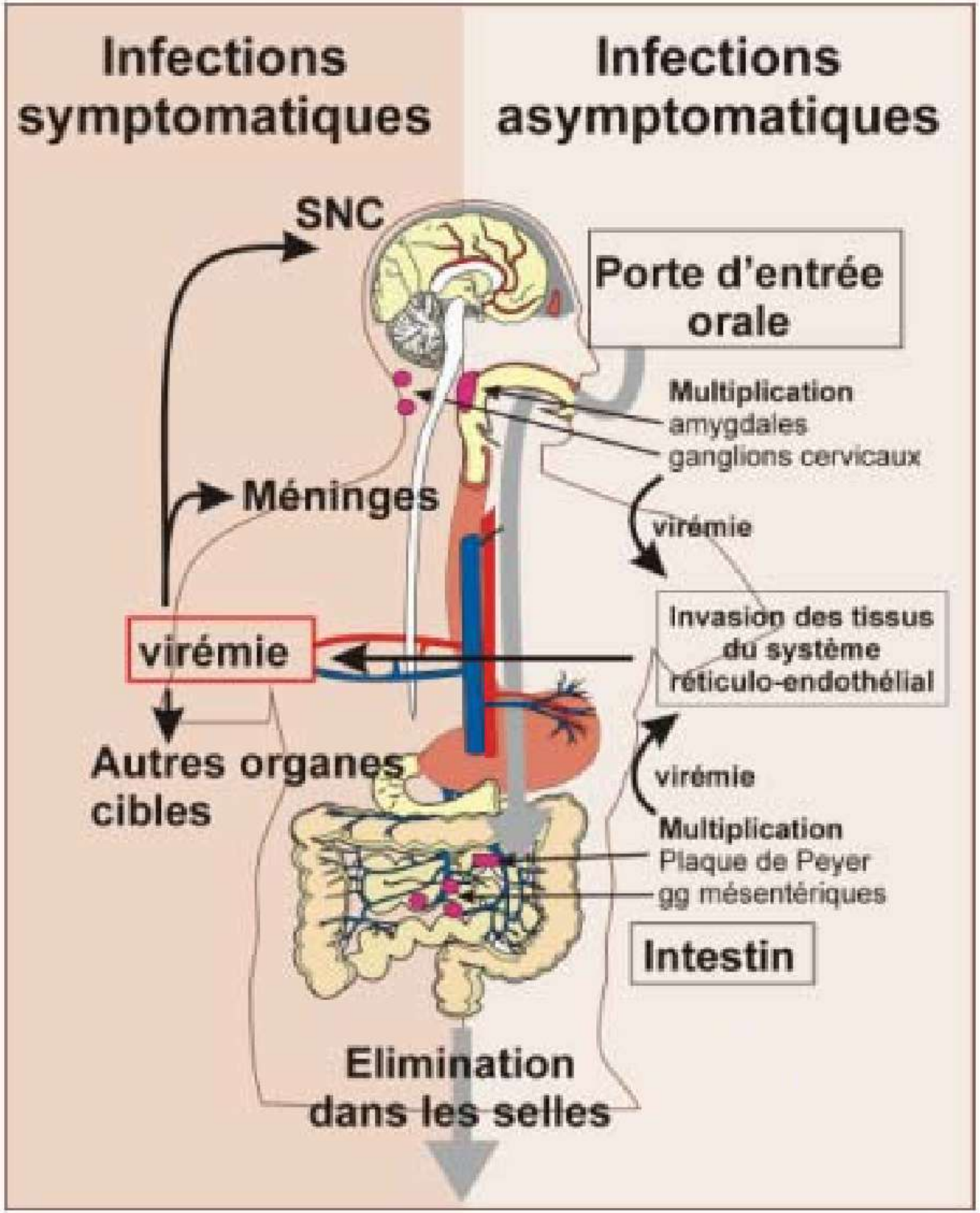
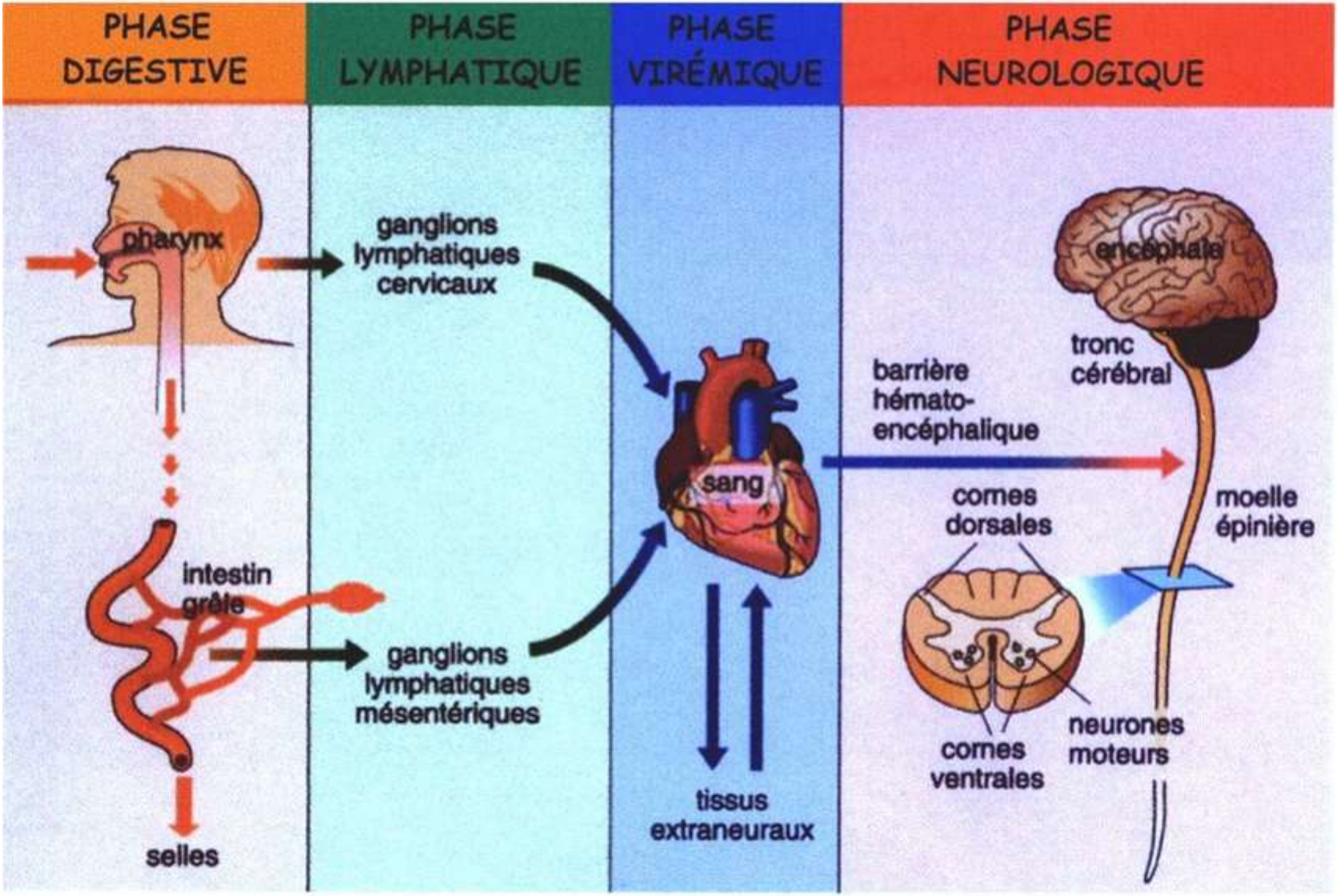
Evidence links poliolike disease in children to a common type of virus

