

BASICS OF HIV

The background of the slide is a dark purple color with several thick, wavy, black lines that create a sense of movement and depth. The lines are layered, with some appearing in front of others, creating a complex, abstract pattern.

What is HIV?

- HIV is a RETROVIRUS.
- A Retrovirus is a ribonucleic acid (RNA) virus that must reverse to the Deoxyribonucleic acid (DNA) before reproducing/replicating.
- It is the DNA gene that enables the Virus to replicate.

What is HIV? Cont..d.

- HIV belongs to the subclass of lentiviruses OR Slow viruses. Characterized by a long interval between infection and development of disease.
- Examples of Naturally Occurring Slow viruses; Feline immune deficiency virus, Simian immune deficiency viruses. Models for Research.

HIV types and sub-types

- 2 types of HIV: HIV-1 and HIV-2. Show 40% to 60% amino acid homology.
- HIV-1 is subdivided into subtypes or clades designated “A to K” (M Clades) and “O”. M and O show 55-70% similarity/homology. N clade is a new group recently reported.

HIV-2

- Human retrovirus. Mainly in W.Africa.
- Less transmissible (5-8fold less than HIV-1 in early stage disease and in MTCT).
- Slower rate of CD4 decline and disease progression.
- 20-30% of HIV-2 patients have negative antibody tests.
- Viral load tests are not generally available.

Structure of HIV



Description-cont..d

- **VIRAL ENVELOPE-** Outer coat of the virus .Diameter of 1/10000 of a millimeter. Spherical in shape. Composed of 2 layers of fat, called lipid. Recent evidence suggests HIV may Enter or exit cells through LIPID RAFTS present on cell membrane.

Description-cont..d

- 72 spikes on average made of complex protein protrude from the virion surface. This protein is called ENV made of a Cap of Glyco protein 120 and a stem of GP41.
- ** Primary focus of VACCINE dev't.

