

HIV & AIDS



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Human Immunodeficiency Virus

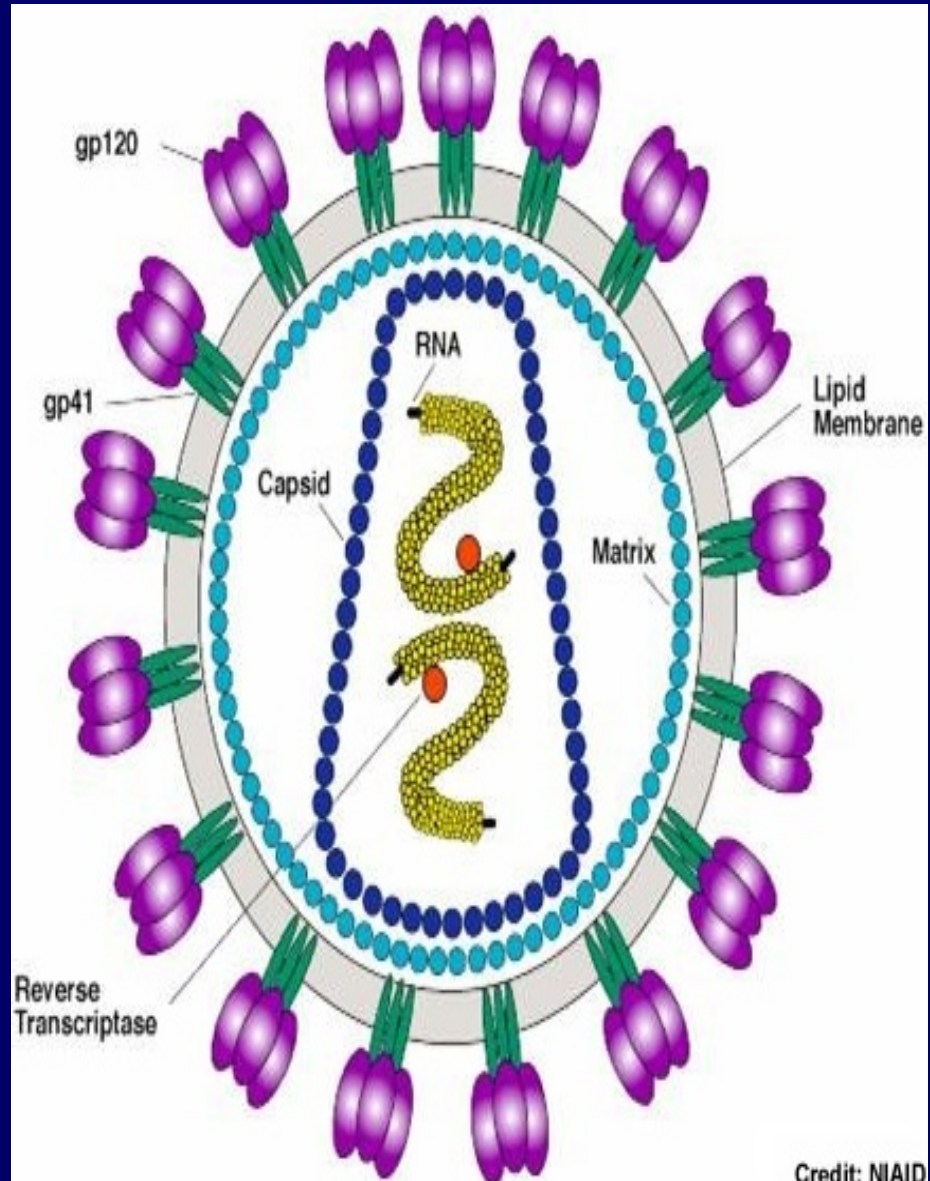
- HIV is known to infect mainly **T-helper cells (CD4)**, macrophages, monocytes and dendritic cells (Target cells).
- Destroying **T-helper cells(CD4)** resulting in the loss of cell mediated immunity which leads to severe immunologic impairment, leading to multiple opportunistic infections, unusual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

Characteristics of HIV

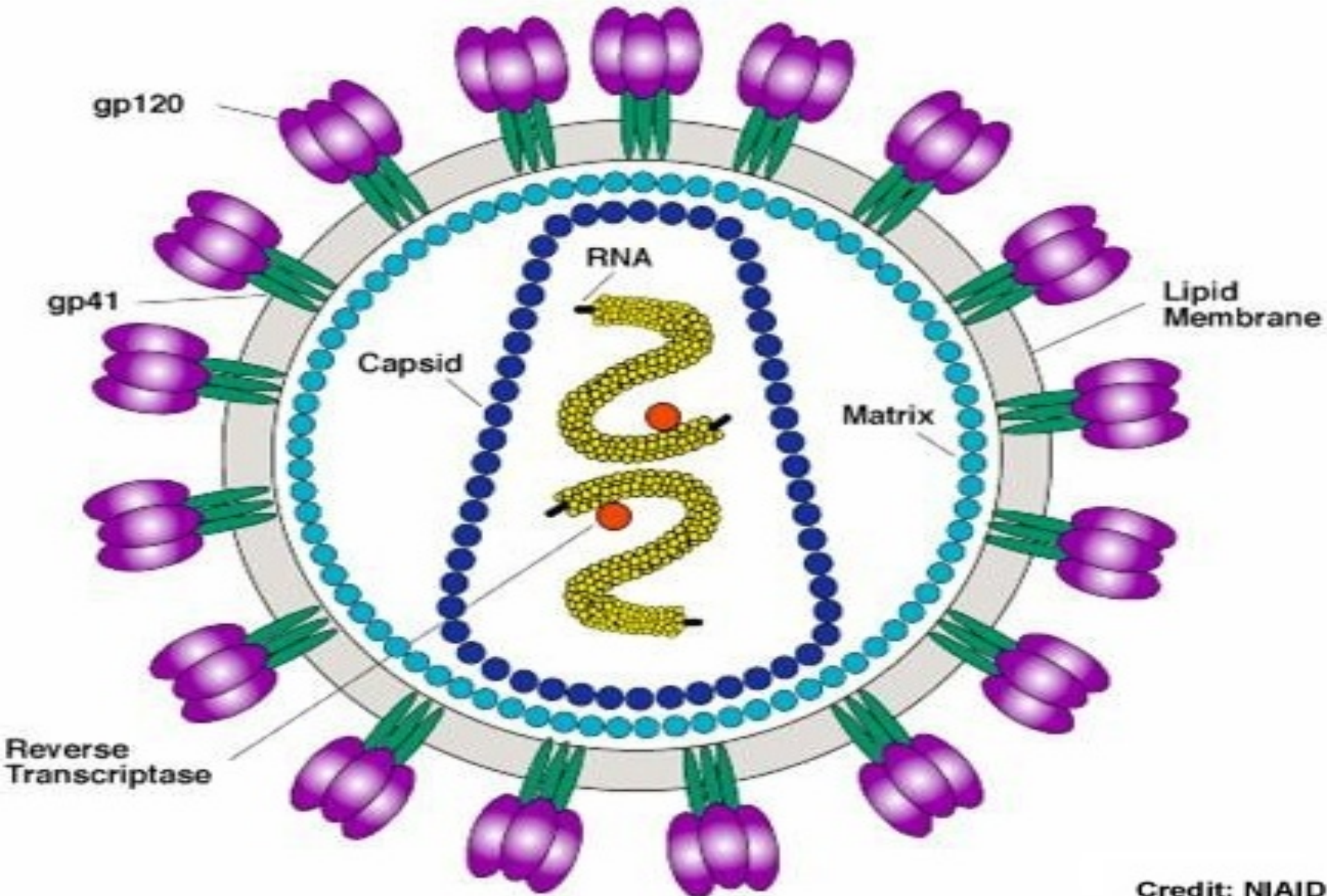
- Family of *Retroviridae*.

