Other (specify): _____

Summary / Plan

Home Isolation Package

The most important measures in preventing transmission of TB are:

- early diagnosis of disease;
- prompt initiation of effective treatment; and
- isolation of the client when necessary and to the degree appropriate⁹⁸.

Recognizing that each individual and situation is unique, determining where isolation is best carried out involves careful consideration of the complex interaction between health status, living conditions, and available resources.

For some individuals, it may be determined that the most appropriate environment for them to be isolated in is their home.

Completion of the *Isolation Assessment Form* may assist with collecting the information necessary to make this determination. Generally speaking, home isolation (or discharge from facility-based isolation) is appropriate only if ALL of the following conditions are met:

1. The client is not known (or likely) to have multidrug resistant TB (MDR-TB) or extensively drug resistant TB (XDR-TB);
2. Directly observed therapy (DOT) has been arranged;
3. Household air is not being recirculated to other housing units (e.g., apartment complex);
4. All immune competent household members have been previously exposed to the client;
5. **NO** infants, children under five years of age, or persons with immunocompromising conditions are present in the household **unless** they are already receiving treatment for TB disease or latent TB infection (LTBI);
6. A written plan for airborne precautions/isolation has been developed and an isolation contract shared with the individual and others living in the home (see *Sample Voluntary Client Isolation Contract* which follows).
7. There is reasonable expectation that the individual will be able to comply with the airborne precautions/isolation plan.

NOTE: Discharge home from facility-based isolation should not occur until/unless there is clinical evidence of improvement and reasonable evidence of adherence to at least two weeks of multidrug TB therapy⁹⁹.

⁹⁸ Long, R. Ellis, E. Editors, Canadian Tuberculosis Standards. 6th Edition, Canadian Lung Association and Public Health Agency of Canada, 2007, p.43.

⁹⁹ Ibid, p. 331.

Airborne Precautions/Isolation Plan

In order to ensure the safety of the individual, other household members, health care providers who visit the home, and the general public, a written plan for airborne precautions/isolation should be developed for each client isolated in the community. The plan should identify the specifics of the treatment plan, including how the directly observed therapy will be provided (where, when, by whom).

Ideally, the plan should be developed and the written contract for adherence reviewed with the client and household members as soon as possible after TB is diagnosed and prior to discharge for those cases initially isolated in a facility. The plan should be regularly revisited, in consultation with AHS central TB Services, the outpatient TB clinic (if involved), and other health care providers involved to ensure that it is the least disruptive to the individual's life while still supporting the goals of optimal treatment and protection of others.

A written contract for adherence to the behaviors and actions required in the plan will ensure the individual, other household members, and health care providers visiting the home understand what is expected and are aware of the consequences of non-adherence (see *Sample Voluntary Client Isolation Contract*).

For example,

- Individuals isolated in the community are not to return to work, school, or usual social activities, nor have visitors
- Contact with individuals other than those living in the household, particularly infants, children under five years of age and those with immune compromising conditions, must be avoided

NOTE: It may be helpful to identify a list of persons who are allowed to remain in the residence or visit while the individual is under isolation restrictions

- The individual must wear a *surgical (or procedure) mask* if attending out-patient follow-up services at health care facilities until such time as they have been proved noninfectious. Home care or other personnel visiting the client in the home should wear appropriate personal respiratory protection (e.g., fitted N95 respirators)
- Activities should be limited to those that the individual can safely perform without putting others at risk. For example, ambulating out of doors is permissible, provided the individual is not in very close physical proximity with susceptible individuals for prolonged periods of time

Sample Voluntary Client Isolation Contract

(Suggested language, may place on AHS letterhead)

To: _____

You have *infectious* TB. *Infectious* means that you could spread TB to other people by being in the same room or home with them. The TB germ spreads from one person to another through the air. The TB germ gets into the air when you cough, sneeze, sing, or speak forcefully. To protect people around you from catching TB, you need to take your TB pills and stay at _____ until you can no longer spread your TB. Then you will be able to return to doing the things you normally do including visiting with other friends and family. You will need to keep taking the TB pills even after you return to your normal activity. The health staff will regularly check on you during the time you are taking pills. We will let you know when new tests need to be done and what those tests show. We will also let you know when you no longer need to take pills.

We found that you have TB from a _____ sample which showed the TB germ under a microscope; a _____ sample with TB germs which grew in a lab; and/or a chest x-ray done on _____ which showed signs of TB disease in your lungs.

It is against the law for people in Alberta with infectious TB to; 1) stop taking their TB pills before the health staff tell them to, or 2) go out in public while they are still able to spread the TB germ to other people. These laws are part of the *Public Health Act* and the *Communicable Diseases Regulation*. If you break these laws you could be picked up by the police and taken to hospital to protect other people from catching your TB and to get medical care. If you follow this agreement you will not break any laws.

I understand the above. I, _____, agree to remain at _____ to protect other people from catching TB from me. I will remain there until I am told by _____ that I no longer need to.

While I remain at _____ I agree that I will only spend time with the people I live with, the TB health staff and the other people agreed to by the Medical Officer of Health. These people are: _____

I will call the Public Health Nurse and/or Community Health Nurse at phone #: _____ if:

- I am having any problem sticking to this agreement,
- My symptoms change, and/or
- I remember anyone else who was in contact with me and should be tested for TB.

I understand that the Public Health Nurse and/or Community Health Nurse will visit me regularly. They will check on how I am doing and make sure that I am not having problems sticking to this agreement.

