

A-Cellular Life

SUMMATIVE TOPICS

- 1- Classification of Virus
- 2- Virus can pass unfavourable conditions outside the host
- 3- Bacteriophage (full topic except 5.3.6)
- 4- HIV
- 5- Virioids and Prions.

History

viruses are even more simpler than Prokaryotes

Virus is derived from latin word Venom, which means Poison

First vaccine was produced by sir Edward Jenner in 1796

Unhon ne cow pox ki eik vaccine banai thi jo k small pox k khilaf bhi immunity deta he. jo k eik kamayab experiment tha

later on Louis Pasteur used the

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term vaccine

⇒ In Old time, People used to refer virus to every thing which causes poisonous diseases

⇒ Cow pox was named so cause it was in early times mostly seen in cows.

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⇒ Charles Chamber land - 1884

He said that causative rabies Pass through Porcelain Filter paper

Pore size of Porcelain

0.1 - 1 microns

100 - 1000 nm

Rabies → Dogs bite ki wajah se hone wali disease

↳ "RABIES IS A FILTERABLE VIRUS"

According to C.C.L

⇒ Iwanowsky (1892)

Tobacco mosaic disease

leaf lia → crush kia → liquid banaya

eik healthy

Porcelain paper

Per wo liq dala

Se Pass kia

↳ wo leaf bemaar ho gaya

→ So in this way Iwanowsky indicated the filterable nature of virus

⇒ W.M. Stanley (1935)

- Discovered virus with its proper chemical composition, took its picture with the help of electron microscope

QUESTIONS

Q Who first discovered virus?

Q Which was the virus which was discovered first?

1- W.M. Stanley

2- Tobacco mosaic disease

CHARACTERISTICS

OF VIRUS

- 1- Extremely small infectious agent
 - 2- Smallest virus is pox virus with 20 nm
 - 3- Largest virus is pox virus with 250 nm
- 10 to 100 times smaller than BACTERIA

LIVING CHARACTER

- ~ Can replicate but only in host cell
- ~ Different varieties through genome mutation
- ~ they have their own genetic material
- ~ Earlier, in living organism and cause disease. Intracellular obligate parasite.
⇒ Obligate = Only Active in host.
- ~ They can't complete their life cycle outside host.
- ~ They get destroyed by UV rad cause genomes are present

NON-LIVING CHARACTER

- ~ They do not have cellular structure
- ~ They do not have any metabolic activities on their own.
- ~ They can be crystallized and stored in bottle
- ~ do not respire and do not require chemical energy
- ~ They behave as non-living, inert infectious particle outside the host
- ~ They can't be grown in artificial medium.

Scanned with CamScanner

- ~ They have parasitic nature
- ~ They are intracellular, obligate, parasite
- ~ mostly show resistance against antibiotics such as penicillin & strepto-

4. Spikes

↳ made up of glycoprotein

In human virus → 160 nm

- ~ They have parasitic nature
- ~ They are intracellular obligate parasite
- ~ mostly show resistance against antibiotics such as penicillin & streptomycin

GENERAL STRUCTURE OF A VIRUS

1. Nucleic Acid (DNA/RNA)
2. Protein coat (capsid)
 - composed of capsomeres
 - capsomeres vary in shape/appearance & no., they are specific to particular kind of virus
3. Lipid layer (envelope)
 - outside capsid
 - host derived
 - In virus & bacteria envelope hota hai un ka khte hai enveloped virus

Spikes

→ made up of glycoprotein

In herpes virus → 162 capsomeres
In adenovirus → 252 capsomeres

CLASSIFICATION OF VIRUS ON BASES OF STRUCTURE

1. Helical / Rod like capsid



Example 2 TMV (Tobacco mosaic virus)

2. Polyhedral capsid with glycoprotein spikes



Example Adenovirus

3. Envelope with spikes



Example Influenza virus

Adenovirus capsid / Tobacco virus



Examples Bacteriophage

ON THE BASIS OF HOST

- 1. Plant Virus
 - Host is plant Ex. TMV
- 2. Animal Virus
 - Host is animal Ex. Poliovirus, Poxvirus, Paramyxovirus
- 3. Bacteriophage
 - Host is Bacteria

ON THE BASIS GENOME

- ds DNA → ds RNA
- ss DNA → ss RNA

BACTERIOPHAGE

Bacteria attacking

⇒ Bacteriophage is a virus that attacks on bacteria.

