



# Chapter:     **Retrovirus**

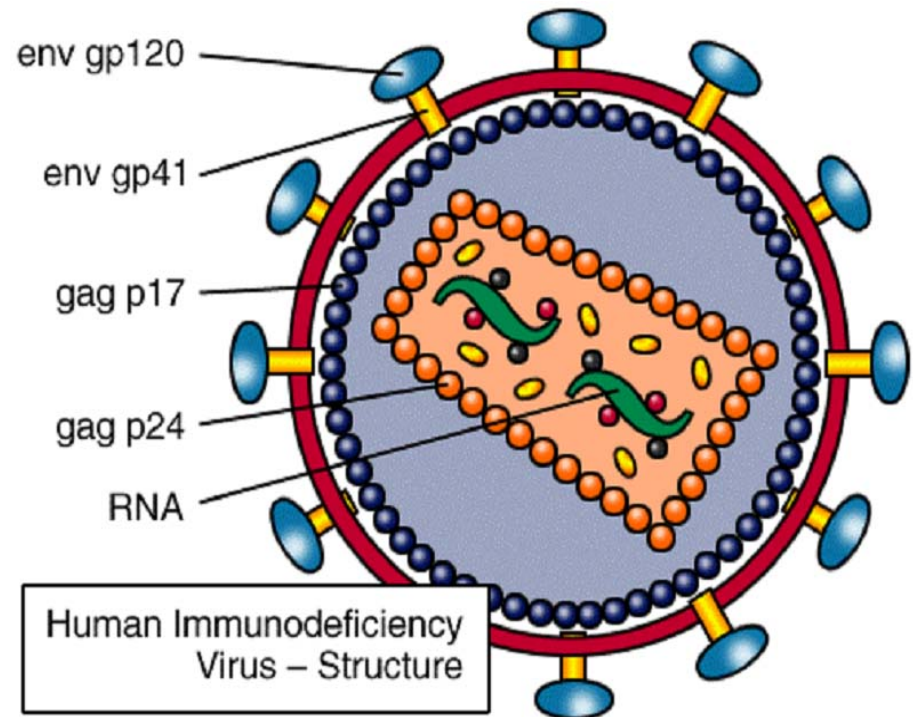
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- **Retroviridae include 3 subfamilies:**
  - Oncovirinae:     **HTLV** (Human T-cell Lymphotropic Virus)
  - Lentivirinae:    **HIV** (Human Immunodeficiency Virus)
  - Spumavirinae:

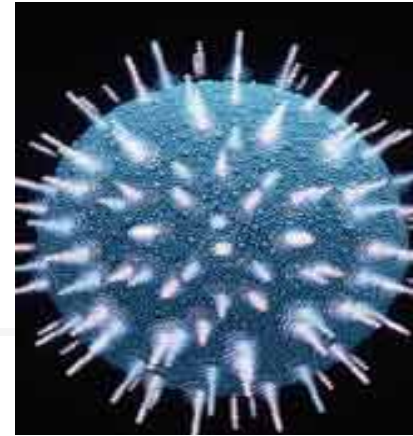
# Human immunodeficiency virus (HIV)

Pathogen of **AIDS**  
( Acquired  
Immunodeficiency  
Syndrome ).

HIV-1 is found  
worldwide, HIV-2 is  
found primarily in  
West Africa.



