

TUBERCULOSIS (TB)

1. **Agents:** *Mycobacterium tuberculosis* complex, which includes *M. tuberculosis*, *M. africanum*, and *M. bovis*

2. **Identification:**

a. **Clinical Features:** A mycobacterial disease that is a major cause of disability and death in much of the world, especially developing countries.

The initial infection usually is asymptomatic leading to a latent infection. Tuberculin skin test reactivity appears within 2-10 weeks. Persons with a positive tuberculin skin test, no symptoms and a normal chest x-ray are said to have a Latent Tuberculosis Infection (LTBI).

Early lung lesions that may occur commonly heal, leaving no residual changes except occasional pulmonary or tracheobronchial lymph node calcifications. Extrapulmonary TB occurs less commonly (30%) than pulmonary TB (70%). Symptoms of active tuberculosis depend on the site of the infection. Systemic symptoms include fever, fatigue, night sweats and weight loss. Symptoms of pulmonary disease include prolonged cough (usually 3 weeks or more), hemoptysis or chest pain. Laryngeal disease may cause hoarseness. Patients may have active TB and be asymptomatic. Examples of TB chest x-ray changes may include pulmonary infiltrates, cavitations, fibrotic changes, and pleural effusions. In adults with normal immunity chest x-ray findings are most commonly in the upper segments of the lobes due to reactivation disease from latent infection.

Adenopathy is a common chest x-ray finding in young children and persons with HIV infection. The younger the child the more commonly adenopathy is present without parenchymal disease.

A positive sputum smear for acid-fast bacilli is indicative of high infectiousness but studies have shown that smear negative patients can still be infectious.

Immunocompetent people who are or have been infected with *Mycobacterium tuberculosis*, *M. africanum*, or *M. bovis* usually react to a tuberculin skin test. In some persons with TB infection, delayed type hypersensitivity to tuberculin may wane with time.

b. **Differential Diagnosis of pulmonary tuberculosis:** Pneumonia, carcinoma, coccidioidomycosis, sarcoidosis.

c. **Diagnosis:**

LATENT TB INFECTION (LTBI):

Targeted tuberculin skin testing (TST) has been the mainstay for testing to detect latent TB infection (LTBI). The aim of testing for LTBI is to identify individuals at high risk for developing active TB who would benefit from treatment of LTBI. High risk is defined by the CDC as risk substantially greater than that of the U.S. population. Individuals who test positive for LTBI should be offered treatment. Tuberculin skin testing of low risk populations will result in unnecessary treatment because of false-positive test results.

TB Skin Test Interpretation

≥ 5 mm of induration:

- Persons known or suspected to have HIV infection.
- Recent contacts to active case of pulmonary or laryngeal TB.
- Persons with fibrotic changes seen on chest radiograph consistent with TB.
- Immunosuppressed individuals

≥ 10 mm of induration:

- All persons except those in the above categories.

QuantiferON-TB- Gold® (QFT-G)

QFT-G is an in-vitro laboratory diagnostic test that was recently approved by the FDA for detecting infection with *M. tuberculosis*. It may be used in place of the TST for screening. For guidance for the use of QuantiferON-TB Gold® refer to the most recent CDC recommendations (MMWR 2005; 54; No. RR-15).

It is essential that anyone with a positive TB screening test (TST or QFT-G) receive a symptom review, chest x-ray and clinical evaluation to rule out active tuberculosis before being started on treatment for latent TB infection. LTBI treatment must be delayed until active TB is ruled out.

ACTIVE TUBERCULOSIS

If active tuberculosis is suspected, specimens should be obtained for acid-fast bacilli (AFB) smears and cultures.

If pulmonary disease is suspected three sputum specimens are recommended, using sputum induction if necessary. Sputa should be obtained even when the chest x-ray abnormalities are consistent with healed or stable lesions. Active disease may be present even if the radiographic findings are stable.

Specimens may be obtained from other body fluids or tissues for AFB stains and culture depending on the site of the disease.

Demonstration of acid-fast bacilli in stained smears is a presumptive diagnosis of active TB disease and initiation of antituberculous treatment must be considered.

Isolation *M. tuberculosis* complex organisms on culture confirm the diagnosis, as does a positive result on

PCR testing. Drug susceptibility testing is essential for all positive cultures.

In the absence of bacteriological confirmation, active disease can be presumed if clinical, histological or radiological evidence is suggestive of TB and other likely disease processes can be ruled out.

Incubation: From infection to a significant tuberculin reaction or positive QFT-G test is about 2-10 weeks.

Risk of Active TB:

The subsequent risk of progression to active TB is greatest within the two years after infection, and there is about a 10% lifetime risk of developing active tuberculosis. The risk of developing active disease is higher for the children under 5 years of age, those with HIV infection or chronic immunosuppression, persons recently infected including recent immigrants from countries with high rates of TB, drug users, persons with underlying medical conditions including diabetes mellitus, chronic renal failure, and malnourishment among others. In both California and San Joaquin County about 70-80% of active TB cases are among foreign born people from countries with high rates of tuberculosis.

