10. VIRUSES (VIRUS-POISON)

CONNECTING LINKS BETWEEN LIVING &r NON-LIVING ORGANISMS

Viruses are the. smallest Ultra Microscopic organisome, which live as parasites. They were discovered by Iwanowsky and the term 'virus' was coined by Beijernick.

Viruses show different shapes. Based on the type of host, viruses are of 5 types.

- **Rant Virus :** Principally attacks plants. It contains single stranded RNA.
- **Animal Virus :** It attacks Animals. It contains double stranded DNA.
- **Bacteriophages :** Viruses which infect bacteria. It contains DNA.
- **Cyanophages :** Viruses infecting blue-green algae.
- **Zymophases :** Viruses infecting yeast.

Note : RNA - Ribo-Nucleic Acid
DNA - Deoxy Ribo Nucleic Acid

STRUCTURE OF VIRUS :

Viruses are nothing but nucleoproteins. They lack cellular organisation. They do not have metabolic activity of their own. They reproduce by using the metabolic machinery of the host cell they infect. A virus consists of just a nucleic acid &'protein. Nucieie acid forms the central core of'virus

Protein coat of virus is called CAPSID

Viruses have both living & non living characters.

LIVING CHARACTERS

1. Viruses live as obligate parasites
2. They can reproduce
3. They can undergo mutations (Sudden changes in heriditary materials are mutations)

NON-LIVING CHARACTERS

1. They exist as crystals outside the cell of host.
2. They do not show cellular organisation
3. They do not show respiration and other metabolic activities

Some important diseases caused by VIRUSES ;

PLANT Diseases

1. Tobacco Mosaic Virus (TMV)
2. Tobacco nucrosis
3. Swollen shoot of cocoa
4. Leaf roll of Potato
5. Leaf curl of papaya
6. Spike disease of Sandal Wood
7. Bunchy top of Banana

ANIMAL Diseases

1. Chicken Sarcoma disease
2. Chicken Polyoma.
3. Foot & Mouth disease of cattle

HUMAN DISEASES

1. Small Pox
2. Chiken pox
3. Rabies
4. Cold
5. Polio
6. Measles
7. Mumps
8. Encephalitis
9. Conjuntivitis
10. AIDS.
11. Dengue Fever
12. SARS

TRANSMISSION OF DISEASES :

Virus transmitting agents are called carriers

Eg : 1. Flies 2 Mosquitoes. They simply carry virus from one place to other place, without being infected by that virus.

Polluted air, water & food stuffs help the dissemi-nation of virus.

VARIOUS HUMAN DISEASES AND THEIR DIAGNOSTIC INSTRUMENTS

Electro Cardio Graph (ECG):

It senses the electrical forces produced by the heart muscle during contraction and relaxation & records them from the body surface.

Electro Encephalo Graph (EEG):

It represents spontanious electrical activity of the drain as recorded from the electrodes placed on the scalp. Normal EEG wave form shows- certain characterstic features which can be described in terms of the frequencies, amplitude, morphlogy of the signals. The changes in these varieties show the disease of brain. EEG is an index of brain function.

Auto Analysers :

These are to estimate the various bio-chemical substances like Glucose, Urea, Cholesterol, En-zymes arid other proteins.

COMPUTED TOMOGRAPHY SCANNING (CT Scanning) :

X-ray images do not sufficiently differentiate soft tissue structures. These draw backs have been eliminated to a large extent by CT Scanning which uses X-rays but employs a computer for recon-structing the image instead of directly recording it an a photographic film. It is extremely useful in detecting tumours and monitoring the extent of their spread to neighbouring tissues and, organs.

Position Emission Tomographic Scanning (PET):

It is also a computerised imaging technique. Unlike the static anatomjical images, produced by CT scan, PET

images give quanitative regional information on the metabolic and physiological process.

Nuclear Magnetic Resonance Imaging (NMR):

The Magnetic resonance generated by the Nuclear Hydrogen; atoms present in abundance • in all biological tissues subjected to an externai mag-netic field is the basis of this Imaging technique.

