Targeted Tuberculin Skin Test

HEARTLAND
NATIONAL TB CENTER
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Monica Rodriguez, BAS, LVN has the following disclosures to make:

- No conflicts of interest
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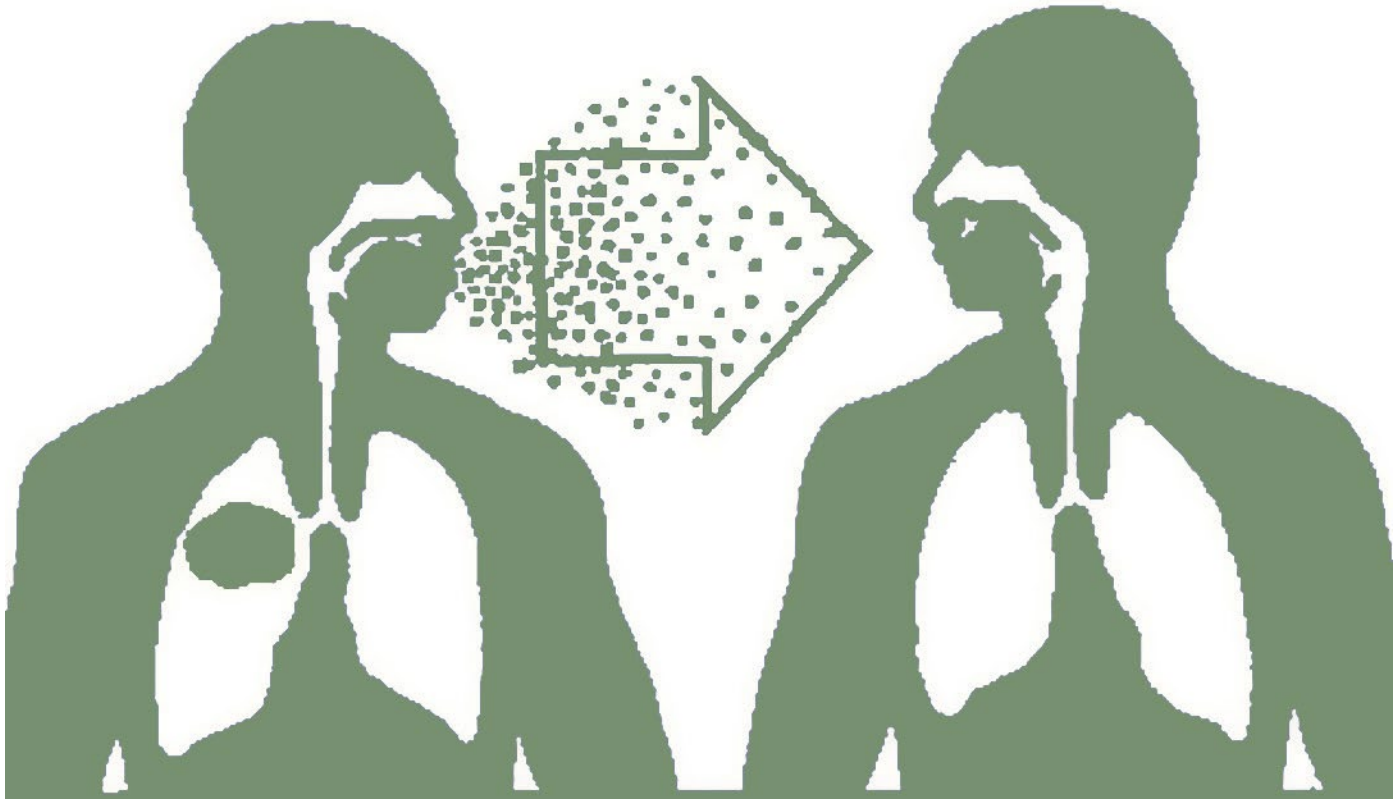
Tuberculosis (TB)

Infectious disease that spreads through the air from one person to another



Latent TB Infection and TB Disease

Latent TB Infection (LTBI)

LTBI is the presence of *M.tuberculosis* organisms (tubercle bacilli) without signs and symptoms or radiographic or bacteriologic evidence of TB disease

- Persons with LTBI are **NOT infectious**
- 90% chance of never getting Active TB Disease
- But the **TB organism is in your body!**

