AIDS – Acquired Immuno Deficiency Syndrome

- The word AIDS stands for **Acquired Immuno Deficiency Syndrome**. This means deficiency of immune system, acquired during the lifetime of an individual indicating that it is not a **congenital disease** [disease or abnormality present from birth]. 'Syndrome' means a group of symptoms.
- AIDS was first reported in 1981 and in the last twenty-five years or so, it has spread all over the world.

Causes of AIDS

- AIDS is caused by the **Human Immuno Deficiency Virus (HIV)**, a member of a group of viruses called **Retrovirus**, which have an **envelope enclosing the RNA genome**.
- Transmission of HIV-infection generally occurs by

1. **sexual contact with infected person,**
2. **by transfusion of contaminated blood and blood products,**
3. **by sharing infected needles as in the case of intravenous drug abusers and**
4. **from infected mother to her child through placenta.**

- So, people who are at high risk of getting this infection includes

1. **individuals who have multiple sexual partners,**
2. **drug addicts who take drugs intravenously,**
3. **individuals who require repeated blood transfusions and**
4. **children born to an HIV infected mother.**

- It is important to note that HIV/AIDS is not spread by mere touch or physical contact; it spreads only through **body fluids**. It is, hence, imperative, for the physical and psychological well-being, that the HIV/AIDS infected persons are not isolated from family and society.
- There is always a time-lag between the infection and appearance of AIDS symptoms. This period may vary from a few months to many years (usually 5-10 years).

Mechanism of HIV Proliferation in Human Body

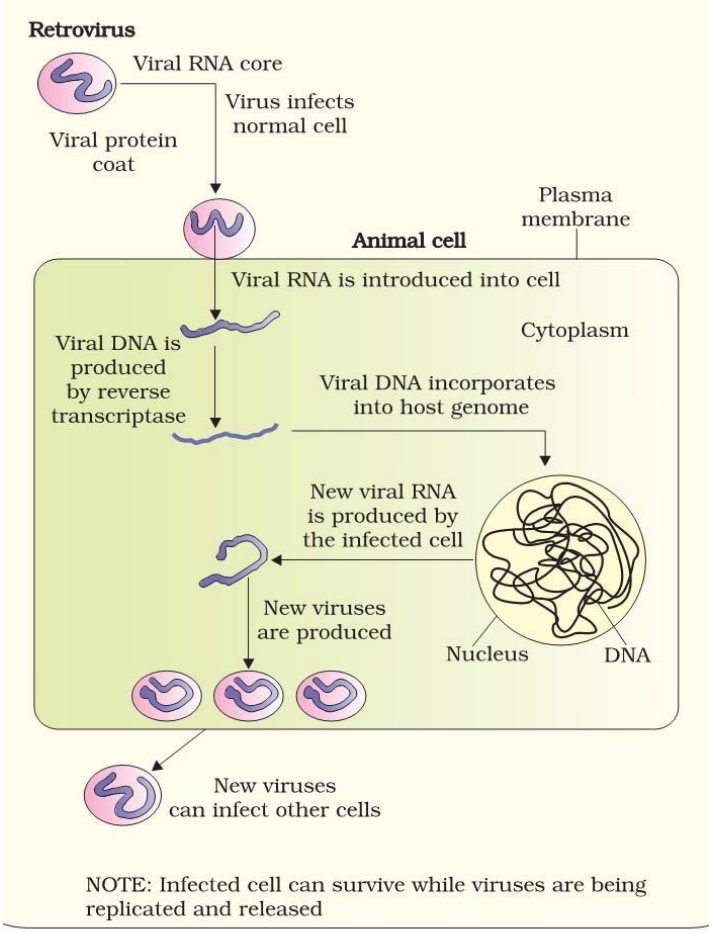


Figure 8.6 Replication of retrovirus

- After getting Into the body of the person, the virus enters into **macrophages** where **RNA genome** of the virus replicates to form **viral DNA** with the help of the enzyme **Reverse Transcriptase**.
- This viral DNA gets incorporated into host cell's DNA and directs the infected cells to produce virus particles. The **macrophages** continue to produce virus and in this way acts like a HIV factory.

- Simultaneously, HIV enters into helper **T-lymphocytes (Th)**, replicates and produce progeny viruses. The progeny viruses released in the blood attack other helper T-lymphocytes. This is repeated leading to a progressive decrease in the number of helper T-lymphocytes in the body of the infected person. During this period, the person suffers from bouts of **fever, diarrhoea** and **weight loss**.
- Due to decrease in the number of **helper** T lymphocytes, the person starts suffering from infections that could have been otherwise overcome such as those due to bacteria especially Mycobacterium, viruses, fungi and even parasites like Toxoplasma. The patient becomes so immuno-deficient that he/she is unable to protect himself/herself against these infections.

Prevention of AIDS

- A widely used diagnostic test for AIDS is **Enzyme Linked Immuno-Sorbent Assay (ELISA)**.
- Treatment of AIDS with **anti-retroviral drugs** is only partially effective. They can only prolong the life of the patient but cannot prevent death, which is inevitable.
- As AIDS has no cure, prevention is the best option. Moreover, HIV infection, more often, spreads due to conscious behavior patterns and is not something that happens inadvertently, like pneumonia or typhoid.
- Of course, infection in blood transfusion patients, new-borns (from mother) etc., may take place due to poor monitoring. The only excuse may be ignorance and it has been rightly said - "don't die of ignorance".
- In our country the **National AIDS Control Organization (NACO)** and other non-governmental organizations (NGOs) are doing a lot to educate people about AIDS.
- WHO has started a number of programmes to prevent the spreading of HIV infection.
- Making blood (from blood banks) safe from HIV, ensuring the use of only disposable needles and syringes in public and private hospitals and clinics, free distribution of condoms, controlling drug abuse, advocating safe sex and promoting regular check-ups for HIV in susceptible populations, are some such steps taken up.
- Infection with HIV or having AIDS is something that should not be hidden - since then, the infection may spread to many more people.
- HIV/AIDS-infected people need help and sympathy instead of being shunned by society.
- Unless society recognizes it as a problem to be dealt with in a collective manner - the chances of wider spread of the disease increase manifold.
- It is a malady that can only be tackled, by the society and medical fraternity acting together, to prevent the spread of the disease.