Virion consist of:

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



Structure of HIV



HIV virus

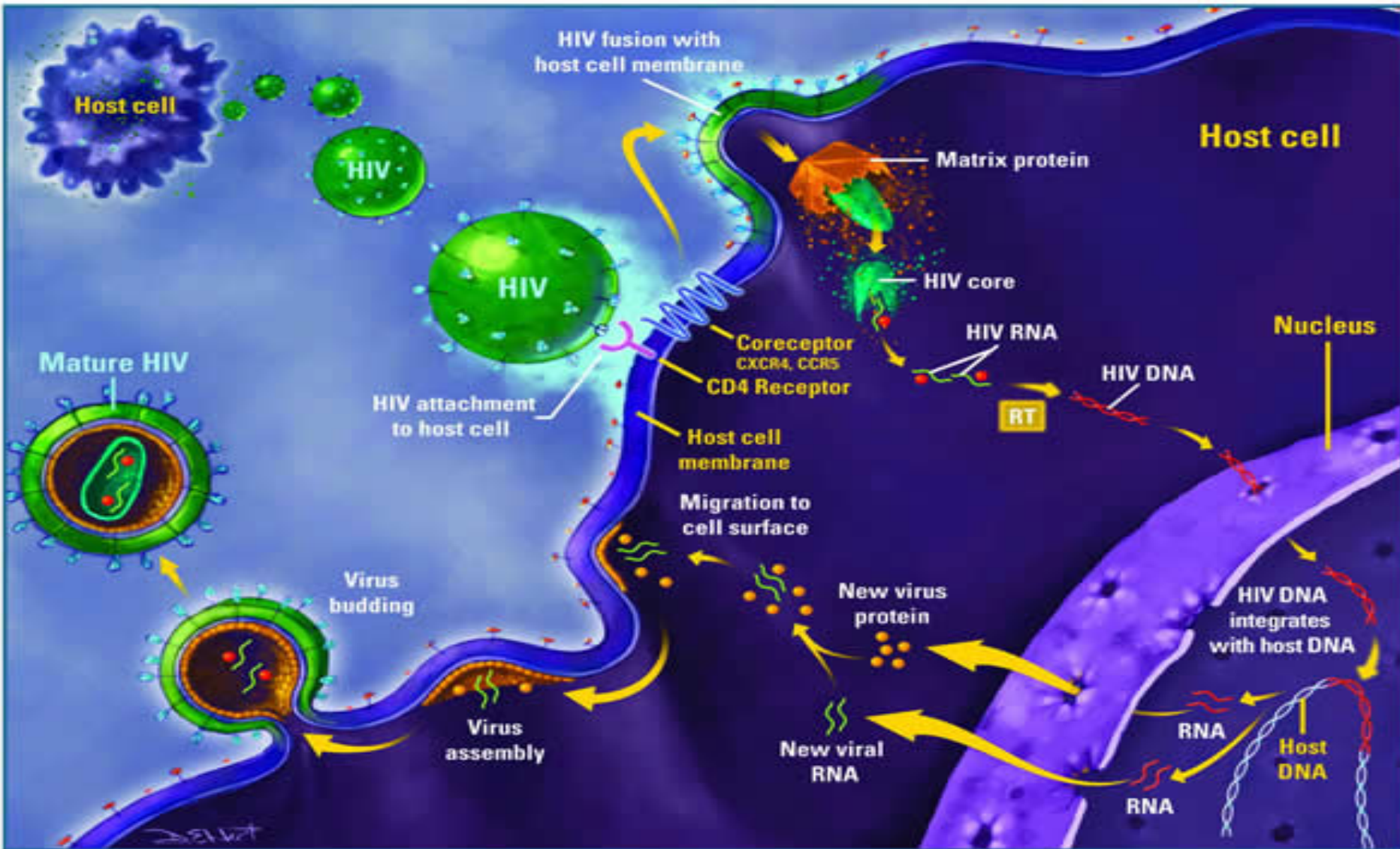
- HIV-1:

- 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.

HIV life cycle



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.

Parenterally:

Direct exposure to infected blood and blood products.

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 perinatally 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:

- Incubation period (2-4 weeks) ,this phase Lasts for about 12 weeks.
- Rapid viral replication (**high viral load RNA in the serum**).
- Gradual decrease in CD4 cell count.
- Mostly asymptomatic, if there is symptoms will be mild ,
- 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.

Serological picture of acute stage

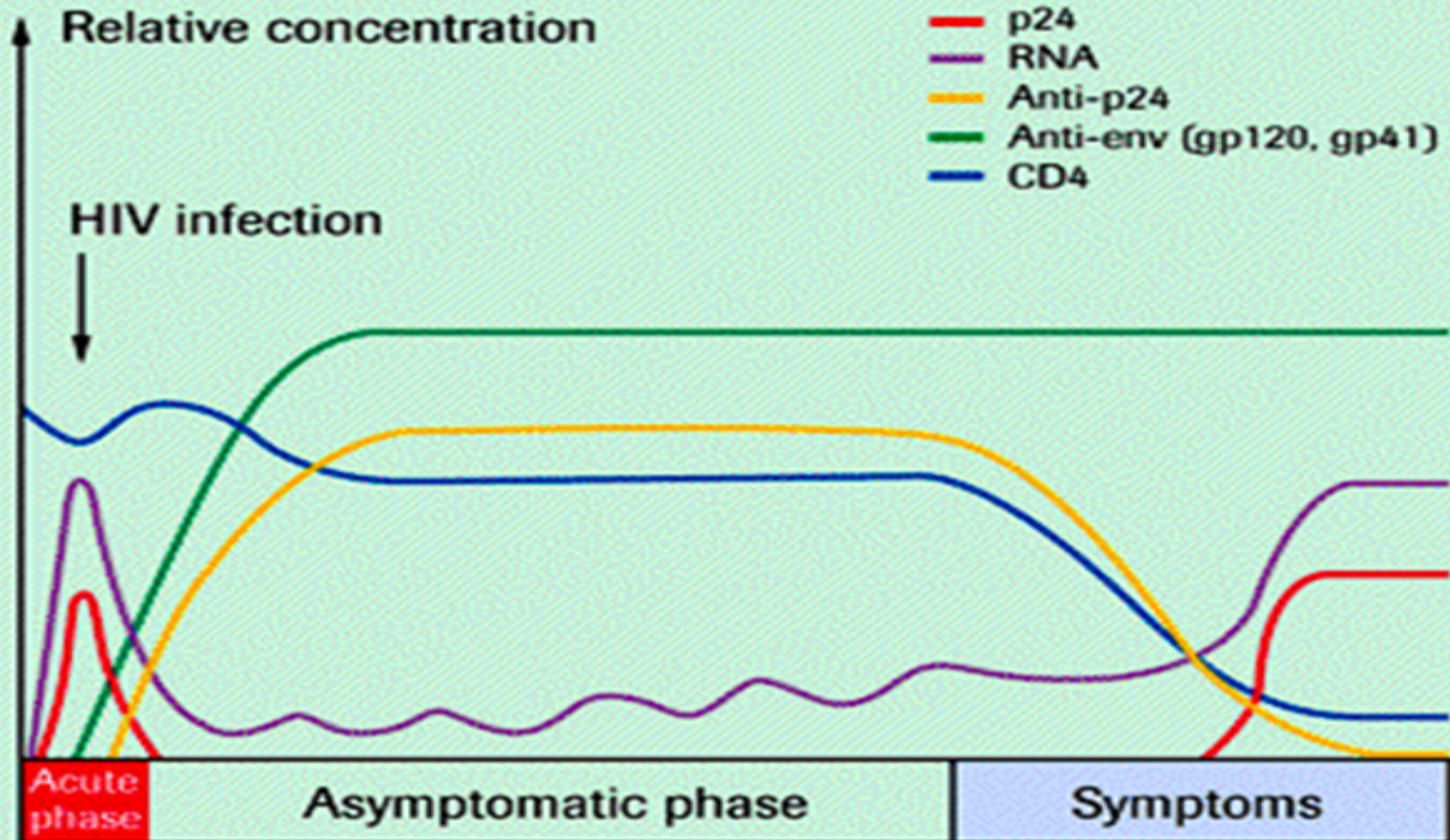
Characterized by appearance of **viral RNA** the first marker appear in the serum. ➤

