

Module 3: Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease

Facilitation Tips

Background

In this module, participants will learn about the diagnosis of tuberculosis (TB) disease and latent TB infection (LTBI), including targeted testing. Targeted testing is a TB control strategy that is used to identify people at high risk for developing TB disease who would benefit by treatment of LTBI, if detected. LTBI is diagnosed with the Mantoux tuberculin skin test (TST) or an interferon-gamma release assay (IGRA). In most cases, TB disease is diagnosed with certain laboratory tests (bacteriologic examination); for patients who may have pulmonary TB disease, a chest x-ray is also useful for diagnosis. It is important to evaluate people who have symptoms of TB disease; if they are found to have TB disease, they need treatment to be cured and to avoid spreading TB to others. For this reason, the diagnosis of TB disease is crucial to controlling the spread of TB in homes and communities.

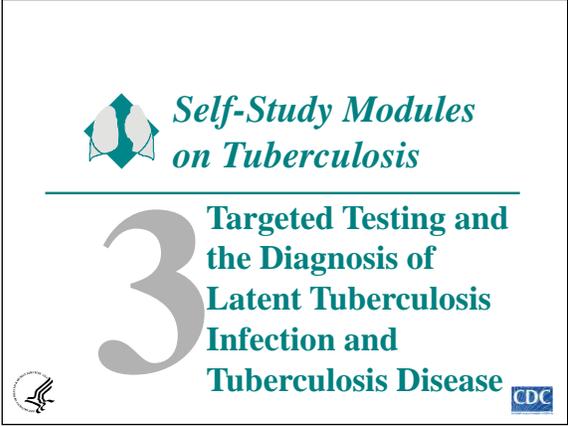
Learning Objectives

After this presentation, participants will be able to

1. Identify high-risk groups for targeted testing
2. Describe how to give and interpret a TST and an IGRA
3. Discuss considerations for using either the TST or IGRA for diagnosing infection with *Mycobacterium tuberculosis*
4. Describe the components of a medical evaluation for diagnosing TB disease

Module Overview

Time	Activity	Content	Slides
2 min.	Presentation	Introduction	Slides 1-3
10 min.	Presentation	Targeted Testing	Slides 4-11
30 min.	Presentation	Diagnosis of LTBI	Slides 12-71
35 min.	Presentation	Diagnosis of TB Disease	Slides 72-121
3 min.	Presentation	Reporting TB Cases	Slides 122-126
10 min.	Case Studies	Case Studies	Slides 127-142
90 min.	Total Time		

		Facilitation Tips
Slide 1		<ul style="list-style-type: none"> - Introduce Module 3
Slide 2	<p>Module 3: Objectives</p> <p>At completion of this module, learners will be able to:</p> <ol style="list-style-type: none"> 1. Identify high-risk groups for targeted testing 2. Describe how to give and interpret a Mantoux tuberculin skin test (TST) and an interferon-gamma release assay (IGRA) 3. Discuss considerations for using either the TST or IGRA for diagnosing infection with <i>M. tuberculosis</i> 4. Describe the components of a medical evaluation for diagnosing TB disease <p><small>Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 2</small></p>	<ul style="list-style-type: none"> - State objectives of presentation <p><i>Background and Objectives - Module 3, p. 1</i></p>
Slide 3	<p>Module 3: Overview</p> <ul style="list-style-type: none"> • Targeted Testing • Diagnosis of latent tuberculosis infection (LTBI) <ul style="list-style-type: none"> - TST - IGRAs - TB Testing Programs, the Booster Phenomenon, and Two-Step Testing • Diagnosis of TB Disease • Reporting TB Cases • Case Studies <p><small>Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 3</small></p>	<ul style="list-style-type: none"> - Review slide content

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 4</p>	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <h2 style="color: #008080;">Targeted Testing</h2> <hr style="width: 30%; margin: 10px auto;"/> <p style="text-align: right; font-size: small;">4</p> </div>	<ul style="list-style-type: none"> - Introduce section - Ask participants if they know what targeted testing is
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 5</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="color: #008080;">Targeted Testing (1)</h3> <ul style="list-style-type: none"> • Targeted testing is a TB control strategy used to identify and treat persons: <ul style="list-style-type: none"> - At high risk for infection with <i>M. tuberculosis</i> - At high risk for developing TB disease once infected with <i>M. tuberculosis</i> <p style="font-size: x-small; margin-top: 10px;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right; font-size: small;">5</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right; margin-top: 20px;"><i>Targeted Testing – Module 3, p. 6</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 6</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="color: #008080;">Targeted Testing (2)</h3> <ul style="list-style-type: none"> • Identifying persons with LTBI is an important goal of TB elimination because LTBI treatment can: <ul style="list-style-type: none"> - Prevent the development of TB disease - Stop the spread of TB <p style="font-size: x-small; margin-top: 10px;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right; font-size: small;">6</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right; margin-top: 20px;"><i>Targeted Testing – Module 3, p. 6</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 7</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Targeted Testing (3) A Decision to Test is a Decision to Treat</p> <ul style="list-style-type: none"> • TB testing activities should be done only when there is a plan for follow-up care • Health care workers (HCWs) should identify and test persons who are at high risk <ul style="list-style-type: none"> – People who are not at high risk generally should not be tested <p style="text-align: center; font-size: small;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 7</p> </div>	<ul style="list-style-type: none"> - Review slide content - Explain that testing people who are not at high risk can take resources away from important activities. Also, positive test results in low-risk population can be inaccurate. - Note that health care agencies and other facilities should consult with their local health department before starting a TB testing program <p style="text-align: right;"><i>Targeted Testing – Module 3, p. 6</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 8</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Targeted Testing (4) High-Risk Groups</p> <ul style="list-style-type: none"> • High-risk groups can be divided into two categories: <ul style="list-style-type: none"> – People who are at high risk for <u>becoming infected</u> with <i>M. tuberculosis</i> – People who are at high risk for <u>developing TB disease</u> once infected with <i>M. tuberculosis</i> <p style="text-align: center; font-size: small;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 8</p> </div>	<ul style="list-style-type: none"> - Review slide content - Explain that these are the high-risk groups that should be tested for TB - Note that definition of high risk should be made at the local (city, county, state) level according to local demographics and TB epidemiology <p style="text-align: right;"><i>Targeted Testing – Module 3, pp. 6-7</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 9</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Targeted Testing (5) High-Risk Groups for TB Infection</p> <ul style="list-style-type: none"> • Close contacts of people known or suspected to have TB • People who have come to U.S. within 5 years from areas where TB is common • Low-income groups • People who inject drugs <p style="text-align: center; font-size: small;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 9</p> </div>	<ul style="list-style-type: none"> - Review slide content - Tell participants that TB is more common in parts of Asia, Africa, Russia, Eastern Europe, and Latin America <p style="text-align: right;"><i>Groups at High Risk for TB Infection – Module 3, p. 7</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 10</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Targeted Testing (6) High-Risk Groups for TB Infection</p> <ul style="list-style-type: none"> • People who live or work in high-risk settings • HCWs who serve high-risk clients • Racial or ethnic minority populations • Infants, children, and adolescents exposed to adults in high-risk groups <p style="text-align: right; font-size: small;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 10</p> </div>	<ul style="list-style-type: none"> - Review slide content - Ask participants what settings they think could be considered “high-risk” (examples include nursing homes, homeless shelters, and correctional facilities) <p style="text-align: right;"><i>Groups at High Risk for TB Infection – Module 3, p. 7</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 11</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Targeted Testing (7) High-Risk Groups for TB Disease</p> <ul style="list-style-type: none"> • People living with HIV • People recently infected with <i>M. tuberculosis</i> (within past 2 years) • People with certain medical conditions known to increase risk for TB • People who inject drugs • Infants and children younger than 4 years old <p style="text-align: right; font-size: small;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 11</p> </div>	<ul style="list-style-type: none"> - Review slide content - Tell participants that the medical conditions known to increase risk for TB include silicosis, diabetes, severe kidney disease, certain types of cancer, certain intestinal conditions, organ transplant, and immunosuppressive therapy <p style="text-align: right;"><i>Groups at High Risk for TB Disease – Module 3, p. 7</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 12</p>	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>Diagnosis of Latent TB Infection (LTBI)</p> <hr style="width: 30%; margin: auto;"/> <p style="text-align: right; font-size: small;">12</p> </div>	<ul style="list-style-type: none"> - Introduce section <p style="text-align: right;"><i>Diagnosis of LTBI – Module 3, pp. 8-38</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 13</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="text-align: center;">Diagnosis of LTBI</h3> <ul style="list-style-type: none"> • Available testing methods for <i>M. tuberculosis</i> infection: <ul style="list-style-type: none"> – Mantoux tuberculin skin test (TST) – Blood tests known as interferon-gamma release assays (IGRAs): <ul style="list-style-type: none"> • QuantiFERON®-TB Gold test (QFT-G) • QuantiFERON®-TB Gold In-Tube (QFT-GIT) • T-SPOT <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 13</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: center;"><i>Diagnosis of LTBI – Module 3, p. 8</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 14</p>	<div style="border: 1px solid black; padding: 10px;"> <h2 style="text-align: center;">Diagnosis of Latent TB Infection (LTBI)</h2> <hr style="width: 30%; margin: auto;"/> <h3 style="text-align: center;">Mantoux Tuberculin Skin Test Administering the Test</h3> <p style="text-align: right; font-size: small;">14</p> </div>	<ul style="list-style-type: none"> - Introduce section - Ask who has had a Mantoux tuberculin skin test (TST) - Ask (if appropriate) how many participants have administered a TST to others - Ask if the TST can detect TB disease <p style="text-align: center;"><i>Mantoux Tuberculin Skin Test – Module 3, pp. 8-30</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 15</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="text-align: center;">Mantoux Tuberculin Skin Test (1)</h3> <ul style="list-style-type: none"> • TST is administered by injection • Tuberculin is made from proteins derived from inactive tubercle bacilli • Most people who have TB infection will have a reaction at injection site <div style="text-align: center;">  <p style="font-size: x-small; text-align: center;">Syringe being filled with 0.1 ml of liquid tuberculin</p> </div> <p style="font-size: x-small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 15</p> </div>	<ul style="list-style-type: none"> - Review slide content - Explain that most people who have TB infection will have a reaction. Their immune system will recognize tuberculin because it is similar to tubercle bacilli. - Note that the tuberculin used for the skin test is also known as purified protein derivative, or PPD. TST is also sometimes called a PPD skin test. <p style="text-align: center;"><i>Mantoux Tuberculin Skin Test – Module 3, p. 8</i></p>

