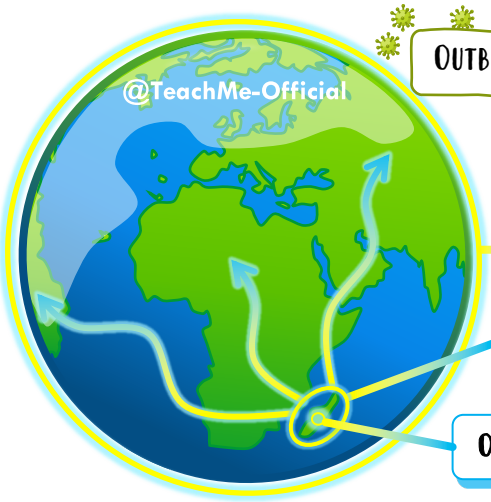
A2.3

Viruses (HL)



OUTBREAK → EPIDEMIC → PANDEMIC

Epidemiology – Study of the occurrence, distribution and control of disease in a population.

PANDEMIC – An epidemic that has gone global and displays exponential growth.

EPIDEMIC – When an outbreak has spread over a large geographical area.

OUTBREAK – Unexpected increase in the number of people with a specific condition.

Not considered alive because they **DON'T CARRY OUT THE FUNCTIONS OF LIFE**

– HOST CELL –
The cell a virus uses to carry out its metabolic and reproductive processes.

ABOUT ME

Small fixed size

Contain Nucleic Acid
DNA, RNA
Double Stranded, Single Stranded

Enclosed by a capsid (use?)
Help determine ability to infect

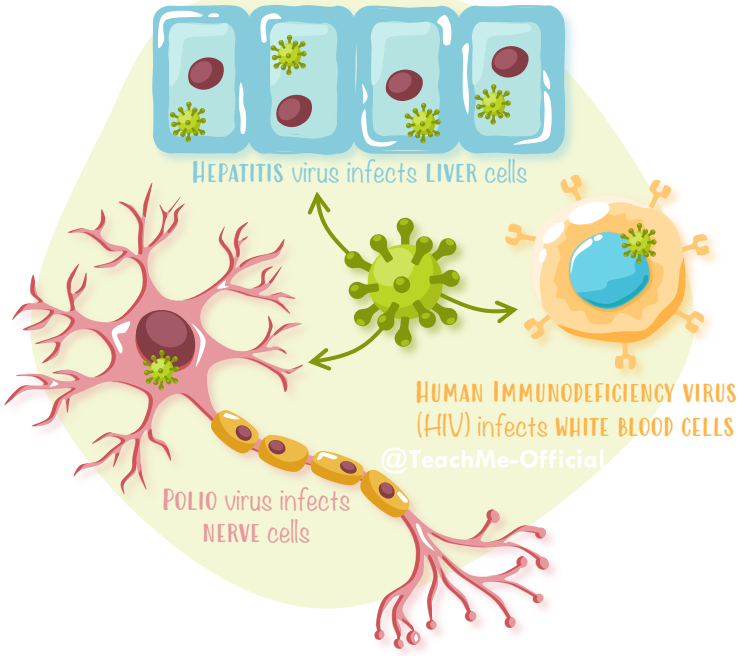
No cytoplasm

Could have envelope
(host cell recognition or attachment)

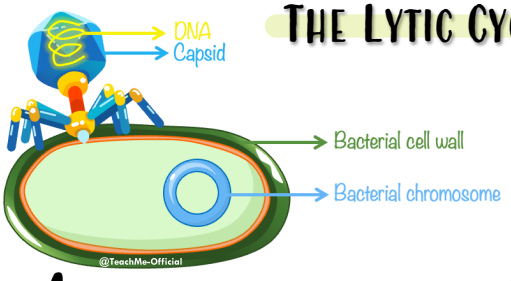
Obligatory intracellular parasites
(depends on living cell)

MOST ABUNDANT BIOLOGICAL ENTITY.

