

# ACELLULAR LIFE

## \* Living Characters of Viruses:

- possess DNA or RNA
- can reproduce
- can undergo mutation and genetic recombination
- can infect living organisms

## \* Non Living Characters of Viruses

- subcellular or noncellular
- do not respire or excrete
- can be crystallized
- can be stored

## \* SIZE OF HIV:

- 100 - 150 billionth of a metre
- 0.1 microns
- 4 millionth of an inch
- one-twentieth of length of E. coli bacterium
- one-seventieth of diameter of human CD4+ WBC

- Hepatitis B virus → DNA
- Bacteriophage Virus = DNA or RNA
- HIV → RNA
- Influenza → RNA
- Polio → RNA

## \* HIV

- 72 little spikes
- Spikes & Proteins <sup>(head)</sup> gp120 and gp41 (tail)
- Matrix : protein p17
- Core : p24

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## \* Lenti Viruses :

SIV → Monkeys

FIV → cats

Visna → sheep

CAEV → goat

## \* HIV Genes:

→ Total : 9 Genes

→ Structural Genes : gag, env, pol

→ Functional Genes : tat, rev, nef, vif, vpr, vpu

→ Phages can be used as cloning vectors to introduce recombinant DNA into bacterial cells.

## \* HIV Enzymes:

1. Reverse Transcriptase :- converts viral RNA into DNA
2. Integrase → viral DNA is integrated into human DNA
3. Protease → cuts up large precursor proteins into smaller proteins. These smaller proteins combine with HIV's genetic material to form a new HIV virus.

**PROVIRUS :** A provirus is a virus genome that is integrated into the DNA of a host cell. In case of bacterial viruses (bacteriophages), proviruses are often referred to as prophages.

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- \* Replication time of bacteria  $\rightarrow$  20 min
- \* Replication time of some viruses  $\rightarrow$  70 sec
- \* No. of HIV genes  $\rightarrow$  9
- \* No. of bacterium genes  $\rightarrow$  more than 500
- \* No. of human genes  $\rightarrow$  20,000 - 25,000
- \* Viral Proteins in Flu Virus : 5
- \* RNA in flu virus  $\rightarrow$  8 separate pieces
- $\rightarrow$  Virus was discovered by Ivanowsky in 1892
- $\rightarrow$  First virus to be discovered : Tobacco Mosaic virus
- $\rightarrow$  Porcelain filter was used by Ivanowsky in his experiment
- $\rightarrow$  Those viruses in which RNA act as hereditary material are called Retroviruses. e.g HIV, influenza etc
- $\rightarrow$  Those viruses which attack on immune system, reproduce slowly and their incubation period is long is called Lentivirus.
- $\rightarrow$   $T_2$  and  $T_4$  are mostly used in the phage study.

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# INCUBATION PERIOD

1. HIV → ~~Between six weeks and 3 months~~ 8-10 years
2. Hepatitis A → 2-6 weeks
3. Hepatitis B → 4-20 weeks
4. Hepatitis C → 2-26 weeks
5. Polio → 5-35 days  
Average : 7-14 days
6. Cotton Leaf Curl Disease → 2-3 weeks
7. Syphilis → 2-3 weeks

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- \* HIV infects human CD4 cells
- \* HIV Therapy → HAART (Highly Active Anti Retroviral Therapy)
- \* Hepatitis A → Infectious Hepatitis
- \* Hepatitis B → Serum Hepatitis
- \* Herpes most commonly caused by HSV<sub>2</sub>, although it can also be caused by HSV<sub>1</sub>
- \* There's no cure for Herpes
- \* Cotton leaf curl disease is caused by a complex of begomovirus species and transmitted by the whitefly *Bemisia tabaci*.

Prions are infectious protein particles thought to be responsible for a group of transmissible neurodegenerative diseases.

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PRIONS :

- infectious proteins
- Prions are misfolded proteins with the ability to transmit their misfolded shape onto normal variants of the same proteins.
- The normal prion proteins, expressed on stem cells in the bone marrow and on cells that will become neurons, plays a role in the maturation of neurons.



→ Infectious prion proteins are modified forms of normal prion proteins.

\* Prion Disease In Sheep and Goats → Scarpie  
In Scarpie CNS of sheep and goats is affected

\* Human Prion Diseases:

1. CJD : Creutzfeld- Jacob Disease
2. GSS : Gerstmann- Straussler- Scheinker Syndrome
3. FFI : Fatal Familial Insomnia
4. Alpers Syndrome

The diseases are characterized by loss of motor control, dementia, paralysis wasting and eventually death

\* Infection might be:

1. Acquired infection (diet and following medical procedures such as surgery, growth hormone injection, corneal transplants etc)
2. Apparent hereditary mammalian transmission where it is an autosomal and dominant trait.

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## \* VIROIDS :

- simpler than viruses
- Small, circular, single-stranded molecules of infectious RNA
- lack protein coat
- free RNA
- First viroid discovered : Potato Spindle Tube Viroid (PSTV)

## Viroids Diseases In Plants :

1. Potato spindle Tuber Disease
2. Cucumber Pale Fruit
3. Citrus exocortis diseas
4. Cadang-cadang (coconuts)

## Viroids Disease In Human :

~~⊗~~ Hepatitis D

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