HealthStream Regulatory Script

Transmission-Based Precautions: Airborne

Version: May 2007

Lesson 1: Introduction
Lesson 2: Airborne Precautions
Lesson 3: Airborne Pathogens
Lesson 4: Tuberculosis
Welcome to the introductory lesson on Airborne Precautions. This lesson provides the course rationale, goals, and outline.

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If you have concerns about any aspect of the safety or quality of patient care in your organization, be aware that you may report these concerns directly to The Joint Commission.
### 1002

#### Course Rationale

Three important pathogens are known to be spread by the airborne route. These are:

- Varicella-zoster virus (VZV), the cause of chickenpox and shingles
- Measles (or rubeola) virus
- *Mycobacterium tuberculosis*, the cause of TB

All three pathogens can cause severe disease.

Importantly, all three pathogens can be spread in the healthcare setting.

This course will teach you how to prevent the spread of airborne infection in the healthcare setting.

You will learn about:
- Current airborne threats
- Airborne Precautions
## 1003 Course Goals

After completing this course, you should be able to:

- List and describe the elements of Airborne Precautions
- Recognize key features and specific precautions for: varicella, measles, SARS, and smallpox
- Recognize key features and [OSHA glossary](#) requirements for tuberculosis
Lesson 1 provided the course rationale and goals.

Lesson 2 will describe Airborne Precautions.

Lesson 3 will give additional information on VZV, measles, SARS-CoV, and smallpox. This includes specific precautions for each.

Finally, lesson 4 will give additional information on *Mycobacterium tuberculosis*. This includes OSHA requirements for TB safety.

Please change title of Lesson 4 to “Tuberculosis”
Welcome to the lesson on Airborne Precautions.

After completing this lesson, you should be able to:
- Define airborne transmission.
- List the key elements of Airborne Precautions.
### Person-to-person airborne transmission happens as a result of infectious **droplet nuclei**.

These tiny particles can stay airborne for long periods of time. They can travel long distances on air currents.

Transmission happens when a **susceptible host** inhales an infectious particle.

Certain hospitalized patients are particularly susceptible to infection. These patients include:

- Patients with weakened immune systems
- Patients with chronic illnesses
- The very young and very old
- Institutionalized individuals

### CLICK TO REVEAL

**More About Droplet Nuclei**

Coughing, sneezing, and sighing all produce respiratory droplets. These respiratory droplets are too heavy to stay in the air for long.

When a person has an infection, respiratory droplets may contain the infectious organism. As these droplets start to dry out, most types of organisms are killed.

Some types of organisms can survive drying out. This results in the formation of infectious droplet nuclei: evaporated droplets containing an organism that can still cause disease.

Dust particles can also contain the infectious organism.

These tiny nuclei are less than five microns across. They can stay airborne for long periods of time. This allows for the spread of airborne disease.
Precautions for Airborne Disease

Patients with diagnosed airborne disease require isolation.

Patients who appear to have an airborne disease also should be isolated, until a certain diagnosis can be made.

Isolation should include:
- Airborne Precautions
- Standard Precautions

Note: Standard Precautions are used in the care of all patients.

Remember: Standard Precautions are used in the care of all patients, regardless of presumed infection status. For more information on Standard Precautions, see the course Standard Precautions: Bloodborne Pathogens and Other Potentially Infectious Materials.
Airborne Precautions have three basic elements:

- Patient placement
- Respiratory protection
- Patient transport

Let’s take a closer look at each.
A patient requiring Airborne Precautions should be placed in a private room.

This room should have monitored negative air pressure. This means that the air pressure in the isolation room is lower than the air pressure in nearby areas. Therefore, contaminated air will not flow out of the room into nearby areas.

The isolation room also should have six to twelve air changes per hour. This helps reduce the concentration of infectious particles in the room air.

For air changes, room air should be vented directly to the outside of the facility. If this is not possible, room air must be filtered before it ties into the facility’s general ventilation system. High efficiency particulate filtration (HEPA) should be used.

The door to the isolation room should be kept closed.

The patient should stay in the room.
If there are no private rooms, patients on Airborne Precautions should be **cohorted**.

A **cohort** is a group of patients who have:
- The same active infection
- **No other infections**

Sometimes:
- There are no private rooms.
- The patient cannot be placed with a cohort.

In this case, the facility’s infection control experts decide where to place the patient.
Healthcare staff must wear certified respiratory protection when working with patients on Airborne Precautions.

N95 respirators are most commonly used.

