

BACKGROUND INFORMATION

The first batch of purified protein derivative (PPD) was produced in 1939 and has continued to serve as the standard reference material for tuberculin testing. While essentially unchanged even after over 60 years of use, there still is no better method widely available for identification of tuberculosis infection. The gold standard for diagnosing latent tuberculosis infection is the Mantoux method, i.e., intradermal administration of 0.1-milliliter (ml) of 5 tuberculin units (5TU) of PPD into the inner surface of the forearm. Alternative sites such as the upper back or shoulder, or back side of upper arm, may be used when the forearms are inaccessible or unsuitable.

TST can be used as a routine screening tool for serial longitudinal use on populations at increased risk, e.g., annual screening of healthcare workers, or as an aid to diagnosis in persons symptomatic for tuberculosis disease.

PROCEDURE (adults and children)

- The tuberculin solution should be kept under refrigeration, away from exposure to strong light, and always handled in an aseptic manner. In order to maintain potency and avoid tampering or contamination, the solution should be used shortly after the syringe is filled.
- Universal Precautions and safe handling of sharps should be implemented. Use of gloves when reading TSTs is not routinely indicated.
- The injection site should be carefully chosen. Usually the inner surface (volar) of the forearm is used. When performing tests serially or among groups, it is often quite helpful for a practice to indicate a preference (when not contraindicated) for the right or the left arm or to always choose either the dominant or non-dominant hand. The injection site should be free of (at least 5-6 cm away from) lesions, hair, tattoos, and away from prominent veins.
- Use a ¼-½ inch 27-gauge steel needle with a tuberculin syringe:
 1. Draw up 0.1 ml of 5-TU solution directly before administration.
 2. Prepare the skin with alcohol pledget and allow to air dry.
 3. Hold the needle almost parallel to the skin, and while holding the skin taut, insert (bevel side up), just beneath the epidermis to the depth of the bevel opening.
 4. When the needle is properly placed, i.e., not too deep nor with the bevel opening exposed, gently inject the solution; the bevel can be rotated to be facing bevel-down and then injected, as per preference.
 5. Observe a discrete wheal of 6-10 mm at the site; if none, repeat at a site 5-6 cm away
 6. Do not massage the site or use a dressing (except for loosely applied adhesive bandage).
 7. Blot the site of any excess fluid or bleeding.
 8. Document the medical record with the date, injection site, brand of solution (Aplisol or Tubersol), name of administrator, and date and time to appear for reading.

NOTES

- If a wheal of at least 6 mm in diameter does not appear immediately after the solution is administered, the test should be administered again; use a site 5-6 centimeters away. Be certain to indicate which injection site to read.
- Multiple-puncture tests (e.g., Tine test) do not deliver a standard dose of test antigen and are not an adequate indicator of skin test reaction.
- Pregnancy is NOT a contraindication to tuberculin testing.
- There is no contraindication to administering skin tests to infants. The dose is the same.
- Concomitant anergy testing is no longer routinely recommended when testing HIV infected persons.
- A TST can be administered on the same day as MMR administration, however if not administered at the same time, the testing must be postponed until six weeks after receipt of MMR.
- Although repeat skin testing of a person with a positive reaction is not contraindicated, it is not necessary. Persons with a credible history of a positive tuberculin skin test (by Mantoux method) should be exempt from further skin testing.
- Healthcare workers who come to a new institution with a history of prior positive TST status should have a chest radiograph as part of an initial evaluation of their tuberculosis status. An institution may want to accept evidence of prior chest x-ray taken within a reasonable period as documentation of being free of disease. The individual should continue to be monitored for symptoms on a routine basis and as otherwise indicated. Repeating routine chest x-rays is not indicated.

