

# HIV & AIDS

UG module

Microbiology lecture 7

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# HIV

**H**uman **I**mmunodeficiency **V**irus



# AIDS

**A**cquired **I**mmune **D**eficiency **S**yndrome

A

**A**cquired, not inherited

I

Targets the **I**mmune system

D

Creates a **D**eficiency of CD4+ cells in the immune system

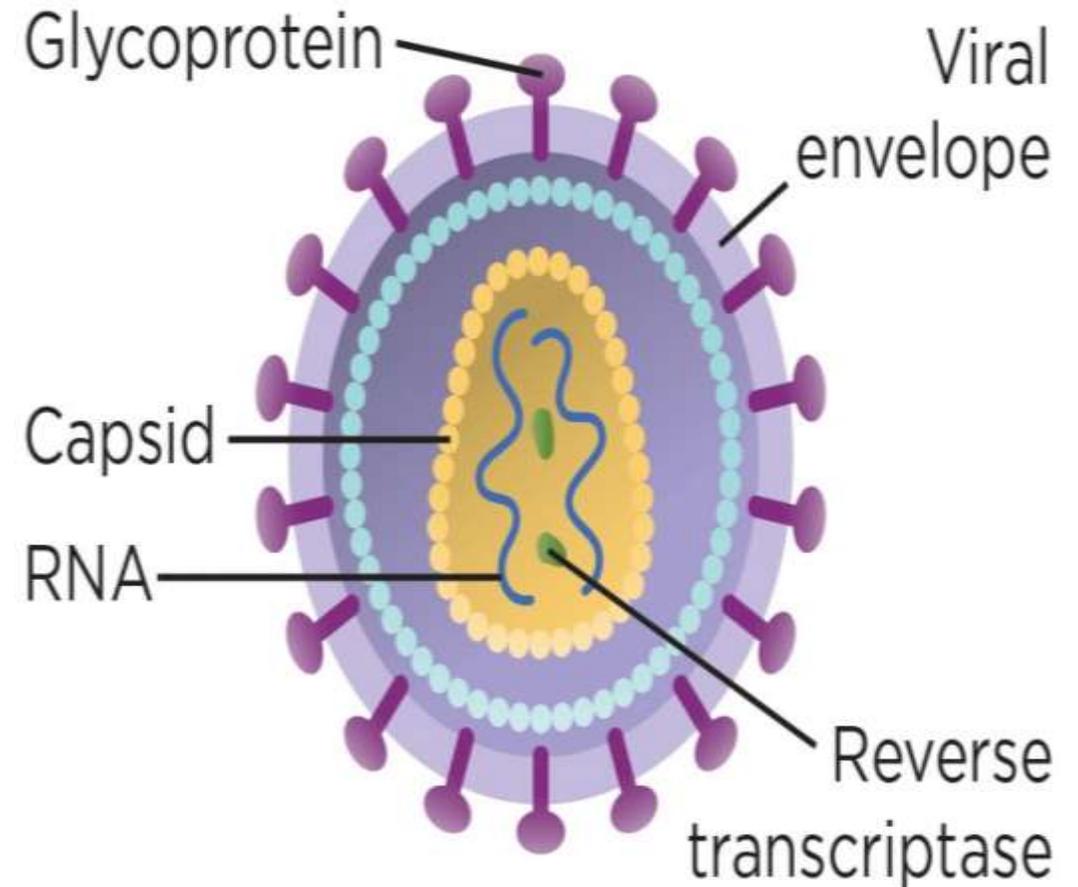
S

**S**yndrome, or a group of illnesses taking place at the same time

# HIV

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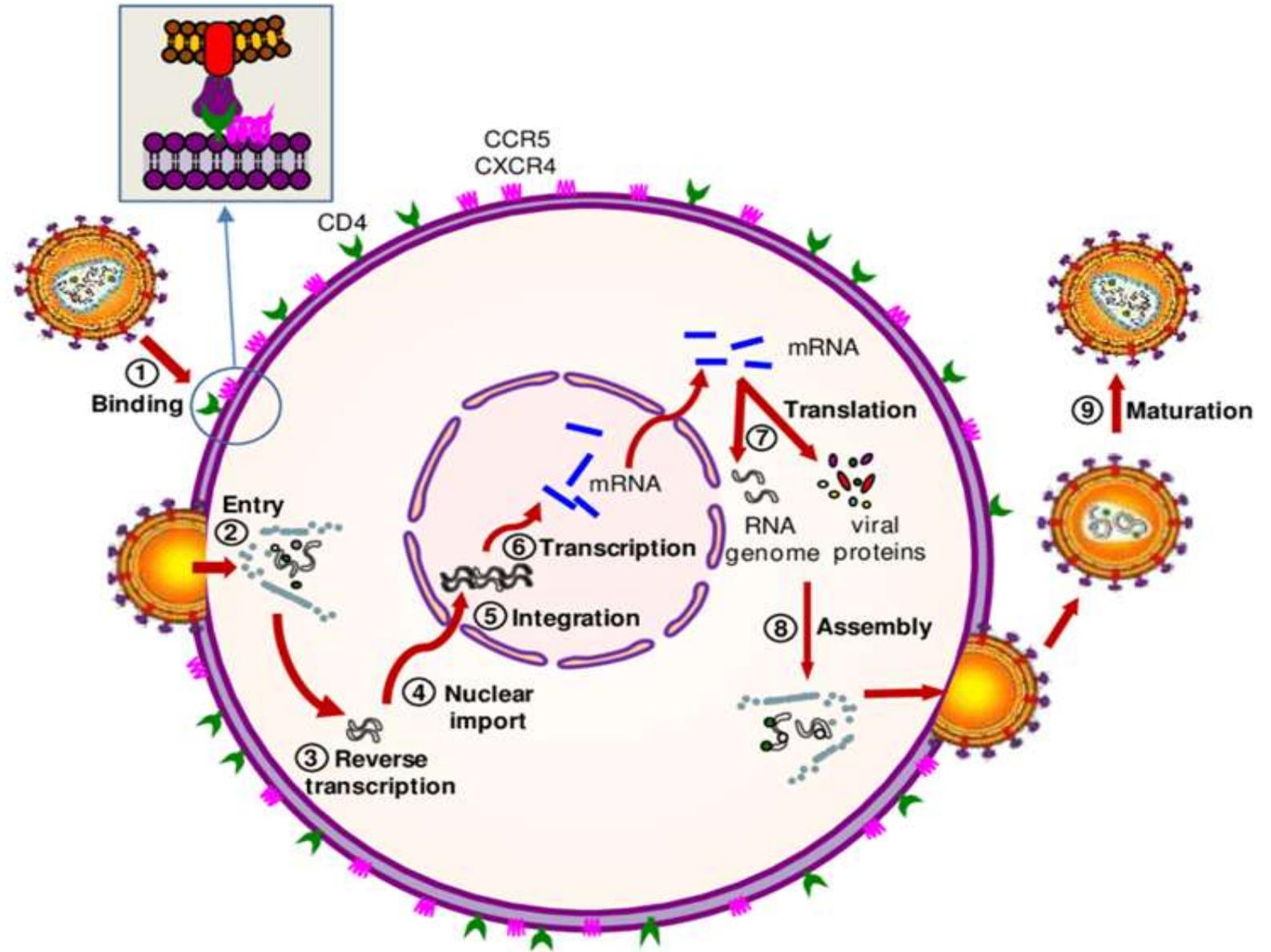
- Family: Retroviridae
- Genus: Lentivirus
- Species:
  - HIV-1: most common species worldwide
  - HIV-2: restricted to West Africa
- Structure: icosahedral with a conical capsid and a spiked envelope.
- Genome: it carries single-stranded RNA as its genetic material.



# Routes of transmission

- Sexual: responsible for ~ 80% of infections worldwide.
- Parenteral transmission:
  - Needle sharing, Needlestick injuries
  - Infectious blood on mucous membranes
  - Blood transfusions.
- Vertical transmission: from mother to child during childbirth or through breastfeeding after birth.

# HIV replicati on cycle



# Clinical features

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HIV infection progress through different phases with different clinical features.

Acute HIV infection  
(ARS)

AIDS  
(also known as advanced HIV)

# Acute HIV infection

- In early HIV infection, patients are often asymptomatic.
- Fever, Fatigue, headache
- Myalgia and arthralgia
- Generalized nontender lymphadenopathy,  
Generalized rash
- Gastrointestinal symptoms (nausea, diarrhea,  
weight loss)
- Oropharyngeal symptoms (sore throat,  
ulcerations, painful swallowing)

