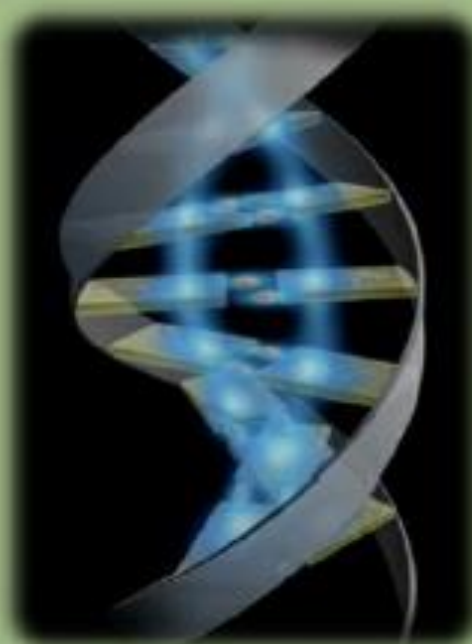
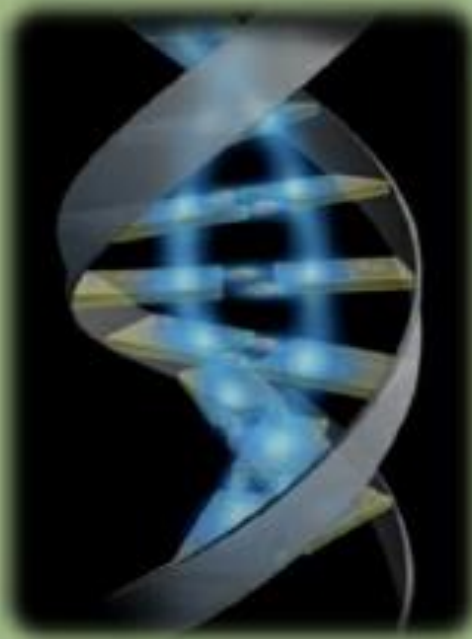


What is Biotechnology?



Biotechnology is the techniques of using live organisms or their enzymes for products and processes useful to humans.

What is Biotechnology?



EUROPEAN FEDERATION OF
BIOTECHNOLOGY

European Federation of Biotechnology (EFB) defines Biotechnology as *'the integration of natural science and organisms, cells, parts thereof, and molecular analogues for products and services'*.

What is Biotechnology?

Biotechnology
deals with

Microbe-mediated processes
(making curd, bread, wine etc).

In vitro fertilization
(‘test-tube’ baby programme)

Synthesis and using of a gene

Preparation of DNA vaccine

Correcting a defective gene



Principles of Biotechnology

Core Techniques of Modern Biotechnology

Genetic engineering

The technique in which genetic material (DNA & RNA) is chemically altered and introduced into host organisms to change the phenotype.



Bioprocess engineering

Maintenance of sterile ambience in chemical engineering processes for growing desired microbe/ eukaryotic cell in large quantities for the manufacture of antibiotics, vaccines, enzymes etc.

Principles of Biotechnology

Basic steps in genetically modifying an organism

1. Identification of DNA with desirable genes
2. Introduction of the identified DNA into the host
3. Maintenance of introduced DNA in the host and transfer of the DNA to its progeny.



Principles of Biotechnology

Basic steps in genetically modifying an organism

1. Identification of DNA with desirable genes

- Traditional hybridisation techniques lead to inclusion and multiplication of undesirable genes & desirable genes.
- In genetic engineering, only desirable genes are introduced.

