

# Human Immunodeficiency Virus (HIV)

## **Course**

*Health Science*

## **Unit VIII**

*Strategies for  
the Prevention  
of Diseases*

## **Essential Question**

*How does HIV  
infect the body?*

## **TEKS**

*130.204 (c)  
1F, 12A, 12B,  
12C*

## **Prior Student Learning**

*Introduction to  
microorganisms  
& infectious  
diseases*

## **Estimated time**

*3-6 hours*

## **Rationale**

HIV is the human immunodeficiency virus. It is the virus that can lead to acquired immune deficiency syndrome, or AIDS. CDC estimates that about 56,000 people in the United States contracted HIV in 2006.

## **Objectives**

Upon completion of this lesson, the student will be able to:

- understand that some diseases are caused by viruses;
- understand the HIV disease process;
- understand how HIV is transmitted;
- understand how to prevent HIV;
- recognize misconceptions about HIV, and
- understand the importance of HIV testing.

## **Engage**

*How is HIV transmitted?*

As a group, talk about each of the following and decide if HIV could be transmitted through each example:

- blood transfusion,
- breastfeeding,
- donating blood,
- handshakes,
- hugging,
- insect bites,
- kissing,
- oral sex,
- pregnancy (from mother to baby),
- protected sexual intercourse,
- sharing food,
- sharing needles, and
- unprotected sexual intercourse

## **Key Points**

I. What is HIV?

- A. HIV is the human immunodeficiency virus. It is the virus that can lead to acquired immune deficiency syndrome, or AIDS.
- B. HIV damages a person's body by destroying specific blood cells, called CD4+ T cells, which are crucial to helping the body fight

diseases.

C. HIV does not live long outside the body.

D. There is no cure for HIV at this time.

## II. How is HIV spread?

A. Not using a condom when having sex with a person who has HIV  
All unprotected sex with someone who has HIV contains some risk

B. Having multiple sex partners or the presence of other sexually transmitted diseases (STDs) can increase the risk of infection during sex. Unprotected oral sex can also be a risk for HIV transmission, but it is a much lower risk than anal or vaginal sex.

C. Sharing needles, syringes, rinse water, or other equipment used to prepare illicit drugs for injection

D. Being born to an infected mother -- HIV can be passed from mother to child during pregnancy, birth, or breast-feeding

## III. HIV Misconceptions – Way You Cannot Contract HIV

A. HIV is not transmitted by day-to-day contact in the workplace, schools, or social settings. HIV is not transmitted through shaking hands, hugging, or a casual kiss. You cannot become infected from a toilet seat, a drinking fountain, a door knob, dishes, drinking glasses, food, or pets.

B. HIV is not transmitted by insects.

## IV. Which body fluids transmit HIV?

A. These body fluids have been shown to contain high concentrations of HIV:

1. blood
2. semen
3. vaginal fluid
4. breast milk
5. other body fluids containing blood

B. The following are additional body fluids that may transmit the virus and that health care workers may come into contact with are:

1. spinal fluid-surrounding the brain and the spinal cord
2. synovial fluid-surrounding bone joints
3. amniotic fluid-surrounding an unborn baby

## V. Where did HIV come from?

A. The earliest known case of infection with HIV-1 in a human was detected in a blood sample collected in 1959 from a man in Kinshasa, Democratic Republic of the Congo. (How he became infected is not known.) Genetic analysis of this blood sample suggested that HIV-1 may have stemmed from a single virus in the

late 1940's or early 1950's.

- B. The virus has existed in the United States since at least the mid-to late 1970's. From 1979–1981 rare types of pneumonia, cancer, and other illnesses were being reported by doctors in Los Angeles and New York among a number of male patients who had sex with other men. These were conditions not usually found in people with healthy immune systems.
- C. In 1982, public health officials began to use the term "acquired immunodeficiency syndrome," or AIDS, to describe the occurrences of opportunistic infections, Kaposi's sarcoma (a kind of cancer), and *Pneumocystis jirovecii* pneumonia in previously healthy people. Formal tracking (surveillance) of AIDS cases began that year in the United States.
- D. In 1983, scientists discovered the virus that causes AIDS. The virus was at first named HTLV-III/LAV (human T-cell lymphotropic virus-type III/lymphadenopathy-associated virus) by an international scientific committee. This name was later changed to HIV (human immunodeficiency virus).
- E. For many years scientists theorized as to the origins of HIV and how it appeared in the human population, most believing that HIV originated in other primates. Then in 1999, an international team of researchers reported that they had discovered the origins of HIV-1, the predominant strain of HIV in the developed world. A subspecies of chimpanzees native to west equatorial Africa had been identified as the original source of the virus. The researchers believe that HIV-1 was introduced into the human population when hunters became exposed to infected blood.

