The Study of HIV

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Etiologic agent

HIV (Human Immunodeficiency Virus), also referred to as AIDS (Autoimmune Deficiency Syndrome) when it manifests itself in the body. HIV is a lentivirus (slowly replicating retrovirus). (1)

Historical information

Scientist track back the HIV virus to Chimpanzees living in West Africa around the early 1800’s. The virus carried by the chimps is called SIV (or Simian Immunodeficiency Virus) that mutated in the human body after ingestion causing what we know today as HIV. At that time, hunters ate infected Chimps and developed the disease. It spread across Africa, before becoming pandemic.

The first case of HIV-I was detected in Congo, in 1959 by taking samples of blood of the infected individual. The virus is thought to have come to America in the mid to late 1970’s. Many “healthy” individuals were suffering from pneumonia, cancer and other illnesses. In consequence, researchers named this infection “Acquired Immunodeficiency Syndrome” (because of the opportunistic factors of this virus).

In comparison to other diseases, this one is fairly recent. While a lot of research and study is being put into finding a treatment and remedy, it has been extremely challenging because of the mutant like morphology of the virus and its hidden surface proteins. A lot of progress has been made. Infected people are able to survive and almost live their entire life as normal under (a lot) of medication, but the person will always be a carrier until we find a treatment to kill the virus completely. (6)

Reservoirs

For a disease to perpetually spread and invade other organisms, it needs a source to proliferate and multiply under certain conditions specific to the microorganism. Reservoirs can be either “Human”, “Animal” or “Non Living”.

In the case of HIV, the biggest reservoir is Human. Although it started from a zoonotic exchange, this disease is usually spread from human to human during any direct contact with blood or mucous glands of infected individuals. This virus mutated from SIV when entering the human body and is now known as HIV (which is a disease specific to humans). An important aspect of the spread of this virus is that people can be carriers. This means that the person has been contaminated but is either not aware of it and/or is not showing any symptoms.

Transmission
The most common way HIV is spread is through unprotected sex with a person who has HIV, or being directly injected with a needle or in contact with blood from an infected person. HIV can be transmitted through blood directly, or through the mucous membranes during sexual interactions or even just kissing IF the person has an open wound. HIV can also be passed from mother to child during pregnancy, birth and breastfeeding. (2)

**General Characteristics of MO**

“HIV is a member of the *Retroviridae* family, genus *Lentivirus*. HIV is an icosahedral, enveloped virus, of approximately 100 to 110 nm in diameter, and has a single-stranded, linear, positive-sense RNA genome. HIV has two recognized strains: HIV-1 and HIV-2.” Upon entry into the host cell, HIV does the opposite of transcription/translation. It uses its retroviral RNA to infect the host’s cell’s DNA with a reverse transcriptase enzyme. The host cell is now infected and loses its functions as it has now been infected with viral DNA. (3) Another important characteristic of this virus is that it has changing and hidden proteins/antigens on its surface that make it hard to recognize and build innate immunity against.

**Signs and symptoms of disease**

There are three distinguishable stages of HIV: (5)

1) **Early Stages of HIV** (first response of immune system will be acute): people who have been infected can develop, about 2-4 weeks after infections, symptoms similar to a “really bad flu”. This includes: sore throat, rash, fatigue, muscle and joint ache, headache, swollen glands and fever (most common).
2) Clinical Latency Stage (disease spreads silently. Chronic phase): no, or mild, symptoms.
3) Progression to AIDS (the immune system is weakened and opportunistic infections will manifest): rapid weight loss for no reason, intense fever and night sweats, extreme tiredness, swelling of lymph glands, diarrhea, sores of mouth or genitals or anus, pneumonia, redish spots on or under skin, depression, memory loss or other neurologic disorders.

It is important to note that these signs/symptoms can be related to other diseases other than HIV. The best and only way to know you are infected is to get tested.

### Key tests for identification

There are a few tests, and steps, essential in identifying HIV positive individuals: (4)

1) Antibody screening test (or Immunoassay): this measures the amount of antibodies (if any) you have against HIV. It may be detected using a blood or oral (not saliva) sample. Newer test can detect HIV within three weeks after infection, and even detect antigens (thus the virus itself).
2) Rapid test: seek antibodies within less than 20 minutes. If positive, a follow up test will need to be implemented.
3) Follow up diagnosis: ELISA
4) At home testing: OraQuick In-home HIV test and the Home Access HIV-1 Test System. If tested positive, you must get a follow up test with a professional. The OraQuick test is approved, but uses mouth fluids to determine whether there is contamination or not. The problem associated with this is that it will take longer for the virus to spread in the oral fluids of our body than the blood. Keeping in mind, there is a 2-3 months window period.
5) RNA tests: detect the antigen directly, as little as 10 days after the infection. This test is more costly and not usually used as a screening test.

