

# TESTING FOR TUBERCULOSIS WITH PPD

## I. Tuberculin skin test

- A. Used to determine whether a person has tuberculosis (TB) infection; it is **not a vaccine**
- B. Tuberculin testing is useful for:
  - 1. examining a person who isn't sick but may have TB infection
  - 2. screening groups of people at risk of TB disease once infected
  - 3. examining a person who has symptoms of TB disease

## II. New recommendations (CDC, April 2000)

- A. Targeted testing
- B. "Decision to screen is a decision to treat"
- C. Conversion defined: at least 10mm increase of induration over 2 years

## III. Types of skin tests

- A. Mantoux skin test (purified protein derivative or PPD)
  - 1. Only standardized method available for identifying persons infected with *M. tb*
  - 2. Administration
    - a. 0.1 ml of PPD tuberculin containing five tuberculin units injected intradermally on the volar surface of the forearm
    - b. gloves are not necessary for proper intradermal injections. However, individual institution or agency policies may vary
  - 3. Reading
    - a. patient's arm is inspected 48 to 72 hours after tuberculin is injected
    - b. most people with TB infection have a positive reaction to tuberculin
    - c. the reaction is the area of induration, or swelling, around the injection site
      - 1) diameter of the indurated area is measured across the forearm and recorded in millimeters
      - 2) erythema, or redness, is not measured. The presence of erythema does not indicate that a person has TB infection

(Based on the CDC's *Self-Study Modules on Tuberculosis*, Module 3, March 1995 and ATS/CDC "Targeted Testing and Treatment of Latent Tuberculosis Infection" Guideline, April 2000.)

- c. a clearly positive reaction may be read up to one week (day 7) after testing

B. Multiple-puncture test

- 1. Easy to give and convenient, but not as accurate as Mantoux skin test
  - a. amount of tuberculin entering the skin cannot be measured
- 2. Positive reactions to multiple-puncture tests should be confirmed with a Mantoux skin test

#### IV. Interpretation of PPD results

- A. Whether a reaction to the Mantoux tuberculin (PPD) skin test is classified as positive depends on the size of the induration and the person's risk factors for TB

- B. California guidelines (vary slightly from CDC classification):

- 1. 5 or more millimeters
  - a. people with HIV infection
  - b. close contacts to active cases
  - c. abnormal chest x-ray
- 2. 10 or more millimeters
  - a. all other persons, including:
    - 1) people born in areas of the world where TB is common (especially immigrants in U.S. < 5 years)
    - 2) injection drug users known to be HIV negative
    - 3) low-income groups with poor access to health care
    - 4) people who live in residential facilities (e.g., prisons, nursing homes)
    - 5) people with medical conditions that increase TB risk (not including HIV infection), such as
      - i. diabetes
      - ii. silicosis
      - iii. chronic renal failure
      - iv. some cancers (head, neck, lung)
      - v. gastrectomy
      - vi. weight < 90% ideal body weight
    - 6) children under 4 years old
    - 7) children or adolescents exposed to adults at high risk
    - 8) people in groups identified by local public health officials as likely to be exposed to TB
- 3. 15 or more millimeters (CDC/ATS guidelines)
  - a. routine skin testing is not recommended for populations at low risk of latent TB infection (LTBI), e.g., military personnel with no other risk factors
  - b. if low-risk individuals are to be tested (where periodic testing programs are in place) a higher cut-off is used

### C. Targeted testing

#### 1. High-risk conditions

Most of our efforts should be directed at providing treatment of LTBI in those persons who have an increased risk of developing TB, once infected with *M.tb*. In the table below are listed some factors that are associated with an increased incidence of TB.

Incidence of Active TB in Persons with a Positive TST by Selected Factors	
Risk Factor	TB Cases/1000 person-years
Infection > 2 years past	0.7
Infection < 1 year past	12.9
HIV-infection	35.0 – 162.0
Injection drug use	
HIV seropositive	76.0
HIV seronegative or unknown	10.0
Silicosis	68
Radiographic findings consistent with old TB	2.0 – 13.6

#### 2. High risk medical conditions

Certain Medical Conditions are Also Associated with an Increased Risk of Developing TB	
Medical Condition	Relative Risk
Silicosis	30
Diabetes mellitus	2.0 – 4.1
Chronic Renal Failure/Hemodialysis	10.0-25.3
Gastrectomy	2-5
Jejunioileal bypass	27 – 63
Solid organ transplant	
Renal	37
Cardiac	20 – 74
Carcinoma of head and neck	16

