

## The HI Virus

Viruses are tiny structures that often cause diseases. They cannot be seen with a light microscope but rather only with an electron microscope. Unlike bacteria or fungi, we do not refer to viruses as living organisms. The reason: They have no metabolism of their own, they cannot actively move around or react to environmental stimuli, and they cannot reproduce.



Fig. 1: Virus  
Source: E. Käding

The construction of viruses is simple: They consist of genetic material (either DNA or RNA) surrounded by a capsule of proteins. Some viruses also have an outer envelope made of a water-insoluble double layer of fat (lipids). Receptor proteins (spikes) can be found on this envelope. The virus can attach itself to a cell using these proteins.

The disease AIDS is caused by the “human immunodeficiency virus” (HIV). It consists of RNA in a capsule surrounded by a shell of lipids. There are about 10 to 15 receptor proteins (spikes) on this envelope. HI viruses are relatively large (compared to other viruses). They have a diameter of about 100 nm. However, red blood cells have a diameter of 7,500 nm. They are thus much bigger.

HI viruses are found in some bodily fluids: Blood, semen, and vaginal fluid. Infection is particularly common through unprotected sexual intercourse. When using recreational drugs, there is also an increased risk through sharing contaminated utensils. You cannot get infected through sweat, tears, and saliva. Once the virus has entered the body, it attacks certain cells of the immune system, the T helper cells. In the process, it docks with its receptors on the outside of the host cell, and the capsule with the RNA penetrates the cell. Inside the cell, the RNA leaves its capsule and enters the cell nucleus. The cell now produces masses of new HI viruses and is finally destroyed. The new HI viruses attack other T helper cells and continue to multiply. The immune system now needs some time to form suitable antibodies. These destroy many of the viruses. The T helper cells are replaced by new cells, and a balance is created. The number of viruses in the blood remains low, and the number of T helper cells remains at a stable level. This often remains the case for many years. Those infected have no symptoms and usually do not even know that they are carrying the HI virus. Nevertheless, the number of T helper cells eventually decreases. This gradually weakens the immune defence until it no longer functions. Diseases such as pneumonia, tuberculosis, cancers, and fungal infections of the esophagus occur. We now speak of AIDS disease. AIDS stands for “Acquired Immune Deficiency Syndrome”. AIDS does not consist of a single disease but rather of a group of different life-threatening diseases that occur only because the immune system no longer functions.

The AIDS disease popped up more frequently from 1981 and many people died because of it. Even after the discovery of the HI virus in 1983. In the meantime, several drugs have been developed that can be combined with each other and prevent the viruses from multiplying if they are taken consistently over a lifetime. As a result, people can lead a relatively normal life even if they are infected with HIV.

There is still no vaccination against the HI virus. This is because the virus mutates very quickly. The antibodies formed thus lose their effectiveness against the virus.