## VI. HIV Testing

- A. The most common HIV tests use blood to detect HIV infection. Tests using saliva or urine are also available. Some tests take a few days for results, but rapid HIV tests can give results in about 20 minutes. All positive HIV tests must be followed up by a high complexity confirmatory test. This may be performed using molecular testing. Results of this confirmatory test can take a few days to a few weeks.
- B. Many places provide testing for HIV infection. Common testing locations include local health departments, clinics, offices of private doctors, hospitals, and other sites set up specifically to provide HIV testing. You can also ask your health care provider about getting tested.
- C. Ninety-seven percent of persons will develop antibodies in the first 3 months following the time of their infection. In very rare cases, it can take up to 6 months to develop antibodies to HIV.

(Important to note during discussion that a negative result for HIV testing does not mean that you do not have HIV if you have been involved with risky behavior. Testing should occur at intervals.)

- D. CDC recommends that everyone between the ages of 13 and 64 should be screened for HIV at least once in their lifetime and more often if they are at risk for HIV.

#### VII. Treatment Options

- A. Medications used to treat HIV infection (antiretroviral drugs) help many people with HIV to lower the levels of virus in their blood (viral load) to undetectable levels.

#### VIII. Health care workers and HIV

- A. The risk of health care workers being exposed to HIV on the job is very low, especially if they carefully follow universal precautions (i.e., using protective practices and personal protective equipment to prevent HIV and other blood-borne infections).
- B. It is important to remember that casual, everyday contact with an HIV-infected person does not expose health care workers or anyone else to HIV.
- C. For health care workers on the job, the main risk of HIV transmission is through accidental injuries from needles and other sharp instruments that may be contaminated with the virus; however, even this risk is small.
- D. Protocol for possible exposure is determined by the infection control department of the hospital. The health care worker is usually tested for HIV over a period of one year at three month intervals to determine if an HIV infection has occurred through exposure.

#### **Activity**

- I. Complete the Spread of Disease Laboratory Investigation.
- II. Complete the HIV project.

#### **Assessment**

HIV Quiz  
Laboratory Investigation Rubric

#### **Materials**

<http://www.cdc.gov/hiv/resources/qa/definitions.htm>

HIV Quiz Key

Invite an epidemiologist to speak to the class about disease transmission

Disposable pipettes with bulb

Test tubes with lids

Phenolphthalein

0.001 M HCl (stock solution for noncarriers)

$$(M_{\text{Concentrated HCl}} \times V_{\text{Concentrated HCl}} = M_{\text{Dilute HCl}} \times V_{\text{Dilute HCl}})$$

Example: If you need 1L of 0.001M HCl, the equation would be as follows:

- $M_1V_1 = M_2V_2$
- $0.001 \times 1 = 0.1 \times V_2$
- $V_2 = 0.01\text{L} = 10\text{mL}$
- Take the 10mL to 0.1M HCl and add enough water to 1L in a graduated cylinder

0.1 M NaOH (stock solution of the carrier) (See above calculation to make NaOH)

Safety goggles

Lab apron

Gloves

Biohazard containers

Surface disinfectant

Paper towels

### **Accommodations for Learning Differences**

For reinforcement, the student will develop a time line for HIV. Include incubation, signs and symptoms, diagnosis, prognosis and treatment.

For enrichment, the student will research and report on an individual HIV drug and its history, including drugs that are still in clinical trials.

### **National and State Education Standards**

National Health Science Cluster Standards

HLC02.01

Health care workers will know the various methods of giving and obtaining information. They will communicate effectively, both orally and in writing.

HLC06.02

Health care workers will understand the fundamentals of wellness and the prevention of disease processes. They will practice preventive health behaviors among their clients.