Normal to slightly decrease in no of **CD4** . ➤

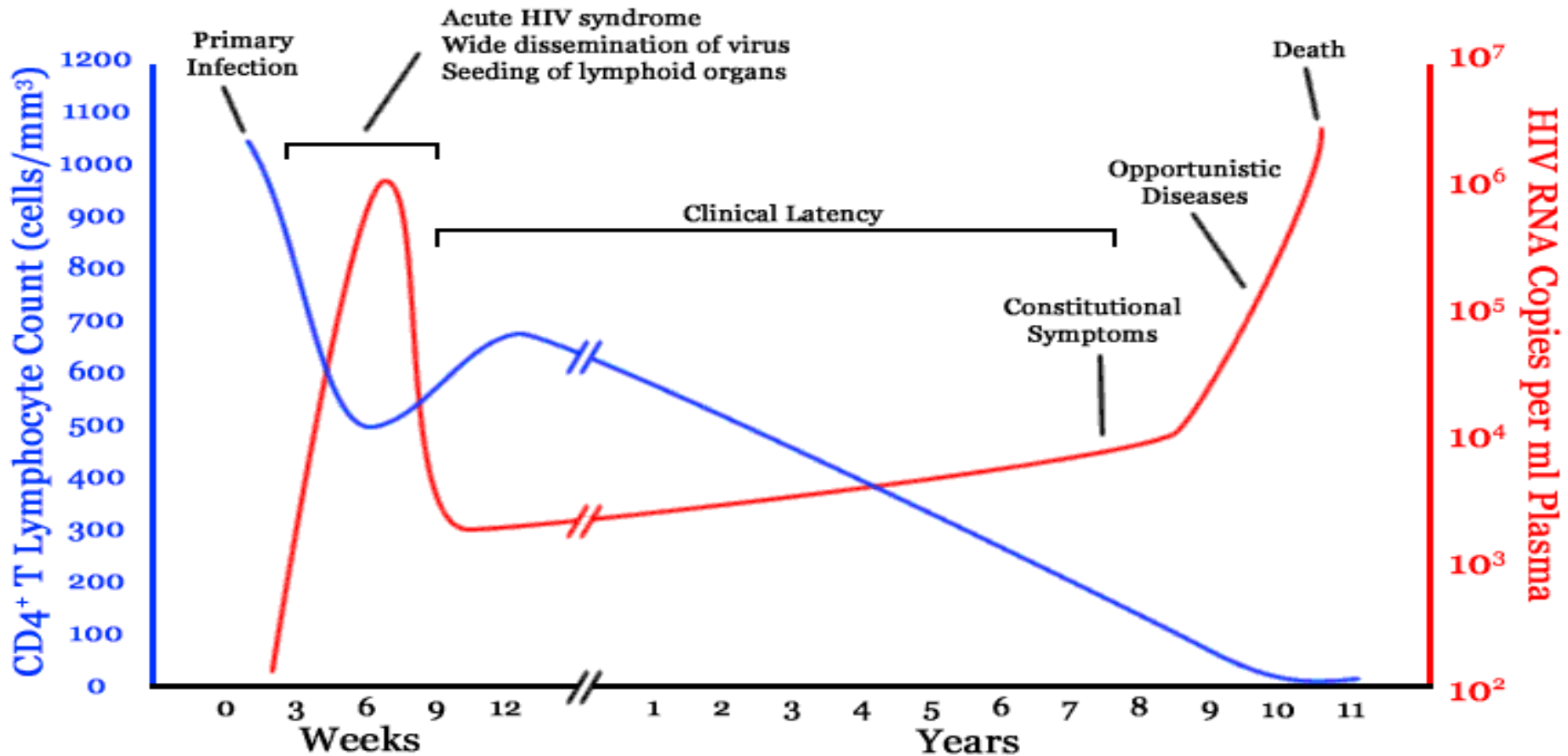
Detection of **core antigen** (**p24 antigen**)
followed by appearance of
Anti-envelop (Anti-gp120, gp41) & ➤

Anti- core (Anti-P24) ➤

Serological profile of HIV infection



Stages of HIV infection



The course of HIV infection goes through 3 stages: Acute phase, Chronic phase, and AIDS.

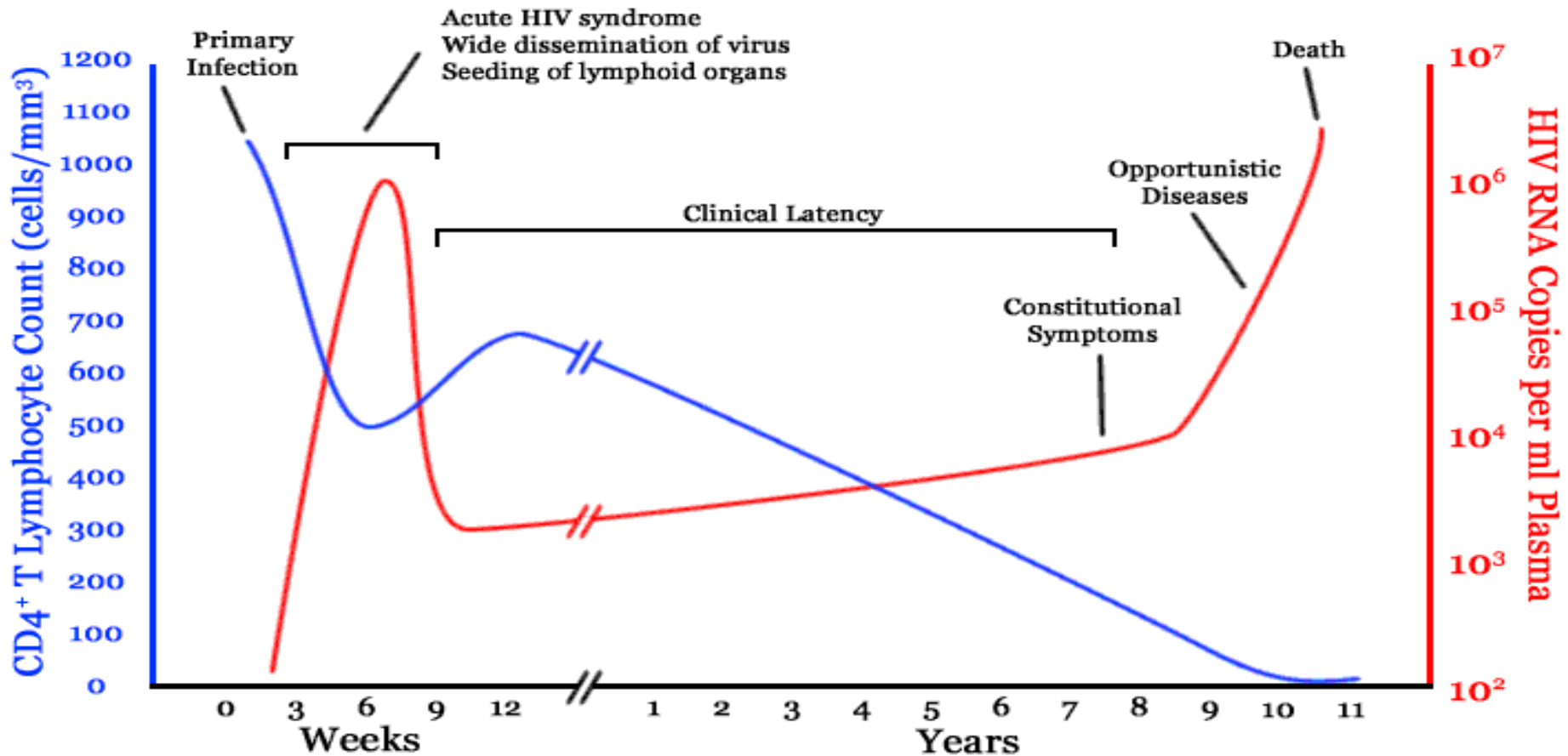
Chronic phase:

