SNS COLLEGE OF ALLIED HEALTH SCIENCES

SNS Kalvi Nagar, Coimbatore - 35

Affiliated to Dr MGR Medical University, Chennai

DEPARTMENT: ALLIED HEALTH SCIENCES

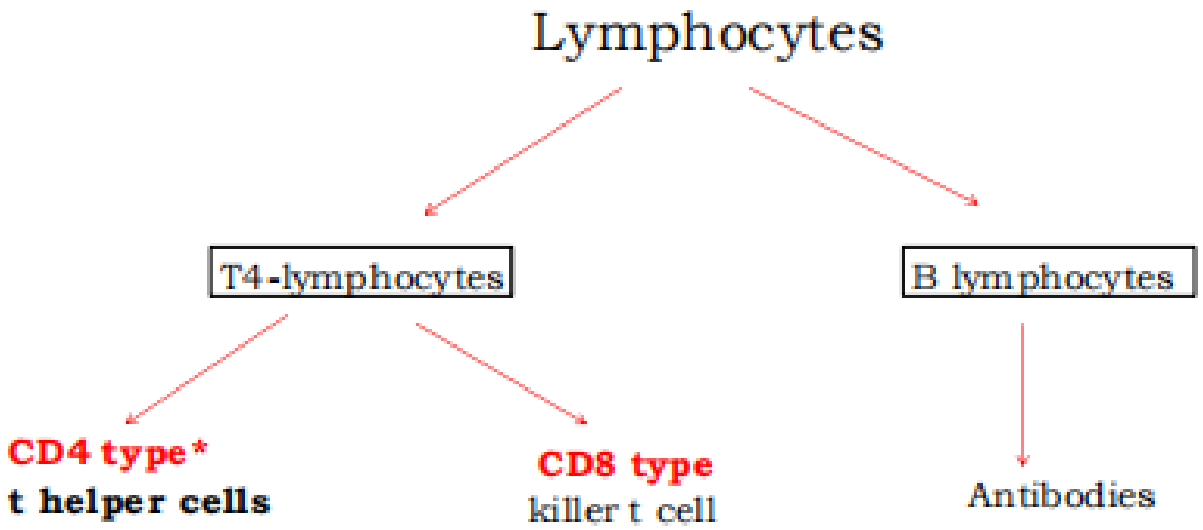
COURSE NAME: Pathology

Topic: Disorders of Immune system

HIV-INTRO

- **WBC** are the most important part of the immune system
- • **Neutrophils** attack bacteria
- • **B-lymphocytes** make antibodies
- • **T-lymphocytes** are responsible for coordinating the immune system's attack on viruses, fungi and some bacteria

Important component of Immune System



HIV uses CD4 cells for replication

Meaning of AIDS

- **A**cquired (not born with) = *Transmitted from person to person*

- **I**mmune (body's defense system) = *It affects the body's immune system, the part of the body which usually works to fight off germs such as bacteria and viruses*

- **D**eficiency (not working properly) = *Malfunctioning of the body's immune system*

- **S**yndrome (a group of signs and symptoms) = *Someone with AIDS may experience a wide range of different diseases*

WHAT IS AIDS ?

- It is a disease in which there is severe loss of body
- cellular immunity gradually results in lower
- resistance to infection .

Difference between HIV and AIDS

HIV is a **virus** and AIDS is a **disease**

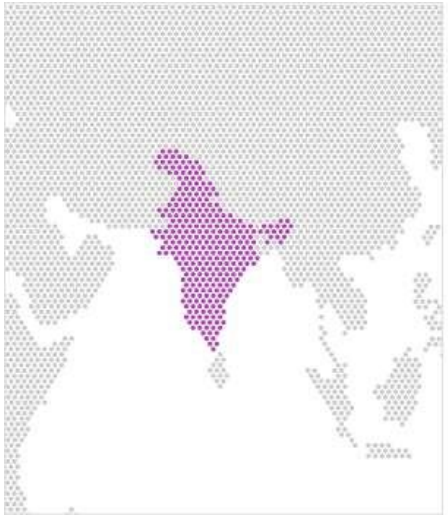
- HIV develops into AIDS

- AIDS is deficiency in the body's defense mechanism or immune system .