Mantoux Tuberculin Skin Test (2)

0.1 ml of 5 tuberculin units of liquid tuberculin are injected between the layers of skin on forearm



HCW administering Mantoux TST

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- Explain that the TST is given by using a single dose disposable syringe
- Review slide content
- Explain that a tuberculin unit is a standard strength of tuberculin
- State that tuberculin is NOT a vaccine

Mantoux Tuberculin Skin Test – Module 3, p. 8

Mantoux Tuberculin Skin Test (3)

- Forearm should be examined within 48 - 72 hours by HCW

- Reaction is an area of **induration** (swelling) around injection site

- Induration is measured in millimeters
- Erythema (redness) is not measured



Only the induration is measured

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- Review slide content
- Explain that patients should NOT be asked to read their own skin test results
- Explain that presence of erythema does NOT indicate a person has TB infection
- State that if the patient does not return in 48-72 the test must be repeated

Mantoux Tuberculin Skin Test – Module 3, p. 9

Multiple-Puncture Test

- In the past, multiple-puncture tests (tine tests) were a popular skin testing method for TB
- No longer recommended
 - Amount of tuberculin that enters skin cannot be measured
- Mantoux TST is preferred TB skin test method because amount of tuberculin can always be measured

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- Review slide content
- Explain that multiple puncture tests were done by puncturing skin of the forearm with a device that has a set of short prongs or tines coated with tuberculin

Multiple-Puncture Test – Module 3, p. 9

Slide 19	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Mantoux Tuberculin Skin Test Study Question 3.1</p> <p>What is the TST used for? (pg. 11)</p> <p style="text-align: center;">The TST is used to determine whether a person has TB infection.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 19</p> </div>	<ul style="list-style-type: none"> - Introduce study questions - Ask participants to turn to p. 11 (if participants have print-based modules) - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 71</i></p>
Slide 20	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Mantoux Tuberculin Skin Test Study Question 3.2</p> <p>How is the Mantoux TST given? (pg. 11)</p> <p style="text-align: center;">The TST is given by a needle and syringe to inject 0.1 ml of 5 tuberculin units of liquid tuberculin between the layers of the skin, usually on the forearm.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 20</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 71</i></p>
Slide 21	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Mantoux Tuberculin Skin Test Study Question 3.3</p> <p>With the TST, when is the patient's arm examined? (pg. 12)</p> <p style="text-align: center;">The patient's arm is examined by a health care worker, 48 – 72 hours after tuberculin is injected.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 21</p> </div>	<ul style="list-style-type: none"> - Ask participants to turn to p. 12 (if participants have print-based modules) - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 71</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 22</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Mantoux Tuberculin Skin Test Study Question 3.4</p> <p>How is the induration measured? (pg. 12)</p> <p>The diameter of indurated area is measured across the forearm; erythema (redness) around the indurated area is not measured.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right;">22</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 71</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 23</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Mantoux Tuberculin Skin Test Study Question 3.5</p> <p>Why is the Mantoux TST preferable to multiple puncture tests? (pg. 12)</p> <p>Mantoux TST is preferable because it is more accurate and the amount of tuberculin can always be measured.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right;">23</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 71</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 24</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Diagnosis of Latent TB Infection (LTBI)</p> <hr style="width: 30%; margin: auto;"/> <p style="text-align: center;">Mantoux Tuberculin Skin Test Interpreting the Reaction</p> <p style="text-align: right;">24</p> </div>	<ul style="list-style-type: none"> - Introduce section

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 25</p>	<div data-bbox="241 266 805 688"> <p>Mantoux Tuberculin Skin Test (4) Interpreting the Reaction</p> <p>Interpretation of TST reaction depends on size of induration and person's risk factors for TB</p>  <p><small>Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</small></p> <p style="text-align: right;"><small>25</small></p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right;"><i>Interpreting the Reaction – Module 3, p. 13</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 26</p>	<div data-bbox="241 762 805 1184"> <p>Mantoux Tuberculin Skin Test (5) Interpreting the Reaction</p> <ul style="list-style-type: none"> • Induration of ≥ 5 mm is considered positive for: <ul style="list-style-type: none"> – People living with HIV – Recent close contacts of people with infectious TB – People with chest x-ray findings suggestive of previous TB disease – People with organ transplants – Other immunosuppressed patients <p><small>Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</small></p> <p style="text-align: right;"><small>26</small></p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right;"><i>Interpreting the Reaction – Module 3, p. 13</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 27</p>	<div data-bbox="241 1293 805 1715"> <p>Mantoux Tuberculin Skin Test (6) Interpreting the Reaction</p> <ul style="list-style-type: none"> • Induration of ≥ 10 mm is considered a positive reaction for: <ul style="list-style-type: none"> – People who have recently come to U.S. from areas where TB is common – People who inject drugs – People who live or work in high-risk congregate settings – Mycobacteriology laboratory workers <p><small>Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</small></p> <p style="text-align: right;"><small>27</small></p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right;"><i>Interpreting the Reaction – Module 3, p. 13</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 28</p>	<div style="border: 1px solid black; padding: 10px;"> <p>Mantoux Tuberculin Skin Test (7) Interpreting the Reaction</p> <ul style="list-style-type: none"> • Induration of ≥ 10 mm is considered a positive reaction for: <ul style="list-style-type: none"> – People with certain medical conditions that increase risk for TB – Children younger than 4 years old – Infants, children, or adolescents exposed to adults in high-risk categories <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 28</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right;"><i>Interpreting the Reaction – Module 3, p. 13</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 29</p>	<div style="border: 1px solid black; padding: 10px;"> <p>Mantoux Tuberculin Skin Test (8) Interpreting the Reaction</p> <ul style="list-style-type: none"> • Induration of ≥ 15 mm is considered a positive reaction for people who have no known risk factors for TB <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 29</p> </div>	<ul style="list-style-type: none"> - Review slide content - Reiterate that targeted testing should only be done in high-risk groups <p style="text-align: right;"><i>Interpreting the Reaction – Module 3, p. 15</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 30</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Mantoux Tuberculin Skin Test Study Question 3.6</p> <p>What 2 factors determine the interpretation of a skin test reaction as positive or negative? What additional factor is considered for people who may be exposed to TB on the job? (pg. 16)</p> <ul style="list-style-type: none"> • Size of induration and risk factors for TB • An additional factor is the risk of exposure to TB in the person's job <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 30</p> </div>	<ul style="list-style-type: none"> - Introduce study questions - Ask participants to turn to p. 16 (if participants have print-based modules) - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 71</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 31</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Mantoux Tuberculin Skin Test Study Question 3.7</p> <p>For which groups of people is ≥ 5 mm of induration considered a positive reaction? Name 4. (pg. 16)</p> <ul style="list-style-type: none"> • People living with HIV • Recent contacts of people with infectious TB • People who have had TB disease before • Patients with organ transplants and other immunosuppressed individuals <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right;">31</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 72</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 32</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Mantoux Tuberculin Skin Test Study Question 3.8</p> <p>For which groups of people is ≥ 10 mm of induration considered a positive reaction? (pg. 17)</p> <ul style="list-style-type: none"> • Recent arrivals to the U.S. from areas where TB is common • People who inject drugs • Mycobacteriology lab workers • People who live or work in high-risk congregate settings • People with certain medical conditions • Children younger than 4 years old • Infants, children, and adolescents exposed to adults in high-risk categories <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right;">32</p> </div>	<ul style="list-style-type: none"> - Ask participants to turn to p. 17 (if participants have print-based modules) - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 72</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 33</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Mantoux Tuberculin Skin Test Study Question 3.9</p> <p>For which group of people is ≥ 15 mm of induration considered a positive reaction? (pg. 17)</p> <p style="text-align: center;">People with no risk factors for TB.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right;">33</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 72</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 34</p>	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <h2 style="margin: 0;">Diagnosis of Latent TB Infection (LTBI)</h2> <hr style="width: 30%; margin: 5px auto;"/> <h3 style="margin: 0;">Mantoux Tuberculin Skin Test Factors that Affect the Reaction</h3> <p style="font-size: small; margin-top: 20px;">34</p> </div>	<ul style="list-style-type: none"> - Introduce section
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 35</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="margin: 0;">Mantoux Tuberculin Skin Test (9) False-Positive Reaction</h3> <ul style="list-style-type: none"> • Factors that can cause people to have a positive reaction even if they do not have TB infection: <ul style="list-style-type: none"> - Infection with nontuberculous mycobacteria - BCG vaccination - Administration of incorrect antigen - Incorrect measuring or interpretation of TST reaction <p style="font-size: x-small; margin-top: 10px;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right; font-size: small;">35</p> </div>	<ul style="list-style-type: none"> - Explain that the TST is a valuable tool, but it is not perfect - Review slide content <p style="text-align: right; font-style: italic; margin-top: 20px;">False-Positive Reaction – Module 3, p. 18</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 36</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="margin: 0;">Mantoux Tuberculin Skin Test (10) BCG Vaccine</h3> <ul style="list-style-type: none"> • People who have been vaccinated with BCG may have a false-positive TST reaction <ul style="list-style-type: none"> - However, there is no reliable way to distinguish between reaction caused by TB infection or by BCG vaccine • Individuals should always be further evaluated if they have a positive TST reaction <p style="font-size: x-small; margin-top: 10px;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right; font-size: small;">36</p> </div>	<ul style="list-style-type: none"> - Explain that BCG is a vaccine for TB that is used in many countries. However, it is rarely used in the U.S. because studies have shown that it is not completely effective - Review slide content <p style="text-align: right; font-style: italic; margin-top: 20px;">BCG Vaccine – Module 3, p. 18</p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 37</p>	<div data-bbox="241 266 805 688" style="border: 1px solid black; padding: 10px;"> <p>Mantoux Tuberculin Skin Test (11) False-Negative Reaction</p> <ul style="list-style-type: none"> • Factors that can cause false-negative reactions: <ul style="list-style-type: none"> – Anergy – Recent TB infection (within past 8 – 10 weeks) <ul style="list-style-type: none"> • It can take 2 – 8 weeks after TB infection for body's immune system to react to tuberculin – Younger than 6 months of age – Recent live-virus (e.g., measles or smallpox) vaccination – Incorrect method of giving the TST – Incorrect measuring or interpretation of TST reaction <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 37</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right;"><i>False-Negative Reaction – Module 3, p. 21</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 38</p>	<div data-bbox="241 798 805 1220" style="border: 1px solid black; padding: 10px;"> <p>Mantoux Tuberculin Skin Test (12)</p> <p>Any patient with symptoms of TB disease should be evaluated for TB disease, regardless of his or her skin test reaction.</p>  <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 38</p> </div>	<ul style="list-style-type: none"> - Review slide content - Stress that people with symptoms of TB should be evaluated for TB disease right away <p style="text-align: right;"><i>Mantoux Tuberculin Skin Test – Module 3, p. 22</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 39</p>	<div data-bbox="241 1329 805 1751" style="border: 1px solid black; padding: 10px;"> <p>Mantoux Tuberculin Skin Test (13) Anergy</p> <ul style="list-style-type: none"> • Inability to react to skin tests due to weakened immune system • Anergy testing is no longer routinely recommended <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 39</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right;"><i>Anergy – Module 3, p. 2</i></p>