- Lasts for about 10 years in adults ,5 years in children ,totally **asymptomatic** but the patients still **contagious** .
- Low viral load , continuous detection of both (Anti-gp120,gp41) and (Anti-p24).

CD4 count > 500/ml.

- at the end of this stage patients start to develop Persistent generalized lymphadenopathy (PGL)
- AIDS-related complex (ARC)

Stages of HIV infection



The course of HIV infection goes through 3 stages: Acute phase, Chronic phase, and AIDS.

A-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.

B-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.

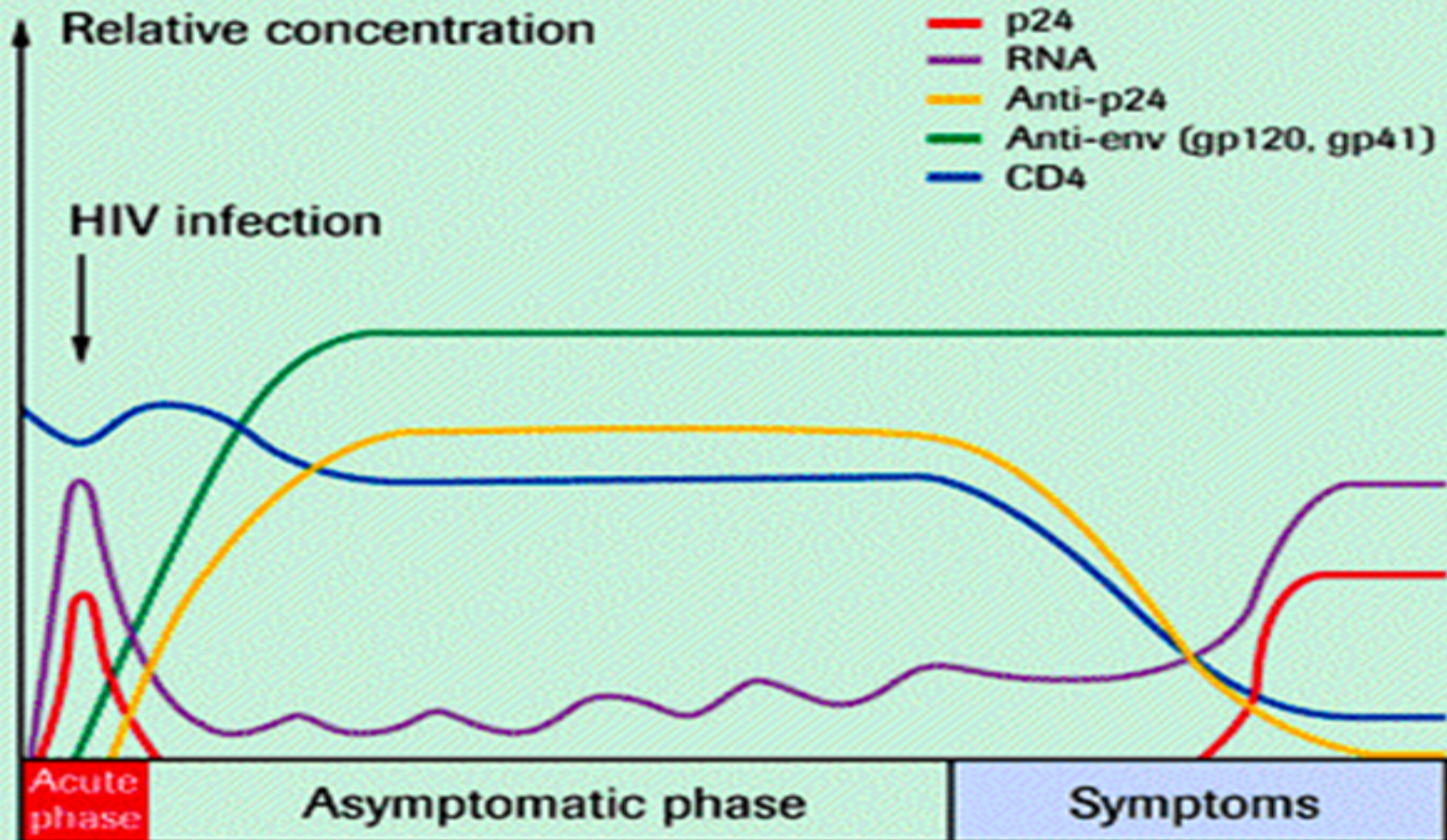
Neurological disease as myelopathies and peripheral neuropathy.



Slim disease

- Blood markers of chronic stage (PGL) &(ARC)
 - High load of Viral RNA and core antigen p24 (indicate active viral replication)
 - Anti-envelop +ve(Anti-gp120)
 - *CD4* count decreased but still more tha (200 cells /mm³)



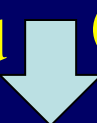
Serological profile of HIV infection



AIDS:

- 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**)

