

Are Viruses Alive?

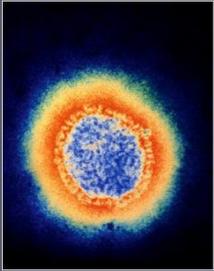


Definition

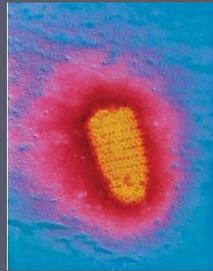
“A virus is a nonliving particle composed of a nucleic acid and a protein coat.”

Characteristics of Life

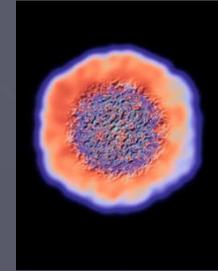
- ▶ Growth
- ▶ Homeostasis
- ▶ Metabolism
- ▶ Mutation
- ▶ Nucleic acids
- ▶ Reproduction
- ▶ Structure



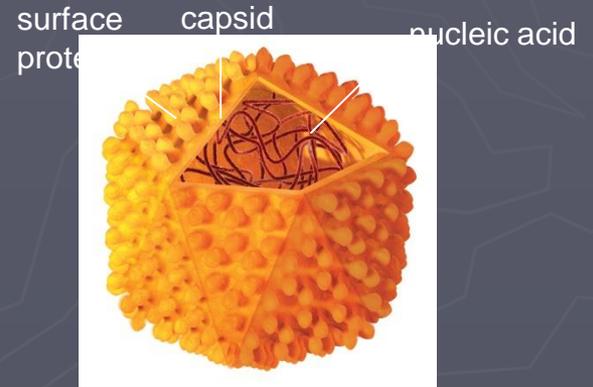
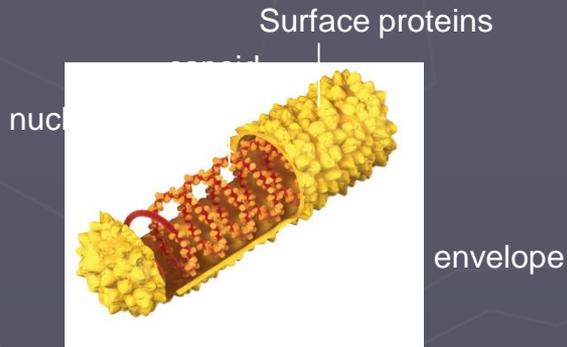
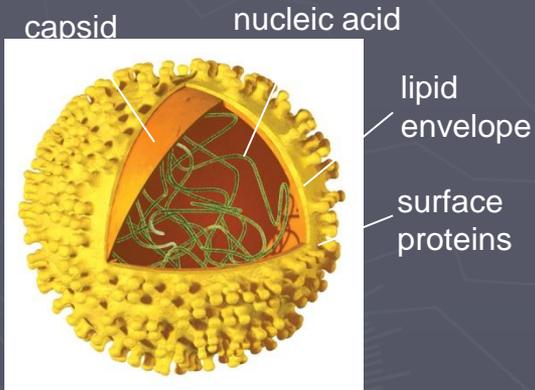
enveloped
(influenza)



helical
(rabies)



polyhedral
(foot-and-mouth
disease)



Are they living or nonliving?

