TB on a College Campus: A Case Study

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Objectives

- Discuss the difference between infectious and non-infectious TB
  
  Public health role
  
  Diagnostic testing beyond PPD
  
  Statistics regarding TB worldwide and U.S. population

- Explain how to read a PPD and discuss guidelines for results
  
  The role of BCG
  
  Public Health referral for follow-up of positive PPDs

- Identify protocols of care in a case of TB on a local college campus
  
  Notification/testing/education of contacts
  
  Direct observed therapy
Review of TB

- Cause
- Spread

Figure 2 - TB pathogenesis. Tubercle bacilli are inhaled in aerosol droplets, enter into the lungs and, when the host innate immune defenses fail to eliminate the bacteria, *Mtb* start multiplying inside alveolar macrophages and then spreads to other tissues and organs through the bloodstream and lymphatics. Once the cell-mediated immune response kicks in, bacterial replication is usually controlled and in 90-95% of cases non overt signs or symptoms of disease ensue (Latent TB). During latent infection a dynamic equilibrium between the bacilli and host immune responses is established and any event that weakens cell mediated immunity may lead to active bacterial replication, tissue damage and disease occurs (active TB).
Latent vs Active TB

Not everyone infected with TB bacteria becomes sick. Strong immune system builds a tubercule around the germ so they are unable to spread

Germs are trapped inside the tubercules, they slow down and stop activity- **Latent (sleeping) TB**

- Do not feel sick
- No symptoms
- Not infectious
- Cannot spread

If TB bacteria become active in the body and multiply, the person will go from having latent TB to being sick with active disease
TB disease

TB bacteria become active if the immune system can’t stop them from growing

- Sick
- May be able to spread to close contacts

Many people who have latent TB infection never develop TB disease.

Some people develop TB disease soon after becoming infected before their immune system can fight it. Most don’t know they have it until they become sick.
Once a person is infected with TB bacteria, the chance of developing TB disease is higher if the person:

- Has HIV infection
- Has recently been infected with TB bacteria (in the past 2 years)
- Has other underlying health problems (diabetes)
- Abuses alcohol or drugs
- Was not treated for TB infection in the past
- Recent arrivals to the U.S within the past 5 years
- Poor compliance with medications
Signs and symptoms of TB

- A cough that lasts 3 weeks or longer
- Pain in the chest
- Coughing up blood or sputum
- Weakness or fatigue
- No appetite
- Chills
- Fever
- Night sweats
How to place and read a PPD


Figure 3.1. Giving the Mantoux tuberculin skin test.
Candidates for Treatment of LTBI

Persons with positive IGRA results or TST reaction >5mm

- HIV positive persons
- Recent contacts of persons with infectious TB disease
- Persons with fibrotic changes on chest x-ray consistent with prior TB and
- Patients with organ transplants and other immunosuppressed patients

Persons with positive IGRA results or TST reaction >10mm

- Recent arrivals (<5 years) from high-prevalence countries (Africa, Asia, Eastern Europe, Latin America, and Russia)
- Injection drug users
- Residents and employees of high-congregate settings (correctional facilities, nursing homes, homeless shelters, hospitals)
- Mycobacteriology laboratory personnel
- Persons with high-risk clinical conditions
- Children < 5 years of age
- Infants, children, and adolescents exposed to adults in high-risk categories

Persons with positive IGRA results or TST reaction >15mm

- Persons with no known risk factors for TB
The role of BCG

BCG (bacilli Calmette-Guerin) is a vaccine for TB disease used in many countries with a high prevalence of TB.

Not generally recommended for use in the U.S.
How common is TB?
TB is one of the most common infectious diseases worldwide. Remains an urgent public health problem in many parts of the world.
Approximately 1/3 of the world’s population is infected with TB.
How is TB treated?

Someone with latent TB infection but not TB disease, may be treated with preventative medications for 4-9 months (depending on the medication) to help them from developing active TB disease.

Treatment of latent TB infection reduces the risk that TB infection will progress to TB disease.