Blood markers of AIDS stage

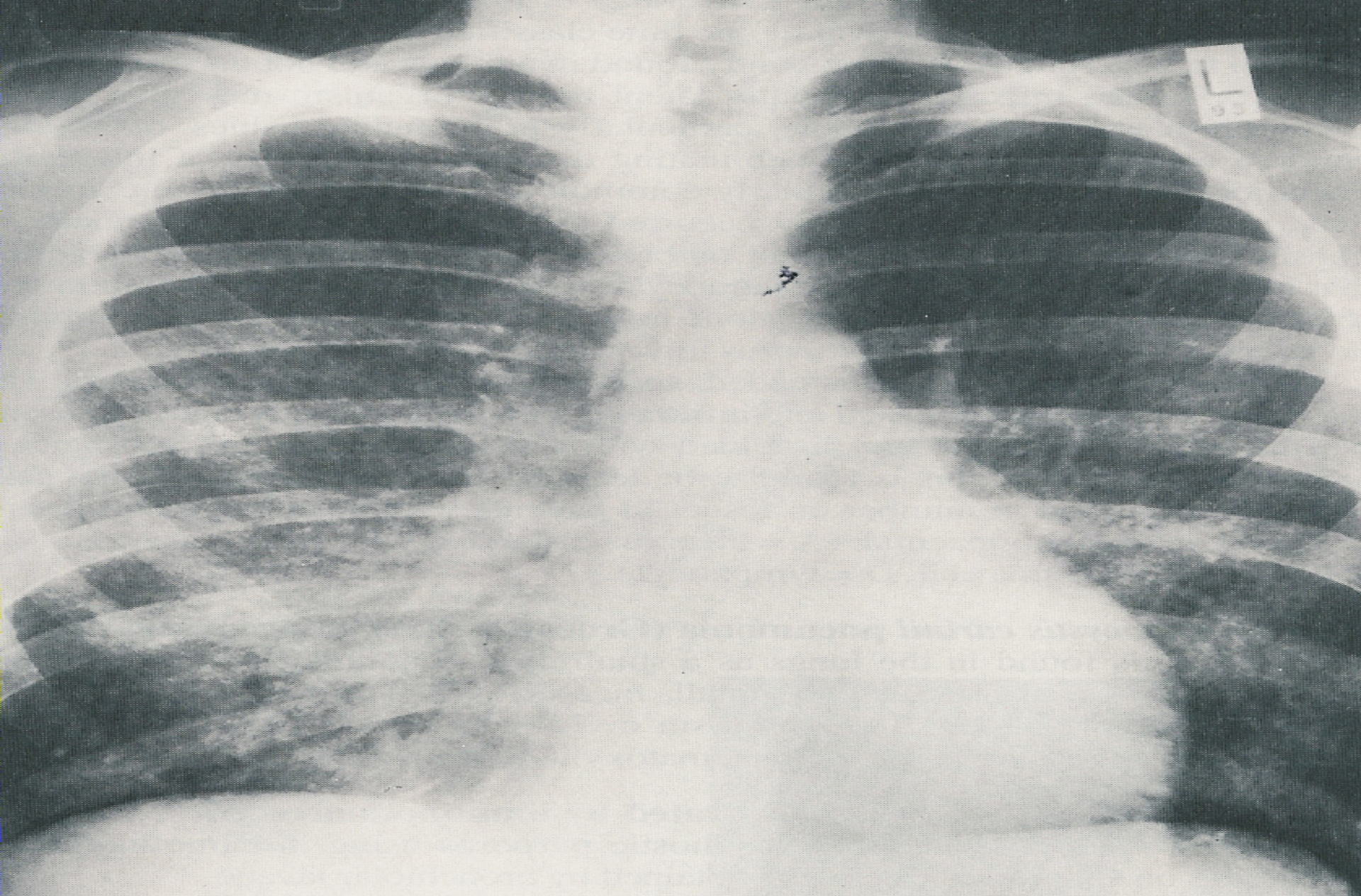
- Marked  **Viral RNA** and  **core antigen Ag p24**
- **Anti envelop +ve(Anti-gp120) ,**
Marked  **CD4** count less than 200 cells/mm³

OPPORTUNIST INFECTIONS AND TUMORS IN AIDS

viruses	<p>disseminated CMV (including retina, brain, peripheral nervous system, gastrointestinal tract)</p> <p>HSV (lungs, gastrointestinal tract, CNS, skin)</p> <p>JC virus (brain – PML)</p> <p>EBV (hairy leukoplakia, primary cerebral lymphoma)</p>
bacteria*	<p>mycobacteria (e.g. <i>Mycobacteria avium</i>, <i>M. tuberculosis</i> – disseminated, extrapulmonary)</p> <p><i>Salmonella</i> (recurrent, disseminated) septicemia</p>
protozoa	<p><i>Toxoplasma gondii</i> (disseminated, including CNS)</p> <p><i>Cryptosporidium</i> (chronic diarrhea)</p> <p><i>Isospora</i> (with diarrhea, persisting more than one month)</p>
fungi	<p><i>Pneumocystis jiroveci</i> (pneumonia)</p> <p><i>Candida albicans</i> (esophagitis, lung infection)</p> <p><i>Cryptococcus neoformans</i> (CNS)</p> <p>histoplasmosis (disseminated, extrapulmonary)</p> <p><i>Coccidioides</i> (disseminated, extrapulmonary)</p>
tumors	<p>Kaposi's sarcoma**</p> <p>B cell lymphoma (e.g. in brain, some are EBV induced)</p>
other	<p>wasting disease (cause unknown)</p> <p>HIV encephalopathy</p>

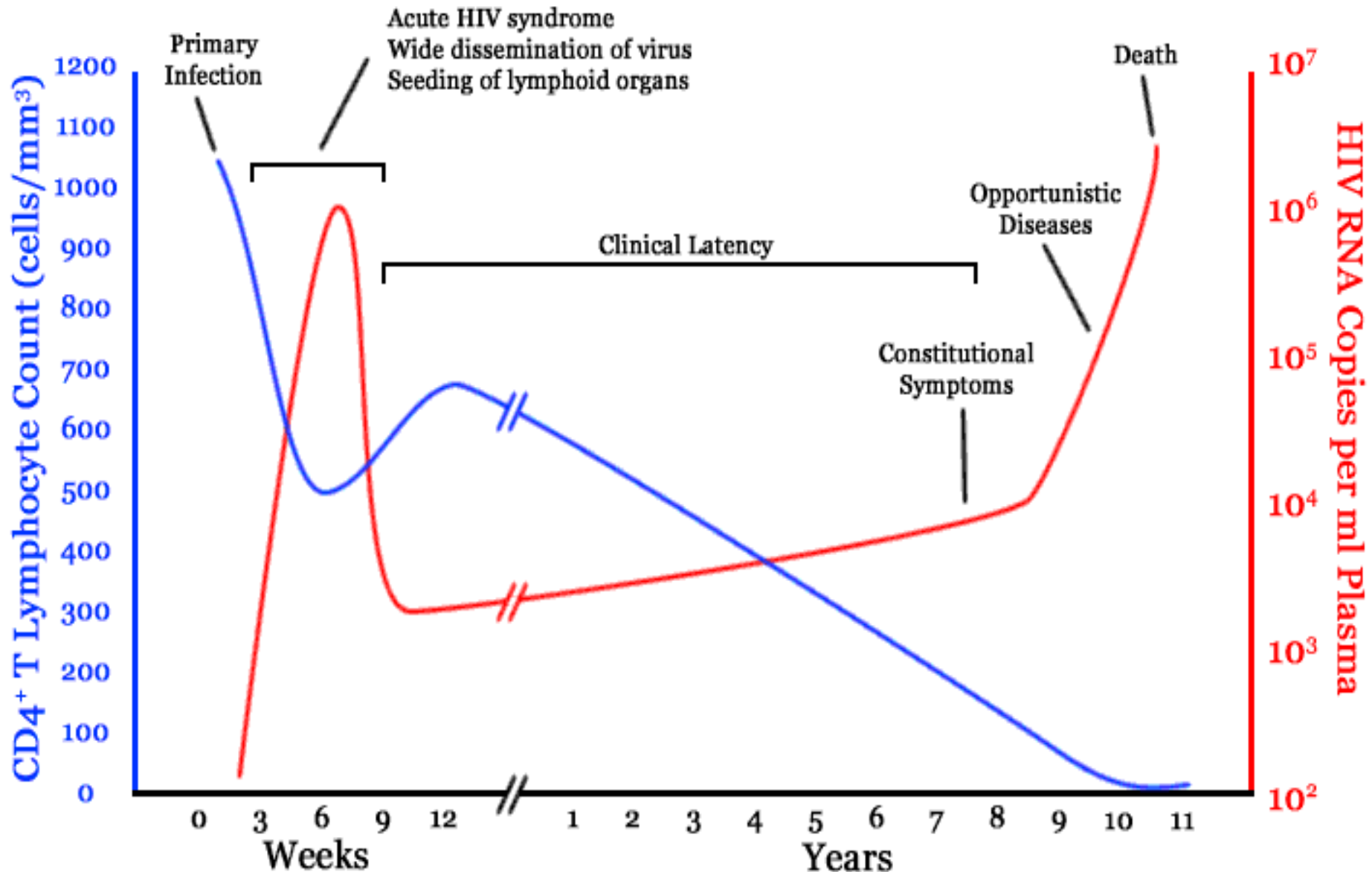
*also pyogenic bacteria (e.g. *Haemophilus*, *Streptococcus*, *Pneumococcus*) causing septicemia, pneumonia, meningitis, osteomyelitis, arthritis, abscesses etc.; multiple or recurrent infections, especially in children