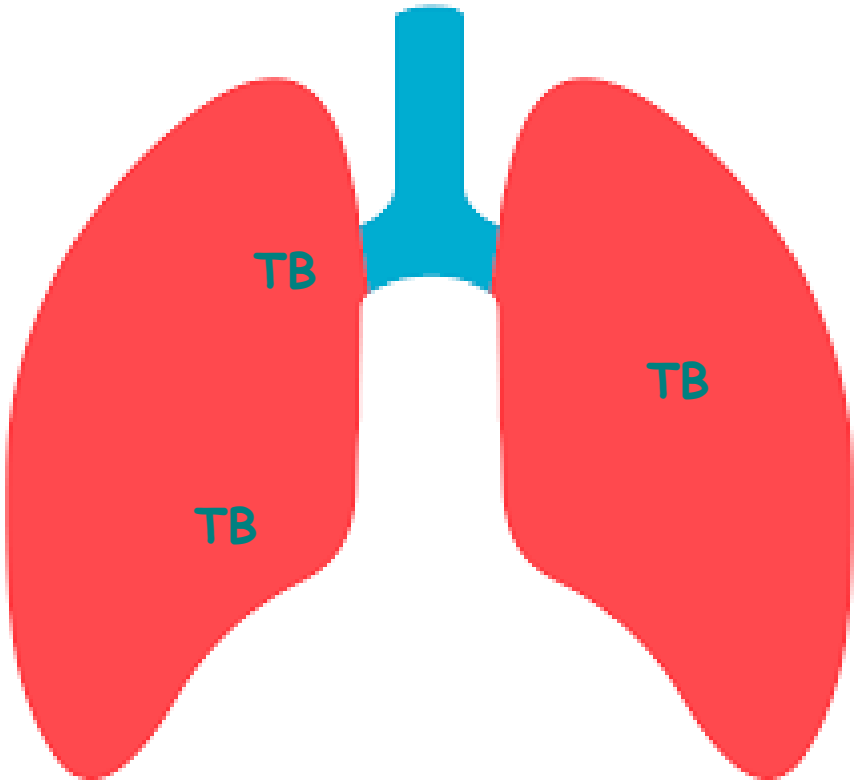
Latent TB Infection (LTBI)

- We used to think the bacteria was in a resting state or dormant but,
  - The TB bacteria is metabolically **active and dividing**, however infection is controlled by the immune system
- Active TB Disease may develop if immunity wanes
- Current methods of LTBI diagnosis are less than perfect

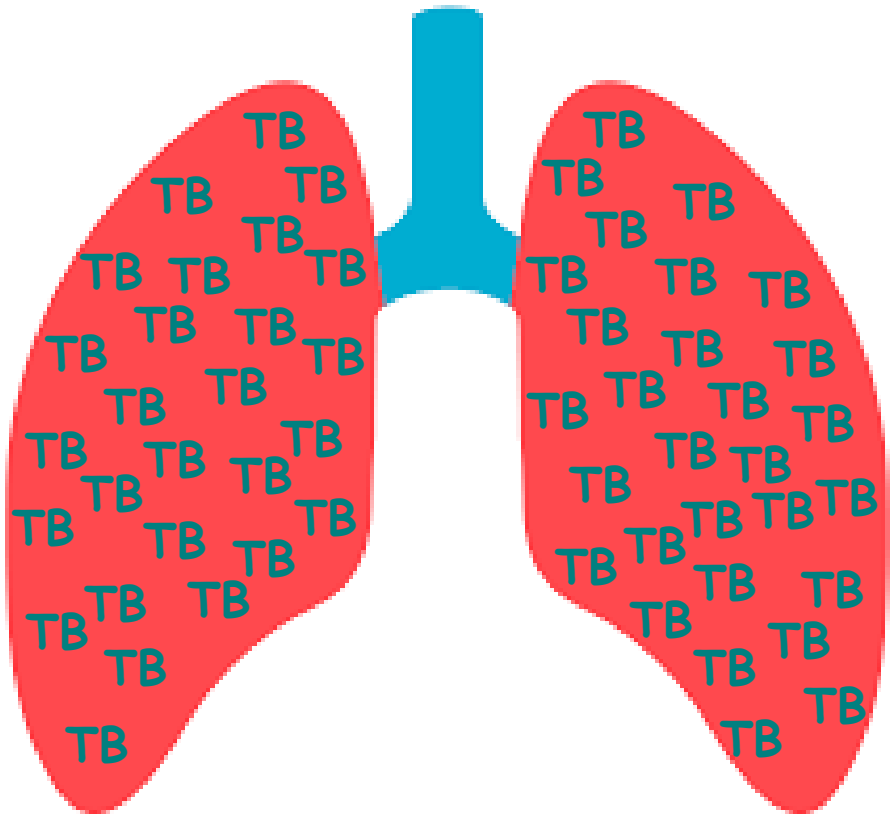
Active TB Disease

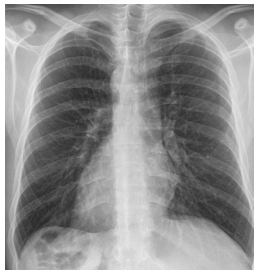
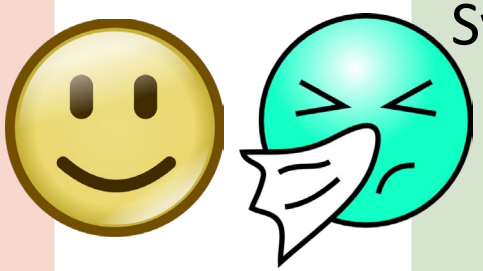
- TB bacteria become active when the immune system cannot stop them from growing and multiplying
- Symptoms
  - Fever
  - Chills
  - Night Sweats
  - Weight Loss
  - Fatigue
  - Cough (dry or productive)
  - Hemoptysis