Slide 40	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Mantoux Tuberculin Skin Test Study Question 3.10</p> <p>Name 4 factors that can cause false-positive reactions to the TST. (pg. 19)</p> <ul style="list-style-type: none"> • Infection with nontuberculous mycobacteria (NTM) • BCG vaccination • Administration of incorrect antigen • Incorrect measuring or interpretation of TST reaction <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right;">40</p> </div>	<ul style="list-style-type: none"> - Introduce study questions - Ask participants to turn to p. 19 (if participants have print-based modules) - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 72</i></p>
Slide 41	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Mantoux Tuberculin Skin Test Study Question 3.11</p> <p>Is there a reliable way to distinguish a positive TST reaction caused by vaccination with BCG from a reaction caused by true TB infection? (pg. 19)</p> <p style="text-align: center;">No. Individuals who have had BCG vaccine should be further evaluated for LTBI or TB disease the same way as if they were not vaccinated with BCG.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right;">41</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 73</i></p>
Slide 42	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Mantoux Tuberculin Skin Test Study Question 3.12</p> <p>Name 6 factors that can cause false-negative reactions to the TST. (pg. 24)</p> <ul style="list-style-type: none"> • Anergy • Recent TB infection (within past 8-10 weeks) • Very young age • Recent live-virus (e.g., measles or smallpox) vaccination • Incorrect method of giving the TST • Incorrect measuring or interpretation of TST reaction <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right;">42</p> </div>	<ul style="list-style-type: none"> - Ask participants to turn to p. 24 (if participants have print-based modules) - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 73</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 43</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Mantoux Tuberculin Skin Test Study Question 3.13</p> <p>What is anergy? (pg. 24)</p> <p style="text-align: center;">The inability to react to skin tests because of a weakened immune system.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right; font-size: small;">43</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right; margin-top: 20px;"><i>Answers – Module 3, p. 73</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 44</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Mantoux Tuberculin Skin Test Study Question 3.14</p> <p>After TB has been transmitted to someone, how long does it take before TB infection can be detected by the TST? (pg. 24)</p> <p style="text-align: center; margin-top: 10px;">2 - 8 weeks</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right; font-size: small;">44</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right; margin-top: 20px;"><i>Answers – Module 3, p. 73</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 45</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Mantoux Tuberculin Skin Test Study Question 3.15</p> <p>What should be done if a patient has a negative TST result, but has symptoms of TB disease? (pg. 25)</p> <p style="text-align: center; margin-top: 10px;">Any patient with symptoms of TB disease should be evaluated for TB disease, regardless of his or her skin test reaction.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right; font-size: small;">45</p> </div>	<ul style="list-style-type: none"> - Ask participants to turn to p. 25 (if participants have print-based modules) - Read question - Ask participants for answers <p style="text-align: right; margin-top: 20px;"><i>Answers – Module 3, p. 73</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 46</p>	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <h2 style="margin: 0;">Diagnosis of Latent TB Infection (LTBI)</h2> <hr style="width: 30%; margin: 5px auto;"/> <h3 style="margin: 0;">Interferon-Gamma Release Assays (IGRAs)</h3> </div> <p style="text-align: right; font-size: small;">46</p>	<ul style="list-style-type: none"> - Introduce section - Ask who has had an IGRA test before - Ask what an IGRA detects <p style="text-align: right; font-style: italic; font-size: small;">Interferon-Gamma Release Assays – Module 3, pp. 33-38</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 47</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="text-align: center; color: teal;">Types of IGRAs</h3> <ul style="list-style-type: none"> • QuantiFERON®-TB Gold (QFT-G) <ul style="list-style-type: none"> - CDC guidelines published in 2005 • QuantiFERON®-TB Gold In-Tube (QFT-GIT) <ul style="list-style-type: none"> - Approved 10/2007 • T-Spot® TB test (T-SPOT) <ul style="list-style-type: none"> - Type of ELISpot assay - Approved 7/2008 • CDC guidelines for IGRAs are under development <div style="text-align: center; margin-top: 10px;">  <p style="font-size: x-small;">T-Spot® TB test Materials Image Credit: U.S. Food and Drug Administration (FDA), 2009</p> </div> <p style="text-align: right; font-size: small;">47</p> <p style="font-size: x-small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right; font-style: italic; font-size: small;">Types of IGRAs – Module 3, p. 33</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 48</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="text-align: center; color: teal;">QFT-G and QFT-GIT (1)</h3> <ul style="list-style-type: none"> • Measures person's immune reactivity to <i>M. tuberculosis</i> • Used to help diagnose <i>M. tuberculosis</i> infection in persons suspected of having either LTBI or TB disease <p style="text-align: right; font-size: small;">48</p> <p style="font-size: x-small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right; font-style: italic; font-size: small;">Note: Information on the QFT-GIT is not presented in the print-based Self-Study Modules on Tuberculosis</p> <p style="text-align: right; font-style: italic; font-size: small;">QFT-G –Module 3, p. 33</p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 49</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">QFT-G and QFT-GIT (2) Conducting the Test</p> <ul style="list-style-type: none"> • Follow manufacturer's instructions <ul style="list-style-type: none"> – Confirm arrangements for delivery and testing of blood within 12 hours of collection – Draw sample of blood into tube with heparin – Schedule appointment for patient to receive test results • If needed, medical evaluation and treatment for LTBI or TB disease <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 49</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: center;"><i>Note: Information on the QFT-GIT is not presented in the print-based Self-Study Modules on Tuberculosis</i></p> <p style="text-align: center;"><i>QFT-G –Module 3, p. 33</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 50</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">QFT-G and QFT-GIT(3) How it Works</p> <ul style="list-style-type: none"> • Blood samples are mixed with antigens and incubated for 16 - 24 hours • If infected with <i>M. tuberculosis</i>, blood cells will recognize antigens and release interferon gamma (IFN-γ) in response • Results are based on the amount of IFN-γ released in response to antigens and control substances <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 50</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: center;"><i>Note: Information on the QFT-GIT is not presented in the print-based Self-Study Modules on Tuberculosis</i></p> <p style="text-align: center;"><i>QFT-G –Module 3, p. 34</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 51</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">QFT-G and QFT-GIT(4) Interpreting Results</p> <ul style="list-style-type: none"> • Test results are based on IFN-γ concentrations • Laboratories can use software provided by manufacturer to calculate results • Results are sent to requesting clinician <div style="text-align: center;">  <p style="font-size: x-small;">Processing QFT-G sample</p> </div> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 51</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: center;"><i>Note: Information on the QFT-GIT is not presented in the print-based Self-Study Modules on Tuberculosis</i></p> <p style="text-align: center;"><i>QFT-G –Module 3, pp. 34-35</i></p>