### Virulence factors

The progression of HIV to AIDS is different in every individual, some can develop it after years, and others are pretty quick in responding to the virus. HIV has both hidden and mutant proteins on its membrane, making it very hard to combat as it changes all the time. HIV has the ability to activate and proliferate in target cells it can efficiently replicate in. This virus targets mostly CD4 glycoproteins which are found on the surface of immune cells such as T helpers, macrophages, monocytes and dendritic cells. By doing so, our immune system is weakened over time and is unable to respond and fight to common infections, which eventually become opportunistic. The changes of the virus over time, are also transmitted from one host to another. Can you imagine how hard it would be to keep track and keep up with all these mutations to find an effective treatment for all? (7)

### Control/treatment

Based on what has previously been discussed in regards to the virus’s virulence, it is very hard to find a treatment. There are 31 approved anti-retroviral drugs that will treat, but not cure, HIV.
This will allow infected people to live longer, but the virus will still remain in their body and the individual will still continue to be a carrier. A few anti-retroviral drugs include: (8)

1) Entry inhibitors: interferes with the virus’s ability to bind to receptors on target cell
2) Fusion inhibitors: interferes with virus’s ability to cross the cell membrane
3) Reverse transcriptase inhibitors: prevents reverse viral transcription from RNA to DNA
4) Integrase inhibitors: prevents HIV from integrating its genetic material to DNA
5) Protease inhibitors: interferes with HIV protease, responsible for cutting HIV proteins
6) Multi class combination products: combination of multiple HIV drugs

Prevention/Vaccine

There is currently no vaccine for HIV, but there are encouraging leads towards the development of one: “a modified poxvirus expressing HIV antigen and a so-called protein subunit vaccine, was shown to provide over 30% protection against HIV infection in a human clinical trial”, according to WHO. Although there are some effective treatments to slow down the progression of HIV to AIDS, the best way remains preventative care. This includes: (9)

1) Use of condom if sexually active
2) Limit your sexual life
3) Get tested on a regular basis
4) Go get tested with your new partner before sexual intercourse
5) Anti-retroviral drug based prevention
6) No sharing of needles
7) Stay informed and educated about outbreaks, especially within your area and if traveling
8) Use gloves if dealing with open wounds

Local cases/outbreaks
The south obviously has the biggest HIV contaminated people. Let’s focus on a current outbreak that happened in California, in the porn industry where 4 major porn stars have come out to be HIV positive. The defendants plead that their “actors” were tested every 14 to 28 days and is a much “safer” way to manage the spread of STDs and HIV than “just casual” sex. This may be true, as testing is a main preventive care action to be taken. However, there is a 2-3 month window before HIV can be detected. In the porn industry, people have sexual intercourse with many different partners (onsite and offsite), increasing the risk of transmission and contamination. Now, a bill is “pending” in Sacramento in requiring the use of condoms.

This is a lesson learned the hard way. The porn industry is very well protected, and it is hard to get a release on porn members who have acquired HIV while fulfilling their “job”. However, this will become an increasing concern and source of surveillance to prevent and control further cases to develop. If it happens in the studio, it will also be spread outside of the scenes. It is a much bigger problem than what the porn management claims. Will the porn industry fade off, or will it resolve to requiring condoms and proper precautions for their actors? If so, will the industry continue to thrive, and at what risk? (10)

Global cases/outbreaks

The first cases of HIV started in Africa, infecting heterosexual populations, mainly in equatorial countries including Congo, Rwanda and Uganda. Initially, the disease was known as “slim disease” because of high diarrhea and weight loss associated with it. After spreading across Africa, other parts of the world such as the Caribbean and Latin America acquired the disease, mostly through Injection Drug Use (IDU) and men to men sexual relationships. In 2000, the
Caribbean had the second highest infection rate after sub-Saharan Africa. Another highly infected part of the globe is Asia, where 10% of female sex workers were infected. The virus then spread to other countries in the region through IDUs, heterosexual and MSM relationships and child-mother.

Most of the global outbreaks are seen in low-middle income countries (making up 91% of the world’s HIV infected population!), in ages ranging from as low as 15 years old to 49. “Being hit the hardest by the epidemic is sub-Saharan Africa, which harbors about three-quarters of the world’s HIV-1-infected individuals from low- and middle-income countries and more than two-thirds of the world’s total”. See for yourself: (11)

Citations:

   http://www.cdc.gov/hiv/basics/testing.html
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