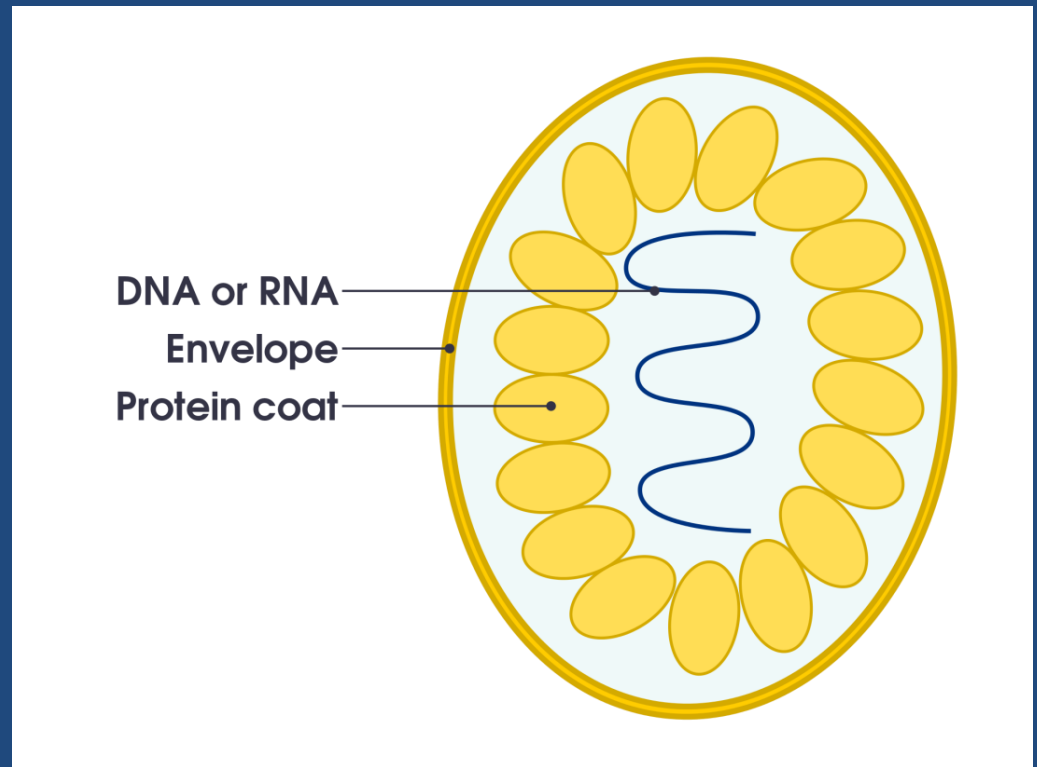


Viruses

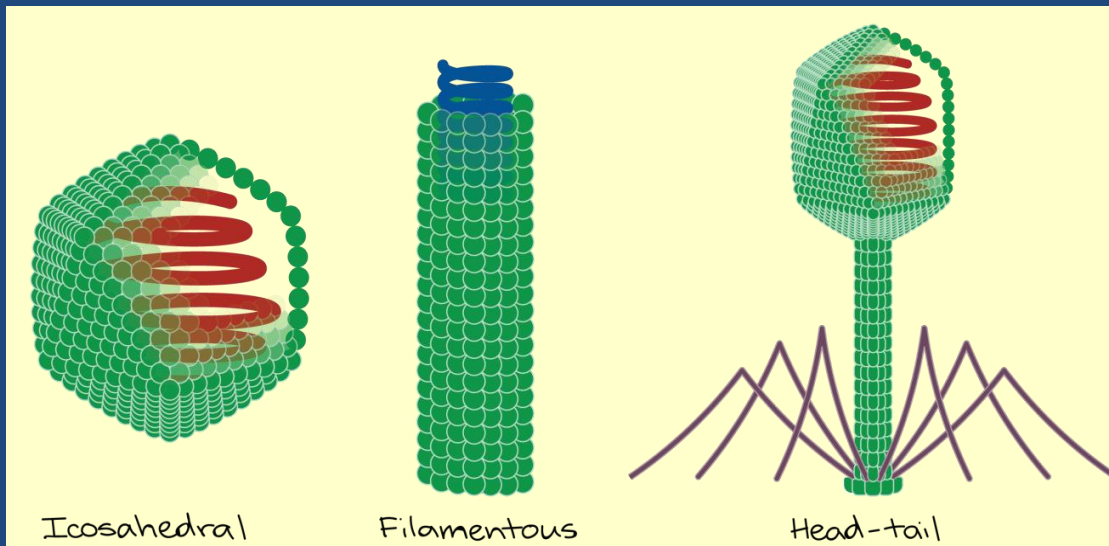
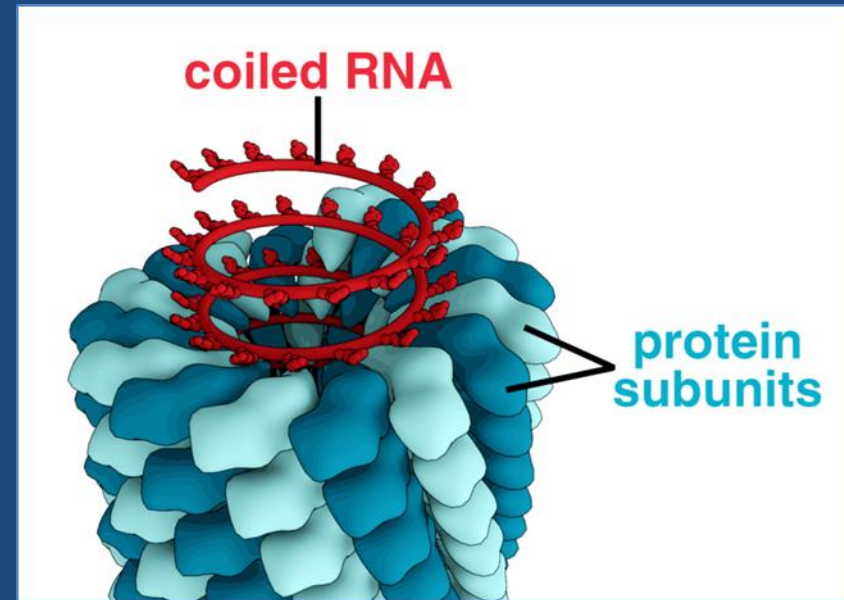
Department of Biology, Medical
Faculty, Medical University of Sofia

Viruses are infectious complexes of a nucleic acid (DNA or RNA but not both) and proteins.