# During the acute infection stage, symptoms



Fever



Chills



Swollen lymph nodes



Muscle aches and joint pain



Skin rash



Sore throat



Painful mouth sores



Headache



Nausea



Upset stomach



Weight loss



Cough



Night sweats

# Progression to chronic immunodeficiency

- HIV infects CD4+ lymphocytes, then reproduces and spreads to other CD4+ lymphocytes → infection of CD4+ lymphocytes concentrated in specialized lymphoid tissue → further growth and dissemination → acute HIV syndrome with high viral load.
- After the acute stage, viral load decreases, and remains at roughly that level for approximately 8–10 years (clinical latency stage).
- Increasing loss of CD4+ lymphocytes impair immune function → facilitates opportunistic infections and development of malignancies (AIDS).
- These secondary diseases are usually the cause of death in individuals with HIV.
- Increased viral load generally leads to a decreased number of CD4+ lymphocytes and vice versa

# AIDS

- AIDS is defined as the development of an AIDS-defining condition or a CD4 count of  $< 200$  cells/ $\mu\text{L}$  in HIV-infected patients.
- AIDS-defining conditions are a set of potentially life-threatening conditions that indicate the progression of HIV infection to AIDS.

# AIDS

- As the CD4 count declines, the immune system is weakened and many pathological processes may occur, such as:
  - Development of malignancies e.g., non-Hodgkin lymphomas
  - Rapid spread of opportunistic and non-opportunistic bacterial and fungal infections (e.g., coccidioidomycosis, pneumocystis pneumonia, mycobacterial infections)
  - Reactivation of latent infections (e.g., tuberculosis, herpes simplex infections, shingles).

# CLINICAL MANIFESTATION OF AIDS

## IMMUNOLOGIC:

- Low white cell counts  
CD4 count  $< 200/\text{mm}^3$
- Opportunistic Infections
- Lymphadenopathy
- Fatigue

## INTEGUMENTARY:

- Poor Wound Healing
- Skin Lesions
- Night Sweats

## RESPIRATORY:

- Cough
- SOB

## GASTROINTESTINAL:

- Diarrhea
- Weight Loss
- Nausea/Vomiting

## CENTRAL NERVOUS SYSTEM:

- Confusion
- Dementia
- Headache
- Visual Changes
- Personality Changes
- Pain
- Seizures



## OPPORTUNISTIC INFECTIONS:

### Protozoal Infections

- Pneumocystis Carinii  
Pneumonia
- Toxoplasmosis (Encephalitis)
- Cryptosporidiosis (GI)

### Fungal Infections

- Candidiasis - Stomatitis  
Esophagitis  
Vaginal

### Bacterial Infections

- Mycobacterium Complex
- Tuberculosis

### Viral Infections

- Cytomegalovirus
- Herpes Simplex Virus
- Varicella-Zoster Virus

## MALIGNANCIES:

- Kaposi's Sarcoma
- Non-Hodgkin's Lymphoma
- Hodgkin's Lymphoma
- Invasive Cervical  
Carcinoma

## AIDS DEMENTIA COMPLEX:

Cognitive, Motor and Behavioral Impairments in 70% AIDS Clients

# Diagnosics

- **Serological assays**

- HIV antigen alone: detects HIV p24 antigen
- HIV antibody assays: Detect IgM and IgG antibodies using enzyme-linked immunosorbent assays (ELISA).

- **Virological testing:**

- Virological tests are most commonly used for screening infants and confirmation of disease in both infants and adults.
- Can detect HIV-1 RNA and/or DNA through nucleic acid testing (NAT).
- Can measure the amount of viral RNA in the blood and detect HIV infection earlier than antibody/antigen-based tests

# Management

- All individuals with HIV infection should begin antiretroviral therapy (ART) as soon as possible.
- The antiretroviral drugs such as abacavir target the viral reverse transcriptase enzyme
- Antiretroviral drugs are combined to prevent resistance.
- Establish regular monitoring to assess treatment response.

# Management

- If CD4 count is  $< 200$ , start prophylaxis for opportunistic infections.
- Treat AIDS-defining condition if present.
- Immunizations: in addition to routine vaccinations, the following vaccines should be prioritized in this population:
  - Hepatitis A&B
  - Human papilloma virus vaccine
  - Influenza vaccine (annually)
  - Meningococcal and Pneumococcal vaccine
  - Herpes zoster, and COVID vaccine.

# Prognosis

- Untreated HIV leads to death on average 8–10 years after infection.
- Progression varies among individuals: Some patients may die within a few years while others can remain asymptomatic for decades.
- The average life expectancy of HIV-infected individuals who receive adequate antiretroviral treatment is approaching that of noninfected individuals of the same age.