Tuberculosis

WRAIR-GEIS Operational Infectious Disease Course

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Outline

• EPIDEMIOLOGY AND PATHOPHYSIOLOGY
• LATENT VS. ACTIVE INFECTION
• ACTIVE TB DIAGNOSIS AND TREATMENT
• LATENT TB DIAGNOSIS AND TREATMENT
• MILITARY SCREENING POLICIES
Global Burden of Tuberculosis

- 9.2 MILLION CASES AND 1.7 MILLION DEATHS YEARLY
- ASSOCIATED WITH CO-PANDEMIC OF HIV
- DRUG-RESISTANCE INCREASINGLY COMMON
- 1/3 OF THE WORLD’S POPULATION ESTIMATED TO BE INFECTED WITH LTBI
  - Focus on identification and treatment of active TB (DOTS)
  - LTBI not a well-known concept outside the US
  - Increasing efforts to extend LTBI treatment to HIV populations
Reported TB Cases United States, 1982-2011

CDC, TB Core Curriculum, 2013
TB Case Rates United States, 2011

*Cases per 100,000.

>CDC, TB Core Curriculum, 2013
TB Pathophysiology

- **CAUSED BY MYCOBACTERIUM TUBERCULOSIS**

- **SPREAD PERSON-TO-PERSON THROUGH AIRBORNE DROPLET NUCLEI**

- **ENTER ALVEOLI AND MULTIPLY; MAY THEN ENTER THE BLOODSTREAM AND SPREAD TO OTHER PARTS OF THE BODY**

- **ENGULFED BY MACROPHAGES AND DEVELOP INTO GRANULOMAS**

- **IF IMMUNE SYSTEM DOES NOT KEEP TB BACTERIA UNDER CONTROL, BACILLI REPLICATE AND DISEASE ENSUES**
# LTBI vs. Active Disease

<table>
<thead>
<tr>
<th>LATENT TB INFECTION</th>
<th>ACTIVE TB DISEASE</th>
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<tbody>
<tr>
<td>• TB BACILLI REMAIN CONTAINED WITHIN GRANULOMAS</td>
<td>• TB BACILLI BREAK OUT FROM PROTECTIVE GRANULOMAS</td>
</tr>
<tr>
<td>• RELATIVELY SMALL NUMBER OF BACILLI PRESENT</td>
<td>• LARGER AMOUNT OF ACTIVELY REPLICATING BACILLI PRESENT</td>
</tr>
<tr>
<td>• NO SIGNS OR SYMPTOMS OF DISEASE</td>
<td>• SIGNS AND SYMPTOMS BASED ON LOCATION OF INFECTIONOUS PROCESS</td>
</tr>
<tr>
<td>• NOT CONTAGIOUS</td>
<td>• VERY OFTEN CONTAGIOUS</td>
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</table>
Progression from LTBI to Active TB

- **RISK IS GREATEST SOON AFTER EXPOSURE**
- **LIFETIME RISK IS 10% IN LOW RISK INDIVIDUALS**
  - 5% risk within 1 to 2 years of exposure
  - 5% risk over remaining lifetime
- **RISK IS SIGNIFICANTLY HIGHER IN THOSE WITH RISK FACTORS**
  - HIV or other immunosuppressive conditions
  - Diabetes
  - Chronic renal failure
  - Prior healed TB on CXR
  - Children < 5 y/o
  - IV drug use
Active TB Disease

- **PULMONARY TB DISEASE IS THE MOST COMMON MANIFESTATION (80%)**
- **EXTRAPULMONARY DISEASE ALSO POSSIBLE (20%)**
  - Laryngeal TB
  - Plueral TB
  - Lymph nodes (scrofula)
  - CNS (meningitis)
  - Bone/spine (Pott’s disease)
  - Kidney
  - Miliary TB
Contagious Forms of Active TB

- PULMONARY TB
- LARYNGEAL TB
- TB OF THE ORAL CAVITY
- OPEN SITES WITH POSSIBLE AEROSOLIZATION
Signs/Symptoms of Pulmonary TB