### **TEKS**

130.204(c)(1)(F) explain the changes in structure and function due to trauma and disease;

130.204 (c)(12)(A) research wellness strategies for the prevention of disease;

130.204 (c)(12)(B) evaluate positive and negative effects of relationships on

physical and emotional health such as peers, family, and friends; and 130.204 (c)(12)(C) explain the benefits of positive relationships among community health professionals in promoting a healthy community.

## **Texas College and Career Readiness Standards**

### *English Language Arts*

- II. B. 1. Identify new words and concepts acquired through study of their relationships to other words and concepts.
- III. A. 2. Adjust presentation (delivery, vocabulary, length) to particular audiences and purposes.
- III. B. 1. Participate actively and effectively in one-on-one oral communication situations.
- III. B. 2. Participate actively and effectively in-group discussions.
- III. B. 3. Plan and deliver focused and coherent presentations that convey clear and distinct perspectives and demonstrate solid reasoning.
- IV. B. 3. Listen actively and effectively in group discussions.
- V. A. 3. Explore a research topic.
- V. B. 1. Gather relevant sources.
- V. B. 2. Evaluate the validity and reliability of sources.
- V. B. 3. Synthesize and organize information effectively.
- V. C. 1. Design and present an effective product.

### *Science*

- III. B. 3. Recognize scientific and technical vocabulary in the field of study and use this vocabulary to enhance clarity of communication.
- III. C. 1. Prepare and present scientific/technical information in appropriate formats for various audiences.
- III. D. 1. Use search engines, databases, and other digital electronic tools effectively to locate information.
- IV. B. 1. Understand how scientific research and technology have an impact on ethical and legal practices.
- X. E. 5. Understand how human practices affect air, water, and soil quality.

### *Social Studies*

- I. A. 2. Analyze the interaction between human communities and the environment.

### *Cross-Disciplinary*

- I. A. 1. Engage in scholarly inquiry and dialogue.
- I. E. 1. Work independently.
- I. E. 2. Work collaboratively.



# HIV QUIZ – Key

**1. What is HIV?**

HIV is the human immunodeficiency virus. It is the virus that can lead to acquired immune deficiency syndrome, or AIDS.

**2. List three ways HIV is transmitted.**

Any of the following three responses:

- a. Not using a condom when having sex with a person who has HIV.
- b. Having multiple sex partners or the presence of other sexually transmitted diseases (STDs) can increase the risk of infection during sex. Unprotected oral sex can also be a risk for HIV transmission.
- c. Sharing needles, syringes, rinse water, or other equipment used to prepare illicit drugs for injection.
- d. Being born to an infected mother—HIV can be passed from mother to child during pregnancy, birth, or breast-feeding.

**3. Where can a person go to get an HIV test?**

Many places provide testing for HIV infection. Common testing locations include local health departments, clinics, offices of private doctors, hospitals, and other sites set up specifically to provide HIV testing.

**4. Who should be tested?**

CDC recommends that everyone between the ages of 13 and 64 should be screened for HIV at least once in their lifetime and more often if they are at risk for HIV.

**5. List three body fluids have been shown to contain high concentrations of HIV.**

Any of the following three responses:

- a. Blood
- b. Semen
- c. vaginal fluid
- d. breast milk
- e. other body fluids containing blood

**6. What is the cure for HIV?**

There is no cure for HIV at this time.

**7. True or False** HIV is the virus that causes AIDS. **True**

**8. True or False** An infected mother can pass HIV to her unborn baby. **True**

**9. True or False** Mosquitoes can transmit HIV. **False**

**10. True or False** You might get infected with HIV if you sit next to an infected person on the bus. **False**

# Spread of Disease Laboratory Investigation

## Purpose:

In this lab you will show how a disease may be spread throughout a population. One student will be the original carrier of a “disease.” This disease is perfectly harmless, if handled properly. You will carry it in a test tube, rather than in your body. The original carrier will make contact with several students in the class who will then make contact with others. All the students will be tested to see who has become infected.

## Background Information:

For the teacher: Upon exchange of fluids from one test tube to another there will be a mixture of acid/base solution in some students’ test tubes. Phenolphthalein will turn red or pink in the presence of a basic solution; therefore, the “infected” students will have a red or pink color in their solution if they have had a base added to their acid solution.

