

**WHY US?**  
**LEFT BEHIND AND DYING**

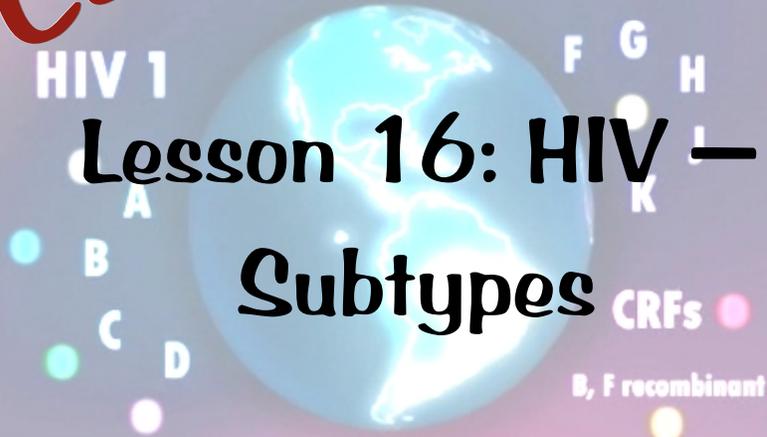


**Video Curriculum Modules**

HIV 1

**Lesson 16: HIV —**

**Subtypes**



*Subtype B is found most often in  
America and Western Europe*

**LEARNING WAS NEVER LIKE THIS**



## Lesson 16: Subtypes

### Standards:

#### Health:

3.12.1

#### Science:

1.2

2.1

2.2

2.4

2.5

4.3

4.4

7.5

7.6

#### Skills Practiced and Gained:

1.1—1.7

2.1—2.5

### Overview

HIV is a retrovirus—replicates in the host cell—and mutates very rapidly. These mutations can be either weaker versions or more disastrously, stronger versions that are resistant to current drug treatments. This rapid mutation is partly why HIV/AIDS has been so catastrophic. There are two major types of HIV, 1 and 2. Each major type is broken down by groups and then within a group there are subtypes. So, for example, HIV-1, cause of the global pandemic, has four groups: M for major; O for outlier; N for non-M or non-O; and P for new discoveries that have not been classified. Group M has over ten subtypes; Subtype C, found mostly in Africa and India, is considered most infectious. The video module, “*Subtypes*,” examines HIV, its subtypes and the speed at which it mutates.

### Key Concepts

Retroviruses

Types of HIV, groups and subtypes

Mutation



### Materials for Activities and Educator Background Knowledge

**Reading 16.1:** Background material on immune system (excerpted from KidsHealth.org; online version has audio clips of the material and Spanish version) [http://kidshealth.org/teen/flu\\_center/about\\_flu/immune.html](http://kidshealth.org/teen/flu_center/about_flu/immune.html)

There are two videos that you will want to view:

<http://www.youtube.com/watch?v=X3dSYA64ZRc> (video explaining two types of viral mutations)

<http://video.about.com/pediatrics/Vaccination.htm> (video on how vaccinations work)



## Procedure

### *Part I*

Combating a disease that mutates quickly is very difficult. Many diseases have been reduced through vaccines. This reduction by vaccine is due to the virus remaining genetically the same. Other viruses are more difficult to reduce. HIV is one such virus that scientists still struggle to subdue. View “*Subtypes*” video module. After viewing the module use the following questions to facilitate group discussion or give the questions as prompts for journal entries.

### *Discussion / Journal Questions*

- 1) **W**hat new information did you gather from the video module?
- 2) **W**hat are the factors that make HIV a difficult virus to combat? What might be the connection between subtypes and the spread of the virus? How do these factors contribute to the high rates of HIV/AIDS in African and African American communities?
- 3) **W**hat other questions or comments do you have?