Signature: _____ Date: _____

Witness: _____ Date: _____

Ensuring Adherence

The PHN (liaising as necessary with the TB Services physician, the Medical Officer of Health, and the attending physician) has immediate responsibility for ensuring adherence with the plan for airborne precautions/isolation. The AHS TB Services program may wish to establish a minimum PHN visiting frequency.

Every effort should be made to promote cooperation and ensure adherence. Consideration should be given to the use of incentives and enablers (e.g., food, personal items, vouchers, books, videotapes, toys, and assistance with housing or personal needs).

Indications that an individual may be having difficulty coping with isolation and/or visitor restrictions should be noted and followed up on with the client. As described in *Sample Voluntary Client Isolation Contract*, isolation requirements are enforceable under the Public Health Act and Communicable Diseases Regulation (see *Sample Warrant*).

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Sample Warrant

**PUBLIC HEALTH ACT
Section 39(2)**

CERTIFICATE OF A MEDICAL OFFICER OF HEALTH

TO ALL OR ANY OF THE PEACE OFFICERS IN ALBERTA
AND TO ALL OR ANY OF THE PHYSICIANS IN ALBERTA

I, **doctor's name**, of city/town Alberta, Medical Officer of Health, hereby certify that **patient's name** of city/town, Alberta.

1. Is or may be infected with a disease which is a prescribed disease for the purpose of section 39 of the *Public Health Act*, AND

2. REFUSES or is NEGLECTING:

(strike inapplicable statement)

- a) to submit to a medical examination for the purpose of ascertaining whether or not he/she is infected with that disease;
- b) to submit to medical, surgical or other remedial treatment that has been prescribed by a physician and that is necessary to render the person non-infectious;
- c) to complete with any other conditions that have been prescribed by a physician as being necessary to mitigate the disease or limit its spread to others.

THIS CERTIFICATE IS AUTHORITY, pursuant to section 40 of the *Public Health Act*,

1. for any peace officer to apprehend **patient's name** and convey him/her to **Walter C MacKenzie Centre 5C3** within 7 days of issue of this certificate.
2. for a physician to conduct an examination of **patient's name**

In the manner prescribed in the regulations under the *Public Health Act* AND for a physician to treat or prescribe treatment for **patient's name** in order to render him/her non-infectious, with or without his/her consent, AND for a physician to detain **him/her** at **WCM 5C3** in accordance with the provisions of the *Public Health Act*, AND

3. for a physician to prescribe any other conditions necessary to mitigate the disease or limit its spread to others.

- 2 -

The following precautions should be observed: (Check appropriate precaution)

- N95 mask (on patient)
- N95 mask on apprehending officer
- hand washing

Medical Officer of Health

DATE OF ISSUE _____

TIME OF ISSUE _____

NOTE: Where this Certificate is issued pursuant to a Notice under section 49(1) of the *Public Health Act*, the Certificate must be issued within 72 hours of the date of service of that Notice.

DESCRIPTION:

NAME

DOB

ETHNIC ORIGIN

WEIGHT

HEIGHT

DISTINGUISHING FEATURES

CURRENT ADDRESS

Archived

Appendix H: Primary Prophylaxis Guideline for Outside of Calgary and Edmonton

Rationale

Children under age five are at a higher risk of developing primary tuberculosis. Identification of secondary cases and vulnerable contacts to an infectious case of tuberculosis should be the first priorities in contact follow up. However, due to the traditional means of follow up in non-metro regions, problems with expedited medical assessment, chest X-ray and related tests often result in delaying onset of primary prophylaxis.

In efforts to counter this issue, a guideline for rapid initiation of primary prophylaxis for vulnerable contacts follows:

Process for AHS Public Health Nurses

1. Identify those under the age of five and vulnerable contacts.

Simultaneously:

- obtain weights, symptom inquiries and sputum if able to produce
 - if symptomatic, refer to family physician immediately
 - begin to arrange for assessment by family physician or designate for those children that are asymptomatic
 - assessment to be completed within one week of identifying case and is to include chest X-ray (PA and lateral) and pre-treatment blood work (ALT, AST, CBC and platelets)
 - ensure chest X-rays are forwarded to AHS central TB Services
 - initiate first round of tuberculin skin tests
 - obtain any other pertinent medical information (i.e., allergies or co-morbidities)
2. Phone AHS central TB Services (780-735-1464) and fax (780-735-1195) all information regarding those identified. Ensure information has been received by AHS central TB Services.
 3. Ensure chest X-ray is completed by client and the film is forwarded to AHS central TB Services. Confirm chest X-rays have been received by AHS central TB Services.
 4. If required, arrange for pick up of stock supply of medications at designated site (health unit/centre, bus terminal).
 5. Initiate medications ordered by AHS central TB Services. (Target is to start primary prophylaxis within two weeks of source case identification)
 6. Continue to follow AHS central TB Services directives regarding follow up.

Process for AHS central TB Services

1. Upon identification of an infectious case of tuberculosis and potential vulnerable contacts, send stock medications to appropriate health unit/centre by fastest means possible in coordination with provincial drug depot.

Amount of stock supply will be determined:

- # of bottles of INH liquid
 - # of tablets of INH
 - # of rifampin liquid kits
 - # of capsules of rifampin
 - # of tablets of vitamin B6
2. Upon receipt of contact list with weights and pertinent information, open files and mark as priority and hold for receipt of chest X-rays and radiology reports.
 3. Once chest X-ray is reviewed by AHS TB Services physician and active disease is ruled out, confirm prescription for primary prophylaxis. If active disease is diagnosed confirm prescription for active disease and fax dosages to appropriate health unit/centre. (Target is to start primary prophylaxis within two weeks of source case identification)
 4. Review vulnerable contact's files in seven days to ensure chest X-ray has been received and prescription is determined.