Slide 52

QFT-G and QFT-GIT(5)	
Report of Results	
Result	Report/Interpretation
Positive	<i>M. tuberculosis</i> infection likely
Negative	<i>M. tuberculosis</i> infection unlikely, but cannot be excluded especially if: 1. Patient has TB signs and symptoms 2. Patient has a high risk for developing TB disease once infected with <i>M. tuberculosis</i>
Indeterminate	Test did not provide useful information about the likelihood of <i>M. tuberculosis</i> infection. Options are to repeat test, administer a TST, or do no additional testing

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 52

- Explain that results are reported as either positive, negative, or indeterminate
- Review slide content

Note: Information on the QFT-GIT is not presented in the print-based Self-Study Modules on Tuberculosis

QFT-G –Module 3, p. 35

Slide 53

T-SPOT

- Type of ELISpot assay
- Interferon gamma is presented as spots from T cells sensitized to *M. tuberculosis*
- Results are interpreted by subtracting the spot count of the control from the spot count of the sample

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 53

- Review slide content

Note: Information on the T-SPOT is not presented in the print-based Self-Study Modules on Tuberculosis

Slide 54

IGRA Advantages

- Requires single patient visit to conduct test
- Results can be available in 24 hours
- Does not cause booster phenomenon
- Less likely to have incorrect reading of results as compared to TST
- BCG vaccination does not affect results

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 54

- Review slide content
- Explain that BCG vaccination does not affect IGRA results because the antigens used for IGRAs are not found in BCG vaccine strains

Note: Booster phenomenon is presented on slides 62-63

IGRA Advantages – Module 3, pp. 36-37

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 55</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="text-align: center;">IGRA Disadvantages and Limitations</h3> <ul style="list-style-type: none"> • Blood samples must be processed within 12 hours for some IGRAs • Errors in running and interpreting test can decrease accuracy • Limited data on its use in certain populations • Limited data on its use to determine who is at risk for developing TB disease <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 55</p> </div>	<ul style="list-style-type: none"> - Review slide content - State that there is limited data on IGRA use in children younger than 17 years of age, persons living with HIV/AIDS, and people living with other medical conditions (including certain blood disorders and cancers, diabetes, silicosis, severe kidney disease, and immunosuppressive therapy) <p style="text-align: right;"><i>IGRA Disadvantages and Limitations – Module 3, p. 38</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 56</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="text-align: center;">QFT-G and QFT-GIT Study Question 3.20</h3> <p>What are the steps for conducting a QFT-G and QFT-GIT? (pg. 39)</p> <p>Follow manufacturer's instructions</p> <ul style="list-style-type: none"> • Confirm arrangements for delivery and testing of blood in qualified laboratory within 12 hours of collection • Draw sample of whole blood from patient into tube with heparin • Schedule appointment for patient to receive test results and, if then needed, medical evaluation and possible treatment <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 56</p> </div>	<ul style="list-style-type: none"> - Introduce study questions - Ask participants to turn to p. 39 (if participants have print-based modules) - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 74</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 57</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="text-align: center;">QFT-G and QFT-GIT Study Question 3.21</h3> <p>How are QFT-G and QFT-GIT results interpreted? (pg. 39)</p> <ul style="list-style-type: none"> • Interpretation is based on the IFN-γ concentrations in the test samples • Laboratories can use software to calculate results • Report of results are submitted to requesting clinician <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 57</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 74</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 58</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">QFT-G and QFT-GIT Study Question 3.22</p> <p>How should a negative QFT-G or QFT-GIT result be interpreted? (pg. 39)</p> <ul style="list-style-type: none"> • Patient is unlikely to have <i>M. tuberculosis</i> infection • Patient may not require further evaluation unless they have signs and symptoms of TB disease <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right; font-size: small;">58</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 74</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 59</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">IGRAs Study Question 3.23</p> <p>What are 5 advantages for using an IGRA as compared to the TST? (pg. 39)</p> <ul style="list-style-type: none"> • Requires a single patient visit • Results can be available in 24 hours • Does not cause the booster phenomenon • Less likely to have incorrect reading of results • BCG vaccine does not affect IGRA results <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right; font-size: small;">59</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 75</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 60</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Diagnosis of Latent TB Infection (LTBI)</p> <hr style="width: 30%; margin: auto;"/> <p style="text-align: center;">TB Testing Programs, the Booster Phenomenon, and Two-Step Testing</p> <p style="text-align: right; font-size: small;">60</p> </div>	<ul style="list-style-type: none"> - Introduce section <p style="text-align: right;"><i>TB Testing Programs – Module 3, p. 26</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 61</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">TB Testing Programs (1)</p> <ul style="list-style-type: none"> • Many health care facilities have TB testing programs <ul style="list-style-type: none"> – Employees and residents are periodically given TSTs or IGRAs • Testing programs: <ul style="list-style-type: none"> – Identify people who have LTBI or TB disease and give them treatment – Determine whether TB is being transmitted in facility <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 61</p> </div>	<ul style="list-style-type: none"> - Review slide content - Ask participants what types of TB testing programs are used where they work <p style="text-align: right;"><i>TB Testing Programs – Module 3, p. 26</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 62</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">TB Testing Programs (2) Baseline Test</p> <ul style="list-style-type: none"> • Employees and/or residents are given TSTs or IGRAs when they first enter facility <ul style="list-style-type: none"> – If person is negative, they may be retested at regular intervals thereafter <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 62</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right;"><i>Baseline Test – Module 3, p. 26</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 63</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">TB Testing Programs (3) Conversion</p> <ul style="list-style-type: none"> • Persons whose TST or IGRA result converts from negative to positive have probably been infected with <i>M. tuberculosis</i> <ul style="list-style-type: none"> – TST or IGRA conversions may indicate that TB is being transmitted in facility <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 63</p> </div>	<ul style="list-style-type: none"> - Review slide content - Explain that people with skin test conversions are at high risk for developing TB disease because a conversion indicates that a person was infected relatively recently <p style="text-align: right;"><i>Conversion – Module 3, p. 26</i></p>

Slide 64

Booster Phenomenon

- Phenomenon in which people who are skin tested many years after they became infected with TB have:
 - Negative reaction to initial TST
 - Positive reaction to subsequent TST given up to one year later
- Occurs mainly in older adults
- May affect accuracy of baseline skin test

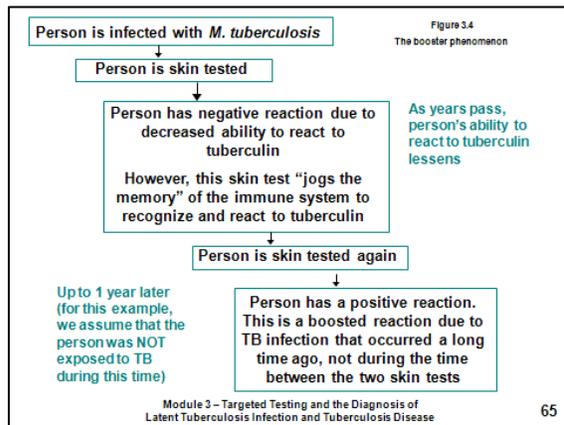
Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease

64

- Review slide content

Booster Phenomenon – Module 3, pp. 27-29

Slide 65



- Explain the booster phenomenon using the flowchart

Booster Phenomenon – Module 3, p. 28

Slide 66

Two-Step Testing

- Only conducted when TST is used
- Distinguishes between boosted reactions and reactions caused by recent infections
- Should be used for initial skin testing of persons who will be retested periodically
- If person's initial skin test is negative, they should be given a second test 1-3 weeks later
 - Second test positive: probably boosted reaction
 - Second test negative: considered uninfected

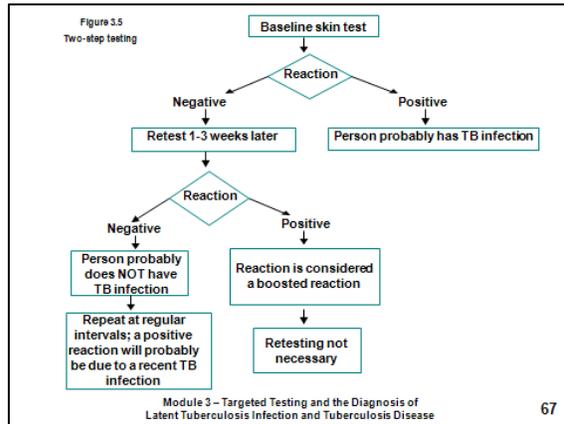
Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease

66

- Review slide content

Two-Step Testing – Module 3, p. 29

Slide 67



- Explain two-step testing using the flowchart

Two-Step Testing – Module 3, p. 30

Slide 68

Booster Phenomenon
Study Question 3.16

What is the booster phenomenon? (pg. 31)

- Phenomenon in which people who are skin tested many years after becoming infected with *M. tuberculosis* have a negative reaction to an initial skin test, followed by a positive reaction to a skin test given up to a year later
- Occurs because the ability to react to tuberculin lessens over time in some people

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- Introduce study questions
- Ask participants to turn to p. 31 (if participants have print-based modules)
- Read question
- Ask participants for answers

Answers – Module 3, p. 73

Slide 69

Two-Step Testing
Study Question 3.17

What is the purpose of two-step testing? (pg. 31)

To distinguish between boosted reactions and reactions caused by recent infection.