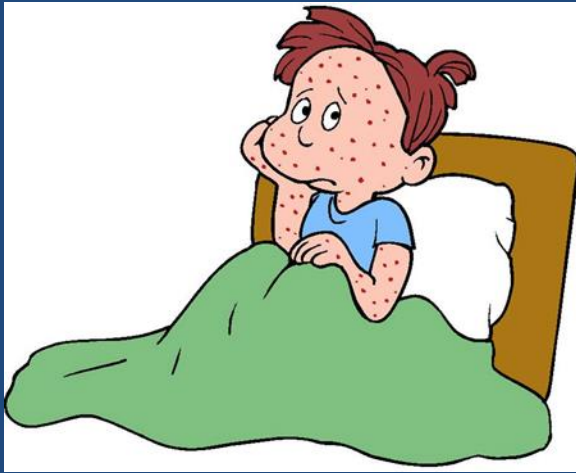
The nucleic acid is in the middle. It is surrounded by a protein coat called capsid. Some (not all) viruses have above the capsid an envelope similar to the cell membrane.



A complete virus particle, known as a **virion**, consists of nucleic acid surrounded by a protective coat of protein called a **capsid**. These are formed from identical protein subunits. Viruses can have a lipid "envelope" derived from the host cell membrane



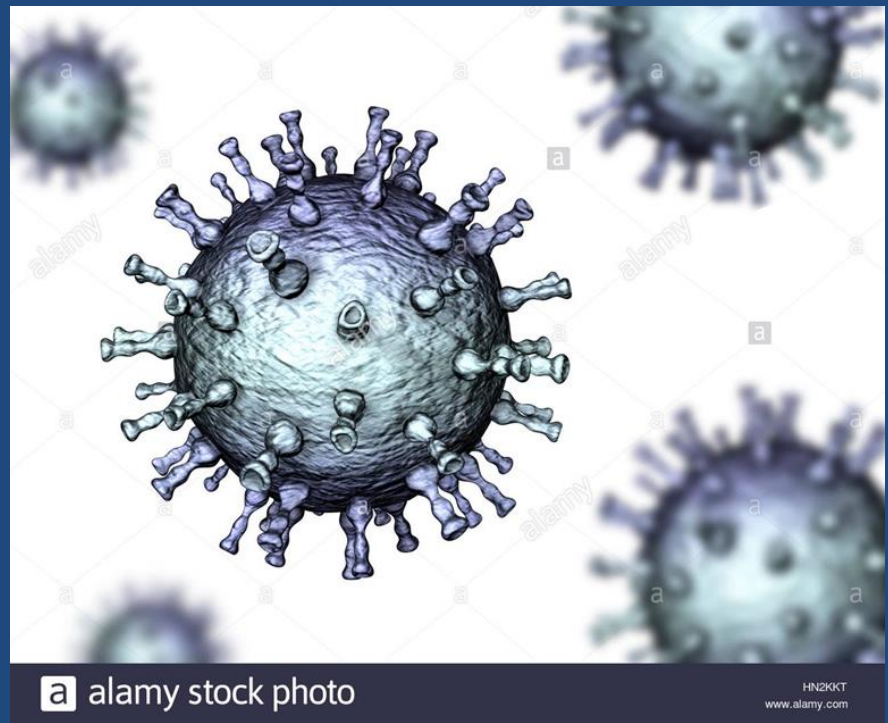
A virus has either a DNA or an RNA genome and is called a DNA virus or an RNA virus, respectively. The vast majority of viruses have RNA genomes. They need a host cell to reproduce.



Chickenpox, also known as varicella, is a highly contagious disease caused by the initial infection with varicella zoster virus.

Small infectious agent that replicates only inside the living cells of other organisms.

Viruses can infect all types of life forms, from animals and plants to microorganisms, including bacteria and archaea.

