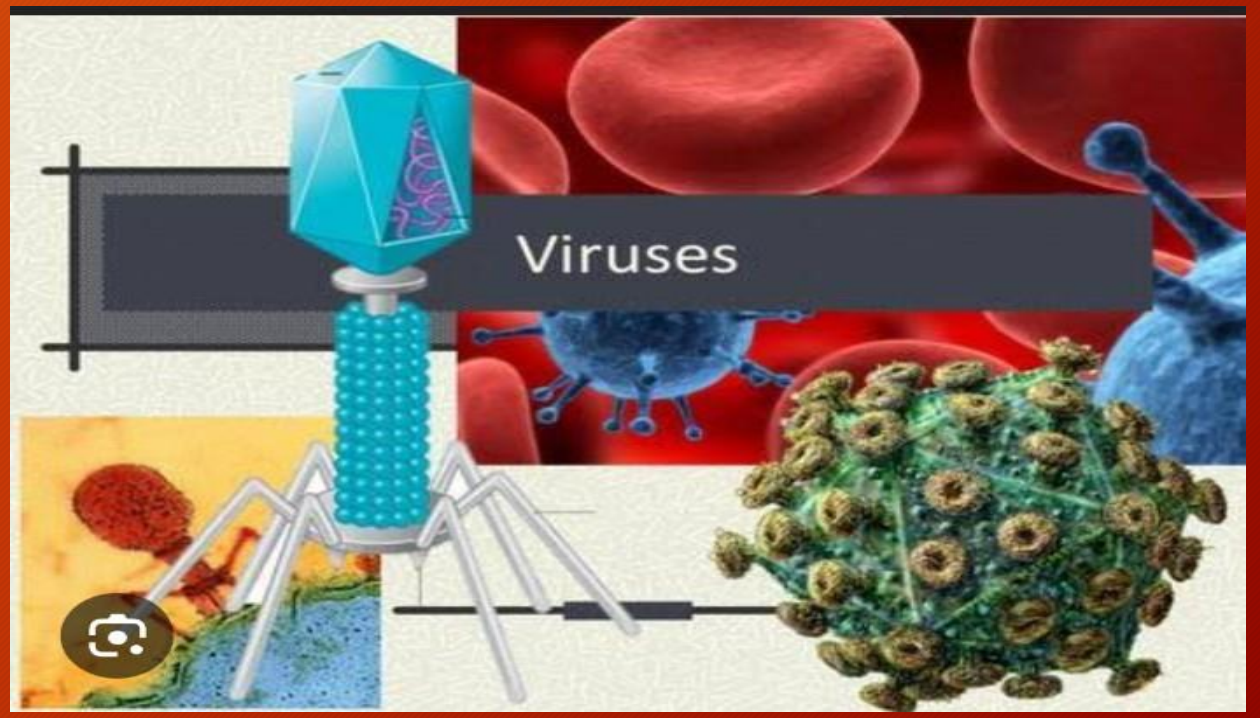
VIRUS :Nature and characteristics

BOTANY (MAJOR) SEM 1 , UNIT -1TOPIC



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INTRODUCTION OF VIRUS

Virus are smallest obligate intracellular infective agent.
They require a living cell for its multiplication.
They contain either DNA or RNA but never both.
Virus can observed only in electron microscope.
It can infect all living forms including plants animals bacteria etc.
They are smaller than bacteria and can pass through filter and have no metabolic activities.
They like the enzyme necessary for protein and nucleic acid synthesis and they are living or nonliving too.

“ THE TERM VIRUS HAS ORGANISED FROM A LATIN WORD WHICH MEANS POISON”

DEFINITION OF VIRUS

- **L.Urea(1953)** give a tentative definition: **“ virus are the minute parasitic ultra microscopic entities capable of being replicate inside a specific living host /obligate parasite and multiply to produce Progenesis in the same host.”**

- **Further with the development of EM and knowledge about nucleic acid present there Lurea and Darvell(1967)** gave the definition as: **“virus are living entities whose genome are the element of nucleic acid and which can command does cellular synthetic machinery of the host and poses a specific phase which is transmitted to the next generation.”**

HISTORY/DISCOVERY OF VIRUS

- The earlier reference of viral disease like smallpox can be found as early as 1700 BC, all though there was no idea of virus at that time.
- CHARLES EDUSE(1576) was first to describe the plant virus disease as varigatious in the colour of turnip flower.
- MAYER(1886) describe a motting disease in the leaves of tobacco plant and called it mosaic virus. He also observed transmissibility of SAP From the inoculated plants.
- IWANOWSKY(1892) was first to give specific demonstration about the existence of The mysterious cause agent virus when he is saw crumpling of the leaves in several plants.
- BEIJERINCK (1899) put forward the theory of contagious vivium fhridium (living infection fluid). Consequently evolutionary significance of Affirascolorosis. Which cause development and which leads to discovery of classical virology.
- W.M.STANLEY (1935) an American scientist was successful in isolating the tobacco mosaic virus in the form of 5 needle or para crystals with the help of Em and Xray diffraction studies.
- EDWARD TWORT(1915) an English bacteriologist was investigating certain types of soil bacteria.
- LE HERELLE(1916) obtained similar observation he also give a new name to the bacteria destroying viruses. He called them bacteriophage.

