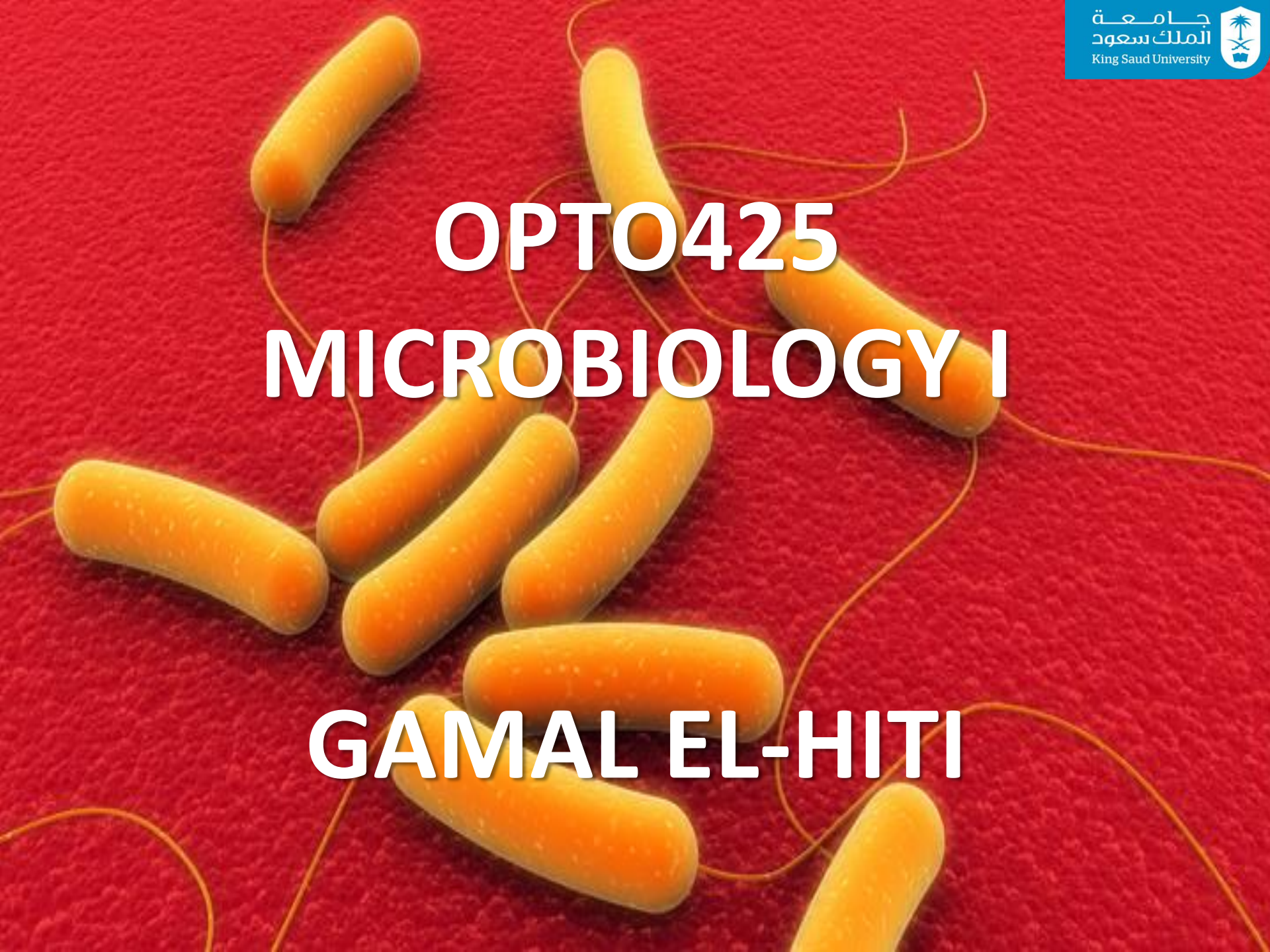
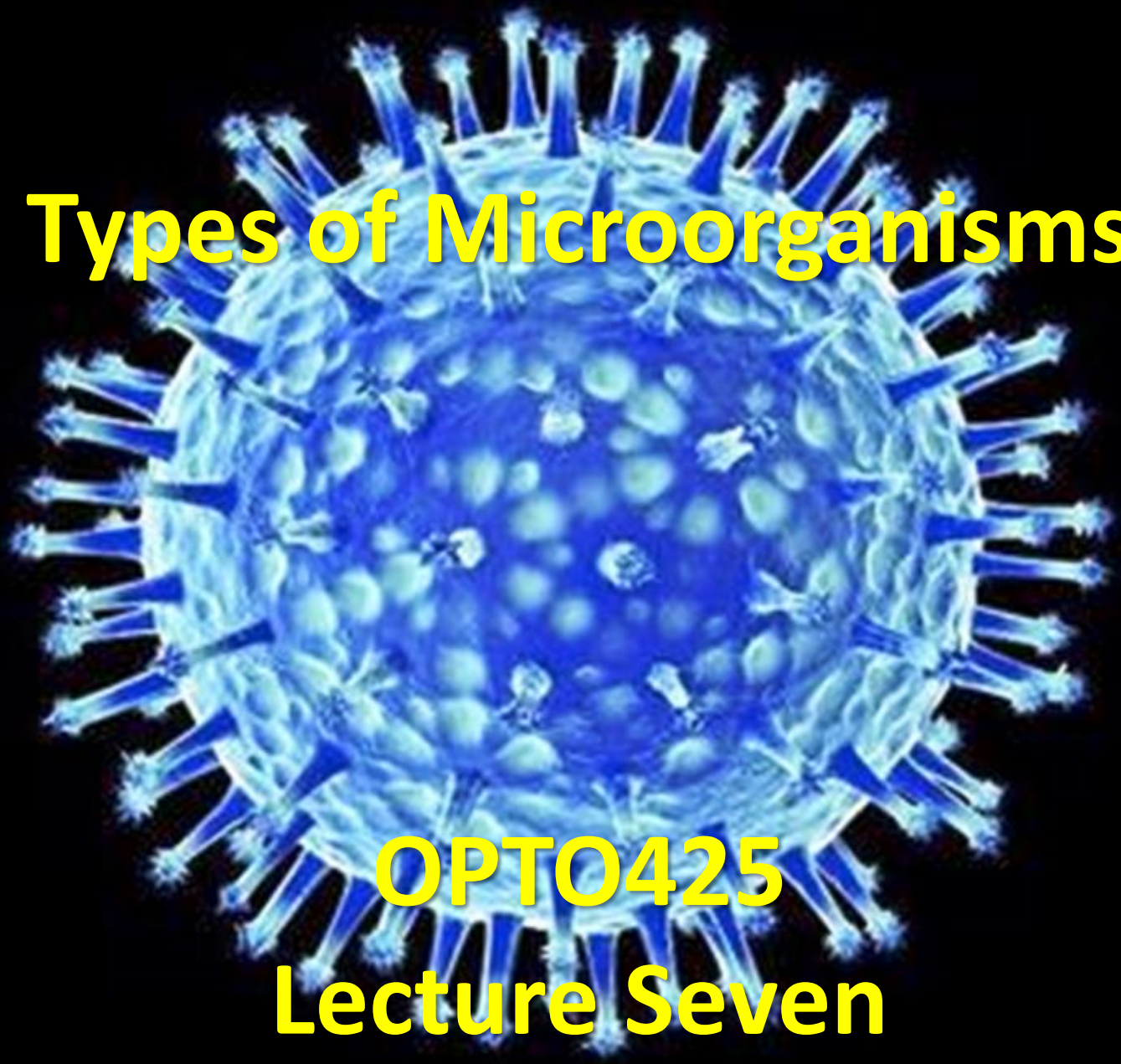

