

**Viruses:** → Poison/Venom

Previously: Diseases → unknown cause

Currently:

→ Acellular, Infectious particles.

→ Parasites

→ Lack Biosynthetic machinery.

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## Discovery:

→ Edward Jenner → 1796 → vaccination against small pox.

→ Louis Pasteur

→ Robert Koch → 1850 → Germ theory of disease  
vaccination.

→ Charles Chamberland → 1884 → Rabies → Filterable  
(Non-separable)

→ Lwansky → 1892 → Tobacco Mosaic → Filterable.

→ Twort ~ 1915 } Bacteriophage

→ D. Herelle ~ 1917

→ W.M Stanley ~ 1935 → Crystallized the virus → separate  
T.M.V → Tobacco mosaic virus.

## Composition:

It is consist of Protein & Nucleic Acid.

→ They are also known as Nucleoprotein.

## Structure:

Out → coat → Proteins → a.a → Capsomere

80 Faces → Icosahedral (Faces) Capsid

Inside → core

→ Nucleic acid

→ RNA → Ribovira

→ DNA → Deoxy ribovira

→ Enzyme

#  
No. specific  
→ 32 - Polio  
→ 162 - Herpes  
→ 252 - Adino

# Characteristics:

- All viruses are ultramicroscopic → 1000 times smaller than bacteria.
- Can only seen with electron microscope
- Viruses are obligate intracellular  
↳ inside of host.
- Viruses are Antibiotic insensetive
- They show living and non-living charactes

- DNA or RNA
- Replicate
- UV rays → dead
- Trans fer
- ↳ Infection

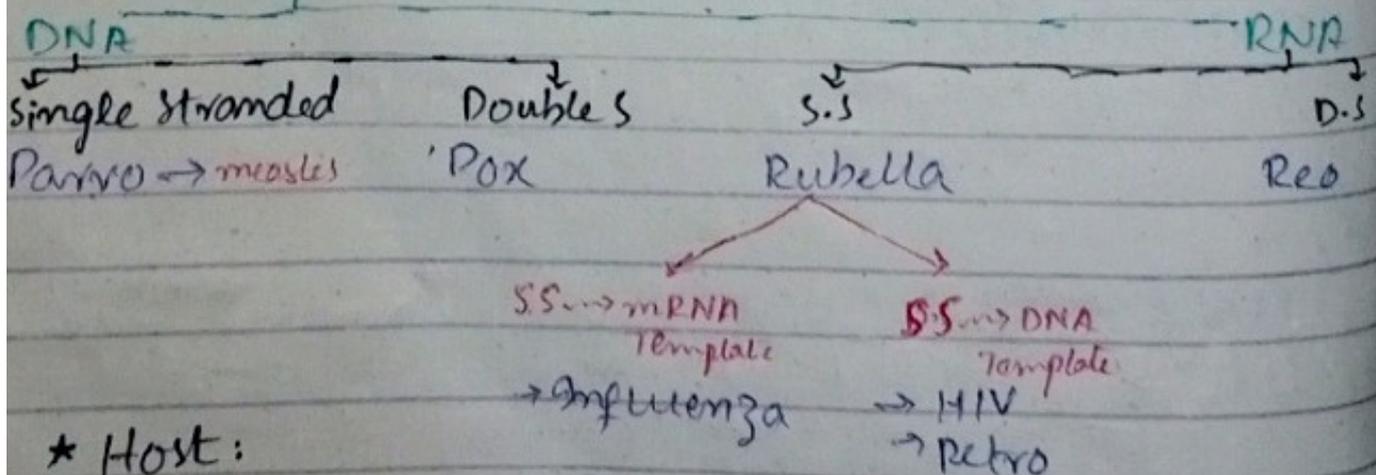
- No Respiration
- No excretion
- No Cytoplasm
- No Ribosome
- Found in crystalline form

# Classification:

## \* Structural:

- Rod shape → TMV (Tobacco mosaic virus)
- Spherical → Polio
- Complex → Bacteriophage.
- Enveloped → HIV, Influenza.

## \* Genomic:



## \* Host:

- Plant: → mostly RNA → 2000 types discovered  
→ TMV

Animal: mostly DNA virus  
HIV, Measles.