# I .Biological properties



1. Spherical, enveloped, spikes.

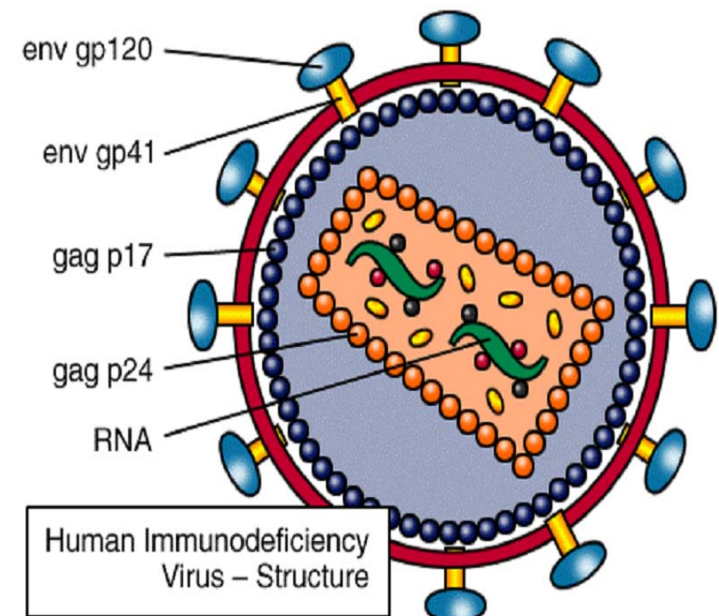
2. Structure:

**Core: 2 copies of +ssRNA ( dimer );**

**reverse transcriptase;**

**Capsid protein: P24**

**Matrix protein: P 17.**





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- **Envelope:**

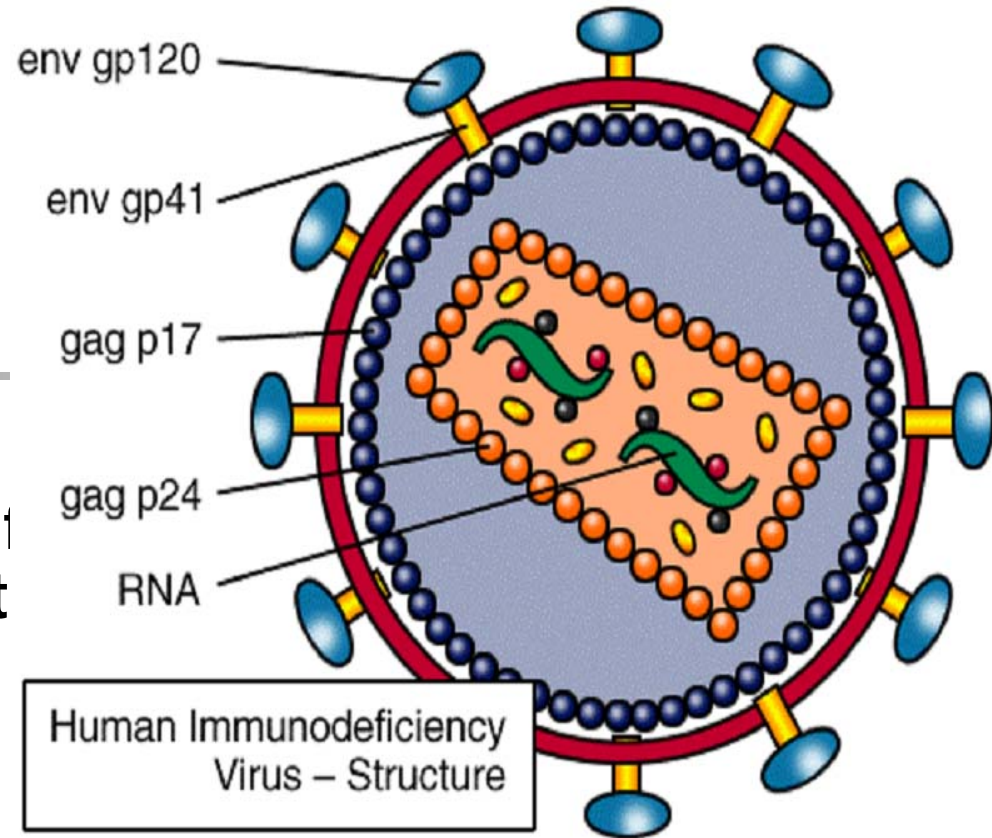
- **gp41:** mediates fusion of the viral envelope with the cell membrane, and the virion enters the cell.