A surgical mask:
- Is NOT a certified respirator
- Will not protect against airborne transmission

![Image: 2007.JPG]
## Respiratory Protection: Measles and Chickenpox

For patients with measles or chickenpox, immune staff members do not need to wear respirators.
- Susceptible (non-immune) staff members must wear respirators.

However, non-immune staff should not work with these patients if an immune staff member is on duty.
Patients on Airborne Precautions should not be transported unless absolutely necessary.

During necessary transport, the patient should wear a surgical mask, if possible.
A room could be used for airborne isolation if it had:

a. Negative air pressure. Two air changes per hour. Room air vented directly to the outside.

b. Positive air pressure. Eight air changes per hour. Room air vented directly to the outside.

c. Negative air pressure. Eight air changes per hour. Room air returned to general ventilation system after HEPA filtration.

d. Positive air pressure. Twelve air changes per hour. Room air returned to general ventilation system after HEPA filtration.

MULTIPLE CHOICE INTERACTION

Correct answer: C

Feedback for A: Incorrect. An airborne isolation room must have: 1) monitored negative air pressure, 2) six to twelve air changes per hour, and 3) room air vented to the outside or returned to the general ventilation system after filtration. Only C has all three features.

Feedback for B: Incorrect. An airborne isolation room must have: 1) monitored negative air pressure, 2) six to twelve air changes per hour, and 3) room air vented to the outside or returned to the general ventilation system after filtration. Only C has all three features.

Feedback for C: Correct. An airborne isolation room must have: 1) monitored negative air pressure, 2) six to twelve air changes per hour, and 3) room air vented to the outside or returned to the general ventilation system after filtration. Only C has all three features.

Feedback for D: Incorrect. An airborne isolation room must have: 1) monitored negative air pressure, 2) six to twelve air changes per hour, and 3) room air vented to the outside or returned to the general ventilation system after filtration. Only C has all three features.
<table>
<thead>
<tr>
<th>Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>A surgical mask is a certified respirator for Airborne Precautions.</td>
</tr>
</tbody>
</table>
| a. True  
| b. False | **TRUE / FALSE INTERACTION** |
| Correct answer: B |
| Feedback for A: Incorrect. A surgical mask is NOT a certified respirator. It will not protect against airborne transmission. |
| Feedback for B: Correct. A surgical mask is NOT a certified respirator. It will not protect against airborne transmission. |
You have completed the lesson on Airborne Precautions.

Remember:
- Infectious droplet nuclei cause airborne transmission.
- Patients who have airborne diseases are isolated with Standard Precautions and Airborne Precautions.
- Patients on Airborne Precautions should be placed in private rooms or cohorted.
- Airborne isolation rooms should have special systems for air and ventilation.
- Non-immune healthcare staff must wear respirators when working with patients on Airborne Precautions.
- If possible, only immune staff should care for patients with measles or varicella.
- Patients on Airborne Precautions should be transported only when absolutely necessary. During necessary transport, the patient should wear a surgical mask, if possible.
Lesson 3: Airborne Pathogens

3001

Introduction & Objectives

Welcome to the lesson on pathogens that call for Airborne Precautions.

After completing this lesson, you should be able to:
- Identify the key features of VZV, measles, SARS, and smallpox
- List precautions to prevent the spread of these diseases in the healthcare setting

FLASH ANIMATION: 3001.SWF/FLA

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<table>
<thead>
<tr>
<th>Airborne Pathogens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease-specific considerations</td>
</tr>
<tr>
<td>VZV</td>
</tr>
<tr>
<td>Measles</td>
</tr>
<tr>
<td>SARS-CoV</td>
</tr>
<tr>
<td>Smallpox</td>
</tr>
</tbody>
</table>
Pathogens Requiring Airborne Precautions

Three important airborne pathogens are:
- Varicella-zoster virus (VZV)
- The measles virus
- *Mycobacterium tuberculosis*

Other pathogens that call for Airborne Precautions are:
- SARS-CoV
- The smallpox virus

*Mycobacterium tuberculosis* will be covered in the next lesson.

This lesson focuses on VZV, measles, SARS, and smallpox.

<table>
<thead>
<tr>
<th>Known Airborne Threats</th>
<th>Chickenpox &amp; Shingles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Measles</td>
</tr>
<tr>
<td></td>
<td>Tuberculosis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Suspected Airborne Threats</th>
<th>SARS</th>
<th>Smallpox</th>
</tr>
</thead>
</table>
Varicella-Zoster Virus

<table>
<thead>
<tr>
<th>Varicella-zoster virus (VZV) causes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Chickenpox (varicella)</td>
</tr>
<tr>
<td>• Shingles (herpes zoster, varicella zoster, or zoster)</td>
</tr>
</tbody>
</table>

VZV can be spread in the healthcare setting.