**associated with HHV8, an independently-transmitted agent; 300-times as frequent in AIDS as in other immunodeficiencies



Pneumocystis pneumonia

Stages of HIV infection

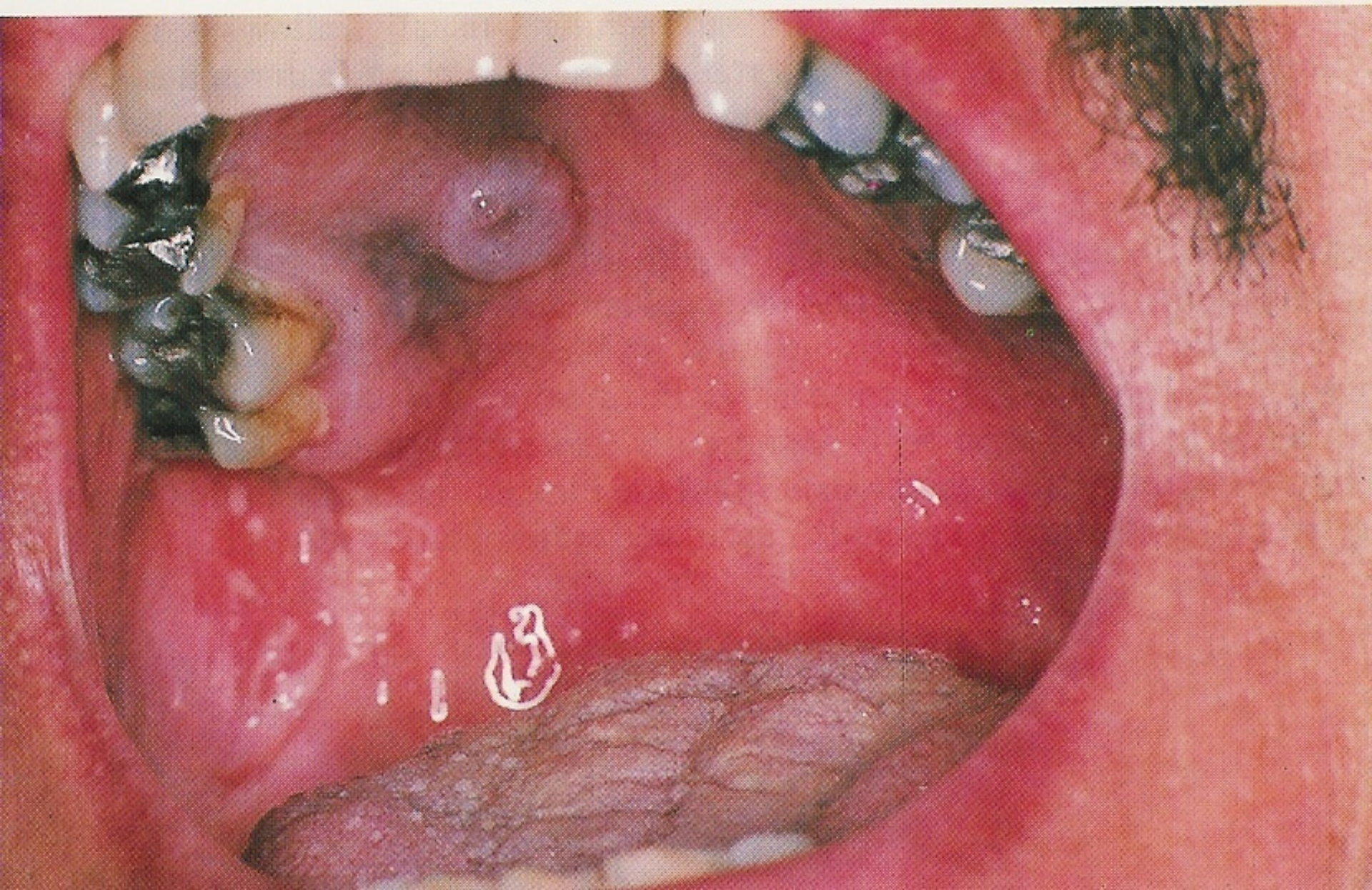




Kaposi's sarcoma

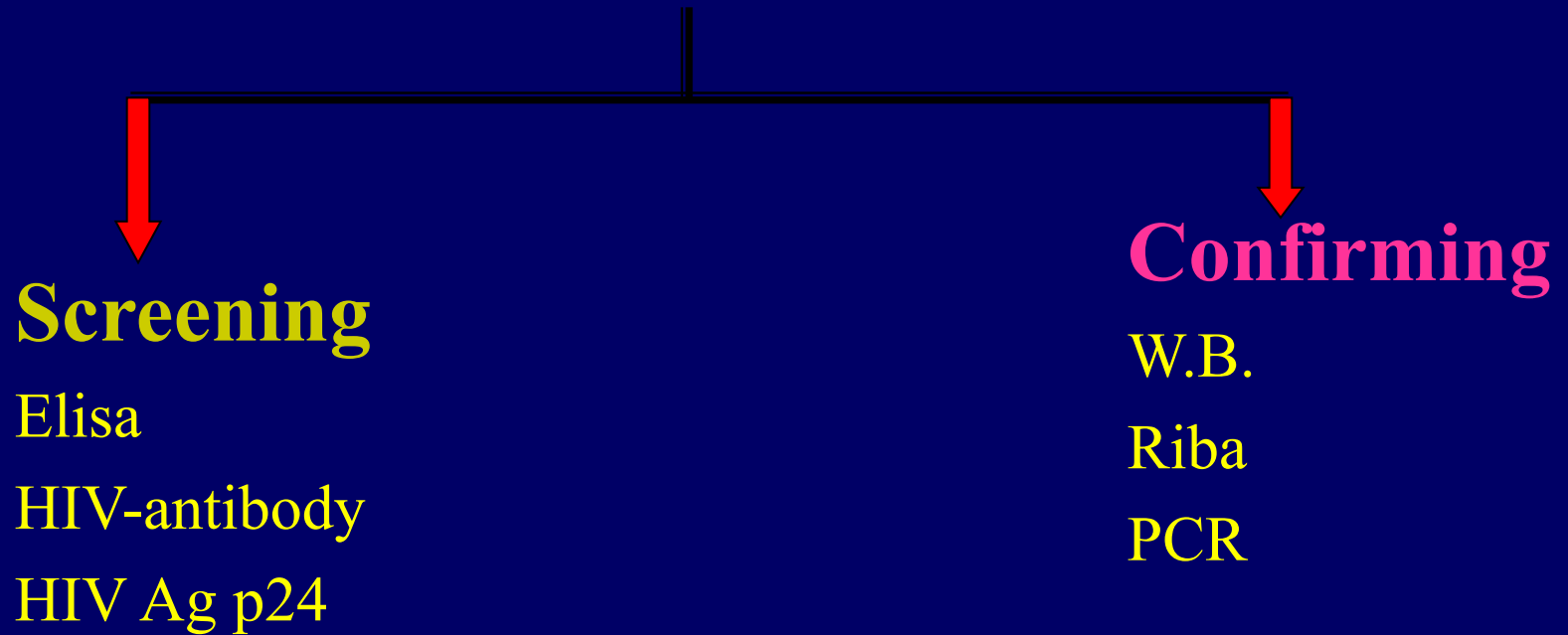


Kaposi's sarcoma



Kaposi's sarcoma

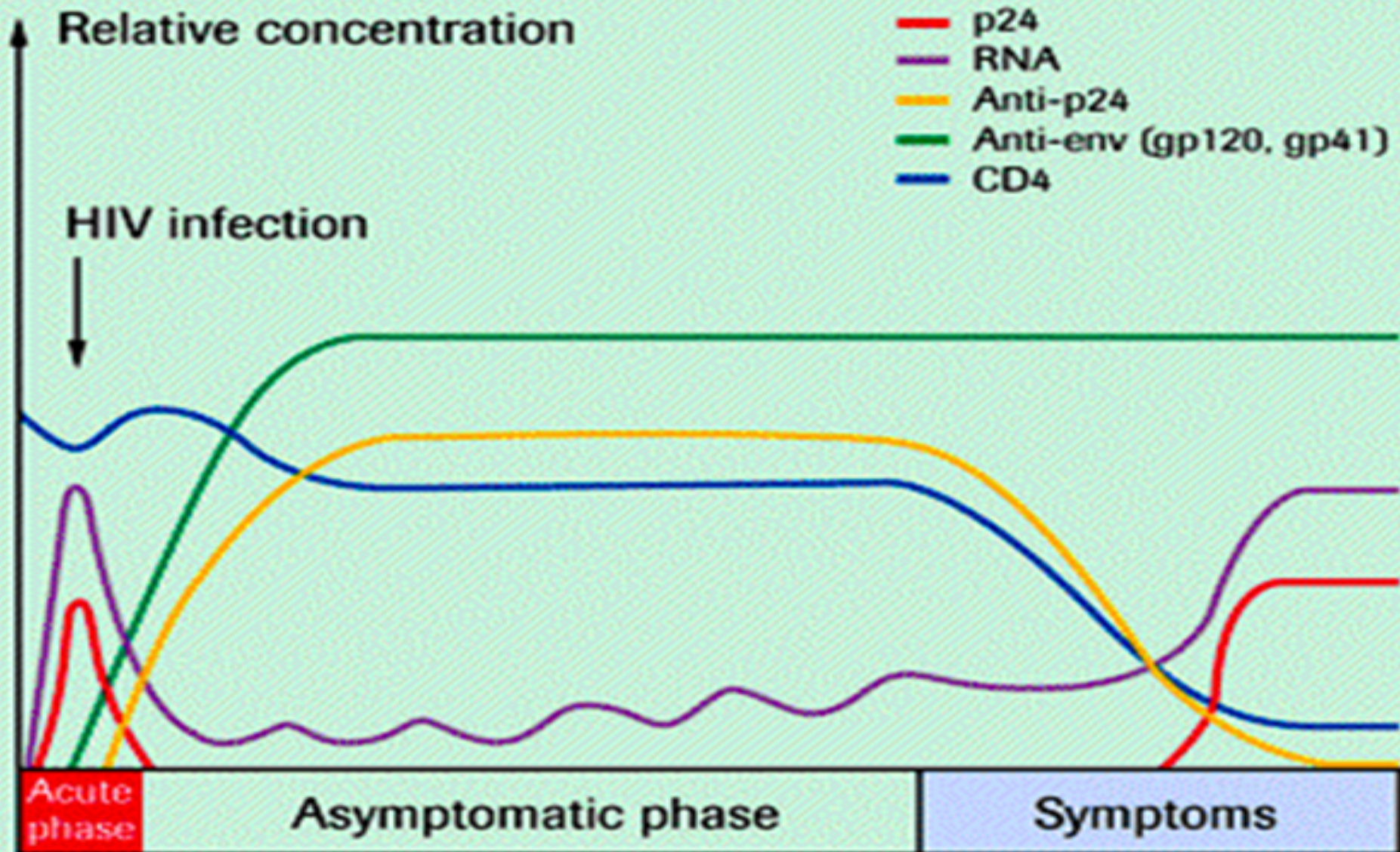
How to diagnose an HIV PATIENTS?



How to diagnose an HIV patient?

