TB 101 and Beyond

Brenda Mayes, RN
VDH TB Control

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Estimated TB Incidence Rates:
2001

TB in Virginia: 1990-2010

Number of Cases

Year
VDH TB Prevention and Control Policies and Procedures

- Based on USPHS/CDC, ATS, IDSA and Pediatric “Red Book” guidelines
- Adapted to address uniquely Virginia issues

Health Department is Responsible For TB Control

- TO ENSURE THAT ALL PERSONS WHO ARE SUSPECTED OF HAVING TUBERCULOSIS ARE IDENTIFIED AND EVALUATED PROMPTLY AND THAT AN APPROPRIATE COURSE OF TREATMENT IS PRESCRIBED AND COMPLETED SUCCESSFULLY
  - See page 15 of MMWR Treatment of TB

TB Control in Virginia

- Code of Virginia
  - Reportable Diseases
  - EPI 1
- Virginia TB Law book
  - Discharge Plan
- CDC MMWR guidelines
- Laboratories
The Mycobacteria

Human pathogens

*M. tuberculosis* Complex

(*M. tuberculosis, M. bovis, M. microti, M. africanum, M. canettii, M. pinnipedii*)

*M. leprae*

Transmission of TB

- Spread person to person through the air

TB: Airborne Transmission

Person with active pulmonary TB

TB bacteria airborne

Person breathing TB bacteria
TB Invades/Infects the Lung

- Effective immune response
- Infection limited to small area of lung
- Immune response insufficient
- Active Disease

Probability of TB Transmission

- Transmission dependent on these factors
  - Infectiousness of the person with TB
  - Environment in which the transmission occurs
  - Duration of the exposure to TB bacteria
  - Virulence of organism
  - Immune system of person exposed

Pathogenesis of TB

- Infection begins when the inhaled droplets reach the lungs
- Tubercle bacilli multiply
- A small number of tubercle bacilli may enter the bloodstream and spread throughout the body (lungs, kidneys, brain, bone)
- Within 2-10 weeks, the immune system produces a capsule that surrounds the tubercle bacilli
Sites of TB Disease

- Pulmonary TB (TB of the lungs)
  - 80% of cases
  - Potential for transmission – infectious until proven otherwise
- Extrapulmonary TB (outside the lungs)
  - Can occur anywhere in body
  - Portal of entry through lungs
  - Typical sites include larynx, lymph nodes, the pleura, brain, kidneys, bones, or joints
  - Usually not infectious – always rule out pulmonary!

Likelihood of Developing TB Disease

- Once infected with tubercle bacilli
  - 90% chance of never developing the disease
  - 10% life time chance that TB disease will develop
    - Half the risk within the first 2 years
    - Risk lower after the first 2 years
  - Other personal health factors can influence risk
    - HIV infection - single highest risk for progress to active disease
      - 10% annual risk

Diagnosis of TB Infection and Disease

Signs and Symptoms
LTBI vs. Disease
Testing
Bacteriology (positive sputa)
Diagnosis of TB Disease:

**Symptoms**
- Pulmonary TB Disease
  - Coughing
  - Pain in the chest when breathing or coughing
  - Coughing up sputum or blood
- General TB Disease
  - Weight loss
  - Fatigue
  - Malaise
  - Fever
  - Night sweats
  - Other symptoms specific to the site of the TB disease

**Latent Infection vs. Active Disease**

<table>
<thead>
<tr>
<th>Latent Infection</th>
<th>Active Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuberculosis bacilli in the body</td>
<td>Tuberculin skin test reaction usually positive</td>
</tr>
<tr>
<td>Chest x-ray usually normal</td>
<td>Chest x-ray usually abnormal</td>
</tr>
<tr>
<td>Sputum smears and cultures negative</td>
<td>Sputum smears and cultures may be positive</td>
</tr>
<tr>
<td>No symptoms</td>
<td>Symptoms such as cough, fever, weight loss</td>
</tr>
<tr>
<td>Not infectious</td>
<td>Often infectious before treatment</td>
</tr>
<tr>
<td>Not a case of TB</td>
<td>A case of TB</td>
</tr>
</tbody>
</table>

**High Risk for Tuberculosis**

Who do we need to see?

