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"CONCEPT AND IMPORTANCE OF MEDICAL VIROLOGY: A LITERATURE REVIEW"

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ABSTRACT:

A virus is the tiny infectious agent which reproduces inside the cells of living hosts. Scientist Louis Pasteur used the term virus to describe any living disease casing agents. When infection occurs, the host cell is forced to rapidly produce thousands of identical copies of the original virus. Viruses can store their genetic information in six different types of nucleic acid. Virus particles can only be observed by an electron microscope.

Keywords: Parasite, Virion, Enterovirus, Helical, Capsid, Adenovirus, Icosahedral.

INTRODUCTION:

Virus: A virus is an obligate intracellular parasite containing genetic material surrounded by protein.

Virology: Virology is the bioscience for study of viral nature, and the relation between the viruses and hosts.

Virology is subfield of microbiology which focuses on the following aspects of viruses: there structure, classification and evolution, their way to infect and exploit host cells for reproduction, the disease they cause, the techniques to isolate and culture them and their use in research and therapy.[1,2]

AIM AND OBJECTIVES:

Aim: To study the different types of viruses and their features.

Objectives:

1) To study the structure and life cycle of viruses.
2) To study the epidemiology of infections.
3) To study the pathogenesis of viral infections.
4) To study the mechanism of host response of viral infection.

Viral morphology:

- Virus particle i.e. virion.
- It has nucleic acid surrounded by a protein coat, called as capsid. It is made up of polypeptide subunit called as capsomeres.
- Capsids are usually symmetrical.
- Capsid +genome = nucleocapsid.
- Additionally, viruses may have lipid membrane called as an envelope.[3,4,5]
- Basic types of viral structure:
  i) Icosahedral nucleocapsid
  ii) Enveloped icosahedral nucleocapsid
  iii) Helical nucleocapsid
  iv) Enveloped helical nucleocapsid
  v) Complex nucleocapsid

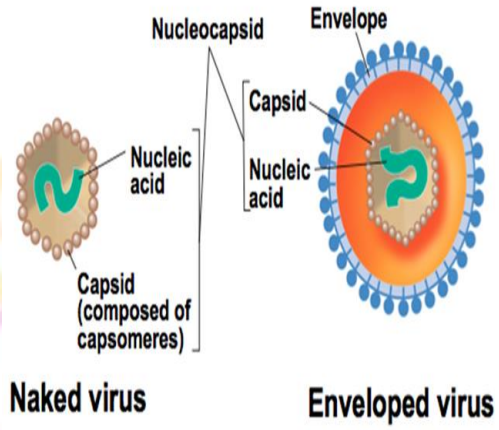

Fig 1: Morphology of virus

Viral properties:

- Viruses are small in size; 10nm-300nm.
- Viral genome is RNA or DNA but not both.
- Viruses are metabolically inert filterable agents.

- Viruses cannot make energy or protein independent of a host cell.
- Viruses do not have the genetic capability multiply by the division.
- Viruses are unaffected by antibiotics.[6,7]

Viral classification:

A) The Baltimore classification system:[8,9,10]

1) **ssDNA viruses** - Parvoviridae
2) **dsDNA viruses** –
   i) Enveloped: herpesviridae
   ii) Non- enveloped: papoviridae (circular) & adenoviridae (linear)
3) **dsRNA viruses**-
   i) Enveloped: coronaviridae(helical) & Flaviviridae(icosahedral)
   ii) Non-enveloped: picornaviridae, astroviridae (icosahedral)
4) **(-) sense ssRNA viruses**-
   i) Enveloped: para and ortho myxoviridae (helical)
5) **(+) sense ssRNA viruses**-
   i) Enveloped: caliciviridae, picornaviridae.
6) **RNA reverse transcribing viruses**- Retroviridae
7) **DNA reverse transcribing viruses**- Hepadnaviridae.

B) The ICTV classification system:

1) **Caudovirales**-Are tailed dsDNA bacteriophages.
2) **Herpesvirales**- Contains large eukaryotic dsDNA viruses.
3) **Mononegavirales**- Includes non-segmented (-) sense ssRNA plant & animal viruses.
4) **Nidovirales**- Composed of (+) sense ssRNA viruses with vertebrate hosts.
5) **Picornavirales**- Contains small (+) sense ssRNA viruses that infects variety of plant, insect and animal host
6) **Tymovirales**- Contains monopartite ssRNA viruses that infects plant.

C) Classification of viruses on the basis of host range:

1) **Bacteriophage**: Phage are virus infecting bacteria. Eg. - T2, T4, MV-11
2) **Plant virus**: Those viruses that infects plants. Eg. -TMV, cauliflower mosaic virus
3) **Animal virus**: Those viruses that infects animals. Eg. - poliovirus, retrovirus, adenovirus.
4) **Insect virus**: Those viruses that infects insects. Eg. - baculovirus, sacbrood virus, entomopox virus, granulosis virus.

Nomenclature of virus:

1) **Based on disease they cause**: Poliovirus, rabies virus

2) **Based on type of disease**: Murine leukaemia virus
3) **Based on geographic location**: Sendai virus, coxsackie virus
4) **Based on their disorder**: Epstein-Barr virus
5) **Based on how they were originally through to be contracted**: Dengue virus (evil spirit)
6) **Combination of above**: Rous sarcoma virus[11,12]

Basic steps in viral life cycle:

Adsorption → Penetration → Uncoating and eclipse → Synthesis of viral nucleic acid and protein → Assembly (maturation) → Release

Mode of transmission of virus:

1) **Respiratory transmission**: Influenza virus
2) **Faecal-oral transmission**: Enterovirus
3) **Blood-borne transmission**: Hepatitis B virus
4) **Sexual transmission**: HIV
5) **Animal or insect vectors**: Rabies virus[13]

Three effects of viruses on cells:

1) **Cell death**: The infection is lethal. It causes a cytopathic effect (CPE) which kills the host.
2) **Cell transformation**: The cell is transformed from a normal to a malignant or cancerous cell.
3) **Latent infection**: The virus remains within the cell in a potentially active state but produces no obvious effect on the cell function.[14,15,16]

DISCUSSION:

Viruses cause disease in animal of economic and welfare importance. Animal virus may pose risk to human health; can act as important models for human disease. it's necessary to control potentially infectious disease. Some viruses easily controlled with a vaccine like measles, mumps, rubella, polio. Some viruses difficult to control with vaccine like retroviruses (HIV). While viruses are used as vectors in biotechnology for vaccine development, gene therapy, tools to investigate host cells.[17]

CONCLUSION:

Viruses are found whenever there is life, and probably viruses exist the moment occurrence of the first living cells. The origin of viruses is unclear so that their relationship can only be studied by methods of molecular phylogenetics.

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