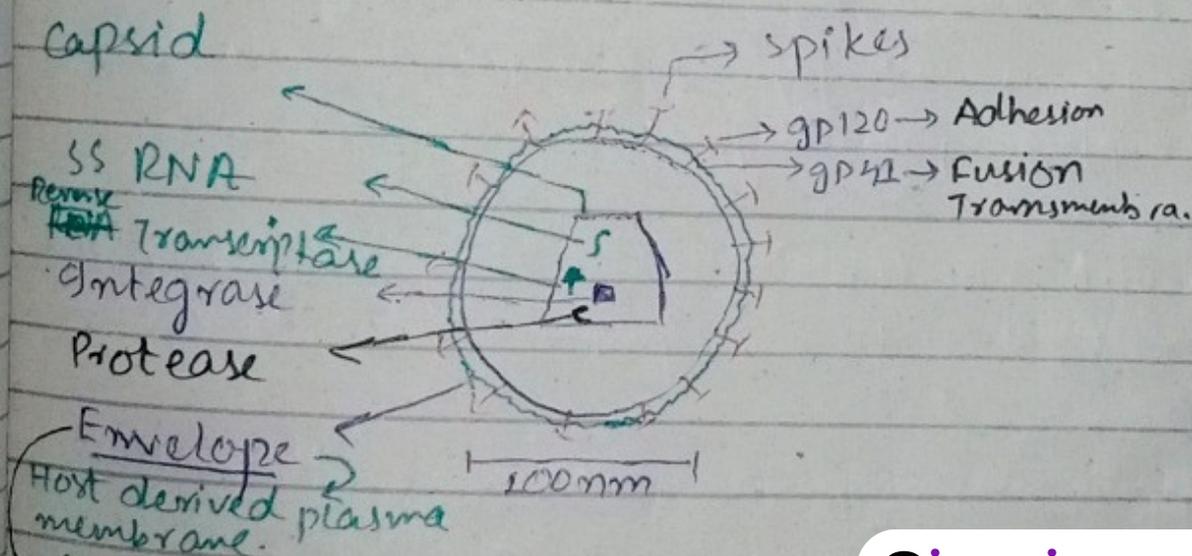
Bacteriophages: discovered in 1915-1917  
T<sub>2</sub>, T<sub>4</sub>

**HIV:** Human Immuno deficiency virus.  
**Discovery:**

- Discovered in 1983 in USA.
- mostly found in Homosexuals → having similar symptoms.
- National Institute of Health resources in USA
- Pasteur Institute in France.

**Occurrence:**

- Monkeys → but causes no disease
- Cats, Rodents, fowls → causes cancer (onco-virus)
- Humans → causes AIDS.



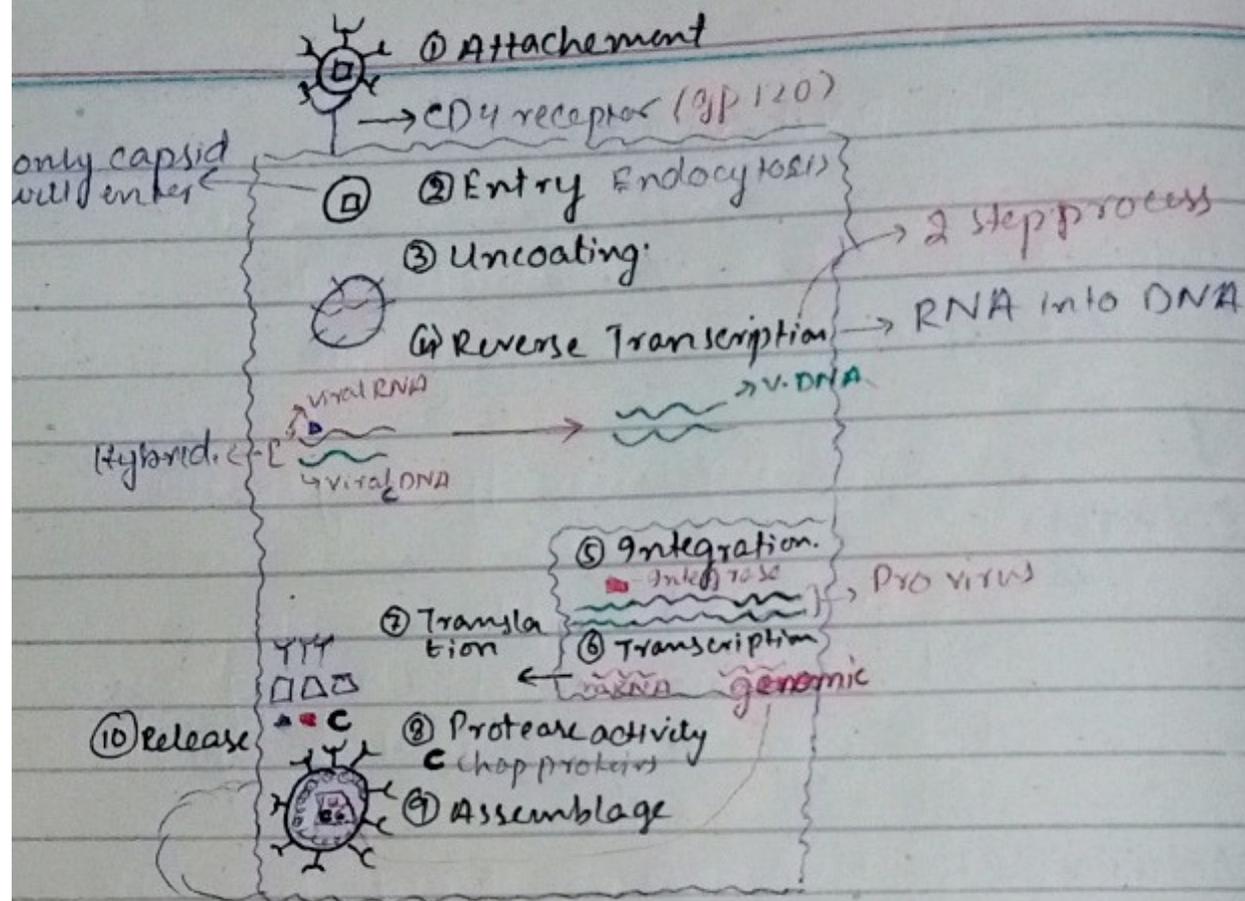
→ If it is in living body.