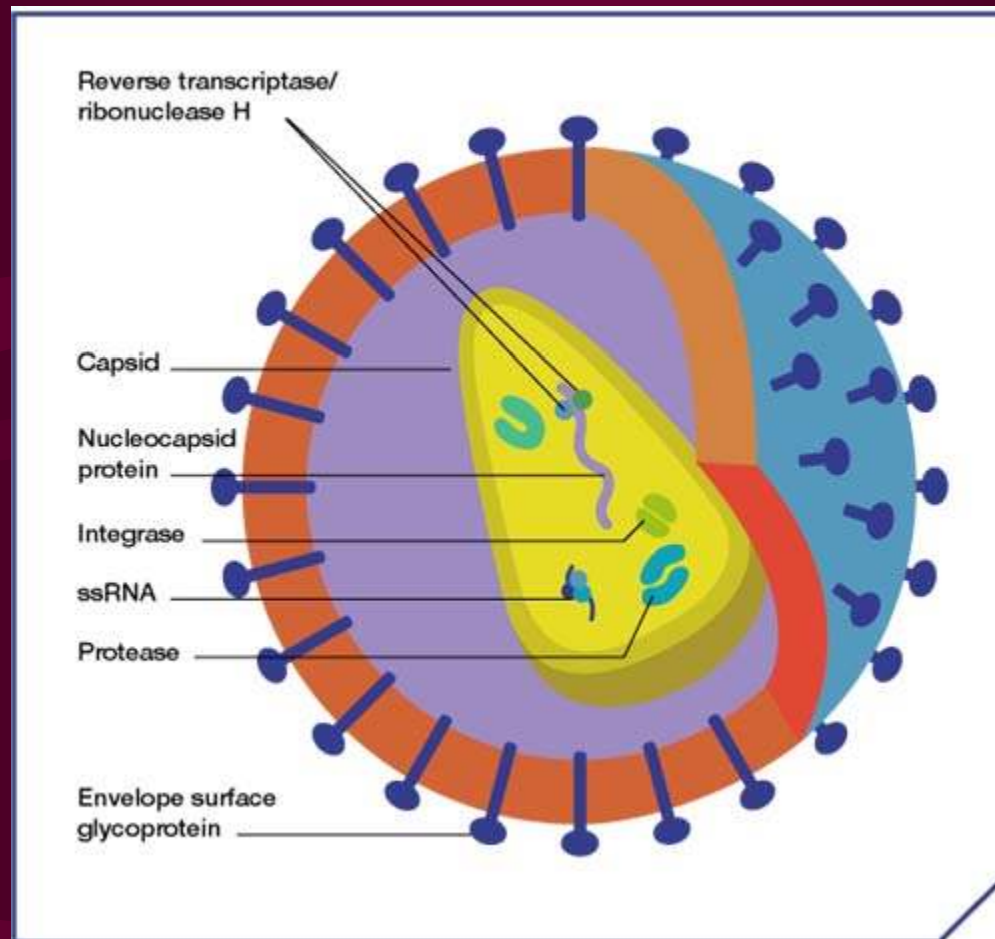
Description-cont..d

- Viral Core- Bullet shaped core called Capsid made of 2000 copies of a protein called P24.
- Capsid protects 2 single strands of HIV RNA, each with a copy of 9 genes. Gag, Pol and Env gene encode for structural proteins. E.g, Env gene encodes for GP160, that is broken down to GP120 and GP41.

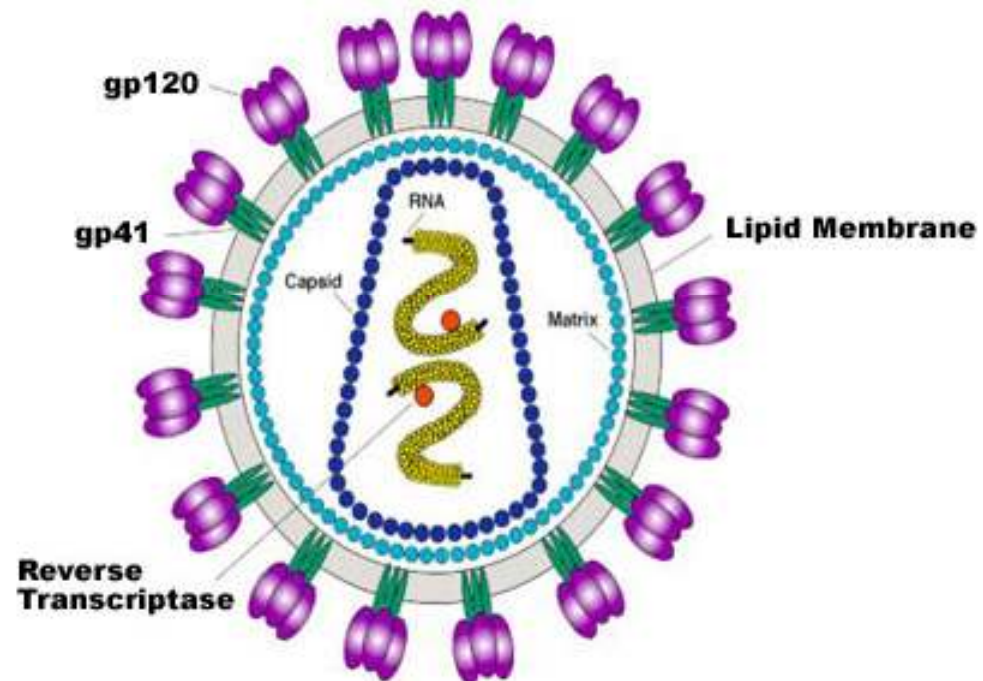
Description cont..d

- 6 regulatory genes control viral replication. Include; Vif, Rev, Nef, Tat, Vpu, Vpr.
- Other core protein include: p7- HIV nucleocapsid protein, and 3 enzymes- Protease, Reverse transcriptase, integrase.
- P17 matrix protein lies between the Core and the envelope.

Description of HIV structure



Organization of the HIV-1 Virion



Stages of HIV life cycles

1. Entry into the Cell. Involves 2 steps:
 - a) Binding
 - b) Fusion- T20 Penta fuside- new drug.
2. Reverse transcription- reverse transcriptase converts HIV RNA to Pro viral DNA. 9 out of the 15 drugs act here.