جامعة
الملك سعود
King Saud University
OPTO425
MICROBIOLOGY I
GAMAL EL-HITI

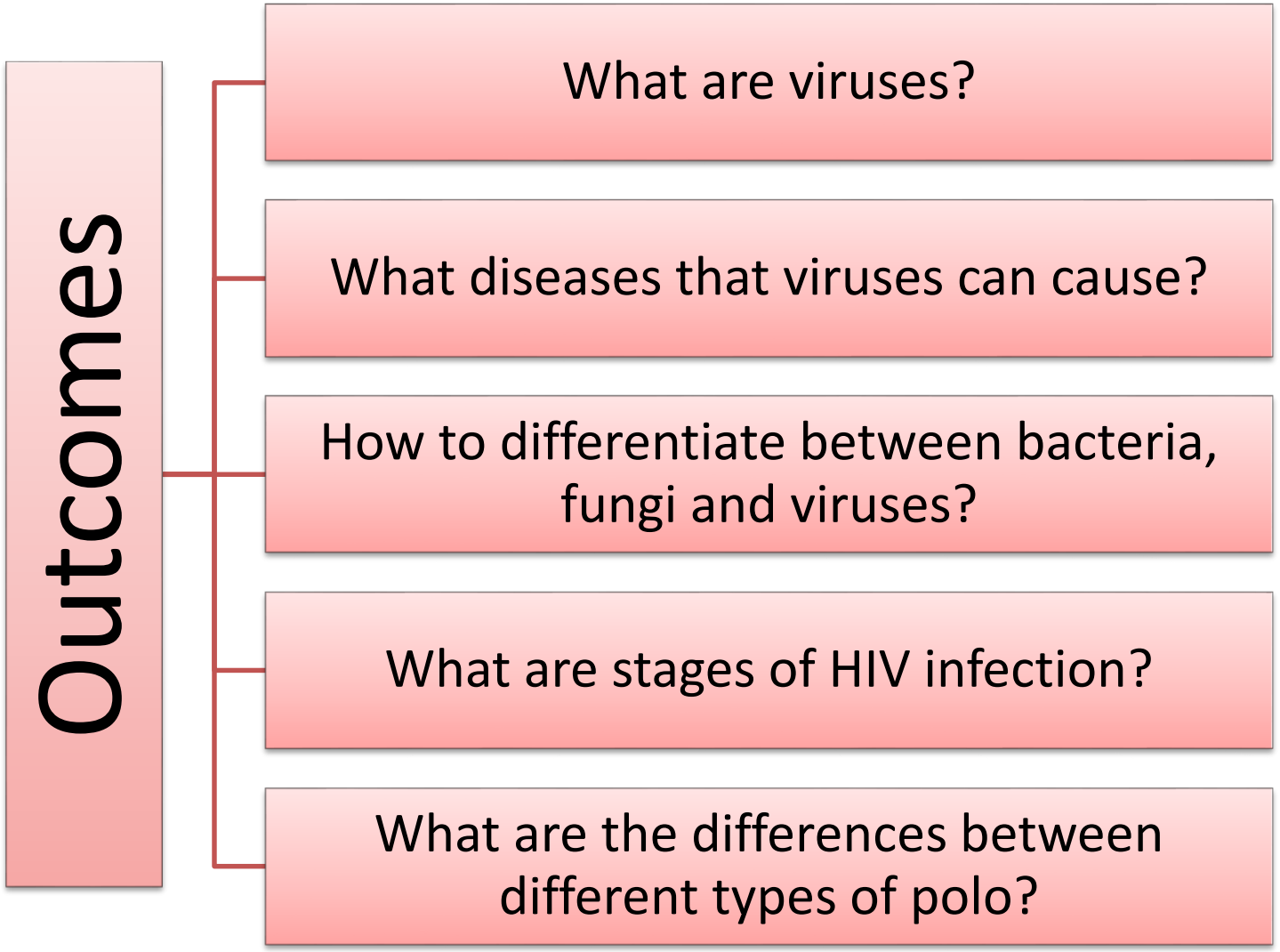
جامعة الملك سعود
King Saud University

Types of Microorganisms



OPTO425
Lecture Seven

Learning Outcomes

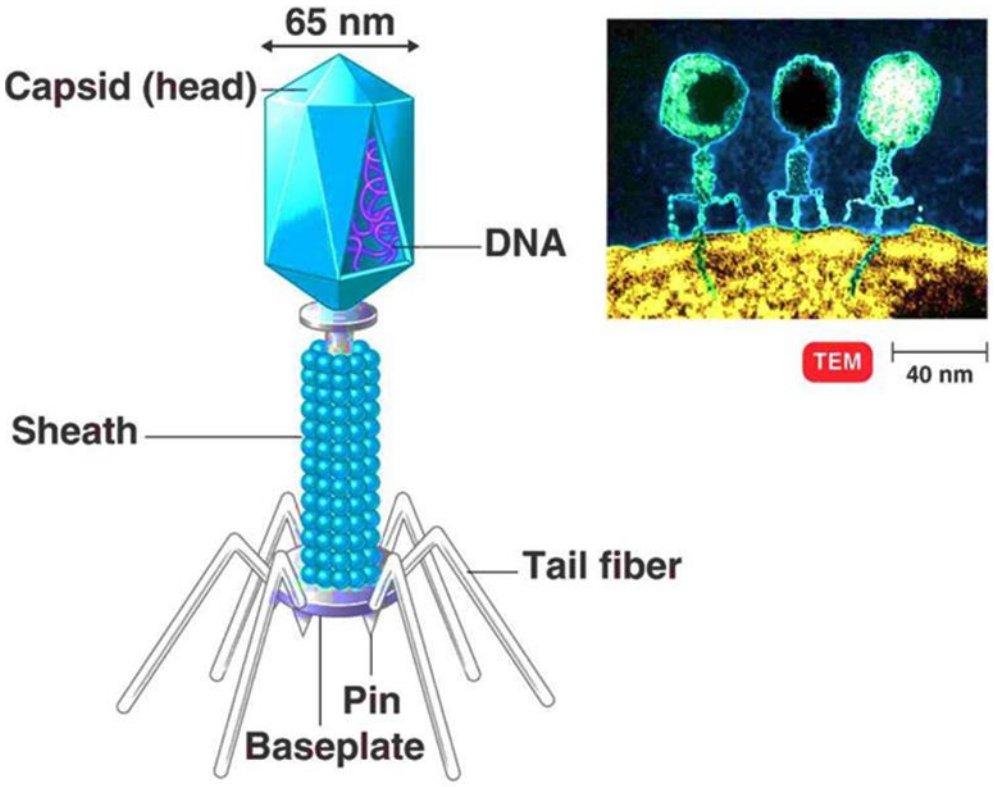


Viruses

- The smallest of all microorganisms.
- Only be seen by electron microscope.
- Grow and reproduce only inside other living cells.
- Humans are infected by contact with other infected living beings.
- Spread by contact with blood and body fluids.
- Health care workers are at great risk of being exposed to blood and body fluids.