- FEVER
- CHRONIC COUGH (> 3 WEEKS)
- NIGHT SWEATS
- WEIGHT LOSS (UNPLANNED)
- FATIGUE
- HEMOPTYSIS
Signs/Symptoms of Extrapulmonary TB

- FEVER, FATIGUE, NIGHTS SWEATS, WEIGHT LOSS
- HEADACHE/CONFUSION (MENINGITIS)
- BACK PAIN (SPINE)
- HEMATURIA (KIDNEY)
- LYMPHADENITIS (SCROFULA)
- HOARSENESS (LARYNX)
Diagnosis of TB

- CLINICAL SIGNS AND SYMPTOMS
- TST OR IGRA – ALSO POSITIVE IN LATENT TB
- CXR – BUT NOT CONFIRMATORY
- SPUTUM TESTING
TST and IGRA

MANTOUX TUBERCULIN SKIN TEST (TST) – ALSO KNOWN AS PPD
• SKIN TEST THAT PRODUCES DELAYED-TYPE HYPERSENSITIVITY REACTION IN PERSONS WITH M. TUBERCULOSIS INFECTION

INTERFERON GAMMA RELEASE ASSAYS (IGRAS)
• BLOOD TESTS THAT MEASURE AND COMPARE AMOUNT OF INTERFERON-GAMMA (IFN-γ) RELEASED BY BLOOD CELLS IN RESPONSE TO ANTIGENS.
• THESE INCLUDE:
  QUANTIFERON® GOLD-IN-TUBE (QFT-GIT)
  T-SPOT®.TB
Chest X-ray

Classic cavitary lesion of pulmonary TB on CXR
Pulmonary Tuberculosis

Daley CL. Radiographic Manifestations of Tuberculosis, 2 Ed.
LLL Consolidation and Pleural Effusion

Daley CL. Radiographic Manifestations of Tuberculosis, 2 Ed.
Military Tuberculosis

Daley CL. Radiographic Manifestations of Tuberculosis, 2 Ed.
Sputum Testing

- THREE SPECIMENS AT 8 TO 24 HOUR INTERVALS, AT LEAST ONE IN THE AM

- TESTING SHOULD INCLUDE:
  - Acid fast bacilli (AFB) smear – sensitivity 50%
  - Nucleic acid amplification test (NAAT)
  - Culture – gold standard for confirmation
  - Antibiotic sensitivities
AFB Smear

Figure 9. Sputum specimen demonstrating acid fast bacilli (AFB) (arrow). Source CDC.
TB Colonies on Growth Media
Treatment

• “4 FOR 2 AND 2 FOR 4”
  o INH, RIF, PZA, EMB X 2 months
  o INH, RIF X 4 months

• DOT IS STANDARD OF CARE

• CHECK BACTERIOLOGIC RESPONSE MONTHLY

• HIV TEST

• DRUG SUSCEPTIBILITY VS. ADHERENCE FOR PERSISTENT CASES

• “NEVER ADD A SINGLE DRUG TO A FAILING REGIMEN”

INH = isoniazid
RIF = rifampin
PZA = pyrazinamide
EMB = ethambutol
Multi-Drug Resistant (MDR) and Extensively Drug Resistant (XDR) Tuberculosis

• **MDR TB = INH + RIF RESISTANCE**

• **XDR TB = MDR+**
  - Any fluoroquinolone; **AND**
  - 1 of 3 injectable second line drugs
    - Capreomycin
    - Kanamycin
    - Amikacin
Global MDR TB Rates (2009)

Proportion of Multidrug-Resistance among Reported TB Cases
- > 6%
- 3% – 6%
- < 3%
- < 3%
- No Data

CDC Health Information for International Travel, 2012
When is a patient no longer infectious?