References: see bibliography

For more information: <http://www.cdc.gov/nchstp/tb/pubs/Mantoux/part1.htm>

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Tuberculosis Skin Testing – TST Interpretation

- The gold standard for screening for, and diagnosing, latent tuberculosis infection is by the Mantoux method, i.e., intradermal administration of 0.1 ml of 5 tuberculin units (5TU) purified protein derivative (PPD). (See accompanying document “ Placement.”)
- A trained healthcare professional should **evaluate the injection site 48-72 hours after TST administration**. The site should be inspected visually under good lighting and then gently palpated. **Measure the widest area of induration** (palpable raised hardened area) **transversely** with a flexible millimeter ruler. **Record the reading in millimeters of induration only**, not “positive/negative” (e.g., if no induration is found, 0 mm is recorded).
- **After the measurement is recorded the reaction can then be classified as either positive or negative depending on the size of the skin reaction and specific risk factors of the individual**, as listed below.

0 mm – 4 mm induration

Generally, a reading less than 5 mm is considered “negative” in all situations. If the individual is being tested because of exposure to a person with pulmonary or laryngeal tuberculosis, he or she might need to be re-tested three months after the last exposure to be certain there is no increase in induration.

5 mm – 9 mm induration

Consider those who have the following risk factors as having a “positive” reaction:

- Immunosuppression, including HIV infection, bone marrow/organ transplantation or other treatment with immunosuppressive drugs such as chemotherapeutic agents or corticosteroids (>15 mg/day prednisone or equivalent for >1 month)
- Recent contact with a person with infectious tuberculosis
- Chest radiographic abnormalities, such as fibrotic changes consistent with old, healed tuberculosis.
- Clinical evidence of TB disease in physical exam or laboratory data

10 mm or greater induration

Consider those who have the following risk factors and children frequently exposed to adults with these risk factors as having a positive reaction:

- Foreign-born persons or children of foreign-born persons (immigrants, refugees, students and adoptees) arriving (within 5 years) from nations with increased prevalence of TB (Latin America [including Mexico], Asia, Africa, Middle East, Eastern Europe and nations within the Russian Federation) **OR** children who travel to these high-prevalence areas
- Injection drug use (with negative or unknown HIV status)
- Medically underserved populations with limited access to health care, e.g., migrant workers, homeless persons
- Clinical condition such as silicosis, diabetes mellitus, end stage renal disease, specific malignancies/leukemias/lymphomas (especially of the head and neck), malabsorption conditions, (>10% below ideal body weight)
- Children younger than four years of age
- Likely to be exposed to tuberculosis because of living or working environment, e.g., long-term residential settings (correctional facilities, nursing homes, mental institutions, homeless shelters, drug treatment centers), working in mycobacteriology laboratories

Induration ≥ 15 mm is considered positive for persons with no risk factors for tuberculosis

NOTES

- Ignore any BCG history when classifying TST results.
- If an individual fails to appear for reading by 72 hours after placement, and the test cannot be assigned an obviously readable (positive) induration, the test can be repeated with no waiting period. However for the most accurate measurement of the exact induration (which should reach the maximum size at 48-72 hours after placement), the test should be replanted and the individual strongly urged to appear for reading at the correct time.
- An increase of 10 mm induration within two years of a previously classified negative test is considered a conversion, i.e., indication of tuberculosis infection, regardless of risk factors.
- Persons with extra-pulmonary tuberculosis will develop a positive skin test reaction. All persons with positive reaction should first be evaluated for pulmonary disease. Recent converters with no apparent pulmonary disease may need further evaluation if extra-pulmonary disease is a possibility.
- Persons not likely to be infected should not be routinely screened, however:
 - persons who are otherwise low-risk for infection, and are screened for a specific purpose [assuming future serial testing, e.g., upon employment in the healthcare field or admission to a long-term care facility (LTCF)], might be considered negative if the reading is ≤ 15 mm.
 - persons who have not had previous testing and are screened for a specific purpose (assuming future serial testing, e.g., upon employment in the healthcare field or admission to a LTCF) with an initial reading that is interpreted as negative, should undergo a repeat test 1-3 weeks after the first to determine if there might be a boosted reaction. The second reading should be considered the accurate baseline reading.