This can happen if a facility has:
- Patients with chickenpox or shingles
- Staff with chickenpox or shingles
- Visitors with chickenpox or shingles
All non-immune people are at risk for chickenpox and its complications.

These complications can be severe.

Certain groups are at increased risk for severe VZV disease and complications.

These groups include:
- Pregnant women
- Premature infants with non-immune mothers
- Infants born at less than 28 weeks or weighing less than 1000 grams (with immune or non-immune mothers)
- Patients with weakened immune systems
Airborne Precautions can help prevent the spread of VZV in the healthcare setting.

The following patients should be placed on Airborne Precautions:

- Patients with chickenpox
- Patients with disseminated shingles [glossary]
- Patients with weakened immune systems and localized shingles [glossary]

Note: VZV is also spread by contact. Therefore, patients should be placed on Contact Precautions as well. For more information on Contact Precautions, see the script Transmission-Based Precautions: Contact and Droplet.
All non-immune healthcare personnel should consider varicella vaccination.

The varicella vaccine is especially important for non-immune personnel who work with high-risk patients.

Healthcare personnel should not come to work if they:
- Have chickenpox
- Have shingles
- Have been exposed to chickenpox or shingles and are not immune

If you have never had chickenpox, you may need to be vaccinated.
VZV can be spread only by patients with chickenpox.

a. True  
b. False

**TRUE / FALSE INTERACTION**

Correct answer: B

Feedback for A: Incorrect. VZV can be spread by people with chickenpox or shingles.

Feedback for B: Correct. VZV can be spread by people with chickenpox or shingles.
<table>
<thead>
<tr>
<th>Measles is a systemic viral infection.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients have high fever.</td>
</tr>
<tr>
<td>They also have a typical rash that:</td>
</tr>
<tr>
<td>• Begins on the face and head</td>
</tr>
<tr>
<td>• Spreads downward and outward to the hands and feet</td>
</tr>
<tr>
<td>• Fades in the same order that it appears</td>
</tr>
<tr>
<td>The measles virus is spread by:</td>
</tr>
<tr>
<td>• The droplet route</td>
</tr>
<tr>
<td>• The airborne route</td>
</tr>
<tr>
<td>Measles can be spread in the healthcare setting.</td>
</tr>
</tbody>
</table>
Approximately 30% of patients with measles have complications.

Complications are most common in:
- Children under the age of five
- Adults over the age of 20

Potential Complications of Measles:
- Diarrhea
- Ear infection
- Pneumonia
- Encephalitis
- Hospitalization
- Death
All patients with known or suspected measles should be placed on Airborne Precautions.

Note: Recall that measles is spread by both droplet and airborne transmission.

What about Droplet Precautions for measles patients?

Droplet Precautions are not necessary. Droplet Precautions do not add anything to Airborne Precautions. Airborne Precautions protect against both airborne and droplet spread.

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**Airborne Precautions**
- Patient Placement
- Respiratory Protection
- Patient Transport
- TB Precautions

**Droplet Precautions**
- Patient Placement
- Mask
- Patient Transport
Measles: Preventing Transmission

<table>
<thead>
<tr>
<th>Healthcare personnel should not come to work if they:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Have measles</td>
</tr>
<tr>
<td>• Have been exposed to measles and are not immune</td>
</tr>
</tbody>
</table>

Measles-mumps-rubella (MMR) vaccine is recommended for all non-immune personnel.

Click on each category below to learn more about immunity in:

| • Healthcare workers born before 1957                  |
| • Healthcare workers born during or after 1957         |

**CLICK TO REVEAL**

**Healthcare workers born before 1957**
These personnel are non-immune if 1) they have **not** been vaccinated and 2) they do **not** have either of the following:

- History of measles disease
- Positive blood test for measles immunity

**Healthcare workers born during or after 1957**
These personnel are non-immune if they do **not** have any of the following:

- Documentation of measles disease diagnosed by a M.D.
- Documentation of **two** doses (at least four weeks apart) of live measles vaccine **on or after their first birthday**
- Positive blood test for measles immunity
One of your workmates is not sure whether she needs a measles vaccine. She was born in 1968. She thinks she was vaccinated as an infant. But she does not have documentation of her childhood immunizations. She does not remember ever having measles. Your workmate should have:

- MMR vaccination
- Blood test for measles immunity
- Either of these
- Neither of these

**MULTIPLE CHOICE INTERACTION**

Correct answer: C

Feedback for A: Not quite. The best answer is C. Your workmate does not have evidence of measles immunity. Therefore, vaccination is a good idea. However, she may wish to have a blood test first, to check for immunity. Either choice is okay.