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- Read question
- Ask participants for answers

Answer – Module 3, p. 74

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 70</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Two-Step Testing Study Question 3.18</p> <p>In what type of situation is two-step testing used? (pg. 31)</p> <p style="margin-left: 40px;">It is used in many programs for skin testing employees when they start their job.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 70</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 74</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 71</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Two-Step Testing Study Question 3.19</p> <p>How is two-step testing done? (pg. 31)</p> <p>If a person has a negative reaction to an initial skin test, he or she is given a second test 1-3 weeks later.</p> <ul style="list-style-type: none"> -If reaction to second test is positive, it is considered a boosted reaction -If reaction to second test is negative, person is considered to be uninfected <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 71</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 74</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 72</p>	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p style="font-size: 2em;">Diagnosis of TB Disease</p> <hr style="width: 30%; margin: auto;"/> <p style="font-size: small; text-align: right;">72</p> </div>	<ul style="list-style-type: none"> - Introduce section <p style="text-align: right;"><i>Diagnosis of TB Disease – Module 3, pp. 40-64</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 73</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Medical Evaluation</p> <ul style="list-style-type: none"> • Anyone with TB symptoms or positive TST or IGRA result should be medically evaluated for TB disease • Components of medical evaluation: <ol style="list-style-type: none"> 1. Medical history 2. Physical examination 3. Test for TB infection 4. Chest x-ray 5. Bacteriological examination <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 73</p> </div>	<ul style="list-style-type: none"> - Review slide content - Note that the key to diagnosing TB is for clinicians to “think TB” when they see a patient with symptoms of TB or abnormal chest x-ray findings <p style="text-align: right;"><i>Medical Evaluation – Module 3, p. 40</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 74</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Diagnosis of TB Disease</p> <p style="text-align: center;">Medical Evaluation</p> <ol style="list-style-type: none"> 1. Medical History 2. Physical Examination 3. Test for TB Infection <p style="text-align: right; font-size: small;">74</p> </div>	<ul style="list-style-type: none"> - Introduce section
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 75</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">1. Medical History (1)</p> <ul style="list-style-type: none"> • Clinicians should ask patients if they have: <ul style="list-style-type: none"> - Symptoms of TB disease - Been exposed to a person with infectious TB or have risk factors for exposure to TB - Any risk factors for developing TB disease - Had LTBI or TB disease before <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 75</p> </div>	<ul style="list-style-type: none"> - Review slide content - Explain that patients who have had TB disease before should be asked when they had disease and if it was treated <p style="text-align: right;"><i>Medical History – Module 3, pp.40-41</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 76</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">1. Medical History (2) General Symptoms of TB Disease</p> <ul style="list-style-type: none"> • Fever • Chills • Nightsweats • Weight loss • Appetite loss • Fatigue • Malaise <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 76</p> </div>	<ul style="list-style-type: none"> - Review slide content - Explain that people with TB disease may or may not have symptoms. However, most people with TB disease will have one or more symptoms. - Explain that usually when patients have symptoms, the symptoms have developed gradually and have been present for week or months <p style="text-align: right; font-style: italic;">General Symptoms of TB Disease – Module 3, p. 41</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 77</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">1. Medical History (3) Symptoms of Pulmonary TB Disease</p> <ul style="list-style-type: none"> • Cough lasting 3 or more weeks • Chest pain • Coughing up sputum or blood <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 77</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right; font-style: italic;">Symptoms of Pulmonary TB Disease – Module 3, p. 41</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 78</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">1. Medical History (4) Symptoms of Extrapulmonary TB Disease</p> <ul style="list-style-type: none"> • Symptoms of extrapulmonary TB disease depend on part of body that is affected • For example: <ul style="list-style-type: none"> – TB disease in spine may cause back pain – TB disease in kidneys may cause blood in urine <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 78</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right; font-style: italic;">Symptoms of Extrapulmonary TB Disease – Module 3, p. 42</p>

Slide 79

2. Physical Examination

A physical examination cannot confirm or rule out TB disease, but can provide valuable information



Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease

79

- Review slide content

Physical Examination – Module 3, p. 43

Slide 80

3. Test for TB Infection (1)

- Types of tests available for diagnosing TB infection in U.S.:

- TST
- IGRAs
 - QFT-G
 - QFT-GIT
 - T-SPOT



QFT-G lab kit

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease

80

- Review slide content

Testing for TB Infection – Module 3, p. 44

Slide 81

3. Test for TB Infection (2)

- Patients with symptoms of TB disease should always be evaluated for TB disease, regardless of their TST or IGRA test result
 - Clinicians should not wait for TST or IGRA results before starting other diagnostic tests
 - TST or IGRA should be given at the same time as other steps in the diagnosis of TB disease

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease

81

- Review slide content
- Explain that sometimes people with TB disease may have a negative test result

