

CLASSIFICATION OF VIRUS : LHT, HOLMES, BALTIMORE AND ICTV CLASSIFICAION

Sivasangari shanmugam

VIRUS

- **Small** infectious agent.
- **Replicate** only inside the living cells.
- **Meaning** **Venome** (or) **Poisonous fluid**.
- **Made** up of nucleic acid and proteins.
- **TMV** is a first virus discovered by Ivanowski in 1892.



VIRUS CLASSIFICATION

- ❖ Virus mainly classified, based on their following character.

1. Phenotype character.
2. Mode of replication.
3. Host organisms.
4. Types of disease they cause.



VIRUS CLASSIFICATION

- ❖ Virus has four classification.
 1. Holmes classification.
 2. LHT classification.
 3. Baltimore classification.
 4. ICTV classification.



VIRUS CLASSIFICATION

Holmes classification

Holmes (1948) used Carl Linnaeus's system of binomial nomenclature.

To classify viruses into 3 groups under one order, *Virales*, they are,

- **Group I:** Phaginae (attacks bacteria)
- **Group II:** Phytophaginae (attacks plants)
- **Group III:** Zoophaginae (attacks animals)



VIRUS CLASSIFICATION

LHT classification

It is based on chemical and physical characters like nucleic acid (DNA or RNA), Symmetry (Helical or Icosahedral or Complex), presence of envelope, diameter of capsid, number of capsomers.

This classification was approved by the Provisional Committee on Nomenclature of Virus (PNVC) of the International Association of Microbiological Societies in 1962.



LHT CLASSIFICATION

❖ It is as follows: **Phylum *Vira*** (divided into 2 subphyla)

1. Subphylum *Deoxyvira* (DNA viruses)

1.1. Class *Deoxybinala* (dual symmetry)

Order *Urovirales*

Family *Phagoviridae*

1.2. Class *Deoxyhelica* (Helical symmetry)

Order *Chitovirales*

Family *Poxviridae*



LHT CLASSIFICATION

1.3. Class *Deoxycubica* (cubical symmetry)

- ❖ **Order *Peplovirales*** (mantle viruses)
 - Family *Herpesviridae*** (162 capsomeres)

- ❖ **Order *Haplovirales*** (no envelope)
 - Family *Iridoviridae*** (812 capsomeres)
 - Family *Adenoviridae*** (252 capsomeres)
 - Family *Papiloviridae*** (72 capsomeres)
 - Family *Parvoviridae*** (32 capsomeres)
 - Family *Microviridae*** (12 capsomeres)



LHT CLASSIFICATION

2. Subphylum *Ribovira* (RNA viruses)

2.1. Class *Ribocubica* (cubical symmetry)

- ❖ Order *Togovirales*
 - Family *Arboviridae*
- ❖ Order *Lymovirales*
 - Family *Napoviridae*
 - Family *Reoviridae*

2.2. Class *Ribohelica* (helical symmetry)

- ❖ Order *Sagovirales*
 - Family *Stomataviridae*
 - Family *Paramyxoviridae*
 - Family *Myxoviridae*



LHT CLASSIFICATION

❖ Order *Rhabdovirales*

- ❑ Suborder *Flexiviridales* (Plant viruses)
Family *Mesoviridae*
Family *Peptoviridae*
- ❑ Suborder *Rigidovirales* (Plant viruses)
Family *Pachyviridae* (20 nm)
Family *Protoviridae* (15 nm)
Family *Dolichoviridae* (12-13 nm)



VIRUS CLASSIFICATION

Baltimore classification

Classified by David Baltimore in 1971.

Classified seven groups based on,

- Nucleic acid (DNA/RNA).
- Strand (double/single).
- Sense (positive/negative).
- Methods of replication.



VIRUS CLASSIFICATION

Baltimore classification

Seven groups are given below :

1. Double stranded DNA
2. Single stranded positive (+) sense DNA
3. Double stranded RNA
4. Single stranded positive (+) sense RNA
5. Single stranded negative (-) sense RNA
6. Single stranded positive (+) sense RNA with DNA intermediated
7. Double stranded DNA with RNA intermediate



BALTIMORE CLASSIFICATION

Double stranded DNA

- Include viruses are, Adenoviruses, Herpesviruses, Poxviruses, etc..
- Replicate in nucleus – Ex: Adenoviruses.
- Replicate in cytoplasm – Ex: Poxviruses.

SS (+) sense DNA

- Involving the formation of a (-)sense strand.
- Replication occurs in nucleus.
Ex: Parvovirus.

Double stranded RNA

- Have segmented genome.
- Each genome is transcribed separately produce monocistronic mRNA.
Ex: Reoviruse , Pirnavirus.

SS (+) sense RNA

- Polycistronic mRNA - Ex: Picrnovirus , Hepatitis A.
- Complex transcription – Ex : togaviruses



BALTIMORE CLASSIFICATION

SS (-) sense RNA

- Segmented - Ex : Orhomxoviruses.
- Non segmented – Ex : Rhabdoviruses.

