Tuberculosis Populations at Risk
• One-third of the world is infected with TB, an average of one new infection per second

• Two million people died from tuberculosis in 2010, 1 every 20 seconds

• TB is the leading killer of those with HIV

• TB is the 2nd leading killer from an infectious disease
Reported TB Cases, United States 1983 – 2011

10,528
Percentage of TB Cases Among Foreign-born Persons, United States

2000

2011

- Dark blue: >50%
- Light blue: 25%–49%
- Lightest blue: <25%
- White: <25%
Countries of Birth of Foreign-born Persons Reported with TB, United States, 2011

Mexico (22%)
Philippines (11%)
Vietnam (8%)
India (8%)
China (6%)
Guatemala (3%)
Haiti (3%)
Other Countries 39%
Hispanic or Latino (19%)
American Indian or Alaska Native (3%)
Asian (3%)
Black or African American (39%)
White (33%)
Native Hawaiian or Other Pacific Islander (2%)

U.S.-born

*All races are non-Hispanic. Persons reporting two or more races accounted for less than 1% of all cases.
** American Indian or Alaska Native and Native Hawaiian or Other Pacific Islander accounted for less than 1% of foreign-born cases and are not shown.
What is Tuberculosis?

TB
Tuberculosis is . . .

- An airborne bacterial disease caused by *Mycobacterium tuberculosis*
  - Non Tuberculosis Mycobacterium (NTM)
- Slow growing
- Acid Fast: An organism that holds a red stain even in the presence of acid
- Appears “rough and buff” in standard culture
Transmission: Airborne
TB Pathogenesis

Multiplication begins
Spread throughout the body
Latent TB Infection (LTBI)

- In 2 – 8 weeks a special type of white blood cell surrounds the TB bacteria.
- This ‘barrier shell’ keeps the TB contained and under control.
This condition is called LTBI

In 8 – 10 weeks infection is detected by the tuberculin skin test or TST
## Groups at risk for TB Infection

<table>
<thead>
<tr>
<th>Group</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Close contacts</td>
<td>Pathogenesis - Two years</td>
</tr>
<tr>
<td>Immigrants</td>
<td>Country of Origin</td>
</tr>
<tr>
<td>Travel to foreign country</td>
<td>Environmental</td>
</tr>
<tr>
<td>Congregate setting employees</td>
<td>Environmental</td>
</tr>
<tr>
<td>Congregate setting residents</td>
<td>Environmental</td>
</tr>
<tr>
<td>Children exposed to high risk adults</td>
<td>Environmental</td>
</tr>
<tr>
<td>Medically underserved, homeless</td>
<td>Environmental</td>
</tr>
<tr>
<td>Substance abuser</td>
<td>Environmental</td>
</tr>
</tbody>
</table>
Groups with LTBI at Risk for Progression to TB Disease

- HIV positive or at risk for HIV infection
- Children ≤ 4 yrs old and adolescents
- Certain medical conditions
- Injection drug users
- Prior untreated TB or fibrotic lesions on chest radiograph suggestive of past TB
- Underweight or malnourished
- Receiving TNF-α antagonists for treatment of rheumatoid arthritis or Crohn’s disease
### Relative Risk by Selected Conditions

<table>
<thead>
<tr>
<th>Clinical Condition</th>
<th>*Relative Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicosis</td>
<td>30</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>2.0-4.1</td>
</tr>
<tr>
<td>Chronic Renal Failure/hemodyalisis</td>
<td>10.0 – 25.3</td>
</tr>
<tr>
<td>Gastrectomy</td>
<td>2 – 5</td>
</tr>
<tr>
<td>Jejunoileal bypass</td>
<td>27 - 63</td>
</tr>
<tr>
<td>Solid organ transplant Renal</td>
<td>37</td>
</tr>
<tr>
<td>Solid organ transplant Cardiac</td>
<td>20-74</td>
</tr>
<tr>
<td>Carcinoma of the head of neck</td>
<td>16</td>
</tr>
</tbody>
</table>

*Probability of developing TB if exposed, compared to those who are not exposed*
Progressing from Infection to Disease

- 10% lifetime chance that TB disease will develop
  - 5% within the first 2 years after infection
  - 5% remaining of their lifetime
Symptoms of TB Disease

- General
  - Fatigue/Malaise
  - Poor Appetite
  - Weight loss
  - Elevated temperature
  - Night Sweats

- Pulmonary
  - Cough
  - Shortness of Breath
  - Chest Pain
  - Hemoptysis
Sites of TB Disease

80-85%

- **Laryngeal** TB is VERY contagious
- Symptoms will vary dependent on site
Diagnosis of TB Disease

- History
  - Exposure
  - Vulnerability
- Bacteriology
  - AFB smear and culture X 3
- Symptoms
- Chest X-ray
  - Upper lobes
  - Cavitary
## Latent TB Infection vs. Active Disease