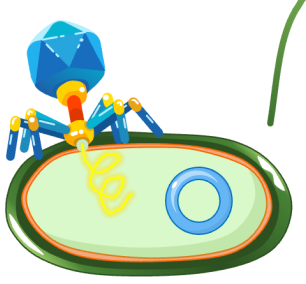
DIFFERENT VIRUSES INFECT DIFFERENT TYPES OF CELLS



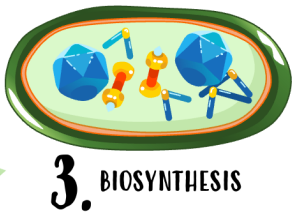
THE LYTIC CYCLE



1. ATTACHMENT

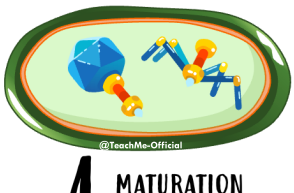


2. PENETRATION

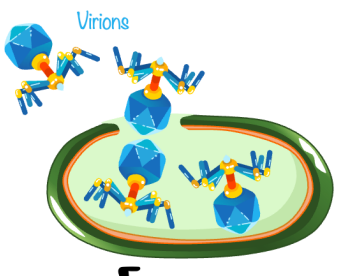


3. BIOSYNTHESIS

Viruses must use host cells to carry out their own protein systhesis to reproduce as they do not have the necessary componants (like mitochondria or enzymes).



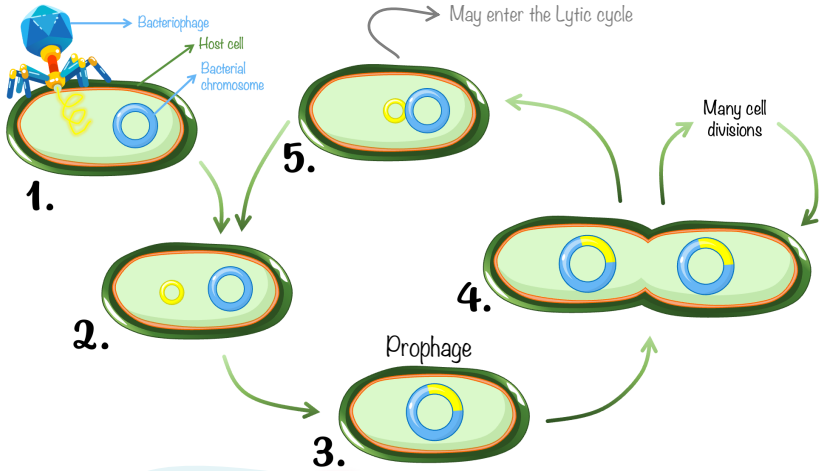
4. MATURATION



5. RELEASE

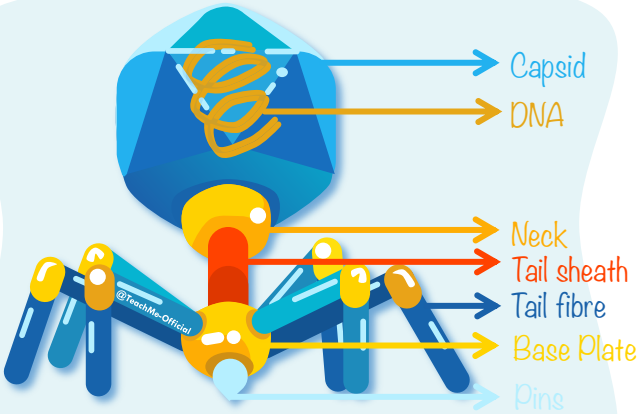
There are two unique reproductive cycles: the **LYTIC CYCLE** and the **LYSOGENIC CYCLE**.