- AIDS is **acquired**, not hereditary

Epidemiology

- Males>females
- Occurs in all ages
- All areas of the country are affected
- AIDS is now the second leading cause of death for all men
- aged 25-44 years



India (2017)

2.1m people living with HIV

0.2% adult HIV prevalence (ages 15-49)

88,000 new HIV infections

69,000 AIDS-related deaths

56% adults on antiretroviral treatment*

n/a children on antiretroviral treatment*

*All adults/children living with HIV

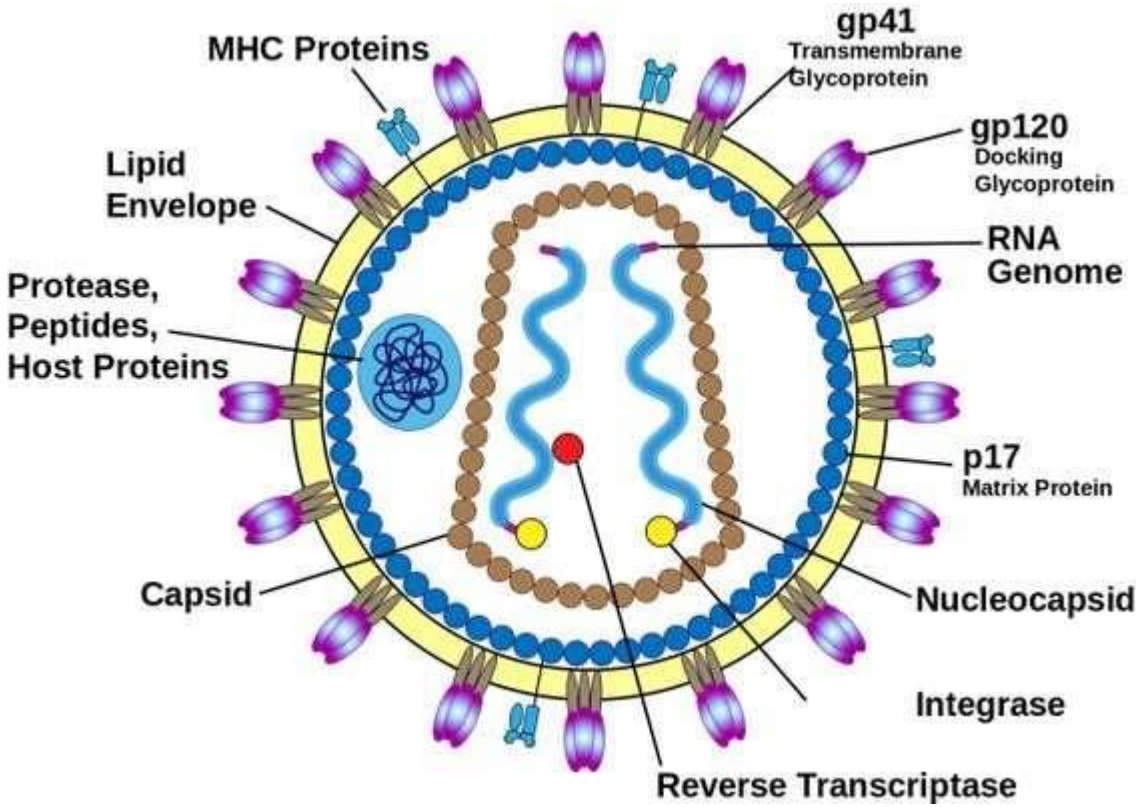
Source: UNAIDS Data 2018

Structure of HIV

- The shape is of the virus is **spherical**. 100- 140 nm in size
- The virus is composed of a **capsid core** which contains the genetic material that
- has been surrounded by a **protein envelope.**
- The protein envelope has many spikes of the **glycoprotein**.
- The outer part of glycoprotein called **gp120** is attached to the **gp41** which is the inner part of the glycoprotein.
- The envelope of HIV also contains other proteins including some **HLA antigens (Human Leucocyte Antigen)**

Structure of HIV

- • The genome of HIV contains two helices of **RNA**
- **molecules** in folded form.
- • The enzymes **reverse transcriptase** is present
- which is responsible for the conversion of the
- RNA to form the DNA.
- • There is another enzyme
- called as **integrase** which
- helps the viral genome to
- incorporate in the host cell



