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- Many serious infectious diseases also have no effective vaccines. These include malaria, trypanosomiasis and AIDS
- In India, vaccines are generally produced at Hoffkins Institute at Mumbai and Virus Institute at Pune
- National Institute of Immunology ( NII), New Delhi is involved in the production of antifertility vaccine kits to detect pregnancy and infectious disease etc.

## DISORDERS OF IMMUNE SYSTEM

### AUTOIMMUNITY ( Auto immune diseases)

- Auto immunity is an abnormal immune response against self antigens. When the cell acts as antigens in the same body then they are called autoantigens
- The nature of auto immune diseases depends on the autoantigens involved. For example, if the autoantigens are RBC then the body destroys its own RBCs, resulting in chronic anemic, if the autoantigens are muscle cells then it results in the destruction of its own muscles resulting in severe weakness ( myasthenia gravis); if the autoantigens are liver cells, then it results in chronic hepatitis, etc. Other autoimmune diseases are insulin dependent diabetes, Addison's disease, ulcerative colitis and rheumatoid arthritis

### ALLERGY ( Hypersensitivity)

- Allergy is the inappropriate immune response of person to harmless substances coming in contact with the body or entering the body from the environment or in food or in medicine
- The substances which causes allergic reaction are called allergens. They are generally weak antigens. The common allergens are dust, dust mites, cat, pollen, feathers, fur, venom etc.
- Allergic reaction depends on the nature of the allergen. The common allergic reactions are inflammation of mucous membrane, sneezing, gasping, running of eyes, irritation of upper respiratory tract, itching, skin rash
- Allergy involves mainly IgE antibodies and histamine. It causes marked dilation of all the peripheral blood vessels and the capillaries becomes highly

permeable so that large amounts of fluid leak out from the blood into tissues. The blood pressure decreases drastically often resulting in the death of the individual within a short time

- Hay fever : In this allergic form, there is swollen, reddened, running eyes and nose. The drugs called antihistamines are of major importance in treatment.
- Asthma: The tissue surrounding the respiratory tubes in the lungs swell up and compress the tubes. Hence there is difficulty in breathing. Antihistamine drugs are also given in this disease

### IMMUNODEFICIENCY

#### Severe combined immune deficiency ( SCID)

- Severe combined immunodeficiency ( SCID) represents a group of rare, sometimes fatal congenital disorders characterized by little or no immune response
- It is a defect in the specialized white blood cells ( B and T-lymphocytes)
- Without a functional immune system, SCID patients are susceptible to recurrent infections such as pneumonia, meningitis and chicken pox. Though invasive, new treatment such as bone marrow and stem cells transplantation save as many as 80% of SCID patients.
- Sometimes new born children are without T-cells and B-cells. These children are susceptible to various infections
- SCID is caused by a defect in the gene that codes for the enzyme adenosine deaminase on chromosome number 20. Lack of the enzyme adenosine deaminase (ADA). Means that the substrate for this enzyme accumulate in the cells. Immature lymphoid cells of the immune system are particularly sensitive to the toxic effects of these unused substrates, so fail to reach maturity.
- As a result, the immune system of the afflicted individual is severely compromised or completely lacking. Lack of this enzyme makes the body defenseless against infections.
- SCID is the first genetic disorder to be combated with gene therapy.

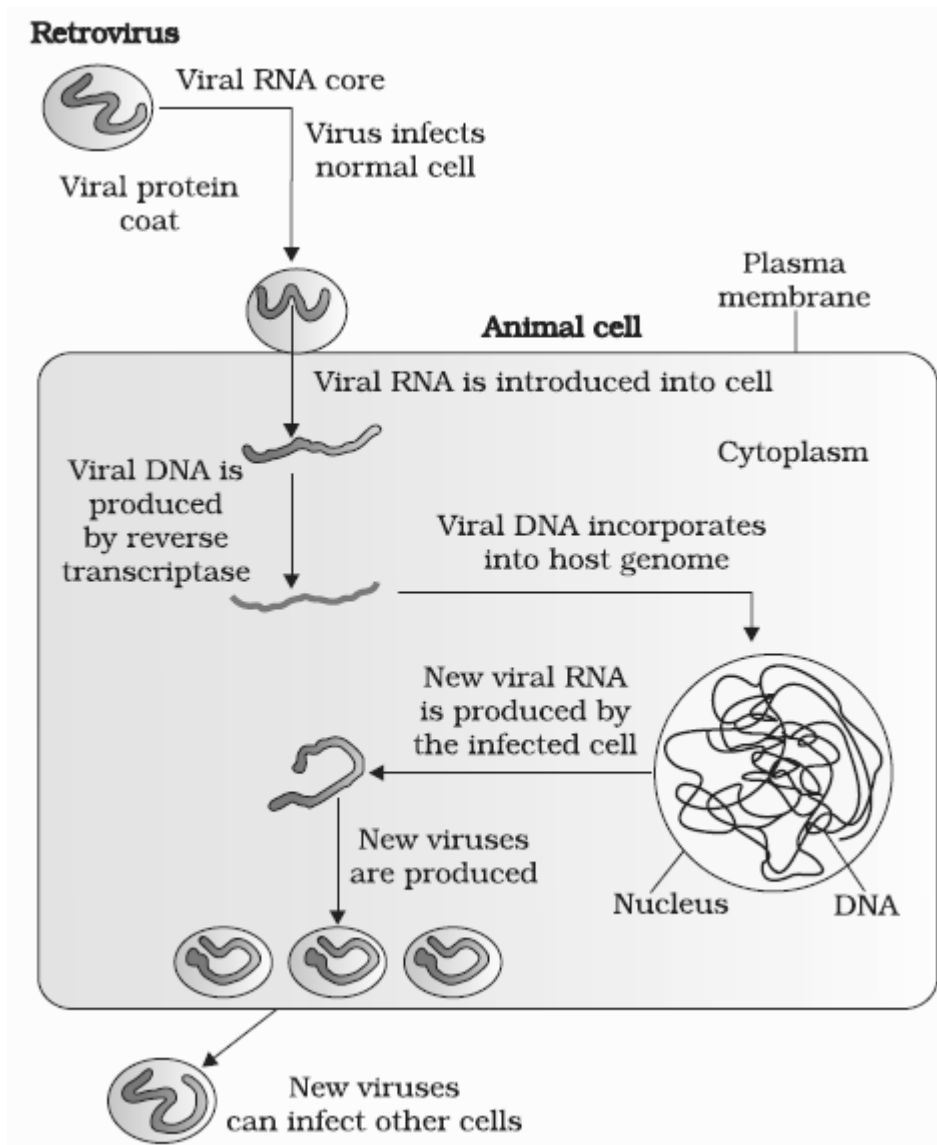
#### Acquired immune deficiency syndrome ( AIDS)

