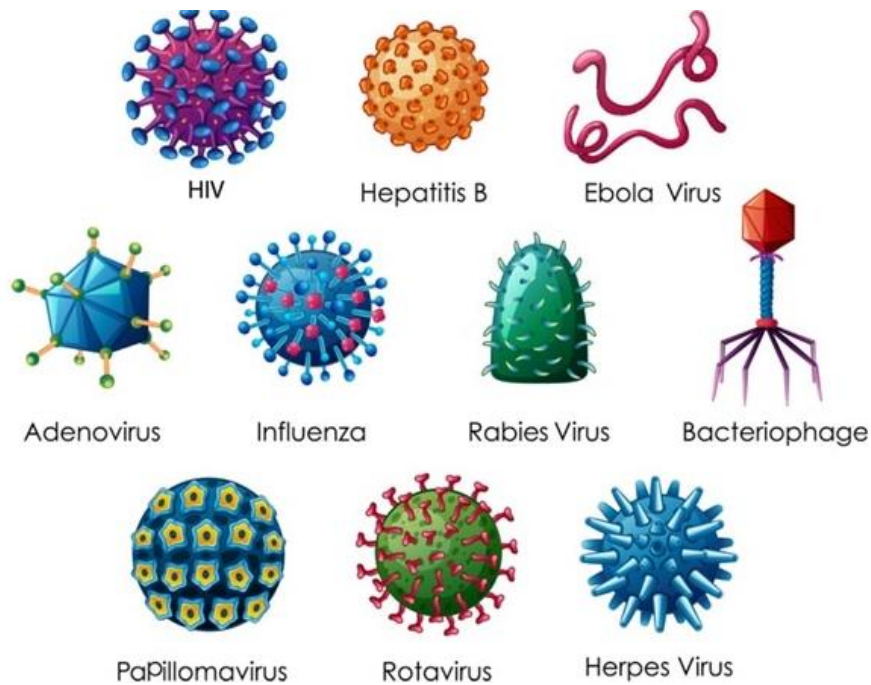


# Viruses



- infectious microbes consisting of genetic information (either DNA or RNA) surrounded by a protein and lipid coat.
- considered non-living by many as they cannot replicate on their own.
- capable of infecting all types of cells including other microbes (bacteria) and of course humans.