Feedback for B: Not quite. The best answer is C. Your workmate does not have evidence of measles immunity. Therefore, vaccination is a good idea. However, she may wish to have a blood test first, to check for immunity. Either choice is okay.

Feedback for C: Correct. Your workmate does not have evidence of measles immunity. Therefore, vaccination is a good idea. However, she may wish to have a blood test first, to check for immunity. Either choice is okay.

Feedback for D: Incorrect. The best answer is C. Your workmate does not have evidence of measles immunity. Therefore, vaccination is a good idea. However, she may wish to have a blood test first, to check for immunity. Either choice is okay.
Severe acute respiratory syndrome (SARS) is a viral respiratory illness. The cause of the disease is the SARS-associated coronavirus (SARS-CoV).

SARS-CoV is known to be spread by contact and droplet. These are the most common routes of transmission.

Airborne transmission is a possibility.

SARS-CoV can be spread in the healthcare setting.

In fact, in the epidemic of 2003, the spread of SARS happened mostly in healthcare facilities.
### SARS-CoV: Impact

Almost 100% of SARS patients develop pneumonia visible on x-ray.

This pneumonia is usually bad enough to call for hospitalization.

The overall SARS death rate is 10%.

In patients over the age of 60, the death rate can be higher than 50%.

![Chest x-rays show pneumonia in virtually 100% of patients hospitalized with SARS.](IMAGE: 3014.JPG)
SARS-CoV: Preventing Transmission

Patients should be placed on Airborne Precautions if they have:

- Positive lab tests for SARS-CoV infection
- Signs, symptoms, and risk factors that make SARS a likely diagnosis

Note: These patients also should be placed on Contact Precautions.
SARS-CoV: Preventing Transmission

Remember: SARS-CoV can spread rapidly through healthcare facilities.

Therefore, the CDC recommends SARS screening for all patients who have pneumonia visible on X-ray.

These patients should be:
- Placed on Droplet Precautions as soon as they are admitted to the facility
- Screened for SARS-CoV risk factors

Patients with risk factors should be monitored. This can help determine whether further precautions are needed.

For more information on SARS-CoV surveillance and triage, see the course **Severe Acute Respiratory Syndrome**.
Almost 100% of SARS patients develop pneumonia visible on x-ray.

The overall SARS death rate is 10%.

In patients over the age of 60, the death rate can be higher than 50%.
Smallpox is a viral disease.

Patients have:
- Fever
- Vomiting
- Aches
- Pustular rash

Mortality rates are high:
- 30% of unvaccinated patients die.
- 3% of vaccinated patients die.

Smallpox is spread mostly by droplet.
Smallpox: Bioterrorist Threat


In 1980, the World Health Organization (WHO) declared that endemic smallpox was dead.

However, smallpox could return as a biological weapon.

After the events of September 11, 2001, the military began to again require active duty personnel to be vaccinated. Since December 2002, over 1,087,000 people have been vaccinated.

Smallpox vaccination is also offered to healthcare workers and first-response personnel.
Airborne spread of smallpox from person-to-person is not common. Nevertheless, all patients with confirmed or suspected smallpox should be placed on Airborne Precautions.
**Smallpox: Preventing Transmission**

Anyone who has direct, unprotected contact with a smallpox patient also should be placed on Airborne Precautions. This should be for a minimum of 16 to 17 days.

Smallpox vaccine should be given to all healthcare workers who will provide direct care to smallpox patients.

If there is no vaccine, only previously vaccinated workers should provide direct care to smallpox patients.

Previously vaccinated workers are:
- Workers born before 1972
- Workers who served in the military before 1989
- Worker who recently served in the military
- Workers who are members of a first response team

Any confirmed case of smallpox should be considered an international emergency and should be reported immediately to public health authorities.
Smallpox is diagnosed in your facility. There is no vaccine on hand. Who should NOT provide direct care to smallpox patients?

- a. An orderly born in 1962
- b. A nurse's aide born in 1978
- c. A medical assistant born in 1970
- d. A nurse who served in the military from 1982 to 1987

**MULTIPLE CHOICE INTERACTION**

Correct answer: B

Feedback for A: Incorrect. The staff members described in A, C, and D all should have been vaccinated previously. The staff member described in B probably has NOT been vaccinated. Therefore, he or she should not provide direct care to smallpox patients.

Feedback for B: Correct. The staff members described in A, C, and D all should have been vaccinated previously. The staff member described in B probably has NOT been vaccinated. Therefore, he or she should not provide direct care to smallpox patients.