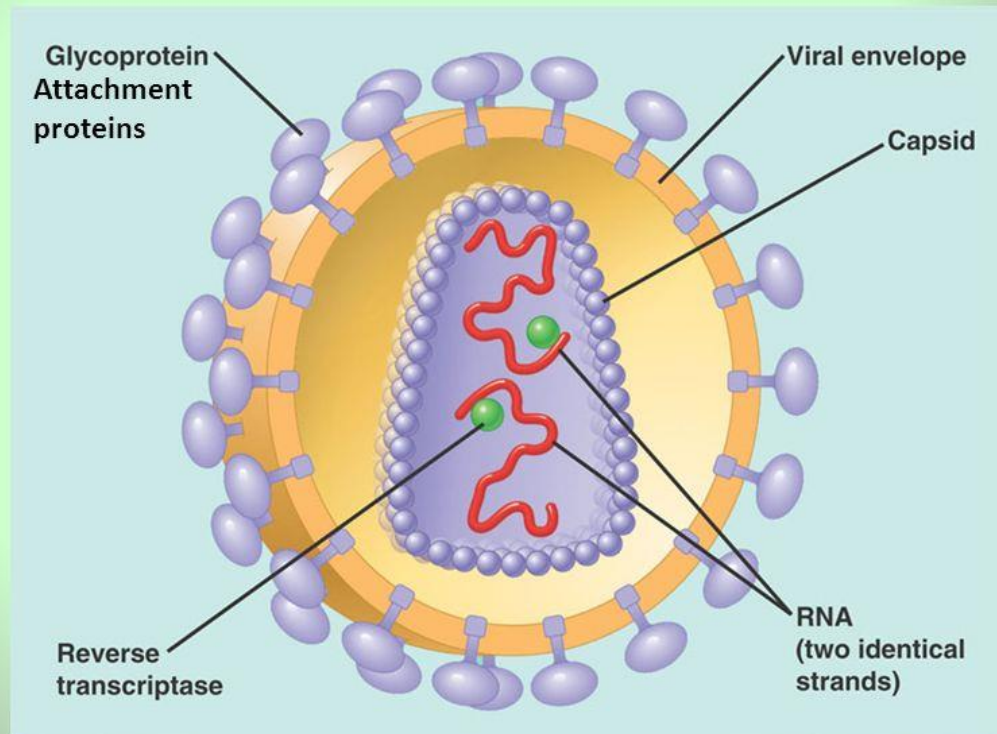




Aydindurdu/Dreamstime.com

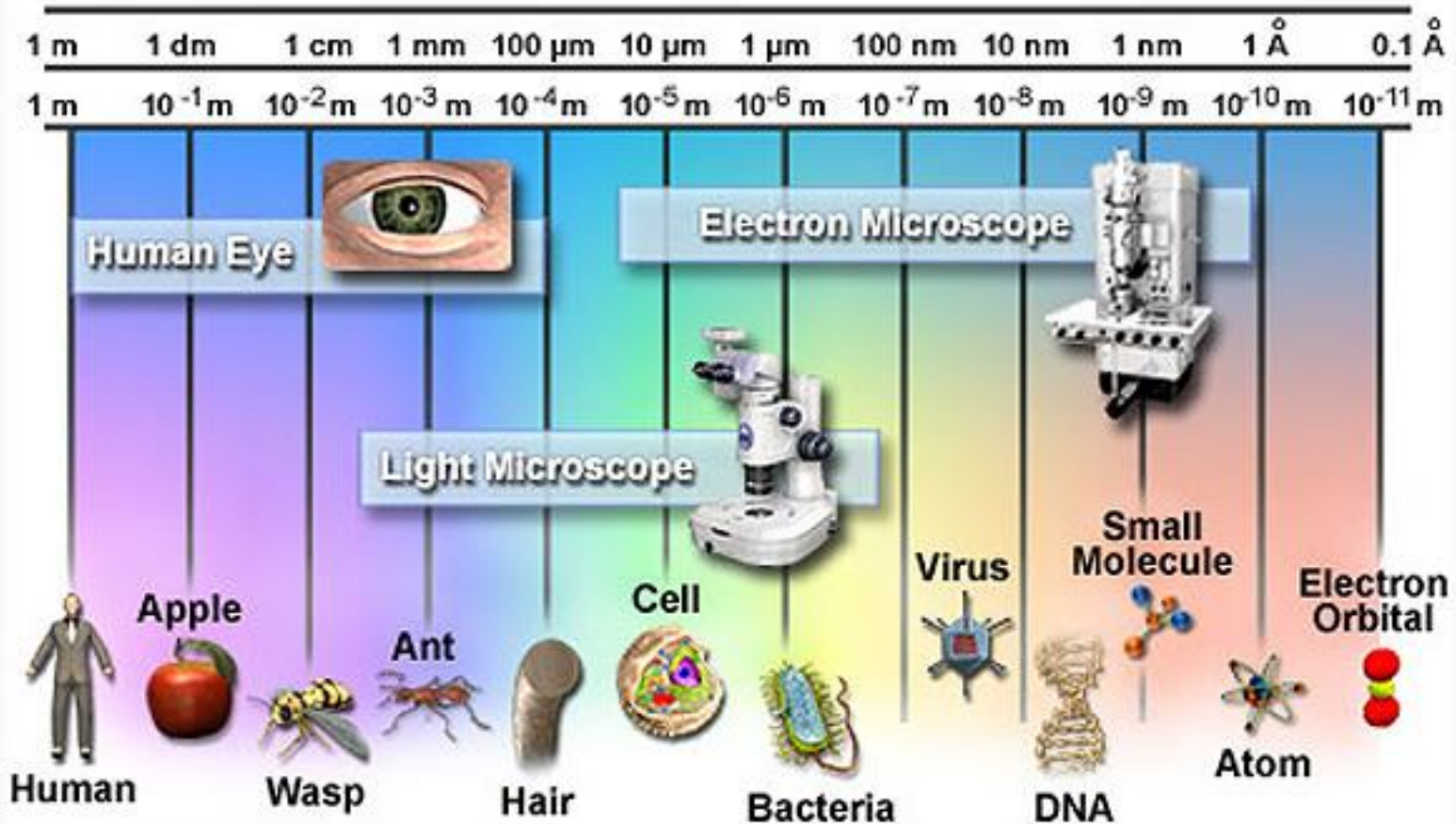
Example: Human immunodeficiency virus (HIV)

Structure of HIV



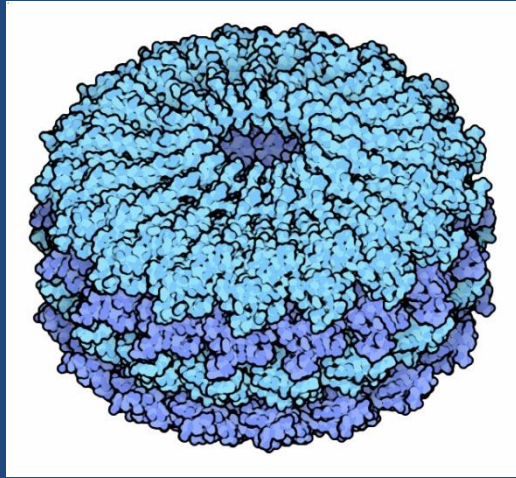
<http://www.duckettandjeffreys.com/hiv-virus-structure/structure-of-hiv-attachment-proteins-hiv-virus-7/>