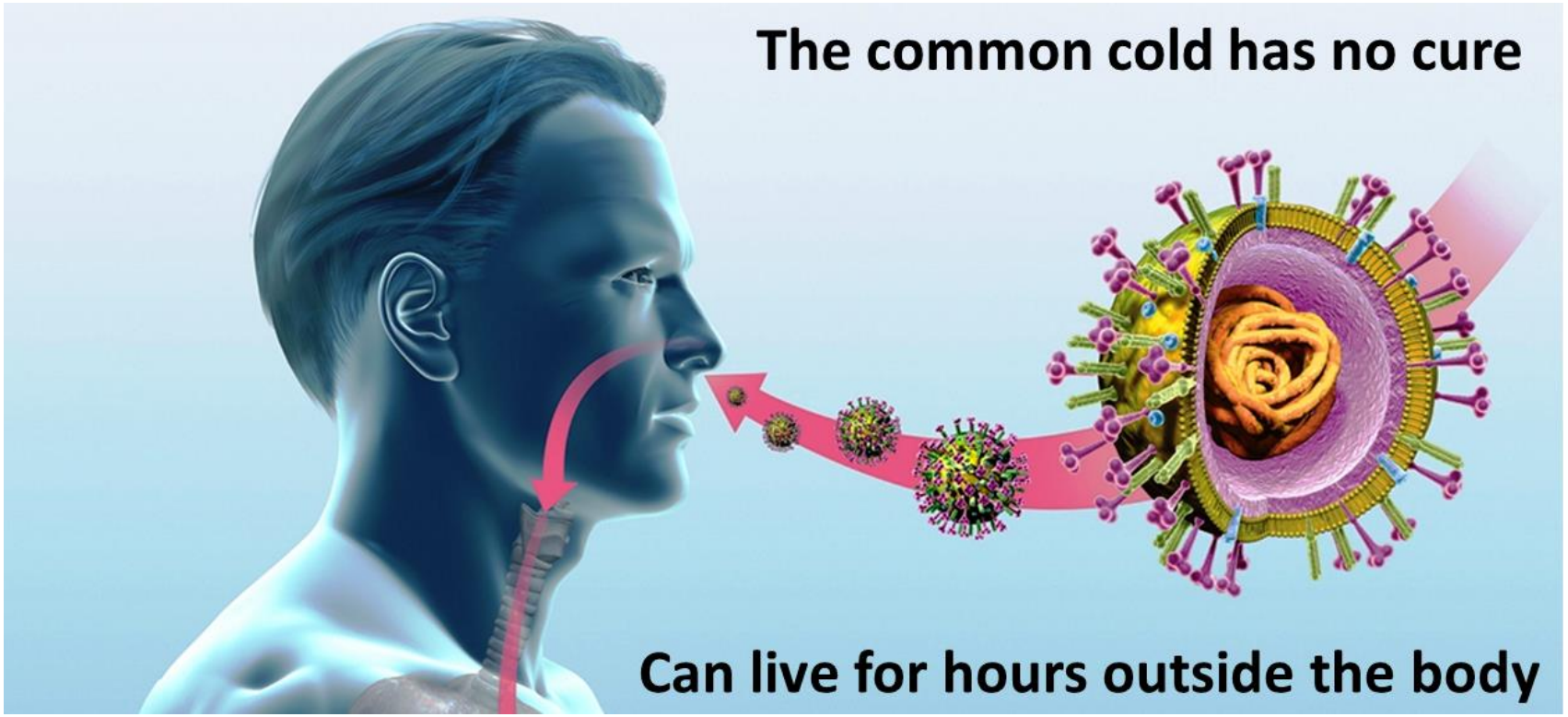
Viruses

- Viruses are difficult to destroy.
- They have either DNA or RNA in core.
- The core is surrounded by a protein coat.
- The coat may be enclosed in a lipid envelope.
- Viruses can only replicate within a living host cell.



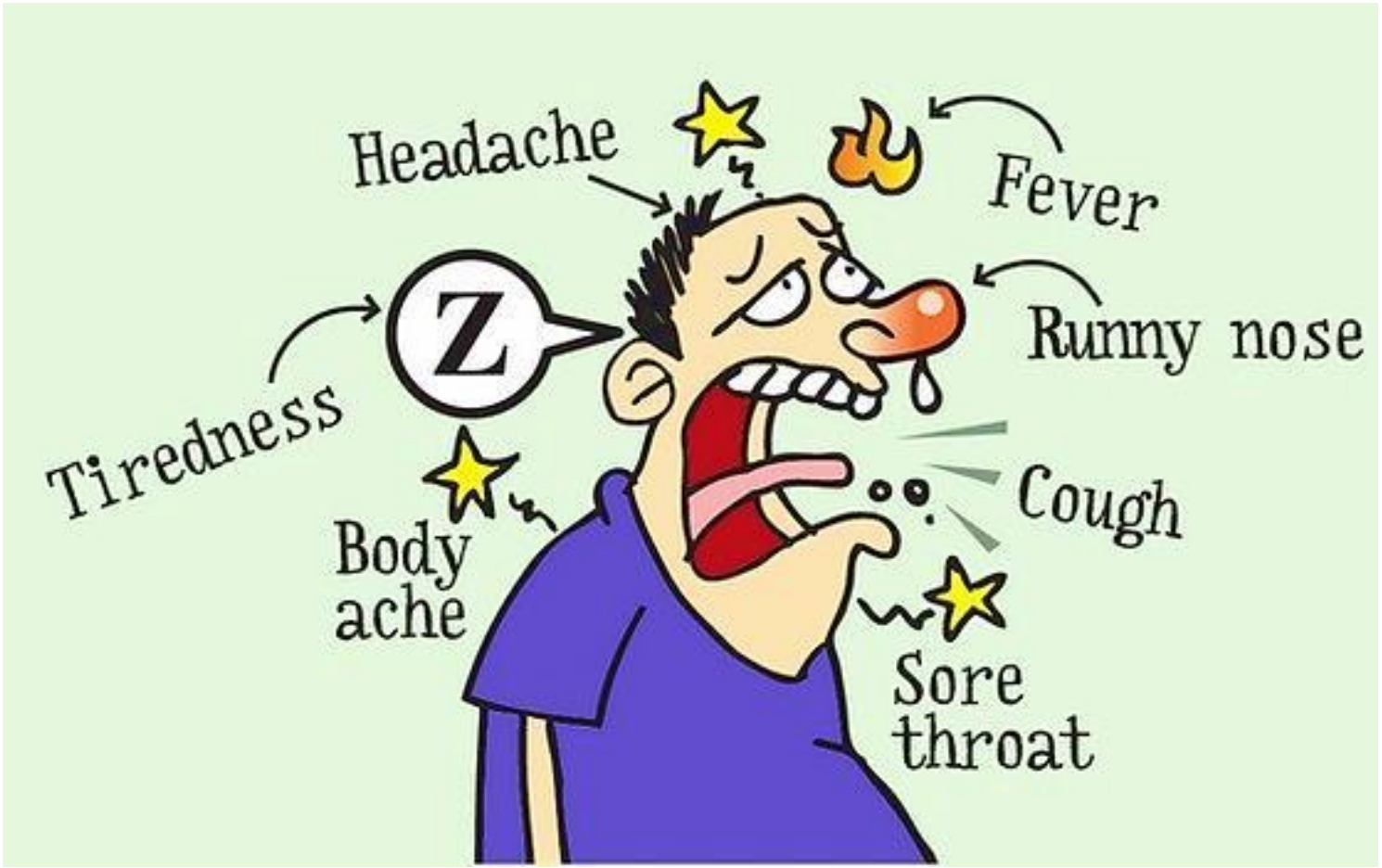
Viruses

- Diseases associated with viruses are:
- Common cold



Viruses

- Common Cold Symptoms



Viruses

- Chickenpox Symptoms
- High temperature (fever).
- Aches and headache often start.

a day or so before a rash appears.

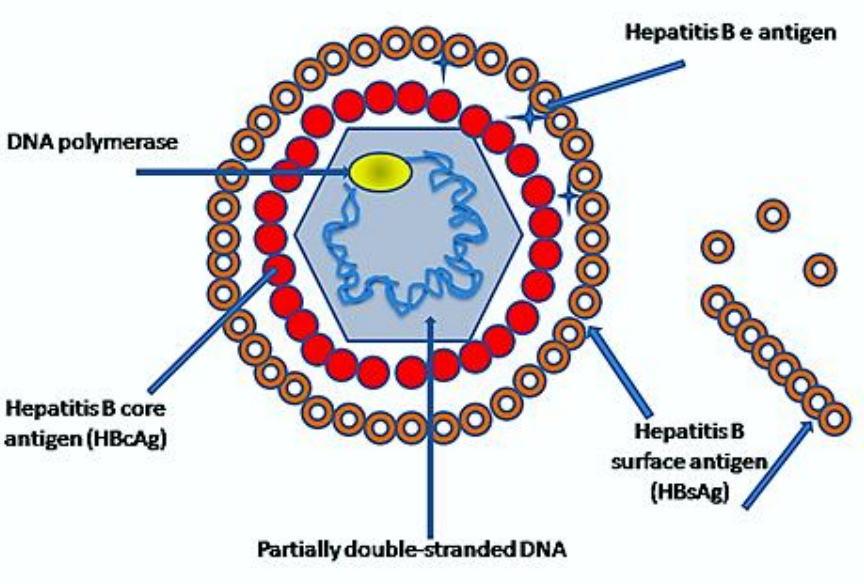
- Spots (rash) that develop into small blisters and are itchy.
- Loss of appetite or feeding problems.