## Materials:

Disposable pipettes with bulb

Test tubes with lids

Phenolphthalein

0.001 M HCl (stock solution for noncarriers)

$(M_{\text{Concentrated HCl}} \times V_{\text{Concentrated HCl}} = M_{\text{Dilute HCl}} \times V_{\text{Dilute HCl}})$

Example: If you need 1L of 0.001M HCl, the equation would be as follows:

- $M_1V_1 = M_2V_2$
- $0.001 \times 1 = 0.1 \times V_2$
- $V_2 = 0.01\text{L} = 10\text{mL}$
- Take the 10mL to 0.1M HCl and add enough water to 1L in a graduated cylinder

0.1 M NaOH (stock solution of the carrier) (See above calculation to make NaOH)

Safety goggles

Lab apron

Gloves

Biohazard containers

Surface disinfectant

Paper towels

**Procedure:**

Strong acids and bases can cause bad burns especially to eye membranes. They can also damage clothing, floor tiles, tables, etc. Therefore, strong acids and bases must be handled carefully and all safety precautions must be followed.

Phenolphthalein is a pH indicator that turns red or pink in the presence of a basic solution.

1. Wash hands and put on gloves and goggles.
2. Assemble equipment and materials.
3. Prepare work area.
4. Choose a partner at random.
5. Remove one pipette full of solution from your test tube and empty it into your partner's. Repeat for partner.
6. Place the lid on your test tube and gently invert the test tube several times.
7. In the individual data table record the name of the person with whom solutions were exchanged.
8. Repeat steps 4 – 7 two more times, each time with a different partner.
9. When solutions have been exchanged with three different partners, add a few drops of phenolphthalein to your test tube to see if you are “infected” with the “disease.” If the solution turns red you are “infected.” If the solution remains clear, you are “not infected.”
10. Complete the class data table using information from others in your class.
11. Wash all test tubes and caps thoroughly with soap and water. Rinse thoroughly.
12. Return all stock solutions to their proper location in the lab.
13. Clean work area with surface disinfectant. Remove goggles and gloves and wash hands.



**Conclusion:**

1. What is the maximum number of people that could test positive after three rounds of contact?
2. How many rounds would it take for everyone in the class to become “infected”?
3. Was there any outward indication of those who were “infected”?
4. Explain why the lack of outward signs of disease could be so dangerous.
5. Predict how a transmission could be prevented.

# Laboratory Investigation Rubric

Student: \_\_\_\_\_

Course: \_\_\_\_\_

Date: \_\_\_\_\_

<b>Scoring Criteria</b>	<b>4 Excellent</b>	<b>3 Good</b>	<b>2 Needs Some Improvement</b>	<b>1 Needs Much Improvement</b>	<b>N/A</b>
Problem is appropriately identified					
Problem is precise, clear, and relevant					
Association between the problem and the predicted result is direct and relevant					
All variables are clearly operationalized					
Student demonstrates comprehension of the use of scientific concepts and vocabulary					
All significant data is measured.					
Data is recorded effectively and efficiently					
Data table is well designed to the task requirements					
Conclusion relates directly to hypothesis					
Conclusion has relevancy in resolution of the original problem					
Conclusion relates the study to general interest					

# HIV Project

The following information should be included in an oral presentation:

<b>Scoring Criteria</b>	<b>Points Worth</b>	<b>Points Earned</b>
<b>Origin and history of HIV</b>	0-15 points	
<b>Description of HIV</b>	0-20 points	
a. transmission		
b. signs		
c. symptoms		
d. stages		
e. treatment		
f. prognosis		
<b>How specific factors contribute to HIV</b>	0-20 points	
a. age		
b. gender		
c. environment		
d. lifestyles		
e. heredity		
<b>Current research and findings</b>	0-10 points	
<b>Clearly and effectively communicates information in oral presentation.</b>	0-15 points	
<b>At least one visual aid relating to HIV</b>	0-10 points	
<b>Follows Instructions:</b>		
• project submitted on time		
• grammatically correct		
• neat	0-10 points	
<b>TOTAL POINTS:</b>	Up to 100 points	