⇒ Structure



head

→ hexagonal head

→ Capsid & Capsomeres

→ Contains DNA only (No RNA)

Tail

→ Sheath

→ Tail pin/spikes

→ Base plates

Sheath: Injects DNA into the host
Tail fibres/pins: Used for attachment
Base Plate: secretes Enzyme lysosomes breaks the cell wall of bacteria

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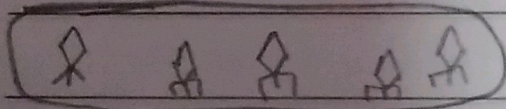
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(master slave relation)

→ Lytic Cycle (mode of replication)

lysosome attach

then wall breaks



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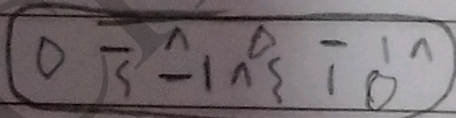
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injects the core tube inside the bacterial cell

viral dna

DNA RNA
phage and protein
↓
Dianase
(to destroy the bacterial DNA)



synthesize by proteins and parts are made

Host →

bacteria -

dnaase enzyme

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is stage per viral dna master ban
jata hai aur bacteria slave hai
dna will order bacteria to do
things.

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- ① disentanglement of host DNA
- ② slave bacterial cell will play and
will accept the orders

enzyme is also made -

lysosomes

ER cycle 20-25 min

200 particles are

made like the broken parts

Q - What is the difference between
lysogenic and lytic cycle

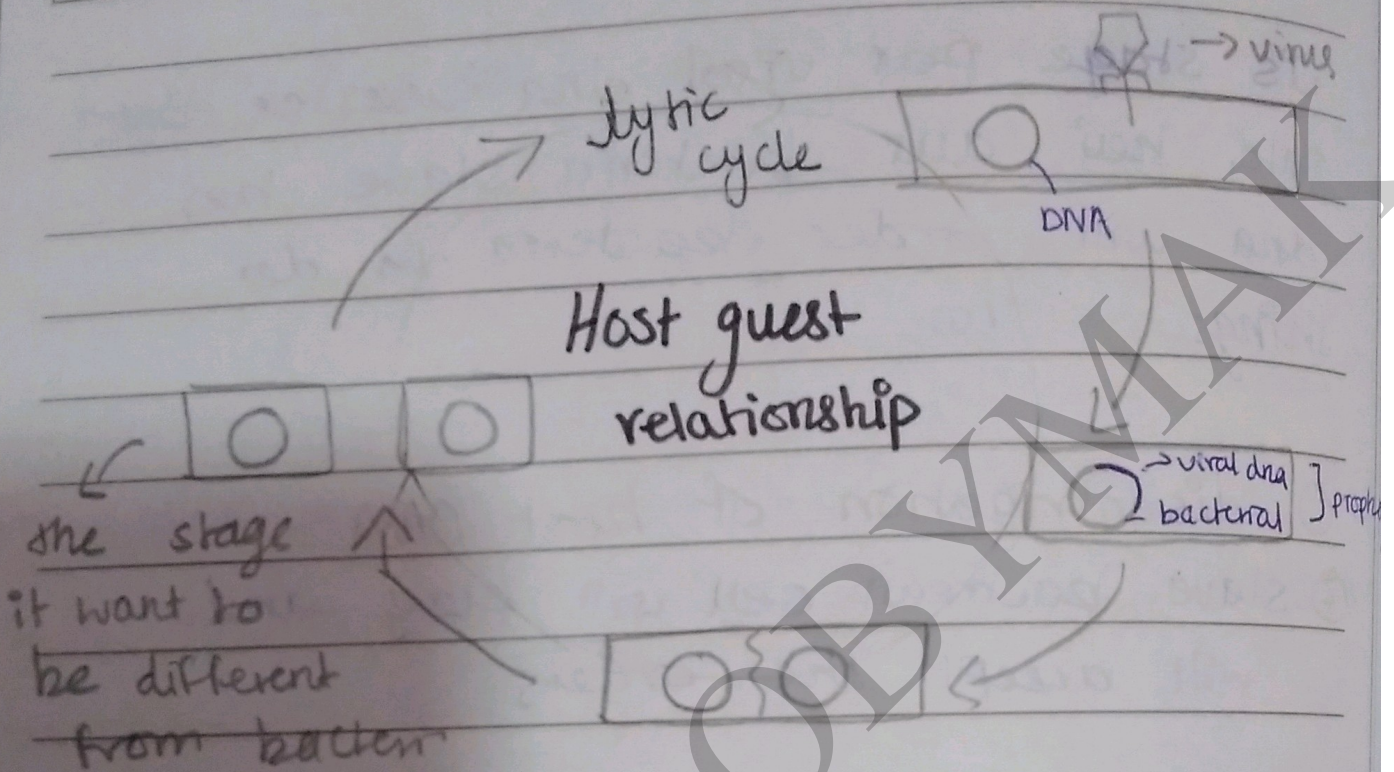
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→ Bacteria can't identify if any foreign particle has enter