### *Part II*

No virus has ever been truly “cured” in medical history – once someone has a disease. Some diseases have become insignificant dangers, however, due to effective treatments that get rid of the disease once

someone has it (some cancers through chemotherapy), treatments that get rid of most of the disease, allowing for the body to recover and become immune to it (diseases like tuberculosis and bubonic plague through antibiotics), and vaccines that prevent people from getting sick from and transmitting the disease (small pox and polio through vaccines).





## *Part II (continued)*

When it comes to viruses, vaccines are the most promising way to manage the disease. Some viruses are easier to make vaccines for and others are more difficult due to mutation rates. All living organisms and viruses make mistakes in copying its DNA. There are correcting mechanisms in place to lessen the chance of mutations in more complex organisms like humans, dogs, horses, etc., so mutations don't happen very frequently. However, simpler organisms and viruses make mistakes more often, resulting in a slightly different variation. When it comes to HIV, these mutations happen very quickly, increasing the difficulty in developing vaccines to combat the virus and disease.

### *Activity 16.1*

Examine the interaction between the immune system, HIV, and mutations; deliberate on this interaction and the potential for a vaccine.

1. Learn about the immune system through the background reading, either in print or online. *Reading 16.1*
2. Make note of the fact that HIV attacks the helper T Cells specifically. Ask students/participants why this target makes HIV especially dangerous. Explain that an HIV infection becomes AIDS once the body's T Cell count has become so low that the body is unable to fight off other diseases. AIDS related deaths are not due to the HIV infection itself, but rather due to a common infection the body would have been able to fight off were it not for the weakened immune system.
3. Watch the video on how vaccines work. Knowing that vaccines are weakened or broken up versions of the cause of the disease, ask students/participants to discuss why the various subtypes of HIV would make developing a vaccine more difficult.
4. Watch the video on how mutations occur. Explain to students/participants that HIV mutates so quickly that it can become a different virus entirely in the course of ONE PERSON's infection (the subtype that infected the individual would not look exactly the same later on in the infection). Furthermore, if two people who are infected with HIV are exposed to each other's virus, there is an even greater likelihood that a third and different virus will develop as a result of the interaction. Knowing the high mutation rates of HIV, ask students/participants to discuss why HIV vaccines would be even more difficult to develop.

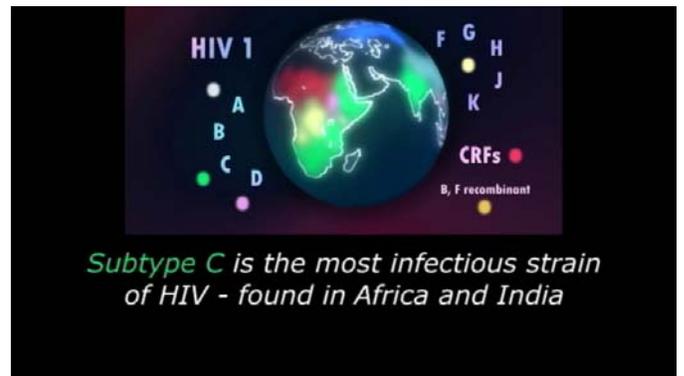


## Closure

Vaccines, though a powerful and promising tool of science in disease prevention, are not the only way to prevent the transmission of HIV.

Use the following questions to facilitate group discussion or give the questions as prompts for journal entries.

1. **W**hat are some ways to prevent transmission?
2. **W**hy is HIV testing so crucial?
3. **D**oes understanding HIV subtypes and mutability change your thoughts about how you might act? Why or why not?





## Reading 16.1

### Immune System

(excerpted from [http://kidshealth.org/teen/flu\\_center/about\\_flu/immune.html#](http://kidshealth.org/teen/flu_center/about_flu/immune.html#))

Whether you're stomping through the showers in your bare feet after gym class or touching the bathroom doorknob, you're being exposed to germs. Fortunately for most of us, the immune system is constantly on call to do battle with bugs that could put us out of commission.