LIVING

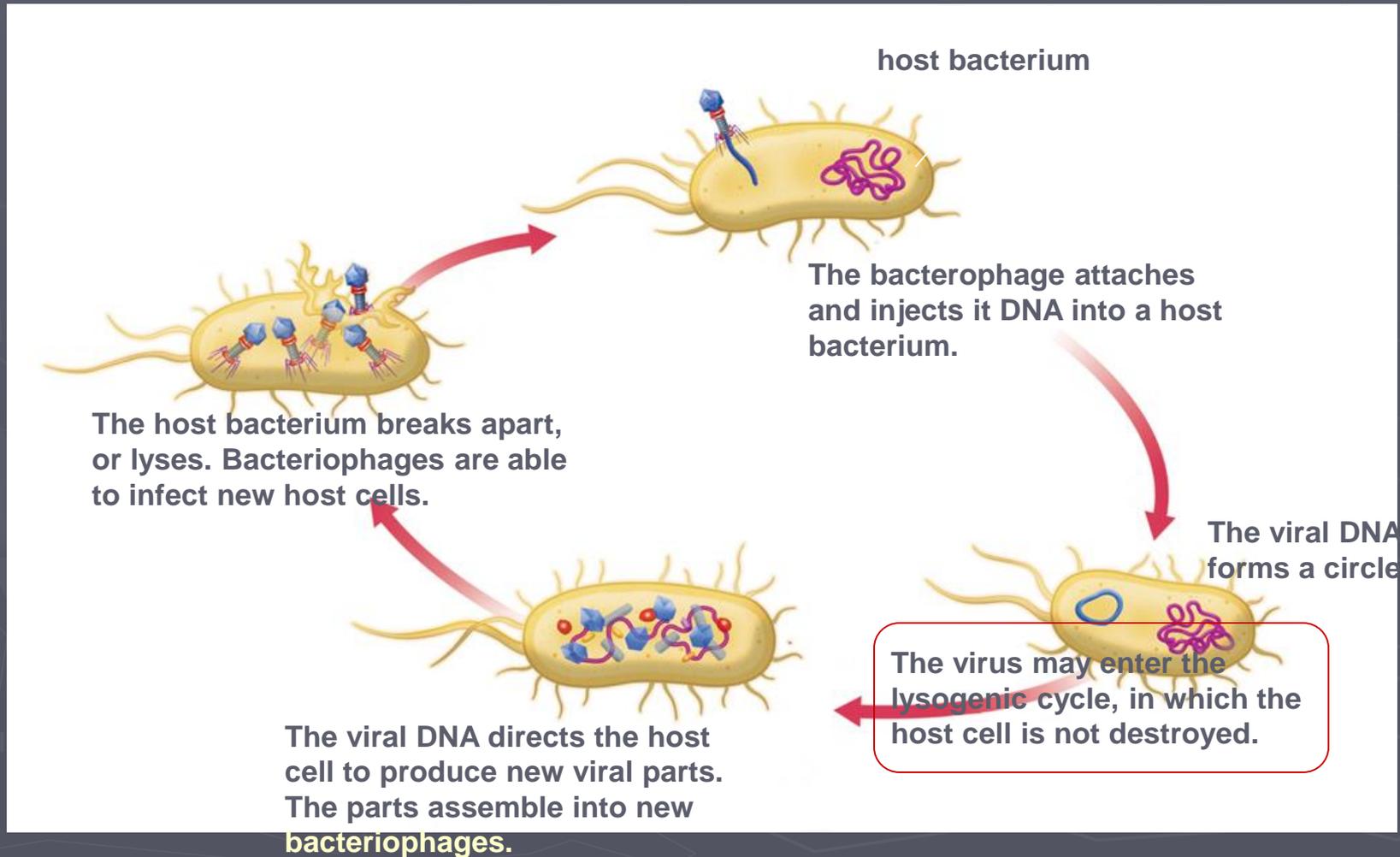
- Contain DNA/RNA
- Replicate
- Made of lipids, proteins, nucleic acids
- Undergo mutations

