

VMC 605: SYSTEMATIC ANIMAL VIROLOGY

RETROVIRIDAE

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RETROVIRIDAE

Retro: from Latin retro, "backwards"

- refers to the activity of reverse transcriptase and the transfer of genetic information from RNA to DNA.

Retroviruses

Retrovirus: A retrovirus is a lysogenic virus with an RNA genome that uses reverse transcriptase to make DNA for insertion into the host genome.



Reverse (retro) transfer of genetic information

Usually, well adapted to their hosts

Endogenous retroviruses



Retroviruses

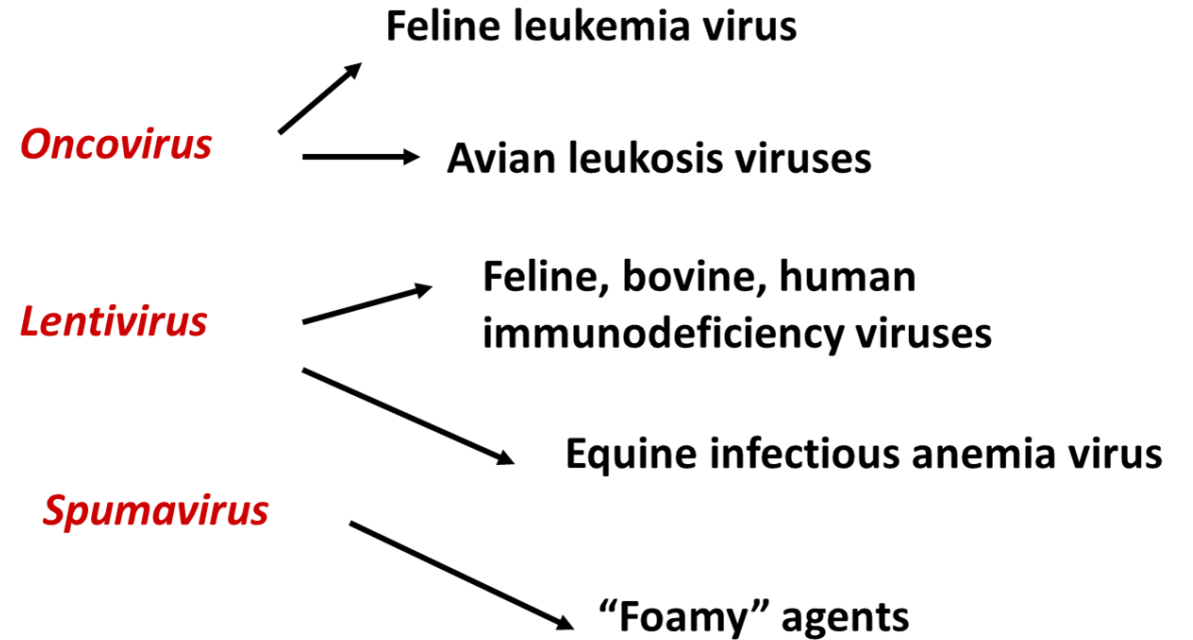
- RNA viruses
- single stranded, positive sense, enveloped, icosahedral.
- Distinguished from all other RNA viruses by presence of an unusual enzyme, reverse transcriptase.
- Retro = reversal
 - RNA is serving as a template for DNA synthesis.
- One genera of veterinary interest
- Alpharetrovirus
 -



Family- *Retroviridae*

- Family - *Retroviridae*
- Subfamily - *Orthoretrovirinae* [*Ortho*: from Greek *orthos*"straight"]
- Genus -. *Alpharetrovirus*
- Genus - *Betaretrovirus*
- Genus - *Gammaretrovirus*
- Genus - *Deltaretrovirus*
- Genus - *Lentivirus* [*Lenti*: from Latin *lentus*, "slow"].
- Genus - *Epsilonretrovirus*
- Subfamily - *Spumaretrovirinae*
- Genus - *Spumavirus*

Retroviridae





Alpharetrovirus

- **Subfamily**
 - *Orthoretrovirinae*
- **Genus**
 - *Alpharetrovirus*
- **Species**
 - *Avian leukosis virus (ALV)*
 - *Rous sarcoma virus (RSV)*
 - *Avian myeloblastosis virus (AMV)*
 - *Fujinami sarcoma virus (FuSV)*



