Name:	Chemistry ✦ Life Science ✦ Earth & Space Science
The Chemistry of HIV and AIDS	**54**

Directions: Read the text below, then answer the text-dependent questions that follow.

The Chemistry of HIV and AIDS

Human Immunodeficiency Virus (HIV) is a virus that attacks the body's immune system, specifically targeting cells called CD4 cells or T-cells. These cells play a critical role in helping the body fight off infections. Without enough healthy T-cells, the body becomes vulnerable to diseases and infections, leading to Acquired Immunodeficiency Syndrome (AIDS) if the virus is left untreated.

How HIV Works on a Chemical Level

HIV is a retrovirus, meaning it stores its genetic information in the form of RNA instead of DNA. Once HIV enters the body, it attaches itself to a T-cell. This process is made possible by proteins on the virus's surface, like gp120, which bind to receptors on the T-cell. Once attached, the virus injects its RNA into the cell.

Inside the T-cell, HIV uses an enzyme called reverse transcriptase to convert its RNA into DNA. This is a unique step because most living organisms use DNA to make RNA, but HIV does the opposite. The newly formed viral DNA is then integrated into the T-cell's own DNA using another enzyme called integrase. This allows the virus to "hide" inside the cell and use the cell's machinery to create more copies of itself.

The Role of Enzymes and Proteins

Several enzymes and proteins are essential in the life cycle of HIV:

1. **Reverse Transcriptase:** Converts viral RNA into DNA.
2. **Integrase:** Helps insert the viral DNA into the host cell's DNA.
3. **Protease:** Cuts long protein chains into smaller pieces needed to assemble new viruses.

These enzymes are key targets for antiretroviral drugs, which are used to treat HIV. By blocking these enzymes, the drugs prevent the virus from multiplying and spreading to other cells.

Antiretroviral Therapy (ART)

Antiretroviral therapy (ART) is the treatment used to manage HIV infection. ART doesn't cure HIV, but it reduces the amount of virus in the body to very low levels. This helps the immune system stay strong and lowers the risk of transmitting the virus to others.

Most ART regimens include a combination of drugs that target different stages of the virus's life cycle. For example, reverse transcriptase inhibitors stop the virus from converting RNA to DNA, while protease inhibitors prevent the virus from assembling new infectious particles.

The Chemistry of HIV Testing

HIV tests often detect either antibodies produced by the immune system in response to the virus or the virus's genetic material itself. One common test is the ELISA (Enzyme-Linked Immunosorbent Assay) test, which uses enzymes to trigger a color change if HIV antibodies are present in a blood sample. Another test, the PCR (Polymerase Chain Reaction) test, detects the genetic material of the virus.

Conclusion

Understanding the chemistry of HIV and AIDS helps scientists develop better treatments and testing methods. While HIV remains a global health issue, advancements in medical science have made it possible for people with HIV to live long, healthy lives with proper treatment.

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Directions: Read the text below, then answer the text-dependent questions that follow.

1. **What type of virus is HIV, and what is unique about how it stores its genetic information?**

2. **Which cell in the immune system does HIV primarily target, and why is this significant?**

3. **Explain the role of reverse transcriptase in the life cycle of HIV.**

4. **How does integrase contribute to HIV's ability to reproduce within a host cell?**

5. **Why are enzymes like reverse transcriptase and protease important targets for antiretroviral drugs?**

6. **What is the purpose of antiretroviral therapy (ART), and how does it affect HIV in the body?**

7. **Describe how the ELISA test detects HIV in a blood sample.**

Scientific Literacy Article