21 Oct 2019

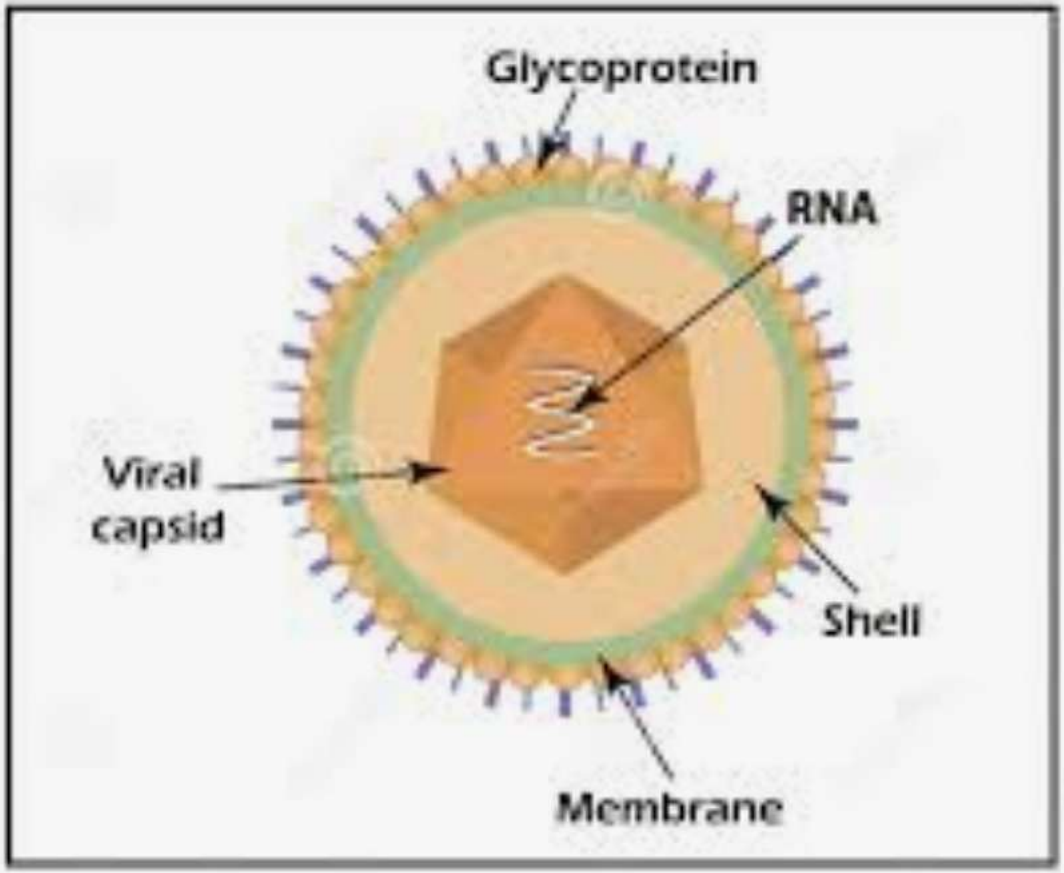
Researchers seeking the cause of mysterious cases of childhood paralysis seem to be closing in on a culprit. Since 2014, more than 500 children in the United States **have suddenly lost muscle control in their arms and legs**, a condition called acute flaccid myelitis (AFM), which can cause permanent disability. But the leading explanation—that a normally mild viral infection occasionally results in AFM—has been hard to prove. A new analysis of young patients' spinal fluid now offers evidence linking a group of common viruses known as enteroviruses to AFM. But questions remain about how such viruses damage nerves and why they seem to do so only rarely.