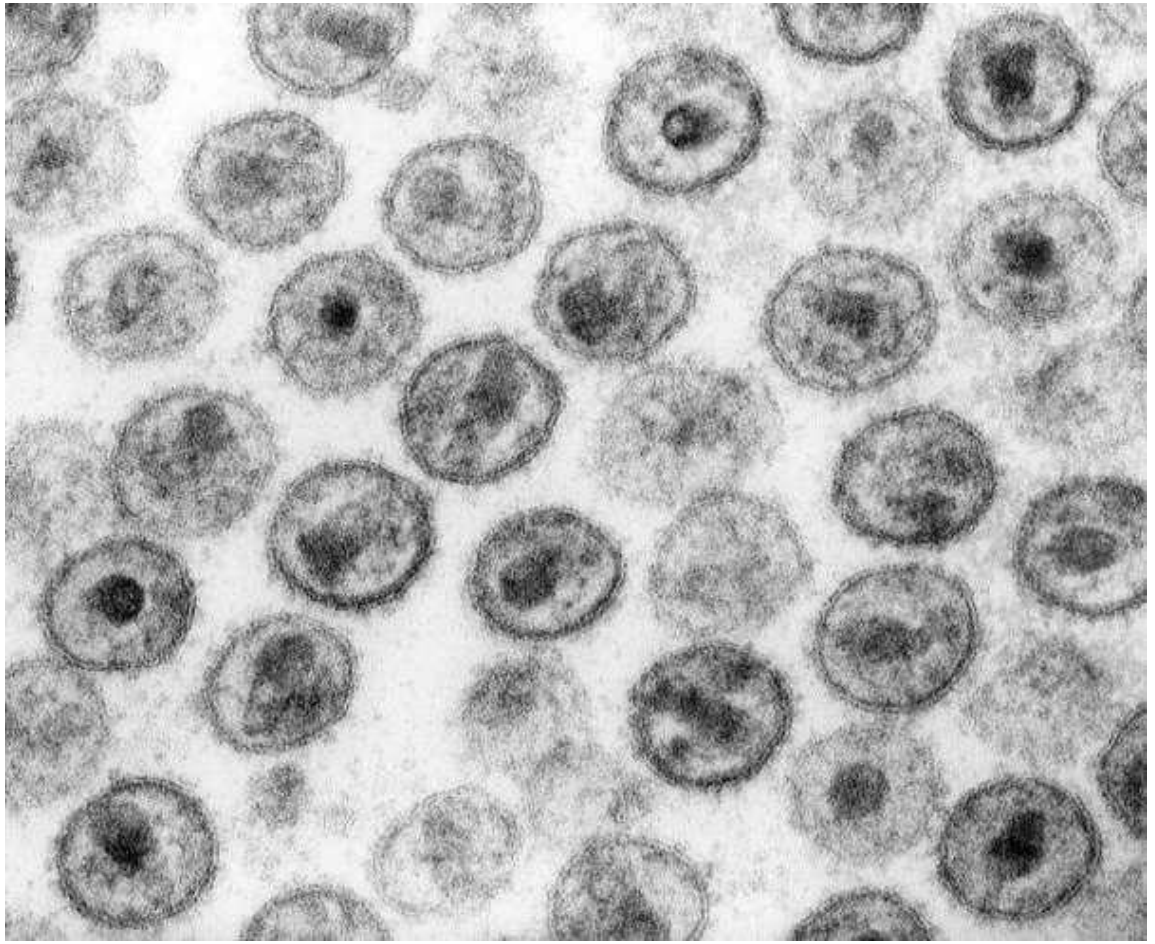
HIV

- **Incubation Period**

6months to 6year

- **Causative Organism**

HIV (Human Immunodeficiency Virus)



How does HIV cause AIDS ?