Relative Sizes and Detection Devices



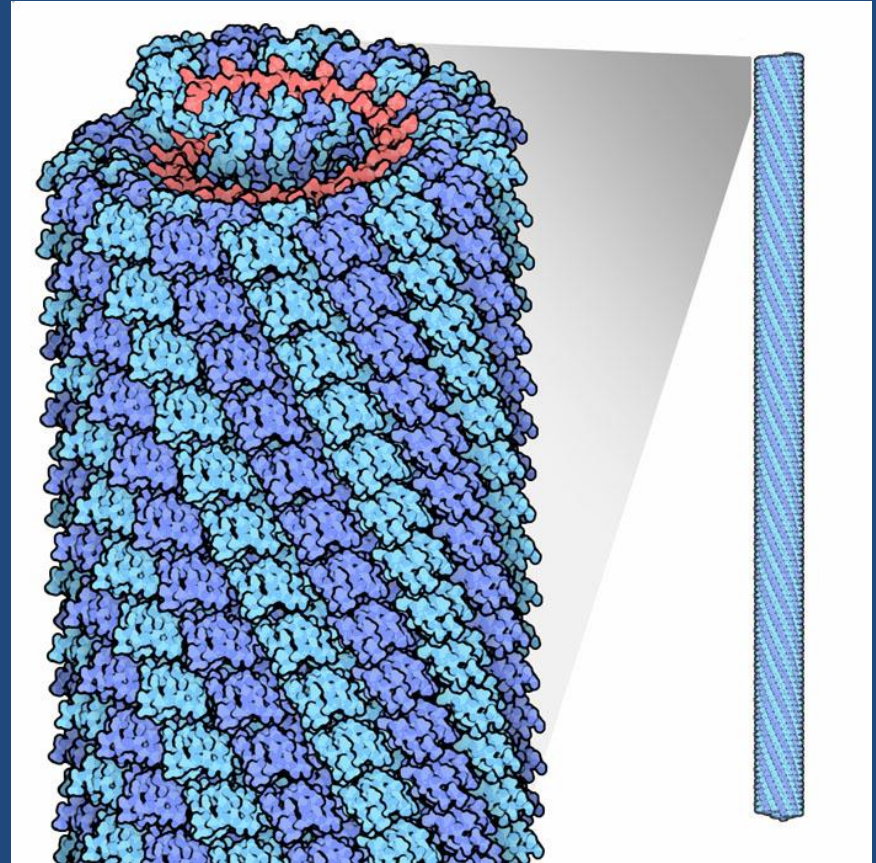
Viruses are smaller than cells (after all, they must fit inside cells). Most viruses have a diameter between 20 and 300 nanometers.

The tobacco mosaic virus



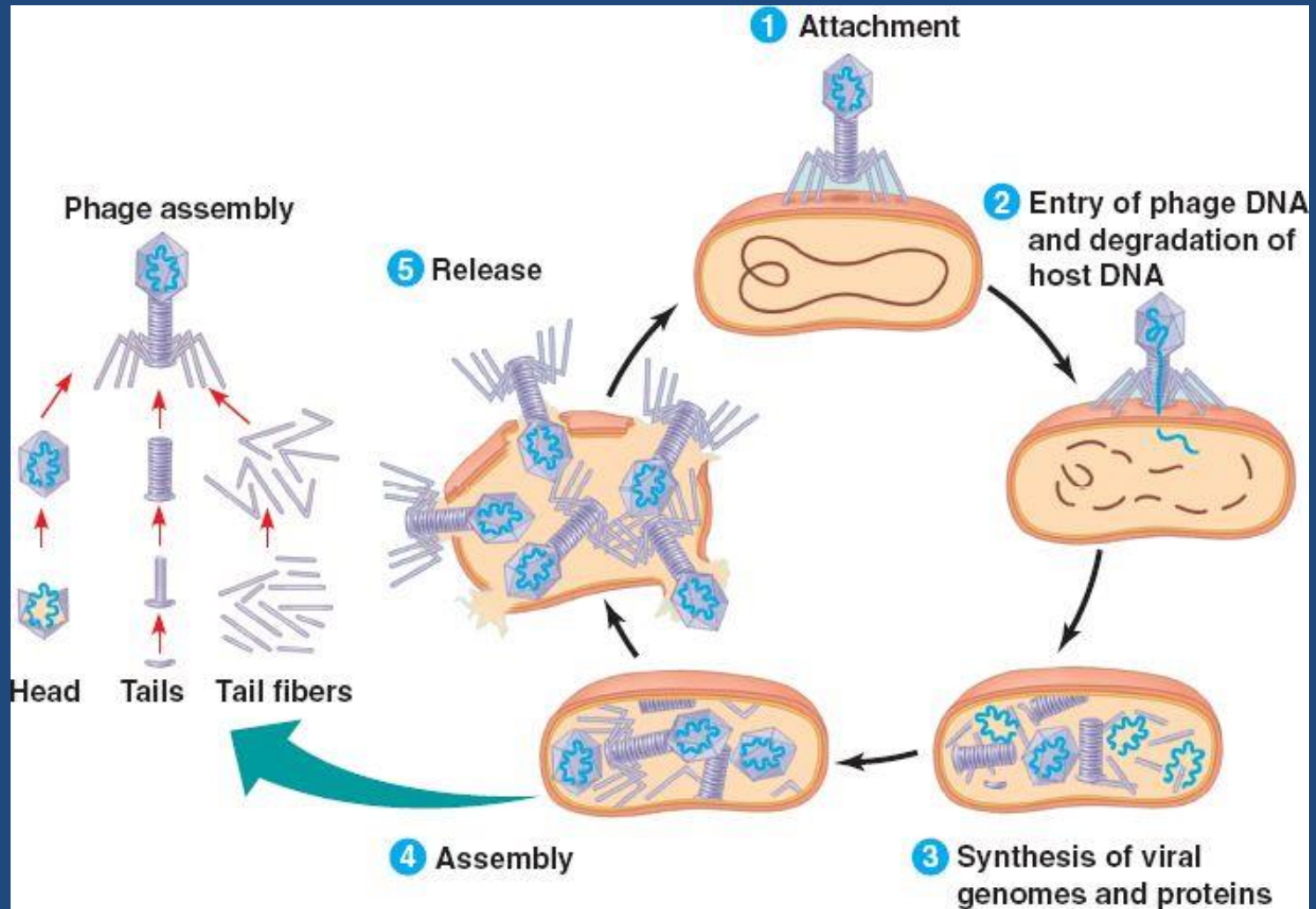
David S. Goodsell (2009), PDB ID: MoM_2009_1.