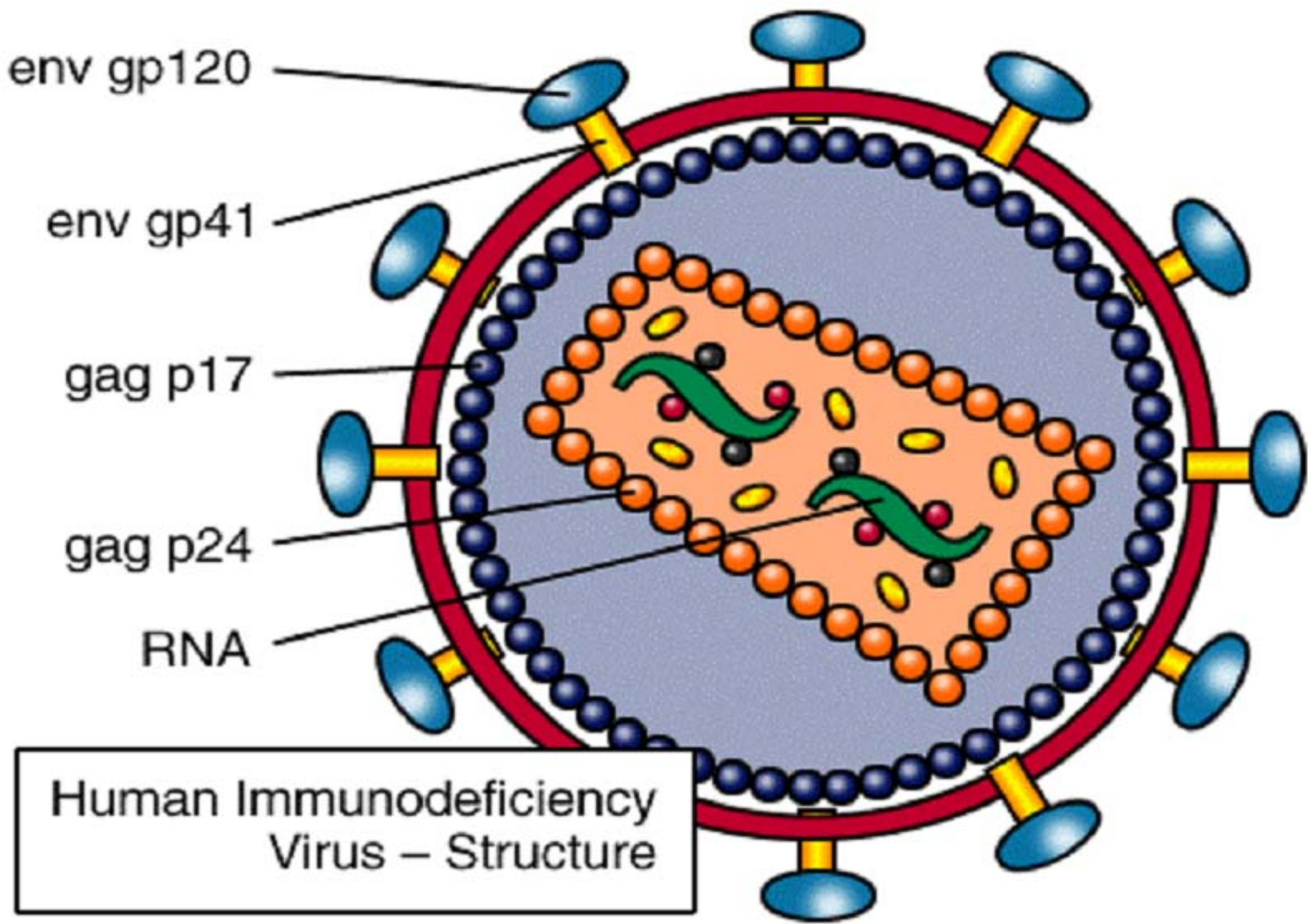
- **gp120:**

- \*be associated with adsorption (binding site for CD4 molecule of T cells).