Testing for TB Infection – Module 3, p. 44

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 82</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Diagnosis of TB Disease Study Question 3.24</p> <p>What are the 5 components for conducting a medical evaluation for diagnosing TB disease? (pg. 44)</p> <ul style="list-style-type: none"> • Medical history • Physical examination • Test for TB infection • Chest x-ray • Bacteriologic examinations <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right;">82</p> </div>	<ul style="list-style-type: none"> - Introduce study questions - Ask participants to turn to p. 44 (if participants have print-based modules) - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 75</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 83</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Diagnosis of TB Disease Study Question 3.25</p> <p>What parts of a patient's medical history should lead a clinician to suspect TB? (pg. 45)</p> <ul style="list-style-type: none"> • Symptoms of TB disease • Exposure to a person who has infectious TB or has other risk factors for exposure to TB • Risk factors for developing TB disease • TB infection or TB disease in the past <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right;">83</p> </div>	<ul style="list-style-type: none"> - Ask participants to turn to p. 45 (if participants have print-based modules) - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 75</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 84</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Diagnosis of TB Disease Study Question 3.26</p> <p>What are the symptoms of pulmonary TB disease? What are the symptoms of extrapulmonary TB disease? (pg. 45)</p> <ul style="list-style-type: none"> • General symptoms of TB disease: Weight loss, fatigue, malaise, fever, and night sweats • Pulmonary: Coughing, pain in chest, coughing up sputum or blood • Extrapulmonary: Depends on the part of the body that is affected by the disease. For example, TB of the spine may cause pain in the back; TB of the kidney may cause blood in the urine <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right;">84</p> </div>	<ul style="list-style-type: none"> - Read questions - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 75</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 85</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Diagnosis of TB Disease Study Question 3.27</p> <p>For patients with symptoms of TB disease, should clinicians wait for TST or IGRA results before starting other diagnostic tests? (pg. 45)</p> <p style="text-align: center;">No, clinicians should not wait for TST or IGRA results before starting other diagnostic tests.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 85</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 76</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 86</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Diagnosis of TB Disease</p> <hr style="width: 20%; margin: auto;"/> <p style="text-align: center;">Medical Evaluation</p> <p style="text-align: center;">4. Chest X-Ray</p> <p style="text-align: right; font-size: small;">86</p> </div>	<ul style="list-style-type: none"> - Introduce section
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 87</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">4. Chest X-Ray (1)</p> <ul style="list-style-type: none"> • When a person has TB disease in lungs, the chest x-ray usually appears abnormal. It may show: <ul style="list-style-type: none"> - Infiltrates (collections of fluid and cells in lung tissue) - Cavities (hollow spaces within lung) <div style="text-align: center;">  <p style="font-size: x-small;">Abnormal chest x-ray with cavity</p> </div> <p style="font-size: x-small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 87</p> </div>	<ul style="list-style-type: none"> - Explain that chest x-rays are useful for diagnosing TB disease because pulmonary TB is the most common form of the disease - Review slide content - Explain that the patient in the picture has a cavity in the right upper lobe. The left lung is normal. <p style="text-align: right;"><i>Chest X-Ray – Module 3, p. 46</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 88</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="text-align: center;">4. Chest X-Ray (2)</h3> <ul style="list-style-type: none"> • Chest x-rays can: <ul style="list-style-type: none"> – Help rule out possibility of pulmonary TB disease in persons who have a positive TST or IGRA result – Check for lung abnormalities <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 88</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right;"><i>Chest X-Ray – Module 3, p. 46</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 89</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="text-align: center;">4. Chest X-Ray (3)</h3> <ul style="list-style-type: none"> • Chest x-rays <u>cannot confirm</u> TB disease <ul style="list-style-type: none"> – Other diseases can cause lung abnormalities – Only bacteriologic culture can prove patient has TB disease – Chest x-ray may appear unusual or even appear normal for persons living with HIV <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 89</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right;"><i>Chest X-Ray – Module 3, p. 46</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 90</p>	<div style="border: 1px solid black; padding: 10px;"> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <h3 style="margin: 0;">Chest X-Ray Study Question 3.28</h3> </div> <p>Name 2 purposes of the chest x-ray. (pg. 47)</p> <ul style="list-style-type: none"> • Help rule out possibility of pulmonary TB disease in a person who has positive TST or QFT-G result and no symptoms of TB • Check for lung abnormalities in people who have symptoms of TB disease <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 90</p> </div>	<ul style="list-style-type: none"> - Introduce study questions - Ask participants to turn to p. 47 (if participants have print-based modules) - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 76</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 91</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Chest X-Ray Study Question 3.29</p> <p>Can the results of a chest x-ray confirm that a person has TB disease? Why or why not? <i>(pg. 47)</i></p> <p>No. A variety of illnesses may produce abnormalities on chest x-ray. Only bacteriologic culture can prove whether or not a patient has TB disease.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 91</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 76</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 92</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Diagnosis of TB Disease</p> <hr style="width: 20%; margin: auto;"/> <p style="text-align: center;">Medical Evaluation</p> <p style="text-align: center;">5. Bacteriologic Examination</p> <p style="text-align: right; font-size: small;">92</p> </div>	<ul style="list-style-type: none"> - Introduce section
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 93</p>	<div style="border: 1px solid black; padding: 10px;"> <p>5. Bacteriologic Examination (1)</p> <ul style="list-style-type: none"> • TB bacteriologic examination is done in a laboratory that specifically deals with <i>M. tuberculosis</i> and other mycobacteria – Clinical specimens (e.g., sputum and urine) are examined and cultured in laboratory <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 93</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right;"><i>Bacteriological Examination – Module 3, p. 48</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 94</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="color: #008080;">5. Bacteriologic Examination (2)</h3> <ul style="list-style-type: none"> • Bacteriologic examination has 5 parts <ul style="list-style-type: none"> – Specimen collection – Examination of acid-fast bacilli (AFB) smears – Direct identification of specimen (nucleic acid amplification) – Specimen culturing and identification – Drug susceptibility testing <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 94</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right; font-style: italic;">Bacteriological Examination – Module 3, p. 48</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 95</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="color: #008080;">5. Bacteriologic Examination (3)</h3> <h4 style="color: #008080;">Specimen Collection</h4> <ul style="list-style-type: none"> • For pulmonary TB, specimens can be collected by: <ul style="list-style-type: none"> – Sputum sample – Induced sputum sample – Bronchoscopy – Gastric washing <div style="text-align: center;">  <p style="font-size: x-small; text-align: center;">TB patient coughing up sputum in a sputum collection booth</p> </div> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 95</p> </div>	<ul style="list-style-type: none"> - Review slide content - Explain that the image is of a TB patient coughing up sputum. The patient is sitting in a special sputum collection booth that prevents the spread of tubercle bacilli. <p style="text-align: right; font-style: italic;">Specimen Collection – Module 3, pp. 48-51</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 96</p>	<div style="border: 1px solid black; padding: 10px;"> <h3 style="color: #008080;">5. Bacteriologic Examination (4)</h3> <h4 style="color: #008080;">Sputum Sample Specimen Collection</h4> <ul style="list-style-type: none"> • Easiest and least expensive method is to have patient cough into sterile container • HCWs should coach and instruct patient • Should have <u>at least 3</u> sputum specimens examined <ul style="list-style-type: none"> – Collected in 8-24 hour intervals – At least one early morning specimen <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 96</p> </div>	<ul style="list-style-type: none"> - Review slide content - Note that health care workers should always supervise the patient when sputum is collected since patients are not always successful in providing an adequate specimen <p style="text-align: right; font-style: italic;">Sputum Sample Specimen Collection – Module 3, pp. 48-49</p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 97</p>	<div style="border: 1px solid black; padding: 10px;"> <p>5. Bacteriologic Examination (5) Induced Sputum Collection</p> <ul style="list-style-type: none"> Induced sputum collection should be used if patient cannot cough up sputum on their own Patient inhales saline mist, causing deep coughing Specimen often clear and watery, should be labeled “induced specimen” <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 97</p> </div>	<ul style="list-style-type: none"> Review slide content <p style="text-align: right;"><i>Induced Sputum Collection – Module 3, p. 49</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 98</p>	<div style="border: 1px solid black; padding: 10px;"> <p>5. Bacteriologic Examination (6) Bronchoscopy</p> <ul style="list-style-type: none"> Bronchoscopy may be used: <ul style="list-style-type: none"> If patient cannot cough up enough sputum If an induced sputum cannot be obtained Procedure: instrument is passed through nose or mouth into lung to obtain pulmonary secretions or lung tissue <div style="text-align: center;">  <p style="font-size: x-small;">Bronchoscopy being performed on a patient</p> </div> <p style="font-size: x-small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 98</p> </div>	<ul style="list-style-type: none"> Review slide content <p style="text-align: right;"><i>Bronchoscopy – Module 3, p. 49</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 99</p>	<div style="border: 1px solid black; padding: 10px;"> <p>5. Bacteriologic Examination (7) Gastric Washing</p> <ul style="list-style-type: none"> Usually only used if sample cannot be obtained from other procedures Often used with children Tube is inserted through nose and into stomach to obtain gastric secretions that may contain sputum <p style="font-size: x-small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 99</p> </div>	<ul style="list-style-type: none"> Review slide content Explain that the goal of gastric washing is to get a sample of gastric secretions that contains sputum that has been coughed into the throat and swallowed Explain that this technique is often used in children because most children produce little or no sputum when they cough <p style="text-align: right;"><i>Gastric Washing – Module 3, p. 49</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 100</p>	<div style="border: 1px solid black; padding: 10px;"> <p>5. Bacteriologic Examination (8) Extrapulmonary TB</p> <ul style="list-style-type: none"> • Specimens other than sputum may be obtained • Depends on part of body affected • For example: <ul style="list-style-type: none"> – Urine samples for TB disease of kidneys – Fluid samples from area around spine for TB meningitis <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 100</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right; font-style: italic;">Extrapulmonary TB–Module 3, p. 50</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 101</p>	<div style="border: 1px solid black; padding: 10px;"> <p>5. Bacteriologic Examination (9) Examination of AFB Smears</p> <ul style="list-style-type: none"> • Specimens are smeared onto glass slide and stained • AFB are mycobacteria that remain stained after being washed in acid solution  <p style="font-size: x-small; text-align: center;">AFB smear</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 101</p> </div>	<ul style="list-style-type: none"> - Review slide content - Explain that tubercle bacilli are one kind of AFB - Note that in this photograph, the AFB (shown in red) are tubercle bacilli <p style="text-align: right; font-style: italic;">Examination of AFB Smears – Module 3, p. 53</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 102</p>	<div style="border: 1px solid black; padding: 10px;"> <p>5. Bacteriologic Examination (10) Examination of AFB Smears</p> <ul style="list-style-type: none"> • Number of AFB on smear are counted • According to number of AFB seen, smears are classified as 4+, 3+, 2+, or 1+ <ul style="list-style-type: none"> – For example, 4+ smear has 10 times as many AFB than 3+ smear • If very few AFB are seen, the smear is classified by the actual number of AFB seen <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 102</p> </div>	<ul style="list-style-type: none"> - Review slide content - Explain that when very few AFB are seen, the smear is classified by the actual number of AFB seen and there is NOT a plus sign (+) <p style="text-align: right; font-style: italic;">Examination of AFB Smears – Module 3, pp. 53-54</p>

Slide 103

5. Bacteriologic Examination (11)
Examination of AFB Smears

Classification of Smear	Smear Result	Infectiousness of Patient
4+	Strongly positive	Probably very infectious
3+	Strongly positive	Probably very infectious
2+	Moderately positive	Probably infectious
1+	Moderately positive	Probably infectious
Actual number of AFB seen (no plus sign)	Weakly positive	Probably infectious
No AFB seen	Negative	May not be infectious

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 103

- Review slide content
- Explain that even though a smear is considered negative if no AFB are seen it **does not rule out** the possibility of TB disease because there can be AFB in the smear that were not seen

Examination of AFB Smears – Module 3, p. 55

Slide 104

Bacteriologic Examination Study Questions 3.30

What are the 4 ways to collect sputum specimens? Indicate which procedure is the least expensive and easiest to perform. (pg. 55)

- Patient simply coughs up sputum and the sputum is collected in a sterile container. This is the least expensive and easiest procedure.
- Induced sputum
- Bronchoscopy
- Gastric washing

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 104

- Introduce study questions
- Ask participants to turn to p. 55 (if participants have print-based modules)
- Read question
- Ask participants for answers

Answers – Module 3, p. 76

Slide 105

Bacteriologic Examination Study Question 3.31

What do laboratory personnel look for in a smear? (pg. 55)

Acid-fast bacilli (AFB)