NATURE OF VIRUS

1. **SIZE:** The size of virus is variable. The virus of lymphogranuloma venereum has a diameter of 300 to 400 mu. The virus of the food and mouth disease is smaller approximately 10 mm. The size of virus where is from 100 to 150 NM.
2. **STRUCTURE:** they consist of a nucleic acid core surrounded by a protein coat (capsid). The other chemical beside protein coat i.e, proteins, carbohydrates, lipids, nucleic acid. Myxoviruses have membraneous envelope consisting of protein.
3. **ABSENCE OF CELLULAR STRUCTURE:** viruses do not have any cytoplasm and this cytoplasmic organelles like mitochondria, Golgi complex, lysosomes, ribosomes etc are absent. They utilise the ribosomes of the host cell for protein synthesis during reproduction.
4. **CHEMICAL NATURE:** viruses usually have only one nucleic acid either DNA or RNA. Typical cell have both DNA and RNA. Example- RVS(Rous Sarcoma Virus)(cancer causing animal virus) have both RNA and DNA and are there for called RNA DNA virus.

- Influenza virus – 1%
- TMV-5%
- Bacteriophage -50%
- Mol.wt. of genome – $36x10^6$ (+3%)
- Capsomers(protein sub unit) made up of different types of polypeptide chain ultimately of amino acid.
- Influenza- number of amino acids is 162.

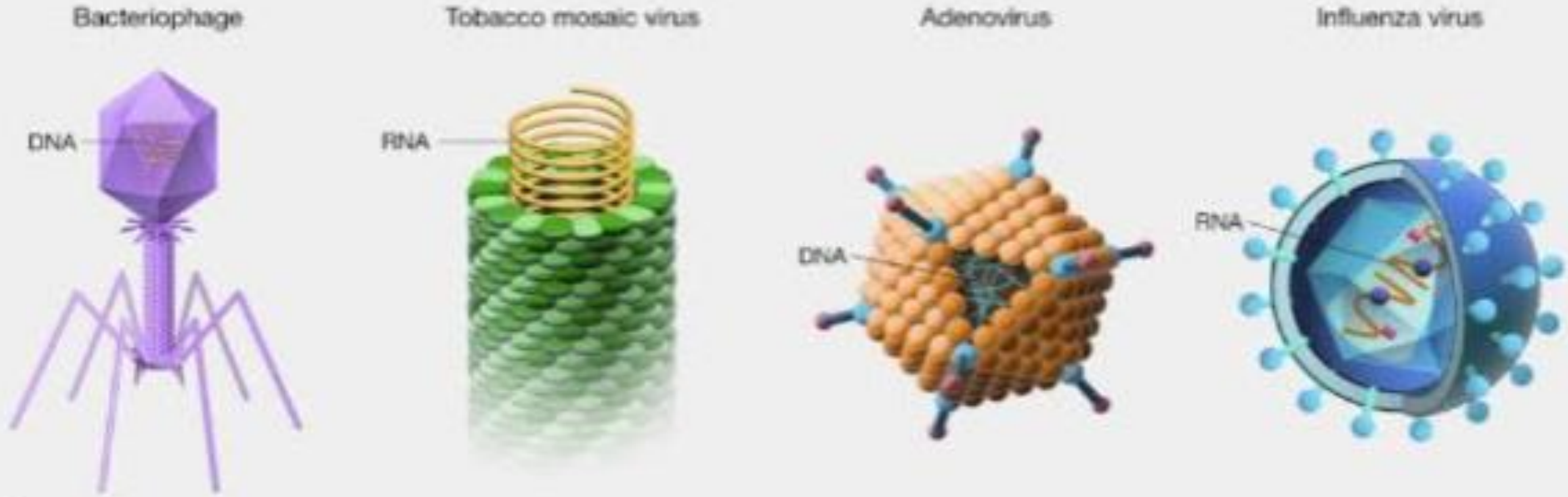
5. **TYPES OF NUCLEIC ACID-**with respect to the number of strand four types of nucleic acid have been found in viruses.

