**Chapter:**

**Pathogenesis of virus in the human body**

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**Introduction :**

Viral infection in humans generally results in disease or accompanying inflammation. Clinical inflammation develops when leukocytic and steady-state cell-intrinsic immunity to the virus is compromised (1). Inflammation is a sign that freshly recruited and activated leukocytes are working to clear an infection in the blood or tissues. The fundamental cause of inflammation and disease can be distinguished from its effects in the complex conflict between various viruses. Few viral diseases are RNA based (e.g., HIV, dengue virus is considered as flaviviruses) and few are known as DNA-based viruses (e.g., herpesviruses and poxviruses) infections (2). So, before designing a protocol to study the pathogenesis of viral infection, we should identify whether it is a DAN or RAN virus. The viral entry mechanism includes the entry pathway of the virus, Viral replication, Epidemiological factors for viral infections, accessibility of the virus from blood to other different tissue etc are very important to study about a pathogen. By reducing or stopping viral replication, an important part of the host's defence against virus-induced disease is provided by our immune systems (3).

**Pathogenesis of viral infection:**

The disease-causing microbes are known as pathogens. Pathogens' effects differ from disease to disease or organ to organ. The vital organs of humans are even very difficult in stages while they get affected by pathogens.

**Pathogenesis of viral infection in the Neural system:**

The central nervous system (CNS) in humans also get effects with virus which is very interesting to understand. In spinal cord Cerebrospinal fluid or CSF flows. Also, brain-Blood Transfusion Multiple methods have been proposed to explain how viruses interact with the cells and membranes separating the blood from vulnerable cells in the brain (4). These processes include both more direct blood-brain channels and those involving blood-cerebrospinal fluid-brain. The *choroid plexus* (CP) is a possible pathway for bloodborne viruses to get into the cerebrospinal fluid and proliferate (5). Cerebrospinal fluid (CSF) is produced by the choroid plexus (CP), an organ found in the lining of the brain ventricles which serves as a selective entry point for immune cells and other agents into the brain parenchyma. Though less frequent than bloodstream dissemination, viral entrance through the nerves is a prevalent way for many serious infections to propagate. Herpesvirus, Japanese encephalitis virus, and rabies virus all use this technique. For instance, the rabies virus spread through the bite of a rabid animal replicates in muscle tissue and subcutaneously reaches nerve endings (6). According to the research, the virus mostly travels through neurons and cells, where it is shielded from antibodies. This nerve channel connects to the brain and spinal cord, where the rabies virus enters the body.

Virus-induced effects on the neural system can effects as:

1. The tissue that envelops the CNS becomes inflamed in viral meningitis.
2. The brain itself is infected and inflamed in encephalitis (example-Japanese encephalitis).

**Pathogenesis of viral infection in the Cardiac system:**

Blood is pumped throughout the circulatory system by the heart muscle or myocardium. Cardiomyopathy, a condition that affects the heart muscle, can cause pathological alterations to the muscle and have a detrimental effect on how well it functions. Cardiomyopathies with dilated cardiomyopathy or DCM, restricted cardiomyopathy, arrhythmogenic cardiomyopathy and many more different types of cardiomyopathy are among the most prevalent (7). Myocarditis is the condition of inflammatory cardiomyopathy of the heart muscle, which is typically brought on by viruses but can also be brought on by bacteria, fungi, parasites, or an autoimmune reaction.

**Pathogenesis of viral infection in the Digestive system:**

The human alimentary system starts from the mouth to the anus along with its organs and glands can easily effects by different pathogens. It takes digestion to turn food into the nutrients that our body needs for energy purposes in the form of ATPs. But it is very easy for viruses to attack this system and cause infections. While some digestive diseases are very mild and only last a short period of time, others are chronic and last for a long time. Generally speaking, swelling and/or decreased salivation might be effects of pathogenic infections of the salivary glands of the mouth. The most typical salivary gland infection, according to Fields et al. (1996), is the paramyxovirus that causes mumps (8). So it is very important to understand that through saliva also pathogens get spread.

An infection called viral hepatitis damages and inflames the liver. When body tissues are harmed or infected, inflammation, or swelling, takes place. Organs can suffer harm from inflammation. Hepatitis are only a few of the viruses linked by researchers to the disease's development (9). They can again be classified as acute and chronic illnesses of liver infection. Many hepatitis infections do not manifest any symptoms of their condition.

An inflammatory condition known as acute pancreatitis (AP) affects the exocrine portion of the pancreatic parenchyma. Acute necrotizing pancreatitis is a more serious and quickly lethal variation, whereas acute interstitial pancreatitis is a milder self-limiting variation. It can also affect the peripancreatic region in addition to pancreatic tissue, and it is frequently accompanied by a systemic inflammatory response that, if left untreated, can lead to multi-organ failure. The two most frequent etiological causes of AP are gallstones and drinking.

In conclusion, it is unclear how many illnesses caused by gut viruses begin. Villous enterocytes are thought to be the primary target of infection for the majority of gut viruses, according to investigations on both humans and animals. As a result, there is a reduction in surface area and an impairment of the digestive and absorptive processes. A net secretory condition could also occur from this. All of these alterations could trigger as acute but brief malabsorptive diarrhoea, coupled with others including decreased enzymatic activity and diminished epithelial integrity.

**Conclusion:**

A complicated set of interactions between viruses and hosts are known as viral pathogenesis, and they affect whether a virus is able to infect a host successfully. This is very important to understand about the role of viral pathogens in the progression of diseases. Because the route of entry, target organs and incubation period of the virus are a few important objectives which we should not avoid.

The organs which are infected by pathogens typically show symptoms sometimes expresses in later stages while travelling through the body. After which mild or severe clinical illness begins symptomatically or asymptomatically. The replication of the virus in our body tries to produce the copies of virus or increases the pathogens.

The process of getting free from viruses or defence against pathogens is engaged at each stage of the virus's transit through the body. As a result, when the target organ becomes infected, the previously diseased areas may be at various degrees of recovery.

The pathogenesis of infection in our body is a complicated, variable, and somewhat uncommon condition. Pathogenesis are governed by balance between host and virus components, much like the course of a virus infection. The immune system also contributes significantly to cell and tissue damage, therefore not all pathogenic symptoms associated with virus infections are directly brought on by the virus. During a virus infection, cells may undergo changes that allow them to continue growing forever. This is very important to understand the awareness about the severity of the virus and the disease.

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