SS (+) sense RNA with DNA intermediate

- Does not serves as mRNA.
- template for reverse transcription .
- Ex : Retroviruses

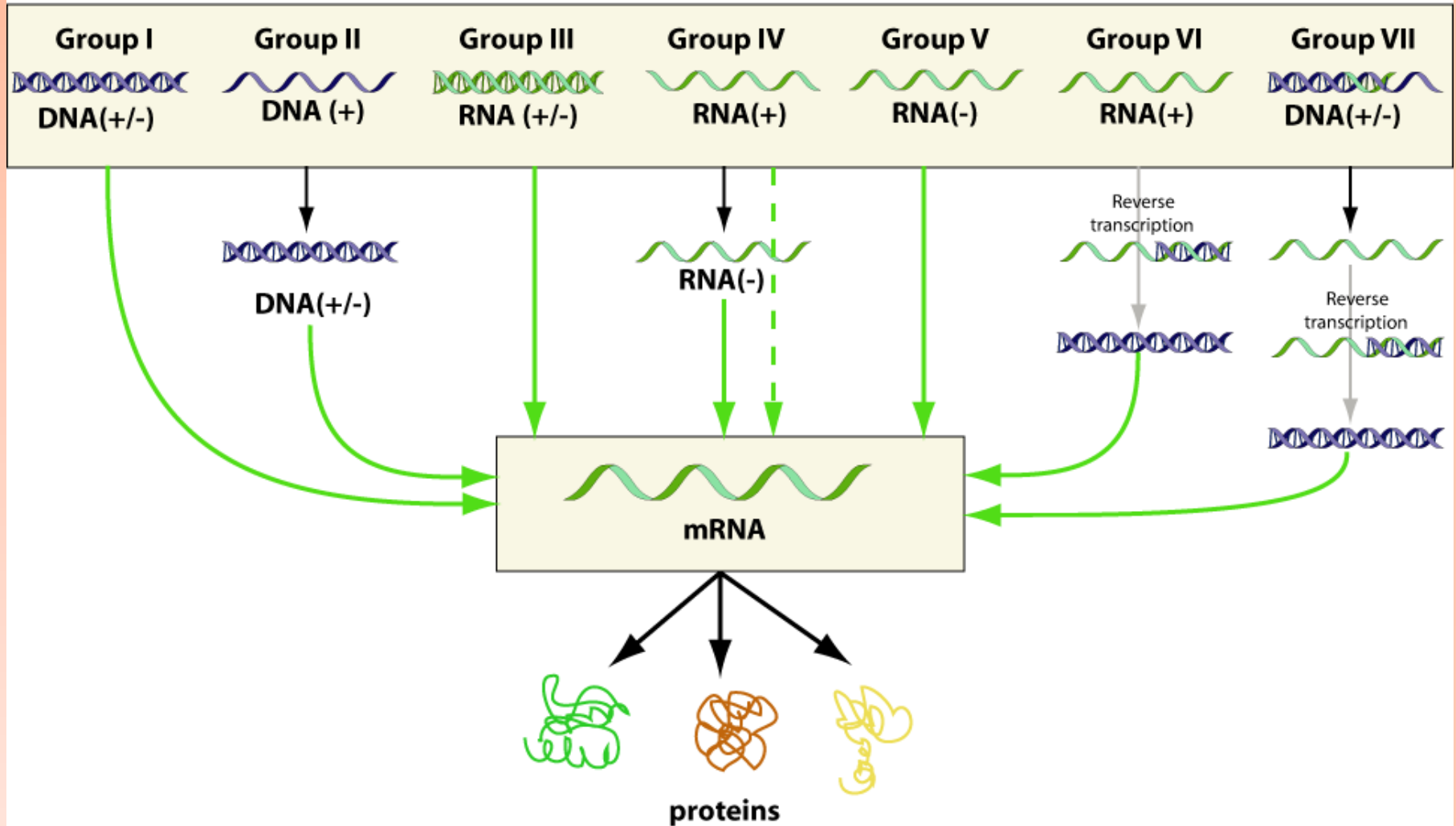
DS RNA with DNA intermediate

- Ex : Hepadnaviruses.



BALTIMORE CLASSIFICATION

Genetic material present in the virion



ICTV CLASSIFICATION

- ❖ ICTV – International committee on taxonomy nomenclature virus.
- ❖ It includes,
 - Orders – 09
 - Families – 131
 - Sub families – 46
 - Genera – 803
 - Species – 4,853



ICTV CLASSIFICATION

The 9 orders are,

1. **Herpesvirales** – Large eukaryotic ds DNA viruses.
2. **Caudovirales** – Tailed ds DNA bacteriophage.
3. **Ligamenvirales** – Linear ds DNA archean virus.
4. **Mononigavirales** – Monosegmented (-) strand ssRNA plants & animals viruses.
5. **Nidovirales** – (+) strand ssRNA viruses with vertebrates hosts.
6. **Ortervirales** – ssRNA & DNA that replicate through a DNA intermediate.
7. **Picornovirales** – Small (+) strand ssRNA viruses. Infect variety of plants & animals.
8. **Tymovirales** – Monopartite (+) sense viruses that infects plants.
9. **Bunyavirales** – Tripartite (+) sense ssRNA viruses.

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THANK YOU !