Viruses

- Herpes Symptoms
- Tingling
- Itching
- Burning
- Sores
- Painful, fluid-filled blisters may appear
- Flu-like symptoms
- Problems urinating

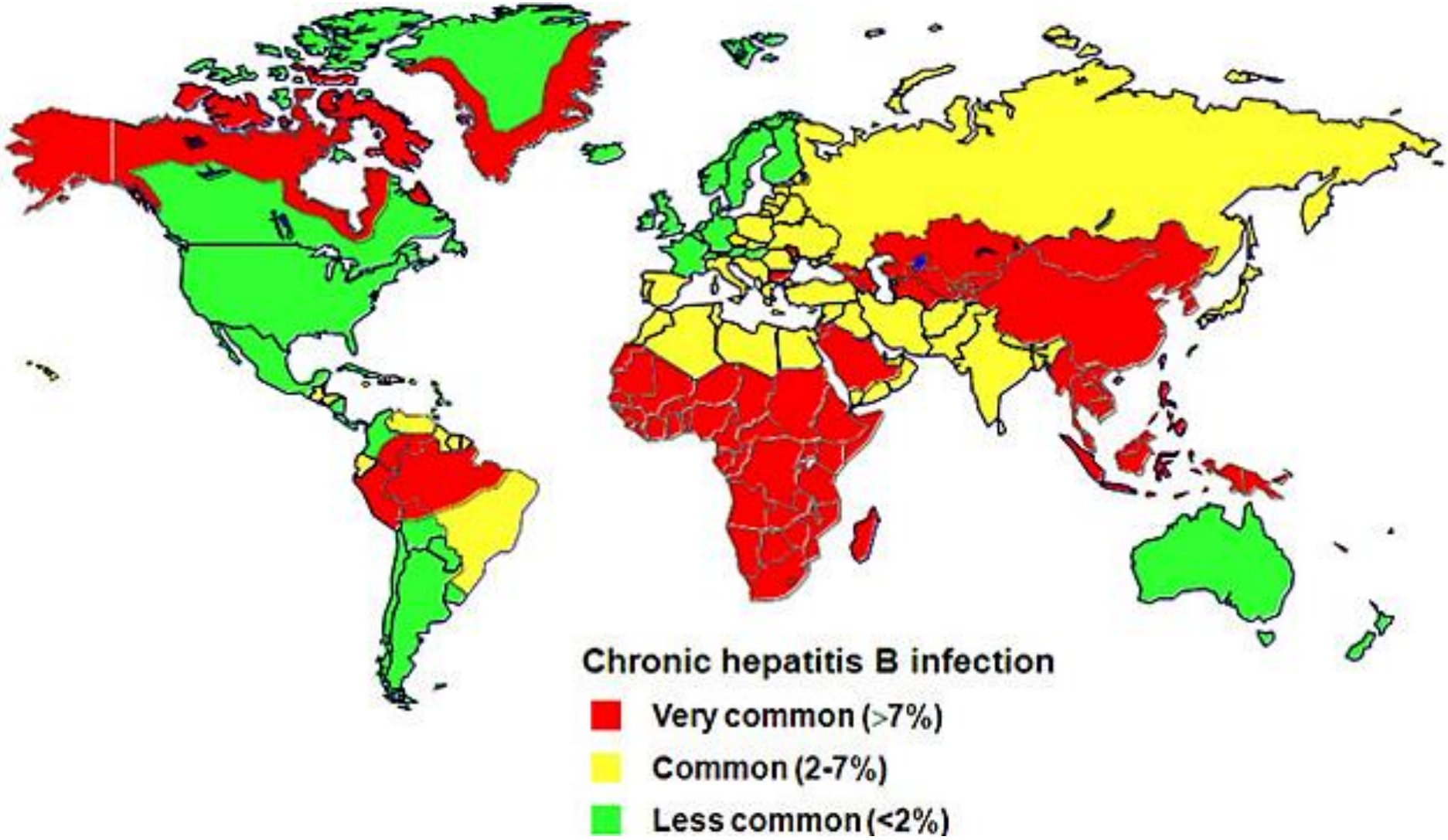
Viruses

- Hepatitis B Symptoms
- Extreme tiredness
- Mild fever
- Headache
- Loss of appetite, nausea and vomiting.



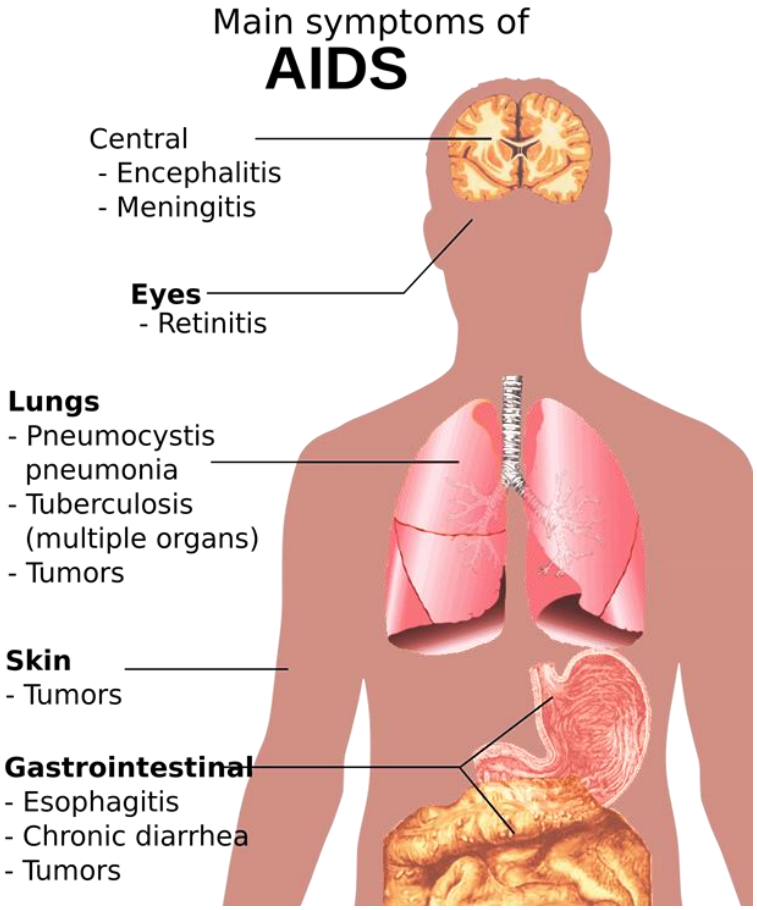
- Constant discomfort on the right side of the belly under the rib cage.
- Diarrhea or constipation.