**Life Cycle:**

Host:

- Primary → Helper T-lymphocytes
- Secondary → Macrophages
- Dendritic cell.

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## Symptoms:

→ Asymptomatic: fever, chill, mild, rashes, itches, swollen lymph nodes.

(These symptoms will just appear for 9 months and then disappear for 10 years.)

→ AIDS related complex:

→ Night sweats, Persistent cough and Diarrhea  
Weight loss, Infection, lymph glands swell

→ Full Blown Aids:

→ Opportunistic infections

## Treatment:

→ HAART (Highly Active Anti Retro Viral Therapy)

## Transmission:

→ sexual contact, Infected surgical instruments, Blood Transfusion, During Pregnancy, Breast feeding. (will not transfer by saliva, tears, sweat)

# Prokaryotes

- Don't have nucleus
- Unicellular
- Both Autotrophic & Heterotrophic.

## Origin:

3.5 billion years

## Discovery:

1674 → A.V. Leuwenhook → Animalcules.

- Ehrenberg → coin → bacteria.
- John Hogg → "Protista"
- E. Chaton → gives concept of Euk & Prokaryotes
- E. Haeckel → monera
- H. Copland → Elevate → kingdom.
- Robert Whittaker → 1<sup>st</sup> Kingdom

## Prokaryotes

Archea	Bacteria
→ Ancient	→ Advance
→ Extrem conditions	→ Normal conditions
→ Absent	→ Absent → mycoplasma
→ Present → Non peptidoglycan	→ Present → Peptidoglycan
→ Proteins	
→ Polysaccharides.	
→ Branched lipids Cell membrane.	→ Unbranched lipids
→ Antibiotic Insensitive	→ Antibiotic sensitive
→ rRNA → Eukaryotes	→ rRNA → Unique
→ Introns	→ No Introns

# Occurrence:

Ubiquitous → present everywhere

## Size:

→ 0.1 μm to 600 μm

• Smallest → Mycoplasmas

0.1 μm → 0.2 μm

100 nm → 200 nm

• Largest → Spirochetes

500 → 600 μm

E. Fishelsoni → 800 μm

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## Shape

Cocci

Round

→ O Coccus

→ ⊕ ∞ Diplo

→ ⊕ ⊗ Tetrad

→ ⊕ ⊗ Sarcina

→ ∞ Strepto

→ ⊙ Staphlo

Bacillus

Rod



∞ Diplo

⊞ Strepto

• Lacto bacillus

• E. coli

• Pseudomonas

Spiral

Helical

→ spirillum

→ short, thick, rigid.

→ Spirochaetes

Long, thin, flexible

→ Vibrio:

Comma shaped.

## Structure:

Common: → present in all bacteria.

1. Cell wall:

→ Absent in mycoplasma

→ shape, rigidity and protection from osmolytic.