Feedback for C: Incorrect. The staff members described in A, C, and D all should have been vaccinated previously. The staff member described in B probably has NOT been vaccinated. Therefore, he or she should not provide direct care to smallpox patients.

Feedback for D: Incorrect. The staff members described in A, C, and D all should have been vaccinated previously. The staff member described in B probably has NOT been vaccinated. Therefore, he or she should not provide direct care to smallpox patients.
You have completed the lesson on airborne pathogens.

Remember:
- Airborne pathogens can be spread in the healthcare setting.
- Varicella, measles, SARS, and smallpox all can have serious consequences.
- Use Airborne Precautions and other infection-control practices to prevent the spread of these diseases in the healthcare setting.
Lesson 4: Tuberculosis

4001

Introduction

Welcome to the lesson on tuberculosis (TB).

After completing this lesson, you should be able to:

• Distinguish between TB infection and TB disease.
• List the requirements of OSHA’s TB Enforcement Policy

Note: For more detailed information on the pathology, diagnosis, treatment, and prevention of TB, see the course Tuberculosis.
Infection vs. Disease

*Mycobacterium tuberculosis* causes both:
- Latent TB infection
- Active TB disease

It is important to distinguish between these two conditions.

Review the table to the right.

Focus on two key differences:
- People with latent TB infection do not have symptoms. They *cannot* spread TB.
- People with active TB disease do have symptoms. They *can* spread TB.

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Infection</th>
<th>Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterium</td>
<td>Live, inactive</td>
<td>Live, active</td>
</tr>
<tr>
<td>Symptoms</td>
<td>None</td>
<td>Cough, fever, chills, weight loss</td>
</tr>
<tr>
<td>TB Test</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Diagnostics</td>
<td>Normal</td>
<td>Abnormal chest x-ray</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Positive sputum smear</td>
</tr>
<tr>
<td>Transmit?</td>
<td>Unable</td>
<td>Able</td>
</tr>
<tr>
<td>Outcome</td>
<td>May develop active disease</td>
<td>May die if not treated</td>
</tr>
</tbody>
</table>
Transmission

Remember:

- People with latent TB infection do not have symptoms. They cannot spread TB.
- People with active TB disease do have symptoms. They can spread TB.

Transmission is airborne.

TB can be spread in the healthcare setting. However, transmission occurs at a low rate in U.S. hospitals.

Transmission is higher in facilities serving communities with:

- High rates of HIV infection
- High numbers of people from TB-endemic countries
- High prevalence of TB infection
<table>
<thead>
<tr>
<th>Preventing Transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients with known or suspected TB disease should be placed on Airborne Precautions.</td>
</tr>
</tbody>
</table>

*Credit: NIH*
CDC Guidelines

In 1994, the CDC published a final version of *Guidelines for Preventing the Transmission of M. tuberculosis in Health Care Facilities*. An updated version was published in 2005.

The CDC guidelines give extensive recommendations for TB infection control.

For details, these guidelines may be accessed at: http://www.cdc.gov/nchstp/tb/pubs/mmwrhtml/maj_guide.htm
(link)

Also, see the course *Tuberculosis*.
Protection from tuberculosis is covered under OSHA’s:

- General Duty Clause
- Respiratory Protection Standards
- Accident Prevention Signs and Tags
- Recording and Reporting Occupational Injuries and Illnesses

In 1996, OSHA published *Enforcement Procedures and Scheduling for Occupational Exposure to Tuberculosis*.

Enforcement:

- Is based on CDC guidelines
- Is meant to protect workers from on-the-job exposure to TB
OSHA Provisions

The OSHA TB Enforcement Policy addresses:
- Patient and employee management
- Respiratory protection
- Education and training for workers
- Posted signs
- Recordkeeping

Let’s take a closer look at each.

FLASH ANIMATION: 4007.SWF/FLA

OSHA TB Enforcement Policy:
- Patient and employee management
- Respiratory protection
- Education and training for workers
- Posted signs
- Recordkeeping
Under the *TB Enforcement Policy*, healthcare facilities must have:

- Protocols to quickly identify and isolate patients with TB
- TB/AFB (glossary) isolation rooms, with proper air and ventilation systems

In addition, healthcare employers must provide certain TB services to employees, at no cost to the employee.

These services are:

- TB screening
- Evaluation and follow-up for employees who have positive screening tests
Under OSHA policy, healthcare workers **must** wear personal respirators during certain activities or procedures with TB patients.

These activities are:
- Entering an isolation room
- Procedures likely to generate infectious respiratory droplets (for example, bronchoscopy)
- Emergency response or transport

Respirators must meet certain minimum standards.