GENETIC ENGINEERING, CLONING AND GENOMICS

Genetic Engineering : It is essentially the alteration of the genetic make-up of cells deliberately. It involves tools and technologies of molecular biology for cleaning and rejoining DNA sequences from two or more different organisms. These genetically modified DNA fragments are called recombinant DNA molecules.

Recombinant DNA Technology : The various steps involved in recombinant DNA teclinology are briefly discussed in the following account. At first, a useful DNA segment (i.e., a gene) is_ isolated from an organism. The usefulness is evaluated by studying the functions of various genes, a process called sequencing. The specific segment of the DNA can be obtained by cutting the double-stranded DNA at specific sites with the help of enzymes called Restriction Enyzmes.°The enzyme separates the DNA molecules lengthwise containing a specific, sequence of base pairs. The next step is to obtain a DNA segment from another organism which is a vector (or a carrier). These two DNA segments (i.e., genes) are then spliced (i.e., joined) with the help of an enzyme called Ligase. The hybrid molecule is called the recombinant DNA. The recombined DNA molecule is then inserted into a cell. The recombinant DNA then multiplies in the ceil as the cell divides.

In the course of inserting the recombined DNA into a cell, phsmids arc considered to be good carriers or vectors. Plasmids are small circular DNA molecules of bacteria. A plasmid is isolated and split by restriction enzymes. This split part of the plasmid is then joined or spliced to a DNA fragment of anothei organism using ligase. These hybrid DNA plasmids are then mixed with bacterial cells which then take up the hybrid molecule. The genetically modified bacterial cells multiply. The bacteria are then inserted into the desired organism (say a human being) and they now infect the human cells. The human cells will, now have the desired gene and hence will manufacture the desired proteins. It may also be noted that in recombinant DNA technique, DNA sysnthesising enzymes called DNA Polymerase or Reverse Transcriptase are used to make a DNA complement to an existing DNA or RNA. These DNA polymerases can transcribe (i.e., write), a DNA sequence from one organism to another organism.

Applications of Recombinant DNA Technology :

1. Manufacture of useful chemical compounds cheaply and efficiently. Genetic engineering using recombinant DNA technique has been used on a very large scale to alter microbes which can produce a wade variety of biochemicals. For e.g., E. Coli bacteria have been genetically altered to produce human insulin, human growth factor interferons, interleukins, injectible hepatitis vacine and so on.
2. To understand molecular events in the biological processes such as aging and cellular differentiation.
3. To spell out the complete nucleotide sequence of the genome of various organisms including Man.
4. To diagnose diseases using DNA probes.. In this method of diagnosis, short segments of single stranded DNA attached to radioactive or fluorescent markers are constructed. These are called ,DNA probes. These DNA probes are introduced in blood or other cell samples of the infected . person to identify a particular pathogen.
5. **DNA Fingerprinting** : Since no two individuals have an identical genetic make-up (except in identical twins), the DNA sequence is unique to an individual. DNA fingerprinting can be used to identify criminals, to determine paternity of children, to verify whether a hopeful immigrant is really a close relative of an established immigrant as claimed, and to identify racial groups to rewrite biological evolution.
6. **Applications in Transgenics:** Recombinant DNA technique is being increasingly used to produce transgenic crops and organisms. The examples of transgenic crops are Bt cotton, transgenic tomato, and a transgenic soyabean called Roundup Ready. Similarly, transgenic organisms have also been developed. For e.g., transgenic cows which can produce useful proteins in their milk and transgenic bacteria producing human insulin, human growth factor interferons, interleukins etc.
7. **Cloning Animals** : Recombinant DNA has been used to develop clones of animals.
8. **Cloning Cells** : In the recent times, recombinant DNA is being used to clone stem cells of humans for a wide variety of applications. Stem cells from the fertilised eggs or very young embryos are pluripotent i.e., they can differentiate into any of the cells of the human body. Molecular biologists are now attempting to use stem cells to treat degenerative disorders like Alzheimer besides generating human organs for organ transplant.