Latent TB Infection

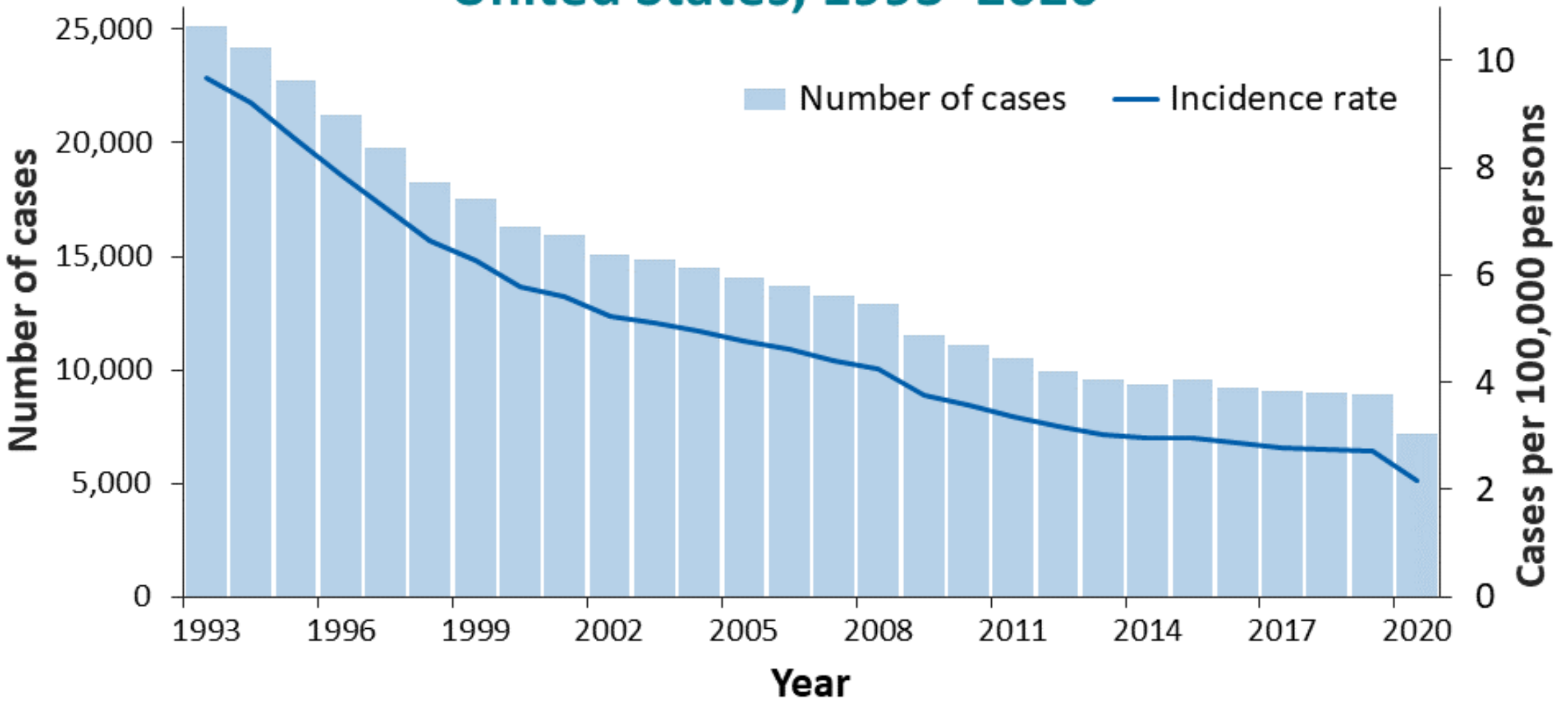


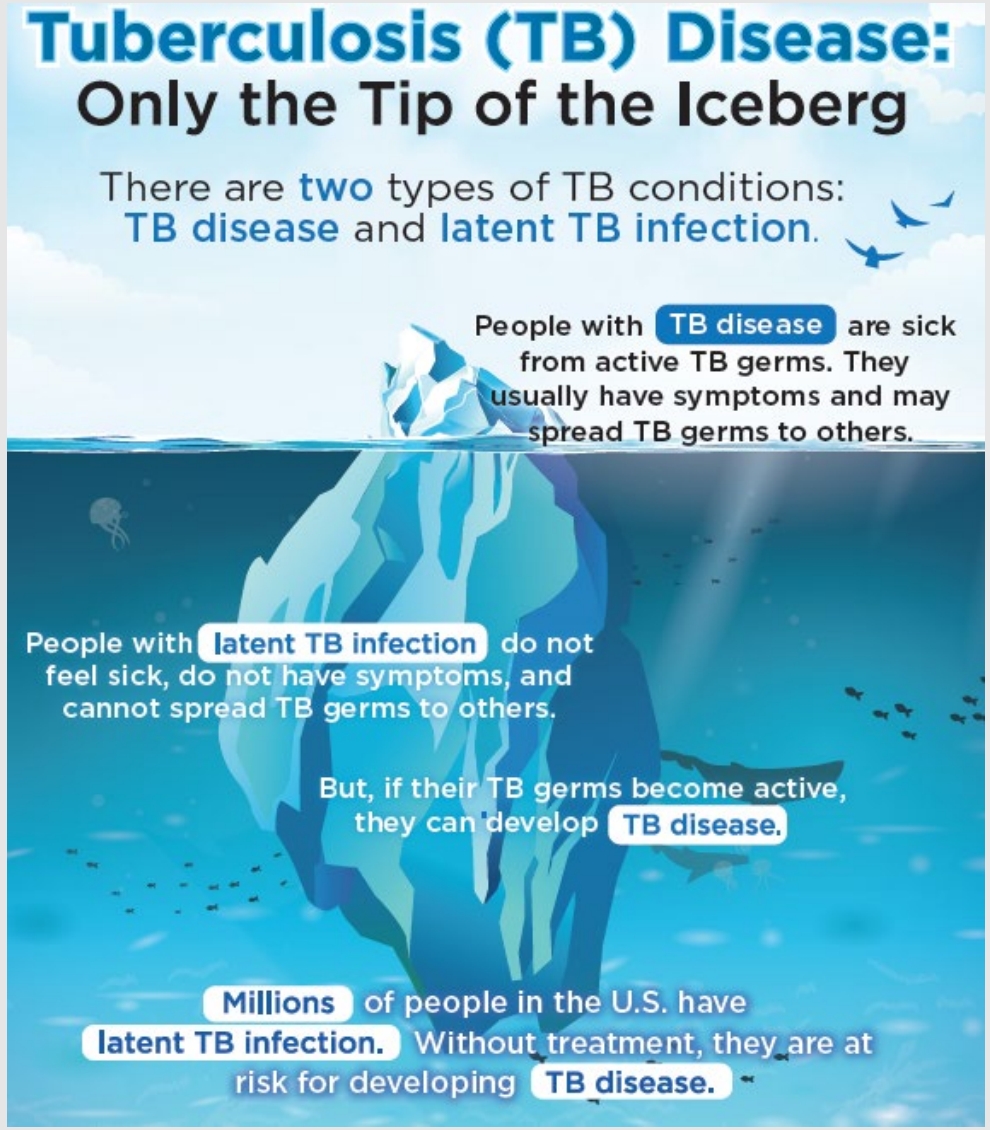
TB Disease



Latent TB Infection		Pulmonary TB Disease
Positive TST or IGRA		TST or IGRA is usually positive
Chest radiograph normal		Chest radiograph is usually abnormal
No symptoms or physical findings suggestive of TB		Symptoms may include: fever, cough, night sweats, weight loss, fatigue, hemoptysis, decreased appetite
If done, respiratory specimens are smear and culture negative		Respiratory specimens are usually culture positive

TB Cases and Incidence Rates, United States, 1993–2020





TB is not a disease of the past

CDC estimates that

13,000,000 people have LTBI in the U.S.

Targeted TB Skin Testing

- As disease rates in the United States decrease, finding and ***treating persons at high risk for latent TB infection*** (LTBI) has become a priority
- Treatment of LTBI substantially reduces the risk that persons infected with *M. tuberculosis* will progress to TB disease
- Targeted TB testing is used to focus program activities and provider practices on groups at the highest risk for TB

Targeted TB Skin Testing

- Essential TB prevention and control strategy
- Detects persons with LTBI who would benefit from treatment
- De-emphasized testing of groups that are not at high risk for TB
- Can help reduce the waste of resources and prevent inappropriate treatment

Morbidity and Mortality Weekly Report

Tuberculosis Screening, Testing, and Treatment of U.S. Health Care Personnel: Recommendations from the National Tuberculosis Controllers Association and CDC, 2019

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US Department of Health and Human Services/Centers for Disease Control and Prevention MMWR / May 17, 2019 / Vol. 68 / No. 19

Tuberculosis Screening, Testing, and Treatment of U.S. Health Care Personnel: Recommendations from the National Tuberculosis Controllers Association and CDC, 2019 | MMWR