Viral replication (8-10 years)

↓

CD4 cell death

↓

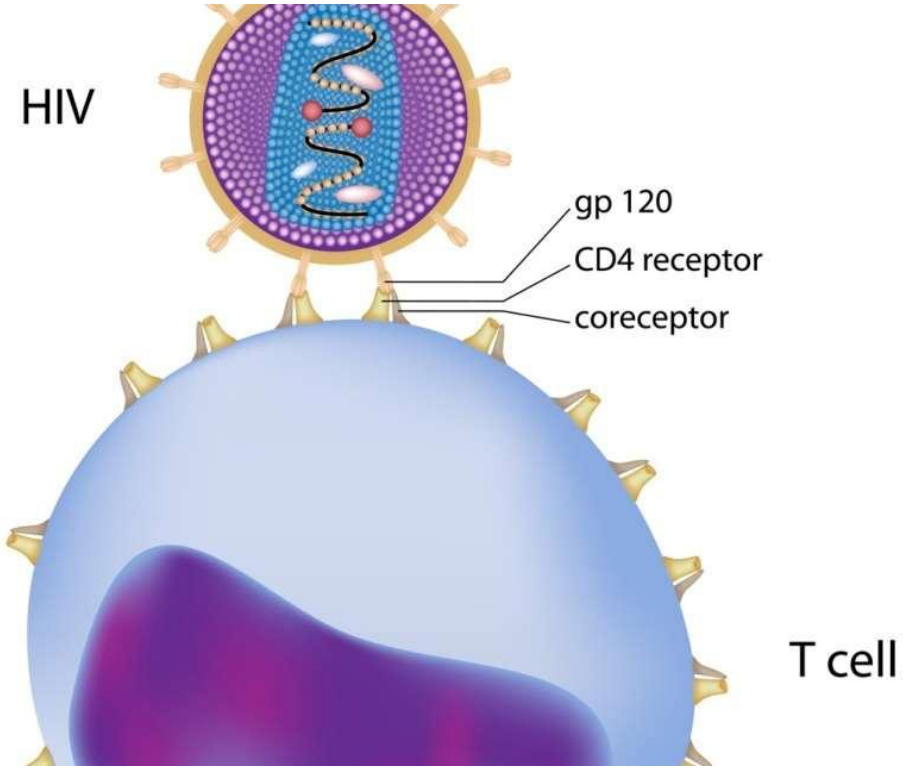
Further impairment of immune system

↓

ıcreased likelihood of opportunistic infections (OIs)

↓

AIDS



Mode of Transmission

- Blood products
- Vaginal fluids
- Semen
- Breast milk
- Sharing Needles
- Unsterilized blades & razor
- Through Sex (Unprotected Intercourse)

Mode of Transmission

- **Perinatal Transmission**
- HIV infection occurs from infected **mother to the newborn** during
- pregnancy *transplacentally*, or in immediate post-partum period
- *through contamination* with maternal blood, infected amniotic fluid or
- breast milk.

Mode of Transmission

- **Occupational transmission**
- • There have been a small number of **health care workers**
- (HCW), laboratory workers and those engaged in disposal of
- waste of sharps who have developed HIV infection by
- occupational exposure to HIV infected material

How HIV is not Transmitted ?

- Hugging
- • Contact with sweat, tears, urine or faeces
- • Bathing/Swimming in the same pool
- • Sharing cooking utensils, cups, toilet seats, bedding, telephones or
- towels
- • Eating food prepared by an infected person

Pathogenesis of HIV / AIDS

- The pathogenesis of HIV infection is largely related to the

depletion of CD4+ T cells (helper T cells) resulting in profound immunosuppression.

- **Selective tropism** (ability to infect a particular cell) for
- **CD4 molecule receptor**

- **Internalisation - gp120** of the virion combines with CD4

Receptor, for fusion purpose it utilize the chemokine coreceptor (CCR).

- Once fusion occurs **gp41 glycoprotein**
- of envelope is internalised in the CD4+ T cell membrane

