

HIV & AIDS



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Human Immunodeficiency Virus

HIV is one of the retroviruses which cause “slow” infections with long incubation.

- HIV is known to infect mainly T-helper cells (CD4), macrophages, monocytes and dendritic cells (Target cells).
- Destroying T-helper cells(CD4) resulting in the loss of **cell mediated immunity** which leads to severe immunologic impairment, leading to multiple opportunistic infections & unusual cancer.

HIV virus

- HIV-1:

- Causes infection worldwide.
- Highly virulent.
- Highly susceptible to mutations.

- HIV-2:

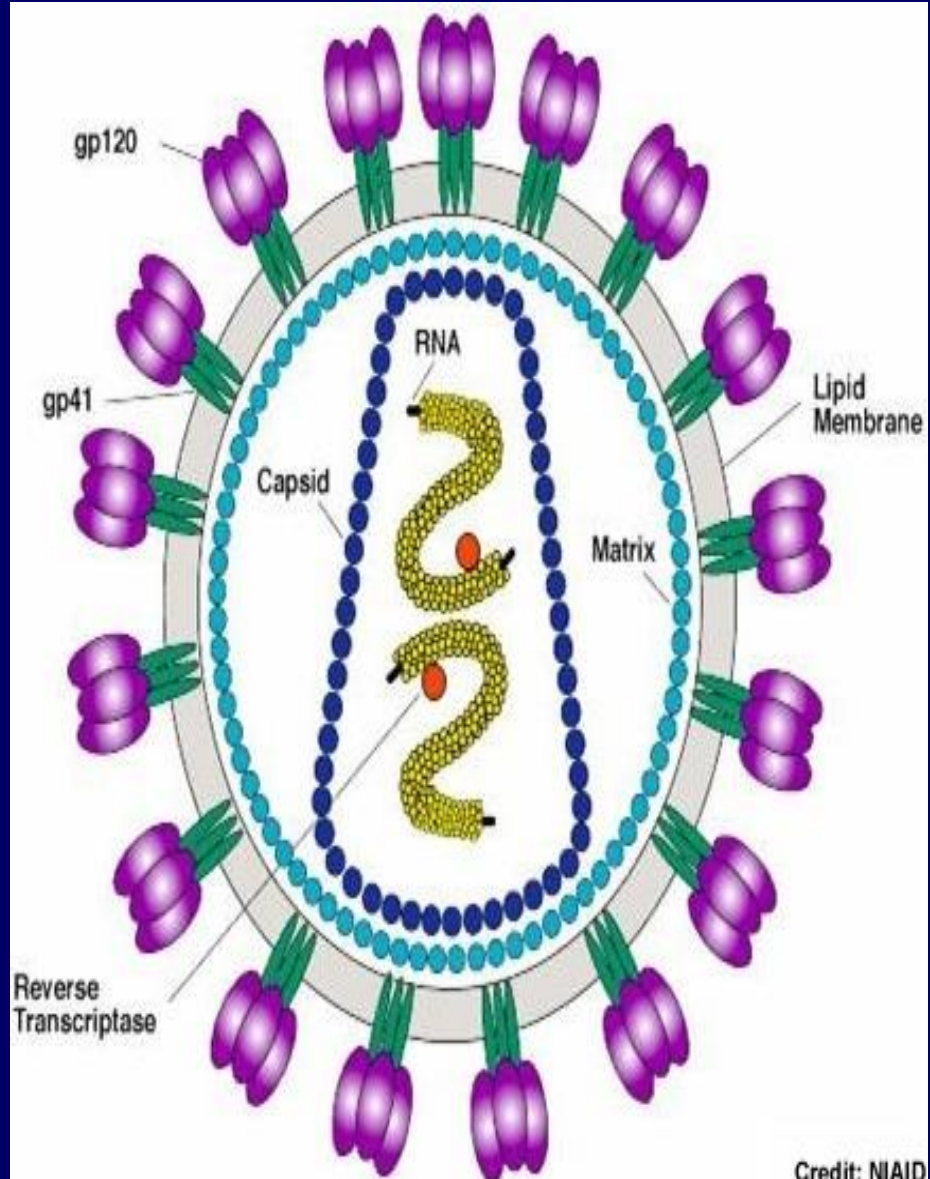
- Causes the infection in specific regions e.g. West Africa
- Relatively less virulent.
- Relatively less susceptible to mutations.

