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:** group specific antigen gene. Encodes viral nucleocapsid proteins. It plays a role in the maturation of the RNA genome.

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

**env:** envelope 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:** transactivator 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 regulator of expression of viral protein. Rev upregulates expression of gag, pol and env, while downregulating itself and tat.

**nef:** encodes a negative regulator protein. It was originally named negative factor.

**Virion Maturation Genes**
vif and vpu encode proteins required for virion maturation.

**vif:** viral infectivity

**vpu:** encodes viral protein U.

**Transcription Activator Gene**
vpr encodes a weak transcriptional activator

**vpr:** encodes viral protein R.
**Notes:**

**LTR** stands for long **terminal** repeat.

**CD** stands for 'cluster of differentiation'; the number that follows is arbitrarily assigned.

In the full designation, the cell type and nature and molecular weight of the antigen are given in brackets; for CD4, this is as follows: [T, gp55]. [From OMIM at NCBI].