- \*be able to stimulate the production of neutralizing antibodies.

- \*easy variation.







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- **3. Genes:**

- \* **Structural genes:**

- gag:** coding for capsid proteins  
( p17, p24, p7 )

- pol:** coding for protease, reverse transcriptase etc.

- env:** coding for gp120, gp41.



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\* **Regulatory genes:**

**tat:** regulating the synthesis of viral proteins ( + ).

**rev:** regulating the synthesis of viral proteins ( + ).

**nef:** regulating the synthesis of viral proteins ( - ).

\* **LTR:** contain promoter and enhancer sequences.



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**4. Resistance: 56°C inactivated.**

**5. Replication:**

**adsorption :**

**gp120 bind for CD4 molecule of T4 cells**

**the necessary co-receptors for HIV-1 entry:**

**CXCR4** (fusin) for T-cell line (T)-tropic strains

**CCR5** for macrophage (M)-tropic strains.





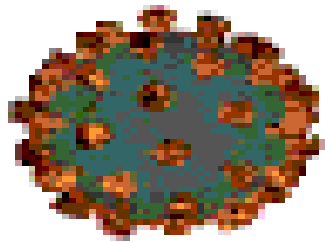
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**Penetration: membrane fusion**

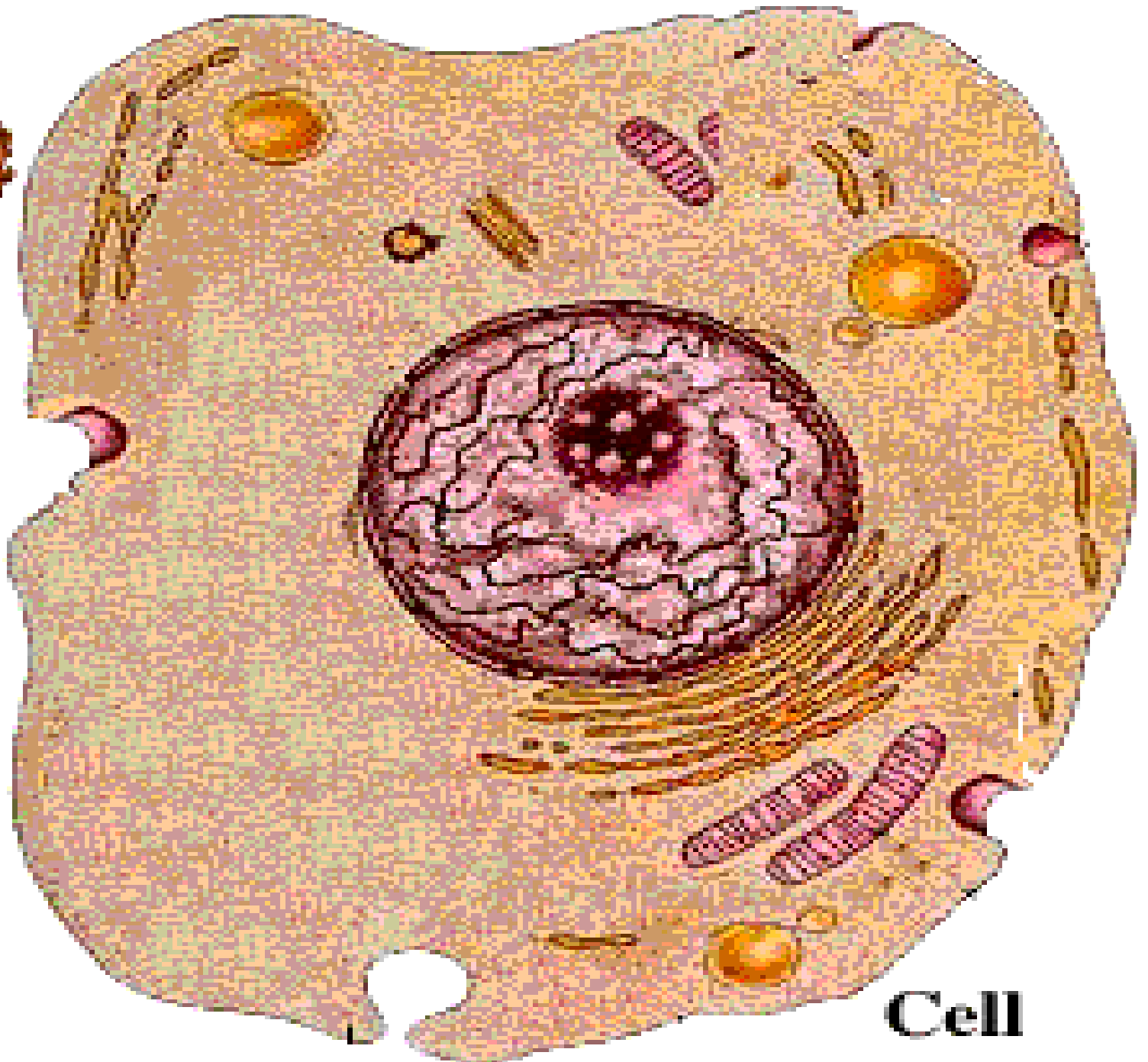
**Uncoating:**

**Biosynthesis:**

- **RNA---cDNA--- RNA:DNA hybrid molecule ---dsDNA(**provirus**) integrated into host DNA--- stay latent ----- enter a productive cycle**
- **assembly and release: budding**



**HIV**



**Cell**



## **II .Pathogenesis & immunity**

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**1.Infectious source: patients (symptomatic), infectious people(anti-HIV(+), asymptomatic).**

**2.Transmission pathway:**

- 1) By blood or blood products;**
- 2) By Sexual contact;**
- 3) Vertical transmission:  
from mother to child.**



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- **3.Pathogenesis:**

