

# What is Biotechnology? Applications of Genetic Technologies

# Applications of Genetic Technologies

- **Definition of biotechnology :**
- " usage of living things, process or system for the manufacturing products used for welfare of mankind".
- **How it is useful for us?**
- °° By the help of it we can clone a gene, produce transgenic plants and animals as well as transgenic bacteria.
- **\*TRANSGENIC ORGANISMS\***
- "Organisms that have a foreign gene inserted into them are called transgenic animals."
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- **Why we produced transgenic organisms ?**
- To obtain useful products from that organism or for any other useful purpose.
- **\*TRANSGENIC BACTERIA\***
- • "The Bacteria with foreign DNA "
- which are mostly produced in bioreactors by the help of recombinant DNA technology.
- **\*Uses\*---**
- **1)Synthesis of pharmaceutical products:-**
- A foreign gene is replicated and expressed in these bacteria. And large amount of protein product is obtained.

Many biotechnology products are produced by bacteria.

**For example -**

- •• Insulin
- •• Human growth hormone
- •• Tissue plasminogen activator
- •• Haemophilia factor VIII
- •• Hepatitis B vaccine
- **2)Promoting health in plants :-**
- A bacterium normally forms colonies in the roots of corn plants.

- Some genes from another bacterium have been inserted into these bacteria.
- These genes code for an insect toxin. This toxin protects the root from insects.
- **3) Biodegradation:-**
  - •The ability of degradation of bacteria can be enhanced by genetic engineering.
- **4) Biofilters:-**
  - • Transgenic bacteria can be used as biofilter in industries.
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- **5) Synthesis of organic compound :-**

- • The catalysts act on precursor molecules during synthesis of organic chemicals. Bacteria can be used in place of these catalysts to carry out the synthesis of compounds.

- **For example:-**

- •• Aspartame is dipeptide sweetener also called NutraSweet prepared by transgenic bacteria.

- **6) Use in mining industry:-**

- • Genetic engineering enhances the ability of bacteria to extract copper, Uranium and gold from low grade sources.

- **TRANSGENIC PLANTS :**

- "The plant with foreign DNA"

- **Uses:**

- **1. Pest and herb resistance :**

- Foreign genes are transferred to cotton, *corn and potato*. The cells of these transgenic plants produce an insect toxin. So these plants become resistant to pest.