Discovery of viruses was helped by the observation that the infectious agent of tobacco mosaic passed through filters that kept bacteria.



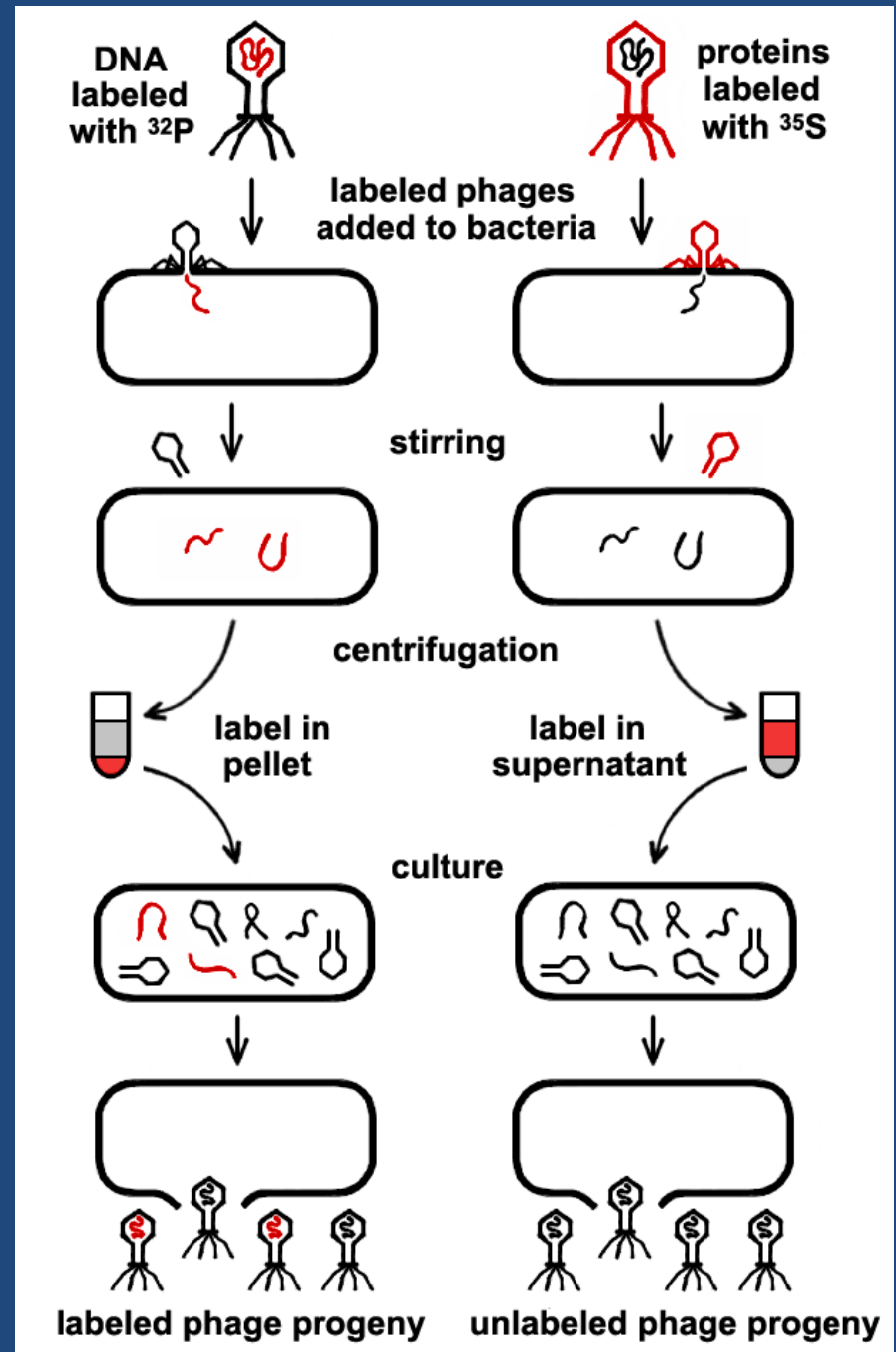
Both HIV and tobacco mosaic virus are RNA viruses. The tobacco mosaic virus replicates its RNA while HIV passes through a DNA intermediate.