TB disease is treated with several drugs, usually for a period of a minimum of 6 months or longer depending on how sick the patient is.

Importance of taking medications exactly as prescribed—resistance

DOT— Direct observed therapy
How long does someone need to be on the medications used to treat TB before they take affect?

After 2 weeks of medication therapy, the patient is no longer infectious.

**RIPE**
- Rifampin
- Isoniazid (INH)
- Pyrazinamide (PZA)
- Ethambutol
How contagious is TB? How likely is it to spread?
TB spreads most easily in closed spaces over a long period of time. Over half the cases in the US are among people born in countries with a high incidence of the disease.

![Proportion of TB Cases by National Origin, 2012](image)

Brief contact with people who are sick with TB is unlikely to give a person TB.
How does Skidmore Health Services screen for TB?

All incoming students are screened.

- Students coming from countries that are high risk are screened by either a TB test or chest x-ray prior to arrival on campus.

- Students coming from countries that are low risk are screened using a questionnaire.

| Afghanistan | Congo | Congo DR | Cote d'Ivoire | Croatia | Djibouti | Dominican Rep | Ecuador | Egypt | El Salvador | Equatorial Guinea | Eritrea | Estonia | Etiopia | Fiji | French Polynesia | Gabon | Gambia | Georgia | Ghana | Guam | Guatemala | Guinea | Guinea-Bissau | Guyana | Haiti | Honduras | India | Indonesia | Iran | Iraq | Japan | Kazakhstan |
|-------------|-------|----------|---------------|---------|----------|---------------|---------|-------|------------|-------------------|---------|---------|---------|------|-----------------|-------|--------|---------|--------|-----|-----------|-------|--------|---------|--------|---------|-----|------|------|---------|
| Algeria     |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Angola      |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Anguilla    |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Argentina   |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Armenia     |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Azerbaijan  |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Bahamas     |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Bahrain     |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Bangladesh  |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Belarus     |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Belize      |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Benin       |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Bhutan      |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Bolivia     |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Bosnia &   |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Herzegovina |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Botswana    |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Brazil      |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Brunei      |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Darussalam  |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Bulgaria    |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Burkin Faso |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Burundi     |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Cambodia    |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Cameroon    |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Cape Verde  |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Central Africa Rep |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Chad        |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| China       |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Colombia    |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |
| Comoros     |       |          |               |         |          |               |         |       |            |                   |         |        |         |      |                 |       |         |         |        |    |           |       |         |         |        |         |    |      |      |          |

- Students coming from countries that are low risk are screened using a questionnaire.
STUDENT NAME: ________________________________
DOB: ________________________________________

SECTION I TUBERCULOSIS (TB) SCREENING FORM

To Be Completed By Incoming Students and Their Health Care Provider Within 6 Months Prior to the Student’s Arrival on Campus
(Health Care Provider’s Signature REQUIRED on the Reverse/Side 2 of this Form)

Please answer the following questions:

Do you have a history of a positive TB skin test or IGRA blood test? If yes, document on page 2. A chest x-ray within 6 months prior to student’s arrival on campus is required (proceed to item #4 on page 2).

☐ Yes ☐ No

Do you have a history of BCG vaccination? If yes, consider IGRA if possible. A history of BCG vaccination should NOT preclude testing of a member of a high risk group.

☐ Yes ☐ No

Have you ever had close contact with persons known or suspected to have active TB disease?

☐ Yes ☐ No

Were you born in one of the countries listed below that have a high incidence of active TB disease?

☐ Yes ☐ No

If yes, please CIRCLE the country below.