Infections symptomatiques
Infections asymptomatiques
SNC
Porte d'entrée orale
Multiplication
amygdales
ganglions cervicaux
Méninges
virémie
Invasion des tissus du système réticulo-endothélial
virémie
Autres organes cibles
virémie
Multiplication
Plaque de Peyer
gg mésentériques
Intestin
Elimination dans les selles

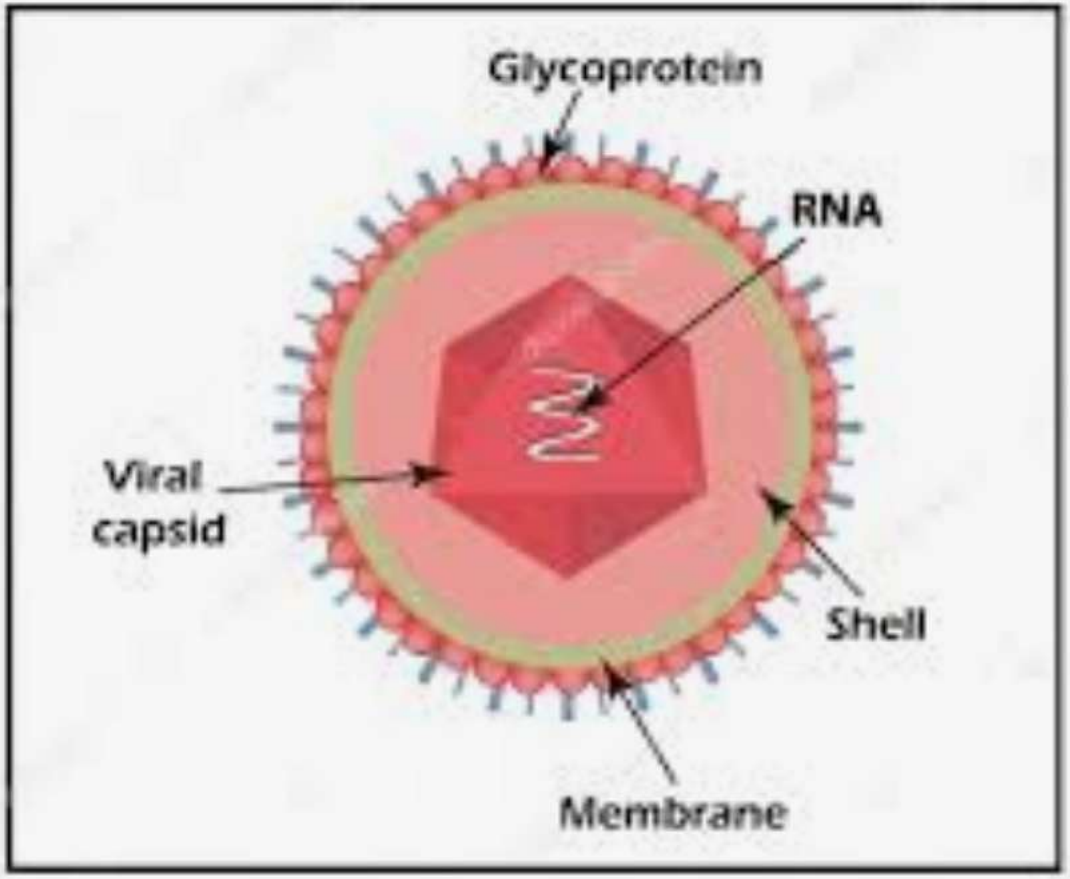

PHASE DIGESTIVE
PHASE LYMPHATIQUE
PHASE VIRÉMIQUE
PHASE NEUROLOGIQUE
pharynx
ganglions lymphatiques cervicaux
encéphale
tronc cérébral
barrière hémato-encéphalique
sang
cornes dorsales
moelle épinière
intestin grêle
ganglions lymphatiques mésentériques
neurones moteurs
cornes ventrales
tissus extraneuraux
selles

for indirect evidence of a viral invasion: antibodies in spinal fluid that would suggest the viruses had provoked an immune response. They analyzed fluid from 42 children with AFM and 58 children with other neurological diseases, who acted as controls. The researchers exposed each sample to viruses displaying peptides from thousands of different viruses on their surface. Only levels of antibodies to enterovirus peptides were significantly higher in the AFM patients, the researchers report today in *Nature Medicine*. Even though just one of the AFM patients had detectable enterovirus RNA in spinal fluid, **69% of them had elevated antibodies against enteroviruses** versus 7% of controls. "[Enterovirus]