**MUST MEET THREE CONDITIONS:**

- On adequate therapy
- Clinical response
- Three consecutive negative AFB smears from sputum collected on different days
Infection Control

**ADMINISTRATIVE CONTROLS**

- Primary strategy for infection control!****
- Policies and protocols to ensure rapid identification, isolation, diagnostic evaluation, and treatment of persons with TB

**ENGINEERING CONTROLS**

- Negative pressure room

**PERSONAL PROTECTIVE EQUIPMENT**

- N95 mask
Contact Investigations

- **CONCENTRIC CIRCLES OF CONTACTS**
- **NEED TO RETEST 8-10 WEEKS AFTER LAST CONTACT WITH CASE**
- **GARRISON**
  - Refer to Preventive Medicine
- **DEPLOYMENT**
  - Refer to Preventive Medicine
Other important management issues

- **DIRECTLY OBSERVED THERAPY (DOT)**
  - Standard of care for Active TB
  - May be used for LTBI, but uncommon
  - Refer to Preventive Medicine

- **DISEASE REPORTING**
  - Active TB is a reportable disease, LTBI is not
  - Positive TST or IGRA must be documented in an electronic registry (ALTHA, MEDPROS, etc)
  - Reportable diseases are reported to Preventive Medicine both in Garrison and Deployment
Case Study

• YOU’RE EVALUATING A 24 YEAR OLD MALE SOLDIER FOLLOWING A 12 MONTH DEPLOYMENT TO AFGHANISTAN. HIS PAPERWORK SAYS “POSITIVE PPD.”
  o What is your first priority?
  o What more do you want to know from the history?
  o What does “positive PPD” mean?
  o Physical exam?
  o Other tests necessary?
  o Is treatment necessary?
Initial Evaluation

SYMPTOMS?
- Sputum X 3 (Smear and Culture)
- 1 NAAT

EXPOSURES?
- Foreign born?
- Contact with known ACTIVE TB case?
- Other risk factors? (occupation, activities, medical history)

TB TEST (TST OR IGRA) RESULTS?
- How many mm?
- Previous positive?
- Previous BCG vaccine?
- Use of Quantiferon Gold-in-tube or T-SPOT.TB?

CXR?

TREATMENT?
LTBI vs. Active Disease

**LATENT TB INFECTION**

- **TST OR IGRA USUALLY POSITIVE**
- **NO SIGNS OR SYMPTOMS OF DISEASE**
- **CXR NEGATIVE**

**Active TB Disease**

- TST or IGRA usually positive
- Signs and symptoms of disease present
- CXR usually positive in pulmonary disease
The TB Skin Test (TST)

- **CELL-FREE PURIFIED PROTEIN FRACTION EXTRACTS OBTAINED FROM A HUMAN STRAIN OF M. TUBERCULOSIS**

- **HISTORY AND SIGNIFICANCE**
  - 100 years of use with known endpoints of active TB disease

- **PROBLEMS WITH TST**
  - *Positive predictive value is low if prevalence of infection is low*
  - Errors and variability in administration
  - False negatives and false positives

- **PSEUDOEPIDEMICS OF TST REACTIONS IN HOSPITALS AND PRISONS**
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 TRAINED HEALTH CARE PROFESSIONAL MEASURES AND INTERPRETS THE TST

Table 7. Criteria for tuberculin positivity, by risk group

<table>
<thead>
<tr>
<th>Reaction ≥5 mm of induration</th>
<th>Reaction ≥10 mm of induration</th>
<th>Reaction ≥15 mm of induration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human immunodeficiency virus (HIV)-positive persons</td>
<td>Recent immigrants (i.e., within the last 5 yr) from high prevalence countries</td>
<td>Persons with no risk factors for TB</td>
</tr>
<tr>
<td>Recent contacts of tuberculosis (TB) case patients</td>
<td>Injection drug users</td>
<td></td>
</tr>
<tr>
<td>Fibrotic changes on chest radiograph consistent with prior TB</td>
<td>Residents and employees of the following high-risk congregate settings: prisons and jails, nursing homes and other long-term facilities for the elderly, hospitals and other health care facilities, residential facilities for patients with acquired immunodeficiency syndrome (AIDS), and homeless shelters</td>
<td></td>
</tr>
<tr>
<td>Patients with organ transplants and other immunosuppressed patients (receiving the equivalent of ≥15 mg/d of prednisone for 1 mo or more)*</td>
<td>Mycobacteriology laboratory personnel</td>
<td></td>
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<tr>
<td></td>
<td>Persons with the following clinical conditions that place them at high risk: silicosis, diabetes mellitus, chronic renal failure, some hematologic disorders (e.g., leukemias and lymphomas), other specific malignancies (e.g., carcinoma of the head or neck and lung), weight loss of ≥10% of ideal body weight, gastrectomy, and jejunoileal bypass</td>
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<td></td>
<td>Children younger than 4 yr of age or infants, children, and adolescents exposed to adults at high-risk</td>
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</tbody>
</table>

**Note:** includes patients taking TNF-α antagonists

*Risk of TB in patients treated with corticosteroids increases with higher dose and longer duration.