Characteristics of HIV

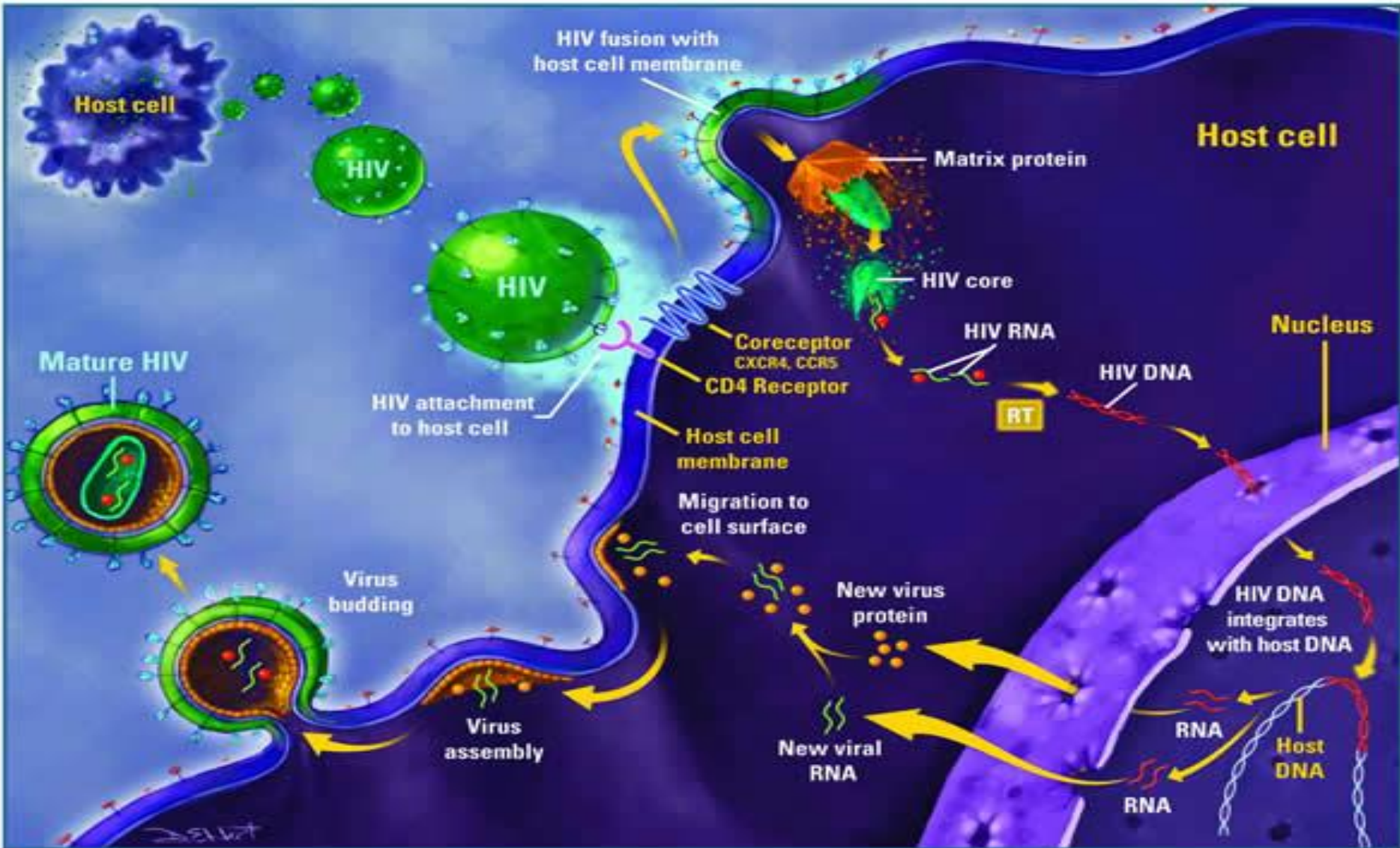
- Family of *Retroviridae*.

Virion consist of:

- Glycoprotein envelope (gp120, gp41).
- Matrix layer (p17) .
- Capsid (p24).
- Two copies of ssRNA.
- Enzymes (reverse transcriptase, integrase, protease).



Life cycle & replication of HIV



Transmission of HIV :

Sexually:

The most common mode of HIV infection is sexual transmission at the genital mucosa through direct contact with infected blood, semen and vaginal secretion.

People with **STD** especially those with ulcerative lesion such as Syphilis, chancroid, and herpes genitalis, have a significantly higher risk of acquiring HIV .Uncircumcised males have a higher risk of acquiring HIV than circumcised males.

Parenterally:

By direct exposure to infected blood and blood products.

Transmission of HIV via blood transfusion has been greatly reduced by screening donated blood for the presence of antibody to HIV & HIV RNA .

Use contaminated needles and syringes as in (drug abuser) and Tattooing.

Through contaminated surgical and dental instruments.

Sharing contaminated razors , tooth brushes, and nail cutters.

Transmission of HIV :

From mother to child

Infected mother transmit HIV to their babies trans-placentally **(vertical 25%)** ,but Treatment of the mother with antiretroviral Anti-reverse transcriptase (**Zidovudine**) during **pregnancy** can reduce transmission in most cases.

Virus spread to child Perinat ally mainly **(50%)** during delivery given Anti-reverse transcriptase (**Nevirapine**) as single dose during delivery can reduce the transmission . **breast feeding also an important way of perinatal transmission (25%)** . Antiretroviral treatment of the mother and infant after birth can also significantly decrease the risk of HIV infection in the newborn.

Virus Inactivation

- HIV is **easily** inactivated by treatment for 10 min at 37°C with any of the following
 - 10% house hold bleach, Sodium Hypochlorite
 - 50% ethanol
 - 35% isopropanol
 - 0.5% Paraformaldehyde
 - 0.3% hydrogen peroxide

The Course of HIV-infection

➤ The course of HIV-infection divided into three stages:

- **The acute phase**

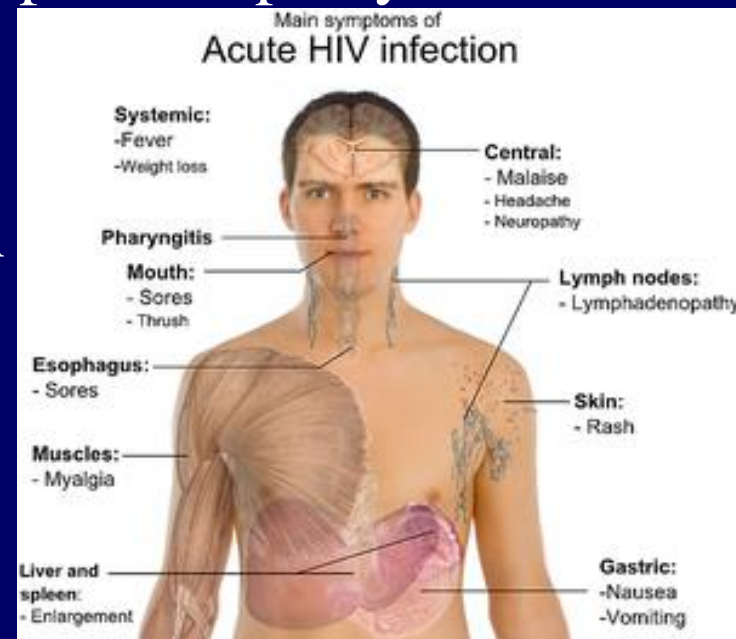
- The chronic phase → (PGL)

- (ARC)