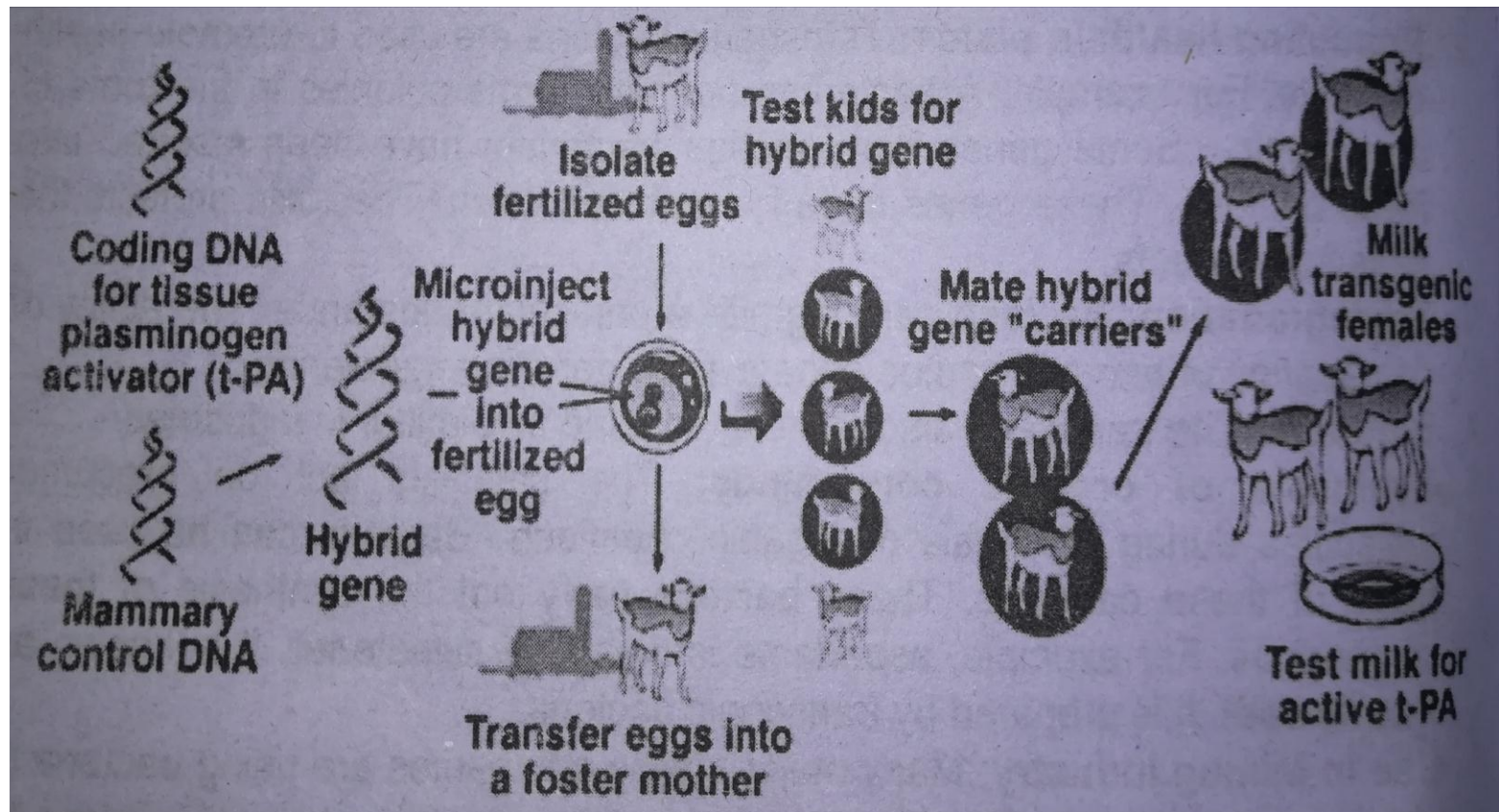
- **2 Transgenic crops :**

- In 1999, these transgenic crops were planted on

- More than 70 million acres worldwide. Their acreage (total acre) is expected to become triple in about five years.
- **3. Increasing production of wheat, corn and rice:**
- \_Agribusiness companies are also developing transgenic varieties of wheat, rice and corn.
- **TRANSGENIC ANIMALS :**
- \_" Animals with foreign DNA".



- **Uses :**
- **1.Higher growth rate of animals:**
- The genes for bovine (cattle) growth hormone are injected by this technique into many types of animal eggs. Thus many larger fishes, cows, pigs, rabbits and sheep are produced by this procedure.
- **2.Gene fishing :**
- The use of transgenic farm animals to produce pharmaceuticals is called gene fishing. Many antibiotics, hormones are produced by these techniques.



# GENE THERAPY

- **Definition:**

- " The insertion of genetic material into human cells for the treatment of a disorder is called gene therapy."

- **Gene Therapy Used For:**

- Gene therapy is used to correct defective genes in order to cure a disease or help your body better fight disease.

- **Is gene therapy safe or not?**

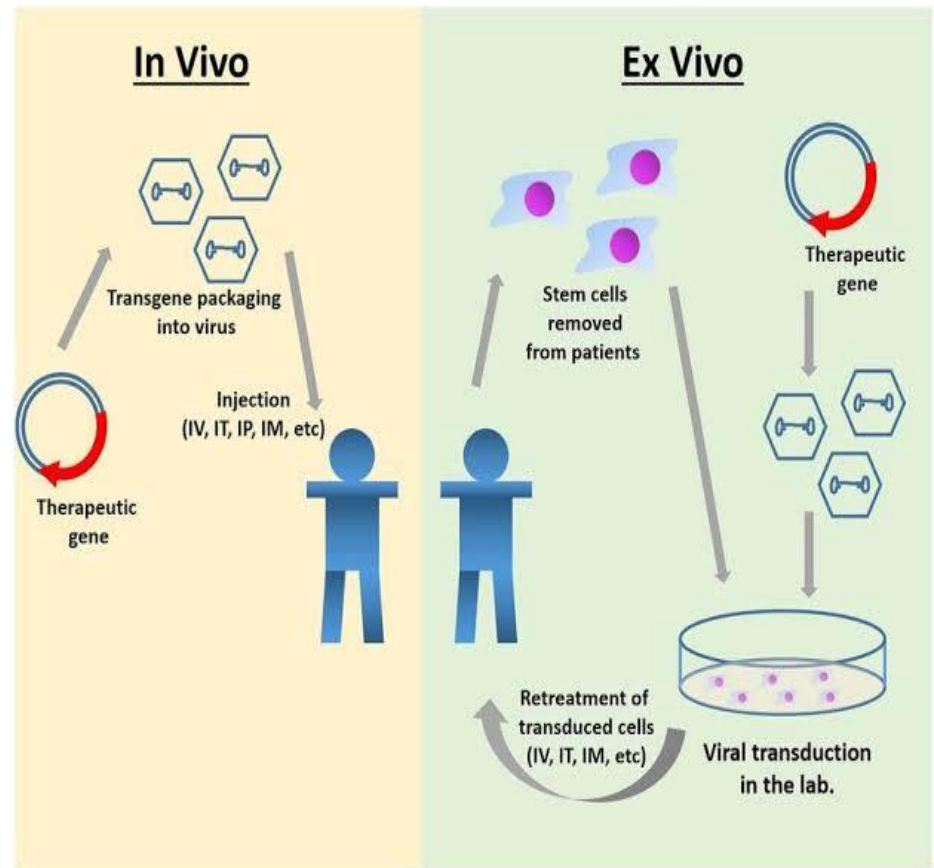
- Although gene therapy is a promising treatment option for a number of diseases (including inherited disorders, some types of cancer, and certain viral infections),