Viruses

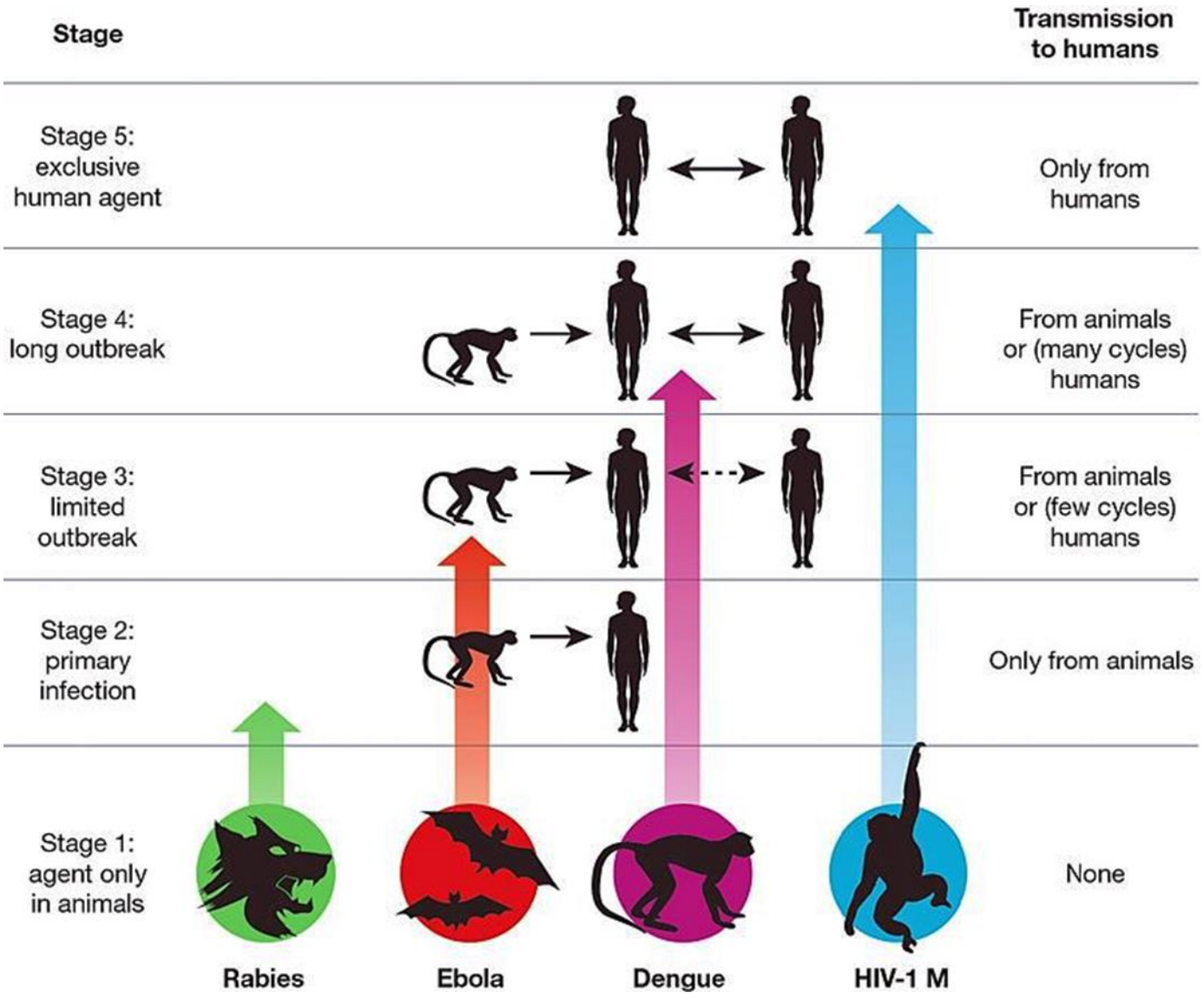

Chronic hepatitis B infection
Very common (>7%)
Common (2-7%)
Less common (<2%)

Viruses

- Human Immunodeficiency Virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS)

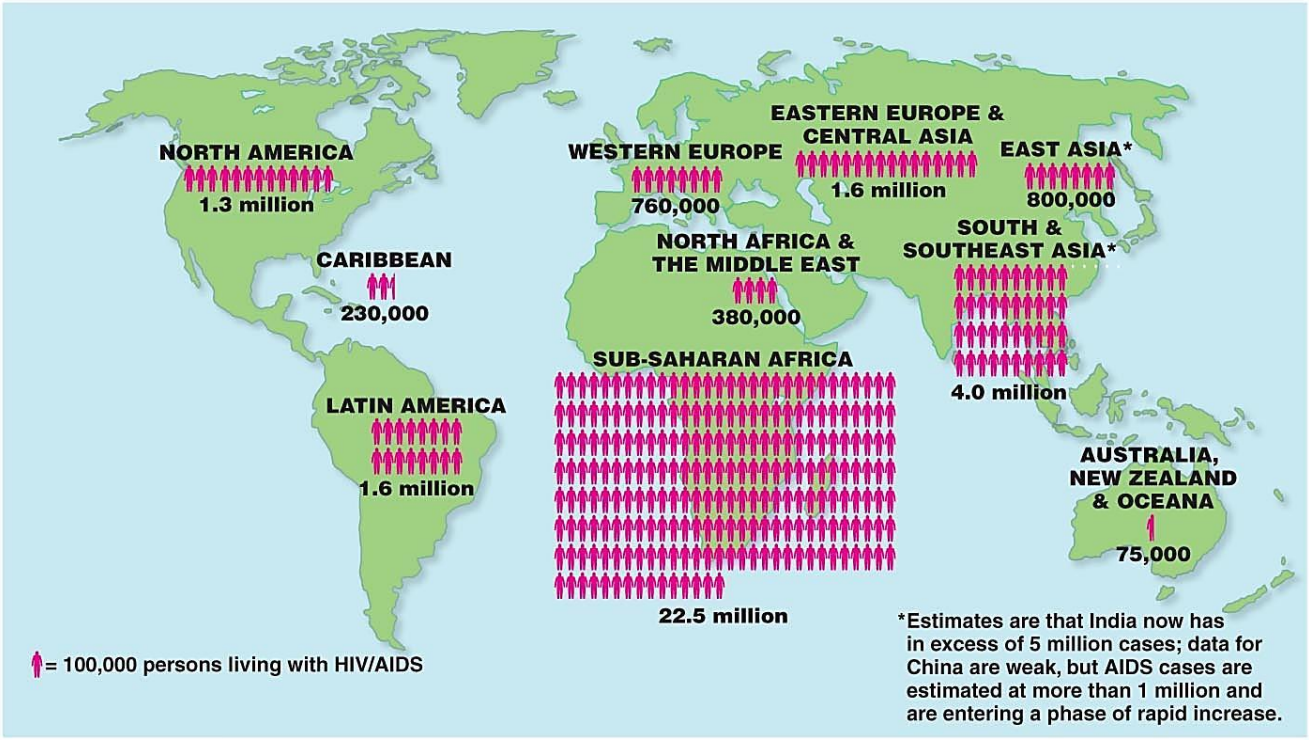


Viruses

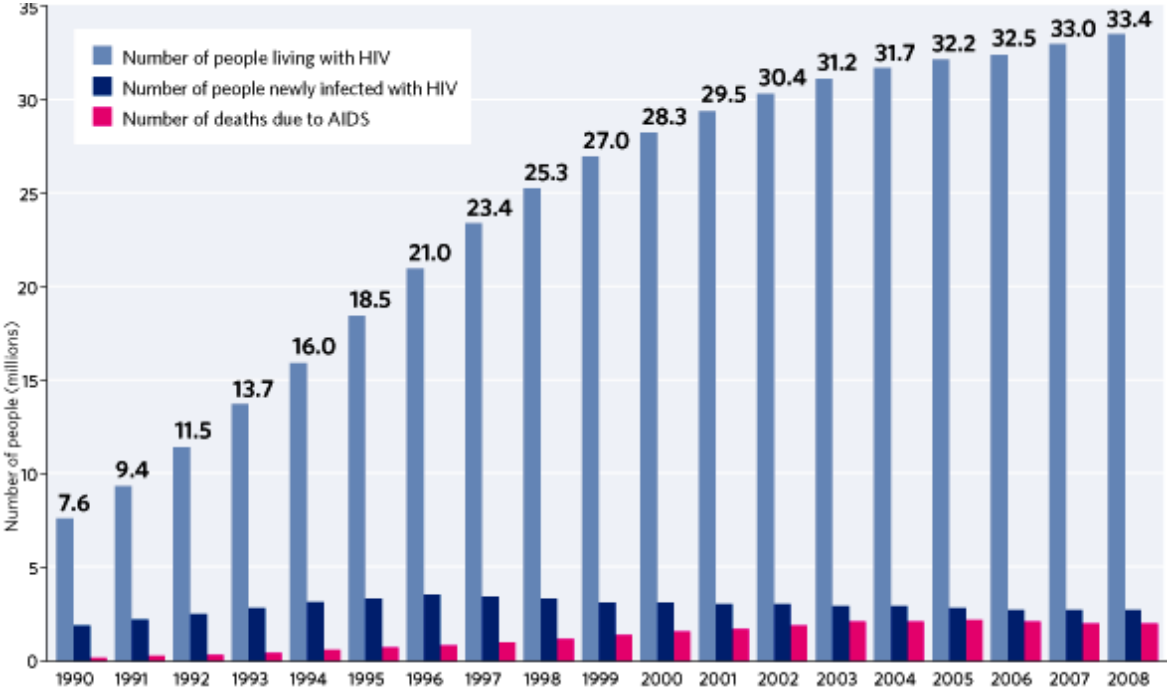

Stage
Transmission to humans
Stage 5: exclusive human agent
Only from humans
Stage 4: long outbreak
From animals or (many cycles) humans
Stage 3: limited outbreak
From animals or (few cycles) humans
Stage 2: primary infection
Only from animals
Stage 1: agent only in animals
None
Rabies
Ebola
Dengue
HIV-1 M

Viruses

- Main cause of HIV infection
- Heterosexual intercourse (85%).
- Injected drug use (IDU).
- Women comprise 42% of infected.