TABLE. Comparison of 2005* and 2019† recommendations for tuberculosis (TB) screening and testing of U.S. health care personnel (HCP)

Category	2005 Recommendation	2019 Recommendation
Baseline (preplacement) screening and testing	TB screening of all HCP, including a symptom evaluation and test (IGRA or TST) for those without documented prior TB disease or LTBI.	TB screening of all HCP, including a symptom evaluation and test (IGRA or TST) for those without documented prior TB disease or LTBI (**unchanged**); individual TB risk assessment (**new**).
Postexposure screening and testing	Symptom evaluation for all HCP when an exposure is recognized. For HCP with a baseline negative TB test and no prior TB disease or LTBI, perform a test (IGRA or TST) when the exposure is identified. If that test is negative, do another test 8–10 weeks after the last exposure.	Symptom evaluation for all HCP when an exposure is recognized. For HCP with a baseline negative TB test and no prior TB disease or LTBI, perform a test (IGRA or TST) when the exposure is identified. If that test is negative, do another test 8–10 weeks after the last exposure (**unchanged**).
Serial screening and testing for HCP without LTBI	According to health care facility and setting risk assessment. Not recommended for HCP working in low-risk health care settings. Recommended for HCP working in medium-risk health care settings and settings with potential ongoing transmission.	Not routinely recommended (**new**); can consider for selected HCP groups (**unchanged**); recommend annual TB education for all HCP (**unchanged**), including information about TB exposure risks for all HCP (**new emphasis**).
Evaluation and treatment of positive test results	Referral to determine whether LTBI treatment is indicated.	Treatment is encouraged for all HCP with untreated LTBI, unless medically contraindicated (**new**).