Pathogenesis of HIV / AIDS

Uncoating and viral DNA formation

Virion enters the CD4 T Cells

↓

reverse transcriptase of the viral RNA forms a **single-stranded DNA**

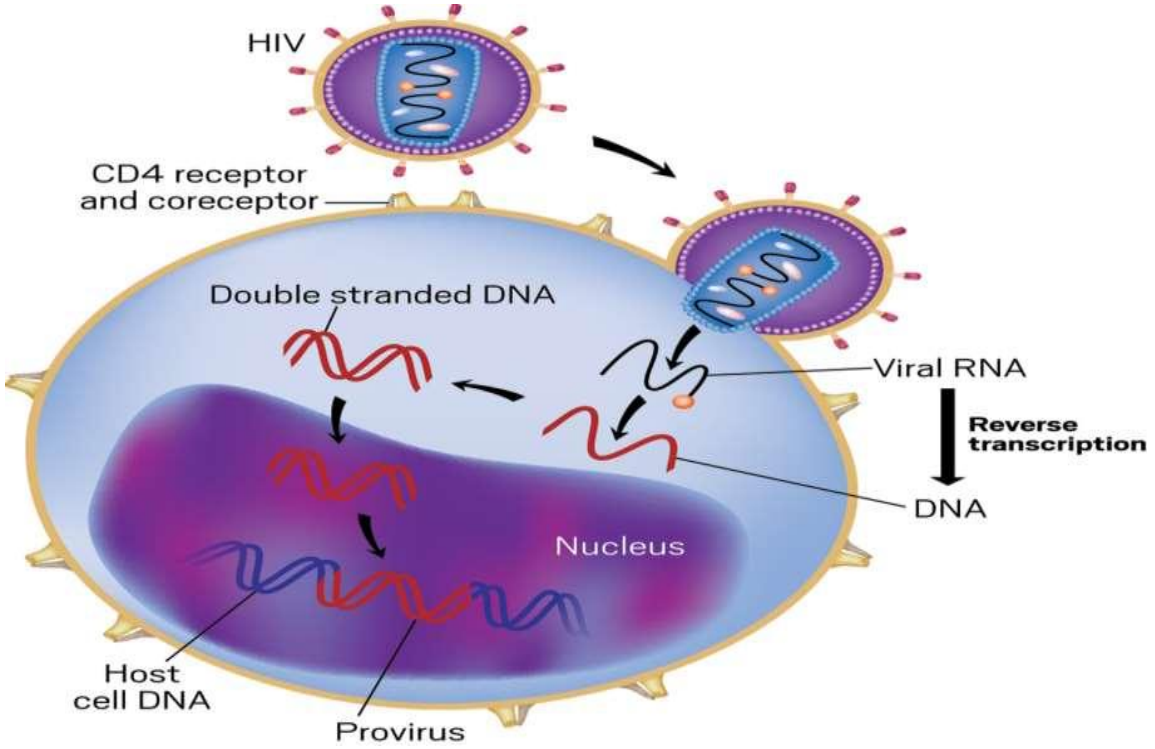
↓

It then copies into **double stranded DNA**

↓

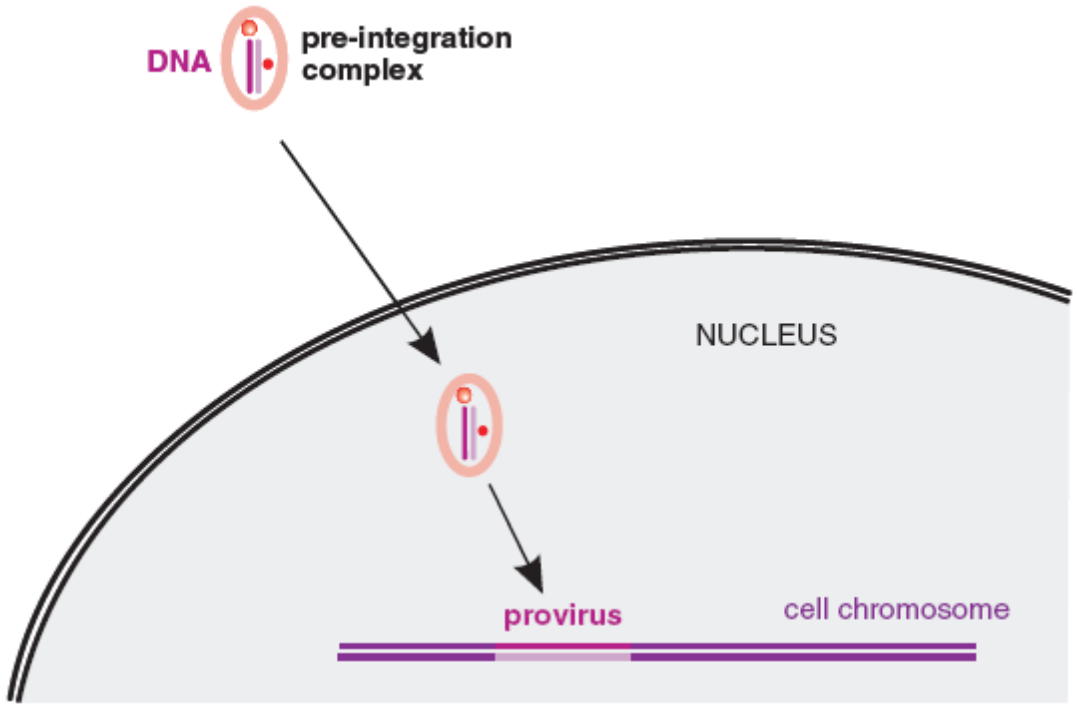
Viral DNA so formed has frequent mutations making the HIV