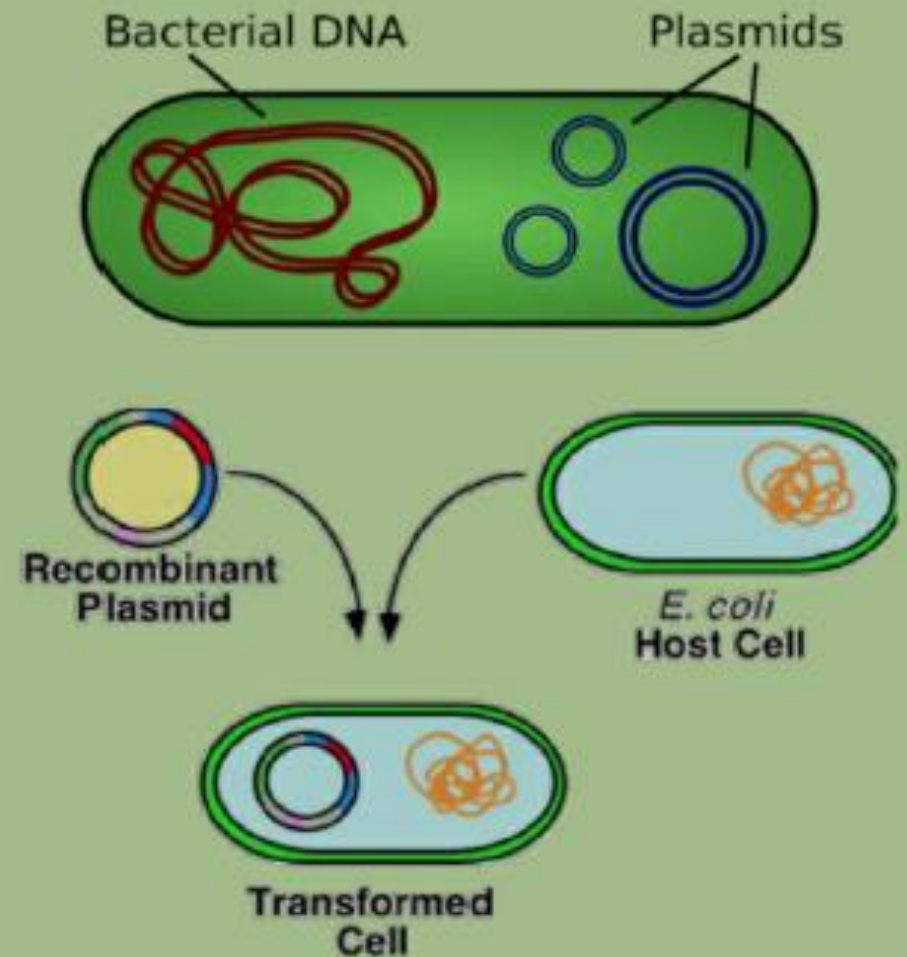


Principles of Biotechnology

Basic steps in genetically modifying an organism

2. Introduction of the identified DNA into the host

- A **vector DNA** such as **plasmid** is used to deliver an alien piece of DNA into the host organism.



Principles of Biotechnology

Basic steps in genetically modifying an organism

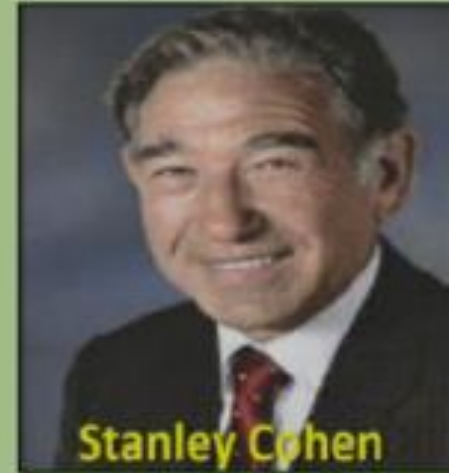
3. Maintenance of introduced DNA in the host and transfer of the DNA to its progeny.

- A piece of alien DNA has no the sequence called *Origin of replication (ori)* needed for starting replication. So, it cannot multiply itself in the progeny cells of the organism.
- Hence alien DNA is integrated into the recipient genome (it has *ori*). It multiplies & inherits along with host DNA.



Principles of Biotechnology

- The process of joining and inserting a foreign piece of DNA into a host organism to produce new genetic combinations is called **recombinant DNA technology**.
- First **recombinant DNA (rDNA)** was produced by **Stanley Cohen & Herbert Boyer (1972)**.
- They isolated an **antibiotic resistance gene** (piece of DNA) from a plasmid of ***Salmonella typhimurium***. It was linked with a plasmid vector and transferred into ***E. coli***. As a result, the gene was expressed & multiplied in *E. coli*.



Stanley Cohen



Herbert Boyer



Salmonella typhimurium