Health Care Personnel (HCP)

Baseline Individual TB Risk Assessment

HCP should be considered at increased risk for TB if any of the following statements are marked "Yes":

Temporary or permanent residence of ≥1 month in a country with a high TB rate

Any country other than the United States, Canada, Australia, New Zealand, and those in Northern Europe or Western Europe

YES ☐

NO ☐

OR

Current or planned immunosuppression,

including human immunodeficiency virus (HIV) infection, organ transplant recipient, treatment with a TNF-alpha antagonist (e.g., infliximab, etanercept, or other), chronic steroids (equivalent of prednisone ≥15 mg/day for ≥1 month) or other immunosuppressive medication

YES ☐

NO ☐

OR

Close contact with someone who has had infectious TB disease since the last TB test

YES ☐

NO ☐

Identifying *Risk Factors* That Lead to the Development of TB Disease

Persons at Risk for Developing TB disease

2 categories

Those who have an increased likelihood of exposure to persons with TB disease

Those with clinical conditions that increase their risk of progressing from LTBI to TB disease

Increased Likelihood of Exposure to Persons with TB Disease

- Close **contacts** to persons with infectious TB
- Residents and employees of high-risk **congregate** settings
- **Recent immigrants** from TB-endemic regions of the world (within 5 years of arrival to the U.S.)

Increased Risk for Progression to TB Disease

- Persons with HIV
- Those with a history of prior, untreated TB or fibrotic lesions on chest radiograph
- Children ≤ 5 years old with a positive TST
- Underweight or malnourished persons
- Substance users
- Those receiving TNF-α antagonists for treatment of rheumatoid arthritis or Crohn's disease

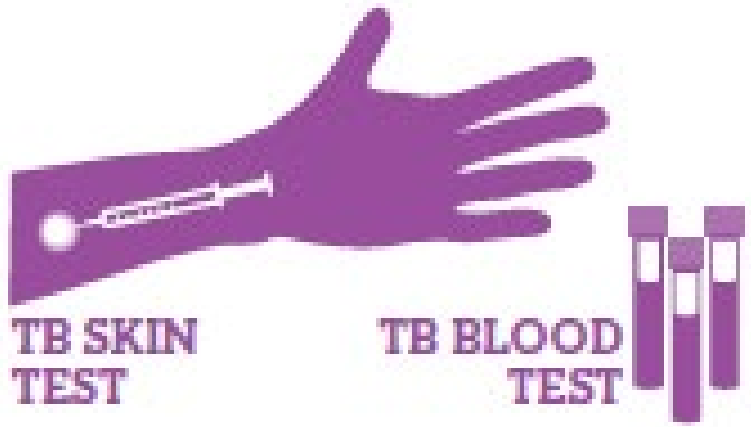
Increased Risk for Progression to TB Disease

- Those with certain medical conditions
  - Silicosis
  - Diabetes mellitus
  - Chronic renal failure or on hemodialysis
  - Solid organ transplantation (i.e., heart, kidney)
  - Carcinoma of head or neck
  - Gastrectomy or jejunoileal bypass

Testing for *M. tuberculosis* infection

Testing for *M. tuberculosis* infection

- There are two testing methods available for the detection of *M. tuberculosis* infection in the United States
  - Mantoux tuberculin skin test (TST)
  - Interferon-gamma release assays (IGRA)



