

VIRUS

Characteristics of virus

- Non-cellular or acellular structure.
- Ultramicroscopic individuals, seen by e.m.
- Unable to grow or multiply independently → No true living.
- Laboratory culture is not possible.
- No own metabolism, do not killed by antibiotics.
- An obligate parasite.
- must enter a host cell to come to life and uses synthesis machinery of host cell, to reproduce.
- Survive at extreme conditions such as boiling water etc.
- Remain inactive in independent state for several decades and become active by availability of suitable host after this long period.
- Remain present in Crystalline form, out of host cell (Inert form).

→ Adolf Mayer, 1866 → Seen 'mosaic disease' on tobacco leaves

→ Pasteur, 1875, → discovered virus and called it as virus. (Term coined by Pasteur)

→ Iwanowski, 1892 → discovered ^{first} viral disease of plant as T.M.V (which pass through 'Bacteria filter paper')

→ Beijerinck, 1898 → Isolated virus and called it as

'Contagium vivum fluidum' (the infectious living fluid of T.M.V.)
non-living. → Awarded Noble Prize.

→ Tiwart and Herelle, 1915 → Isolated 'Bacteriophage'.

→ Safferman and Morris, 1963 → Discovered 'Cyanophage'.

→ Edward Jenner, → discovered vaccination against 'small pox'.

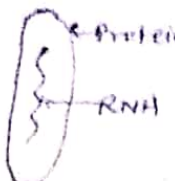
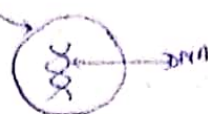
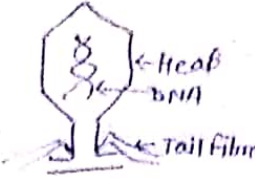
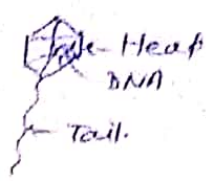
Size of virus → 2 μ to 300 μ long.

- smallest → Polio virus
- Foot & mouth virus
- Largest → Pox virus.

Nature of Virus

- Casper and Under and Pirie, 1936 → said that virus remain chemically as Nucleoprotein.
- Casper and Franklin → said that in virus nucleic acid remain surrounded by protein.
- Hershey and Chase → observed that infective portion of virus is nucleic acid (DNA is the genetic material in Bacteriophage).
- Fraenkel conrat → firstly separated nucleic acid (RNA) and protein coat of viral body.
- Virus remain made up of Nucleoprotein (Nucleic acid + protein).
- Nucleic acid is also called as Nucleoid. Genetic material remain as infectious particles.
- Either DNA or RNA not both, remain present in any virus.
- Nucleic acid remain covered by 'Protein coat'.
- Protein coat is also called as 'Capsid'.
- capsid remain made up of protein sub-units, called as 'Capsomere'.
- capsid protects nucleic acid, capsid remain as un-infective part of viral body.

Type of Virus (A/c to host).

<u>Plant Virus</u>	<u>Animal Virus</u>	<u>Bacteriophage</u>	<u>Cyanophage</u>
<ul style="list-style-type: none"> → Rod shaped or Helical. → Generally RNA as nucleic acid. 	<ul style="list-style-type: none"> → Spherical or Hexagonal (Polio virus) → Generally DNA as nucleic acid 	<ul style="list-style-type: none"> → Tadpole shaped → DNA present. 	<ul style="list-style-type: none"> → Polyhedral or Icosahedral (having 20 faces). → DNA present.
			

Classification of virus

→ Lwoff and Tournier, 1966 → classified virus into following two Phylum on the basis of nucleic acid present.