AIDS Worldwide



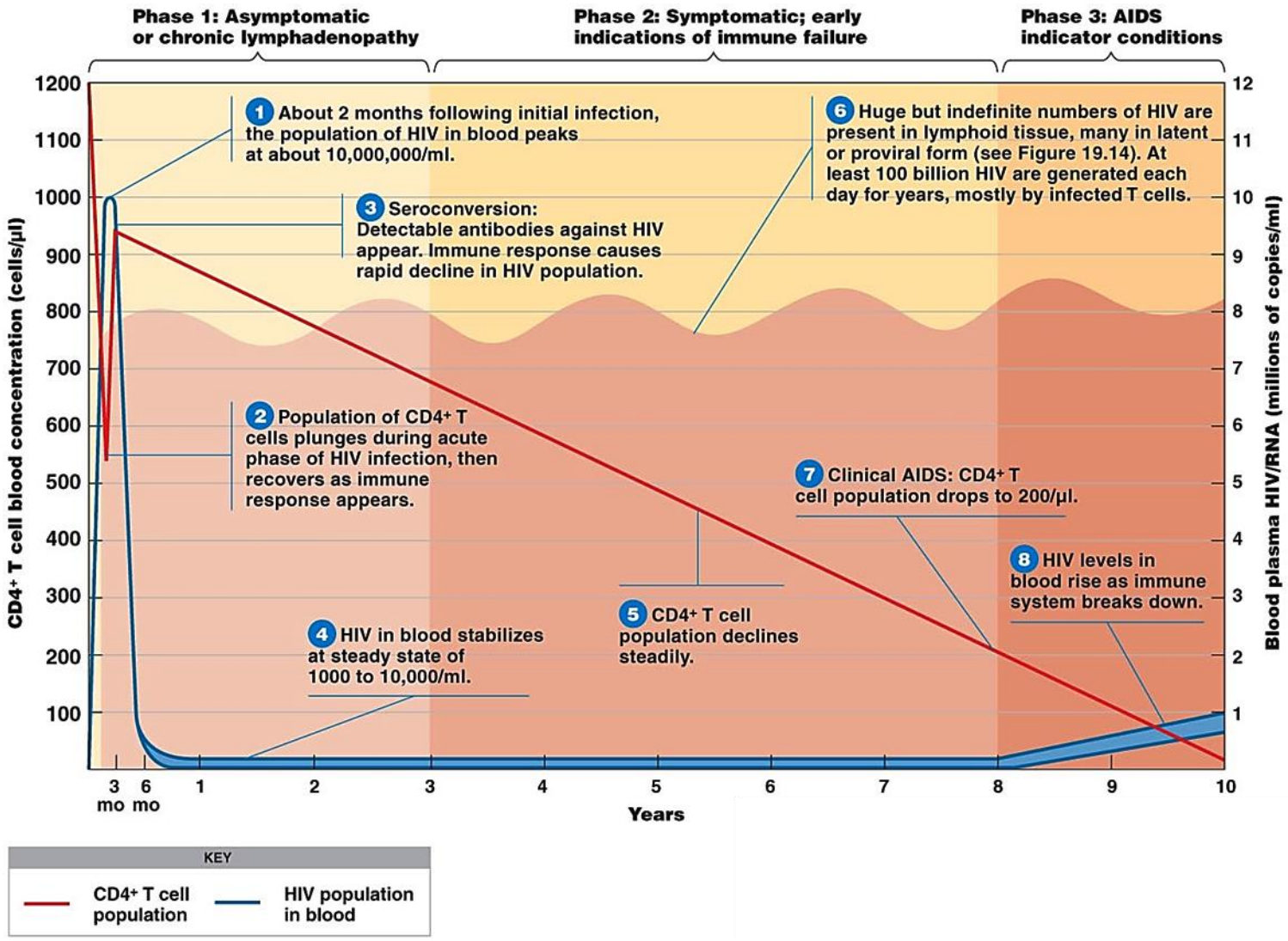
The Stages of HIV Infection

- There are three stages of HIV infection:
- Phase 1: Asymptomatic or chronic lymphadenopathy.
- Develops within 2 to 4 weeks after HIV infection.
- Phase 2: Symptomatic and early indications of the immune system failure.
- Advances to AIDS in 10 to 12 years.
- Phase 3 (AIDS): Characterized by indicator conditions such as Kaposi's sarcoma.