Afghanistan

Algeria

Angola

Argentina

Azerbaijan

Bahrain

Bangladesh

Belarus

Belize

Benin

Bhutan

Bolivia (Plurinational State of)

Botswana

Brazil

Brunei Darussalam

Bulgaria

Burkina Faso

Burundi

Cabo Verde

Cambodia

Cameroon

Central African Republic

Chad

China

Colombia

Comoros

Côte d’Ivoire

Democratic People’s Republic of Korea

Democratic Republic of the Congo

Democratic Republic

Dominican Republic

Dominican Republic of

Ecuador

El Salvador

Equatorial Guinea

Eritrea

Estonia

Ethiopia

Fiji

Gabon

Gambia

Georgia

Ghana

Guatemala

Guinea

Guinea-Bissau

Guyana

Haiti

Honduras

India

Indonesia

Iran (Islamic Republic of)

Iraq

Kenya

Kiribati

Kuwait

Kazakhstan

Lao People’s

Democratic Republic

Democratic Republic

Lesotho

Liberia

Libya

Lithuania

Malaysia

Maldives

Mali

Marshall Islands

Mauritania

Mauritius

Mexico

Micronesia (Federated States of)

Nicaragua

Niger

Nigeria

Niue

Pakistan

Palau

Panama

Papua New Guinea

Peru

Philippines

Poland

Portugal

Qatar

Republic of Korea

Republic of Moldova

Romania

Russian Federation

Rwanda

Saint Vincent and the Grenadines

Sao Tome and Principe

Senegal

Serbia

Republic of

Seychelles

Sierra Leone

Singapore

Solomon Islands

South Africa

South Sudan

Sri Lanka

Sudan

Suriname

Swaziland

Tajikistan

Timor-Leste

Togo

Tunisia

Turkey

Turkmenistan

Tuvalu

Uganda

Ukraine

United Republic of

Uzbekistan

Venezuela (Bolivarian Republic of)

Viet Nam

Yemen

Zambia

Zimbabwe

Source: World Health Organization, Global Health Observatory, Tuberculosis Incidence 2012. Countries with incidence rates of ≥ 20 cases per 100,000 population. For future updates, refer to http://apps.who.int/ghodata

If the answer is NO to all of the above questions, no further testing is required however; Health Care Provider must indicate LOW RISK below and complete Section III.

If the answer is YES to any of the above questions, Skidmore College requires that you have a documented TB test within 6 months prior to your arrival on campus (no earlier than March 1, 2015). Health Care Provider must complete Sections II and III.

SECTION II – TUBERCULOSIS (TB) RISK ASSESSMENT & TESTING (To be Completed by Health Care Provider)

Clinicians should review and verify the information above. Persons answering YES to any of the questions in Section I are candidates for either Mantoux tuberculin skin test (TST) or Interferon Gamma Release (IGRA), unless a previous positive test has been documented.

As determined by review of the Section I screening questionnaire, this STUDENT IS CONSIDERED TO BE (please check appropriate box):

☐ Low Risk – proceed directly to Section III – PROVIDER SIGNATURE

☐ High Risk – complete Sections II and III – TB TESTING & PROVIDER SIGNATURE
1. TB Symptom Check

Does the student have signs or symptoms of active pulmonary tuberculosis disease? □ Yes □ No

If NO, proceed to 2 or 3

If YES, check below:

☐ Cough (especially if lasting for 3 weeks or longer) with or without sputum production

☐ Chest pain

☐ Unexplained weight loss

☐ Fever

Proceed with additional evaluation to exclude active tuberculosis disease including tuberculin skin testing, chest x-ray, and sputum evaluation as indicated.

2. Tuberculin Skin Test (TST) – PPD or Mantoux

(TST result should be recorded as actual millimeters (mm) of induration, transverse diameter; if no induration, write “0”. The TST interpretation should be based on mm of induration as well as risk factors.)

Date Given: / / Date Read: / / Result: mm of induration

**Interpretation:** positive ___ negative ___

**Interpretation guidelines**

**>5 mm is positive in:**

• recent close contacts of an individual with infectious TB

• persons with fibrotic changes on a prior chest x-ray, consistent with past TB disease

• organ transplant recipients and other immunosuppressed persons (including receiving equivalent of >15 mg/d of prednisone for > 1 month)

• HIV-infected persons

**>10 mm is positive in:**

• recent arrivals to the U.S. (>5 years) from high prevalence areas or who resided in one for a significant amount of time

• injection drug users

• mycobacteriology laboratory personnel

• residents, employees, or volunteers in high-risk congregate settings

• persons with medical conditions that increase the risk of progression to TB disease including silicosis, diabetes mellitus, chronic renal failure, certain types of cancer (leukemias and lymphomas, cancers of the head, neck, or lung), gastrectomy or jejunoileal bypass and weight loss of at least 10% below ideal body weight.