1 For persons who are otherwise at low risk and are tested at the start of employment, a reaction of ≥15 mm induration is considered positive.

Boosting and Two-step Testing

• **BOOSTING**
  - May have an initially negative test due to waning responsiveness
  - First test may stimulate immune response for 2\textsuperscript{nd} test
  - 2\textsuperscript{nd} test positive = boosted reaction

• **TWO-STEP TESTING**
  - Standard of care when doing repeated testing (e.g. healthcare worker surveillance programs)
  - Initial test followed by 2\textsuperscript{nd} test 1-2 weeks later
  - Differentiates boosted reaction from recent infection
When should I use the IGRA?

Depends who you talk to

- CDC guidelines: may be used to in place of TST, but don’t do both
- UK, many other European countries: use IGRA as confirmatory test
- Evolving issue, not yet fully resolved

Benefits of IGRA over TST

- Single visit for the patient
- Less subjective interpretation of results
- Two-step testing not necessary with IGRAs
- Preferred among BCG vaccinated individuals
Decision to Treat LTBI

• “A DECISION TO TEST IS A DECISION TO TREAT”
  o Don’t ignore a positive test
  o However, don’t test low-risk populations!

• MUST RULE OUT ACTIVE TB FIRST
  o Symptoms of active TB
  o Chest x-ray
  o If symptoms → 3 sputum smear & cx, at least 1 NAAT test

• LOOK AT CRITERIA TO DETERMINE CUTOFF

• ASSESS RISKS & BENEFITS FOR EACH INDIVIDUAL PATIENT
  o Medical history (esp. liver disease, alcohol abuse)
  o Pregnancy
  o Allergies
  o How close and how recent was contact with active TB case
<table>
<thead>
<tr>
<th>Drug(s)</th>
<th>Duration</th>
<th>Dose</th>
<th>Frequency</th>
<th>Total Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isoniazid (INH)</td>
<td>9 months</td>
<td>Adult: 5 mg/kg</td>
<td>Daily</td>
<td>270</td>
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<tr>
<td></td>
<td></td>
<td>Children: 10-20 mg**</td>
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<td></td>
<td></td>
<td>Maximum dose: 300 mg</td>
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<td></td>
<td>Adult: 15 mg/kg</td>
<td>Twice weekly*</td>
<td>76</td>
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<td></td>
<td>Children: 20-40 mg**</td>
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<td></td>
<td>Maximum dose: 900 mg</td>
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<tr>
<td></td>
<td>6 months</td>
<td>Adult: 5 mg/kg</td>
<td>Daily</td>
<td>180</td>
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<td></td>
<td></td>
<td>Children: Not recommended</td>
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<td></td>
<td>Maximum dose: 300 mg</td>
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<td></td>
<td>3 months</td>
<td>Adults and Children 12 years of age and</td>
<td>Once weekly*</td>
<td>12</td>
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<td></td>
<td></td>
<td>older:</td>
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<td></td>
<td><strong>INH</strong>: 15 mg/kg rounded up to the nearest 50 or 100 mg; 900 mg maximum</td>
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<td><strong>RPT</strong>: 10.0–14.0 kg 300 mg</td>
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<td></td>
<td>14.1–25.0 kg 450 mg</td>
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<td>25.1–32.0 kg 600 mg</td>
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<td></td>
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<td>32.1–49.9 kg 750 mg</td>
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<td></td>
<td>≥50.0 kg 900 mg maximum</td>
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</tr>
<tr>
<td>Isoniazid (INH) and Rifapentine (RPT)</td>
<td></td>
<td>Adult: 15 mg/kg</td>
<td>Twice weekly*</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Children: Not recommended</td>
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<td></td>
<td></td>
<td>Maximum dose: 900 mg</td>
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</tr>
<tr>
<td>Rifampin (RIF)</td>
<td>4 months</td>
<td>Adult: 10 mg/kg***</td>
<td>Daily</td>
<td>120</td>
</tr>
<tr>
<td></td>
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<td>Maximum dose: 600 mg</td>
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</table>
INH/RPT DOT Regimen for Treatment of LTBI