<table>
<thead>
<tr>
<th>Latent TB Infection (LTBI)</th>
<th>Active TB Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tubercle bacilli in the body</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Tuberculin skin test reaction</strong> or <strong>IGRA usually positive</strong></td>
<td></td>
</tr>
<tr>
<td>No symptoms</td>
<td>Symptoms</td>
</tr>
<tr>
<td>Chest x-ray normal or not consistent with TB</td>
<td>Chest x-ray usually abnormal</td>
</tr>
<tr>
<td>Not infectious</td>
<td>Often infectious (sputum)</td>
</tr>
<tr>
<td>Not a Case of TB</td>
<td>Case of TB</td>
</tr>
</tbody>
</table>
TB and HIV

- Strongest risk factor for progression from LTBI to active TB disease
  - Estimated risk is 20 to 37 times greater
  - CD4 count + viral load
- Difficult to diagnose and treat
  - CXR
  - Sputum
  - Testing for infection
  - Drug/drug interactions
- All HIV patients should be screened for TB annually
- All TB patients should be tested for HIV
Drug Resistant TB

- Globally: found in ALL regions of the world
  - 50%: China, India and Russia
- United States: all states have been impacted
  - 80% are foreign born
    - Mexico, Philippines, Vietnam, India, China, Haiti, Korea, Peru, Ecuador, Guatemala, Ethiopia, Honduras
- Primary Cause
  - Inadequate treatment
    - Non-adherence
    - Incorrect regimen
LTBI
Testing and Treatment
Mantoux tuberculin skin test (TST)

- Gold Standard: method using 0.1 ml of Purified Protein Derivative for identifying persons with Latent TB Infection
- Accurate results are dependent upon:
  - Correct Handling
  - Correct History
  - Correct Technique
TB Screening or TB Testing

- **TB Screening**
  - a thorough patient history is taken by asking questions relevant to potential TB exposure
  - Baye’s theorem:
    - **Inverse probability principle** - The accuracy of your test is dependent upon the prevalence of the disease in the population
    - The lower the risk in a population the lower the accuracy of a test

- **TST Testing**
  - Specificity and Sensitivity is 20% - 40%
Recommendations for TST Interpretation

- ≥ 5 mm
  - close contacts and HIV-infected individuals
- ≥ 10 mm
  - other persons at risk
- ≥ 15 mm
  - all others not in the above categories
Bacille Calmette-Guérin (BCG)

- Given to prevent serious forms of TB disease in very young children
- Used in countries where TB is endemic
- BCG does not preclude skin testing for TB infection
The Booster Phenomena

- Beneficial for groups who will have serial TST’s
- A person’s immune system tends to stop reacting strongly to the TB bacteria over time
- Do **two step testing** to avoid misinterpreting the results of the second TST as a new infection
Interferon Gamma Release Assay (IGRA)

- Blood Test – diagnose LTBI
  - T-spot
  - QuantiFERON
## IGRA’s: The pro’s and con’s

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single patient visit</td>
<td>Local availability</td>
</tr>
<tr>
<td>Results available in 24 hours</td>
<td>Stringent processing</td>
</tr>
<tr>
<td>No boosting effect</td>
<td>More expensive than the TST</td>
</tr>
<tr>
<td>Less subject to reader bias</td>
<td>Limited data on it’s use</td>
</tr>
<tr>
<td>Does not cross react with BCG</td>
<td>Not for use in children ≥ 5</td>
</tr>
</tbody>
</table>
# Diagnosis and Treatment for LTBI

- Positive TST or IGRA
- Asymptomatic
- Negative Chest x-ray

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dosage</th>
<th>Length of treatment</th>
<th># of Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isoniazid</td>
<td>300mgs/daily</td>
<td>9 months (6 mths)</td>
<td>270 (180)</td>
</tr>
<tr>
<td>Rifampin</td>
<td>600 mgs/daily</td>
<td>4 months (6 mths)</td>
<td>120 (180)</td>
</tr>
<tr>
<td>Rifapentine/</td>
<td>600 mgs</td>
<td>Once weekly by DOT</td>
<td>12</td>
</tr>
<tr>
<td>Isoniazid</td>
<td>300 mgs</td>
<td>3 months</td>
<td></td>
</tr>
</tbody>
</table>
Short Course treatment for LTBI

Short Course Treatment
Rifapentine (Priftin)/Isoniazid
3HP
Isoniazid/Rifapentine

Pros
• Shorter duration of treatment 3 months
• Individuals more likely to complete therapy (82% vs 69%)
• Similar amount of adverse drug events in each group
• Expense

Cons
• Availability
• Must be by DOT - directly observed therapy
• Pill burden
• Not recommended for:
  • HIV positive patients
  • Children under 2
  • Pregnant women
  • Contacts to MDR index case
• Links to major guidelines
  • Treatment of TB
  • TB Testing and Treatment for Latent Infection
  • Infection Control in Facilities
  • Others
• The “Standards For Care”
Resources

- State TB Control Offices
  - Key contacts for information on epi and TB services in your state and locality
RTMCC’s

- Regional Training and Medical Consultation Centers
  - Phone consultation for difficult to manage patients
- Online Continuing Education Opportunities
Fact Sheets


Educational Materials for Providers

http://www.cdc.gov/tb/education/provider_edmaterials.htm
Patient Education

- CDC Patient and Public Educational Materials

- Materials for non-readers and non-English speakers
  - Audio, multimedia, mobile apps
  - [http://www.healthyroadsmedia.org/](http://www.healthyroadsmedia.org/)
Contact Information

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