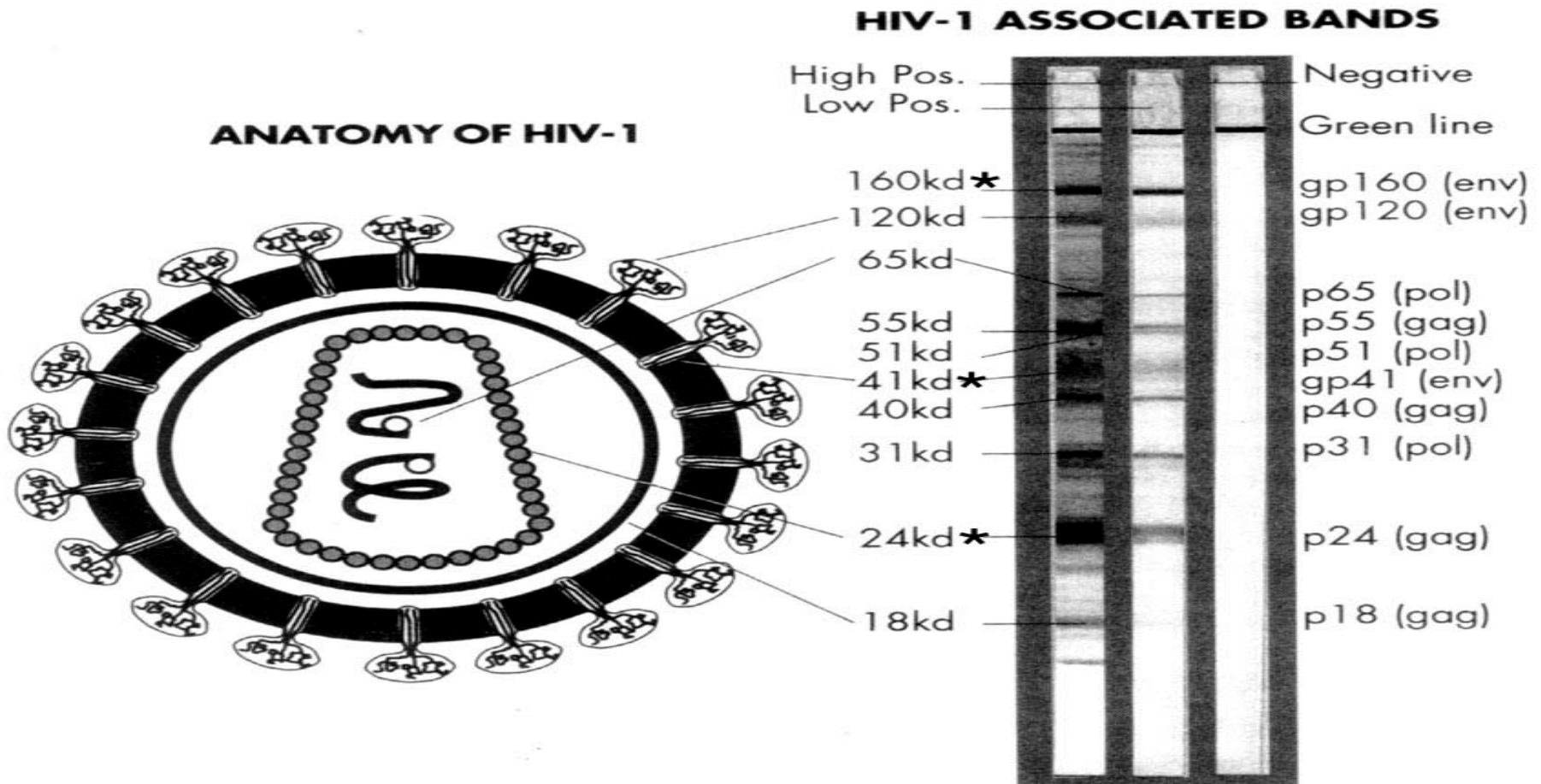
- Patient's history with or without clinical symptoms may give hints for a physician whether the patient has ever exposed to HIV or not.
- Screening patient's serum by **ELISA** for both (HIV Ag & HIV Ab) if the result is **+ve we** repeated the specimen twice in duplicate if still giving **+ve result 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.