- **ISONIAZID (INH) 900MG + RIFAPENTINE (RPT) 900MG**
- **ONCE WEEKLY X 12 WEEKS**
- **ADMINISTERED UNDER DIRECTLY OBSERVED THERAPY**
- **“EQUAL ALTERNATIVE TO THE 9 MONTH INH REGIMEN”**
- **NOT RECOMMENDED FOR:**
  - Children < age 2
  - HIV receiving ARTs
  - Pregnant women
  - INH or RIF resistance

CDC. *MMWR* 2011;60:1650-1653.
LTBI Treatment Myths

• MUST BE UNDER 35 YEARS OLD TO TREAT
  o Liver disease is the more important factor

• PATIENTS WITH BCG VACCINATION SHOULD NOT BE TREATED

• SERIAL LIVER ENZYME TESTS SHOULD BE PERFORMED FOR ALL LTBI PATIENTS
  o Liver enzymes are not routinely done (see next slides)
  o Clinical monitoring monthly

• 6 MONTH THERAPY IS THE STANDARD REGIMEN
  o 9 months of INH (isoniazid) is the preferred regimen
Patient Instructions

No alcohol!

Instruct patient to report signs or symptoms of adverse drug reactions:

• ANOREXIA, NAUSEA, VOMITING, OR ABDOMINAL PAIN
• FATIGUE OR WEAKNESS
• DARK URINE, LIGHT-COLORED STOOLS
• PERSISTENT NUMBNESS IN HANDS OR FEET
• RASH
Monthly Clinical Monitoring

Monthly visits should include a brief physical exam and a review of:

- RATIONALE FOR TREATMENT
- ADHERENCE WITH THERAPY
- SYMPTOMS OF ADVERSE DRUG REACTIONS
- PLANS TO CONTINUE TREATMENT
Baseline Laboratory Monitoring

Baseline liver function tests (e.g., AST, ALT, and bilirubin) are not necessary except for patients with the following risk factors:

• HIV infection
• History of liver disease
• Alcoholism
• Pregnancy or in early postpartum period
Continued Laboratory Monitoring

Repeat laboratory monitoring if patient has:

- Abnormal baseline results
- Current or recent pregnancy
- High risk for adverse reactions
- Symptoms of adverse reaction
- Liver enlargement or tenderness on exam
Adverse Effects of Medications: Isoniazid (INH)

10-20% HAVE ELEVATED LIVER ENZYMES
- Up to 5 times normal
- Usually return to normal even if rx is continued

CLINICAL HEPATITIS IN 0.1%

PERIPHERAL NEUROPATHY IN 0.2%
- More common with liver disease, diabetes
- Rx with Vitamin B6 (Pyridoxine)
Adverse Effects of Medications: Rifampin (RIF)

- HEPATOTOXICITY IN 0.6%
- CUTANEOUS REACTIONS IN 6%
- GI SYMPTOMS RARELY SEVERE
- ORANGE DISCOLORATION OF BODY FLUIDS
- DRUG INTERACTIONS (WARFARIN, OCPS, PHENYTOIN)
- CONTRAINDICATED IN HIV-INFECTED INDIVIDUALS ON CERTAIN PIS OR NNRTIS
  - Substitute with Rifabutin
Who handles these cases?