Examples: HIV, COVID-19, Influenza, Measles, Chickenpox, Smallpox, Rhinovirus

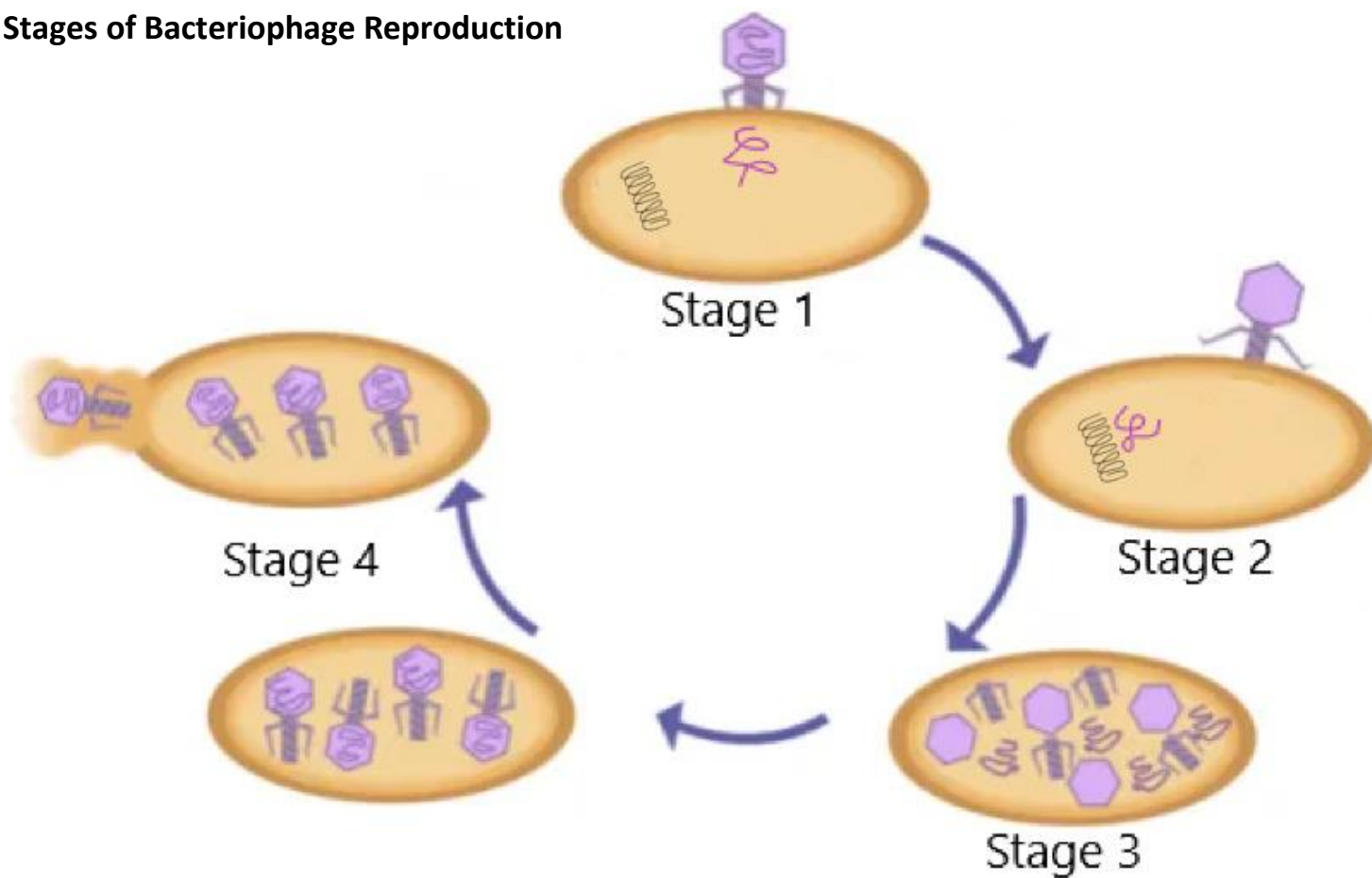
## **Virus Spread**

- Person to person through close contact. This usually involves exchanging bodily fluids often through the mucus membranes.
- Via mucus droplets in the air and on surfaces.
- By 'intermediate hosts' often referred to as vectors. An example are ticks that carry the virus that causes lime disease.
- Via contaminated water and food.
- Through infected blood.