- These tests do not exclude LTBI or TB disease

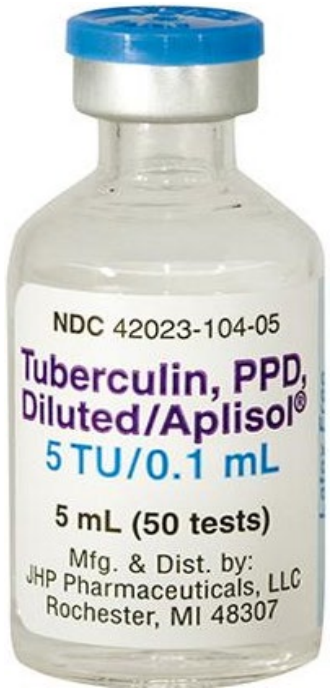
Mantoux Tuberculin Skin Test

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

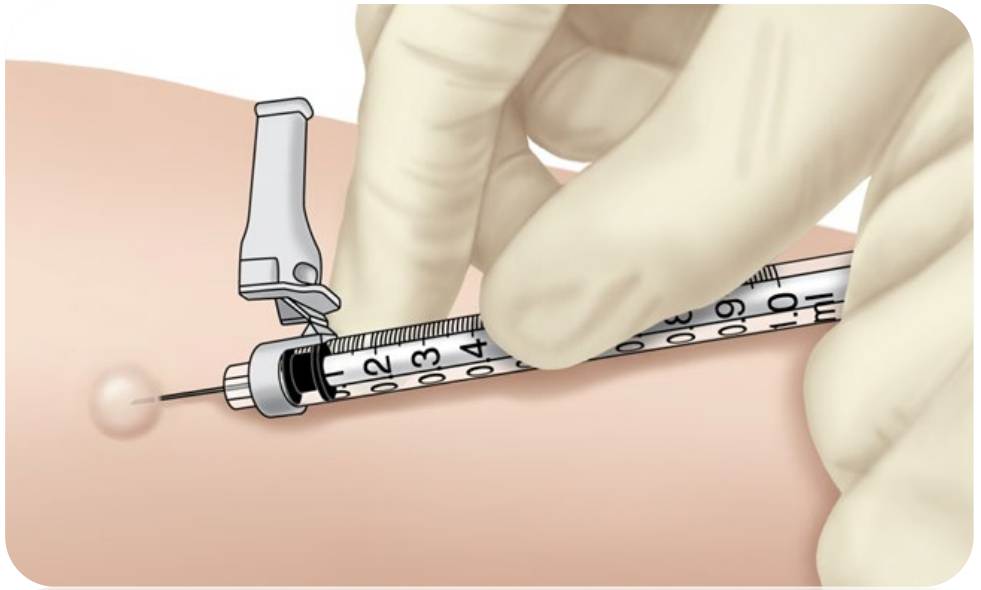
- Administration
- Reading
- Interpretation

Administering the TST

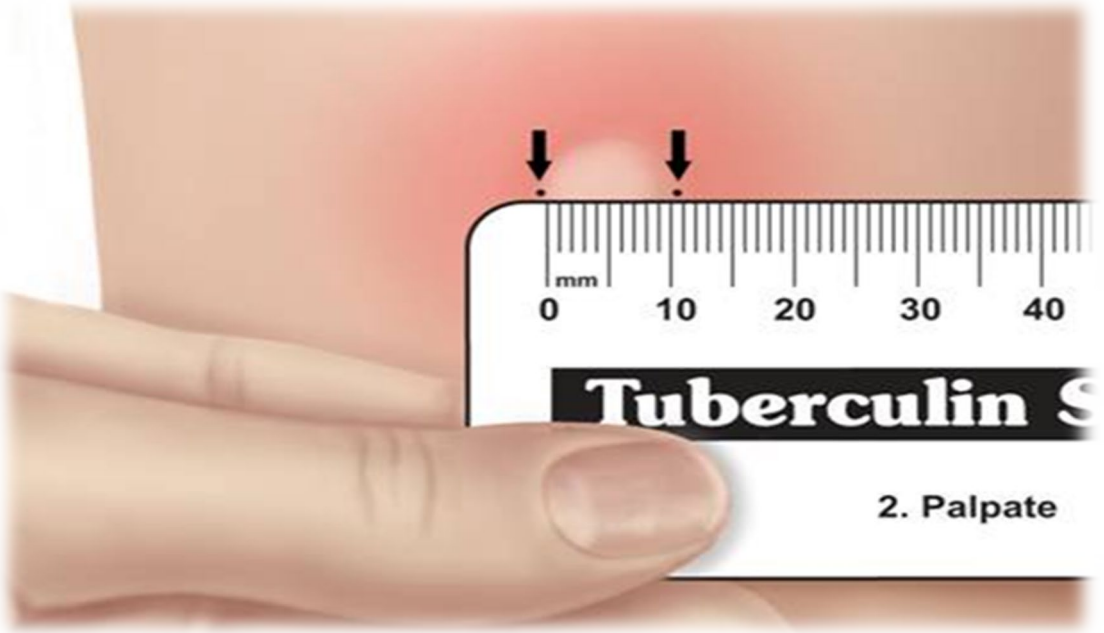
- Inject 0.1 mL of 5 TU PPD tuberculin solution intradermally on volar surface of lower arm using a 27-gauge needle



- Produce a wheal 6 to 10 mm in diameter



Reading the TST



- Measure reaction in 48 to 72 hours
- Measure induration, not erythema
- Record reaction in millimeters, not negative or positive
- Ensure a trained health care professional measures and interprets the TST
- Educate the patient and family on the significance of a positive TST

Reading the TST

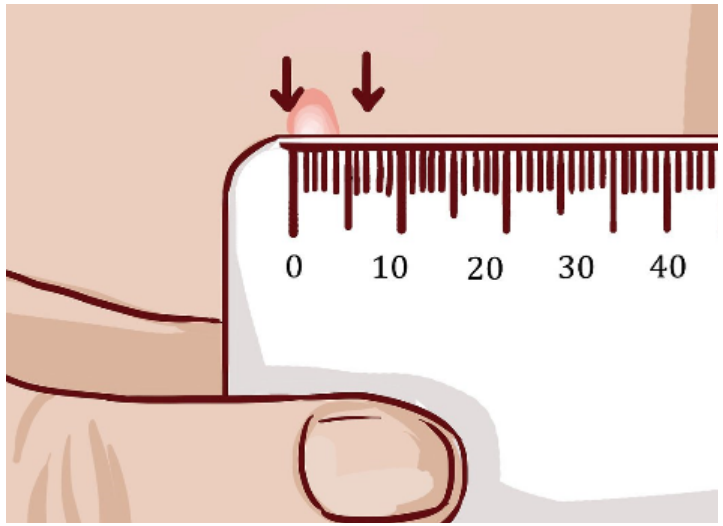
Palpating for induration
Can use zig zag motion.