• **CIVILIAN: PUBLIC HEALTH/PRIMARY CARE PARTNERSHIP**
  - Most county health departments offer therapy free of charge

• **MILITARY: USUALLY REFERRED TO PREVENTIVE MEDICINE**
  - Can be ID, pulmonology, or primary care
  - Public health nurses usually do monthly clinical follow-up

• **IN THE FIELD (E.G. PRE-DEPLOYMENT TEST IS POSITIVE)**
  - Many elect to defer therapy until after deployment
  - Depends on comfort level, available resources, and closeness of contact
CDC Guidelines Call for Targeted Testing Only

**TARGETED TESTING:**
- “…targeted tuberculin testing programs should be conducted only among groups at high risk and discouraged in those at low risk.” (MMWR 2000)

**CDC CLEARLY CONSIDERS HIGH-RISK:**
- Hospitals and health care settings (MMWR 2005)
- Prisons (MMWR 2006)
- HIV-infected, homeless, contacts of active case, etc. (MMWR 2000, 2005)
- Military not considered high-risk
FIGURE 1. Numbers of cases and rates of pulmonary tuberculosis (TB), active component, U.S. Armed Forces, and expected age-adjusted rates of pulmonary tuberculosis in the general U.S. population, based on U.S. military population standard, 1998-2012\textsuperscript{a}

\textsuperscript{a}Data not available from the CDC in 2012

What do the US Military Services Do?

- OVER 250,000 TESTS PER YEAR AMONG RECRUITS

- ACCESSIONS: ALL SERVICES DO UNIVERSAL SCREENING
  - Army (DA PAM 40-11; 20 Oct 2008)
  - Navy (BUMED Instruction 6224.8A; 12 Feb 2009)
  - Air Force (AFI 48-105; 1 Mar 2005)

- PREVALENCE OF TST REACTORS
  - Navy: 5%
  - Army: 3%
  - Air Force: 1.5%
  - *Depends on proportion of foreign-born*

- DEPLOYMENT-RELATED SCREENING
MEDCOM Regulation
No. 40-64

Medical Services
THE TUBERCULOSIS SURVEILLANCE AND CONTROL PROGRAM

Supplementation of this regulation and establishment of forms other than MEDCOM forms are prohibited without prior approval from HQ MEDCOM, ATTN: MCPO-SA.

1. History. This issue publishes a new regulation.

2. Purpose. The purpose of the Tuberculosis (TB) Surveillance and Control Program is to prevent new cases of TB through prompt identification and treatment of both TB infection and disease. This regulation prescribes policy and procedures for testing, evaluating, treating, monitoring, referring, documenting, and tracking Army personnel and beneficiaries at risk for TB. It also assigns responsibilities applicable to key personnel working with this program.

3. Applicability. This regulation applies to personnel in all U.S. Army Medical Command (MEDCOM) installations and activities.

4. References. References are listed at appendix A. (See Note at appendix A for information specific to references in this regulation.)

5. Responsibilities

a. The Office of The Surgeon General/MEDCOM G-3/5/7 Health & Wellness is responsible for the oversight of practice standards and providing regulation updates as applicable.

b. The U.S. Army Public Health Command (PHC) will provide disease and epidemiology surveillance, relevant training, and resources that support the TB Surveillance and Control Program.

c. Regional medical command preventive medicine (PM) physicians will ensure subordinate military treatment facilities (MTFs) maintain effective TB control programs.

d. MTF Commanders are responsible for ensuring that PM personnel have sufficient staffing, resources, and training to implement the TB Surveillance and Control Program.
# Army
**(MEDCOM Reg 40-64, Dec 2013)**

## Initial Entry Tuberculosis (TB) Risk Assessment Tool

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Have you ever had face-to-face contact with someone who was sick with tuberculosis (TB)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Were you born outside the United States?</td>
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<td></td>
</tr>
<tr>
<td>If yes, list the country:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Did you ever live with a family member who was born outside the United States?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If yes, list the country:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Have you ever had a positive TB test, prior diagnosis of TB, or prior treatment for TB?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Reviewer Instruction**

- If "NO" answers = low risk → STOP.
- Any "YES" answers = increase risk → Go to question #5

**If "YES"** → STOP.
**If "NO"** → Go to question #6.

- Do you have any of the following symptoms of tuberculosis?:
  - cough > 2 weeks, fever > 2 weeks, drenching night sweats, or unplanned weight loss.

**If "YES" then refer immediately to provider for evaluation of TB disease.**

- Do you have documentation of previous TB treatment with you today?