#### What Is the Immune System and What Does It Do?

The immune (pronounced: ih-myoon) system is the body's defense against infectious organisms and other invaders. Through a series of steps called the immune response, the immune system attacks organisms and substances that invade our systems and cause disease. The immune system is made up of a network of cells, tissues, and organs that work together to protect the body.

The cells that are part of this defense system are white blood cells or leukocytes (pronounced: loo-kuh-sytes). They come in two basic types, which combine to seek out and destroy the organisms or substances that cause disease.

The phagocytes (pronounced: fah-guh-sytes) are cells that chew up invading organisms.

The lymphocytes (pronounced: lim-fuh-sytes) are cells that allow the body to remember and recognize previous invaders and help the body destroy them.

There are two kinds of lymphocytes: the B lymphocytes and the T lymphocytes. B lymphocytes are like the body's military intelligence system, seeking out their targets and sending defenses to lock onto them. T cells are like the soldiers, destroying the invaders that the intelligence system has identified. Here's how it works.

A foreign substance that invades the body is called an antigen (pronounced: an-tih-jun). When an antigen is detected, several types of cells work together to recognize and respond to it. These cells trigger the B lymphocytes to produce antibodies (pronounced: an-tye-bah-deez). Antibodies are specialized proteins that lock onto specific antigens. Antibodies and antigens fit together like a key and a lock.

Once the B lymphocytes recognize specific antigens, they develop a memory for the antigen and will immediately produce antibodies the next time the antigen enters a person's body. That's why if someone gets sick with a certain disease, like chickenpox, that person typically doesn't get sick from it again.

This is also why we use immunizations to prevent certain diseases. The immunization introduces the body to the antigen in a way that doesn't make a person sick, but it does allow the body to produce antibodies that will then protect that person from future attack by the germ or substance that produces that particular disease.



## Reading 16.1

Although antibodies can recognize an antigen and lock onto it, they are not capable of destroying it without help. That is the job of the T cells. The T cells are part of the system that destroys antigens that have been tagged by antibodies or cells that have been infected or somehow changed. (There are actually T cells that are called "killer cells.") T cells are also involved in helping signal other cells (like phagocytes) to do their jobs.

All of these specialized cells and parts of the immune system offer the body protection against disease. This protection is called immunity.

### **Immunodeficiency Disorders**

Immunodeficiencies (pronounced: ih-myoon-o-dih-fih-shun-seez) occur when a part of the immune system is not present or is not working properly. Sometimes a person is born with an immunodeficiency — these are called primary immunodeficiencies. (Although primary immunodeficiencies are conditions that a person is born with, symptoms of the disorder sometimes may not show up until later in life.) Immunodeficiencies can also be acquired through infection or produced by drugs. These are sometimes called secondary immunodeficiencies.

Primary immunodeficiencies can affect B lymphocytes, T lymphocytes, or phagocytes. The most common immunodeficiency disorder is IgA deficiency, in which the body doesn't produce enough of the antibody IgA, an immunoglobulin found primarily in the saliva and other body fluids that help guard the entrances to the body. People with IgA deficiency tend to have allergies or get more colds and other respiratory infections, but the condition is usually not severe.

Acquired (or secondary) immunodeficiencies usually develop after a person has a disease, although they can also be the result of malnutrition, burns, or other medical problems. Certain medicines also can cause problems with the functioning of the immune system.

HIV (human immunodeficiency virus) infection causes AIDS (acquired immunodeficiency syndrome), which is a secondary immunodeficiency. This disease slowly and steadily destroys the immune system. HIV wipes out certain types of lymphocytes called T-helper cells. Without T-helper cells, the immune system is unable to defend the body against normally harmless organisms, which can cause life-threatening infections in people who have AIDS.

Newborns can get HIV infection from their mothers while in the uterus, during the birth process, or during breastfeeding. Teens and adults can get HIV infection by having unprotected sexual intercourse with an infected person or from sharing contaminated needles for drugs, steroids, or tattoos.