- AIDS is a disorder of cell mediated immune system of the body. There is a reduction in the number of helper T-cells which stimulate antibody production of B-cells. This results in loss of natural defense against viral infection
- AIDS infection were detected in India for the first time in prostitutes of Chennai in 1986.

- Virus responsible for AIDS was identified and named HIV

### AIDS virus – HIV

- HIV virus belong to the retrovirus family, a family of single stand RNA viruses distinguished by possession of viral reverse transcriptase that transcribes viral RNA into provirus DNA which is integrated into the host cell genome.
- HIV is 100 to 140 nm in diameter, has a cylindrical core, single-stranded linear RNA and reverse transcriptase enzyme surrounded by glycoprotein coat, double lipid membrane and two protein coats
- Virus of AIDS was isolated and identified in green monkey by Prof. Luc Montagnier in France in 1983 and almost the same time by Prof Robert Gallo in USA ( 1984 )
- HIV is subdivided into two distantly related types, HIV-1 and HIV-2. HIV-1 is the predominant world wide isolated from individuals with AIDS or at high risks for the development of AIDS. HIV-2 is endemic among people in west Africa.



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- HIV -1 and HIV-2 differ in their ability to cause disease and their geographical distribution
- Both, HIV-1 and HIV-2, cause the body to produce antibodies with three to six months, although the period between initial infection and illness may be longer in case of HIV-2
- The incubation period of HIV is 15 -57 months. Average incubation period is 28 months

#### Transmission

- AIDS is transmitted only by a constant of infected cells containing blood of a patient with the blood of a healthy person as in:
  - (i) Unprotected sexual intercourse with an infected person
  - (ii) Use of contaminated needles and syringes to inject drugs or vaccines.
  - (iii) Use of contaminated razors for shaving

- (iv) Use of infected blood or blood product for transfusion
- (v) Organ transplant
- (vi) Parturition from mother to baby due to rupturing of blood vessels
- The sexual route of transmission accounts for over 75% of infections
- AIDS can not be acquired by
  - i) Insect bites
  - ii) Crowded transport
  - iii) Shaking hands
  - iv) Sharing towels
  - v) Coughing and sneezing
  - vi) Kissing and embracing
  - vii) Sharing utilities

#### Signs and symptoms of AIDS

- People infected with AIDS virus remain apparently well even after infection. They may not show any physical symptoms of illness for a long time
- When the AIDS virus enters the blood stream it begins to attack certain white blood vessels and antibodies. These antibodies can be detected by a specific blood test usually two weeks to three months after infection.
- In some people, the protective immune system may be destroyed by the virus and then other germs that ordinarily do not attack cause opportunistic disease to infect and destroy the body.
- Opportunistic infections occur during the last phase of HIV, which can occur up to 10 to 11 years after the infection. These infections are described as AIDS related complex (ARC)
- AIDS virus may attack nervous system causing damage to the brain resulting in memory loss and other neurological disorders.
- Some early signs may be persistent cough and fever associated with difficulty in breathing.
- Certain cancers
- Tuberculosis
- A typical pneumonia by fungus pneumocystis carinii
- Brain damage
- Night sweats and tiredness
- Swollen lymph nodes and fever
- Weight loss, chronic diarrhea that last for more than one week, loss of appetite and lack of resistance to infection.

### Diagnostic test

- HIV is diagnosed by testing the blood for the presence of antibodies to the virus.
- ELISA ( Enzyme -linked immunosorbent assay) screening test is the initial one. The test works by detecting antibodies, substances, proteins which are produced in the blood, when the virus is present.
- Western blot test will confirm the result of repeated test through detection of HIV proteins.
- Viral load test measures the amount of virus in the blood which will help in determining the probable progression of the disease

### Treatment

- However, no specific treatment has been found so far, and the mortality from AIDS is virtually 100%
- A combination of three and more antiretroviral agents, called triple therapy or highly active anti-retroviral therapy ( HAART ), has been highly effective in reducing the number of HIV particles in blood stream though HAART is not cure for HIV.

### Prevention

- The following steps may help in controlling this dreaded disease:
  - i) People should be educated about AIDS transmission, advantage of condoms.
  - ii) Disposable needles and syringes should be used
  - iii) High risk group should be refrain from donating blood
  - iv) Sexual habits should be changed
  - v) Before receiving blood, ensure that it has been screened for HIV
  - vi) While getting dental treatment, insist on the use of thoroughly sterilized equipment.
- December 1 is celebrated every year as the world AIDS Day.