**STOP**
What about guidelines for travelers?

- **US GUIDELINES (CDC YELLOW BOOK):** BOTH PRE- AND POST-TRAVEL TESTING FOR THOSE WITH “PROLONGED EXPOSURE TO TUBERCULOSIS...E.G. [ROUTINE CONTACT WITH] HOSPITAL, PRISON, AND HOMELESS SHELTER POPULATIONS”

- **IDSA GUIDELINES:** TST “SHOULD BE PERFORMED FOR THOSE WITH ANTICIPATED EXPOSURE TO TB OR LONG-TERM STAYS IN DEVELOPING AREAS OR WHEN REQUESTED BY THE TRAVELER BECAUSE OF CONCERN ABOUT EXPOSURE”

- **TRAVAX:** “TRAVELERS TO COUNTRIES WITH HIGH RISK (I.E., > 100 CASES PER 100,000) SHOULD HAVE PRE-DEPARTURE TESTING IF STAYING FOR > 1 MONTH; TRAVELERS TO COUNTRIES WITH MODERATE RISK (APPROXIMATELY 25-100 CASES PER 100,000) SHOULD HAVE PRE-DEPARTURE TESTING IF THEY PLAN ON STAYING FOR > 3 MONTHS”

- **CANADIAN GUIDELINES:** A SINGLE, POST-TRAVEL TEST BASED ON DURATION OF TRAVEL AS WELL AS TB INCIDENCE IN THE COUNTRY VISITED.
Recent Deployment TB Epidemiology

• **OUTBREAKS ON NAVY SHIPS—COMMON IN THE 1960S**
  - USS Wasp (1998): 21 infected from failure to diagnose index case
  - USS Ronald Reagan (2003): 1 case reactivated despite prior INH Rx

• **ACTIVE TB: LOWER RATE OF DISEASE THAN IN THE US POPULATION**

• **TST REACTORS DURING DEPLOYMENT**
  - Risk of TST conversion: about 1-2% per test
  - Problems with false positives and pseudo-outbreaks of TST conversions

Camarca MM and Krauss MR. *Mil Med* 2001;166(5):452-6
### Pseudoepidemics of TST conversions in the US Army and their attributed causes, 1983-2005

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>Location</th>
<th>Pre-investigation estimate of % conversions</th>
<th>Post-investigation estimate of % conversions</th>
<th>% of conversions with negative repeat test</th>
<th>Active TB cases identified</th>
<th>Primary attributed cause(s) of outbreak</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>Aviation unit</td>
<td>Afghanistan</td>
<td>15% (30 of 198)</td>
<td>4.3% (16 of 374)</td>
<td>81% (13 of 16)</td>
<td>0</td>
<td>Test administration and reading; use of Aplisol; prior positives not documented; foreign birth</td>
</tr>
<tr>
<td>2005</td>
<td>Army National Guard</td>
<td>TF Falcon, Kosovo</td>
<td>5% (75 of 1500)</td>
<td>2.5% (37 of 1500)</td>
<td>95% (38 of 40)</td>
<td>0</td>
<td>Test administration and reading; use of Aplisol</td>
</tr>
<tr>
<td>2003</td>
<td>Army National Guard</td>
<td>TF Eagle, Bosnia</td>
<td>1.6% (19 of 1222)</td>
<td>0.5% (6 of 1222)</td>
<td>--</td>
<td>0</td>
<td>68% (13 of 19) were prior reactors; conversion rate was not elevated</td>
</tr>
<tr>
<td>1996</td>
<td>Hospital Staff</td>
<td>TF Eagle, Bosnia</td>
<td>1.3% (1 of 80)</td>
<td>1.3% (1 of 80)</td>
<td>--</td>
<td>1</td>
<td>Conversion rate not elevated</td>
</tr>
<tr>
<td>1996</td>
<td>Prisoners and prison guards</td>
<td>Ft. Leavenworth, KS</td>
<td>2.5% (34 of 1345)</td>
<td>--</td>
<td>30% (9 of 30)</td>
<td>0</td>
<td>Use of Aplisol</td>
</tr>
<tr>
<td>1995</td>
<td>Military Police</td>
<td>Guantanamo Bay, Cuba</td>
<td>6.3% (81 of 1280)</td>
<td>3.6% (46 of 1280)</td>
<td>100% (6 of 6)</td>
<td>0</td>
<td>33% (25 of 75) were prior reactors; foreign birth</td>
</tr>
<tr>
<td>1984</td>
<td>Prisoners and prison guards</td>
<td>Ft. Leavenworth, KS</td>
<td>9.1% (191 of 2106)</td>
<td>--</td>
<td>36% (62 of 172)</td>
<td>0</td>
<td>Increased surveillance, variability in test administration and reading; ethnic group and region of birth</td>
</tr>
<tr>
<td>1983</td>
<td>Medical students</td>
<td>Ft. Benning, GA</td>
<td>7.7% (5 of 65)</td>
<td>3.1% (2 of 65)</td>
<td>--</td>
<td>0</td>
<td>60% (3 of 5) had dominant reactions to PPD-B, indicating cross-reactions with non-tuberculous mycobacteria (NTM)</td>
</tr>
</tbody>
</table>