PAY ME NOW OR PAY ME LATER

EVERY TB CASE WE NOW HAVE WAS ONCE LTBI
High Risk Contacts
- Immunocompromised
  - HIV
  - TNFa drugs
  - Steroids
- Children
- Non high risk contacts

Others at High Risk?
- Recent Convertors
- Those with medical conditions
- Congregate living
- Drug/Alcohol users
- Illegal Immigrants
- Persons in US on Visa
- Any newly positive TST
- College/University applicants

VDH Eligibility Guidelines
- TB charges see page 30
- Vdhweb
  - Office of Community Health Services
  - Forms and Manuels on left
  - Eligibility near bottom of page on right
Refugees and Immigrants

Classification System for TB

<table>
<thead>
<tr>
<th>Class</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No TB exposure</td>
<td>No history of exposure, negative reaction to tuberculin skin test</td>
</tr>
<tr>
<td>1</td>
<td>TB exposure</td>
<td>History of exposure, negative reaction to tuberculin skin test</td>
</tr>
<tr>
<td>2</td>
<td>TB infection</td>
<td>Positive reaction to tuberculin skin test, no clinical, bacteriologic, or radiographic evidence of active TB</td>
</tr>
<tr>
<td>3</td>
<td>TB, clinically active</td>
<td>All tuberculosis cultured (if done)</td>
</tr>
<tr>
<td>4</td>
<td>TB, not clinically active</td>
<td>History of episode(s) of TB or Abnormal but stable radiographic findings Positive reaction to the tuberculin skin test Negative bacteriologic studies (if done) and No clinical or radiographic evidence of current disease</td>
</tr>
<tr>
<td>5</td>
<td>TB suspected</td>
<td>Diagnosis pending</td>
</tr>
</tbody>
</table>

Interferon Gamma Release Assays: IGRAs

- Measures interferon-gamma (IFN-y) released from a patient’s T cells after stimulation with specific TB antigens
- QuantiFERON - TB Gold (QFT-G) 2005
- QuantiFERON - TB Gold InTube 10/2007
- T-SPOT.TB Test approved 2008
Diagnosis of Active TB

- Evaluate all patients with symptoms of TB for TB disease, regardless of the patient's skin test reaction
- 1/4 to 1/3 of all active MTB cases have negative TST at onset of treatment

Diagnosis of TB Disease: Bacteriologic Examinations

- Sputum collection
  - Spontaneous or induced
  - All symptomatic individuals
  - Abnormal CXR
  - *M. tb* can be cultured from any body fluid or tissue

- Specimen collected depends on the site of potential disease

Yield of smear and culture from repeated sputum induction for the diagnosis of pulmonary tuberculosis.

<table>
<thead>
<tr>
<th>Specimen</th>
<th>One</th>
<th>Two</th>
<th>Three</th>
<th>Four</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFB smear</td>
<td>64</td>
<td>81</td>
<td>91</td>
<td>98</td>
</tr>
<tr>
<td>AFB culture</td>
<td>70</td>
<td>91</td>
<td>99</td>
<td>100</td>
</tr>
</tbody>
</table>

Bacteriologic Examination (Cont.)

- Microscopy
  - “Smear results”
  - Presence acid-fast bacilli (AFB)
    - AFB are bacteria that remain stained even after they have been washed in an acid solution
    - Tubercle bacilli are only one kind of AFB
    - Results available usually within one day

Bacteriologic Examination: AFB Smear Interpretation

- Classify smear according to the number of AFB seen
  - Measure of number of organisms presented (negative to 4+)
  - Helps to determine level of potential infectiousness
- If no AFB seen, result is negative
- Does not rule out possibility of TB
New Testing  NAAT (nucleic acid amplification testing)

- MTD NAA testing of RNA for MTb is now done on all positive AFB smears at the state lab results within 48 hours
- PCR
- HAINES