Cancer

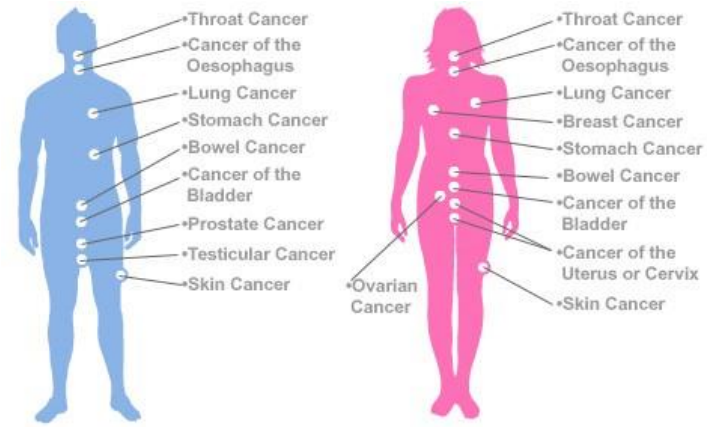
- Cancer is one of the most dreaded diseases of human beings and is a major cause of death all over the globe.
- More than a million Indians suffer from cancer and a large number of them die from it annually.
- The mechanisms that underlie development of cancer or **oncogenic** transformation of cells, its treatment and control have been some of the most intense areas of research in biology and medicine.
- In our body, cell growth and differentiation is highly controlled and regulated. In cancer cells, there is **breakdown** of these regulatory mechanisms.
- Normal cells show a property called **contact inhibition** by virtue of which contact with other cells inhibits their uncontrolled growth.
- Cancer cells appears to have lost this property of contact inhibition. As a result of this, cancerous cells just continue to divide giving rise to masses of cells called **tumors**.

Types of Tumors

- Tumors are of two types: **benign** and **malignant**.
- Benign tumors normally remain confined to their original location and **do not spread** to other parts of the body and cause little damage.
- The malignant tumors, on the other hand are a mass of **proliferating cells** called **neoplastic** or **tumor cells**. These cells grow very rapidly, invading and damaging the surrounding normal tissues.
- As these cells actively divide and grow they also starve the normal cells by competing for vital nutrients.
- Cells sloughed from such tumors reach distant sites through blood, and wherever they get lodged in the body, they start a new tumor there. This property called **Metastasis** is the most feared property of malignant tumors.

Causes of Cancer

- Transformation of normal cells into **cancerous neoplastic cells** may be induced by physical, chemical or biological agents. These agents are called **carcinogens**.
- **Ionizing radiations** like **X-rays** and **gamma rays** and **non-ionizing radiations** like **UV** cause DNA damage leading to neoplastic transformation.
- The chemical carcinogens present in tobacco smoke have been identified as a major cause of lung cancer.
- Cancer causing viruses called **oncogenic viruses** have genes called **viral oncogenes**.
- Furthermore, several genes called **cellular oncogenes (c-onc) or proto oncogenes** have been identified in normal cells which, when activated under certain conditions, could lead to oncogenic transformation of the cells.



Cancer Detection and Diagnosis

- Early detection of cancers is essential as it allows the disease to be treated successfully in many cases.
- Cancer detection is based on **biopsy** and histopathological studies of the tissue and blood and bone marrow tests for increased cell counts in the case of **leukemias**.
- In biopsy, a piece of the suspected tissue cut into thin sections is stained and examined under microscope (histopathological studies) by a pathologist.
- Techniques like **radiography (use of X-rays)**, **CT (computed tomography)** and **MRI (magnetic resonance imaging)** are very useful to detect cancers of the internal organs.
- Computed tomography uses **X-rays** to generate a three-dimensional image of the internals of an object.
- MRI uses strong **magnetic fields** and **non-ionising** radiations to accurately detect

pathological and physiological changes in the living tissue.

- **Antibodies** against cancer-specific antigens are also used for detection of certain cancers.
- Techniques of molecular biology can be applied to detect genes in individuals with inherited susceptibility to certain cancers. Identification of such genes, which predispose an Individual to certain cancers, may be very helpful in prevention of cancers.
- Such individuals may be advised to avoid exposure to particular carcinogens to which they are susceptible (e.g., tobacco smoke in case of lung cancer).

Treatment of cancer

- The common approaches for treatment of cancer are **surgery, radiation therapy** and **immunotherapy**.
- In radiotherapy, tumor cells are Irradiated lethally, taking proper care of the normal tissues surrounding the tumor mass.
- Several chemotherapeutic drugs are used to kill cancerous cells. Some of these are specific for particular tumors. Majority of drugs have side effects like hair loss, anemia, etc.
- Most cancers are treated by combination of surgery, radiotherapy and chemotherapy.
- Tumor cells have been shown to avoid detection and destruction by immune system. Therefore, the patients are given substances called **biological response modifiers** such as **a-interferon** which activate their immune system and help in destroying the tumor.