The HIV life cycle

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HIV is a virus. Viruses are microscopic germs that are unable to reproduce (replicate) by themselves. Instead they need to find and infect a cell that will act as a host in which new viruses can be made. When HIV is outside a cell it is known as a virion and is surrounded by a protective envelope. The envelope surrounds a number of viral proteins and some genetic material - a 'blueprint' containing all the information necessary to make new viruses.
Viruses can be divided into two forms: those whose genetic material is made of DNA, and those whose genetic material consists of RNA (such as HIV). RNA viruses are called retroviruses. Their reproductive process involves an additional step that is not needed by DNA viruses.

Fusion

Viruses often have a specific cell in the host human, animal or plant that they particularly like to infect. The main cells that HIV infects are those carrying a molecule called CD4 on their surface. CD4 is found on immune cells, most particularly on T helper cells, which co-ordinate the immune system, and on macrophages, cells which roam the body engulfing bacteria and other germs.

HIV gets inside these cells by binding to the CD4 receptor using a molecule on the surface of the virus called gp120. Once HIV has bound to CD4, it activates other proteins on the surface of the human cell known as CCR5 and CXCR4 in order to complete its fusion with the cell.

Anti-HIV drugs which are designed to attack this stage of the HIV life cycle are called entry inhibitors, including co-receptor inhibitors (being researched at present) and fusion inhibitors such as T-20 (Fuzeon), the only one of its kind currently available.

Reverse transcription

Once fusion has occurred, the inside of the virus (the RNA and some important enzymes) is absorbed into the human cell. A viral enzyme called reverse transcriptase performs the process required to translate HIV's genetic material (RNA) into DNA.

In order to stop this process, two broad types of anti-HIV drugs – known as reverse transcriptase inhibitors– target this stage of viral reproduction:

1. Nucleoside analogue reverse transcriptase inhibitors (NRTI): AZT, ddI, 3TC, d4T, abacavir, FTC; or nucleotide reverse transcriptase inhibitors (NtRTI): tenofovir.
2. Non-nucleoside reverse transcriptase inhibitors (NNRTI): efavirenz and nevirapine.

Integration

The newly formed viral DNA is then integrated with the DNA of the human host cell using a viral enzyme called integrase. This allows HIV to reprogramme the human cell to make more HIV. New drugs called integrase inhibitors, which impede this stage of the HIV life cycle, are in the very early stages of development.

Transcription

In this stage, DNA is reprogrammed to form a new strand of viral RNA, sometimes called messenger RNA. Drugs called antisense nucleotides are being developed to target this stage.

Translation

Next the protein building blocks which will go on to form the new HIV particle are assembled within the human cell. These blocks are laid out in turn through the translation of the information contained in the messenger RNA.

Viral assembly

The protein building blocks are then cut into smaller pieces by a viral enzyme called protease. These pieces form the structure of the new HIV particle, including each of the enzymes and proteins needed to repeat the reproductive process. Once this assembly has occurred, the new viral particle buds off the human cell, floats off into the bloodstream and is able to infect other cells. It is estimated that about 10 billion new HIV virions are produced every day in people who are not on HAART of proven efficacy. The protease inhibitors (indinavir, ritonavir, saquinavir, nelfinavir, amprenavir, fosamprenavir, lopinavir, atazanavir, tipranavir) target this stage of the HIV lifecycle.

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POR FAVOR, FOTOCÓPIALO Y HAZLO CIRCULAR

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