"Pathogenesis of Viruses"

Viral pathogenesis is the study of how biological viruses cause diseases in their target hosts, usually carried out at the cellular or molecular level. Pathogenesis is a process in which an initial infection becomes a disease. Viral disease is a sum of the effects on the host caused by the replication of the virus and of the host's subsequent immune response.

Pathogen: the term is used to describe an infectious agent as a virus, bacterium , prion, a fungus or even another microorganism.

Pathogenicity: The severity of diseases caused by different microorganisms.

Virulency: Severity of disease caused by different strains of the same microorganism and this dependent on the quantity of virus cause infection for example 10 virions of strain A of herpes simplex virus (HSV) may cause vascular lesion whereas 104 virions of strain B of H S V required to do the same lesion

Acute viral infection: an acute viral infection is characterized by rapid onset of disease, a relatively brief period of symptoms, and resolution within days. It is usually may cause little or no clinical symptoms accompanied by early production of infectious virions and elimination of infection by the host immune system. Acute viral infections are typically observed with pathogens such as influenza virus and rhinovirus. Ebola hemorrhagic fever is an acute viral infection, although the course of disease is unusually severe.

Chronic viral infection: is a human disease that is persistent or otherwise long-lasting in its effects or a disease that comes with time. The term chronic is often applied when the course of the disease lasts for more than three months.in chronic infection viruses continuously produced with or without integration of the viral DNA with the host cell DNA . Varicella-zoster virus, measles virus, HIV-1, and human cytomegalovirus are examples of viruses that cause typical persistent infections. A chronic infection is a type of persistent infection that is eventually cleared.

Latent viral infection or viral latency: is the ability of a pathogenic virus to lie dormant (latent) within a cell, latency is the phase in certain viruses' life cycles in which, after initial infection, proliferation of virus particles ceases. However, the viral genome is not fully eradicated. The result of this is that the virus can reactivate and begin producing large amounts of viral progeny without the host being infected by new outside virus, denoted as the lytic part of the viral life cycle, and stays within the host indefinitely.

Mechanism of infection:

There must be sufficient virus available to initiate the infection. Cells at the site of infection must be accessible, susceptible, and allow the virus to enter, and the host anti-viral defense systems must be ineffective or absent. There are several mechanisms that must occur for a viral disease to develop including:

- **Implantation**: The virus must implant at the entry portal into the body. Viruses usually implant on cells of respiratory, gastrointestinal, skin and genital tissues.
- **Replication:** The invading virus must reproduce itself in large numbers. It usually does this intracellularly.
- **Dispersal:** The replicated viruses must spread to target organs (disease sites) throughout the body. The most common route of spread from the portal of entry is the circulatory system, which the virus reaches via the lymphatic system. Viruses can access target organs from the blood capillaries by multiplying inside endothelial cells, moving through gaps, or by being carried inside the organ on leukocytes. Some viruses, such as Herpes, rabies and polio viruses, can also disseminate via nerves.
- **Shedding:** The viruses must spread to sites where shedding into the environment can occur. The respiratory, alimentary and urogenital tracts and the blood are the most frequent sites of shedding.

Not all infections lead to new progeny virus. ***Productive* infections** occur in permissive cells and result in the production of infectious virus. ***Abortive* infections** fail to produce infectious progeny, either because the cell may be non-permissive and unable to support the expression of all viral genes or because the infecting virus may be defective, lacking some functional viral gene. ***A latent* infection** may ensue with the persistence of viral genome, the expression of no or few viral genes and the survival of infected cell. So, the pattern of replication may vary for a given virus, depending on the types of host cell infected.

The Target Organs of Viral Infection:

- Skin**:** a rash is features in number of viral infections like hemorrhagic rash, macula-popular rash like Meseals or purpuric rash**.**
- Lung: most respiratory infection involved as a part of generalized infection like Meseals.
- Liver: Target of hepatitis viruses (A,B,C,D,E) also may be damaged as a part of generalized infection
- Central nervous system: like Rabies.
- Blood stream: virus cause viremia like polio virus
- Nervous system: like VZV and Rabies.
- Kidney: like CMV shed in to the urine.

Incubation period of viral infection:

Incubation period is the time elapsed between exposure to a pathogenic organism, when symptoms and signs are first apparent. Study of incubation period aid in the diagnosis of disease, it may be short period, medium, long or very long period. The following Table showing some incubation period of viral diseases.

Disease	Incubation period (days)[a]
Influenza	1–2
Common cold	1–3
Bronchiolitis, croup	3–5
Acute respiratory disease (adenoviruses)	5–7
Dengue	5–8
Herpes simplex	5–8
Enterovirus disease	6–12
Poliomyelitis	5–20
Measles	9–12
Smallpox	12–14
Chickenpox	13–17
Mumps	16–20
Rubella	17–20
Mononucleosis	30–50
Hepatitis A	15–40
Hepatitis B and C	50–150
Rabies	30–100
Papilloma (warts)	50–150
AIDS	1–10 yr

[a]Until first appearance of prodromal symptoms.