quite resistant to anti-viral therapy.



Pathogenesis of HIV / AIDS

- **Viral Integration** - viral integrase protein inserts the viral DNA
- into nucleus of the host T cell and *integrates* in the host cell DNA.
- At this stage, viral particle is termed as ***HIV provirus***.

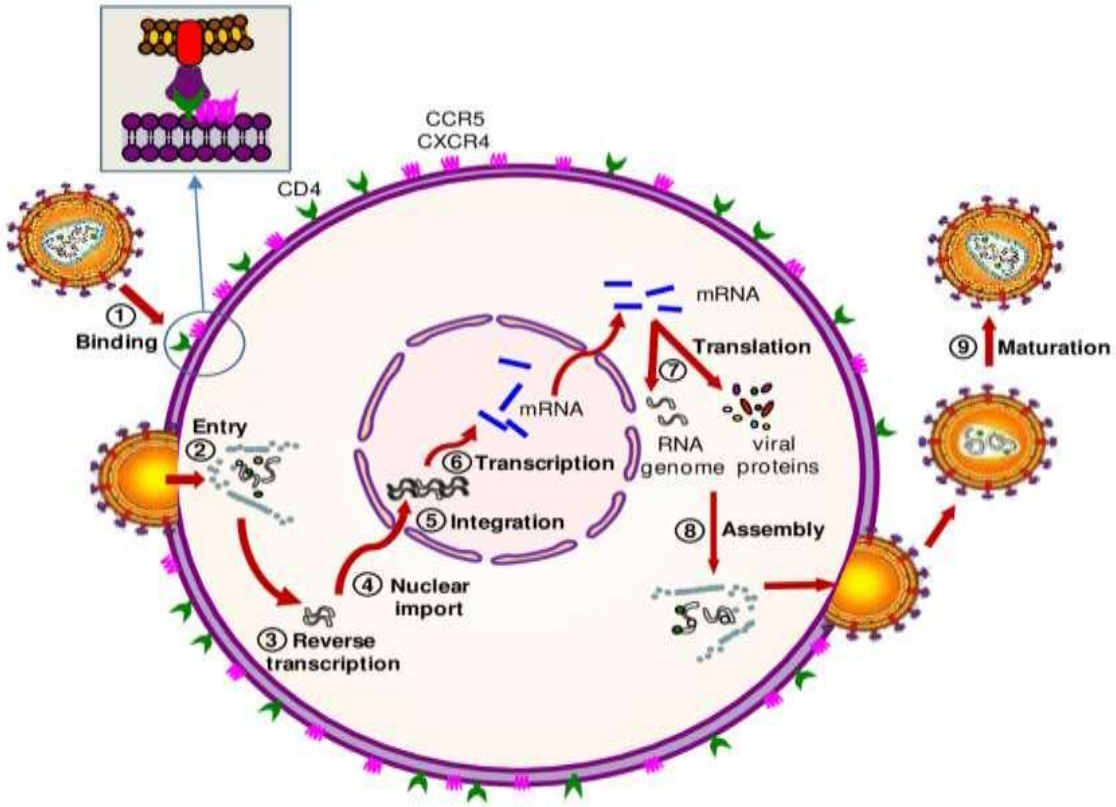


Pathogenesis of HIV / AIDS

Viral Replication

• **Integration** of the viral genome into the cellular DNA transcription of the HIV-1 proviral genome

• **Translation** of the viral Messenger RNA (mRNA) into new viral proteins virion assembly inside the cell maturation of the immature virion into a completely infectious particle .