- **AIDS**

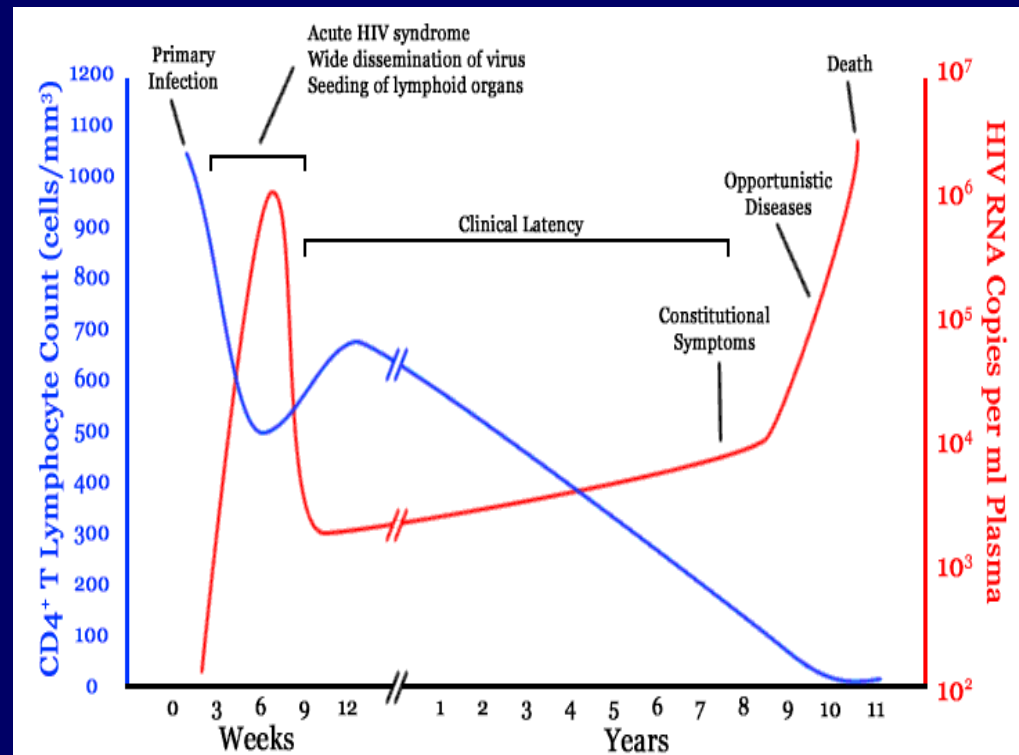
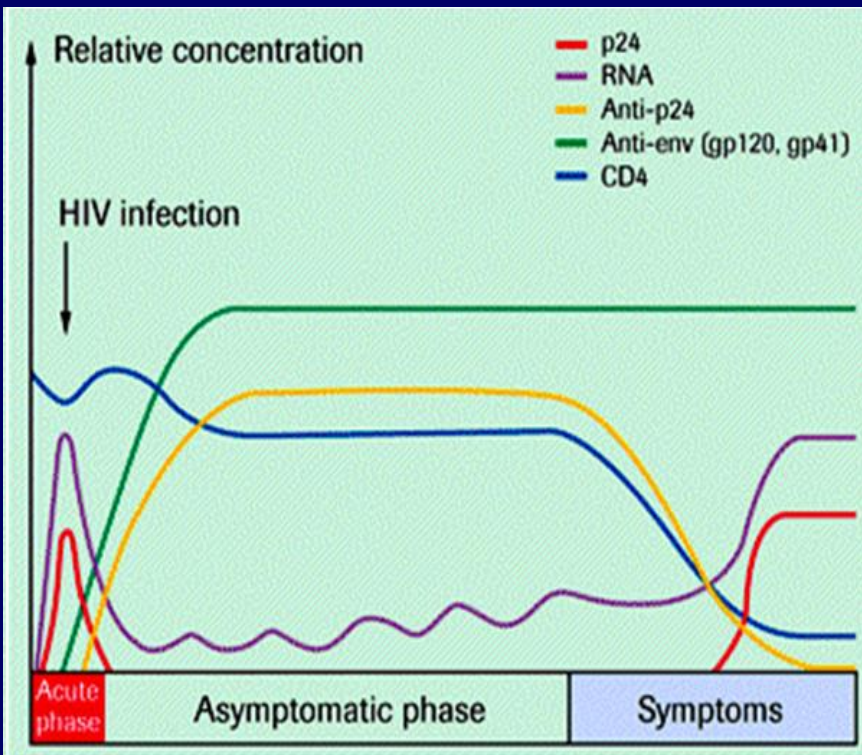
Acute phase:

- Usually begins 2-4 weeks after infection.
Rapid viral replication (**high viral load RNA in the serum**).
- Gradual decrease in **CD4** cell count but still within normal limit.
- Mostly asymptomatic, in 25-65% of patients develop symptoms resemble **infectious mononucleosis** or **Flu like syndrome** (fever, headache, anorexia, fatigue, lymphadenopathy, & skin rash).
- Some of patients may develop aseptic meningitis, maculopapular rash on the trunk, arms and legs.
- This acute stage typically resolves spontaneously in about 2 weeks.



