

Advisement Teacher & Room # _____

Biology Tutorial #21

Student Name _____ Tutor: _____

Biology Teacher's Name _____ Period _____

CA State Standard 10e: Students know why an individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign.

A **virus** is made of DNA or RNA surrounded by a protein coat. It contains no cell parts and requires a host cell in which to reproduce. In the cell, the DNA code is read to make RNA which is then used as the code for the construction of proteins. In other words, the normal flow of genetic information in the cell is usually

DNA → RNA → protein.

The HIV virus, on the other hand, is a **retrovirus**. Its genetic material is made of RNA. It has to insert its genetic code into that of the host cell in order to replicate. To achieve this it must first make a DNA copy so that it is compatible with the DNA of the host cell. DNA is then made using the viral RNA and then inserted into the host DNA.

RNA → DNA → insertion → make HIV viruses

Diseases can compromise, or weaken, the immune system in several ways. Some may attack the bone marrow, where white blood cells are made. An example is leukemia, which is cancer of the bone marrow. **Leukemia** prevents white blood cells from developing properly. Abnormal white blood cells cannot fight infections. The disease **Myasthenia gravis** blocks receptors in muscle that cause progressive muscle weakening. **Lupus** can attack many different tissues causing a variety of symptoms including rashes, kidney damage, and light sensitivity.

Other diseases, such as a **human immunodeficiency virus (HIV)** infection, attack the immune system itself. HIV eventually causes acquired immune deficiency syndrome (AIDS). Over time people with AIDS die from infections that the immune system can no longer fight.

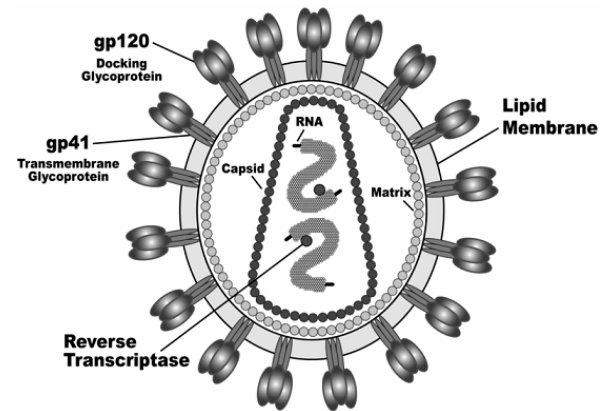
HIV does not survive for long outside of the human body. It **can only be spread** by direct contact with blood or body fluids that contain the virus. Once the virus enters a person's bloodstream, that person is infected with HIV. HIV targets T-cells of the immune system.

T-cells are important in "directing and fighting" during an immune response, or when your body detects a pathogen. When HIV enters T cells, the T cells can no longer fight infections. Instead, the T cells become hosts in which the virus reproduces at a rapid rate. HIV also kills off T cells. Thus HIV in the body increases in number at the same time the number of T cells decreases (see graph next page). After a period of time, a person will begin to experience symptoms of HIV infection. The person develops AIDS when the immune system no longer functions as it should and cannot fight off other infections.

An **opportunistic infection** is an infection that a person with a healthy immune system would be able to fight. People with leukemia, HIV, and AIDS suffer from opportunistic infections because their immune systems are very weak. They cannot fight viral infections, pneumonia, or cancers, for example. AIDS is fatal because the body loses its ability to fight these opportunistic infections.

Answer the following questions:

1. Describe a typical virus:
2. Describe the normal flow of genetic information:



3. Describe how retrovirus genetic information flows:
4. Explain what leukemia is and how it weakens the immune system:
5. List 3 other diseases that can weaken the immune system:
6. How do opportunistic infections affect someone with HIV/AIDS? Explain your answer:
7. A patient with an HIV infection has a very low T cell count. The patient also has diseases such as pneumonia and tuberculosis. Which statement best describes the patient's condition?
 - A) The patient's T cells are numerous and very healthy.
 - B) The patient probably has AIDS resulting from HIV infection.
 - C) The patient has had an HIV infection for only a few weeks.
 - D) The patient's B cells are still producing antibodies.
8. Which of the following is most likely a characteristic of a person with a weakened immune system?
 - A) T cells are very active in fighting infections.
 - B) The body replaces T cells as quickly as those cells die.
 - C) Opportunistic infections make the person very sick.
 - D) White blood cells produce many antibodies.
9. Which statement *best* describes AIDS?
 - A) AIDS is a pathogen that weakens the immune system.
 - B) AIDS is a retrovirus that contains RNA.
 - C) AIDS is a condition that results from having an HIV infection.
 - D) AIDS is a type of opportunistic infection.
10. In which of the following ways can HIV be transmitted?
 - A) through an insect bite, such as from a mosquito
 - B) through shaking hands with an infected person
 - C) through swimming in a pool with an infected person
 - D) through unprotected sexual activity with an infected person
11. The graph shows how the number of T cells and HIV changes over time in the blood of a person infected with HIV. How does HIV weaken the immune system?
 - A) HIV destroys T cells faster than the body can replace them.
 - B) HIV causes T cells to differentiate into different cells.
 - C) HIV causes no significant changes in T cell numbers.
 - D) HIV kills T cells without reproducing new viruses.

