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## Viral Infections

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Viruses are small particles of genetic material (either DNA or RNA) that are surrounded by a protein coat. Some viruses also have a fatty "envelope" covering. They are incapable of reproducing on their own. Viruses depend on the organisms they infect (hosts) for their very survival. Viruses get a bad rap, but they also perform many important functions for humans, plants, animals, and the environment. For example, some viruses protect the host against other infections. Viruses also participate in the process of evolution by transferring genes among different species. In biomedical research, scientists use viruses to insert new genes into cells.

When most people hear the word "virus," they think of disease- causing (pathogenic) viruses such as the common cold, influenza, chickenpox, human immunodeficiency virus (HIV), SARS-CoV-2 and others. Viruses can affect many areas in the body, including the reproductive, respiratory, and gastrointestinal systems. They can also affect the liver, brain, and skin. Research reveals that viruses are implicated in many cancers as well.

A viral infection is a proliferation of a harmful virus inside your body. Viruses cannot reproduce without the assistance of a host. Viruses infect a host by introducing their genetic material into the cells and hijacking the cell's internal machinery to make more virus particles. With an active viral infection, a virus makes copies of itself and bursts the host cell (killing it) to set the newly-formed virus particles free. In other cases, virus particles "bud" off the host cell over a period of time before killing the host cell. Either way, newvirus particles are then free to infect other cells. Symptoms of the viral illness occur as a result of cell damage, tissue destruction, and the associated immune response.

Certain viruses like the ones that cause chickenpox and cold sores may be inactive or "latent" after the initial infection. For example, you may have a cold sore that erupts and then heals. The cold sore virus remains in your cells in a dormant state. Later, a trigger like stress, sunlight, or something else, may reactivate the virus and lead to new symptoms. The virus makes more copies of itself, releases new virus particles, and kills more host cells.

Viruses and bacteria are two types of potentially disease-causing (pathogenic) particles. Viruses are much smaller than bacteria and can't reproduce without the assistance of a host. Bacteria are capable of reproducing on their own. The symptoms of viral and bacterial illnesses are sometimes similar. A doctor can determine the underlying cause of an illness based on the patient's symptoms and other factors. Lab tests may help clarify whether an illness is due to a virus, bacteria, or other infectious agent or disease process.

In order to cause disease, viruses must first infect their host, spread to and within target tissue and cause damage. Transmission to other susceptible individuals is necessary to ensure their perpetuation, thus viruses developed panoply of remarkable strategies for survival. As viruses are obligate intracellular parasites that are transmitted as inert particles, they must attach to and infect cells at one of the body surfaces to infect the host (unless these barriers are bypassed by parenteral inoculation via a needle, a wound or the bite of an arthropod).

The propensity of viruses to infect cells selectively in particular organs is referred to as tropism (either on cellular or organ level), which is dependent on both viral and host factors. Factors that determine whether the cell may become infected are the presence of critical receptors and presence of required intracellular factors.

Once inside the cell, viruses use the host cell metabolism to replicate. The mechanism of viral replication varies depending on the type of the virus, but the end-goal is always the same – to produce messenger RNA molecules from which viral proteins are translated by the host cell.

Clinical disease arises due to host cell rupture and death, host cell dysfunction (including fusion with other cells to produce multinucleate giant cells), malignant transformation and by stimulating the body's cellular host defenses against infection. The final mechanism is responsible for a myriad of systemic symptoms associated with viral infection, such as fever, malaise, loss of appetite and increased mucus production.

Because a large number of virus genera and species exist, they are usually considered in groups. For example, respiratory syncytial virus (RSV), rhinovirus, influenza virus and the severe acute respiratory syndromeassociated coronavirus (SARS-Cov) are responsible for respiratory infections that affect the practice of respiratory care around the world.