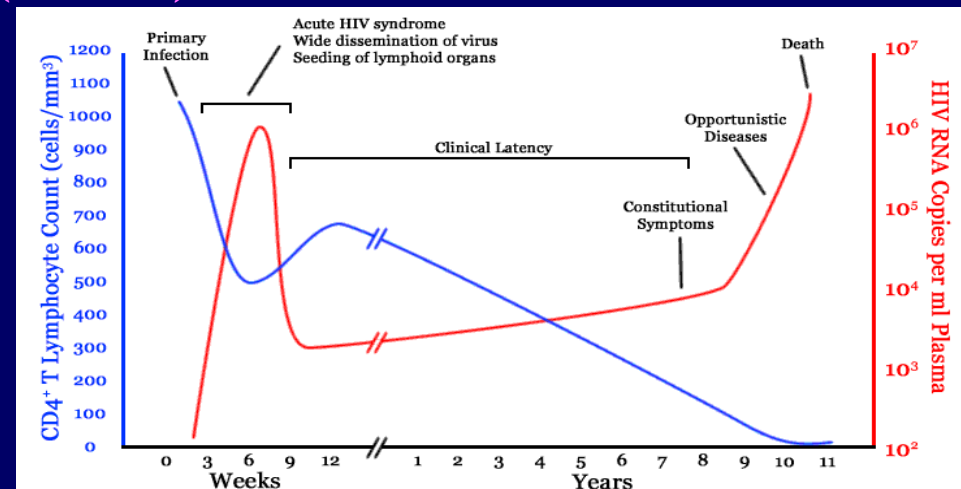
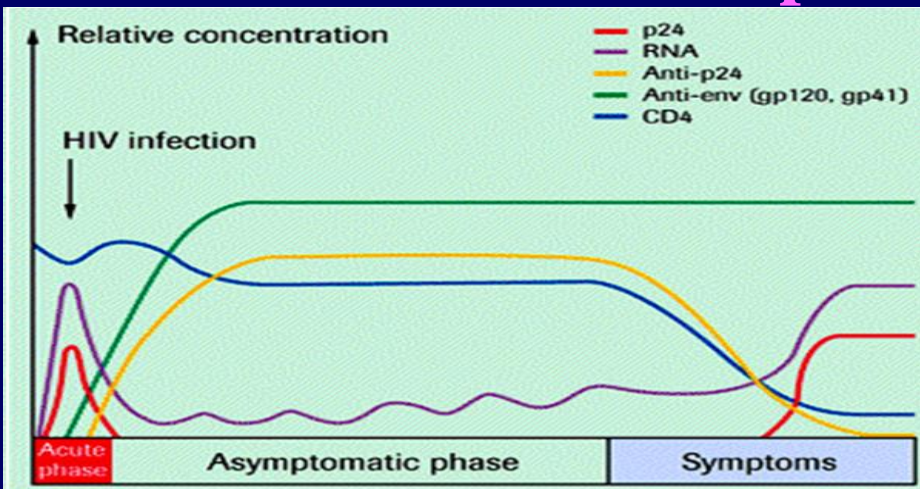
Serological profile of HIV infection

- **Characterized by appearance of viral RNA the first marker appear in the serum.**
- **Normal to slightly decrease in no of CD4 .**
- **Detection of core antigen (p24 antigen) followed by appearance of Anti-envelop (Anti-gp120, gp41) &**
- **Anti- core (Anti-P24)**



Chronic phase:

- Long latent period, measured in years ,about 10 years in adults ,5 years in children , The patient is totally asymptomatic during this period. But the patients still **contagious** .
- Low viral load ,**CD4 count** ↓ **but still > 500/ml.**
 - at the end of this stage patients start to develop **1-Persistent generalized lymphadenopathy (PGL)**
 - **2-AIDS-related complex (ARC)**



1-Persistent generalized lymphadenopathy (PGL)

Is defined as enlargement of lymph nodes for at least **1 cm** in diameter, and must meet the following conditions:

- In two or more **extra inguinal area.**
- Persists for at **least 3 months.**
- In the absence of any illness or medication known to cause PGL.



Vietnamese man with tuberculous lymphadenitis

2-AIDS-related complex (ARC)

Is a group of clinical symptoms that come before **AIDS** and may include the following:

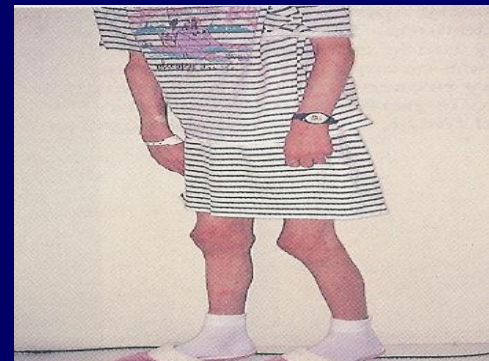
Fever of unknown origin that persists > 1 month. •

Chronic diarrhea, persisting > 1 month. •

Weight loss (Slim disease) $> 10\%$ of the original weight. •

Fatigue.

Neurological disease as myelopathies and peripheral neuropathy.

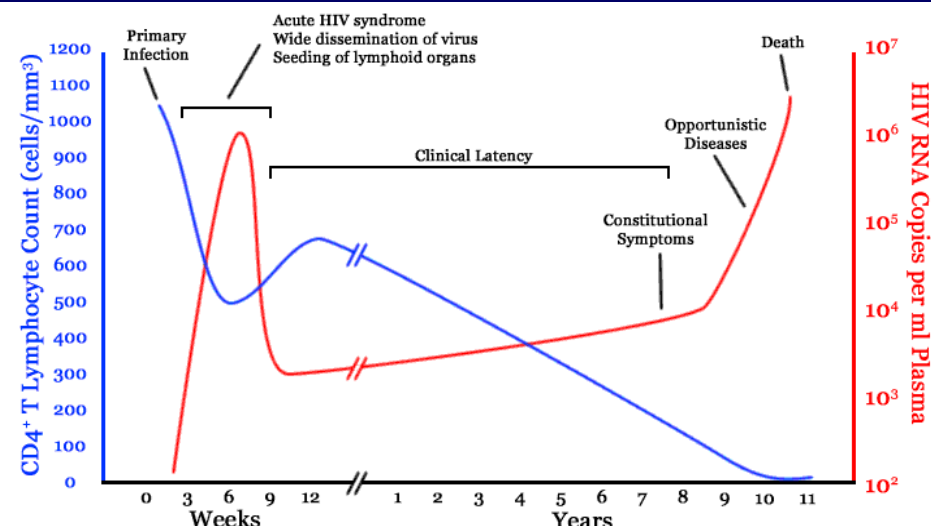
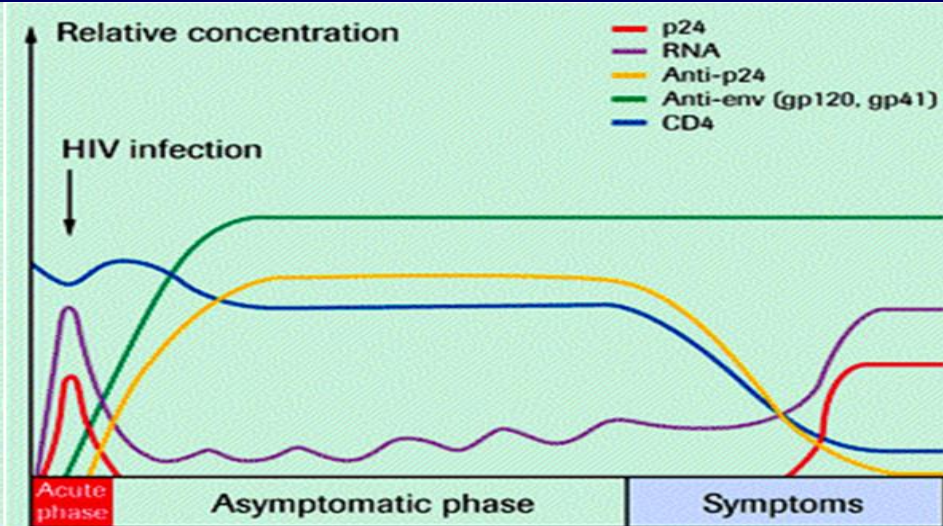