NONLIVING

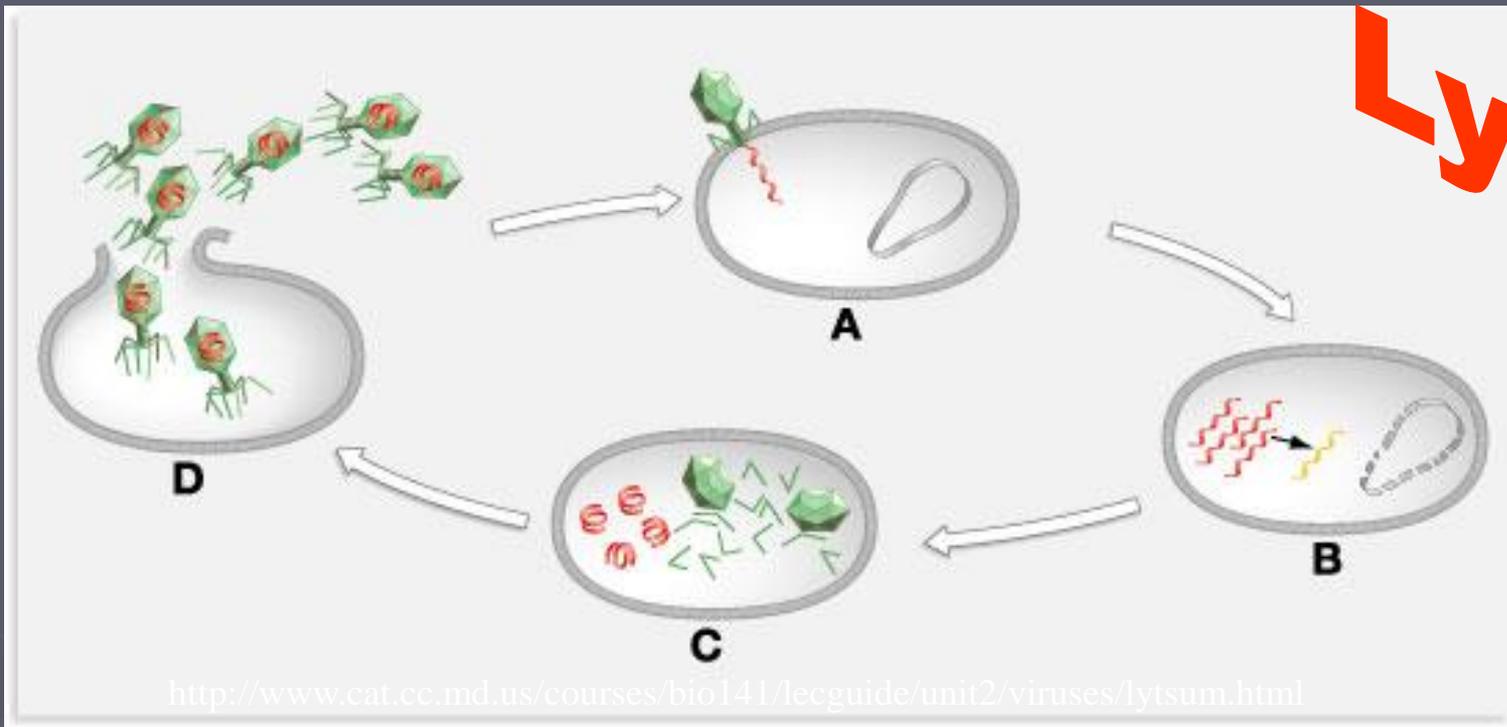
- Do not reproduce
- Need a HOST in order to survive
- No nucleus
- Do not grow
- Do not make energy

Viruses cause two types of infections.

- ▶ A lytic infection causes the host cell to burst.