Viruses infecting prokaryotic cells are called bacteriophages (phages)

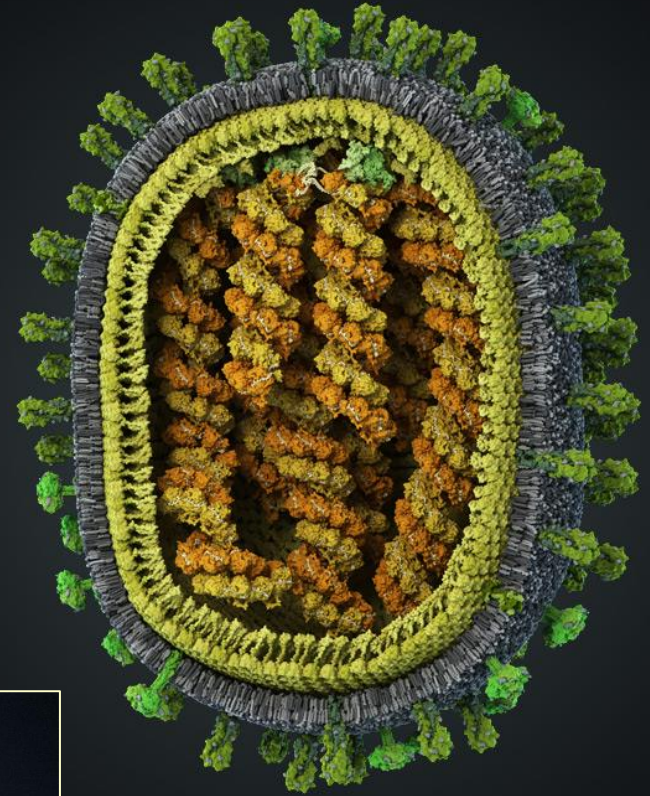


The phage injects its DNA into the host cell

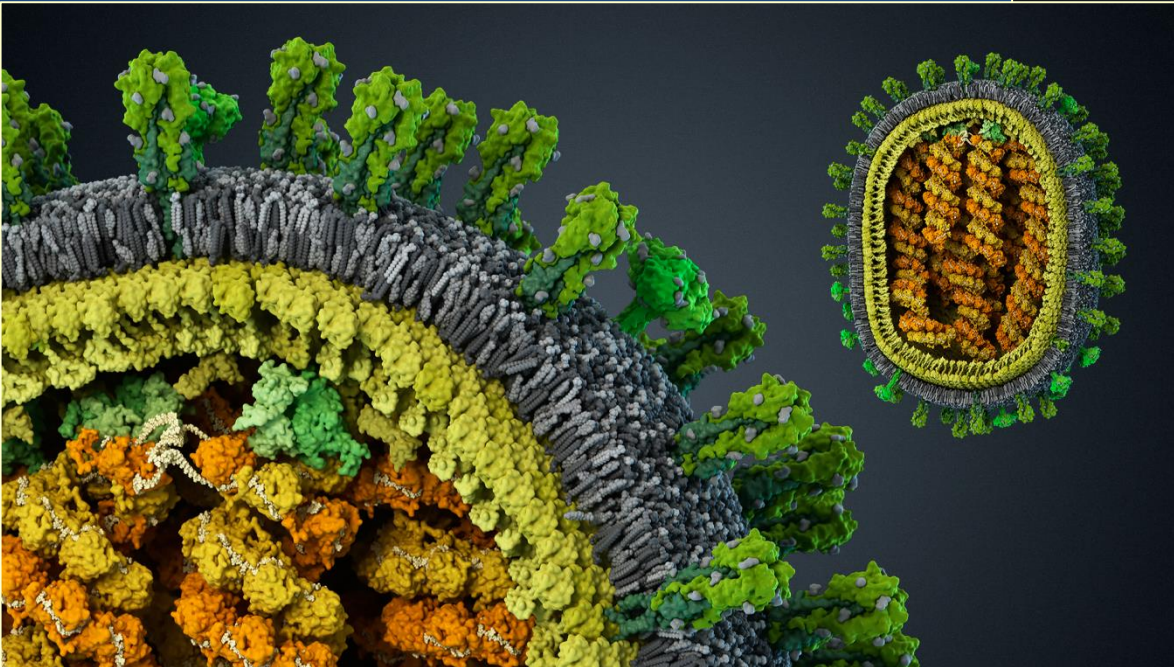
This 1952 experiment by Alfred Hershey and Martha Chase proved the hereditary role of DNA.



The viral RNAs that make up the genome are shown as coils inside the particle and bound to ribonucleic proteins.