Serological markers of ARC

High load of Viral RNA indicate active viral replication.

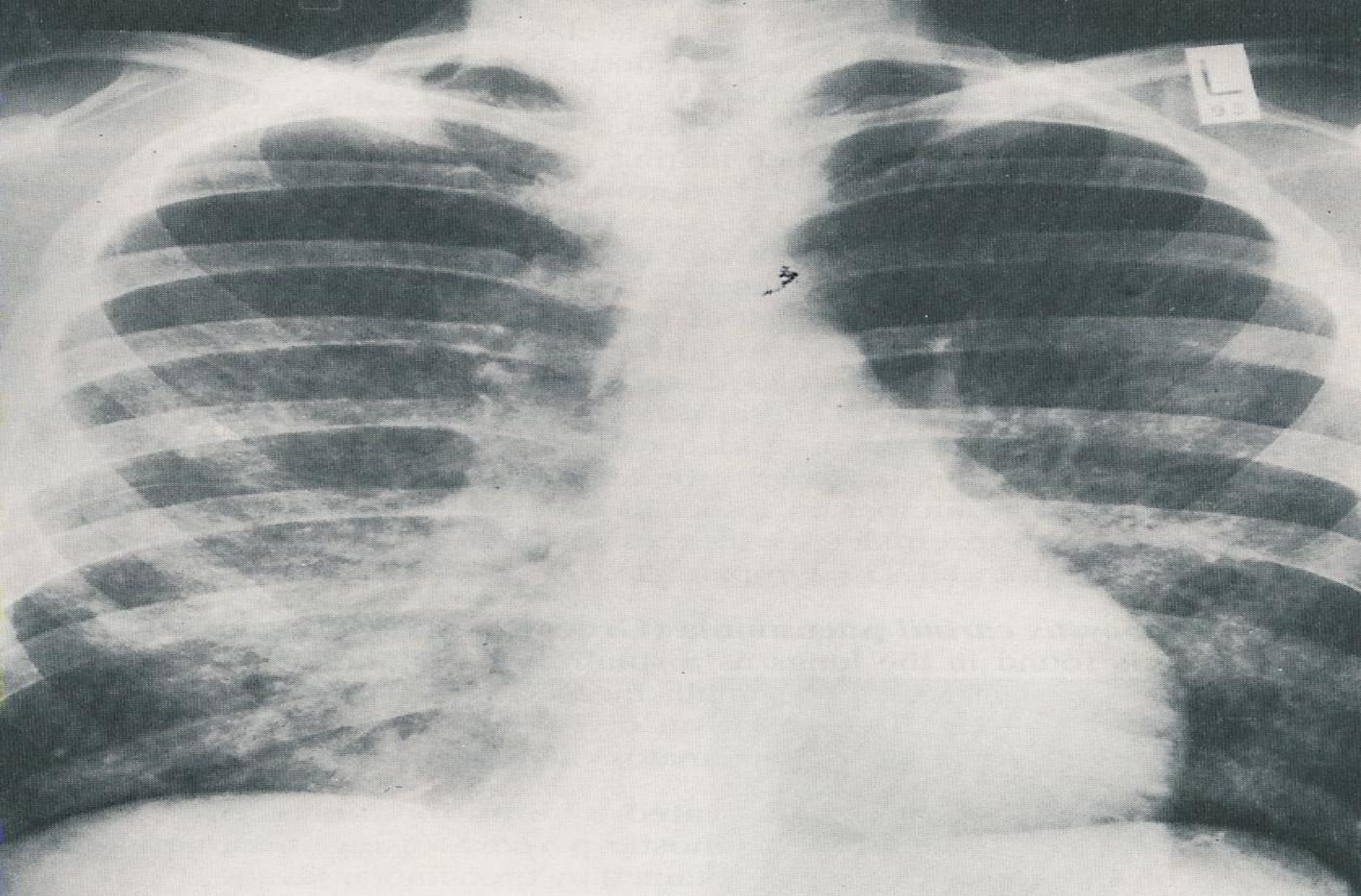
CD4 count decrease but still $>$ than 200 cells/mm^3

Detection of both **Anti-envelop (Anti-gp120)** & **core antigen p24**



AIDS (end stage):

- The end stage of the disease.
- Continuous viral replication (high viral load viral RNA in the serum).
- Marked decrease in **CD4 cell count < 200**
- Persistent or frequent **multiple opportunistic infections** e.g **Pneumocystis pneumonia**, toxoplasmosis, extra pulmonary myco-bacterial disease.
- Development of unusual cancer (**Kaposi sarcoma**)