Serological profile of HIV infection

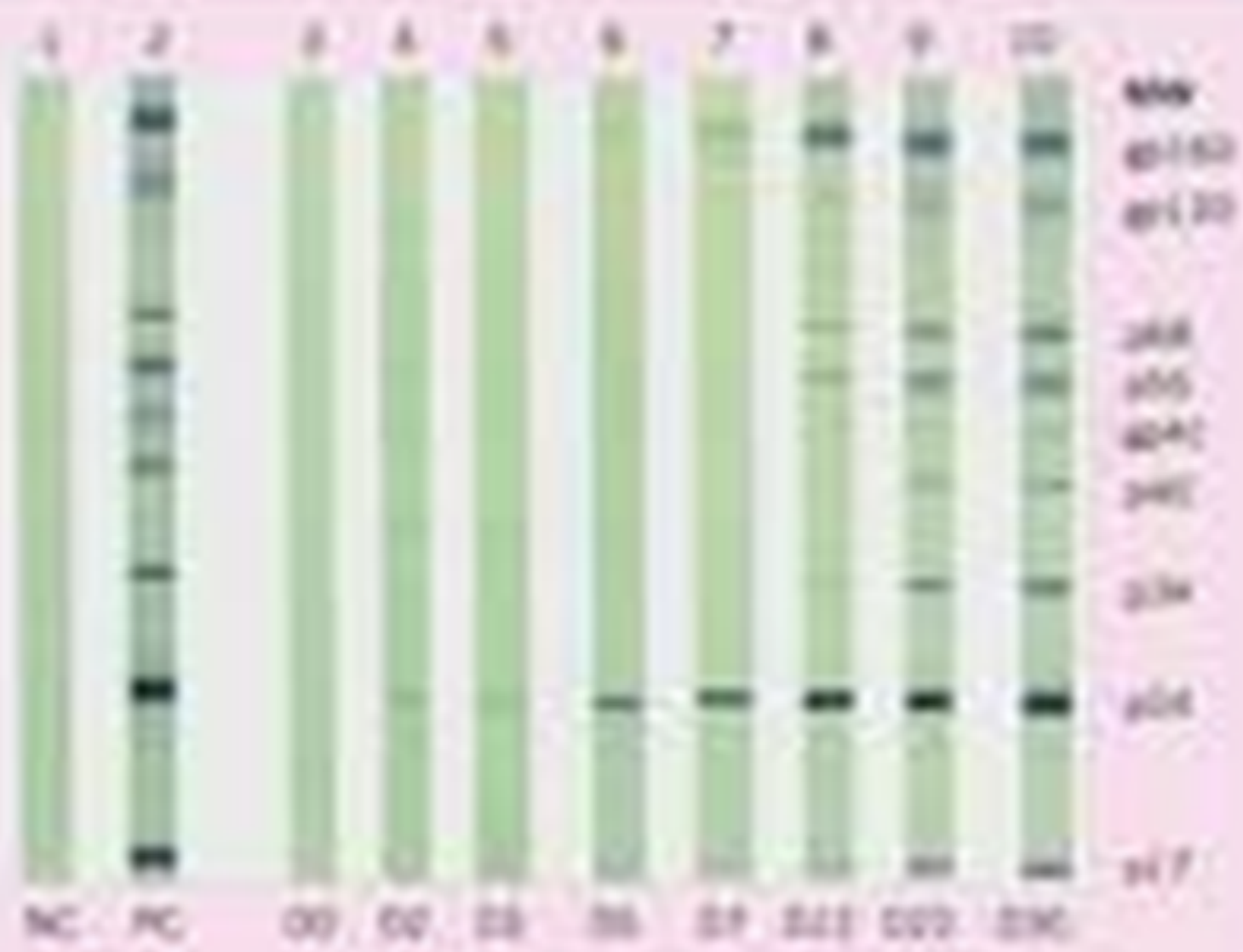


Western Blot

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



WESTERN BLOT REACTIVITY IN ONE HIV-1 SEROCONVERTER

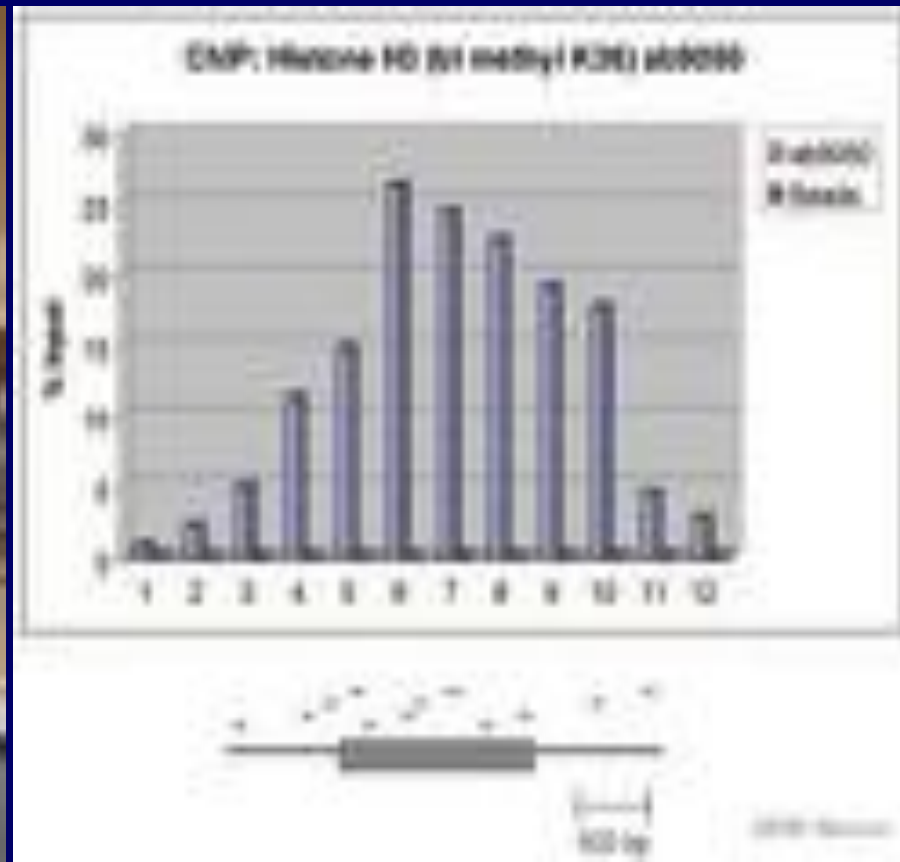


Indeterminate results of Western blot:

- Western blot indeterminate result, means that the test specimen not **positive** nor **negative**.
- The individual must be retested after 8-12 weeks.
- If the result is negative, report negative
- If the result is positive, report positive
- If the individual still indeterminate then the patient must be referred to medical evaluation and PCR are recommended to look for HIV-RNA genome.

PCR

For detection of **HIV RNA** in the blood (viral load) this test is important for HIV diagnosis 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/ μL).
- HAART is usually composed of two reverse transcriptase inhibitors and 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 !