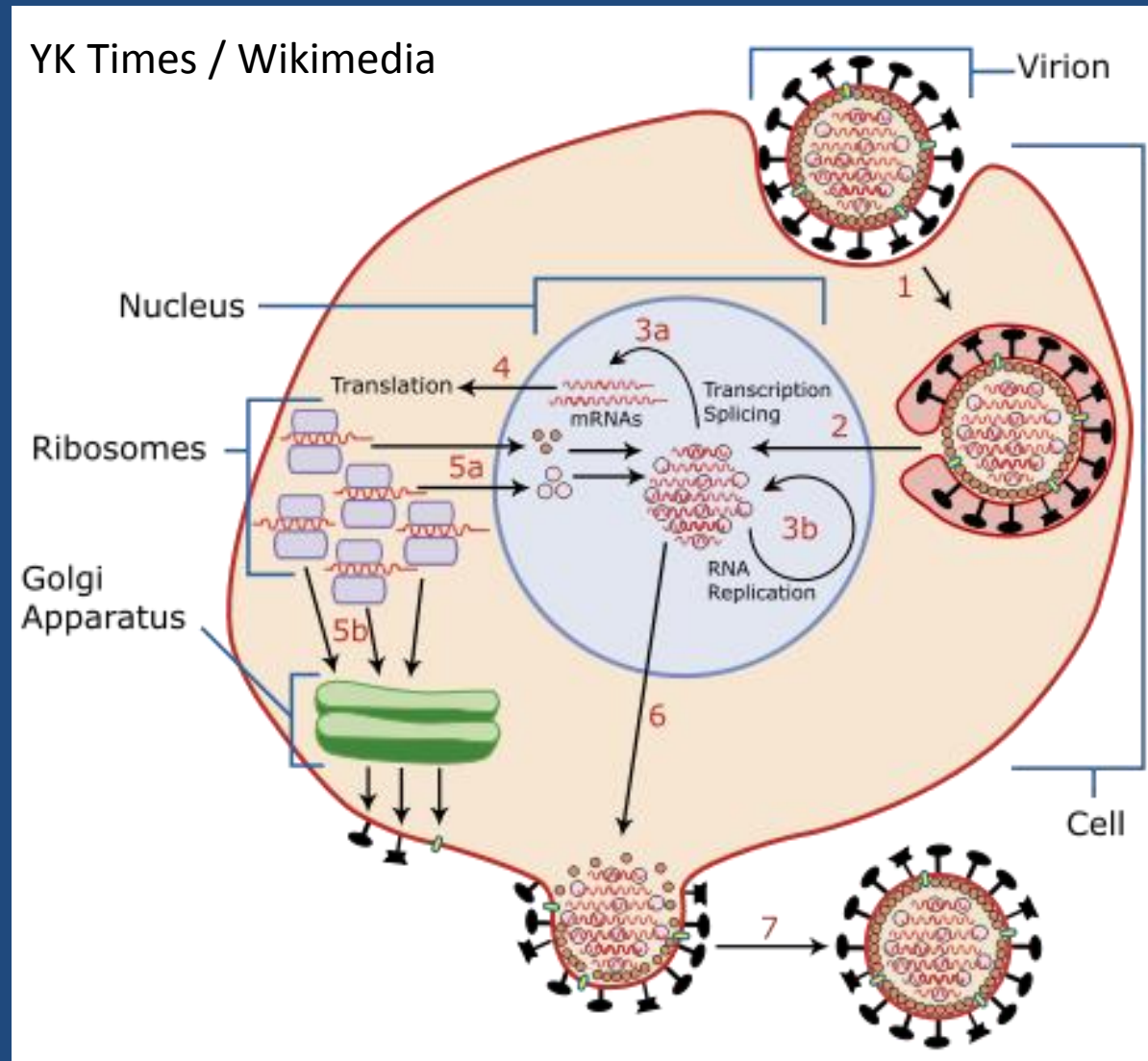


VISUAL SCIENCE
Scientific illustration, animation, design



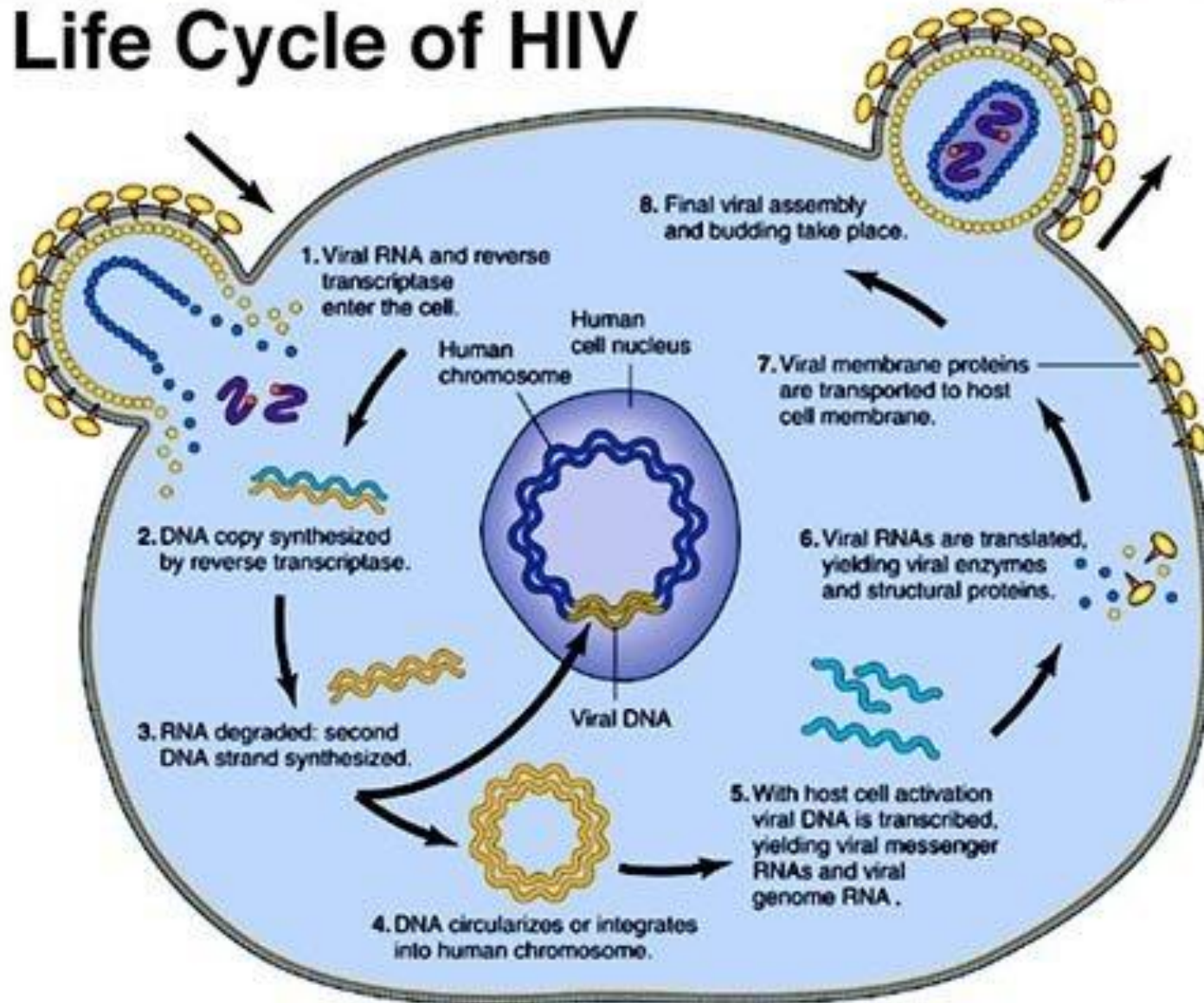
Influenza virus

Animal viruses enter host cells by phagocytosis or fusion



Life cycle of the flu virus (RNA virus, replicates its RNA)