Avian leukosis- sarcoma virus (ALV)

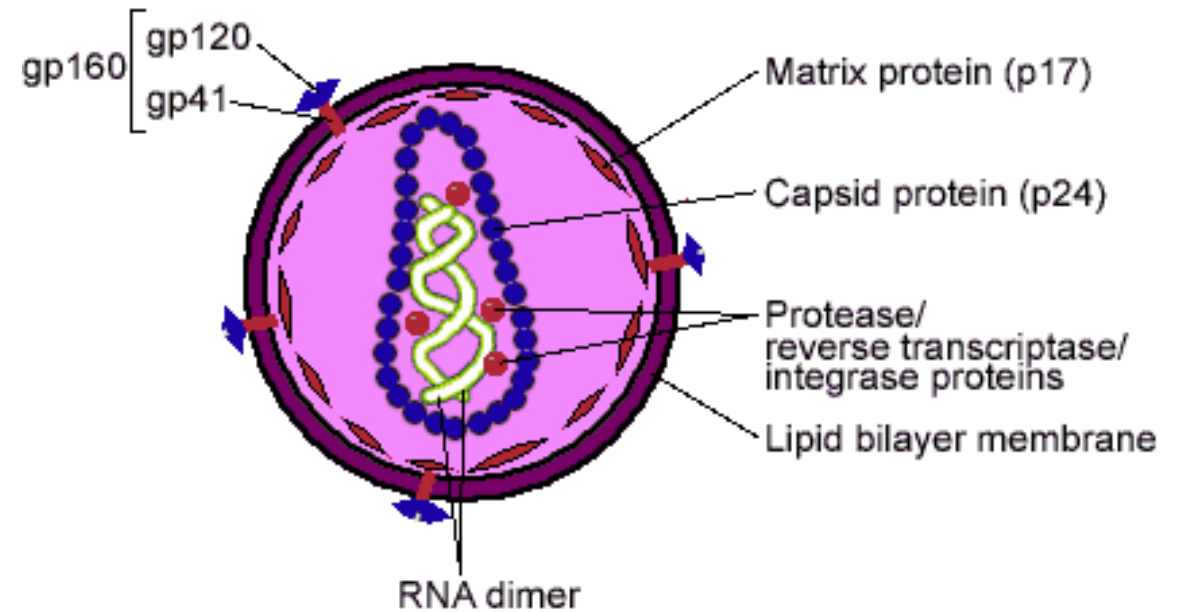
- ALVs have been divided into 10 envelope subgroups - A , B, C, D, E, F, G, H, I & J based on
 - host range
 - receptor interference patterns
 - neutralization by antibodies
- subgroup A to E viruses have been divided into two groups
 - Noncytopathic (A, C, and E)
 - Cytopathic (B and D)
- Cytopathic ALVs can cause a transient cytotoxicity in 30- 40% of the infected cells