Marking the borders.

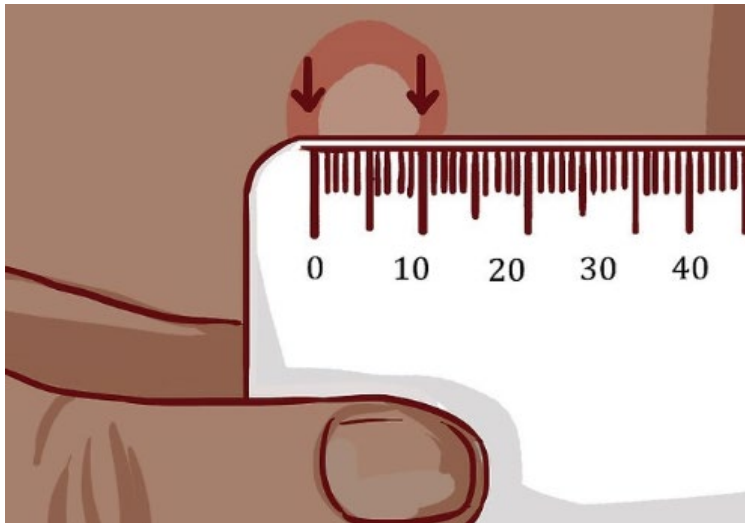
Pen method

TST Interpretation

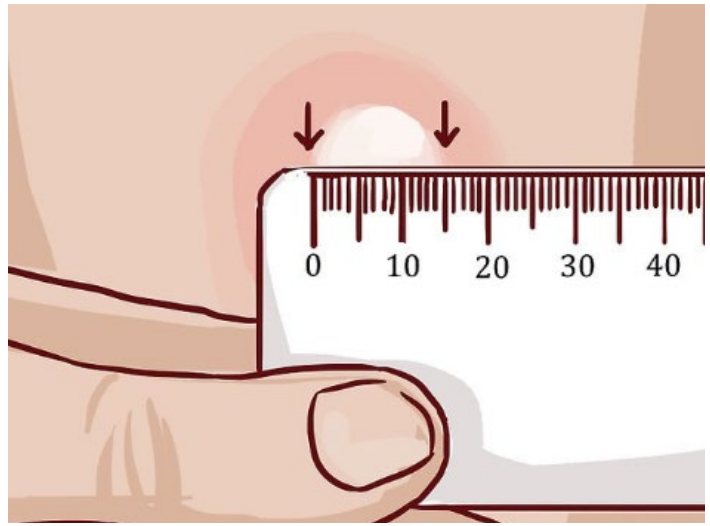
≥ 5 mm



≥ 10 mm



≥ 15 mm



3 Cut-Points

TST Interpretation ≥ 5 mm

- **≥ 5mm** is interpreted as **positive** in:
  - HIV- infected persons
  - Close contacts to a person with infectious TB
  - Persons with chest radiographs consistent with prior untreated TB
  - Organ transplant recipients
  - Other immunosuppressed patients
    - Taking the equivalent of > 15 mg/day of prednisone for 1 months
    - Taking TNF-α antagonists

TST Interpretation ≥ 10 mm

- **≥ 10 mm** is interpreted as **positive** in:
  - Recent immigrants (arrived in past 5 years)
  - Injection drug users
  - Residents or employees of congregate settings
  - Mycobacteriology lab personnel
  - Persons with medical conditions that place them at high risk
  - Children ≤ 4 years old
  - Infants, children, and adolescents exposed to adults at high risk

TST Interpretation ≥ 15 mm

- **≥ 15 mm** is interpreted as **positive** in:
  - Persons with no known risk factor for TB

Note:

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***

ADMINISTERING the Mantoux Tuberculin Skin Test

Video

READING the Mantoux Tuberculin Skin Test

Video

Mantoux Tuberculin Skin Test

Live Demo

Case Studies: *Interpreting the TST results*

The TST and Biologics

A 58-year-old U.S. born female with rheumatoid arthritis presents to her rheumatologist for a follow up visit. She has been taking Humira since her diagnosis two years ago. The patient reports a lingering dry cough, loss of appetite and night sweats for the past 3 weeks. The Humira is stopped and a TST is placed. Three days later the patient returns for her skin reading. The nurse notes the patient to have a 6 mm induration.

- How would you interpret this reading?
  a) Positive
  b) Negative

The TST and Biologics

Rationale:

- ✓ A reaction of 5 mm or greater is considered **positive** for immunosuppressed persons taking tumor necrosis factor-alpha (TNF) antagonists.