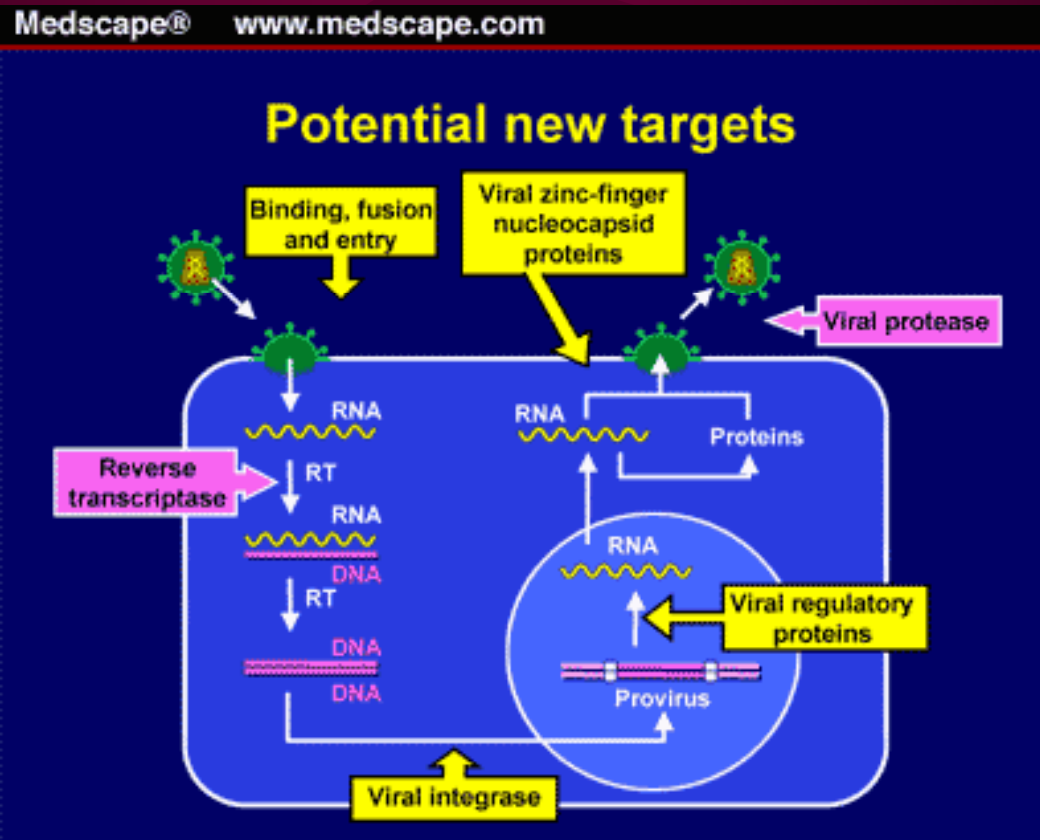
Stages of HIV lifecycle- cont..d

3. Integration- mediated by Integrase enzyme. Proviral DNA spliced into Human DNA.
4. Transcription-process of making new HIV RNA copies called mRNA.mRNA will use the body's protein making machinery to make viral proteins.