3. **Reservoir:** Primarily humans, rarely primates; in some areas, diseased cattle, badgers, swine and other mammals are infected with *M. bovis*.
4. **Source:** Airborne droplet nuclei containing tubercle bacilli from infected individuals.
5. **Transmission:** Exposure to tubercle bacilli in airborne droplet nuclei, 1 to 5 microns in diameter, produced by people with pulmonary, laryngeal or respiratory tract TB during expiratory efforts (coughing, singing, or sneezing), and inhaled by a vulnerable contact into the pulmonary alveolae. Direct invasion through mucous membranes or breaks in the skin may occur but is rare. Except for rare situations

where there is a draining sinus, extrapulmonary TB (other than laryngeal) is generally not communicable.

6. **Communicability:** Patients with AFB smear-positive pulmonary TB are considered infectious until completion of at least 2 weeks of adequate therapy AND have a favorable clinical response to therapy AND have 3 consecutive negative sputum smears collected on different days. It is well documented that persons whose sputa are initially AFB smear negative may still be communicable to others, although they are less infectious than those with AFB smear-positive disease. Young children with primary tuberculosis are usually not infectious.

7. **Specific Treatment:**

LATENT TUBERCULOSIS INFECTION:

Isoniazid (INH)

- Adults: 300 mg (PO) daily
 - Children: 10-20 mg/kg up to 300mg maximum (PO) daily
- 6-9 months for immunocompetent adults. A 9-month regimen is considered optimum to provide a greater degree of protection.
 - 9 month regimen for children and adolescents.
 - 9 month regimen for HIV-infected persons or persons suspected of having HIV infection.

Pyridoxine 25 mg (PO) daily (Vitamin B-6) is recommended to be given with the INH for patients with diabetes, uremia, alcoholism, malnutrition, HIV infection, seizure disorder, symptoms of peripheral neuropathy, as well as for pregnant and postpartum or breastfeeding women and breastfed infants.

Contact the local Tuberculosis Control Program for treatment recommendations for contacts to drug resistant tuberculosis.

ACTIVE TUBERCULOSIS:

Patients with TB disease need to be treated with a combination of

antituberculosis drugs. Sputum smears and cultures for AFB must be monitored at regular intervals during treatment. For most cases of drug-susceptible disease, a 6 month regimen is recommended, including isoniazid, rifampin, pyrazinamide and ethambutol for the first 2 months, followed by isoniazid and rifampin for 4 additional months. After drug susceptibility results become available the drug regimen will be modified if drug resistance is present. Consult the local Tuberculosis Control Program for specific recommendations. Coordination with the local TB Control Program will help ensure patient support for taking medications as prescribed. This may include directly observed treatment (DOT) which is highly effective in achieving completion of therapy and cure.

8. **Immunity:** The risk of infection with the tubercle bacillus is directly related to the degree of exposure and does not appear related to genetic or other host factors.

REPORTING PROCEDURES

Report within 1 working day of identification of case or suspected case (Title 17, Section 2500, *California Code of Regulations*).

CONTROL OF CASE & CONTACTS

CASE:

Isolation: Patients with suspected or confirmed tuberculosis disease are to be in respiratory isolation. Hospitalized patients require a private room with negative pressure ventilation with personal protective equipment for medical staff and visitors.

Young children with active TB disease are not considered infectious to others. Adolescents should be treated as adults.

Concurrent disinfection: Hand-washing and good housekeeping practices must be maintained according to policy. No special precautions necessary for handling fomites. Decontamination of room air may be achieved by negative pressure ventilation or HEPA filtration; this may be supplemented by ultraviolet light.

CONTACTS:

All persons who are contacts to suspected and confirmed cases of pulmonary tuberculosis should be tested for TB infection with either a TST or QFT-G. If initial test is negative it should be repeated 10 weeks follow the last day of exposure.

LTBI treatment is recommended for contacts found to have TB infection and in whom TB disease has been ruled out (via chest x-ray and symptom review). Young children (4 years old and under) should be started on treatment after the first screening test even if negative due to the high risk of developing TB disease. The treatment can be stopped if the second test is still negative; except in infants where it is recommended that the final skin test be performed after the child is one year of age to ensure maturity of the immune response. In HIV infected contacts, empiric treatment for LTBI should be completed regardless of the result of the repeat TST.

Some individuals may require another course of LTBI therapy if re-exposed to an infectious case. Indications for re-treatment following re-exposure include age < 5 years, HIV infection or other significant immunosuppressive conditions.

PREVENTION-EDUCATION

1. Educating patients and their families on tuberculosis disease, mode of spread and the treatment will facilitate cooperation with the therapy.

2. Monthly clinical evaluation is important to assess compliance and monitor for possible side effects such as hepatotoxicity.
3. For TB disease, periodic sputum specimens and other clinical evaluations are needed to monitor the patient's response to therapy.
4. Educate patient on symptoms of hepatotoxicity and the need to report any symptoms promptly.

DIAGNOSTIC PROCEDURES

San Joaquin County Public Health Laboratory services are available. Refer to the Laboratory Services Manual in Section 2, Disease Reporting.

NOTE:

More information on screening, diagnosis and treatment of both active tuberculosis and latent TB infection can be found at the website for the California Tuberculosis Controllers Association at www.ctca.org/guidelines and the Francis J. Curry National Tuberculosis Center at www.nationaltbcenter.edu.