- **Double standard DNA-** Herpes virus, Adenovirus,Coliphage etc
- **Single standard DNA-**bacteriophage,¢x174, M-15 etc
- **Double standard RNA-**Reovirus,wound tumour virus,Rice dwarf virus.
- **Single standard RNA-** TMV, influenza etc

6. ENZYME - usually no enzymes for energy generation. But in bacteriophage lysozymes is formed. In some cases nucleic acid polymerizes found.

7. GENES-number of Jane in virus may very from 3 to 300. In MS-2 virus-3 genes.
Pox virus – more than 300 genes.

Examples of viruses



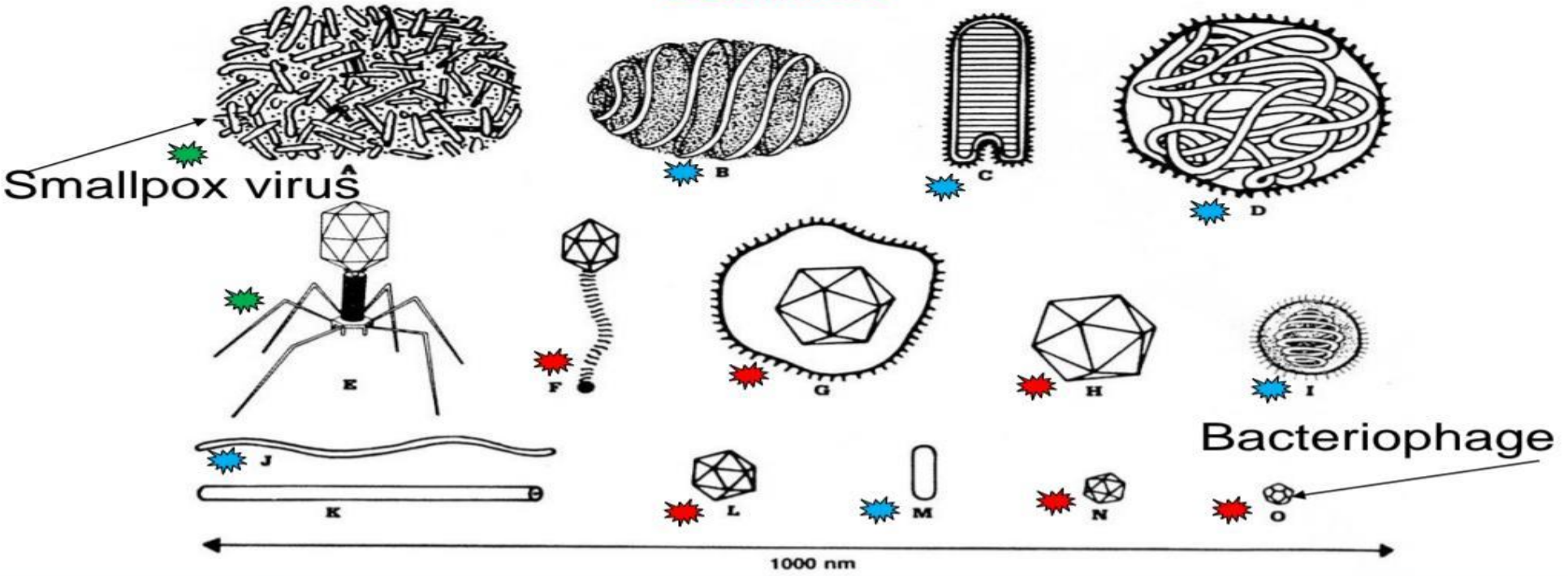
General characteristics of Viruses

1. **small size**: cannot be viewed with a light microscope, range of size = 30-400 nm
2. **characteristic shapes** - spherical (complex), helical, rod or polyhedral, sometimes with tails or envelopes. Most common polyhedron is the icosahedron which as 20 triangular faces.
3. **obligate intracellular parasites:** Viruses do not contain within their coats the machinery for replication. For this they depend upon a host cell and this accounts for their existence as obligate intracellular parasites. Each virus can only infect certain species of cells. This refers to the virus **host range**.
4. **no built-in metabolic machinery:** Viruses have no metabolic enzymes and cannot generate their own energy.

General characteristics of Viruses

5. **no ribosomes:** Viruses cannot synthesize their own proteins. For this they utilize host cell ribosomes during replication.
6. **only one type of nucleic acid:** Viruses contain either DNA or RNA (never both) as their genetic material. The nucleic acid can be single-stranded or double stranded.
7. **do not grow in size:** Unlike cells, viruses do not grow in size and mass leading to a division process. Rather viruses grow by separate synthesis and assembly of their components resulting in production of a "crop" of mature viruses.

Comparative size and shape of various groups of viruses



Viruses have fundamentally three morphologies:
1. icosahedron (E, F, G, H, L, N);
2. helical (D, I, J, K, M; B is controversial); 3. complex (A).