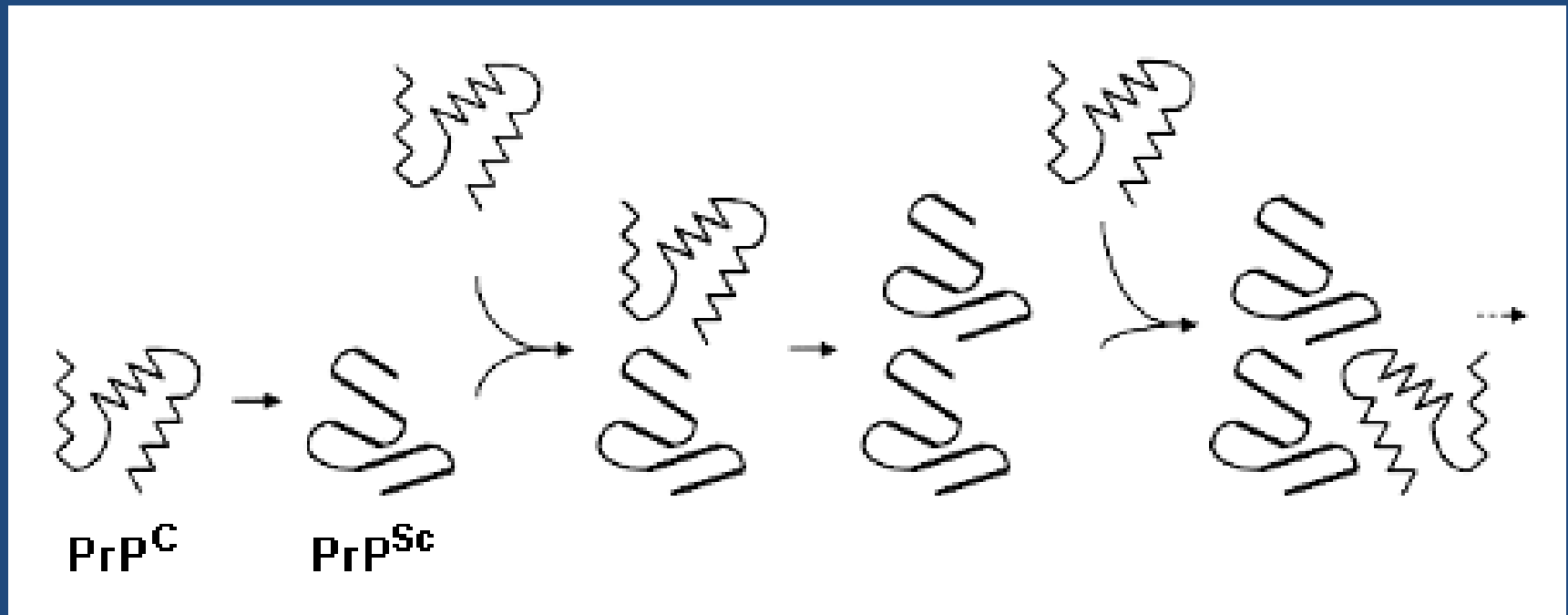
Life Cycle of HIV



Here, the RNA genome replicates via a DNA intermediate.

Prions

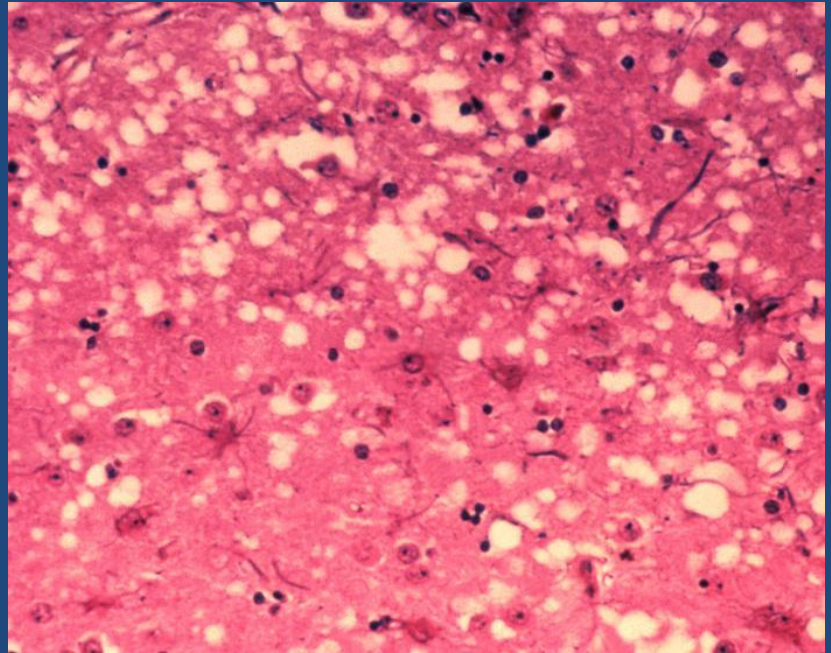
Prions are *proteinaceous infectious* particles. They are formed of misfolded molecules of a particular brain protein. Upon contact with normally folded molecules of this protein, prions cause them to misfold in the same way.



Prions cause deadly diseases

When an animal or a human is infected with a prion, its aggregates grow inside neurons and kill them, leaving empty spaces in brain tissue.

Prion diseases are incurable and fatal.



Al Jenny, Public Health Image Library (APHIS)



A cow struck by “mad cow disease” (Art Davis, APHIS).