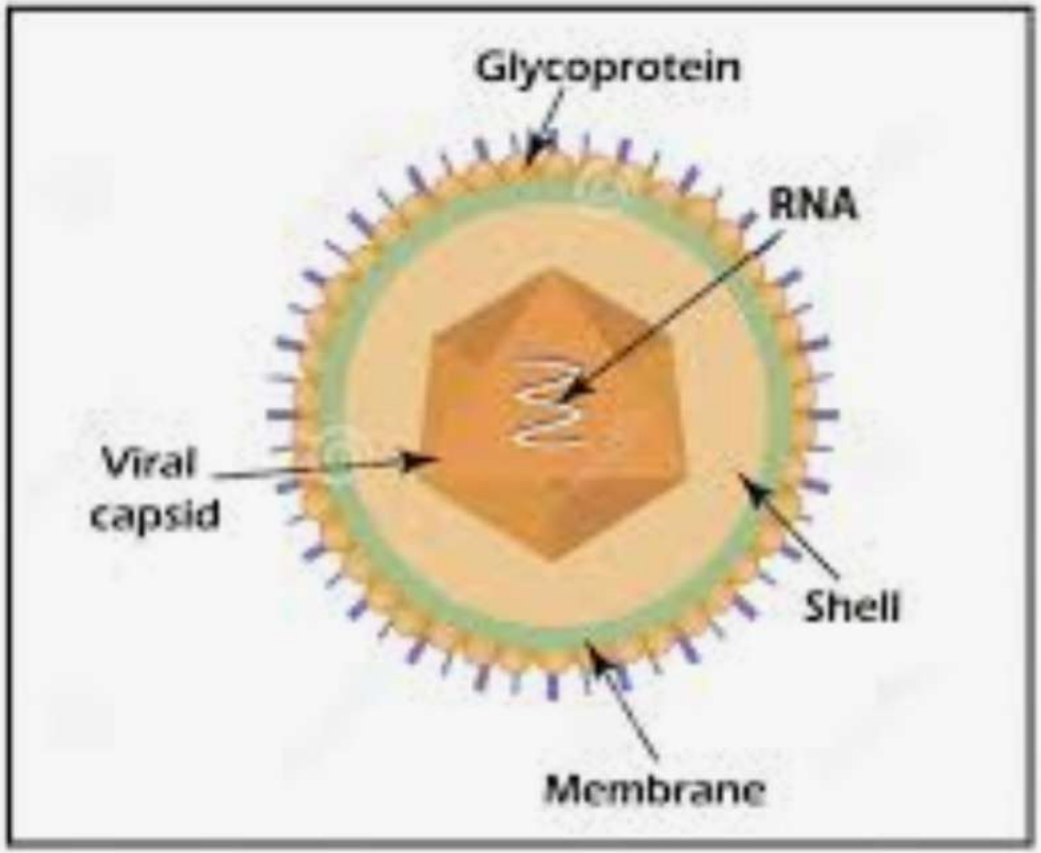
Structure of Enterovirus



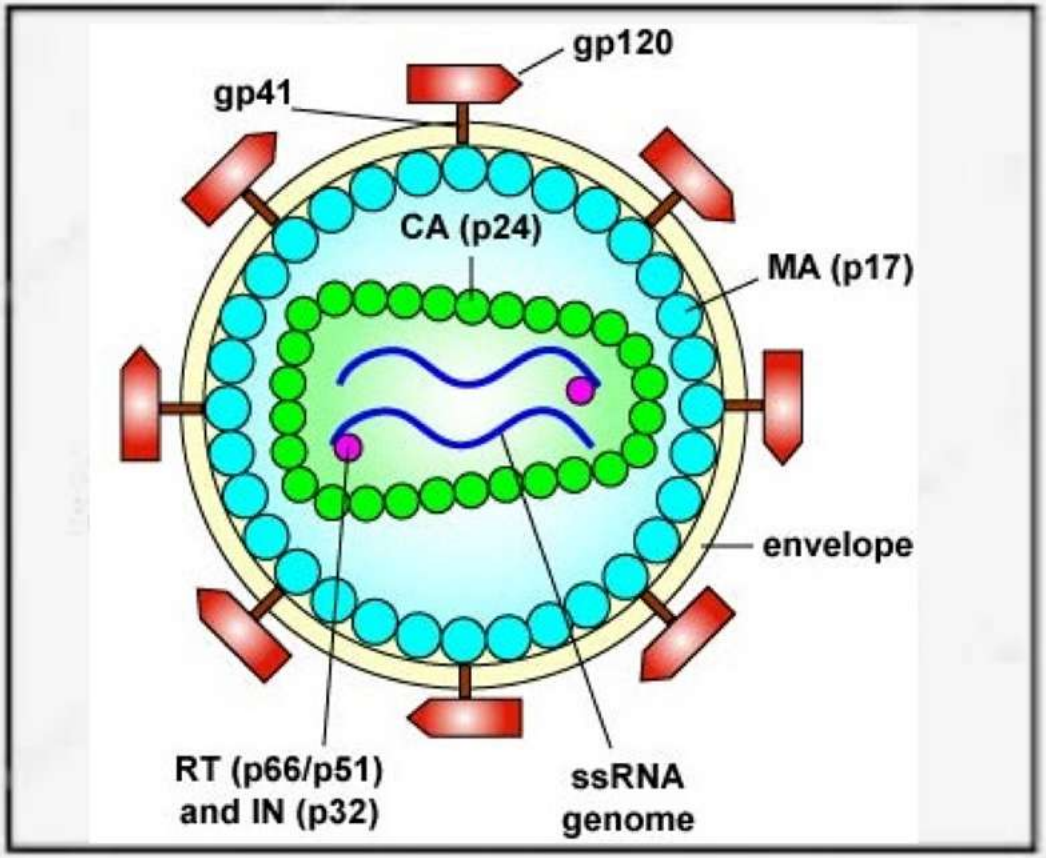
Structure of Poliovirus

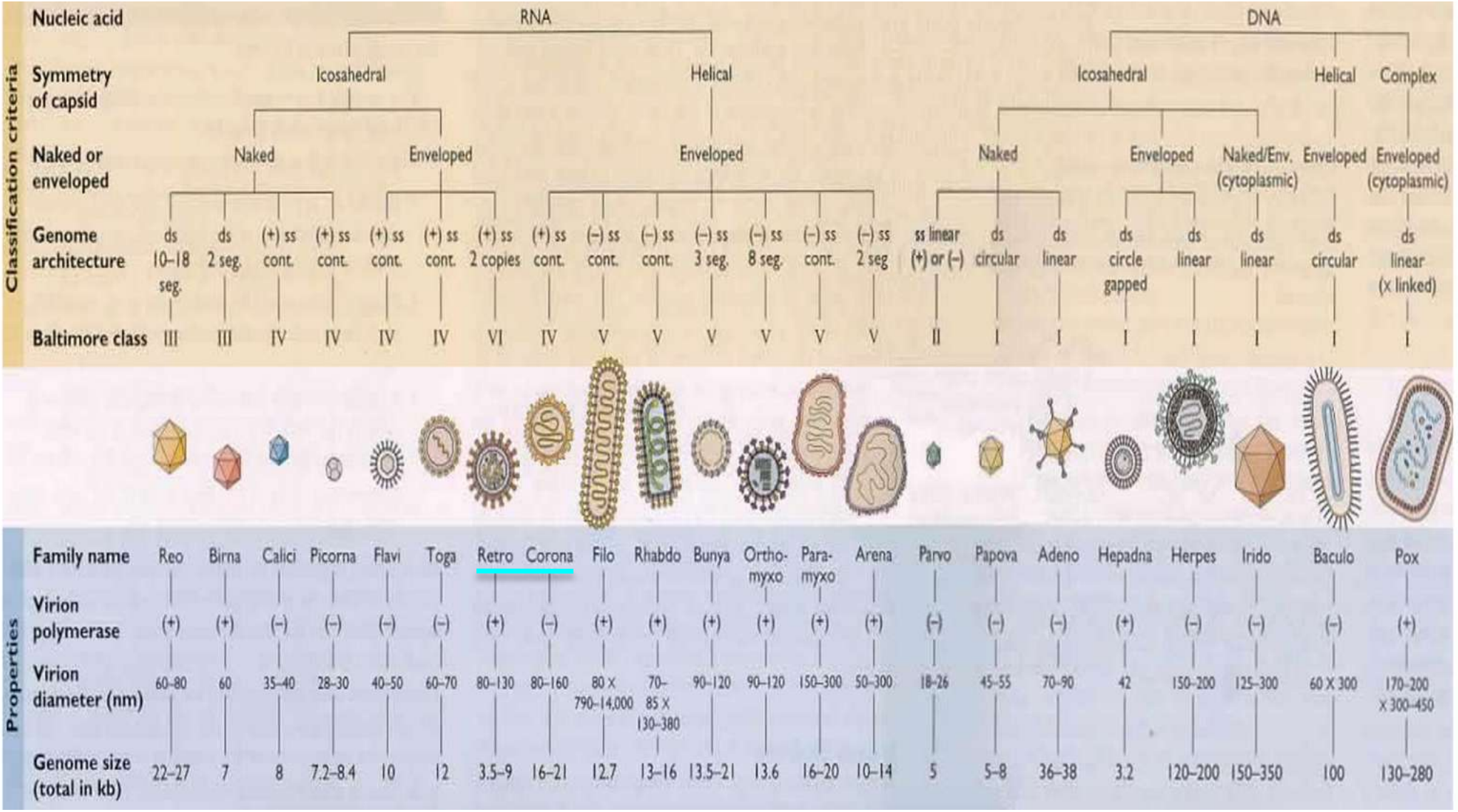


Structure of Enterovirus

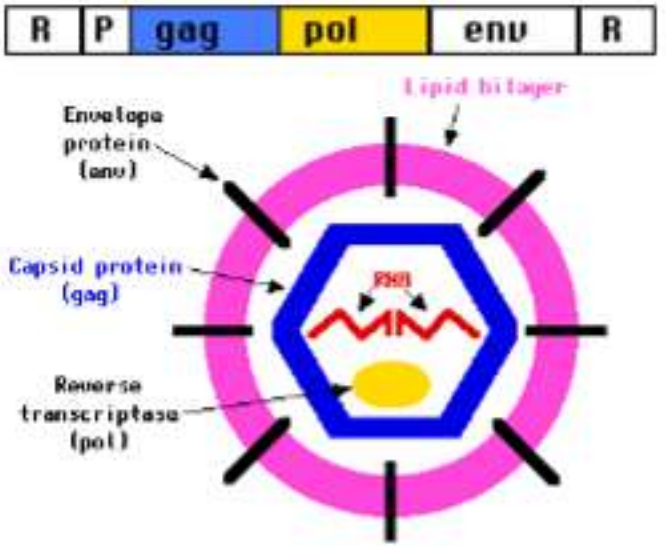


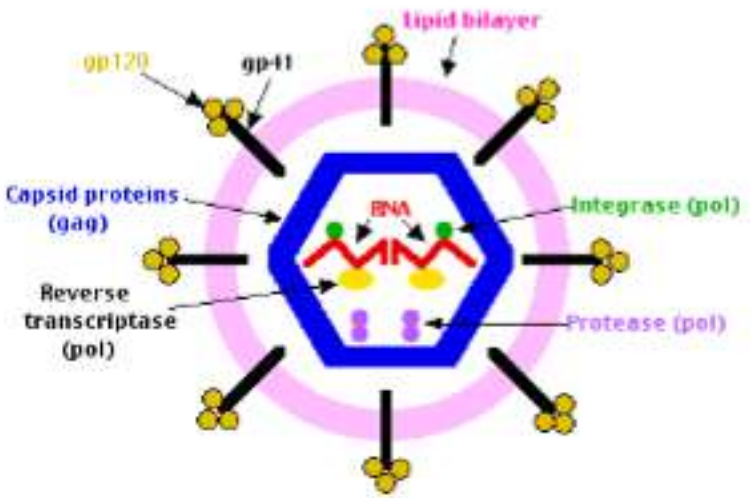
Structure of VIH

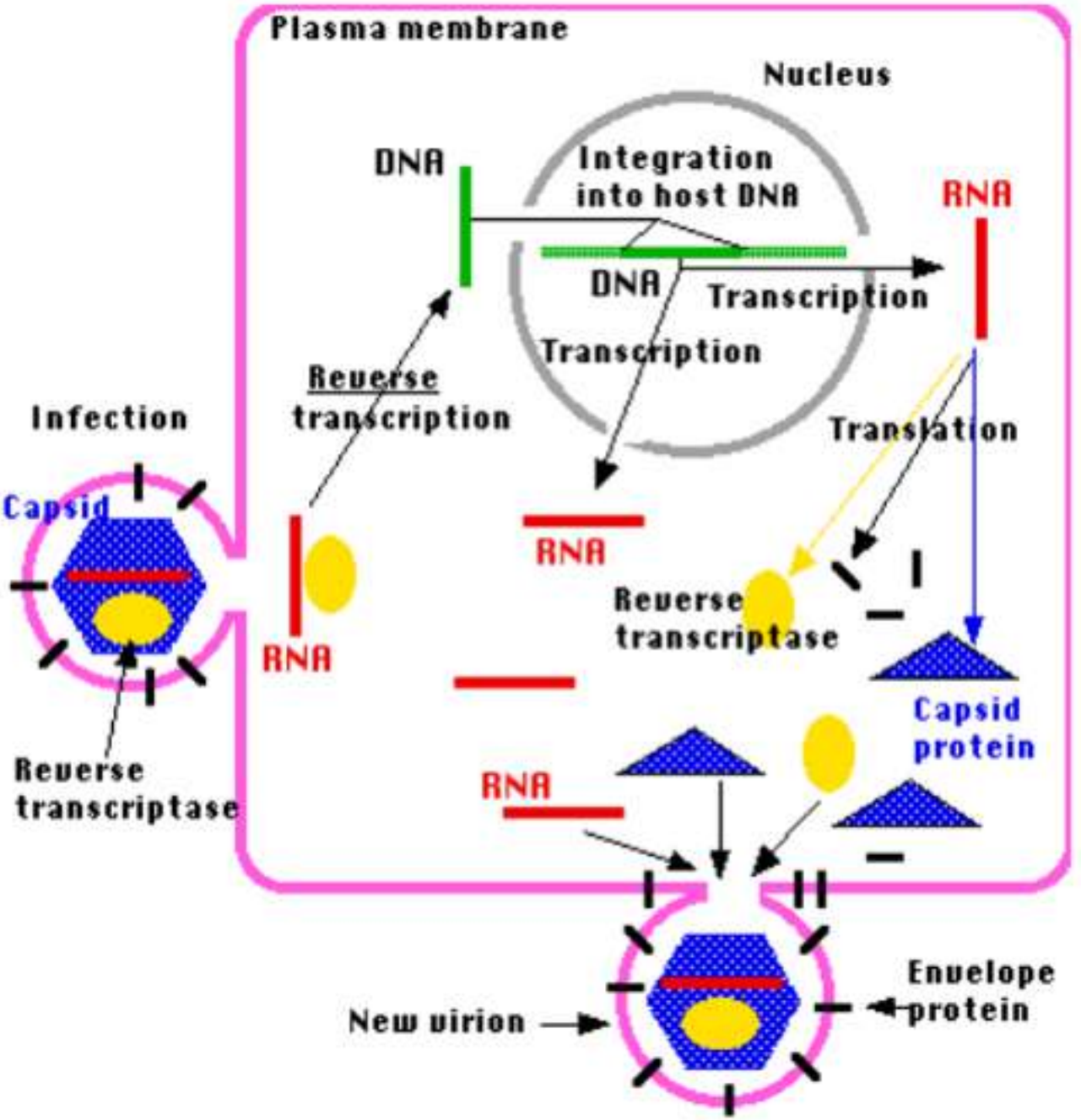


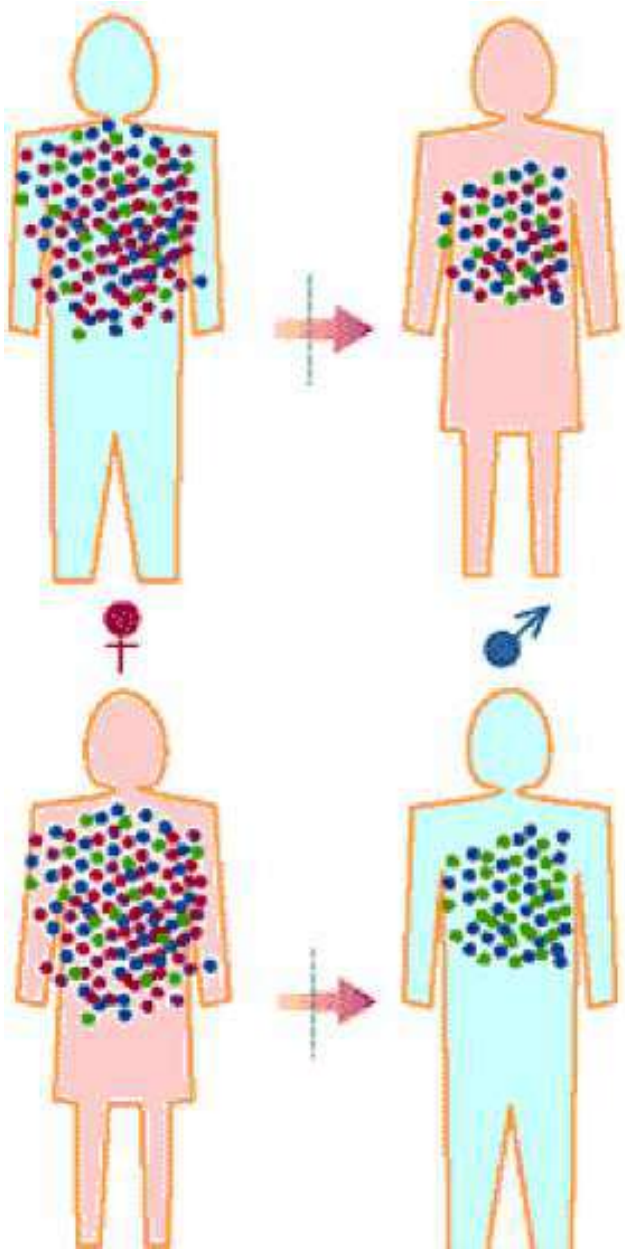

Classification criteria
Nucleic acid
RNA
DNA
Symmetry of capsid
Icosahedral
Helical
Icosahedral
Helical
Complex
Naked or enveloped
Naked
Enveloped
Enveloped
Naked
Enveloped