- ① Ribovirus → Ex - Most of plant virus and some of animal virus (Influenza virus).
- RNA present as genetic material.
 - Generally single stranded RNA present but double stranded RNA also found in Reo virus and Penicillium virus.
 - Lipovirus → Influenza virus remain made up of RNA, protein, carbohydrate and lipid.
 - Viroid → virus without protein coat. → RNA of low mol. weight → 300 nucleobds. → only made up of RNA → Ex - potato spindle virus. - cause "Potato spindle tuber" disease. → firstly observed by → (Diener, 1971.)
 - Viroin → virus made up of nucleic protein.

- ② Deoxyvira → Ex - most of animal virus, Bacteriophage, Cyanophage and some of plant virus. (Tobacco and Cauliflower mosaic virus).
- DNA present as genetic material.
 - Generally double stranded DNA present but single stranded DNA also found in Polio virus and ϕ X174 Bacteriophage.
 - Adenovirus → made up of only DNA without protein coat.

Prion → made up of protein only, without nucleic acid.
→ cause human mad-cow disease.

Reproduction of virus (Bacteriophage)

- viral reproduction is called as Transduction.
- completes one life cycle in minimum 20 minutes.
- chicken allantoic membrane tissues are used for culture of animal virus.
- shoot apex cannot be infected by virus.
- do not reproduce independently but multiply in living host cell only.
- Reproduce by following two methods: →

① Lysogenic method

- Temperate phase → No death of host → No new virus is produced.
- Ex: - λ-phage in E. coli Bacteria
- After infection viral genome combine with bacterial genome.
- viral genome multiply during bacterial reproduction ^{in all daughter} _{lysogenic bacteria indefinitely}
- occasionally (one in a million) chance of, viral DNA breaks unity with bacterial genome and leads to lytic method.
- Recombination of viral genome with bacterial genome within bacterial cell is called as 'Gene acquisition' or 'Transduction'.
- prophage stage: - viral genome united with bacterial genome
- Do not disturb other functions of bacterial genome.

② Lytic method

- virulent phase → death of host takes place.
- Ex: - T-series virus in E. coli Bacteria
- stages of Lytic cycle: →

① Infection: → ① Adsorption → attachment with host cell wall

② Pore formation → this process is also called as 'virufexis'
→ by phage enzyme.

③ Injection of Genome → viral DNA migrates into bacterial cell.
→ Pore is repaired and protein coat degrades outside bacterial cell.