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 105

- Read question
- Ask participants for answers

Answers – Module 3, p. 76

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 106</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Bacteriologic Examination Study Question 3.32</p> <p>What does a positive smear indicate about a patient's infectiousness? (pg. 55)</p> <p style="margin-left: 20px;">Patients who have <u>any</u> tubercle bacilli seen in their sputum have a positive smear. Patients who have positive smears are considered infectious because they can cough tubercle bacilli into the air.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 106</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 77</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 107</p>	<div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>Diagnosis of TB Disease</p> <hr style="width: 30%; margin: auto;"/> <p>Medical Evaluation</p> <p>5. Bacteriologic Examination</p> <p style="font-size: small; text-align: right;">107</p> </div>	<ul style="list-style-type: none"> - Introduce section
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 108</p>	<div style="border: 1px solid black; padding: 10px;"> <p>5. Bacteriologic Examination (12) Nucleic Acid Amplification Tests (NAA)</p> <ul style="list-style-type: none"> • NAA tests directly identify <i>M. tuberculosis</i> from sputum specimens by: <ul style="list-style-type: none"> – Amplifying (copying) DNA and RNA segments • Can help guide clinician's decision for patient therapy and isolation • Does not replace need for AFB smear, culture, or clinical judgment <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 108</p> </div>	<ul style="list-style-type: none"> - Review slide content - Note that NAA test results can be available in 24-48 hours <p style="text-align: right;"><i>Nucleic Acid Amplification Tests – Module 3, p. 58</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 109</p>	<div style="border: 1px solid black; padding: 10px;"> <p>5. Bacteriologic Examination (13) Nucleic Acid Amplification Tests (NAA)</p> <ul style="list-style-type: none"> • If NAA test and AFB smears are positive: <ul style="list-style-type: none"> – Patients are presumed to have TB and should begin treatment • If NAA test is negative and AFB smears are positive: <ul style="list-style-type: none"> – Patients may have nontuberculous mycobacteria infection (NTM) <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 109</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right; font-style: italic;">Nucleic Acid Amplification Tests – Module 3, p. 58</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 110</p>	<div style="border: 1px solid black; padding: 10px;"> <p>5. Bacteriologic Examination (14) Culturing and Identifying Specimen</p> <ul style="list-style-type: none"> • Culturing: <ul style="list-style-type: none"> – Determines if specimen contains <i>M. tuberculosis</i> – Confirms diagnosis of TB disease • All specimens should be cultured <div style="text-align: center;">  <p style="font-size: x-small; text-align: center;">Colonies of <i>M. tuberculosis</i> growing on media</p> </div> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 110</p> </div>	<ul style="list-style-type: none"> - Review slide content - Explain that the image is of colonies of <i>M. tuberculosis</i> growing on solid media <p style="text-align: right; font-style: italic;">Culturing and Identifying Specimen – Module 3, p.58</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 111</p>	<div style="border: 1px solid black; padding: 10px;"> <p>5. Bacteriologic Examination (15) Culturing and Identifying Specimen</p> <ul style="list-style-type: none"> • Step 1: Detect growth of mycobacteria <ul style="list-style-type: none"> – Solid media: 3 - 6 weeks – Liquid media: 4 - 14 days • Step 2: Identify organism that has grown <ul style="list-style-type: none"> – Nucleic acid probes: 2 - 4 hours – Biochemical tests: 6 - 12 weeks <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 111</p> </div>	<ul style="list-style-type: none"> - Review slide content - Explain that mycobacteria grow very slowly - Explain that it is necessary to identify the organism that has grown because all types of mycobacteria can grow on media. Laboratory tests must be done to determine whether the organism is <i>M. tuberculosis</i> or one of the nontuberculous mycobacteria. <p style="text-align: right; font-style: italic;">Culturing and Identifying Specimen – Module 3, p. 60</p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 112</p>	<div style="border: 1px solid black; padding: 10px;"> <p>5. Bacteriologic Examination (16) Culturing and Identifying Specimen</p> <ul style="list-style-type: none"> • Positive culture: <i>M. tuberculosis</i> identified in patient's culture <ul style="list-style-type: none"> – Called <i>M. tuberculosis</i> isolate – Confirms diagnosis of TB disease <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 112</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right;"><i>Culturing and Identifying Specimen – Module 3, p. 60</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 113</p>	<div style="border: 1px solid black; padding: 10px;"> <p>5. Bacteriologic Examination (17) Culturing and Identifying Specimen</p> <ul style="list-style-type: none"> • Negative culture: <i>M. tuberculosis</i> NOT identified in patient's culture <ul style="list-style-type: none"> – Does not rule out TB disease – Some patients with negative cultures are diagnosed with TB based on signs and symptoms <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 113</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right;"><i>Culturing and Identifying Specimen – Module 3, p. 60</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 114</p>	<div style="border: 1px solid black; padding: 10px;"> <p>5. Bacteriologic Examination (18) Culturing and Identifying Specimen</p> <ul style="list-style-type: none"> • Bacteriological examinations are important for assessing infectiousness and response to treatment • Specimens should be obtained monthly until 2 consecutive cultures are negative • Culture conversion is the most important objective measure of response to treatment <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 114</p> </div>	<ul style="list-style-type: none"> - Review slide content - Explain that culture conversion is when the culture goes from positive growth to negative growth of <i>M. tuberculosis</i> <p style="text-align: right;"><i>Culturing and Identifying Specimen – Module 3, p. 61</i></p>

5. Bacteriologic Examination (19) Drug Susceptibility Testing

- Conducted when patient is first found to have positive culture for TB
- Determines which drugs kill tubercle bacilli
- Tubercle bacilli killed by a particular drug are susceptible to that drug
- Tubercle bacilli that grow in presence of a particular drug are resistant to that drug

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease

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- Review slide content
- Explain that the **drug susceptibility pattern** of a strain of tubercle bacilli is the list of drugs to which the strain is susceptible and to which it is resistant
- Stress that it is crucial to identify drug resistance as early as possible to ensure effective treatment

Drug Susceptibility Testing – Module 3, p. 63

5. Bacteriologic Examination (20) Drug Susceptibility Testing

- Tests should be repeated if:
 - Patient has positive culture after 3 months of treatment; or
 - Patient does not get better



Drug susceptibility testing on solid media

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- Review slide content
- Explain that the image is of drug susceptibility testing on solid media. Organisms are resistant to the drug in the upper right compartment and susceptible to the drugs in the lower compartments. The upper left contains no drugs.

Drug Susceptibility Testing – Module 3, pp. 63-64

5. Bacteriologic Examination (21) Types of Drug-Resistant TB

Mono-resistant	Resistant to any one TB treatment drug
Poly-resistant	Resistant to at least any two TB drugs (but not both isoniazid and rifampin)
Multidrug-resistant (MDR TB)	Resistant to at least isoniazid and rifampin, the two best first-line TB treatment drugs
Extensively drug-resistant (XDR TB)	Resistant to isoniazid and rifampin, PLUS resistant to any fluoroquinolone AND at least 1 of the 3 injectable second-line drugs (e.g., amikacin, kanamycin, or capreomycin)

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- Explain that these are four types of drug-resistant TB
- Review slide content

Types of Drug-Resistant TB – Module 3, p. 63

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 118</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Culture Specimen Study Question 3.33</p> <p>Why is it necessary to culture a specimen? <i>(pg. 65)</i></p> <p style="text-align: center;">It is necessary to culture a specimen to determine whether the specimen contains <i>M. tuberculosis</i> and to confirm diagnosis of TB disease.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 118</p> </div>	<ul style="list-style-type: none"> - Introduce study questions - Ask participants to turn to p. 65 (if participants have print-based modules) - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 77</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 119</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Culture Specimen Study Question 3.34</p> <p>What does a positive culture for <i>M. tuberculosis</i> mean? How is this important for the TB diagnosis? <i>(pg. 65)</i></p> <p style="text-align: center;">It means that <i>M. tuberculosis</i> has been identified in a patient’s culture. A positive culture for <i>M. tuberculosis</i> confirms the diagnosis of TB disease.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 119</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 77</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 120</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Drug Susceptibility Study Question 3.35</p> <p>Why are drug susceptibility tests done? <i>(pg. 65)</i></p> <p style="text-align: center;">To determine which drugs will kill the tubercle bacilli that are causing disease in a particular patient. Test results can help clinicians choose the appropriate drugs for each patient.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 120</p> </div>	<ul style="list-style-type: none"> - Read question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 77</i></p>

Slide 121

Drug Susceptibility Study Question 3.36

How often should drug susceptibility tests be done? (pg. 65)

- Should be done when the patient is first found to have a positive culture for *M. tuberculosis*
- Tests should be repeated if a patient has a positive culture for *M. tuberculosis* after 3 months of treatment or if a patient is not getting better

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- Read question
- Ask participants for answers

Answers – Module 3, p. 77

Slide 122

Reporting TB Cases

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- Introduce section

Reporting TB Cases – Module 3, p. 62

Slide 123

Reporting TB Cases

- TB programs report TB cases to CDC using a standard case report form called the *Report of Verified of Case of Tuberculosis (RVCT)*

– All cases that meet criteria are called verified TB cases

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease

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- Review slide content
- State that health care providers are required by law to report TB cases to state or local health departments
- Note that the image is of the first page of the RVCT form