Fit-testing and fit-checking for respirators are **required**.
Employers are required to educate healthcare workers about TB. Education and training should focus on:

- The basics of TB
- The importance of screening
- What TB skin tests mean
- TB infection control
- Underlying medical conditions that could increase a worker’s risk of developing active TB disease
TB Enforcement Policy: Posted Signs

TB isolation rooms must have posted signs. These signs should have:

- A signal word, such as “STOP” or “NO ADMITTANCE”
- A major message
  - “Respiratory Isolation”
  - “Pulmonary Isolation”
  - “AFB Isolation”
- Precautions required to interact with the patient
Finally, under OSHA’s *TB Enforcement Policy*, employers must keep TB records.

Records should be kept of all employees with:
- TB infection (positive skin test)
- TB disease
Complete the following chart with words from the word bank.

<table>
<thead>
<tr>
<th>A person with TB infection:</th>
<th>A person with TB disease:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carries the TB bacterium in a live, but inactive, state</td>
<td>Carries the TB bacterium in a live, active state</td>
</tr>
<tr>
<td>Does not have any symptoms</td>
<td>Has symptoms</td>
</tr>
<tr>
<td>Cannot spread TB to others</td>
<td>Can spread TB to others</td>
</tr>
</tbody>
</table>
Under OSHA’s *TB Enforcement Policy*, healthcare employers are required to provide certain TB services to employees, at no cost to the employee. One of these services is TB screening.

**a. True**

**b. False**

**TRUE / FALSE INTERACTION**

Correct answer: A

Feedback for A: Correct. This statement is true.

Feedback for B: Incorrect. This statement is true.
Summary

You have completed the lesson on tuberculosis.

Remember:

- *Mycobacterium tuberculosis* can cause either latent infection or active disease.
- Patients with active TB disease can spread TB by the airborne route.
- All patients with known or suspected active TB disease should be placed on Airborne Precautions.
- Additional precautions are published in the CDC *Guidelines for Preventing the Transmission of M. tuberculosis in Health-Care Settings, 2005.*
- OSHA requires employers to protect workers from on-the-job exposure to TB, under the *TB Enforcement Policy.*
## Course Glossary

<table>
<thead>
<tr>
<th>#</th>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>acid-fast bacilli (AFB)</em></td>
<td>bacteria that test positive after a particular staining procedure</td>
</tr>
<tr>
<td>2</td>
<td>CDC</td>
<td>Centers for Disease Control and Prevention</td>
</tr>
<tr>
<td>3</td>
<td>disseminated shingles HEPA</td>
<td>shingles covering a large area of the body</td>
</tr>
<tr>
<td></td>
<td></td>
<td>high-efficiency particulate air</td>
</tr>
<tr>
<td>4</td>
<td>immunodeficient</td>
<td>having a weakened immune system</td>
</tr>
<tr>
<td>5</td>
<td>localized shingles</td>
<td>shingles confined to a small area of the body</td>
</tr>
<tr>
<td>6</td>
<td>NIOSH</td>
<td>National Institute for Occupational Safety and Health</td>
</tr>
<tr>
<td>7</td>
<td>healthcare-associated transmission</td>
<td>spread of pathogens in the healthcare setting</td>
</tr>
<tr>
<td>8</td>
<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
</tr>
<tr>
<td>9</td>
<td>susceptible host</td>
<td>person (or other organism) able to be colonized or infected by a particular microorganism</td>
</tr>
</tbody>
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[Transmission-Based Precautions: Airborne]

Pre-Assessment

1. All hospitalized patients should be placed on ___________.
   a. Droplet Precautions
   b. Contact Precautions
   c. Standard Precautions
   d. Airborne Precautions

Correct answer: C
Rationale: Standard Precautions apply to all patients.

2. You are treating a patient with an active respiratory infection. Your patient coughs. This releases respiratory droplets. These droplets can evaporate to form infectious nuclei if your patient has:
   a. Influenza
   b. Tuberculosis
   c. N. meningitides pneumonia
   d. All of these
   e. None of these

Correct answer: B
Rationale: TB is transmitted by infectious droplet nuclei. The influenza virus and N. meningitides are transmitted by the droplet route. They do not form infectious droplet nuclei.

3. In an airborne isolation room, room air must be vented directly to the outside.
   a. True
   b. False

Correct answer: B
Rationale: Room air must be vented directly to the outside. Or, room air can tie into the general ventilation system after HEPA filtration.