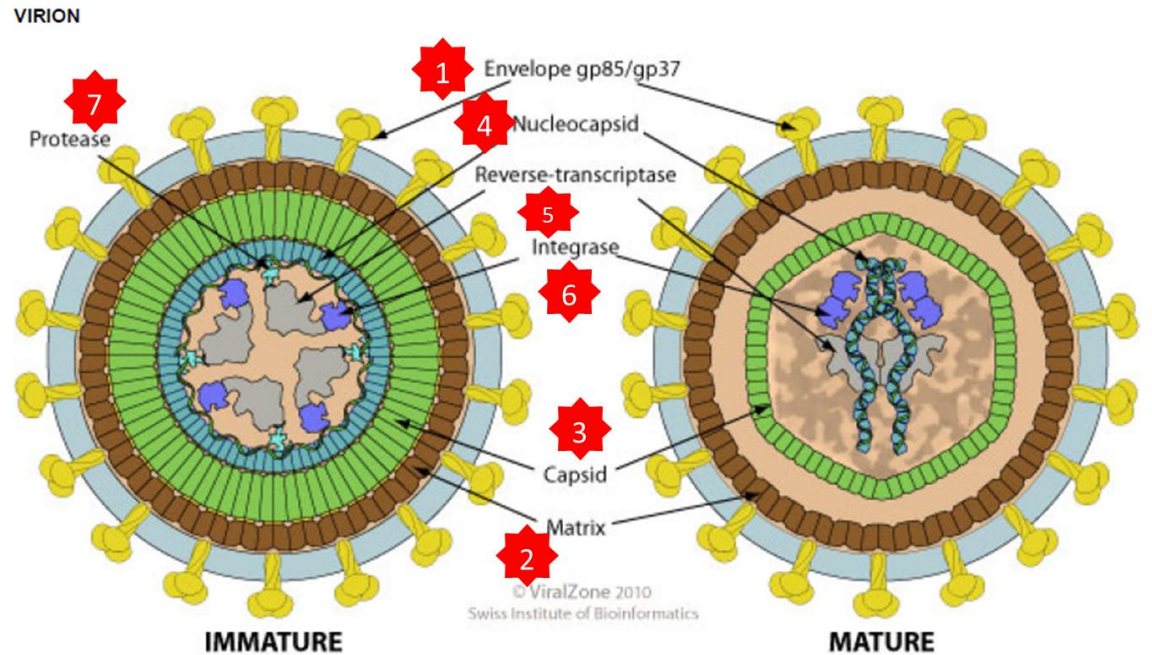
Structure

1. The viral envelope formed from host cell membrane; contains 72 spiked knobs.
2. These consist of a transmembrane protein TM (gp 41), which is linked to surface protein SU (gp 120) that binds to a cell receptor during infection.
3. The virion has cone-shaped, icosahedral core, containing the major capsid protein
4. Between capsid and envelope is an outer matrix protein, MA
5. Two identical copies of positive sense ssRNA genome (retroviruses are diploid).
6. Enzymes: reverse transcriptase, integrase and protease.

