Cytopathic Effects of Viruses

Infection of a host cell by an animal virus usually kills the host cell. Death can be caused by the accumulationof large numbers of multiplying viruses, by the effects of viral proteins on the permeability of the host cell's plasma membrane, or by inhibition of host DNA, RNA, or protein synthesis.

The visible effects of viral infection arc known as cytopathic effects (ePE). Those cytopathic effects that result incell death are called *cytocidal effects;* those that result in cell damage but not cell death are called *noncytocidal effects.* CPEs are used to diagnose many viral infections .Cytopathic effects vary with the virus. A virus can produce one or more of the following cytopathic effects:

I. At some stage in their multiplication, cytocidal viruses cause the macromolecular synthesis within the host cell to stop. Some viruses, such as herpes simplex virus, irreversibly stop mitosis.

2. When a cytocidal virus infects a cell, it causes the cell's Iysosomes to release their enzymes, resulting in destruction of intracellular contents and host cell death .

3. Inclusion bodies arc granules found in the cytoplasm or nucleus of some infected cells .These granules are sometimes viral parts-nucleic acids or proteins in the process of being assembled into virions. The granules vary in size, shape, and staining properties, according to the virus. Inclusion bodies are important because their presence can help identify the virus causing an infection. For example, in most cases, rabies virus produces inclusion bodies (Negri bodies) in the cytoplasm of nerve cells, and their pres*ence* in the brain tissue of animals suspected of being rabid has been used as one diagnostic tool for rabies. Diagnostic inclusion bodies are also associated with measles virus, vaccinia virus, smallpox virus, herpesvirus, and adenoviruses.

4. At times, several adjacent infected cells fuse to form a very large multinucleate cell.

5. Some virus-infected cells produce substances called interferons. Viral infection induces cells to produce interferons, but the host cell's DNA actually codes for the interferon . This protects neighboring un infected cells from viral infection.

Table 15.4 Cytopathic Effects of Selected Viruses

Virus (Genus)	Cytopathic Effect
Poliovirus (*Enterovirus*)	Cytocidal (cell death)
Papovavirus (family Papovaviridae)	Acidophilic inclusion bodies in nucleus
Adenovirus (*Mastadenovirus*)	Basophilic inclusion bodies in nucleus
Rhabdovirus (family Rhabdoviridae)	Acidophilic inclusion bodies in cytoplasm
Cytomegalovirus	Acidophilic inclusion bodies in nucleus and cytoplasm
Measles virus (*Morbillivirus*)	Cell fusion
Polyomavirus	Transformation
HIV (*Lentivirus*)	Destruction of T cells

Prion.

Protenious infectious particles does not contain genes. They are causative agent of various animal diseases . eg.Madcow disease

Viriods.

Infectious pieces of RNA , only 300 to 400 nucleotides long , with no protein coat. They cause some plant diseases.

Oncogenic viruses

Viruses capable of inducing tumors in animals are called oncogenic viruses, or *oncoviruses* Approximately 10% of cancers are known to be virus-induced. An outstanding feature of all oncogenic viruses is that their genetic material integrates into the host cell's DNA and replicates along with the host cell's chromosome. This mechanism is similar to the phenomenon of lysogeny in bacteria, and it can alter the host cell's characteristics in the same way.

Tumor cells undergo transformation; that is, they acquire properties that are distinct from the properties of uninfected cells or from infected cells that do not form tumors. After being transformed by viruses, many tumor cells contain a virus specific antigen on their cell surface, called tumor-specific transplantation antigen (TSTA), or an antigen in their nucleus, called the T antigen. Transformed cells tend to be less round than normal cells, and they tend to exhibit certain chromosomal abnormalities, such as unusual numbers of chromosomes and fragmented chromosomes.

DNA Oncogenic Viruses

Oncogenic viruses are found within several families of DNA containing viruses. Virtually all cervical cancers are caused by human papillomavirus (HPV); HPV- 16 accounts for about half of all cervical cancers.

Another DNA virus that causes cancer is hepatitis B virus (HBV). Many animal studies have been performed that have clearly indicated the causal role of HBV in liver cancer. In one human study, virtually all people with liver cancer had previous HBV infections.

RNA Oncogenic Viruses

Among the RNA viruses, only the oncoviruses in the family Retroviridae that cause cancer. The human T-cell leukemia viruses (HTLV- l and HTLV-2) are retroviruses that cause adult T-cell leukemia and lymphoma in humans.