### V. Recording PPD skin test results

#### A. It is important to record the size of the induration in millimeters (mm)

1. Don't write "negative" or "neg" but record negative results as 00 mm
2. Do write positive results as a number, not "positive", such as 10 mm, 12 mm
3. Remember that conversion is defined as an increase of 10 mm over a 2 year period

- B. Refer all PPD results over 10 mm for medical evaluation (refer high risk contacts and immunocompromised persons if PPD > 5 mm)
- C. People who are contacts to active TB need another PPD 10 – 12 weeks after the first negative result
- D. "If not written down, it didn't happen." Repeat PPD if no documented results are available

## VI. False-positive reactions

- A. Factors that may cause a false-positive reaction
  - 1. Infection with mycobacteria other than *M.tb* (MOTT)
  - 2. Bacille Calmette-Guérin (BCG) vaccination
- B. There is no reliable way to differentiate between a positive tuberculin reaction caused by BCG vaccination and one due to TB infection
  - 1. Positive reaction is more likely to be due to TB infection if:
    - a. the reaction is large
    - b. the person was vaccinated long ago
    - c. the person comes from an area of the world where TB is common
    - d. the person has been exposed to someone with infectious TB disease
    - e. the person's family has a history of TB disease
- C. People who have positive reaction should be further evaluated, regardless of BCG status

## VII. False-negative reactions

- A. A negative PPD reaction does not exclude disease
- B. Factors that may cause a false-negative reaction
  - 1. Anergy
    - a. the inability to react to skin tests due to a weakened immune system, caused by:
      - 1) cancer
      - 2) HIV infection
      - 3) severe TB disease
  - 2. Recent TB infection (within the past 10 weeks)
    - a. it takes 2-10 weeks after TB infection for the body's immune system to react to tuberculin
  - 3. Very young age (younger than 6 months)

- a. because their immune system is not fully developed, children younger than 6 months may have a false-negative reaction to the tuberculin skin test
  - 4. Recent immunization with live virus vaccine (polio, measles, mumps, rubella, varicella, yellow fever) can suppress reactivity to tuberculin for as long as four weeks
    - a. give the TST on the same day as a live virus vaccine, **OR**
    - b. administer the TST at least 4 weeks after live virus vaccine
  - 5. Prolonged corticosteroid therapy can depress reaction to TSTs
- C. Any patient with symptoms of TB should be evaluated for TB disease, regardless of skin test reaction

Type of Reaction	Possible Cause	People at Risk	Action to Take
False-positive	Nontuberculous mycobacteria	People infected with nontuberculous mycobacteria	Evaluate for TB disease if person has TB symptoms
	BCG vaccination	People vaccinated with BCG	Assess likelihood of true TB infection
False negative	Anergy	HIV-infected people, other people with weakened immune systems	Anergy testing is discouraged in most cases
	Recent TB infection	People infected with <i>M. tb</i> within the past 10 weeks	Retest 10 weeks after exposure to TB ended
	Very young age	Children younger than 6 months old	Retest when child is 6 months old and 10 weeks after exposure to TB has ended

## VI. TB screening programs and two-step testing

- A. Certain facilities (e.g., residential facilities, health care facilities) have TB screening programs, in which employees and residents are periodically given tuberculin skin tests
- B. Purposes of screening programs
  - 1. Identify people who have TB infection and possibly TB disease, so that they can be treated as needed
  - 2. Determine whether TB is being transmitted in the facility
    - a. baseline skin test determines person's TB status when they enter facility or start their job

C. Skin test conversions

1. Employees or residents whose skin test converts from negative to positive between screenings have probably become infected with *M.tb*
  - a. people with skin test conversions are at high risk of developing TB disease because they were recently infected with *M.tb*
  - b. in order to detect *M.tb* transmission and identify people who have skin test conversions, accurate information must be obtained for every employee's baseline skin test, as well as for additional tests

D. Booster Phenomenon

1. A phenomenon in which some people (especially older adults) who are skin tested many years after becoming infected with *M.tb* may have a negative reaction to an initial skin test, followed by a positive reaction to a skin test given up to a year later. This happens because the first test boosts the immune response

E. Two-step testing

1. To avoid misinterpretation, two-step testing has been developed to tell the difference between boosted reactions and those caused by recent infection. If a person has a negative reaction to the initial skin test, he or she is given a second test 1 to 3 weeks later
  - a. if the reaction to the second test is positive, it's probably a boosted reaction (due to TB infection that occurred a long time ago)
  - b. if the reaction to the second test is negative, the person is considered uninfected. If this person has a positive reaction to a skin test given later, it's probably due to recent infection