Structure - Retrovirus

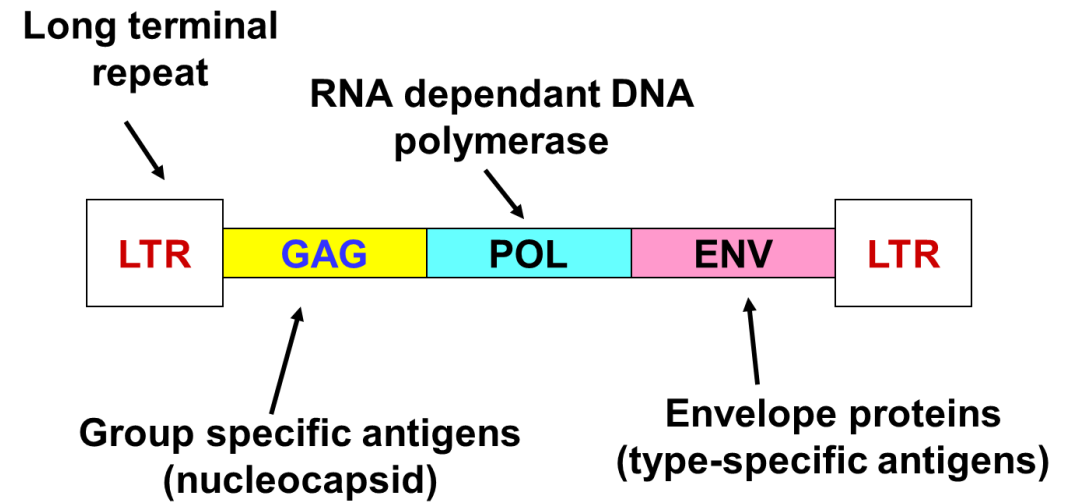


Structure - Alpharetrovirus



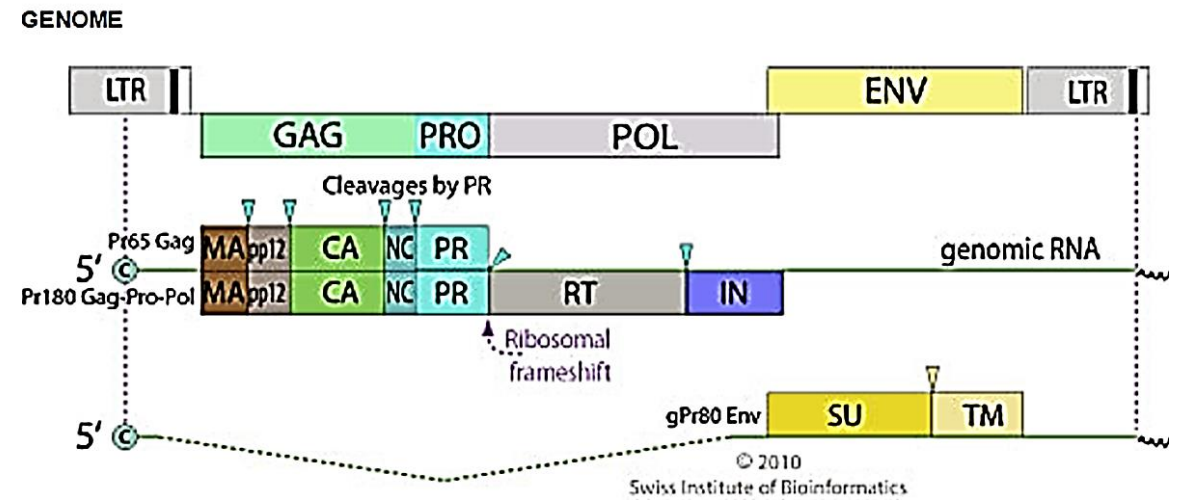
Enveloped, spherical to pleomorphic in shape, 80 - 100 nm in diameter.

The viral genome (oncornaviruses).



All three genes - GAG, POL, ENV - required for replication

Genome



Monopartite, linear, dimeric, ssRNA(+) genome of about 7.2 kb

wo long terminal repeats (LTRs) of about 600nt long at the 5' and 3'



REPLICATION - NUCLEAR

- Virus attaches to host receptors
- Fusion with cell membrane.
- Internalization and partial uncoating.
- ssRNA(+) genome is copied into a linear dsDNA molecule by RT



- Nuclear entry of the viral dsDNA at the nuclear membrane is disassembled at mitosis.
- Viral dsDNA is covalently and randomly integrated into the cell's genome by the viral integrase (=provirus).
- Transcription of provirus by Pol II



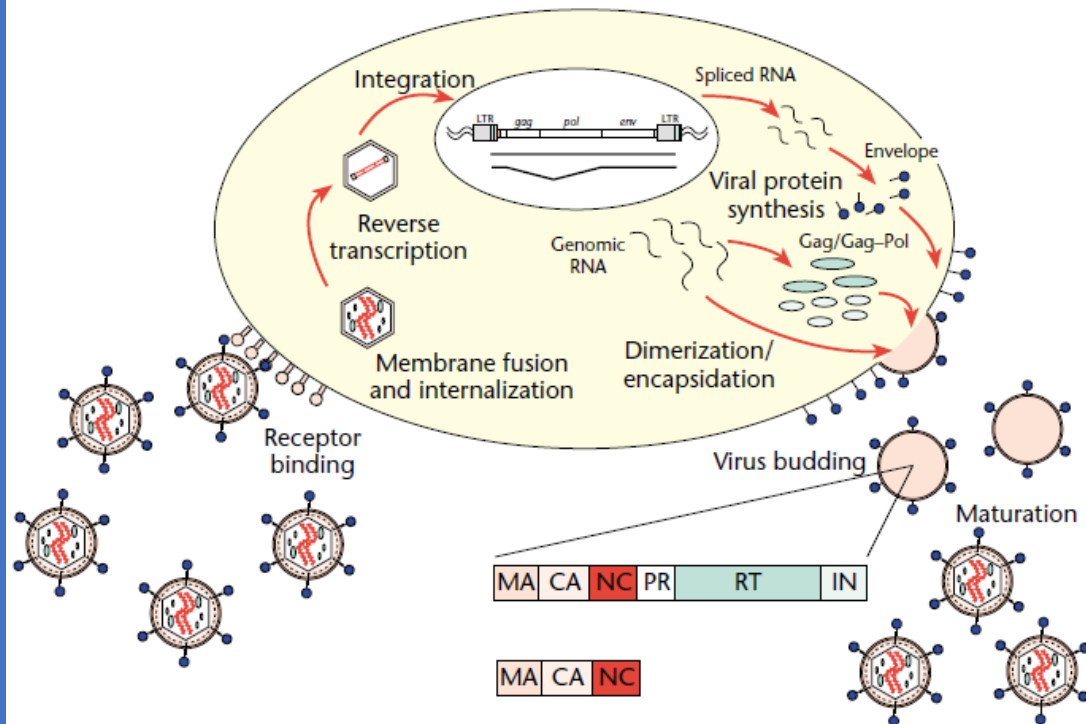
- Nuclear export of RNAs.
- Translation of viral RNAs >>> produces Env, Gag and GagPol polyproteins.
- Assembly of the virion at the host cellular membrane and packaging of the viral RNA genome.