- the technique remains risky and is still under study to make sure that it will be safe and effective. Gene therapy is currently being tested only for diseases that have no other cures.
- **Methods used for gene therapy :**
- **1.Ex vivo therapy :**
- "The gene therapy in which genes are inserted into the cell outside the body is called ex vivo therapy."
- Diseases like **SCID, hypercholesterolemia** etc are treated by ex vivo gene therapy.

. ***In vivo gene therapy*** :

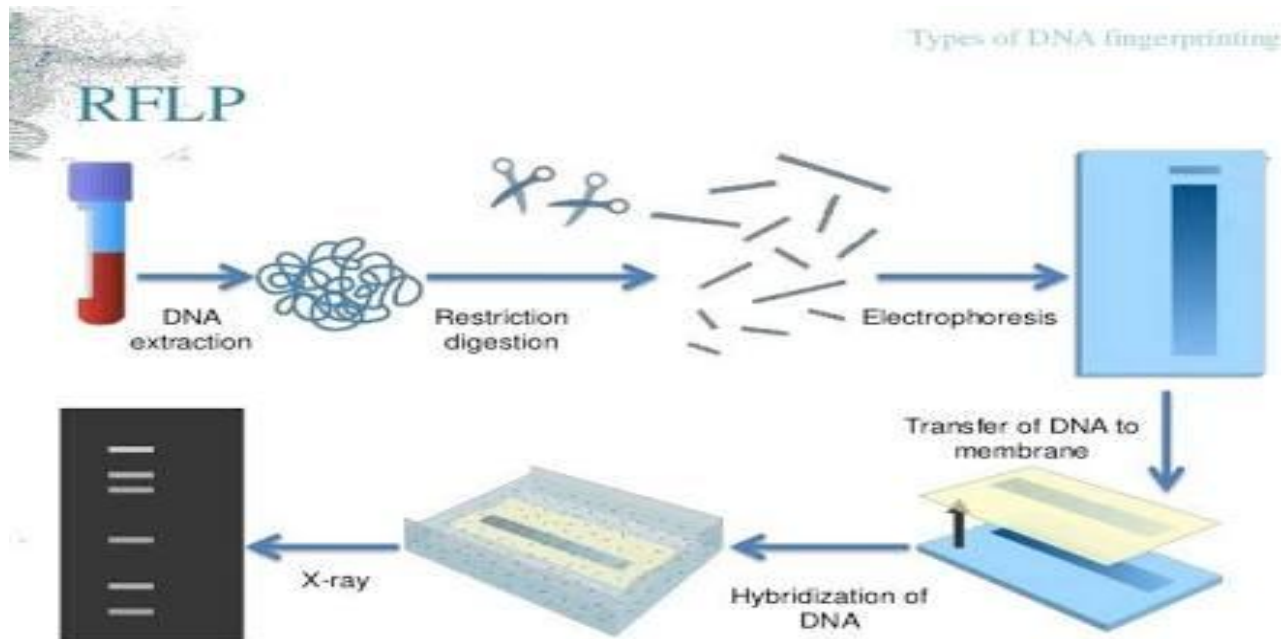
" The gene therapy in which genes are inserted in the cells within the body"

. Diseases like **cystic fibrosis, cancer coronary artery angioplasty hemophilia, AIDS** etc are treated by in vivo gene therapy.



# DNA Finger Printing

- **Definition** :
- "DNA fingerprinting is a method used to identify an individual from a sample of DNA by looking at unique patterns in their DNA."



- **Discovery:**

- DNA fingerprinting was invented in 1984 by Professor Sir Alec Jeffreys after he realised you could detect variations in human DNA, in the form of these minisatellites.

- **Basic requirements:**

- DNA fingerprinting require the availability of biological sample such as: Skin cells, few blood drops, semen, bone marrow cells, hair with its root.

- **Usage of DNA Analysis :**

- **1.Diagnosis :**

- DNA analysis are used to diagnose viral infections, genetic disorders and cancer.

- **2.Use in forensic laboratories:**

- DNA analysis is used to identify criminals.

- **3.Parentage:.**

- The DNA is inherited. Thus the finger print of offspring resembles the finger prints of one's parents. So it can be used to establish parentage.