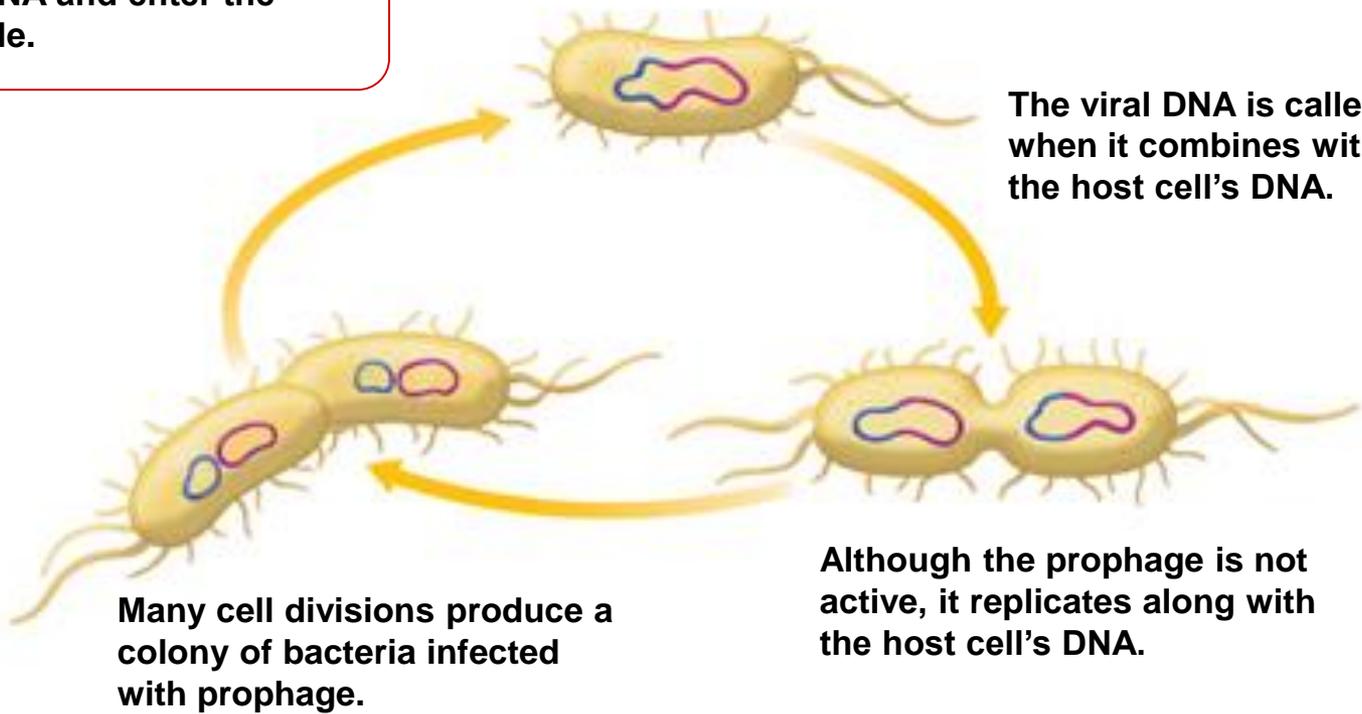
Lytic



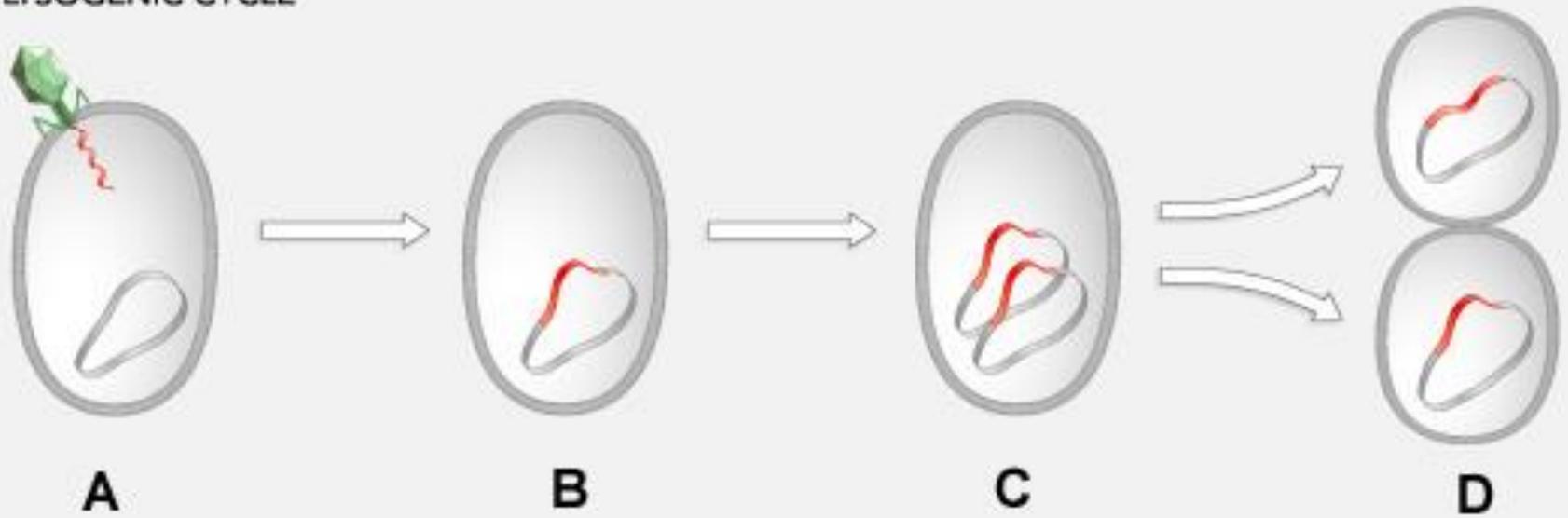
- A Virus attaches to the host and injects its DNA into the cell.
- B The DNA replicates in the host cell.
- C The parts of the virus are created.
- D The new viruses erupt from the host cell.