Pathogenesis of HIV / AIDS

Latent period and immune attack

- In an inactive infected T cell, the infection may remain in latent phase for a

long time, accounting for the **long incubation period.**

- Our body immune system will fight against the virus
- But in short period, the **virus soon overpowers** the host
- immune system.
- **CD4+ T cell destruction and Viral dissemination** takes place, the infected
- host cell spreads virus to other CD4+ cell

Signs and Symptoms

- Weight Loss
- Frequent Fever and sweating
- Persistence skin rashes & flaky skin
- Severe & persistence Diarrhea
- Vision loss
- Nausea
- Vomiting
- Abdominal cramps

CDC HIV/AIDS Classification

- A **normal CD4 count** ranges from 500–1,200 cells/mm 3

Phase	Period after infection	CDC clinical category	CDC CD4 + T cell count
Early, Acute	3-6 weeks	Category A: Asymptomatic Infection Acute HIV Syndrome Persistent generalized lymphadenopathy	> 500/µl
Middle, Chronic	10 to 12 years	Category B: Symptomatic Disease Condition secondary to impaired CMI (Cell Mediated Immunity)	200-499/µl
Final, Crisis	Any period up to death	Category C: AIDS surveillance case	< 200/µl (AIDS indicator T cell counts)

Symptoms Associated with CD4 count

CD4 count[a]	Symptoms experienced
800-1200 (normal count)	Well, with no symptoms
500-799 (generally healthy count)	Well, with no symptoms
350-499	Minor immune symptoms
200-349	Major symptoms and opportunistic infections
<200	Severe symptoms of advanced HIV infection

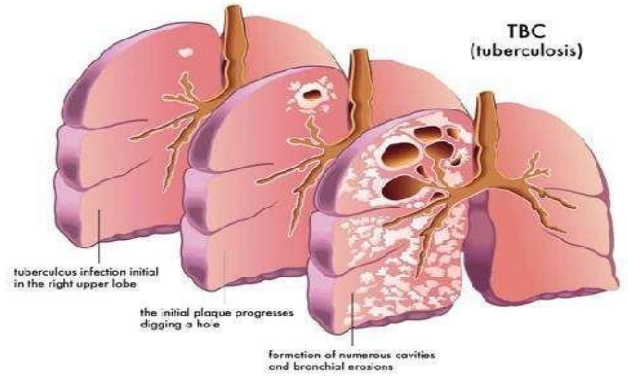
[a]Number of CD4 cells per mm^3 of blood.

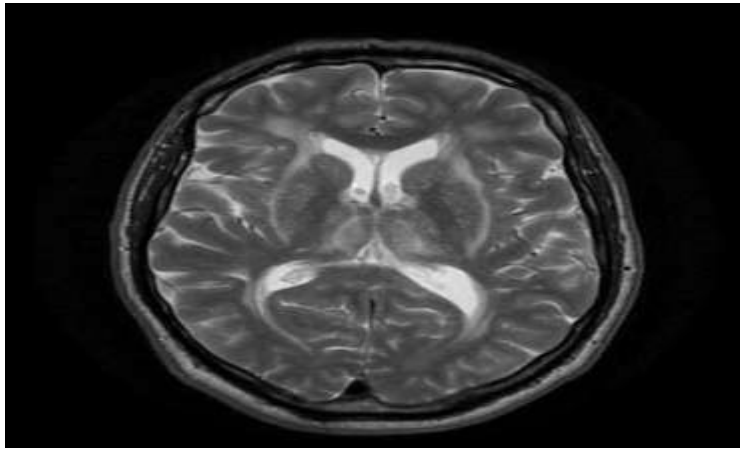
Pathogenesis of HIV / AIDS

- • **Wasting syndrome -** involuntary loss of body weight by more than 10%
- • **Persistent generalised lymphadenopathy -** presence of enlarged lymph nodes >1 cm at two or more extra-inguinal sites
- • **GI lesions and manifestations -** chronic watery or bloody diarrhoea, oral, oropharyngeal and oesophageal candidiasis (A fungal infection on skin and mucous) , anorexia, nausea, vomiting, mucosal ulcers, abdominal pain