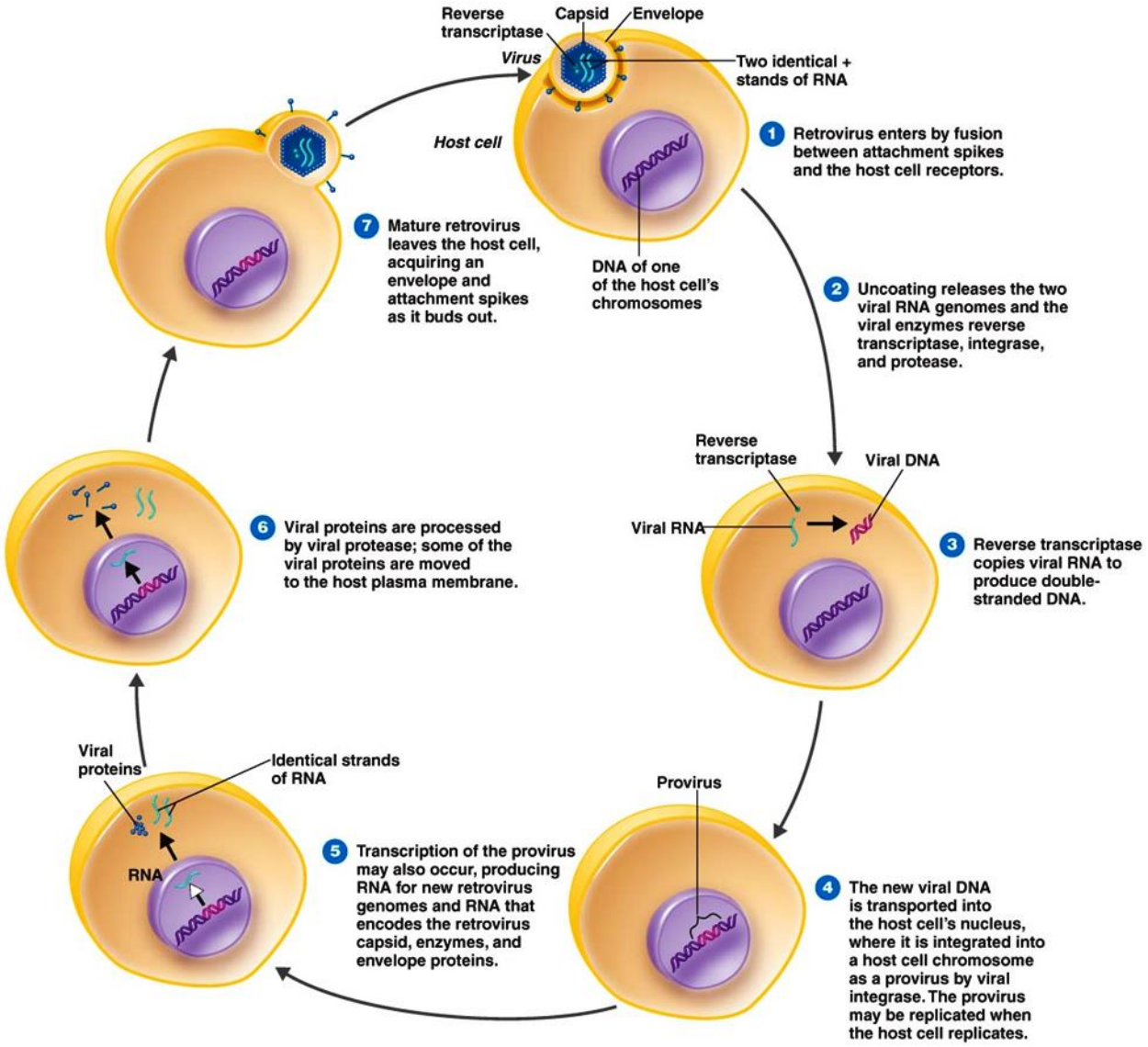
The Stages of HIV Infection

- Phases 1 and 2 are reported as AIDS if $CD4^+$ T cells <200 cells/µl.
- Phase 3 always reported as AIDS.
- Progression from HIV infection to AIDS takes ~ 10 years.
- The life of an AIDS patient can be prolonged by the proper treatment of opportunistic infections.
- People lacking CCR5 (a co-receptor for HIV on lymphocytes) are resistant to HIV.

The Progression of HIV Infection



HIV Infection



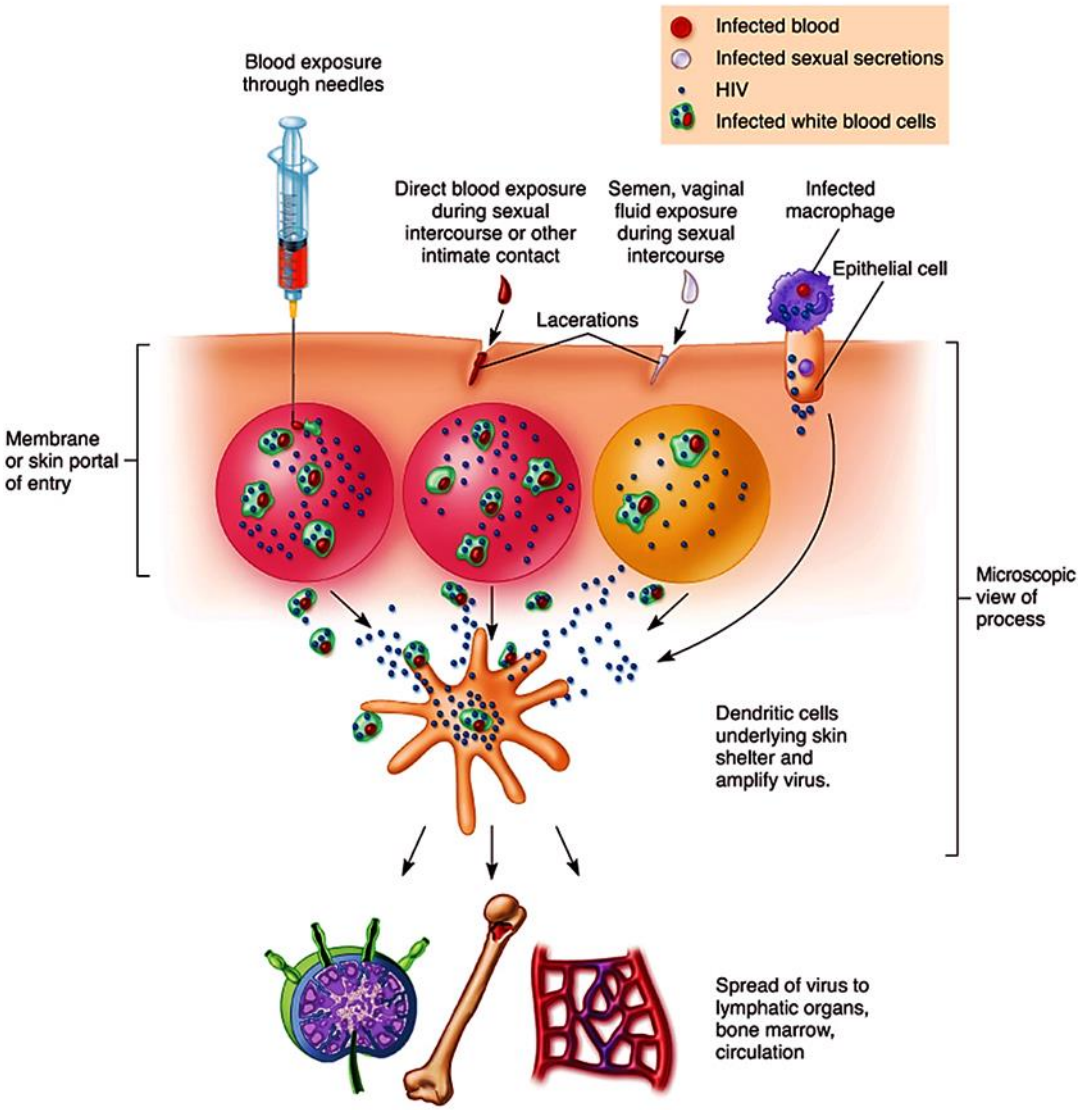
HIV Transmission

- HIV survives 6 hours outside a cell and less than 1.5 day inside a cell.
- HIV is extremely labile in a free state and cannot readily enter through intact body.
- HIV has been detected in a number of body fluids including blood, semen, breast milk, urine, saliva and tears.
- According to most sources, urine, saliva and tears are not likely to be the mode of transmission.

HIV Transmission

- Infected body fluids transmit HIV:
- Sexual contact
- Breast milk
- Transplacental infection of fetus
- Blood-contaminated needles
- Organ transplants
- Blood transfusion
- In developed countries, blood transfusions are not a likely source of infection anymore.

HIV Transmission

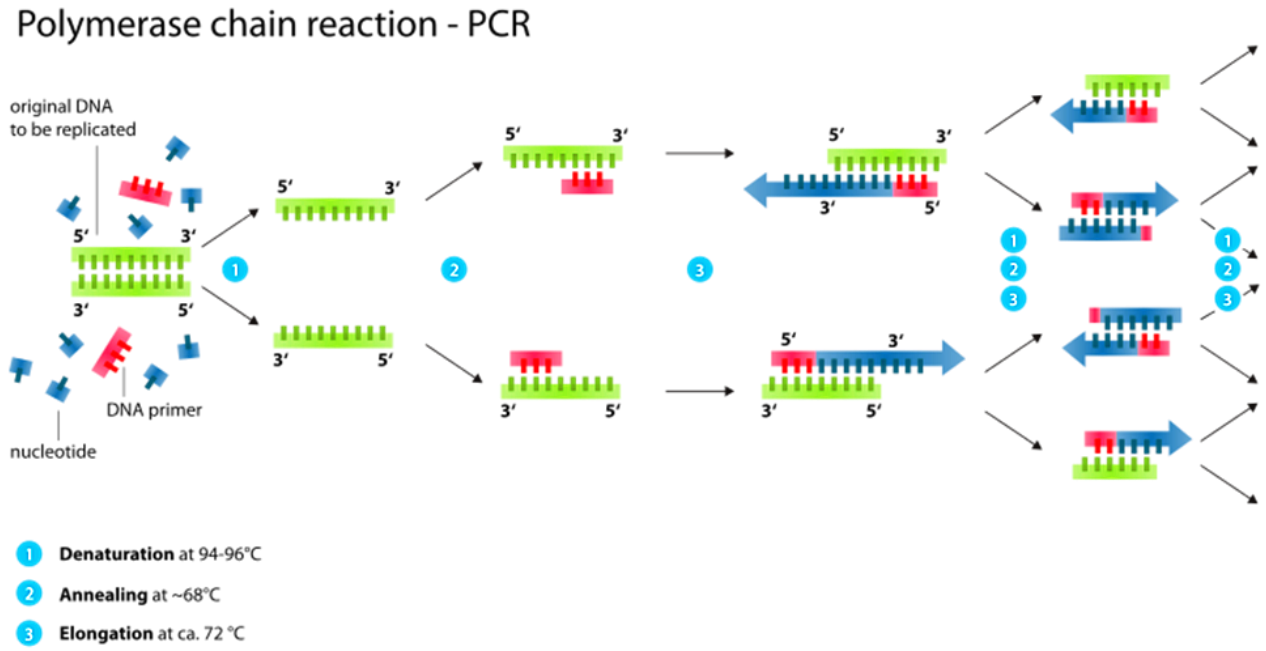


HIV/AIDS

- Acquired Immune Deficiency Syndrome (AIDS) caused by:
- The HIV virus is a retrovirus.
- A single-stranded RNA virus, with reverse transcriptase for a copy of viral DNA, which is then transcribed into viral RNA.
- Some retroviruses can become incorporated into host DNA genome.
- An integrase enzyme helps to splice the viral DNA into host DNA genome.

