

## 13.3: HIV vaccine

A vaccine that can prevent infection would teach the immune system to respond to HIV by making antibodies that can bind to the virus and stop it from infecting cells. There are two approaches to an HIV vaccine:

**1. Preventive HIV vaccine approach**, is given to people who do not have HIV. The purpose of this vaccine to protect individuals from being infected with the virus.

**2. Therapeutic HIV vaccine approach**, is for the individuals who already have HIV. The goal of the vaccine is to strengthen a person's immune response to HIV.

Today, there is no licensed HIV vaccine available on the market, but several research projects are ongoing and scientific communities throughout the world are trying to find an effective ways to fight against the disease. Some HIV-infected individuals, but certainly not all, naturally produce **broadly neutralizing antibodies** which keep the virus suppressed and these people do not tend to see any clinical signs of HIV illness and remain asymptomatic for decades.

A neutralizing antibody defends a cell from an antigen or infectious body by inhibiting or neutralizing any effect it has biologically. The antibody response is crucial for preventing many viral infections and may also contribute to the resolution of an infection. When a vertebrate is infected with a virus, antibodies are produced against many epitopes of multiple virus proteins. A subset of these antibodies can block viral infection by a process called neutralization. This usually involves the formation of a virus-antibody complex.

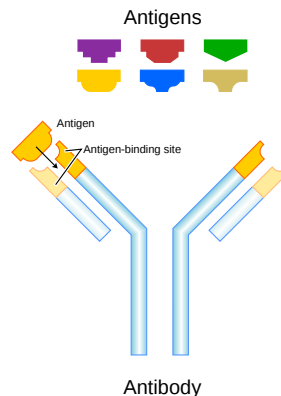


Figure13.3.1: Antibody neutralizing an antigen and preventing its biological effect.

This virus-antibody complex can prevent viral infections in many ways. It may interfere with virion binding to receptors, block uptake into cells, prevent uncoating of the genomes in endosomes, or cause aggregation of virus particles. Many enveloped viruses are lysed when antiviral antibodies and serum complement disrupt membranes. Antibodies can also neutralize viral infectivity by binding to cell surface receptors.

Neutralizing antibodies have shown potential in the treatment of retroviral infections. Medical professionals and researchers have shown how the encoding of genes which influence the production of this particular type of antibody could help in the treatment of infections that attack the immune system. Experts in the field have used HIV treatment as an example of infections these antibodies can treat. Recently, potent and broadly neutralizing human antibodies against influenza have been reported, and have suggested possible strategies to generate an improved vaccine that would confer long-lasting immunity. Another disease which has been linked to the production of neutralizing antibodies is multiple sclerosis.

In diagnostic immunology and virology laboratories, the evaluation of neutralizing antibodies, which destroy the infectivity of viruses, can be measured by the neutralization method. In this procedure, patient serum is mixed with a suspension of infectious virus particles of the same type as those suspected of causing disease in the patient. A control suspension of virus is mixed with normal serum and is then inoculated into an appropriate cell culture. If the patient serum contains antibody to the virus, the antibody will bind to the virus particles and prevent them from invading the cells in culture, thereby neutralizing the infectivity of the virus. This technique is labor-intensive, demanding, and time consuming. Its application is restricted to laboratories that perform routine viral cultures and related diagnosis.

## Summary

- Human immunodeficiency virus (HIV) is a sexually transmitted virus that infects and destroys helper T cells of the immune system. The virus can also be transmitted through contaminated blood or breast milk. HIV infection is diagnosed on the basis of a blood test for antibodies to the virus.
- AIDS stands for acquired immunodeficiency syndrome, is a disease that develops in people with untreated HIV infections, typically several years after their initial infection with the virus. AIDS is diagnosed when the immune system has been weakened to the point that it can no longer fight off opportunistic diseases that do not normally occur in healthy individuals.
- The development of new anti-retroviral drugs to treat HIV infection has changed the disease from fatal to a chronic disease. The drugs keep the virus at low levels, reducing the risk of transmission as well as infection progressing to AIDS.

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