- ✓ Screening for TB should be done on persons who are receiving immunosuppressive therapy, such as TNF antagonists, because they are at increased risk for progression to active TB disease if they have been infected. (2015 American College of Rheumatology Guidelines)

- ✓ It is recommended that at least 1 month of LTBI treatment is completed before resuming biologics. (2015 American College of Rheumatology Guidelines)

The TST and Foreign-Born

A 19-year-old female who immigrated from India 2 years ago had a TB skin test placed as part of her school application process. Three days after the PPD placement the student returns to the school clinic where the school nurse examines her forearm and notes a 12 mm induration.

- **What would be the appropriate interpretation of the TST reading?**

  a) Positive

  b) Negative

Rationale:

✓ A reaction of 10 mm or greater is considered **positive** for recent immigrants (<5 years) from high prevalence countries (e.g. Asia, Middle East, Africa, Latin America, former Soviet Union).
(For a full list of high burden countries, please see the WHO website)

The TST and Organ Transplant

Kelly is a 55-year-old Caucasian female, born and raised in Montana. She has never travelled outside of the U.S. and is diagnosed with leukemia. She has been identified as a candidate for Stem Cell transplant. As part of the pre-transplant physical, she received a TB skin test. When she returns to the office for her skin test reading, it is identified that she has a 4 mm induration.

- **What is the interpretation of this reading?**

  a) Positive

  b) Negative

The TST and Organ Transplant

Rationale:

- ✓ A reaction of **5 mm or greater is considered positive** for immunosuppressed persons such as persons with auto-immune diseases. This patient received an induration of 4 mm therefore is negative.

- ✓ Targeted pre-transplant screening of both recipient and, if possible, donors to allow focused management of recipients selected for preventive intervention in the pre- and/or post-transplant period is recommended.

- ✓ If not identified prior to transplantation, active TB in transplant recipients can result from latent infection with *M. tuberculosis* (LTBI) in the transplant candidate or in the donor tissue.

European Respiratory Journal 40 (4) E22; Published 30 September 2012. ***The risk of tuberculosis in transplant candidates and recipients:*** *a TBNET consensus statement* https://erj.ersjournals.com/content/40/4/990#sec-19

The TST and Congregate Settings

Barry is a 33-year-old U.S. born male. He has currently worked for 5 consecutive years as a security guard at a state correctional facility. He works overtime and has constant interactions with the inmates. In the past, his required annual TB skin test has resulted in a 0 mm induration. During the most recent annual TB skin test, his induration was read at 10 mm.

- **What is the interpretation of this reading?**

  a) Positive

  b) Negative

The TST and Congregate Settings

Rationale:

- ✓ An induration of **10 or more** millimeters is considered **positive** in residents and employees of high-risk congregate settings (e.g., correctional facilities, nursing homes, homeless shelters, hospitals, and other health care facilities).

- ✓ Persons more likely to progress from LTBI to TB disease include recent converters (those with an increase of 10mm or more in size of TST reaction within a 2-year period).

- ✓ Generally, persons at high risk for developing TB disease fall into two categories: those who have an increased likelihood of exposure to persons with TB disease, and those with clinical conditions that increase the risk of progression from LTBI to TB disease.

CDC. Fact Sheet. Targeted Tuberculosis Testing and Interpreting Tuberculin Skin Test Results

The TST and Children

Julia, a 4-year-old U.S. born female has been accepted into an accelerated pre-school. As part of the application process, the school requires all first-time entry students to have a TST placed. She has had no history of exposure to a person with TB disease and is generally healthy. When she returned to have the TST read, the induration was identified as 13 mm.

- **What is the interpretation of this reading?**

  a) Positive

  b) Negative

The TST and Children

Rationale:

- ✓ In a U.S. born child with no previous history of exposure to a person with TB disease and otherwise generally healthy, the induration **would have to be 15 millimeters or greater**.

- ✓ In order for the TST to be interpreted as positive in a child with an induration of 13 mm (or greater than 10 mm), certain risk factors would need to be considered: children who are born in or travel to high-prevalence regions of the world, children frequently exposed to adults who are HIV infected, experiencing homelessness, incarcerated, or are users of illicit drugs.

- ✓ An induration of 5 mm or greater is considered positive in children who are in close contact with known or suspected contagious people with TB disease.

AAP. 2018 Red Book. Tuberculosis in Children.

The TST and persons living with HIV

George, a 42-year-old male, living with HIV, was identified as a close contact to his girlfriend recently diagnosed with TB disease. They do not live together. The local health department contacted him for a TB skin test. When he returned for the reading, the induration was read at 4 mm.

- **What is the interpretation of this reading?**

  a) Positive

  b) Negative

The TST and Persons Living with HIV

Rationale:

✓ This test would be classified as **negative.** A 5 mm or greater induration would be a positive result for an HIV positive patient.

Note: Despite the results of a TST, a follow-up chest x-ray is indicated for persons living with HIV who are close contacts of a person diagnosed with TB disease.

U.S. Department of Health and Human Services, AIDS info. (2017). Guidelines for the Prevention and Treatment of Opportunistic Infections in HIV-Infected Adults and Adolescents.


THANK
YOU