Naked/Env. (cytoplasmic)
Enveloped
Enveloped (cytoplasmic)
Genome architecture
ds 10–18 seg.
ds 2 seg.
(+) ss cont.
(+) ss cont.
(+) ss cont.
(+) ss cont.
(+) ss 2 copies
(+) ss cont.
(–) ss cont.
(–) ss cont.
(–) ss 3 seg.
(–) ss 8 seg.
(–) ss cont.
(–) ss 2 seg
ss linear (+) or (–)
ds circular
ds linear
ds circle gapped
ds linear
ds linear
ds circular
ds linear (x linked)
Baltimore class
III III IV IV IV IV VI IV V V V V V V II I I I I I I I
Properties
Family name
Reo Birna Calici Picorna Flavi Toga Retro Corona Filo Rhabdo Bunya Ortho-myxo Para-myxo Arena Parvo Papova Adeno Hepadna Herpes Irido Baculo Pox
Virion polymerase
(+) (+) (–) (–) (–) (–) (+) (–) (+) (+) (+) (+) (+) (+) (–) (–) (–) (+) (–) (–) (–) (+)
Virion diameter (nm)
60–80 60 35–40 28–30 40–50 60–70 80–130 80–160 80 X 790–14,000 70–85 X 130–380 90–120 90–120 150–300 50–300 18–26 45–55 70–90 42 150–200 125–300 60 X 300 170–200 X 300–450
Genome size (total in kb)
22–27 7 8 7.2–8.4 10 12 3.5–9 16–21 12.7 13–16 13.5–21 13.6 16–20 10–14 5 5–8 36–38 3.2 120–200 150–350 100 130–280

Nigeria has more HIV-infected babies than anywhere in the world. 12 Jun 2018


R
P
gag
pol
env
