

HUMAN IMMUNODEFICIENCY VIRUS (HIV)

- Since HIV was first recognized in 1981, it has claimed an estimated 27 million lives.
- 33.4 million people globally were living with HIV at the end of 2008, of which 60% live in sub-Saharan Africa.
- At the end of 2008 there were 83,000 HIV-positive people in the UK.

WHAT IS HIV?

HIV is an RNA retrovirus that infects specific white blood cells with the CD4 receptor on their surface (CD4+ cells). CD4 is hijacked by HIV which uses it to gain access to the cell.

Once inside the cell, the virus's genetic material, RNA, is converted to DNA in a process called reverse transcription. The viral DNA is then inserted into the host's DNA where it remains for the lifetime of the cell. The host cell synthesizes viral RNA and proteins, new HIV particles are assembled, which escape and infect other CD4+ cells. As the virus leaves the cell it disrupts the cell membrane leading to host cell death.

HIV is so destructive because it infects and destroys the white cells that are responsible for regulating other immune cells. This causes the individual to become severely immunocompromised, which leads to acquired immune deficiency syndrome (AIDS).

HOW IS HIV TRANSMITTED?

The three main routes for HIV transmission are:

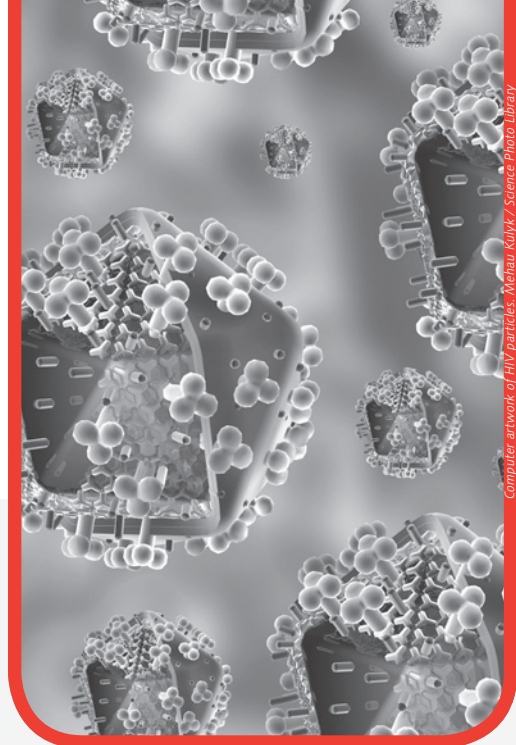
- Contaminated blood (for example between injecting drug users)
- Sex: vaginal, anal (and very rarely oral)
- From mother to child (either in pregnancy, during birth or via breast milk)

Worldwide, approximately 60% of new HIV infections are contracted through sex between men and women. The other cases are usually due to:

- Babies who acquire the virus from their mothers (10%)
- Drug users sharing needles (10%)
- Sex between men (5–10%)

HOW DOES THE DISEASE PROGRESS?

Stage	Duration	CD4+ cell count	Characteristics
1. Acute/primary	1 month	Falls then returns to normal	Symptoms are similar to those of glandular fever or flu, including fever, headache, lymph node enlargement and muscle pain.
2. Chronic/asymptomatic	7–11 years (but varies)	Normal	Asymptomatic. Many patients will be unaware they are infected.
3. Crisis/AIDS	Varies	Very low	Patients are severely immunocompromised, allowing opportunistic infections to develop.



Computer artwork of HIV particles. Mehar Kulkarni / Science Photo Library

AIDS

AIDS occurs when the virus has destroyed the immune system, leaving the patient highly susceptible to other life-threatening infections. It is defined by the occurrence of any of more than 20 opportunistic infections or HIV-related cancers. Tuberculosis (TB) is the most common infection and is the number one cause of death among HIV-infected people in Africa. TB kills nearly a quarter of a million people living with HIV each year.

Other opportunistic infections commonly associated with AIDS include candidiasis (or 'thrush'), Kaposi's sarcoma, fungal pneumonia, toxoplasmosis, infection by cytomegalovirus or herpes simplex virus. Further complications arise if patients are co-infected with other viruses such as hepatitis B and C.

HIV TESTS

Most labs use combination assays that detect the presence of host-generated antibodies against HIV as well as the virus itself. HIV proteins (antigens) are present in the blood before antibodies are produced (up to 3 months after infection), allowing infection to be detected sooner. Combination assays give a more conclusive result sooner after infection than traditional HIV tests which detect antibodies only.

VACCINES

There are many possible types of experimental HIV vaccines, although none have successfully passed a phase three clinical trial.

TREATING HIV

There is currently no cure for HIV infection, or a vaccine to prevent it. Treatment consists of a combination of three or more anti-retroviral drugs (ARVs). This combination therapy [also known as Highly Active Anti-Retroviral Therapy (HAART)] slows down the progression of HIV, prolonging the patient's life. There are currently 24 ARVs licensed for use.

The 2010 guidelines from the World Health Organization (WHO) promote earlier treatment for all patients, when their CD4+ cell count falls to 350 cells/mm³ or less, regardless of symptoms.

WHY IS A 'COCKTAIL' OF DRUGS REQUIRED?

HIV replicates very fast and is able to mutate rapidly to resist ARVs. Individuals may be infected with one or more different drug-resistant HIV strains and occasionally patients are infected with strains that are resistant to all 24 currently available ARVs. Patients must undergo resistance tests before and during treatment so their prescribed combination of drugs remains effective.

HIV IN THE UK

- Data from 2008 show an estimated 27% of HIV-positive individuals were unaware of their infection.
- Preventing the infections probably acquired in the UK, and subsequently diagnosed during 2008, would have reduced future HIV-related costs by £1.1 billion.

A GLOBAL VIEW OF HIV INFECTION

- The annual number of new HIV infections globally has declined by 30% – 2.7 million in 2008 compared to 3.5 million new infections at the pandemic's peak in 1996.
- From 2003 to 2010, the number of people receiving HIV treatment in low- and middle-income countries increased 12-fold, resulting in millions of lives saved.
- The provision of prophylactic ARVs to HIV-positive pregnant women has prevented an estimated 200,000 cumulative new HIV infections in the past 12 years.

SGM BRIEFINGS

The Society for General Microbiology (SGM) aims to highlight the important issues relating to microbiology to key audiences, including parliamentarians, policy-makers and the media. It does this through a range of activities, including issuing topical briefing papers. Through its many members, the SGM can offer impartial, expert information on all areas of microbiology.

Contact **Laura Udakis, SGM, Marlborough House, Basingstoke Road, Spencers Wood, Reading RG7 1AG** [tel. **+44 (0)118 988 1843**; email **l.udakis@sgm.ac.uk**]

Thanks are due to Dr Siobhan O'Shea, St Guy's and St Thomas' Foundation Trust, for her helpful comments on the text.

- Written by Laura Udakis
- Edited by Dariel Burdass
- Designed by Ian Atherton

society for general
Microbiology