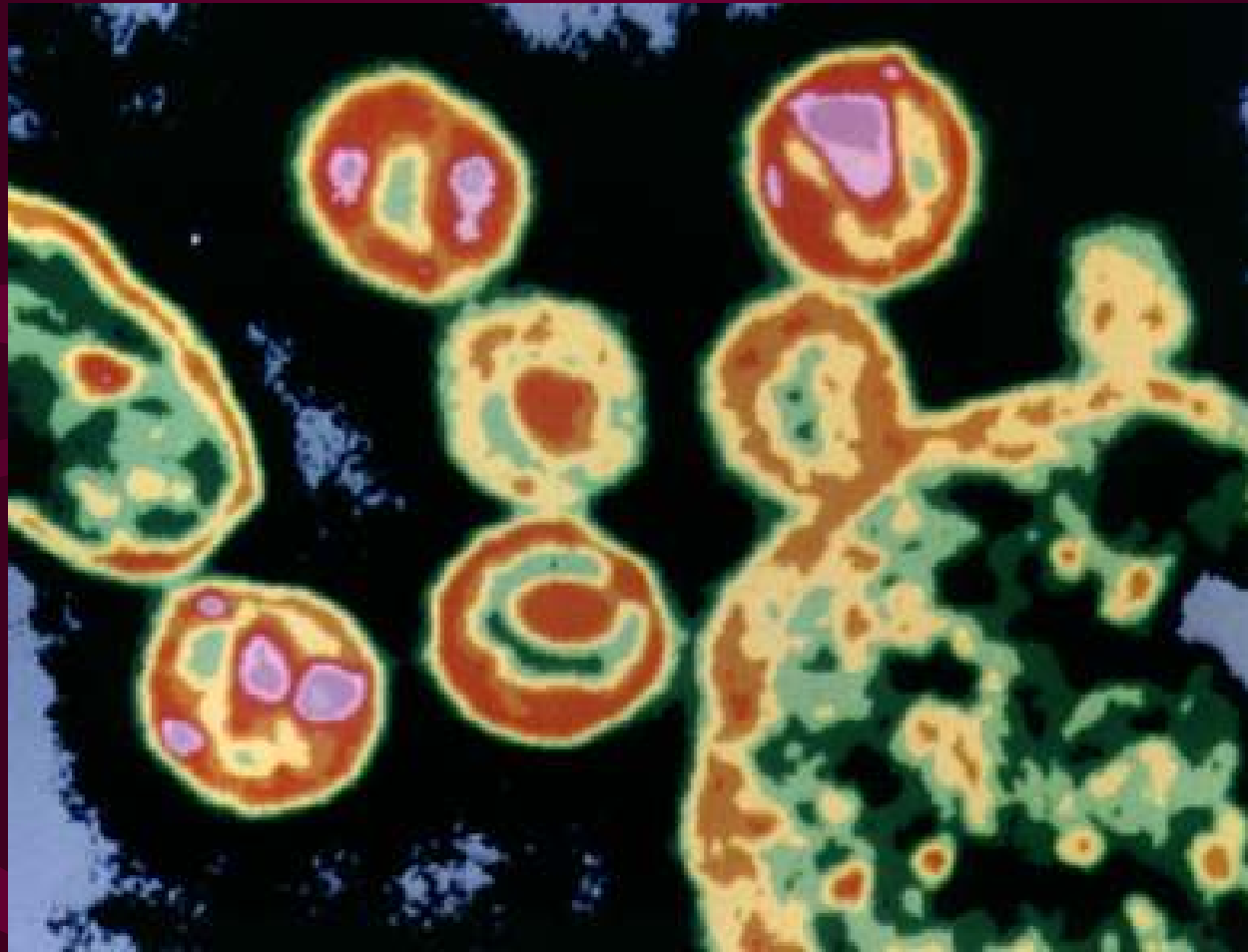
Stages of HIV cycle-cont..d

5. Translation- Making of HIV structural protein using the host's protein making machinery.Processed HIV mRNA copies acts as a template . Occurs in the cytoplasm.long chain proteins formed.
6. Assembly and budding. Cleavage of long chain proteins by protease.