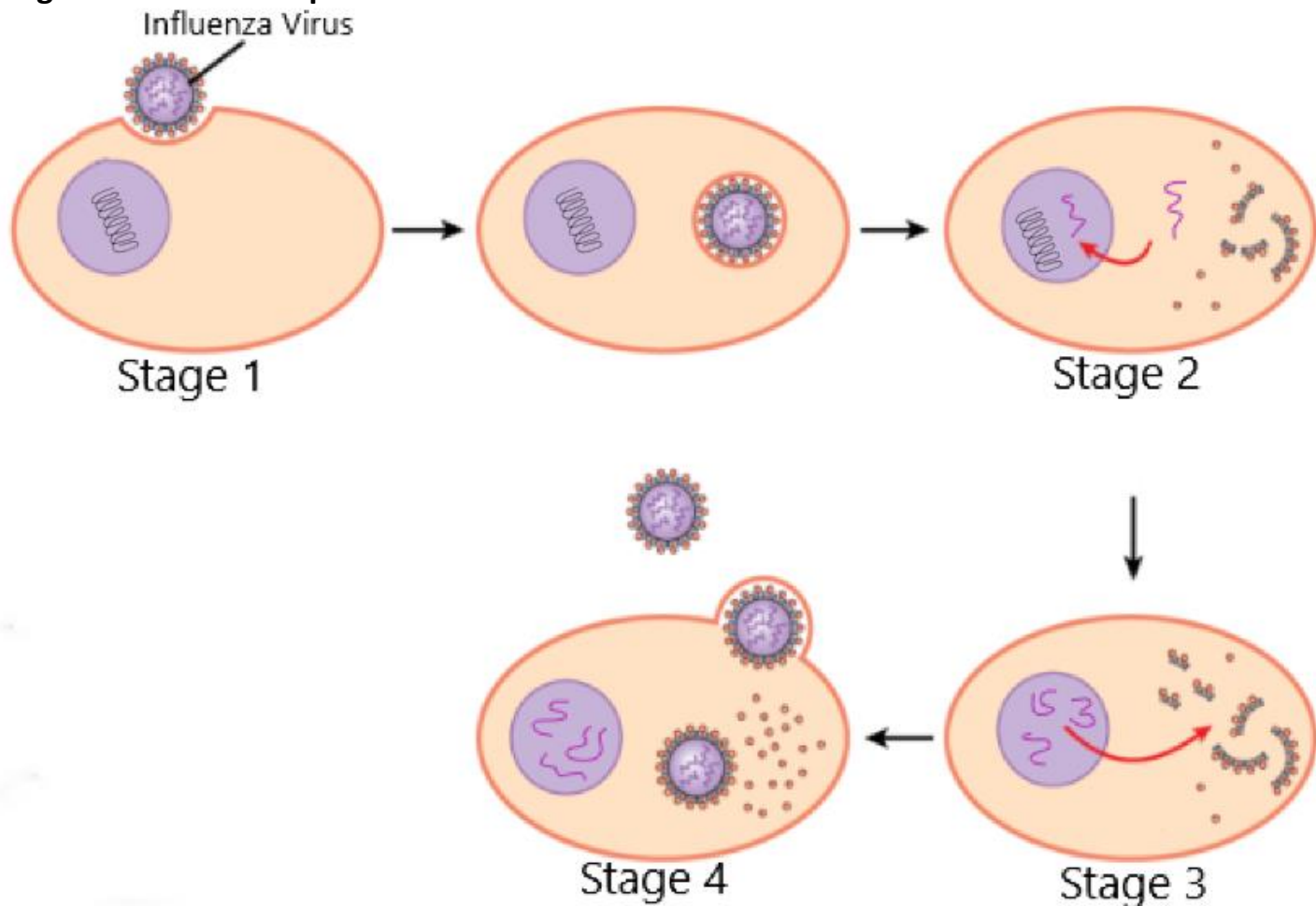
## **Virus Reproduction**

- Viruses do not contain enzymes and therefore must infect other cells in order to replicate.
- **Stage One** - virus injects their DNA/RNA into the host cell.
- **Stage Two** - the viral DNA/RNA migrates to the host's DNA where it incorporates itself.
- **Stage Three** - the virus now takes control of the host cell using its own protein synthesis machinery to manufacture new viral components that are assembled into new viruses.
- **Stage Four** - the infected cell bursts releasing millions of new viruses (aka virions).