- A lysogenic infection does no immediate harm.

The prophage may leave the host's DNA and enter the lytic cycle.



LYSOGENIC CYCLE



A Virus attaches to the host and injects its DNA into the cell.

B The viral DNA attaches to the host DNA.

C DNA replication takes place

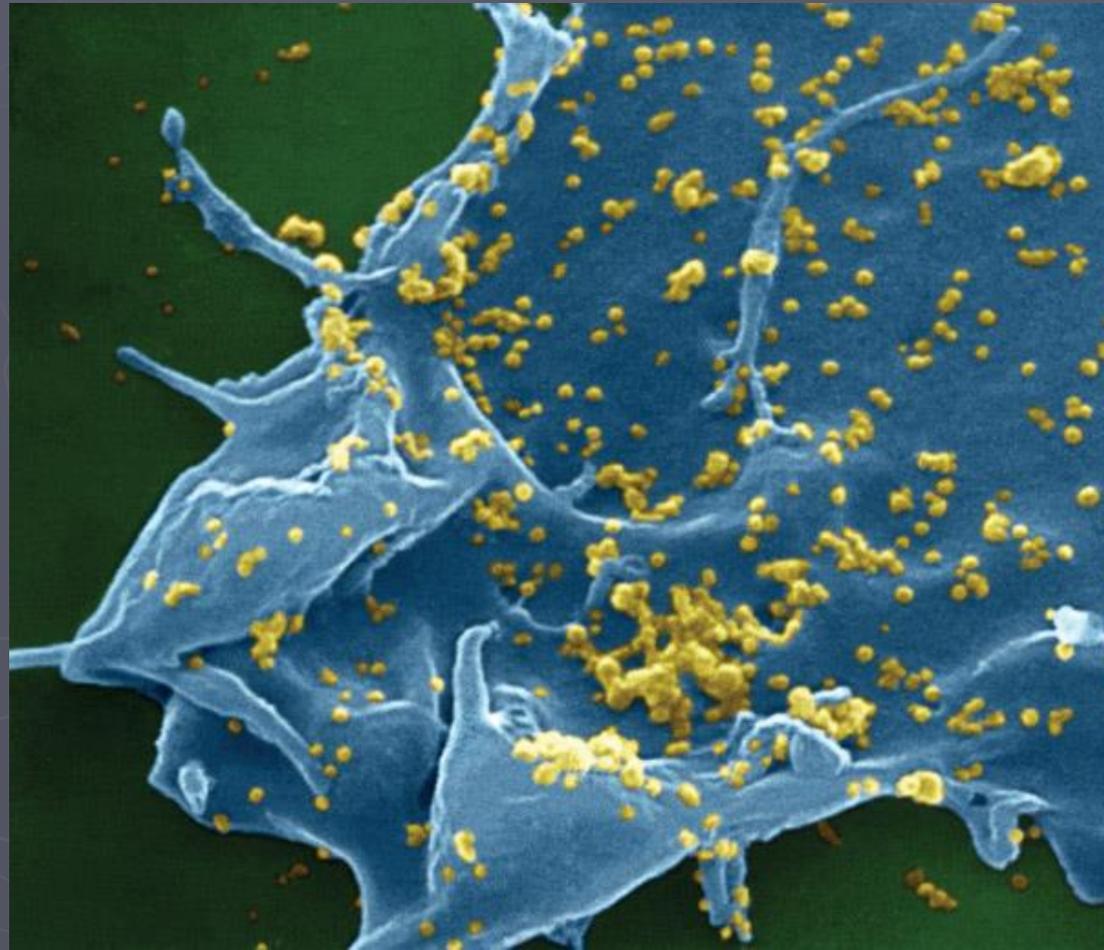
D The cell undergoes mitosis (replicating with the viral DNA inside of it)

RNA viruses (Ex: HIV)

