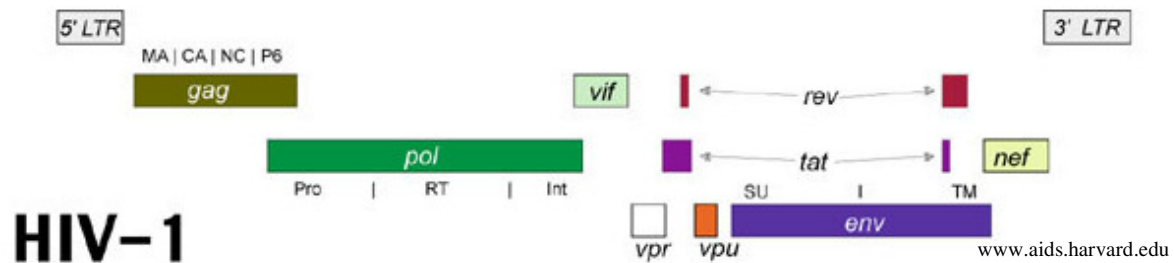


# The Nine Genes of HIV-1



## Three Major Genes

gag, pol, and env encode polyprotein precursors that are cleaved to yield the nucleocapsid core proteins, enzymes required for replication, and envelope core proteins.

**gag**: **g**roup specific **a**ntigen **g**ene. Encodes viral nucleocapsid proteins.

It plays a role in the maturation of the RNA genome.

**pol**: **p**olymerase gene. Encodes the viral enzyme, protease (Pro), reverse transcriptase (RT), and integrase (Int).

**env**: **e**nvelope gene. Encodes the viral envelope glycoproteins: extracellular (gp120) and transmembrane (gp41). The env protein is necessary for the virus to leave the cell to infect other cells.

## Regulatory Genes

tat and rev encode regulatory proteins that play a major role in controlling expression.

**tat**: **t**rans**a**ctivator regulatory gene. Encodes transactivator protein.

Tat acts as transcriptional regulator of viral gene expression by binding to the transactivating responsive sequence (TAR) RNA element. It regulates the elongation of transcription across the integrated viral genome.

**rev**: encodes a **r**egulator of **e**xpression of **v**iral protein.

Rev upregulates expression of gag, pol and env, while downregulating itself and tat.

**nef**: encodes a negative regulator protein. It was originally named **n**egative **f**actor.

## Virion Maturation Genes

vif and vpu encode proteins required for virion maturation.

**vif**: **v**iral **i**nfectivity

**vpu**: encodes **v**iral **p**rotein **U**.

## Transcription Activator Gene

vpr encodes a weak transcriptional activator

**vpr**: encodes **v**iral **p**rotein **R**.