→ After some time virus recognized that I shouldn't came here to destroy bacteria

→ Then it enters the lytic cell cycle.

→ genome = dna = genetic dna

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→ bacteriophage is virus that attacks bacteria

→ bacteriophage ka dna is called viral dna

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→ After replication usko apna kaam yaad aata hai key i came to destroy bacteria.

→ Break everything and the start process of lytic cell.

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Lytic Cycle

→ Lysis takes place in the start.

→ prophage does not happens

→ Lytic phage → name of bacteriophage used or virulent phage.

→ master slave relation

Lysogenic cycle

→ Lysis takes place when it does replication

viral dna combines it self with bacteria called prophage

temperate phage

Host guest relation

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→ Usage of bacteriophage in genetic engineering

→ gene defect replace

① Gene library : Collection of Gene (DNA fragment) from a particular specie

Bacteriophage → used for copy

② Phage Therapy : use bacteriophage to beat bacterial infection.

③ Antibacterial nano medicine - drug delivery to the targeted area

→ Phage therapy : Bacteriophage only kills harmful bacteria.

Antibiotic can kill

any type of bacteria

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→ bacteriophage only kills the bacteria

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HIV

- dec immunity inside human
- it causes aids (Acquired immune deficiency syndrome)
- HIV is a agent that causes aids due to many virus
- syndrome that is cause to ~~dec of immunity~~ virus
- the development of immunity when a virus enters the body and body takes action against.
- acquired immunity ki deficiency.
- linked sickness (syndrome) multiple disorders together.

→ Structure of HIV

→ RNA enveloped virus

→ Oncovirus

B/c of cancer

↳ capsid is conical shape

↳ dual layer (envelope)

integrase

capit
made of
protein

coat (made of
capsomeres)

enzyme

reverse transcriptase

Protease

help to
recognize

→ envelope

matrix
protein

capsomere

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- ② matrix protein
- ③ capsid contains protein coat
- ④ single strand RNA spikes

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⑤ Bacteriophage mein tails are present in tails

⑥ it help to recognize its host -
the two spikes join -

⑦ Host → human

protein matrix → the part that is embedded into the envelope gp41
Main function →

human key immune system ko deficiency krta.

→ They destroy white blood

→ bahir ke part gp120

→ Host cell ko attach krta which catch other

→ spikes envelope is made when

A comes out of the host cell

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→ gp 41 comes in play when pentahexon wants to happen.