4. A three-year-old girl is admitted to your facility with fever and a rash. You suspect measles. You place the patient on Airborne Precautions. No private rooms are available. The patient should be placed:
   a. In an isolation room with other patients who have airborne infections
   b. In an isolation room with other patients who have only measles
   c. In a bed on the pediatric unit, at least three feet away from the nearest uninfected patient
d. None of these

Correct answer: B
Rationale: If a private room is not available, patients on Airborne Precautions should be cohorted.

5. Your colleague had chickenpox as a child. She is currently caring for a patient with shingles. When she enters this patient’s room, your workmate should wear:
   a. No respiratory protection
   b. A surgical mask
   c. An N95 respirator
   d. Any respirator equipped with HEPA filtration

Correct answer: A
Rationale: Your colleague had chickenpox as a child. Therefore, she should be immune to the virus. She does not need respiratory protection.

6. _________ should be placed on Airborne Precautions.
   a. A patient with confirmed smallpox
   b. A patient with suspected disseminated shingles
   c. A patient with suspected active TB disease
   d. All of these
   e. None of these

Correct answer: D
Rationale: Patients with known or suspected airborne diseases should be placed on Airborne Precautions.

7. Non-immune healthcare workers should be vaccinated against:
   a. Measles
   b. Varicella
   c. Both of these
   d. Neither of these

Correct answer: C
Rationale: Both measles and varicella vaccination are recommended for non-immune workers.

8. You are reviewing staff records and questionnaires. Based on your review, you will recommend MMR vaccine to appropriate staff. None of these staff members has had a blood test for measles immunity. You are likely to recommend MMR vaccine to:
   a. Linda, born in 1968. Her staff record contains documentation of measles diagnosed by an M.D.
   b. Jack, born in 1962. On his questionnaire, he reports that he was immunized as a child. He has never had measles.
   c. Andrew, born in 1950. His staff record shows that he was vaccinated against measles when he started work at your hospital.
   d. All of these staff members
9. SARS-CoV is most commonly spread by the airborne route.
   a. True
   b. False
   Correct answer: B
   Rationale: SARS-CoV is transmitted primarily by contact and droplet. Airborne transmission could be possible. Therefore, all patients with confirmed or strongly suspected SARS should be placed on Airborne Precautions.

10. Droplet Precautions protect against both airborne and droplet transmission.
   a. True
   b. False
   Correct answer: B
   Rationale: Droplet Precautions do not add anything to Airborne Precautions. Airborne Precautions protect against airborne and droplet transmission.

11. Suppose smallpox is diagnosed in a large number of civilians in one part of the world. This probably means that:
   a. Smallpox is being used as a biological weapon.
   b. Endemic smallpox has reentered the human population from an animal source.
   c. Drug-sensitive strains of smallpox have mutated to drug-resistant forms.
   d. Smallpox is spreading rapidly among hospitalized patients with weakened immune systems.
   Correct answer: A
   Rationale: Smallpox is no longer an endemic pathogen. Today, smallpox could be used as a biological weapon.

12. Which of the following signs and symptoms call for Airborne Precautions?
   d. All of these answers.
   e. None of these answers.
   Correct answer: C
Rationale: Only patients with active TB disease can spread TB. All three of these patients have evidence of TB infection. However, only the patient with cough, fever, and chills has evidence of active TB disease. Therefore, only this patient should be placed on Airborne Precautions.

13. Under OSHA’s *TB Enforcement Policy*, healthcare employers must provide:
   - Protocols for quickly identifying and isolating patients with TB disease
   - TB screening for employees, at no cost to the employee
   - Medical evaluation for employees who have positive TB skin tests, at no cost to the employee
   - All of these answers
   - None of these answers

Correct answer: D
Rationale: Under the *TB Enforcement Policy*, healthcare employers must provide all of these items.

14. Under OSHA’s *TB Enforcement Policy*, healthcare workers must wear respiratory protection when they:
   - Enter a TB isolation room
   - Perform bronchoscopy on a patient with TB
   - Provide ambulance transportation for a patient with TB
   - All of these answers
   - None of these answers

Correct answer: D
Rationale: OSHA requires respiratory protection during all of these activities.

15. Chickenpox, smallpox, and shingles are all caused by:
   - Bacteria
   - Viruses
   - Fungi
   - Parasites

Correct answer: B
Rationale: Chickenpox, smallpox, and shingles are all viral diseases.
Final Exam

1. A patient is admitted to the hospital with diagnosed TB disease. This patient should be placed on Airborne Precautions _______ Standard Precautions.

   A. Instead of
   B. In addition to
   C. As an alternative to
   D. After the expiration of

Correct Answer: B In addition to

Answer Rationale: Standard Precautions are for all patients. When needed, Airborne Precautions are always in addition to Standard Precautions.