Pathogenesis of HIV / AIDS

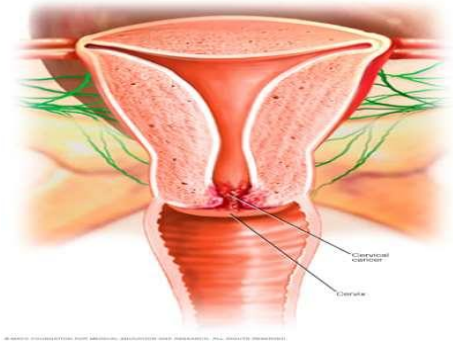
- **Pulmonary lesions -** Lung abscess, *M. tuberculosis*
- • **Mucocutaneous lesions -** form of erythematous rash is seen at the onset of primary infection itself.
- • **Haematologic lesions –** anaemia, leucopenia
- • **CNS lesions -** HIV encephalopathy or AIDS associated dementia complex

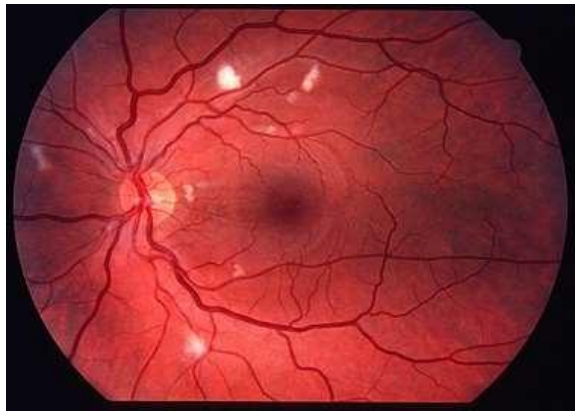




Pathogenesis of HIV / AIDS

- • **Gynaecologic lesions -** carcinoma cervix, and pelvic inflammatory disease.
- • **Renal lesions -** HIV-associated nephropathy and genitourinary tract
- infections
- • **Cardiovascular lesions -** dilated cardiomyopathy, Pericardial lesion
- • **Ophthalmic lesions -** HIV retinopathy





Investigations

- **Antibody test – ELISA** enzyme-linked immunosorbent assay
- **Western Blot** - *p24* antigen capture assay
- *HIV RNA* assay methods by reverse transcriptase (RT)
- **Tests for defects in immunity -** *CD4+ T cell counts,* Platelet count revealing thrombocytopenia
- **Tests for detection of opportunistic infections and secondary tumours**

Treatment and prevention

- Antiretroviral Drugs - Zidovudine (AZT), Lamivudine, Abacavir, Lopinavir,
- Atazanavir
- • Using Proper Contraceptives, Protected Intercourse
- • Use sterile needles each time for injection
- • Never share needles
- • Avoid unnecessary blood transfusions
- • All pregnant women should be tested for HIV
- • Use standard work precautions – hand hygiene,
- • personal protective gear.
- • Proper disposal of biomedical waste.
- • Immunization against HBV
- • Education

Occupational Exposure

- Percutaneous injury (needle stick, cut with sharp object)
- Contact with mucous membrane
- Contact with non intact skin (abraded, chapped, dermatitis)

Management

- Do not panic
- **Skin** - Wash wound & surrounding with soap/water, Rinse well, Don't scrub
- **Splash of Blood**
- **Eye** irrigation with water or Saline
- **Mouth** - Spit fluid immediately, Rinse mouth thoroughly with water / saline
- repeatedly
- **Contact ART Therapist** – Start ART Drugs as early as possible (within 72
- hours) upto 4 weeks
- **HIV testing** should be done at baseline, 6weeks, 3months & 6months

Sterilization and Disinfection

- HIV contaminated waste products can be *sterilised and disinfected by*
- *chemical germicides at much lower concentration.*
- These are: sodium hypochlorite (liquid chlorine bleach),
- formaldehyde (5%)
- ethanol (70%),
- glutaraldehyde (2%),
- β-propionolactone
- HIV is also heatsensitive and can be inactivated at 56°C for 30 min.