The Lysogenic Cycle

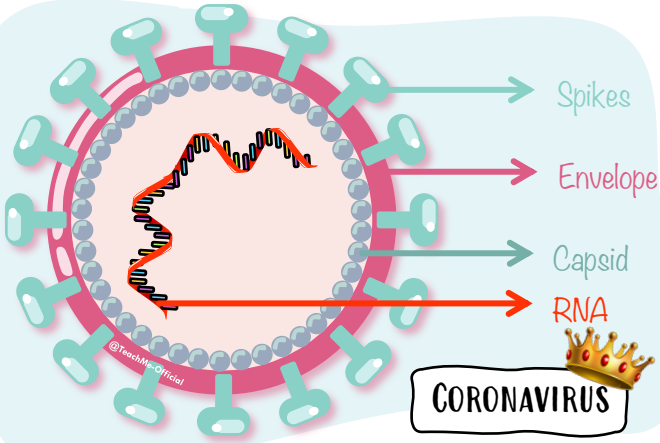


Structural Diversity in Viruses

Viruses exist in various shapes and sizes but all are obligate intracellular parasites

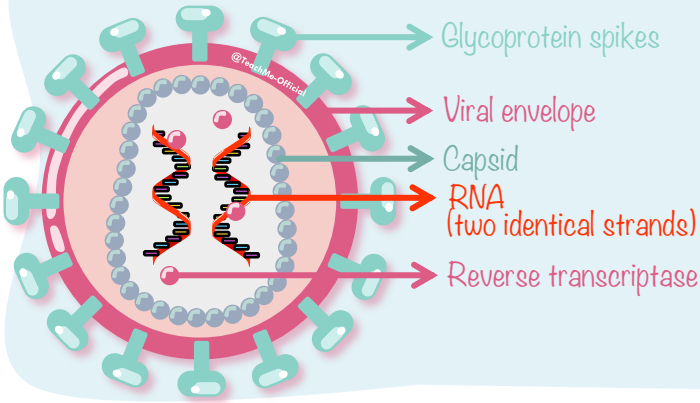


Bacteriophage Lambda



Coronavirus

3 Examples of viruses



HIV Virus

HIV (human immunodeficiency virus) is a kind of **retrovirus** – meaning it can produce **DNA from RNA** using a special enzyme "**reverse transcriptase**"

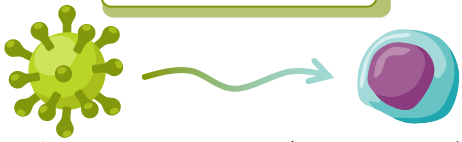
Normally: **DNA -> RNA**

Retrovirus: **RNA -> DNA**

It infects **white blood cells (CD4)** and is the virus responsible for causing **AIDS (acquired immune deficiency syndrome)**

Origin of Viruses

1. Virus first hypothesis



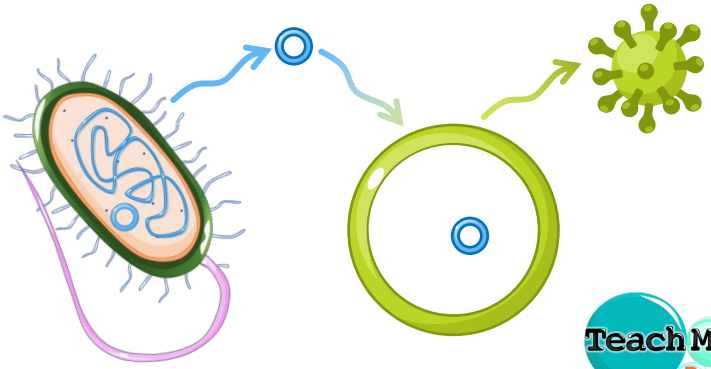
Virus originated before cells (simple to complex)

2. Regressive hypothesis (reduction or degeneracy)

Viruses were once small cells that became parasites of larger cells. Eventually shedding small structures no longer needed via gene reduction.

