Acquired Immune Deficiency Syndrome (AIDS)

By Jennifer Osita

Disease

The disease I am studying is AIDS (Acquired Immune Deficiency Syndrome) which is when the immune system is too weak to fight off many infections. (1)

Etiologic agent

The etiologic agent for AIDS is HIV (Human immunodeficiency virus) which is when the virus destroys a type of white blood cell called a T-helper cell and makes copies of itself inside them. T-helper cells are also referred to as CD4 cells. (1)

Transmission

HIV is spread directly from person to person through certain body fluids-blood, semen (cum), pre-semenal fluid (pre-cum), rectal fluids, vaginal fluids, and breast milk. These fluids must come in contact with a mucous membrane or damaged tissue or be directly injected into the bloodstream (from a needle or syringe) for transmission to occur. Mucous membranes are found inside the rectum, vagina, penis, and mouth. HIV can also be spread from mother to child during pregnancy, birth, or breastfeeding which is less common. Lastly receiving blood transfusions, blood products, or organ/tissue transplants that are contaminated with HIV. This was more common in the early years of HIV, but now the risk is extremely small because of rigorous testing of the US blood supply and donated organs and tissues. (2)

Reservoirs
HIV is able to remain a chronic, life-long infection due to its ability to stay hidden within infected blood cells. Latent reservoirs of HIV are located throughout the body, including the brain, lymphoid tissue, bone marrow, and the genital tract. (3)

**General characteristics of Microorganism**

HIV is a retrovirus with a genome consisting of two identical RNA molecules linked in a dimeric structure. Retroviruses use an enzyme called reverse transcriptase to synthesize DNA that is then incorporated into the genome of the host cell, forming a provirus. HIV belongs to a subgroup known as lentiviruses (“slow” viruses) that have a long period of time between the initial infection and the onset of serious symptoms. HIV is a spherical virus with an envelope comprised of a lipid bilayer and surface glycoproteins, gp120 and gp41, that attach to host cell receptors, CD4 and CCR5. (4)

**Key tests for identification**

HIV is diagnosed by blood tests involving two or more positive ELISA (enzyme linked immunosorbent assay) tests that have been confirmed by a Western blot assay. The level of CD4+ helper T cells is counted as well. A normal CD4+ count is 800-1200 cells/mm³, but for people with HIV the count is usually under 350 cells/mm³ in HIV patients. AIDS is generally considered the state at which the CD4+ count drops below 200 cells/mm³. (4)

**Signs and symptoms of disease**

During the early stages of HIV signs and symptoms include fever, chill, night sweats, rash, muscle aches, sore throat, fatigue, swollen lymph nodes, and mouth ulcers. Then the virus undergoes a latent phase until it begins its progression to AIDS whom signs and symptoms include rapid weight loss, pneumonia, sores of the mouth, anal and genitals, memory loss, depression, and other neurologic disorders, red, brown, pink, or purplish blotches on or under the skin or inside the mouth, nose, or eyelids, recurring
fever or profuse night sweats, extreme and unexplained tiredness, prolonged swelling of the lymph glands in the armpits, groin, or neck, and diarrhea that lasts for more than a week. (5)

**Historical information**

In 1999, a strain of SIV (called SIVcpz) was found in a chimpanzee that was almost identical to HIV in humans. The most commonly accepted theory is that of the 'hunter'. In this scenario, SIVcpz was transferred to humans as a result of chimps being killed and eaten, or their blood getting into cuts or wounds on the human hunter. Their studies concluded that the first transmission of SIV to HIV in humans took place around 1920 in Kinshasa in the Democratic Republic of Congo (DR Congo). The area around Kinshasa is full of transport links, such as roads, railways and rivers. It also had a growing sex trade around this time. The high population of migrants and sex trade might explain how HIV spread along these infrastructure routes, firstly to Brazzaville by 1937. (6)

**Virulence factors**

HIV primarily attacks CD4+ helper T cells by recognizing and binding the CD4 receptor on the surface of the T cells. It can sometimes invade monocytes and macrophages as well since they also have some CD4 receptors on their surfaces. Tumor necrosis factor alpha (TNF-a) and interleukin-6 (IL-6) are secreted at higher levels in infected individuals, and this may help activate the HIV proviruses (latent viruses). HIV has a high mutation rate during replication with the reverse transcriptase, which is why it is able to readily evade our immune response. (4)

**Control/Treatment**

One proposed eradication strategy is to activate these latently infected cells in the continued presence of HAART. The rationale for the strategy is two-fold. By stimulating latently infected cells to replicate and express the virus, such cells will die more rapidly [HIV-induced cell death]. Once the cellular reservoirs begin producing HIV, the infected cells will be recognized by the immune system. The key to
this strategy is the simultaneous administration of an activating agent concurrently with HAART, and perhaps other therapies to prevent new or spreading infection. (3)

**Prevention/Vaccine information, new trials?**

The best way to prevent HIV is to practice safe sex and make sure you and your partner(s) are tested annually. Also, do not share needles. There is currently no vaccine that will prevent HIV infection or treat those who have it. As the lead National Institutes of Health (NIH) Institute for HIV vaccine research, NIAID conducts and/or supports vaccine clinical research primarily through the Vaccine Research Center and the NIAID-sponsored HIV Vaccine Trials Network. To date, NIAID has supported 143 vaccine trials involving 98 different products and 27 adjuvants. (7)

**Local cases or outbreaks (with incidence figures)**

An estimated number of 73,959 are living with HIV/AIDS in Texas as of 2016. An estimated number of 931,526 are living with HIV/AIDS in the United States. (8). In Travis County alone, it is said that someone in infected with HIV/AIDS every 35 hours alone, and as of now the total count of people living with this disease is at 4,138. (9)

**Global cases or outbreaks (with incidence figures)**

According to World Health Organization there were approximately 36.9 million people worldwide living with HIV/AIDS at the end of 2015. Of these, 2.6 million were children (<15 years old). Sub-Saharan Africa accounts for almost 70 percent of the global total of new HIV infections. (10)

**References**


Hyperlinks


2. [http://www.cdc.gov/hiv/basics/transmission.html](http://www.cdc.gov/hiv/basics/transmission.html)


4. [http://web.uconn.edu/mcbstaff/graf/Student%20presentations/HIV/HIV.html](http://web.uconn.edu/mcbstaff/graf/Student%20presentations/HIV/HIV.html)


7. [http://www.niaid.nih.gov/topics/HIVAIDS/Research/vaccines/Pages/clinical.aspx](http://www.niaid.nih.gov/topics/HIVAIDS/Research/vaccines/Pages/clinical.aspx)

8. [http://www.austincc.edu/microbio/2704y/hiv.htm](http://www.austincc.edu/microbio/2704y/hiv.htm)