→ ~~gpa~~ - g

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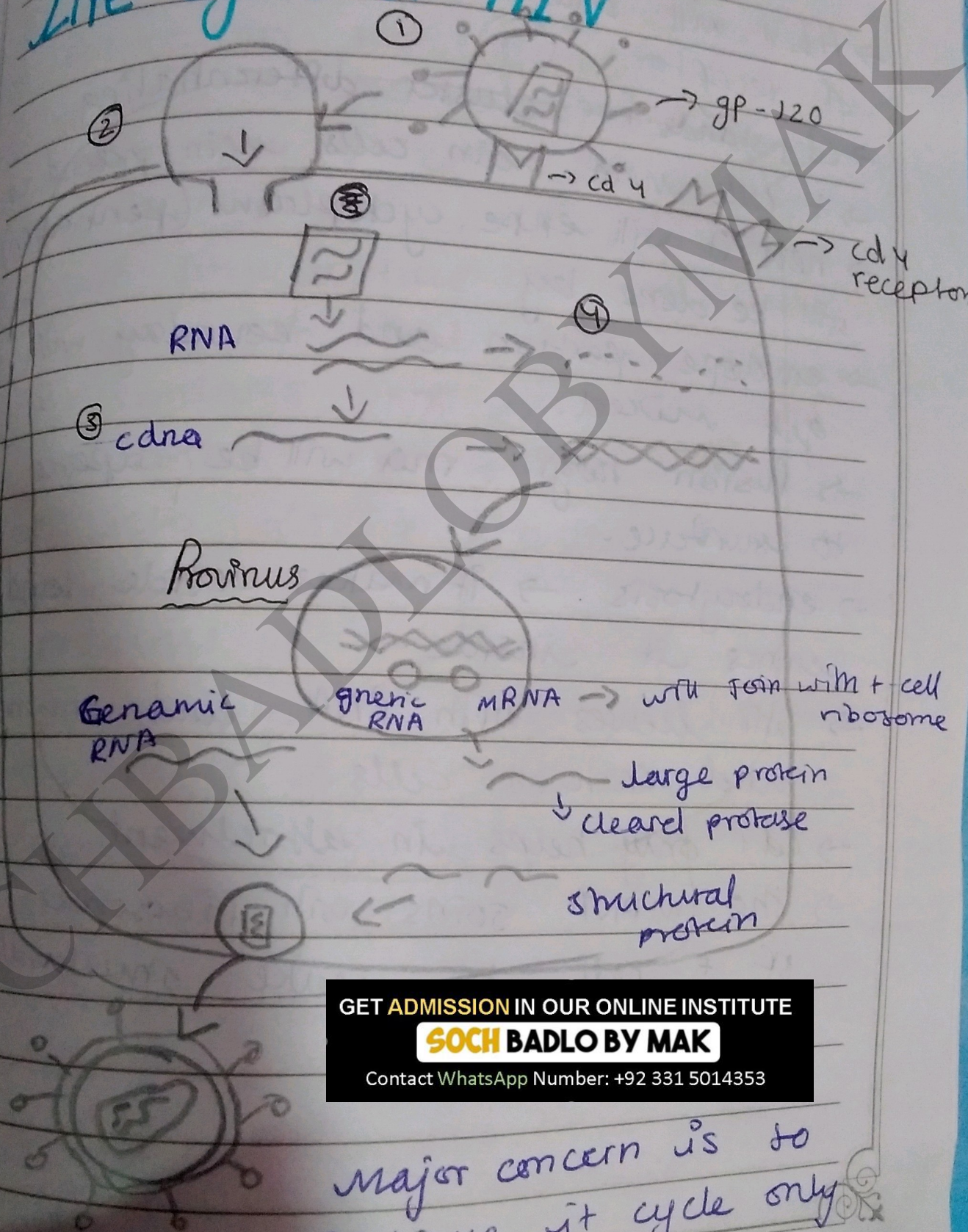
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→ virus key dna to make membrane change may mean.

→ where CD receptors are present only they are attached there - its their target area.

→ 9 genes mean say 3 genes are specific for structural protein

Life Cycle of HIV



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major concern is to
continue it cycle only
possible by using t-cells.

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- HIV will bind itself on t-cells of receptor
- Cd stands for cluster differentiating
- t cells mein brain cells mein present cd-4
- now it will enter cytoplasm (penetration) will be done by
- envelope portion and boundary will get mixed.
- fusion hogi rna will be exposed to surface.
- endocytosis → it makes vesicle and enters it inside.
- will leaves with RNA and enzyme and enter t-cells.
- Cd4 only helps in attachment
- the mRNA joins with ribosomes of t-cell to make structural protein

- ① landing + attachment = adsorption
- ② penetration + uncoating (fusion)
- ③ contains reverse transcriptase that enters the + cells RNA say DNA
- ④ better here it will be reverse
- ⑤ reverse transcriptase
- ⑥ breakdown of viral genome / disintegration
- ⑦ HIV contains RNA enzyme
- ⑧ replication of single stranded DNA into double stranded
- ⑨ integration
- ⑩ provirus

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- ⑪ Transcription of viral ds c DNA
- ⑫ Biosynthesis of viral DNA
- ⑬ Assembly / maturation
- ⑭ Bud off / Release

from the host + cell the envelope is made by host

Host (it cell) size dec that much it becomes non-functional.

