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What You NEED to Know about HIV/AIDS

Lauren McClain
Otterbein University, lauren.mcclain@otterbein.edu

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HIV is a member of the lentivirus genus. These viruses are characterized by long latency period and progressive infection where the virus erodes the immune response of the host. The virus is transmitted through blood, semen, vaginal fluids, and breast milk. HIV infects cells in the immune system and the central nervous system. More specifically, HIV can infect CD4+ T cells, also known as T lymphocytes. T cells play a crucial role in the immune system to fight infection. Therefore, a significant reduction in T cells weakens the immune system. HIV is comprised of two antigens that are specific to the virus: gp120 and gp41. These two antigens bind with the immune system to initiate the infectious cycle (Moss, 2013). In order for the virus to survive and replicate, the virus must go through multiple stages.

1. Attachment: HIV transmission begins with the virus gp120 attaching to the T cell’s surface.
2. Penetration: After the virus is attached, the virus inserts into the T cell. Once inside, the capsid proteins are released, digestion and viral RNA enters the cytoplasm of the T cell.
3. Reverse Transcription: The HIV enzyme transcribes the viral RNA into single-stranded DNA. It is common for errors to occur in the process of transcribing the viral RNA. When this occurs HIV invades and destroys other T cells; the host immune system is weakened, which leads to the onset of AIDS (Moss, 2013).

During integration, the newly created HIV DNA moves into the T cell’s nucleus and is split into the host DNA. Once the viral DNA is integrated with the host’s DNA, the DNA is replicated using normal replication mechanisms.

Transcription: Next, HIV uses T cells to make copies of the virus. The viral RNA is used as a template for producing messenger RNA (mRNA). The mRNA produces viral proteins with ribosomes in the cell membrane that mutate and form into mature HIV. The mRNA also produces proteins that are specific to the virus, which includes the virion envelope (Moss, 2013).

Assembly: During assembly, viral proteins collect at the plasma membrane, and move together toward the cell surface. Building: When the virus reaches the cell surface, the virus breaks away from the host cell.

Maturatión: The cell does not mature until the HIV protease enzyme, which was produced during building, cuts the viral maturation proteins chains into their specific parts. This leads to a mature and functional HIV that is able to infect other T cells, and eventually HIV infects cells in the immune system, and the immune system responds to the virus by generating HIV antibodies and cytotoxic lymphocytes. The process of creating antibodies to a specific antigen is called seroconversion (Moss, 2013).

Stage I: The first stage of infection last only for a couple of months, it is common for the infected person to experience no symptoms and has a brief period of flu-like illness (AIDS.gov, 2015). During this time, there is a high amount of HIV in the blood, and the immune system responds to the virus by generating HIV antibodies and cytotoxic lymphocytes. The process of creating antibodies to a specific antigen is called seroconversion (Moss, 2013).

Stage II: After seroconversion is complete, the infected person will test positive for HIV. The clinical symptoms of AIDS have decreased in recent years. Individuals who have antibodies against HIV but do not have an HIV test, can be exposed to HIV and internalize the virus. Some HIV-infected people have developed such symptoms, however, the symptoms do not develop immediately (Moss, 2013).

Stage III - In the symptomatic HIV phase, HIV has significantly damaged the individual’s immune system. When lymphocyte counts drop below 200 cells/cu, the person is at risk for multiple infections. Opportunistic infections can include pneumonia, diarrhea, eye infections, and meningitis. Having a severely weakened immune system also increases the risk for various cancers. It is common for the individual to develop HIV-related cancer, which is characterized by rapid weight loss and weakness (Moss, 2013).

Stage IV - As the immune system becomes increasingly impaired, the individual will begin to experience the symptoms of AIDS. The symptomatic stage progresses from AIDS to HIV death in 12 years (Moss, 2013).