**>15 mm is positive in:**

• persons with no known risk factors for TB

3. Interferon Gamma Release Assay (IGRA)

Date Obtained: / / (specify method) □ QFT-G □ QFT-GIT □ other ____________

Result: negative ____ positive ____ indeterminate ____

4. Chest X-Ray: Required within 6 months prior to student’s arrival on campus if either the TST or IGRA result is positive, there is a past history of a positive tuberculosis test, or is experiencing signs or symptoms of active pulmonary tuberculosis disease.

Date of chest x-ray: / / Result: normal ____ abnormal ____

5. Preventive or Therapeutic Tuberculosis Treatment

Medication(s) – Please List:

_________________________________________ Dates Taken: ____________ ____________ Dates Taken: ____________

☐ Treatment offered but student declined.

SECTION III - PROVIDER INFORMATION and SIGNATURE REQUIRED:

(Print) Name and Title/Degree of Health Care Provider

______________________________

Address: (Please print or stamp)____________________________________

____________________________________

Provider Signature

____________________________________

Phone: (_______)

Fax: (_______)

For Administrative Purposes Only:

Form Complete: ____ Yes ____ No Action Needed: ____________ Date Reviewed: ________

Reviewer: ________ Date Contacted: ________ Date Requested Info Received: ________ Reviewer: ________
TUBERCULOSIS TESTING – REQUIRED for all international students within 6 months prior to arrival on campus*

*If the student has ever had a previous positive tuberculin skin test or IGRA, then a chest x-ray within 6 months prior to student’s arrival on campus is REQUIRED (item #3) in lieu of testing. All dates should be recorded in the format of month/day/year. See **interpretation guidelines on reverse/side 2 of this form.

1. **Tuberculin Skin Test (TST) – PPD or Mantoux**
   TST result should be recorded as actual millimeters (mm) of induration, transverse diameter; if no induration, write “0”. The TST interpretation should be based on mm of induration as well as risk factors. See **interpretation guidelines on reverse/side 2 of this form.
   Date Given: / / M D Y  Date Read: / / M D Y
   Result: mm of induration  **Interpretation:** positive  negative

2. **Interferon Gamma Release Assay (IGRA)**
   Date Obtained: / / M D Y  (specify method)  QFT-G  QFT-GIT  other
   Result: positive  negative  indeterminate

3. **Chest X-Ray:** Required within 6 months prior to student’s arrival on campus if either the TST or IGRA result is positive or there is a past history of a positive tuberculosis test
   Date of chest x-ray: / / M D Y  Result: normal  abnormal

4. **Preventive or Therapeutic Tuberculosis Treatment:**
   Medication(s) – Please List:
   Dates Taken: __________________________
   __________________________
   __________________________
   __________________________
   [ ] Treatment offered but student declined.

**PROVIDER INFORMATION & SIGNATURE REQUIRED**

Address: (Please print or stamp)

(Print) Name and Title/Degree of Health Care Provider

____________________________

Provider Signature

____________________________

Date Signed: __________________________

Phone: ( )

Fax: ( )

For Administrative Purposes Only:

Form Complete: [ ] Yes  [ ] No  Action Needed: __________________________  Date Reviewed: __________________________

Reviewer: __________________________  Date Contacted: __________________________  Date Requested Info Received: __________________________  Reviewer: __________________________
**Tuberculosis Skin Test Interpretation Guidelines**

Positive in:
- Close contacts of an individual with infectious TB
- With fibrotic changes on a prior chest x-ray, consistent with past TB disease
- Organ transplant recipients and other immunosuppressed persons (including receiving equivalent of >15 mg/d of prednisone for > 1 month)
- Tuberculosis laboratory personnel

More positive in:
- Residents to the U.S. (>5 years) from high prevalence areas or who resided in one for a significant* amount of time
- Drug users
- Employees, or volunteers in high-risk congregate settings
- With medical conditions that increase the risk of progression to TB disease including silicosis, diabetes mellitus, chronic renal failure, cancer (leukemias and lymphomas, cancers of the head, neck, or lung), gastrectomy or jejunoileal bypass and weight loss of at least body weight.