R
Lipid bilayer
Envelope protein (env)
Capsid protein (gag)
RNA
Reverse transcriptase (pol)

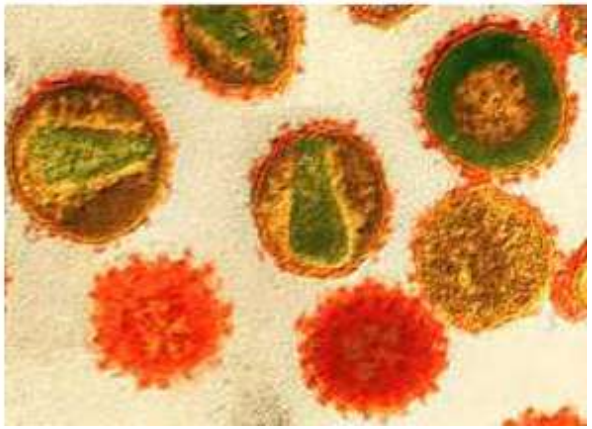

lipid bilayer
gp120
gp41
Capsid proteins (gag)
RNA
Integrase (pol)
Reverse transcriptase (pol)
Protease (pol)


Plasma membrane
Nucleus
DNA
Integration into host DNA
RNA
DNA
Transcription
Transcription
Reverse transcription
Translation
Infection
Capsid
RNA
RNA
Reverse transcriptase
Capsid protein
RNA
Reverse transcriptase
New virion
Envelope protein



Long, E. M., Martin, H. L., Kreiss, J. K., Rainwater, S. M. J., Lavreys, L., Jackson, D. J., Rakwar, J., Mandaliya, K. & Overbaugh, J. Gender differences in HIV-1 diversity at time of infection ***Nature Medicine*** **6**, 71 - 75 (2000).

Sexual transmission of HIV from man to woman results in a more diverse 'swarm' of variants (dots; different variants indicated with different colors) than does transmission from woman to man.



The HIV virus changes its outer protein coat (shown in orange above) to evade the immune system.

Derdeyn, C. A. *et al. Science*, **303,** 2019 - 2022, (2004). **|Homepage|**

Why some at high risk are still HIV-free