- ▶ The genome of some viruses uses RNA instead of DNA.
 - In order to replicate, a RNA virus uses a special enzyme to create DNA (enzyme = reverse transcriptase)
 - Once the DNA is created then it is incorporated into the host genome (like the lysogenic cycle)
 - The difference is the genome is now a permanent resident of the host cell

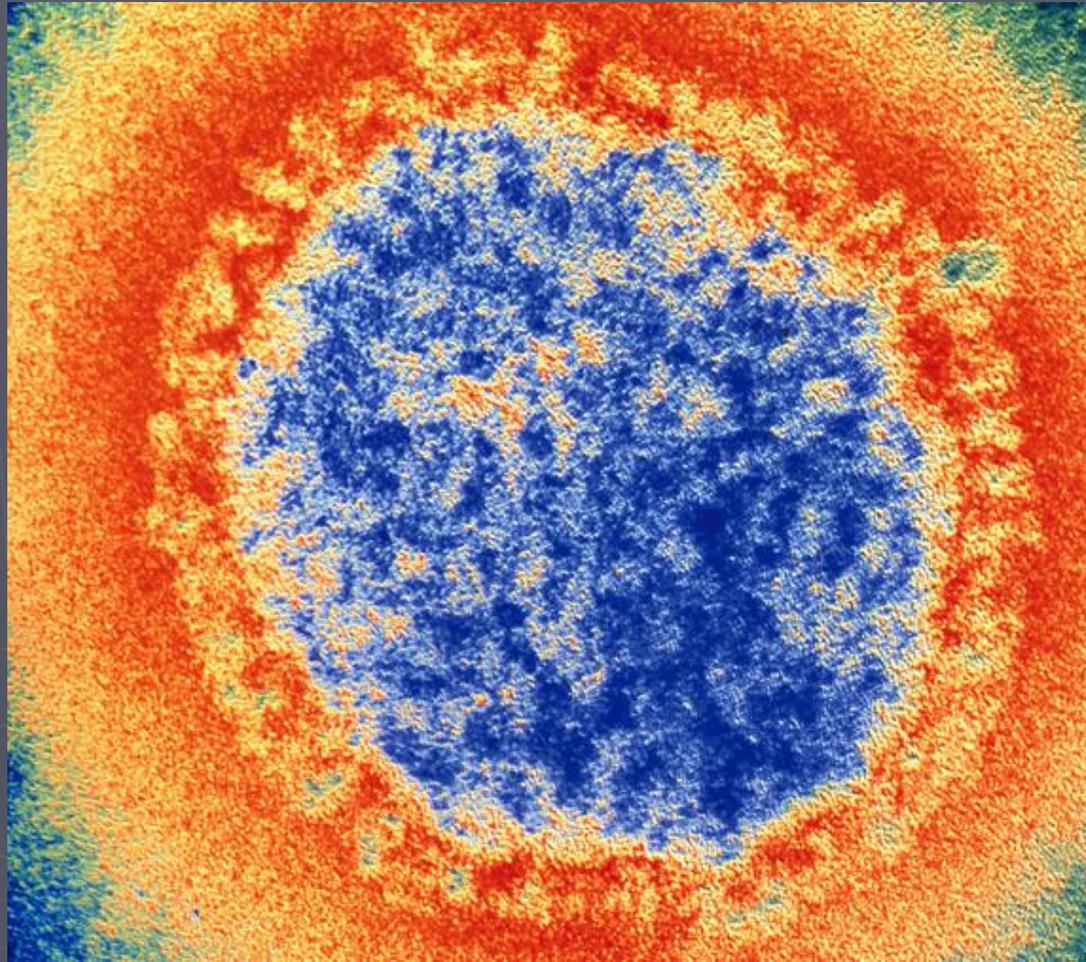
Viruses cause many infectious diseases

- ▶ There are many examples of viral infections.
 - common cold



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- ▶ There are many examples of viral infections.
 - common cold
 - influenza