Bacteriologic Examination: Culturing the Specimen

- Grow the mycobacteria on media
  - Several types of media
- All specimens should be cultured, regardless of whether the smear is positive or negative
- Results may take up to 6-8 weeks
- If *M. tuberculosis* present, confirms diagnosis of TB disease

Bacteriologic Examination: Drug Susceptibility Testing

- Critical test for appropriate management of active TB disease
- Test mandated by VA TB Control laws
- Determines which drugs will kill the tubercle bacilli that are causing disease in the individual patient
- Done in initial **positive** culture for *M. tuberculosis*
- May need to be repeated later in treatment course
- Drug levels
**Sputa Results**

- AFB smear 24 hours: nothing growing
- MTD 48 to 72 hrs after AFB: nothing growing
- DNA probe 10 to 14 days: growing
- DRUG Sensitivities: growing
- Final Culture 6 to 8 weeks: growing

**Treatment of MTB Case**

- **CONTINUATION PHASE** by DOT
  - Either 4 or 7 months
  - Daily 126 doses (INH and RIF)
  - 5X/wk 90 doses (INH and RIF)
  - 2X/wk 36 doses (INH and RIF)
  - 1X/wk 18 doses (INH and RIF)
- The 4 month continuation phase will be used on most clients

**Drug Resistance**

- **MONO-RESISTANT** resistant to one drug only
- **POLY-RESISTANT** resistant to more than one drug, but not the combination of INH and RIF
Drug Resistance - 2

- MDR (Multiple Drug Resistance)
  INH AND Rifampin

- XDR (Extreme Drug Resistance)
  INH and Rifampin plus any fluoroquinolone and at least one of the three injectable second-line drugs (amikacin, kanamycin or capreomycin)

Definitions

- Primary drug resistance:
  - Infected with TB which is already drug resistant

- Secondary (acquired) drug resistance:
  - Drug resistance develops during treatment

What Causes Secondary Drug Resistance?

TREATMENT FAILURE
Who is Higher Risk of MDR-TB???

- History of previous TB Tx especially if recent
- Foreign-born patients from countries or ethnicities with high prevalence of MDR
- Poor response to standard 4 drug regimen
- Known exposure to MDR-TB case
- HIV+

Criteria for Reporting TB Cases

- All TB cases and suspects are required to be reported in Virginia (EPI 1)
  - Positive smear
  - Positive culture
  - Clinical findings and/or treatment started
- All children under age 4 found to have latent TB infection are required to be reported (EPI 1)

LTBI Treatment Regimens
Before Initiating Treatment

- Rule out TB disease (i.e., wait for culture result if specimen obtained)
- Determine prior history of treatment for LTBI or TB disease
- Assess risks and benefits of treatment
- Determine current and previous drug therapy

Isoniazid Regimens

- 9-month regimen of Isoniazid 300mg qd (INH) is the preferred regimen (270 doses in 12 months)
- 6-month regimen is less effective but may be used if unable to complete 9 months (180 doses)
- May be given daily or intermittently (twice weekly)
  - Dosage different 900mg twice weekly
  - 76 doses in 12 months or 52 doses in 9 months
  - Use directly observed therapy (DOT) for intermittent regimen
  - Private sector/HD does not do intermittent INH

Rifampin Regimens

- Rifampin 600mg (RIF) given daily for 4 months is an acceptable alternative when treatment with INH is not feasible.
  - 120 doses in 6 months
- In situations where RIF cannot be used (e.g., HIV-infected persons receiving protease inhibitors), rifabutin may be substituted.
Regimens

- RIF daily for 4 months
  
  *(120 doses within 6 months)*

- RIF and PZA for 2 months should generally not be offered due to risk of severe adverse events

Completion of Therapy

Completion of therapy is based on the total number of doses administered, not on duration alone.

VDH Nursing Directives

- DOT
- CI
- Case management
- Delegation of Tasks

- Vdhweb
  
  - Office of Nursing
    
    - Nursing Directives