- **\* gp120 of HIV select CD4 molecule of T4 cells ---viruses multiply in T4 cells--- cell-mediated immunodeficiency--- opportunistic infections and tumors occur---death**



## **Destruction of T4 cells is achieved by:**

- **① Viral replication**
- **② Syncytium formation via membrane gp120 binding to cell CD4 antigen**
- **③ Cytotoxic T cell lysis of infected cells**
- **④ Cytotoxic T cell lysis of T4 cells carrying gp120 released from infected cells**
- **⑤ Natural killer cells**
- **⑥ Antibody-dependent cell cytotoxicity.**
- **⑦ Induce apoptosis.**



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## 4. Clinical features

Exposure---Seroconversion---Asymptomatic---  
PGL(persistent generalized lymphadenopathy,  
) or ARC(AIDS-related complex) ---AIDS

- a. Opportunistic Infections:  
Protozoal, Fungal, Bacterial, Viral
- b. Opportunistic Tumours  
Kaposi's sarcoma, is observed in 20% of patients  
with AIDS.



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- **III. Diagnosis**

- **1. The detection of the antibody to HIV**

**The presumptive diagnosis of HIV infection is made by the detection of antibodies by ELISA. The definitive diagnosis is made by western blot.**

- **2. The detection of viral components or detection of viral RNA**

- **3. Isolation of the virus in culture**



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- **IV.Control**

- 1.Vaccines:

Several vaccines are under trial.





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## 2. Treatment

- **(1.) Nucleoside analogues reverse transcriptase inhibitors. AZT, DDC, DDI and lamuvidine.**
- **(2.) Non-nucleoside analogue reverse transcriptase inhibitors e.g. Nevirapine(抑制DNA合成)**
- **(3.) HIV Protease inhibitors e.g. Ritonavir, Indivavir. They are the most potent inhibitors of HIV replication to date.**