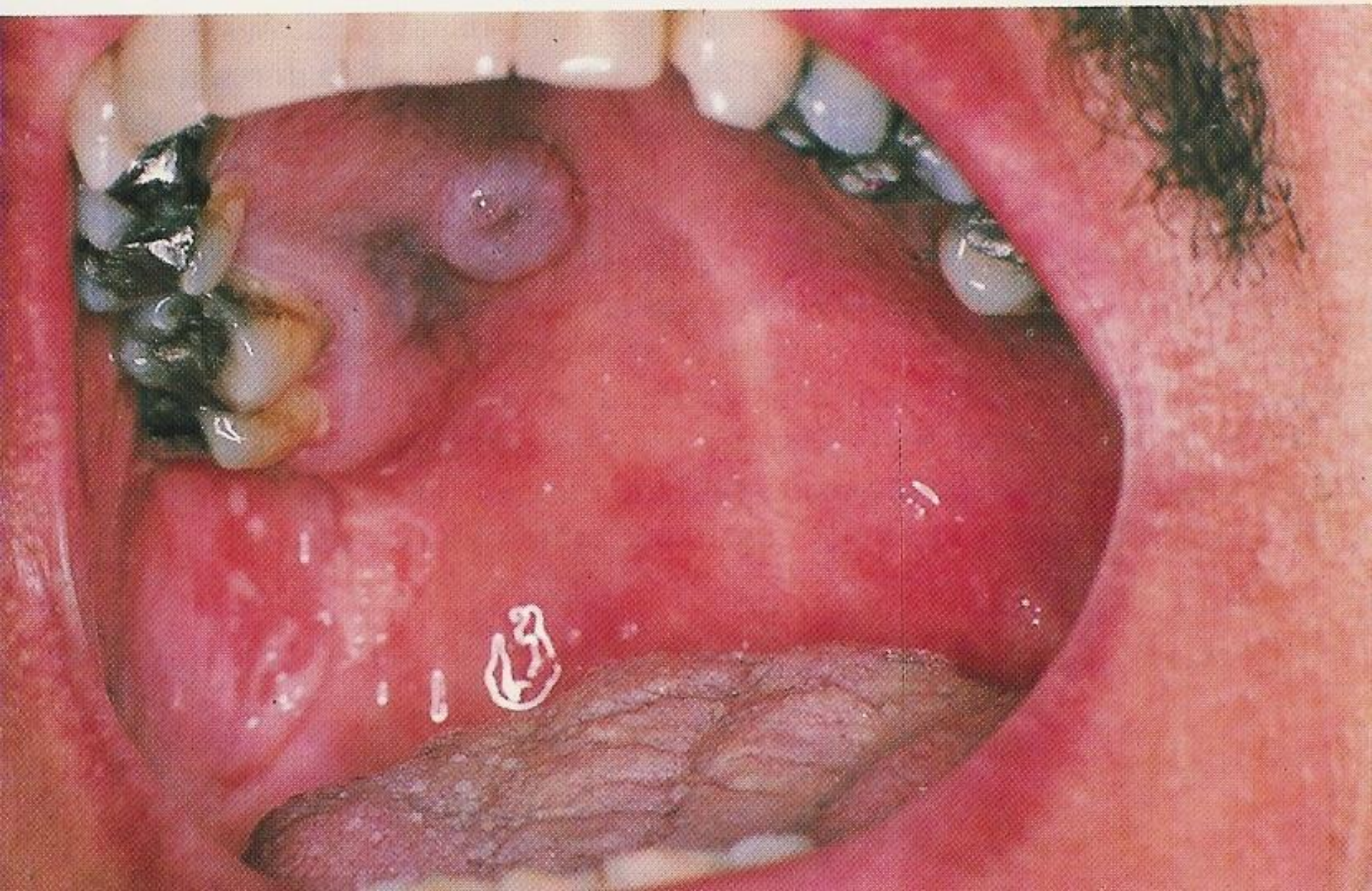
Pneumocystis pneumonia



Kaposi's sarcoma



Kaposi's sarcoma



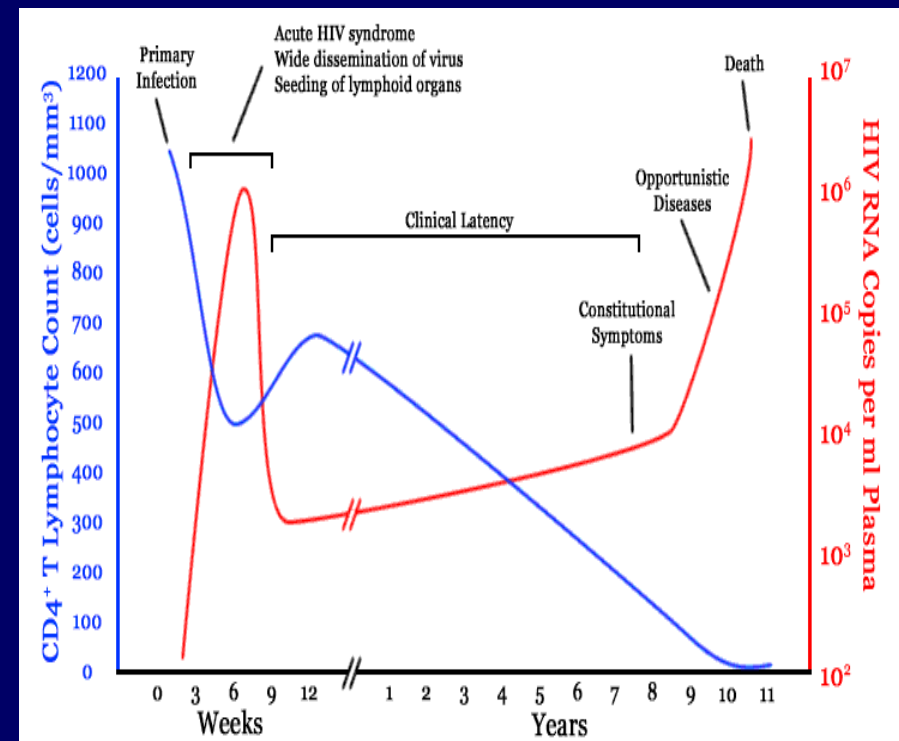
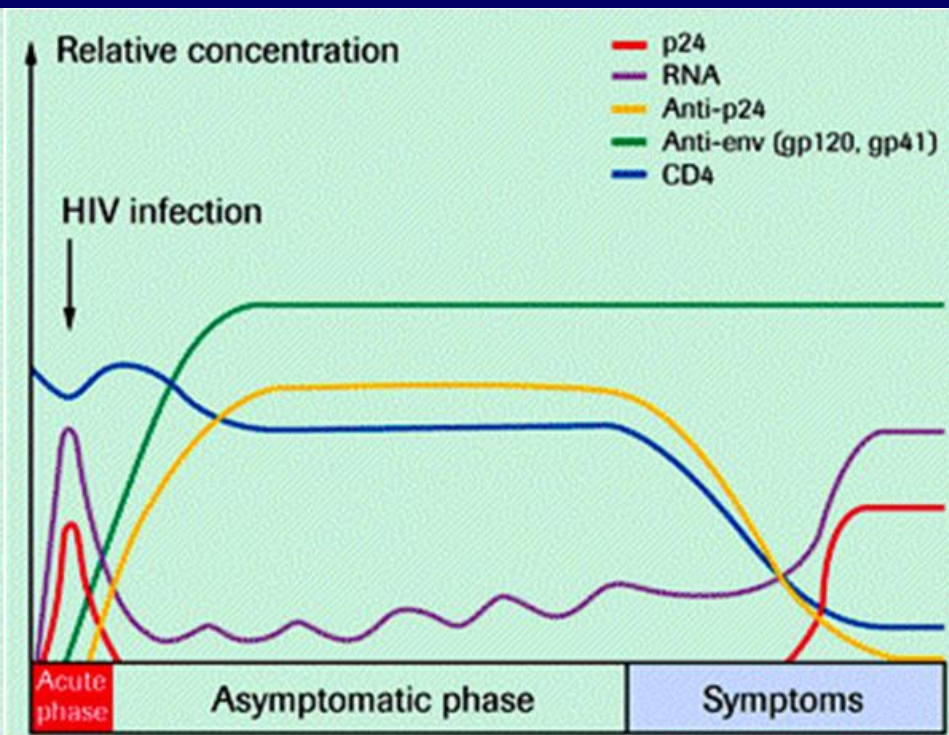
Kaposi's sarcoma

Blood markers of AIDS stage