## Stages of Bacteriophage Reproduction

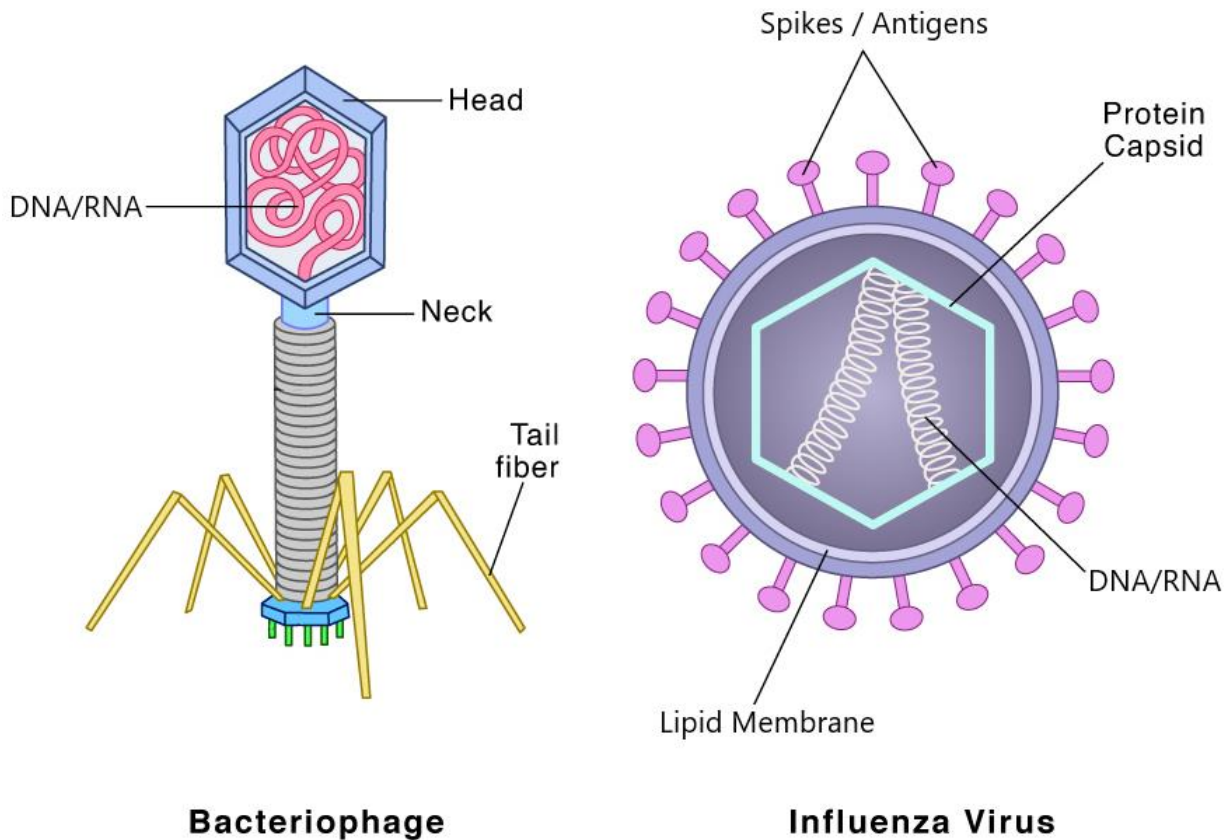


## Stages of Influenza Reproduction



## Virus Structure

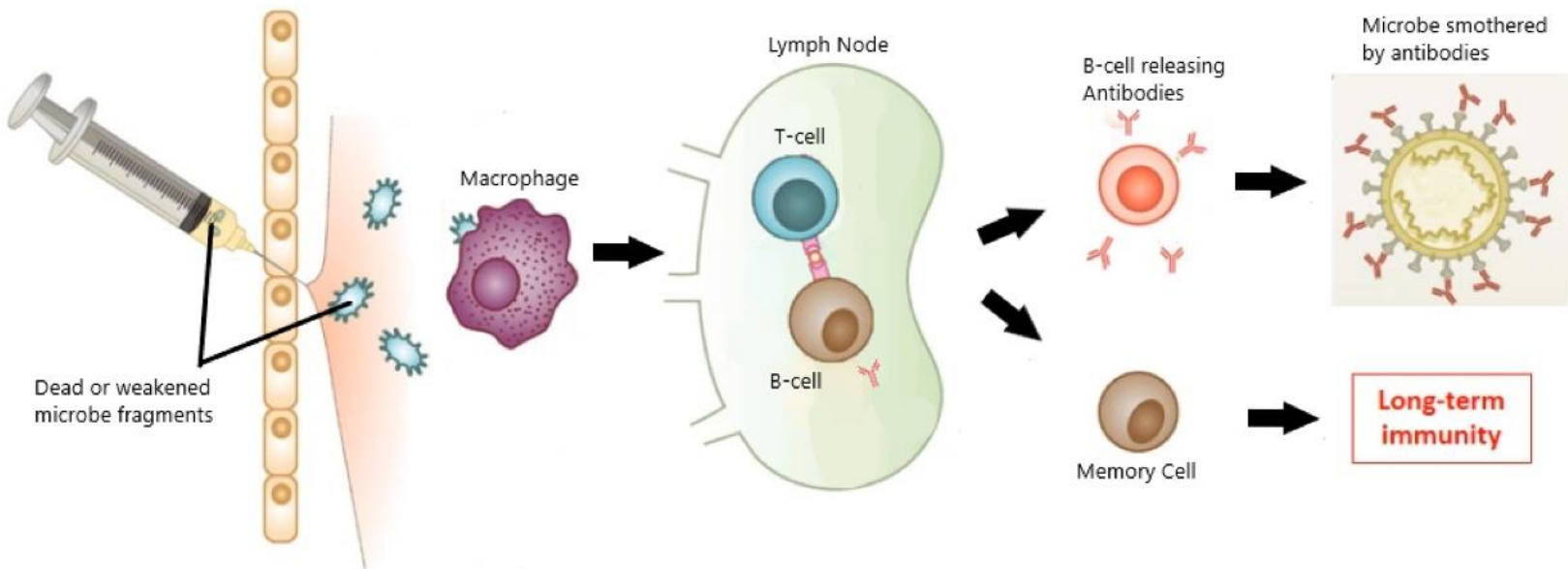
- **Bacteriophage** – Viruses that infect bacteria.
- Head – Neck – Tail (see diagram) are all viral structures that house the genetic material and provide a mechanism for which the virus can dock with and inject its genetic material into a host cell.
- **Influenza Virus** – Representative of a typical virus capable of infecting animal cells.
- Spikes/Antigens (see diagram) allow the virus to dock with target cell.
- Protein Capsid and Lipid Membrane (see diagram) together house the genetic material.
- DNA/RNA the genetic material of the virus.



## Vaccines

- Recognized by many as the greatest medical science discovery in the history of humanity.
- Discovered in 1796 by Edward Jenner, while working on a cure for smallpox.
- Responsible for saving an estimated 2 billion lives over the past 225 years.
- Vaccines are our best defense against viruses but have no effect on bacteria.
- In a nutshell, vaccines work by either injecting the body with tiny fragments of dead viruses (the viral spike antigens) or tiny fragments of viral mRNA which (through the process of translation) produce viral spike antigens. These viral spike antigens are detected by the body's immune system triggering the production of antibodies designed to seek out and defend the body against the living virus if ever encountered.

## Traditional Vaccines





# mRNA Vaccines