**s positive in:**
- With no known risk factors for TB who, except for certain testing programs required by law or regulation, would otherwise not be

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*can College Health Association has published guidelines on “Tuberculosis Screening and Targeted Testing of College and University Students.” To read guidelines, visit [http://www.acha.org/For_Members/Policy_Guideline_index.cfm](http://www.acha.org/For_Members/Policy_Guideline_index.cfm)*
Case Study

Entering freshman August 2011, from Zimbabwe

6/21/11 Negative chest x-ray prior to coming to Skidmore (no PPD)
11/13/13– Positive PPD for travel abroad to London in spring 2014, negative chest x-ray, declined prophylactic meds
9/23/14-
Cold symptoms x 5 days
T-98.2
Pulse ox-99%
9/29/14-
Sick for 14 days
T-99.7
Pulse ox-98%
9/30/14-
Intermittent fevers, feels worse at the end of the day
T-100.5
Pulse ox-98%
10/3/14-
Sick for 18 days with URI symptoms
Afebrile
Pulse ox-99%
10/20/14-
Increased cough
T-103.1
Pulse ox-98%
10/22/14-
T-103.1
Chest x-ray ordered-”dense consolidation right upper lobe suspicious for developing infectious process”
To ER
10/29/14-
Re-check, day 5 of antibiotic
T-98.2
Pulse ox- 98%
11/7/14-
Fever last evening, increased cough
T-98.5
Pulse-136
To ER (please)- “I’ll go tomorrow”
11/8/14-
Back to ER
Admitted
11/24/14-
Notification from Public Health, positive TB

Non-infectious
11/25/14-
Shared information with SAIG and conference call
12/1/14-
Dean of Student Affairs and Communications

12/2 and 12/3/14-
Roommates
12/4/14-
Discharge from hospital (27 days!)

12/5/14-
Admitted to Public Health

Roommate #2
12/10/14-
Sensitivity results

12/12/14-
Roommate follow-up
Visits to Health Services

9/23/14
9/29/14
9/30/14
10/3/14
10/20/14
10/22/14–To ER, overnight stay
10/29/14

11/7/15

11/8/14– Back to ER-admitted
11/24/14–Positive TB notification from Public Health

12/4/14–Discharge date

12/5/14– Admitted to Public Health, DOT for 6 months

5/15/15–Graduation!!!!!!
Questions/thoughts/what does your campus do?

- Negative pressure room
- PPDs post-travel abroad
- Classroom and housing accommodations
- Isolation versus quarantine
- IGRA
<table>
<thead>
<tr>
<th></th>
<th>Isolation</th>
<th>Quarantine</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Used for:</strong></td>
<td>People who are ill with contagious diseases</td>
<td>People who have been exposed to a contagious disease, but are not sick</td>
</tr>
<tr>
<td><strong>Process:</strong></td>
<td>Receive care for the disease, with precautions put into place to prevent the spread of disease</td>
<td>Individuals are separated from others who have not been exposed to the disease, and can receive vaccinations, antibiotics, early diagnostic testing, and symptom monitoring</td>
</tr>
<tr>
<td><strong>Length:</strong></td>
<td>Period of infectiousness for the disease</td>
<td>Incubation period of the disease</td>
</tr>
<tr>
<td><strong>Location:</strong></td>
<td>Hospital, care facility, or patient’s home</td>
<td>Home, designated emergency facility or specialized hospital</td>
</tr>
</tbody>
</table>