Reporting TB Cases – Module 3, p. 62

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 124</p>	<div style="border: 1px solid black; padding: 10px;"> <p>Criteria for Reporting TB Cases (1)</p> <p>Cases that meet one of these four sets of criteria are counted as verified TB cases:</p> <ol style="list-style-type: none"> 1. Patient has positive culture for <i>M. tuberculosis</i> 2. Patient has positive NAA test for <i>M. tuberculosis</i> <ul style="list-style-type: none"> • NAA test must be accompanied by culture for mycobacteria species <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 124</p> </div>	<ul style="list-style-type: none"> - Explain that each reported TB case is checked to make sure it meets certain criteria. All cases that meet the criteria, called <i>verified TB cases</i>, are counted each year - Review slide content <p style="text-align: right;"><i>Reporting TB Cases – Module 3, p. 62</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 125</p>	<div style="border: 1px solid black; padding: 10px;"> <p>Criteria for Reporting TB Cases (2)</p> <ol style="list-style-type: none"> 3. Patient has positive AFB smear, but culture has not or cannot be done 4. In the absence of laboratory confirmation, patient has: <ul style="list-style-type: none"> • Positive TST reaction • Other signs and symptoms of TB disease • Been treated with 2 or more TB drugs • Been given a complete diagnostic evaluation <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 125</p> </div>	<ul style="list-style-type: none"> - Review slide content <p style="text-align: right;"><i>Reporting TB Cases – Module 3, p. 62</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 126</p>	<div style="border: 1px solid black; padding: 10px;"> <p>Criteria for Reporting TB Cases (3)</p> <ul style="list-style-type: none"> • Cases that do not meet any of these sets of criteria may be counted as a verified TB case if health care provider has decided to treat the patient for TB disease <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 126</p> </div>	<ul style="list-style-type: none"> - Review slide content - Provide an example of this situation (e.g., a patient who is anergic and has a negative culture for <i>M. tuberculosis</i> but who has signs and symptoms of TB disease may be counted as a verified case of TB if the health care provider has reported the case and decided to treat the patient for TB disease) <p style="text-align: right;"><i>Reporting TB Cases – Module 3, p. 62</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 127</p>	<div style="border: 1px solid black; padding: 20px; text-align: center;"> <h2 style="color: #008080;">Case Studies</h2> <hr style="width: 30%; margin: 10px auto;"/> <p style="text-align: right; font-size: small;">127</p> </div>	<ul style="list-style-type: none"> - Introduce case studies
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 128</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center; color: #008080;">Module 3: Case Study 3.1</p> <p>Which of the following patients have a positive TST reaction? Circle the best answer(s). (pg. 17)</p> <ul style="list-style-type: none"> a. Mr. West, 36 yrs. old, HIV infected, 8 mm induration b. Ms. Hernandez, 26 yrs. old, native of Mexico, 7 mm induration c. Ms. Jones, 56 yrs. old, diabetic, 12 mm induration d. Mr. Sung, 79 yrs. old, nursing home resident, 11 mm induration e. Mr. Williams, 21 yrs. old, no known risk factors, 13 mm induration f. Mr. Marcos, 42 yrs. old, chest x-rays findings suggestive of previous TB, 6 mm induration g. Ms. Rayle, 50 yrs. old, husband has pulmonary TB, 9 mm of induration <p style="font-size: x-small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right; font-size: x-small;">128</p> </div>	<ul style="list-style-type: none"> - Ask participants to turn to p. 17 (if participants have print-based modules) - Read case study - Ask participants which of the patients have a positive TST reaction <p style="text-align: right; font-style: italic;">Answers – Module 3, p. 78</p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 129</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center; color: #008080;">Module 3: Case Study 3.2 (1)</p> <p>A 30 year-old man who recently immigrated from India is given a TST and found to have 14mm of induration. He reports that he was vaccinated with BCG as a child. He also says that his wife was treated for pulmonary TB disease last year. (pg. 20)</p> <p style="font-size: x-small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease</p> <p style="text-align: right; font-size: x-small;">129</p> </div>	<ul style="list-style-type: none"> - Ask participants to turn to p. 20 (if participants have print-based modules) - Read case study <p style="text-align: right; font-style: italic;">Case Study 3.2 – Module 3, p. 20</p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 130</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Module 3: Case Study 3.2 (2)</p> <p>How should this man's results be interpreted?</p> <ul style="list-style-type: none"> • Positive reaction to TST • Should be further evaluated for LTBI or TB disease <p>What factors make it more likely that this man's positive reaction is due to TB infection?</p> <ul style="list-style-type: none"> • From area of the world where TB is common • Wife had pulmonary TB <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 130</p> </div>	<ul style="list-style-type: none"> - Read case study questions - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 78</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 131</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Module 3: Case Study 3.3 (1)</p> <p>Mr. Bell comes to the TB clinic for a TST. He believes that he has been exposed to TB, and he knows he is at high risk for TB because he is HIV infected. He is given a TST, and his reaction is read 48 hours later as 0 mm of induration. (pg. 25)</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 131</p> </div>	<ul style="list-style-type: none"> - Ask participants to turn to p. 25 (if participants have print-based modules) - Read case study <p style="text-align: right;"><i>Case Study 3.3 – Module 3, p. 25</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 132</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Module 3: Case Study 3.3 (2)</p> <p>What are 3 ways to interpret this result?</p> <ul style="list-style-type: none"> • May not have TB infection • May be anergic • It may be less than 8–10 weeks since he was exposed to TB <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 132</p> </div>	<ul style="list-style-type: none"> - Read case study question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 79</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 133</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Module 3: Case Study 3.4 (1)</p> <p>Ms. Wilson is a 60 year-old nurse. When she started a job at the local hospital, she was given a TST, her first test in 25 years. Her reaction was read 48 hours later as 0 mm induration. Six months later, she was retested as part of the TB testing program in the unit where she works. Her skin test reaction was read 48 hours later as 11 mm of induration. (pg. 32)</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 133</p> </div>	<ul style="list-style-type: none"> - Ask participants to turn to p. 32 (if participants have print-based modules) - Read case study <p style="text-align: right;"><i>Case Study 3.4 – Module 3, p. 32</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 134</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Module 3: Case Study 3.4 (2)</p> <p>What are 2 ways to interpret this result?</p> <ul style="list-style-type: none"> • She was exposed to TB sometime in the 6 months between her first and second skin tests • Booster phenomenon <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 134</p> </div>	<ul style="list-style-type: none"> - Read case study question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 79</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 135</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Module 3: Case Study 3.5 (1)</p> <p>Mr. Lee has a cough and other symptoms of TB disease, and he is evaluated with a chest x-ray. However, he is unable to cough up any sputum on his own for the bacteriologic examination. (pg. 52)</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 135</p> </div>	<ul style="list-style-type: none"> - Ask participants to turn to p. 52 (if participants have print-based modules) - Read case study <p style="text-align: right;"><i>Case Study 3.5 – Module 3, p. 52</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 136</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Module 3: Case Study 3.5 (2)</p> <p>What should be done?</p> <p>Other techniques can be used to obtain sputum. First, clinicians can try to obtain an induced sputum sample. If they cannot obtain the sample, a bronchoscopy or gastric washing may be done.</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 130</p> </div>	<ul style="list-style-type: none"> - Read case study question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 80</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 137</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Module 3: Case Study 3.6 (1)</p> <p>Ms. Thompson gave three sputum specimens, which were sent to the laboratory for smear examination and culture. The smear results were reported as 4+, 3+, and 4+. (pg. 56)</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 137</p> </div>	<ul style="list-style-type: none"> - Ask participants to turn to p. 56 (if participants have print-based modules) - Read case study <p style="text-align: right;"><i>Case Study 3.6 – Module 3, p. 56</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 138</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Module 3: Case Study 3.6 (2)</p> <p>What do these results tell you about Ms. Thompson's diagnosis and her infectiousness?</p> <ul style="list-style-type: none"> • Results show that Ms. Thompson's sputum specimens contain many acid-fast bacilli • Smears are positive, clinicians should suspect that she has TB disease and should consider her infectious • It is possible that the AFB are mycobacteria other than tubercle bacilli • Diagnosis cannot be proven until culture results are available <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 138</p> </div>	<ul style="list-style-type: none"> - Read case study question - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 80</i></p>

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 139</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Module 3: Case Study 3.7 (1)</p> <p>Mr. Sagoo has symptoms of TB disease and a cavity on his chest x-ray, but all of his sputum smears are negative for acid-fast bacilli. (pg. 57)</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 139</p> </div>	<ul style="list-style-type: none"> - Ask participants to turn to p. 57 (if participants have print-based modules) - Read case study <p style="text-align: right;"><i>Case Study 3.7 – Module 3, p. 57</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 140</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Module 3: Case Study 3.7 (2)</p> <p>Does this rule out the diagnosis of pulmonary TB disease?</p> <p style="text-align: center;">No</p> <p>Why or why not?</p> <p><i>M. tuberculosis may grow in the cultures even though there were no acid-fast bacilli on the smear. Mr. Sagoo's symptoms and his abnormal chest x-ray suggest that he does have pulmonary TB disease.</i></p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 140</p> </div>	<ul style="list-style-type: none"> - Read case study questions - Ask participants for answers <p style="text-align: right;"><i>Answers – Module 3, p. 80</i></p>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Slide 141</p>	<div style="border: 1px solid black; padding: 10px;"> <p style="text-align: center;">Module 3: Case Study 3.8 (1)</p> <p>In the public health clinic, you see a patient, Ms. Sanchez, who complains of weight loss, fever, and a cough of 4 weeks' duration. When questioned, she reports that she has been treated for TB disease in the past and that she occasionally injects heroin. (pg. 66)</p> <p style="font-size: small; text-align: center;">Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 141</p> </div>	<ul style="list-style-type: none"> - Ask participants to turn to p. 66 (if participants have print-based modules) - Read case study <p style="text-align: right;"><i>Case Study 3.8 – Module 3, p. 66</i></p>

Module 3: Case Study 3.8 (2)

What parts of Ms. Sanchez's medical history lead you to suspect TB disease?

- Symptoms of TB disease (weight loss, fever, persistent cough)
- Past treatment for TB disease
- History of injecting illegal drugs

What diagnostic tests should be done?

- Chest x-ray
- Sputum smear and culture
- Drug susceptibility testing

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease

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- Read case study questions
- Ask participants for answers
- Ask if there are any questions about Module 3 before moving on to Module 4

Answers – Module 3, p. 81