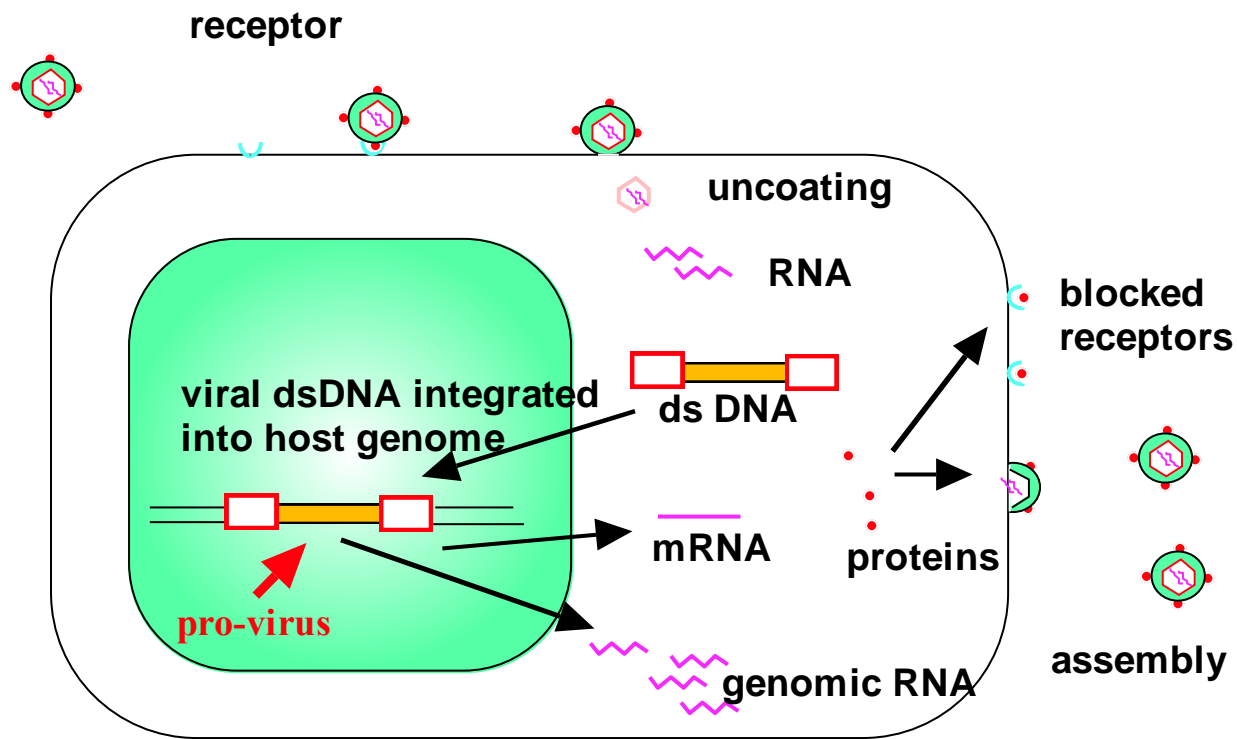


- Budding through the plasma membrane and release of the virions
- Proteolytic processing of the precursors polyproteins by viral protease and maturation of the virions.