H.C. Gram:

Gram +ve:

→ Purple stained

→ Primary stain → Crystal Violet

Gram -ve:

→ Pink stained

→ Secondary stain → Safranin

→ CV-I Complex → Retained

→ Thick peptidoglycan

→ Teichoic Acid

→ Single layer

→ Lipid ↓

→ Permeable

→ No porins

→ 20-80 nm

→ No periplasmic space

Mycoplasmic Tuberculosis

Streptococcus pneumoniae

Clostridium species tetani

→ CV-I complex → disappear

→ Thin Peptidoglycan:

→ No Teichoic acid

→ 2-layer → lipopolysaccharide

→ Lipid ↑

→ Less permeable

→ Porins

→ 8-11 nm

→ Periplasmic space → All.

E. coli

Vibrio cholera

Salmonella

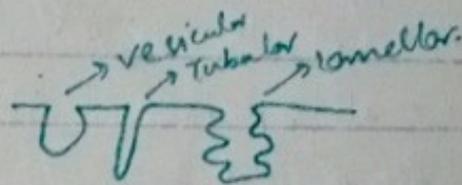
## 2: Cell Membrane:

→ Thin & delicate.

→ No cholesterol.

### Mesosome:

Invagination → cell membrane.



↳ DNA replication

↳ cell division.

↳ Respiratory Junction

↳ Extracellular transport

∴ It is known as mitochondria of bacteria only by function not by structure.

## 3: Cytoplasm:

→ Gel like

→ It lacks cytoskeleton & membrane bounded organelles.

## 4: Ribosomes:

70S → 30S  
→ 50S

## 5: Storage:

Useful:

Waste:

→ Glycogen, lipids,

Alcohol

→  $SO_4^{2-}$  &  $PO_4^{2-}$

Lactic acid

capsule + slime = Glycocalyx.  
 cell wall + cell membrane = cell envelope

## 6: Nuclear Organization:

### Plasmids:

- Double stranded DNA
- Independently replicate
  - Fertility
  - Antibiotic resistant
  - Heavy metal resistant.
- Used as vectors

### Nucleoid:

- Central dense region.
- Single, double stranded circular DNA.
- haploid.

## Uncommon:

### 1: Glycocalyx:

↳ Outer wrappings.

#### Capsule:

- Thick & Gummy
- Tight covering
  - ↳ Adhesion
  - ↳ Biofilms (colonies of bacteria)
  - ↳ Polysaccharides/proteins
- Insoluble

#### Slime:

- Thin & slippery.
- Loose covering.
  - ↳ Avoid phagocytosis
  - ↳ Enhance pathogenicity
- Soluble.

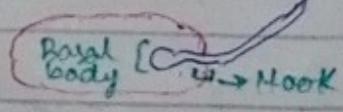
### 2: Appendages:

#### Pilli (Pillin)

- Short, unbranched & helical.
- Non locomotory organ.
- ~~Form~~ conjugation
- Occur in gram-ve

#### Flagella (Flagella)

- Long, filamentous.
  - ↳ 360° rotation
- Locomotory organ.
- Locomotion involves chemotaxis

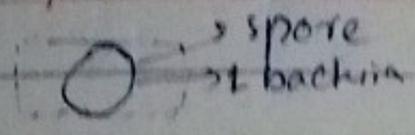


- Atrichous → NO
- Mono → 1
- Bi → 2
- Stapho → tuft at one end
- Amphitri → tuft at both ends.

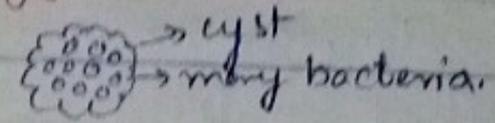
### 3: Spores & Cyst

- ↳ Thick walled resistant structures.
- ↳ Dormant.

→ Unfavorable conditions



→ Differentiation



→ Heat resistant

→ Not heat resistant.

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## Ecological Importance:

- Decomposers
- Ecological cycles
- Milk industries
- Beverages
- Agriculture
- Antibiotics

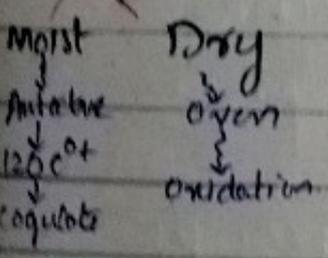
## Control:

→ Decompose (200 harmful)

### Physical Sterilization

Heat

↓  
UV  
300nm



### Chemical:

→ Disinfectant

↳ apply on non living surfaces.

phenyls Alcohol

→ Antiseptic:

↳ apply on living surfaces

→ Iodine

→ Antibiotic:

↳ rupture cell membrane or cell wall.

### Filtration:

- ↳ Enzymes
- ↳ Bacteriophages
- ↳ Blood