3. Escape hypothesis (vagrancy)

DNA or RNA escapes larger cells and became surrounded by an outer boundary



Antigenic Shift

Different viruses infect the same cell and recombine genetic material

Major changes in a relatively **short time** in the **surface proteins** of the virus

Totally **new viral strain** does not get recognized by the immune system – possible to cause **pandemics**

Example

Influenza virus vaccine must be adjusted each year so that it is effective

Because they are RNA viruses, they need to first convert RNA to DNA to carry out replication. So **lots** of error.

VS.

Antigenic Drift

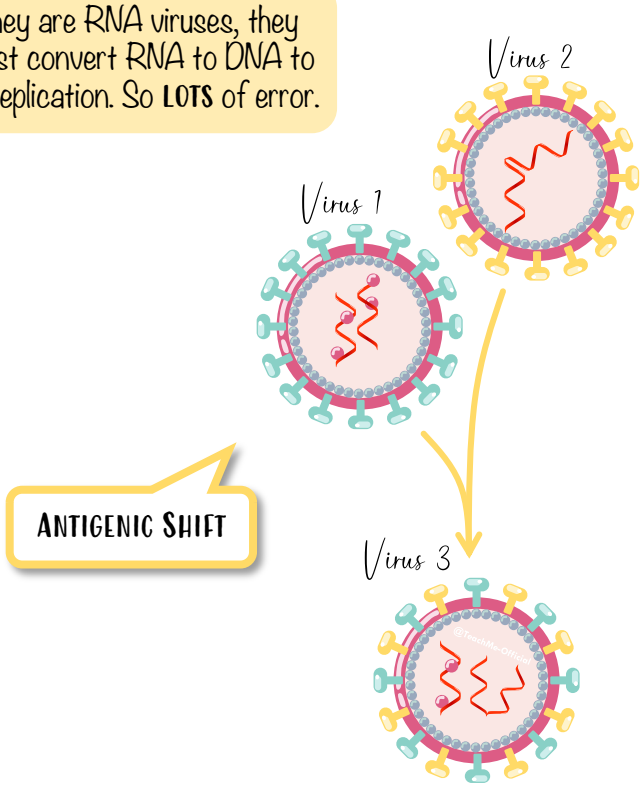
Small incremental changes in the viral genetic material occur over time

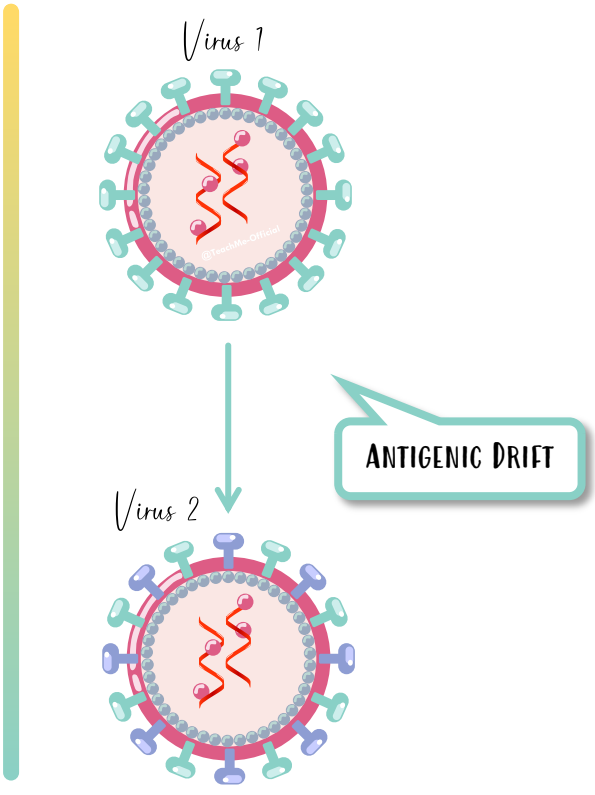
Slowly producing variation in the **surface proteins** of the virus

Accumulated changes eventually prevents the immune system from recognizing the virus

Example

HIV undergoes rapid antigenic drift, even within a single individual, creating problems for the immune system to control the virus.





notes