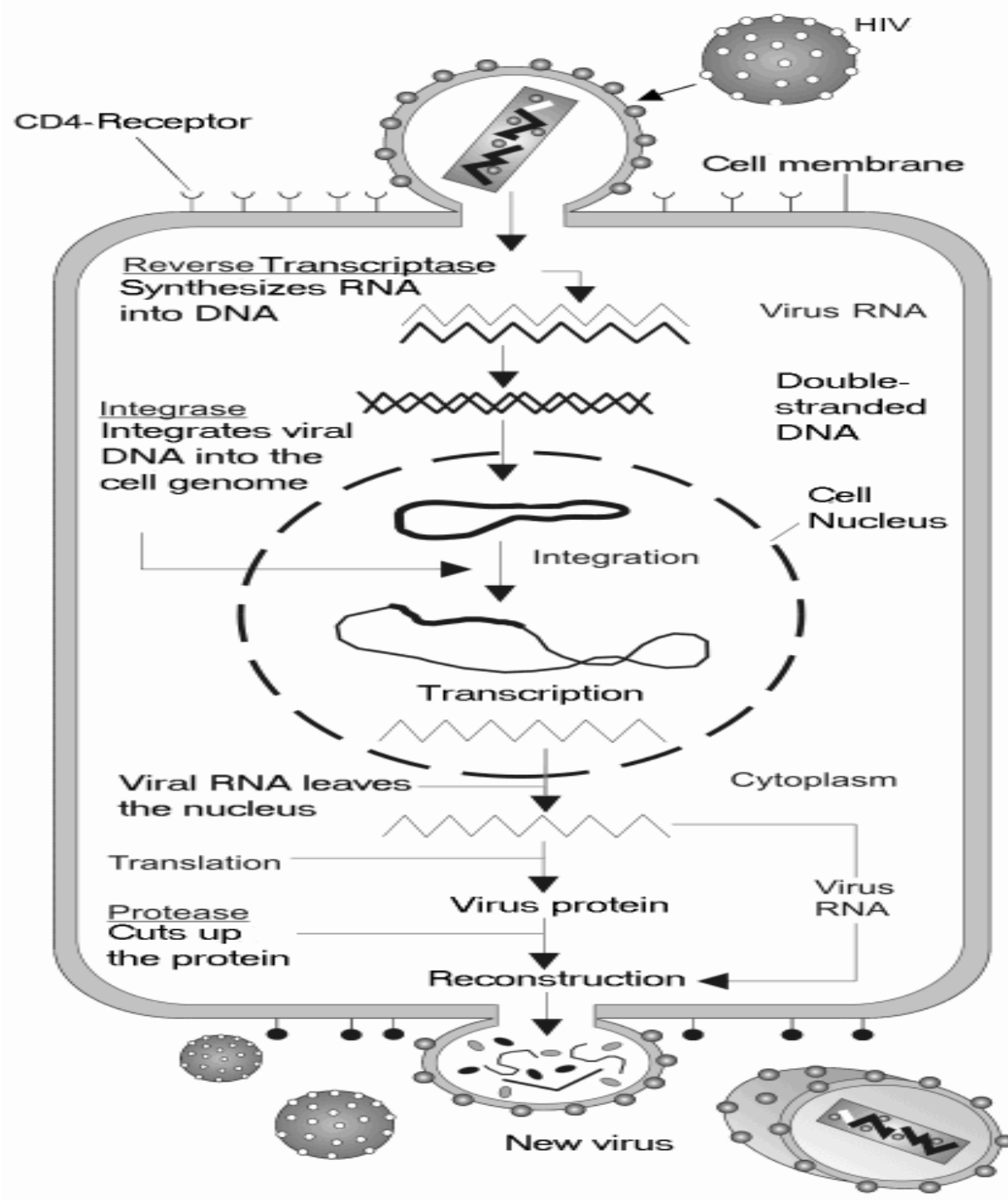
Replication cycle of Alpharetrovirus

- The flow of the early part of the replication cycle goes from receptor binding and internalization at the left through reverse transcription to integration of the proviral DNA. The late part of the replication cycle proceeds from the provirus through transcription
- and processing and translation of viral RNA to assembly and release of viral particles. Maturation of the released particles involves cleavage of viral polyproteins by PR (protease).





Replicative cycle



Questions???

Thanks