- Marked  Viral RNA .

Marked  CD4 count less than 200 cells/mm³

- Detection of both core antigen Ag p24 &
- Anti envelop +ve(Anti-gp120) ,

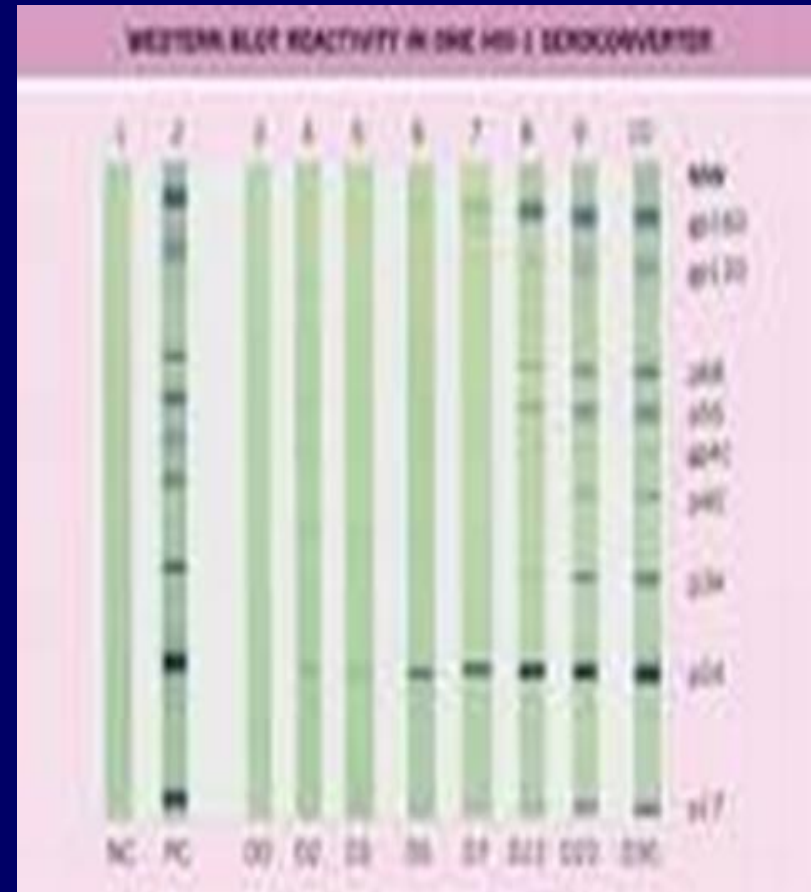
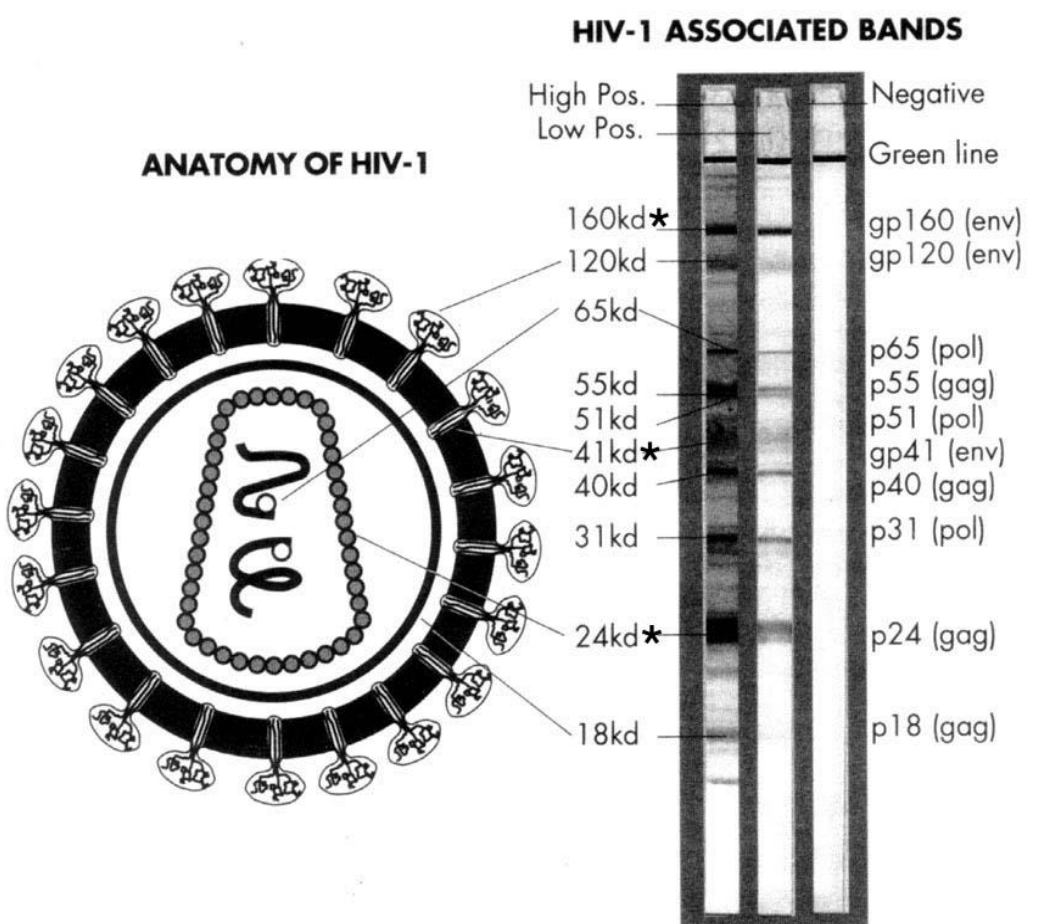