HIV Life Cycle



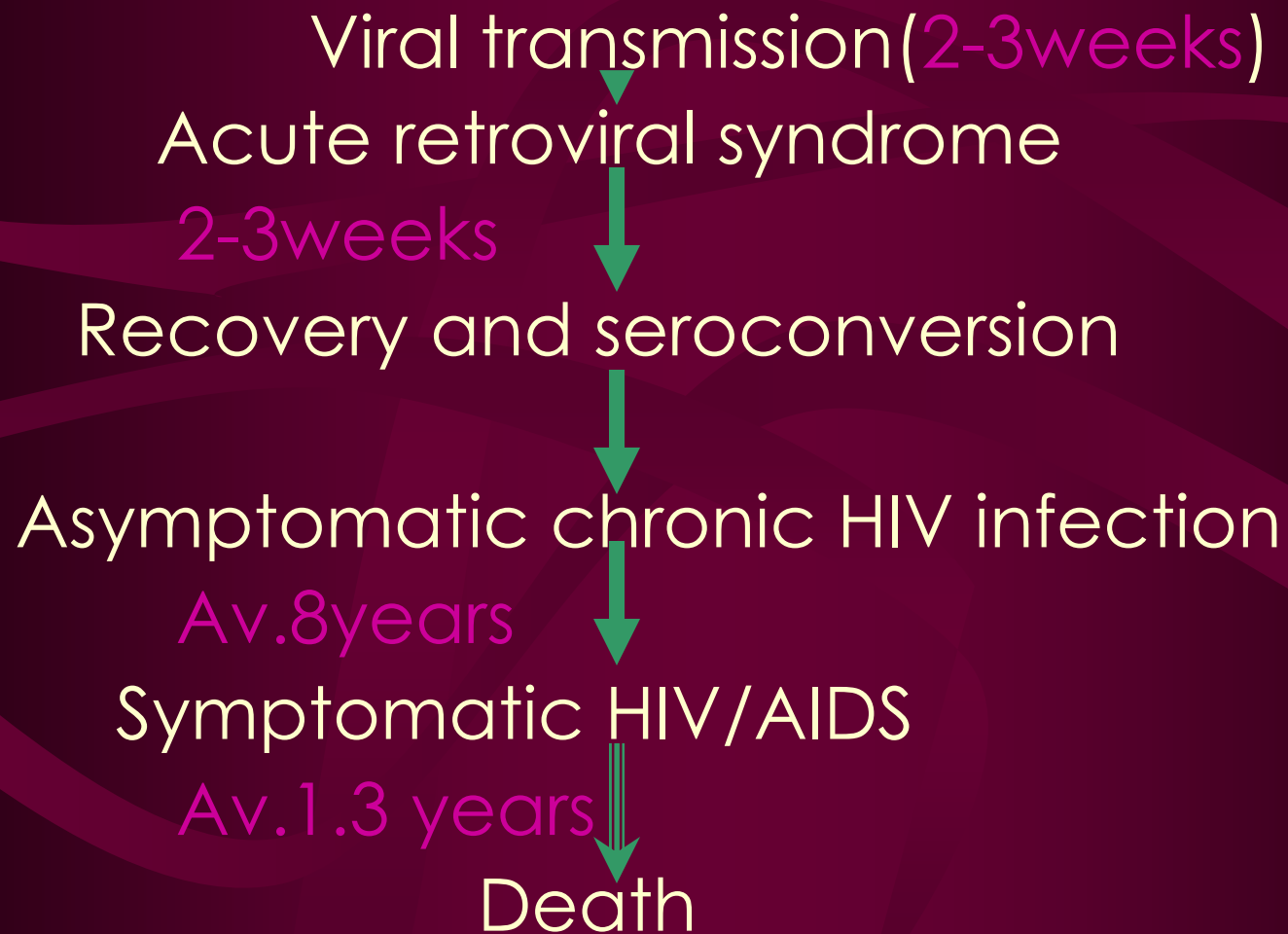
Infected white blood cell



Transmission of HIV

- **Unprotected sexual intercourse** with an infected person: HST, MSM, OS etc.
- **Contact with infected blood**- needle stick injury, sharing contaminated needles, blood transfusion.
- **Mother to child transmission**; Before, during birth and after birth through breast feeding.

Natural history of HIV



Early Events in HIV progression

- Acute retroviral syndrome- occurs 2-3 weeks after acute HIV infection. 70-80% suffer flu like symptoms. Immune system fights back with killer cells (CD8) and later B cells produce antibodies. This eventually leads to CD4 recovery and reduction of HIV RNA to a low "SET POINT".

Later Course of Infection

- Asymptomatic chronic stage. Average of 8 years before progression to AIDS.
- There is clinical latency while Asymptomatic.
- Viral load determines rate of disease progression-Velocity of progress.
- CD4 counts-Where you are- Correlates with risk of opportunistic infections.

Advanced HIV/AIDS disease stage

- Defined by CD4 count less than 200/mm³. Median survival 3.7 years.
- Characterized by opportunistic infections, selected tumors/cancers, wasting and neurological complications.
- After AID defining complication, median survival is 1.3 years.

Correlation of complications with CD4

CD4 cell count	Infection complication	Non.infectious complication
>500	Acute retroviral syndrome Candida vaginitis	PGL, myopathy, GBS, Aseptic meningitis
200-500	TB, Pneumonia, HZ, oral thrush, KS, OHL, cryptosporidiosis	Cervical cancer, anemia, lymphoma, mononeuronal simplex
<200	PCP, extra.pulm.TB, PML, Histoplasmosis,	Wasting, peripheral neuropathy, HIV assoc.dementia, NHL, cardiomyopathy.

Correlation of complications with CD4 counts

CD4 Cell Count	Infectious complication	Non-infectious complication
<100	Disseminated Herpes simplex, Toxoplasmosis, Cryptosporidiosis, microsporidiosis, candidiasis	
<50	Disseminated CMV, MAC	CNS lymphoma