Diagnostic Methods

- Polymerase chain reaction (PCR) is used to amplify a single copy or a few copies of a piece of DNA generating thousands to millions of particular DNA sequence.

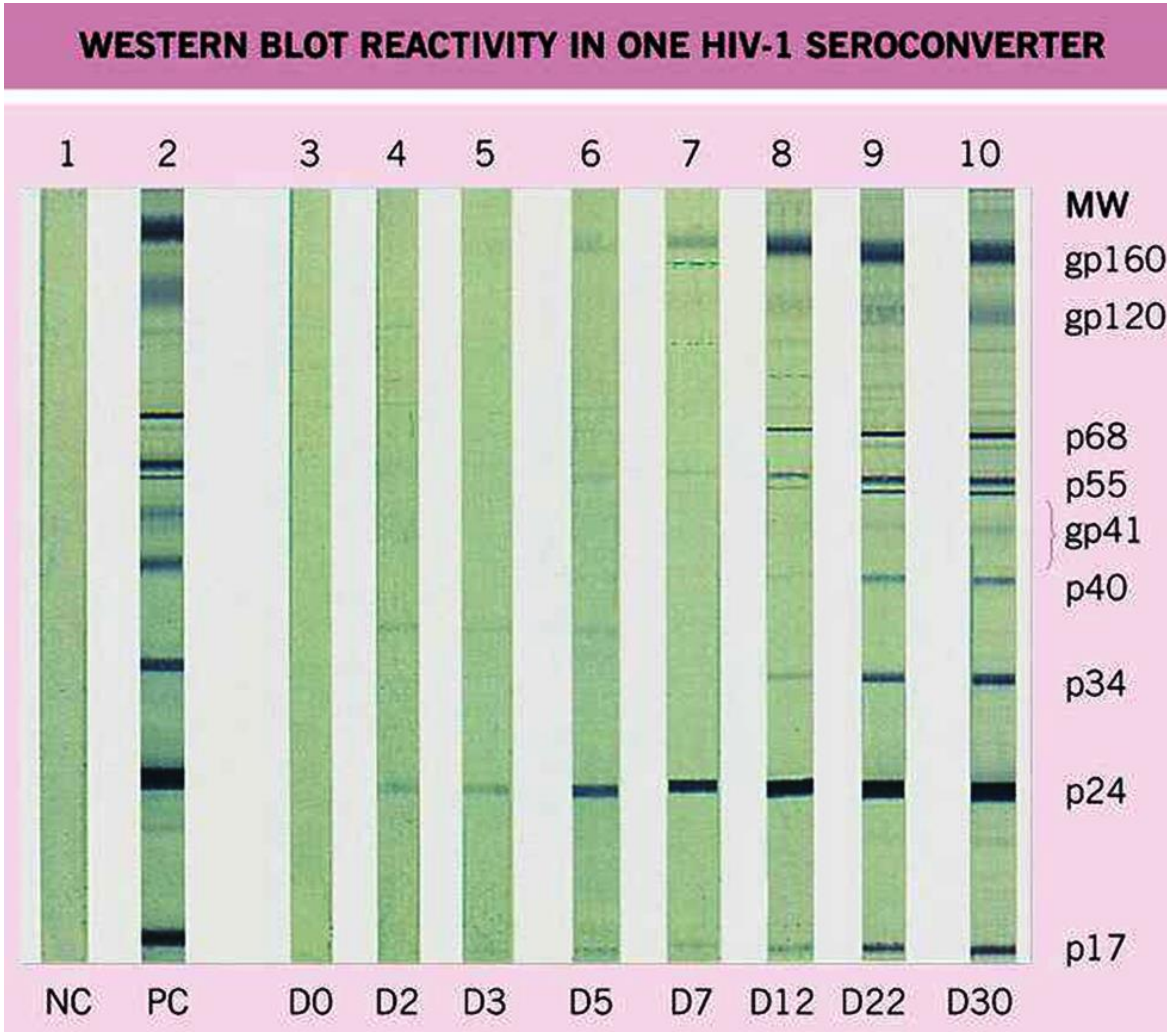


Diagnostic Methods

- HIV Antigens detected by Western blot.
- The Western blot is a widely used analytical technique to detect specific proteins in a sample of tissue homogenate or extract.
- Western blot uses gel electrophoresis to separate native proteins by 3-D structure or denatured proteins by the length of the polypeptide.
- Western blot must have 5 horizontal stripes for positive-HIV.

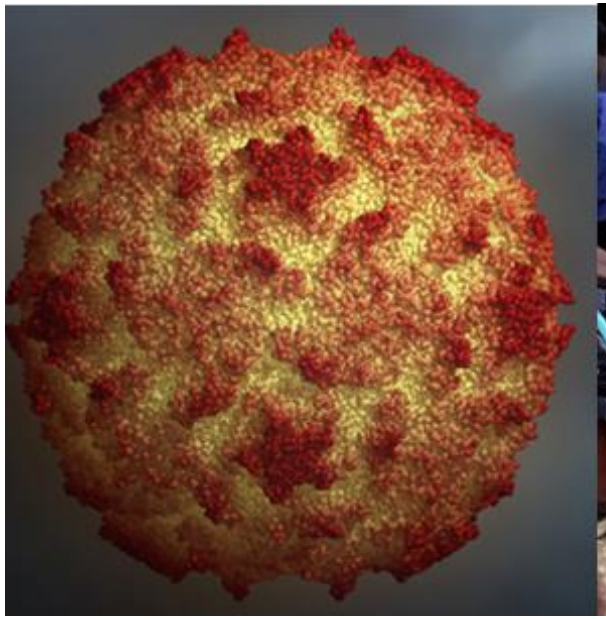
Diagnostic Methods

1. • Sampling
2. • DNA extraction
3. • PCR amplification of 16S RNA gene
4. • Electrophoresis (separation) of 16S RNA



Polio

- Non-paralytic: Affect the central nervous system and produces only mild symptoms and does not result in paralysis.
- Paralytic: The rarest and most serious form of polio and lead to paralysis.



Polio

- There are three types of paralytic polio:
- Spinal polio that affects the spine.
- Bulbar polio that affects the brainstem.
- Bulbospinal polio that affects the spine and brainstem.
- There are two types of vaccines that protect against polio:
- Mid 1950s – Salk vaccine (inactivated virus): The first effective polio vaccine that has been developed in 1952 by Jonas Salk.

Polio

- Inactivated poliovirus vaccine (IPV) is given as an injection in the leg or arm, depending on the patient's age.
- Salk vaccine is safer but no mucosal immunity.
- Four doses of IPV is given at 2 months, 4 months, 6–18 months and at 4–6 years.

Polio

- 1962 – Sabin vaccine (attenuated virus):
- An oral vaccine that has been developed by Albert Sabin using attenuated poliovirus.
- It is an oral poliovirus vaccine (OPV) which has not been used in the United States since 2000 but is still used in many parts of the world.
- Sabin vaccine provides Herd immunity.