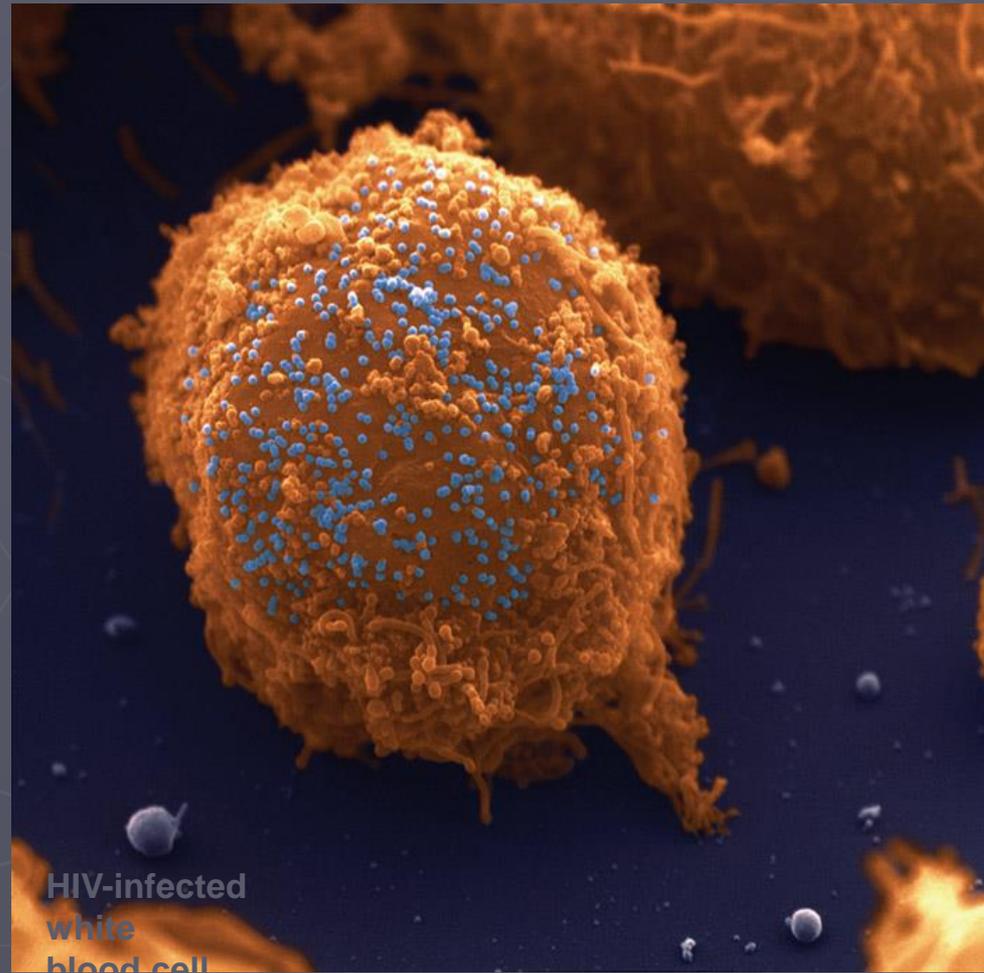
Viruses cause many infectious diseases

- ▶ There are many examples of viral infections.
 - common cold
 - influenza
 - SARS
 - Animal viruses
 - are prions
 - Plant viruses
 - are viroids



Viruses cause many infectious diseases

- ▶ There are many examples of viral infections.
 - HIV which is a RNA virus
- ▶ The body has natural defenses against viruses.



HIV-infected
white
blood cell

Vaccines are made from weakened pathogens.

- ▶ A vaccine stimulates the body's own immune response.
- ▶ Vaccines prepare the immune system for a future attack by creating memory cells.

VIRAL INFECTION	SYMPTOMS OF DISEASE	TRANSMISSION OF DISEASE	U.S. VACCINE RECOMMENDATION
Chickenpox	rash, itchy skin, fever, fatigue	contact with rash, droplet inhalation	for children between 12 and 18 months
Hepatitis A	yellow skin, fatigue, abdominal pain	contact with contaminated feces	for people traveling to infected locations and protection during outbreaks
Mumps	painful swelling in salivary glands, fever	droplet inhalation	for children between 12 and 15 months and again at 4 to 6 years
Rabies	anxiety, paralysis, fear of water	bite from infected animal	for veterinarians and biologists in contact with wildlife
West Nile	fever, headache, body ache	bite from infected mosquito	no available vaccine

- ▶ Pathogen = infectious agent, or germ, is a biological agent that causes disease or illness to its host
- ▶ Some viruses have a limited host range and others are able to jump to different species.