↓
→ immunodeficiency

Symptoms of Aids :

(acquire immune disease syndrome) ◦ group of linked diseases.

→ symptoms are also like normal diseases
symptoms (fatigue, flu, rash, itching)

starting symptoms → normal (develop and then disappear)

→ After 9 months symptoms attack again
last stage → deadly virus

→ no cure just can control

↳ First stage (asymptomatic carrier)

◦ Fever, itching, rash, chills

◦ these symptoms disappear for months

◦ HIV is present in the body but don't spread.

◦ if HIV is tested, the person will be 'HIV+'

↳ AID related complex - (second stage)

◦ fever, diarrhea, swollen lymph node
swollen glands, loss of memory,
night sweats.

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Q- Why the disease is known as HIV ?
it is called hiv cause it

weakness your immune system.

→ diffience immune syste

→ by dec. hyper + cells , macrophage

imp cells of immune system

→ hyper + - cells

they activate B cells

10K helper + - cells.

helper + - cells against specific cells.

HIV can not be cured but
can be controlled

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→ Full blown Aids :

→ loss of appetite

→ opportunistic

→ weight loss → weakness
infection.

jasay he 4 mark
miley shi
will attach.

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ART - HIV ki replication ko kam krta hai
→ Interagase krta nahi krta.

→ There is a no vaccine found till now coz it does mutation and repeatedly increases.
vaccines are made against one variant but it has many variants.
→ its not a genetic disease.

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Hepatitis :

inflammation of liver

Causes :

- viral infection
- Toxic agent
- Drug

Symptoms :

- Jaundice
- liver enlargement
- fatigue
- Rarely fever
- abdomen

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hepatitis B consecutive agent

interferon.

virus ko replicate

honey say rokey ga

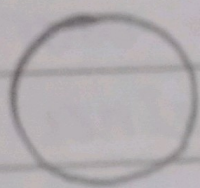
→ it is prepared by wbc

→ help immune system to fight against virus.

interferon against hepatitis

B

viroid →



→ circular RNA

taab virus cause karega

tab protein coat aagay

coat lega B say

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RNA
DNA } enveloped
RNA }
DNA enveloped
RNA + - enveloped

Antiriovirus :

throat ka back part - oropharynx

→ motor neuron mein replicate krta -

death of these cells causes paralysis

muscle will stop working -

→ 2 types of vaccines :

IPV (inactivated polio virus)

OPV (oral polio)

IPV - when polio will enter it will kill the virus. (salk vaccine)

OPV : it is active but its not that strong -

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Cotton leaf curl -

- o curling of leaf
- o it will turn int too much dark green colour.
- o it destroyed many plants in before time
- o Begimo virus ki waja say
- o prevention $\rightarrow$ insecticide

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Limitations of the vaccine

- $\rightarrow$ it involves itself very fast
- $\rightarrow$ maybe antibodies effect sm time sm time rest -

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Subviral particle

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Viroids

- ↳ No protein coat
- ↳ only free circular RNA
- ↳ low molecular weight
- ↳ Human → Hepatitis
- ↳ PST-P
- ↳ cucumber pale fruit disease
- ↳ NO RNA
- ↳ only protein is present
- ↳ Molecular weight is like virus
- ↳ new reproductive disease
- ↳ Attack on nervous system
- ↳ Human → Kuru
- ↳ Cattle → mad cow disease

VIROIDS AND PRIONS

Definition

Viroids are infectious RNA molecules.

Prions are infectious Protein Particle

Size

Smaller than virus

Smaller than viroids

Composition

Composed of single strand of RNA

Prions are composed of only Protein molecule

Nucleic Acid

Present

Absent

Protein Component

Absent

Present

Infections

Cause disease MOSTLY in Plants (Only HDV in humans)

Prions mostly cause neuro-degenerative disease in animals & Humans

Type of Disease

Potatoe Tuber disease

Kuru in humans

Cucumber Pale fruit "

Mad cows in cows

Treatment

Antiviral Treatment

Not discovered yet

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