2. Droplet nuclei are:

   A. Less than five microns across
   B. Formed when respiratory droplets evaporate
   C. Able to remain suspended in the air for long periods of time
   D. All of these answers
   E. None of these answers

Correct Answer: D All of these

Answer Rationale: All of these are true of droplet nuclei.

3. To cohort patients:

   A. Keep all patients separate.
   B. Keep all infectious patients together in one area of the hospital.
   C. Keep patients with the same active infection together in the same area. These patients must have no other infections.
   D. Keep all patients with infections spread by the same route (airborne, droplet, or contact) together in the same area. These patients must have no other infections.

Correct Answer: C Keep patients with the same active infection together in the same area. These patients must have no other infections.

Answer Rationale: Cohorting means keeping patients with the same active infection together. These patients must have no other active infections.
4. Which of the following statements is (are) true?
   A. Immune healthcare workers do not need to wear certified respiratory protection when they enter a measles isolation room.
   B. Non-immune healthcare workers should not enter a measles isolation room if immune staff members are available.
   C. A surgical mask is not a certified respiratory protection for healthcare workers who enter a measles isolation room.
   D. Non-immune healthcare workers must wear certified respiratory protection when they enter a measles isolation room.
   E. All of the above

Correct Answer: E All of the above

Answer Rationale: All of these statements are true.

5. You can help prevent the spread of VZV within your facility by doing all of the following EXCEPT:
   A. Not going to work if you have chickenpox
   B. Getting the varicella vaccine if you have never had chickenpox
   C. Following Airborne Precautions for all patients with chickenpox
   D. Using standard precautions for patients with disseminated shingles
   E. None of these answers

Correct Answer: D Using standard precautions for patients with disseminated shingles

Answer Rationale: Standard Precautions alone will not prevent the spread of disseminated shingles. Patients with disseminated shingles should be placed on Airborne Precautions in addition to Standard Precautions.

6. Less than 1% of all measles cases have complications.

   A. True
   B. False

Correct Answer: B False

Answer Rationale: Complications occur in approximately 30% of reported cases of measles.

7. A patient is admitted to your facility. This patient has pneumonia visible on x-ray. The patient should immediately be placed on:
   A. Droplet Precautions only
   B. Airborne Precautions only
   C. Standard Precautions only
   D. Standard and Droplet Precautions
   E. Standard and Airborne Precautions
Correct Answer: D Standard and Droplet Precautions

Answer Rationale: All admitted patients are placed on Standard Precautions. Patients with pneumonia visible on x-ray also should be placed on Droplet Precautions and screened for SARS-CoV risk factors.

8. What is the death rate for unvaccinated patients who get smallpox?

   A. 3%
   B. 13%
   C. 30%
   D. 63%

Correct Answer: C 30%

Answer Rationale: Smallpox death rates are 30% for unvaccinated patients and 3% for vaccinated patients.

9. Smallpox is a _____ disease.

   A. Bacterial
   B. Viral
   C. Fungal
   D. Parasitic

Correct Answer: B Viral

Answer Rationale: Smallpox is a viral disease.

10. TB can be spread by a patient with:

    A. Latent TB infection
    B. Active TB disease
    C. Either of these
    D. Neither of these

Correct Answer: B Active TB disease

Answer Rationale: Only patients with active TB disease can spread TB.
11. Under OSHA standards, respirators used to protect healthcare workers from TB must be:
   A. Fit-tested
   B. Fit-checked
   C. Both of these answers
   D. Neither of these answers

Correct Answer: Both of these answers

Answer Rationale: C OSHA requires fit-testing and fit-checking for respirators.

12. A patient on Airborne Precautions should be placed in a private room with monitored positive air pressure.
   A. True
   B. False

Correct Answer: B False.

Answer Rationale: Rooms of patient on Airborne Precautions should have monitored negative air pressure.

13. Patients on Airborne Precautions should not be transported unless absolutely necessary.
   A. True
   B. False

Correct Answer: A True

Answer Rationale: Patients on Airborne Precautions should not be transported unless absolutely necessary to reduce the chance of infection transmission.

14. Airborne Precautions protect against both airborne and droplet transmission.
   A. True
   B. False

Correct Answer: A True

Answer Rationale: Droplet Precautions do not add any additional protection against transmission.

15. Which pathogen cannot be spread by the airborne route?
A. VZV  
B. Measles  
C. SARS  
D. Polio

Correct Answer: D Polio  
Rationale: All of the others may be spread via the airborne route.