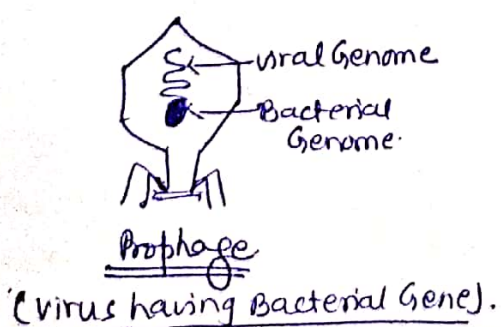
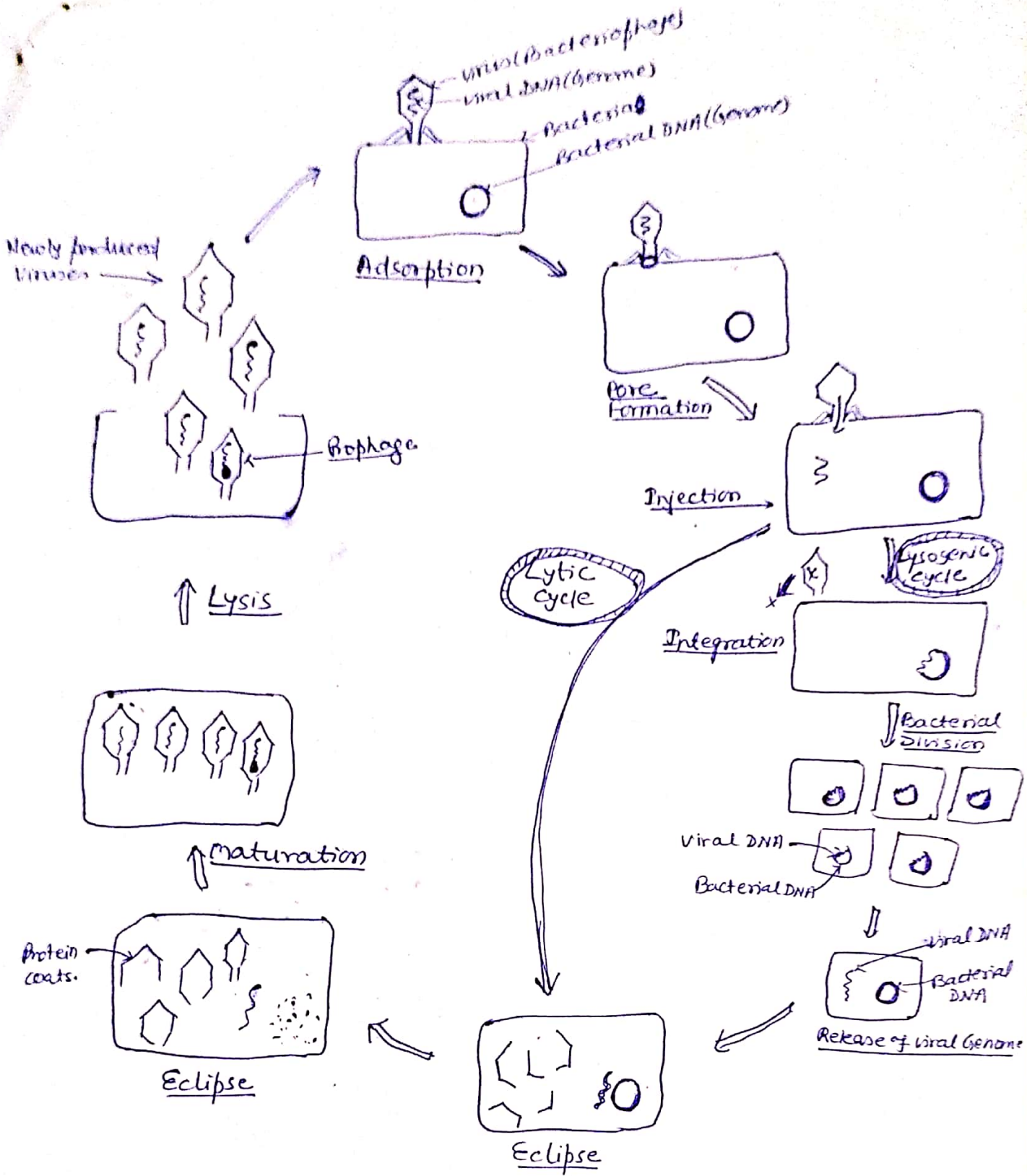
④ Eclipse: → ④ viral protein synthesis → Through bacterial ribosome.

⑤ viral DNA synthesis → by degradation of bacterial DNA

⑥ Maturation: - formation of daughter viruses.

⑦ Lysis: - death of host cell by lysozyme enzyme and release of about 200 daughter viruses.

Transduction (Viral Reproduction).



Viral Diseases

Human Viral Diseases

- Mumps
- Measles
- Smallpox (Chickenpox)
- Polio
- Rabies - (Hydrophobia)
- Common cold, Flu, Influenza (Virus)
- Tetanus (Wound Infection)
- Viral Conjunctivitis (Red eye)
- Dengue
- Bronchitis
- Herpes - HSV - Human Herpes Virus
- Herpes - HSV - Herpes simplex virus
- AIDS - HIV - A retrovirus - single stranded RNA virus - 1-2 years after infection
- Hepatitis - A, B, C

of these viruses cause viral multiplication & eventually lead to viral multiplication