Mancuso JD. *Am J Resp Crit Care Med* 2008;177:1285
So what does the US military do for “travelers” (deployers)?

- **AIR FORCE** moved to targeted testing after deployment in ’05 (AFI 48-105)

- **ARMY**
  - Used to test before deployment, after deployment, and then again 3-6 months after deployment (3 tests per deployment)
  - In 2008, moved to targeted testing after deployment using DD 2796 (OTSG Memo, 25 Sept 2008)
  - In 2013, moved to totally targeted testing (MEDCOM Reg 40-64)

- **NAVY**
  - Used to test operational units yearly with TST
  - Now targets testing during PHA with questionnaire (BUMEDINST 6224.8B, 21 Feb 2013)

- **POLICIES AVAILABLE AT:** [WWW.PDHEALTH.MIL](http://WWW.PDHEALTH.MIL)
### Periodic Tuberculosis (TB) Risk Assessment Tool

#### Periodic Tuberculosis (TB) Risk Assessment Tool

1. **Since your last TB risk assessment, did you have face-to-face contact with someone who was sick with tuberculosis (TB)?**
   - [ ] Yes
   - [ ] No
   - **If yes, nature of exposure:** Household - Co-worker - Family - Other ___________
   - **Dates of exposure** ___________

2. **Since your last TB risk assessment, did you work, volunteer, or reside in a detainee facility, prison, homeless shelter, refugee camp, or drug treatment facility?**
   - [ ] Yes
   - [ ] No

3. **Since your last TB risk assessment, did you develop any of the following conditions: organ transplant; HIV infection; immunosuppression secondary to use of prednisone (equivalent of >15mg/day for >1 month) or other immunosuppressive medication such as Humira, Enbrel or Remicade?**
   - [ ] Yes
   - [ ] No

4. **Since your last TB risk assessment, did you develop any of the following conditions: diabetes, silicosis, cancer of head or neck, Hodgkin's disease, leukemia, end-stage renal disease, intestinal bypass or gastrectomy, chronic malabsorption syndrome, low body weight [10% or more below ideal weight], or injection drug use?**
   - [ ] Yes
   - [ ] No

**All "NO" answers = low risk → STOP.**

Any "YES" answers = increased risk → Go to question #5.

**If all "NO" responses → Do NOT test for TB**

5. **Do you have any of the following symptoms of tuberculosis: cough > 2 weeks, fever > 2 weeks, drenching night sweats, or unplanned weight loss?**
   - [ ] Yes
   - [ ] No

**If "NO" → Go to question #6.**

**If "YES" → STOP.**

6. **Have you had a prior TB test, prior diagnosis of TB, or prior?**
   - [ ] Yes
   - [ ] No

**If "YES" then refer immediately to provider for evaluation of TB disease.**
Policy Discussion

- **NO COMPELLING INDICATION TO USE IGRAS**
- **SCREENING ≠ TESTING**
- **TARGETED TESTING IN BASIC TRAINING...**
  - Followed by compulsory treatment!
- **D/C PRE- AND POST-DEPLOYMENT TESTING**
- **INITIATE ANNUAL SCREENING AT PHA**
  - Use validated questions to target testing
- **MONITORING AND ACCOUNTABILITY**
Questions?