How to diagnose an HIV patient?

- Patient's history with or without clinical symptoms may give hints for a physician whether the patient has ever exposed to HIV or not.
- Screening patient's serum by **ELISA** for both (HIV Ag & HIV Ab) if the result is **+ve we** repeated the specimen twice in duplicate if still giving **+ve result will do confirmatory tests (Western Blot)**.
- Blood viral load by PCR is also used as confirmatory test and to follow up patients response to treatment.

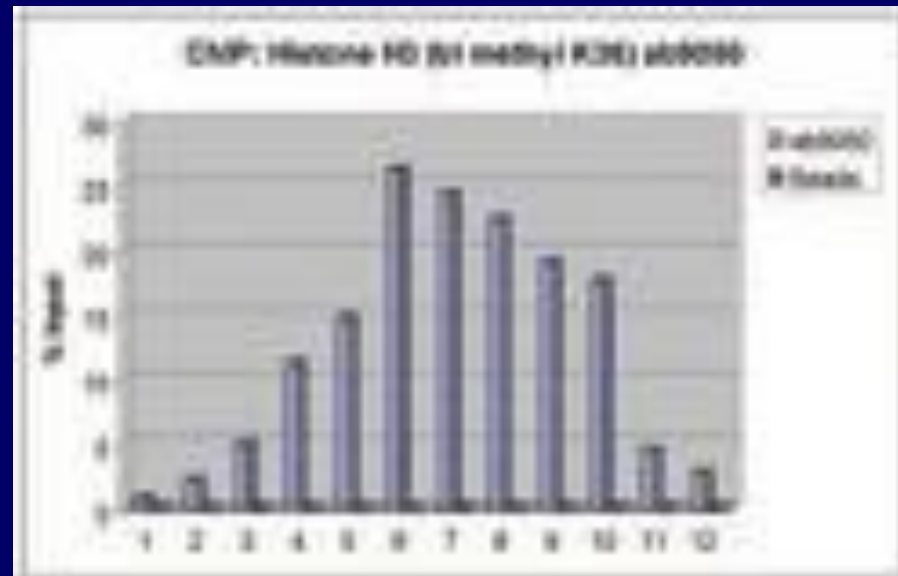
Western Blot

To confirm the presence of Anti-HIV to the structural proteins of the virus by **ELECTROPHORESIS**



PCR

For detection of **HIV RNA** in the serum (viral load) this test is the most important test for HIV diagnosis now can diagnose the disease before antibodies appear in the serum and especially in infant of infected mother and also to monitor the antiviral treatment



Treatment

- Is a combined therapy known as **High Active Antiretroviral Therapy (HAART)**.
- **NOTE:** HAART does not clear the virus, and should be taken all life.
- **NOTE:** HAART treated patients are still contagious even if their blood viral load below detection (< 50 copies/ μ L).
- HAART is usually composed of :
two reverse transcriptase inhibitors & one protease inhibitor.

Treatment (Continued)

A. Reverse Transcriptase Inhibitors:

- AZT **Zidovudine**
- ddC Zalcitabine
- ddI Didanosine
- d4T Stavudine
- 3TC **Lamivudine**

B. Protease inhibitors

- Saquinavir
- Indinavir
- Ritonavir
- Nelfinavir

Goals of HIV treatment

- **To inhibit viral replication.**
- **To control chronic immune activation and keep the immune system close to the normal state.**
- **To prevent the development of opportunistic infection.**
- **To minimize the chance of viral transmission especially from mother to neonate.**
- **Treatment will never eradicate the HIV virus.**

Prevention & Control:

- **There is no vaccine available yet for HIV**
- Practice safer sex .
- Do not share razors, tooth brushes, etc
- Do not share needles and syringes
- Avoid direct exposure to body fluids
- Educate the public about HIV-infection.

Thank you for your
attention !