Animal Viral Diseases

- Scramia - of chicken
- Swine - of pigs, Buffalo, goat
- Foot and Mouth disease of cattle
- Anthrax - bloody head and other having blood and necrotic material
 - animal dies within 7 days
 - cured by injection of 2 sulphamethoxazole sodium antibiotic
 - vaccine available in India

Viral plant diseases

- Tobacco Mosaic Disease
- Cauliflower Mosaic "
- Mosaic disease of potato, tomato by TMV
- Leaf curl of papaya
- Yellow vein mosaic of Ladyfinger
- Dwarf disease of rice
- Increased proliferation in chicken by cucumber mosaic virus

Transmission

- by contact
- infected seed & tubers
- infected agricultural implements
- sucking insects
- from leaves & flowers
- spread in any living plant through air & tube, cells of phloem

Symptoms

- mosaic
- yellowing of veins
- chlorotic mottling
- stunting
- distortion of leaves
- stunting
- reduction in yield
- wilting of stem & fruit
- reduction of fruit quality

Prevention

- Selection of disease free plants
- Precaution in cultivation

- 1) Tobacco Mosaic Disease → Mosaic like lesions appear on leaf - T.M.V. (Virus)
(Nicotiana glauca)
- 2) Citrus Canker → Lesions appear on fruit & leaves - Xanthomonas citri (Bacteria)
- 3) Rundu disease of Wheat → Wrinkling & wilting of leaf, rotting of tubers, twisting of leaves → Corynebacterium tritici (Bact.)
(Triticum aestivum)
- 4) Loose Smut of wheat → Black powdery Smut → Ustilago nuda tritici (Fungi)
- 5) Rust of Linseed → orange powdery mass → Melampsora lini (Fungi)
(Linum usitatissimum)
- 6) Red Rot of Sugarcane → reddening of leaf & stem tissues → Colletotrichum falcatum (Fungi)
(Saccharum officinarum)
- 7) Late Blight of Potato → Wilting of leaves & rotting of tubers → Phytophthora infestans (Fungi)
(Solanum tuberosum)
- 8) Little Leaf of Brinjal → Short leaves produced → Mycoplasma (Bacteria)
(Solanum melongena)

————— ✗ —————

① Branch of science which deals with the improvement of human race through the laws of heredity is called -
 (A) Heredity (B) Genetics (C) Eugenics (D) Euthenic

② Existence of coal and petroleum may be related with the study of -
 (A) Palaeobotany (B) Ecology (C) Bacteriology (D) Economic botany.

③ Nodules with nitrogen fixing bacteria present in
 (A) Mustard, (B) Wheat, (C) Gram (D) Cotton.

④ Agar-agar is derived from.
 (A) Algae (B) Fungi (C) Bryophyta (D) Gymnosperms.

⑤ Mycorrhiza a relationship between fungi and high plants is -
 (A) Parasitism relationship (B) Saprophytic relationship
 (C) Symbiotic relationship (D) Epiphytic relationship

⑥ Which of the following is not the mode of reproduction in Yeast?
 (A) Budding (B) Fission (C) Plasmogamy (D) Oogamy

⑦ Vegetative reproduction in yeast takes place by or common yeast generally reproduce by:-
 (A) Akinetes (B) Ascospores (C) Aplanospores (D) Budding

⑧ The substance algin which is used for getting and thickening the ice-creams is derived from:-

November (A) Kelps (B) Blue green algae (C) Red algae (D) All. Wednesday

9. The pyramid of energy is
a) Always upright b) Always inverted
c) Both upright and inverted d) None of the above

10. Minamata disease is a pollution related disease which results from
a) oil spills into sea
b) Accumulation of arsenic into atmosphere.
c) Release of industrial waste mercury into fishing and water.
d) Release human organic waste into drinking water.

11. Renewable source of energy is
a) Coal b) Petroleum c) Kerosene d) Biomass

12. Petroleum is a
a) Non-renewable source
b) A renewable source
c) A synthetic product
d) An inconvenient source.