Tuberculin Testing

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Testing for TB Disease and Infection
Purpose of Targeted Tuberculin Testing

- Find persons with Latent Tuberculosis Infection (LTBI) who would benefit from treatment
- Groups that are not high risk for TB should not be tested routinely
- Tuberculin skin testing (TST) should not be performed on someone who has written documentation of either previous + TST or TX for TB disease.
TST and Treatment of Latent Tuberculosis Infection

- As tuberculosis (TB) disease rates in the United States (U.S.) decrease, finding and treating persons at high risk for latent TB infection (LTBI) has become a priority.

- Without TX, 5-10% of those with LTBI will progress to TB disease at some point in their lives.
Test Methods for detecting *M. tuberculosis* Infection

Mantoux tuberculin skin test (TST)

- Skin test that produces delayed-type hypersensitivity reaction in persons with *M. tuberculosis* infection

- “Tubersol” and “Aplisol” are two commercially available tuberculin products of purified protein derivative (“PPD”) solution. PPD is the solution/not the test.
Selecting TB test

- Routine testing with both TST and IGRA is **NOT** recommended

- Multiple puncture tests (e.g., Tine Test) are inaccurate and not recommended
Mantoux Tuberculin Skin Test

Primarily used for:

- Examining those who have SX of TB
- Contact investigations—test close contacts of people who have active TB
- Targeted testing of those at high risk for TB: i.e., HCW who serve high risk clients, residents/employees of correctional facilities, and foreign born from areas of high TB incidence.
Administering the Mantoux TST

- Always follow your institution’s standard precautions for infection control.
- Inject 0.1 ml of 5 TU PPD solution \textit{intradermally} using Mantoux technique on volar surface of lower arm about 2 to 4 inches below the elbow using a 27-gauge needle.
Administering the Mantoux TST (1)

- Stretch taut the selected area of skin between the thumb and forefinger.
- The area selected should be free of any barriers to placing and reading the skin test such as muscle margins, heavy hair, veins, sores, or scars.
- With the needle bevel facing up against the patient’s skin, insert it slowly at a 5 to 15 degree angle.
Needle bevel is advanced through the epidermis approximately 3 mm so that the entire bevel is covered

Produce a wheal 6 to 10 mm in diameter

Document location of TST, date, time, lot # of PPD.
Reading the TST

- Measure reaction in 48 to 72 hours
- Measure induration, not erythema
- Record reaction in millimeters, not “negative” or “positive”.
- A TST not measured and recorded in mm of induration must be repeated. (wait at least 7 days before repeating the test)
- Ensure trained health care professional measures and interprets the TST
Reading the TST

- Educate patient and family regarding significance of a positive TST result
- Positive TST reactions can be measured accurately for up to 7 days
- Negative reactions can only be read accurately for only 72 hours
- Interpretation of TST result is the same for those who have had BCG vaccination.
TST Interpretation

5-mm induration is interpreted as positive in:

- HIV-infected persons
- Recent close contacts to an infectious TB case
- Persons with chest radiographs consistent with prior untreated TB
TST Interpretation

5-mm induration is interpreted as positive in (cont.)

- Organ transplant recipients
- Other immunosuppressed patients (e.g., those taking the equivalent of >15 mg/d of prednisone for 1 month or those taking TNF-α antagonists)
10-mm induration is interpreted as positive in

- Recent immigrants (within 5 years) from high-prevalence countries
  - In 2009, approximately 60% of TB cases in US occurred in foreign born individuals.
  - Majority from Mexico, Philippines, Vietnam, India, China, Haiti, Guatemala.
(http://www.stoptb.org/countries/tbdata.asp)
TST Interpretation

10-mm induration is interpreted as positive in:

- Injection drug users
- Residents or employees of congregate settings (prisons, LTC facilities, hospitals and other HC facilities, homeless shelters)
- Mycobacteriology laboratory personnel
10-mm induration is interpreted as positive in persons with clinical conditions that place them at high risk:

- Silicosis, diabetes mellitus
- Chronic renal failure or on hemodialysis
- Leukemias or lymphomas
- Gastrectomy, jejunoileal bypass
- Head and neck cancer
10-mm induration is interpreted as positive in (cont.)

- Weight loss of > 10% of ideal body weight
- Children < 4 years or infants, children, and adolescents exposed to adults at high-risk
TST Interpretation

15-mm induration is interpreted as positive in

- Persons with no known risk factors for TB.*

*Although skin testing programs should be conducted only among high-risk groups, certain individuals may require TST for employment or school attendance. Diagnosis and treatment of LTBI should always be tied to risk assessment.
Converters

Higher risk LTBI:

- Recent TST converters:
- Those with baseline testing results who have an increase of 10 mm or more in the size of the TST reaction within a 2-year period.
- The risk of progression is greatest in the first 1 or 2 years after infection.
Factors That May Cause False-Positive TST Reactions

- Nontuberculous mycobacteria
  - Reactions caused by nontuberculous mycobacteria are usually $\leq 10$ mm of induration

- BCG vaccination
  - Reactivity in BCG vaccine recipients generally wanes over time; positive TST result is likely due to TB infection if risk factors are present
Factors That May Cause False-Negative TST Reactions

- **Anergy**
  - Inability to react to a TST because of a weakened immune system (i.e. HIV)
  - Usefulness of anergy testing in TST-negative persons who are HIV infected has not been demonstrated
Factors That May Cause False-Negative TST Reactions

- Recent TB infection
  - Defined as 2 to 10 weeks after exposure
- Very young age
  - Newborns
Factors That May Cause False-Negative TST Reactions

- Live-virus vaccination
  - For example, MMR or chickenpox
  - Can temporarily suppress TST reactivity
- Overwhelming TB disease
- Poor TST administration technique
  - For example, TST injection too shallow or too deep, or wheal is too small
Some people with LTBI may have a negative skin test reaction when tested years after infection because of a waning response.

An initial skin test may stimulate (boost) the ability to react to tuberculin.

Positive reactions to subsequent tests may be misinterpreted as new infections rather than “boosted” reactions.
A strategy to determine the difference between boosted reactions and reactions due to recent infection.

- If first TST is positive, consider the person infected.
- If first TST is negative, give second TST 1–3 weeks later.
- If second TST is positive, consider the person infected.
- If second TST is negative, consider the person uninfected at baseline.
Two-Step Testing

Use two-step tests for initial baseline skin testing of adults who will be retested periodically (e.g., health care workers).
Storage and Handling of PPD

- Store PPD in the main part of the refrigerator, not in the door to avoid fluctuations in temperature.
- Maintain refrigerator temperature between 36 - 46°F.
- Syringes must be filled immediately prior to administration.
- Keep PPD protected from light.
- Unlike vaccine, PPD must be discarded 30 days after the vial was opened or when the expiration date has passed, whichever is first.
For More Information & Resources From CDC

- http://www.cdc.gov/tb/education/Mantoux/default.htm
- Mantoux Tuberculin Skin Testing DVD
- Mantoux Tuberculin Skin Testing Facilitator Guide
- Mantoux Tuberculin Skin Testing Ruler
- Mantoux Tuberculin Skin Test Wall Chart
References

- CDC (2003). *Mantoux tuberculin skin test*
- CDC (2009). *Questions and Answers About Tuberculosis*