Genetic Engineering

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What is genetic engineering???

Genetic engineering: is the artificial manipulation or alteration of genes.

Genetic Engineering involves:

- removing a gene (target gene) from one organism
- inserting target gene into DNA of another organism
- 'cut and paste' process.

Some important terms!!!

Recombinant DNA: the altered DNA is called recombinant DNA (recombines after small section of DNA inserted into it).

Genetically Modified Organism (GMO): is the organism with the altered DNA.

TOOLS USED IN GENETIC ENGINEERING

1. **Restriction Endonuclease(RE):**

These are the enzyme which cleaves the DNA from particular sequence.

The sequence from where it cleaves the DNA is called as recognition sequence. Recognition site can be 4 to 8 *bp* long.

It breaks the nucleotide bond of base pair.

TYPES OF RESTRICTION ENDONUCLEASE

- **Type I** : Made up of three non-identical subunit. Require ATP, mg2+ for activation. They cleave the DNA 1000 *bp* away from the recognition.
- **Type II** : Require only mg2+. Made of two identical subunit. Cleaves DNA from recognition site. These are widely used enzyme. More than 300 enzyme are discovered.
- **Type III** : Cleave 26 *bp* away from recognition site.

2) Gene library

The gene of interest (DNA fragment) is stored in gene library. There are two gene library available.

Genomic library : A collection clones contain all DNA segments of the genome of an organism is called Genomic library.

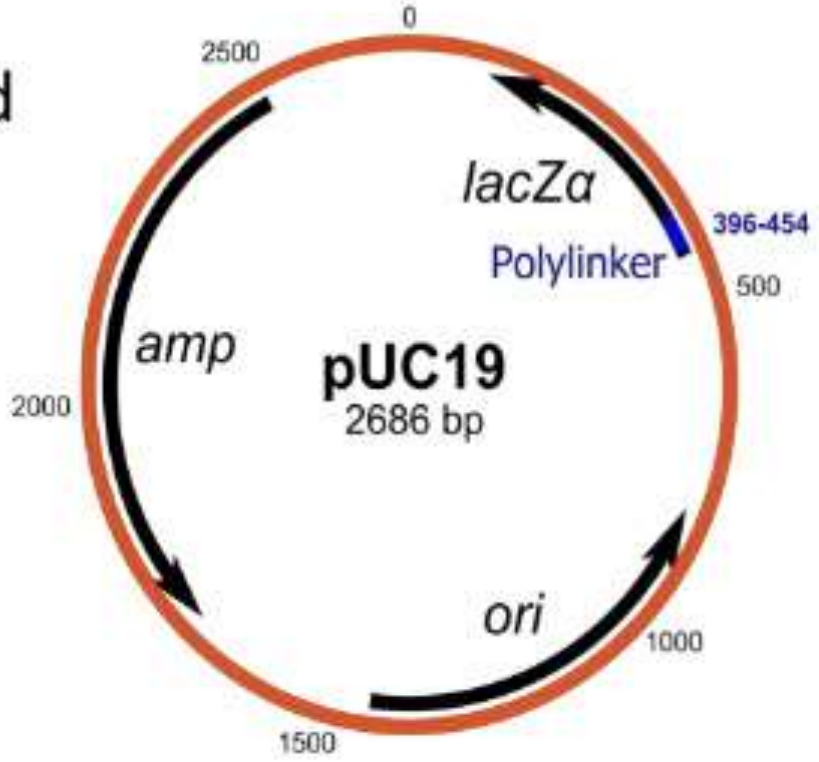
cDNA library : A collection of clones each of which carries a cDNA of an organism is called cDNA.

3) VECTOR

A vector is a DNA molecule that has the ability to replicate autonomously in an host cell and into which the DNA fragment to be cloned.

Any extra chromosomal small genome/DNA, self replicating

e.G :- Plasmid(pBR322, pUC18/19), Phage(**λ** phage, phage M13), Cosmid, Phasmid, BAC, YAC.

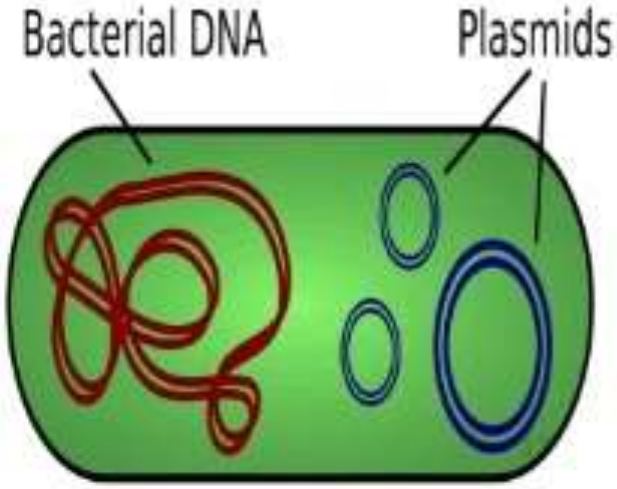


4) HOST CELL

Host cell are the organism in which rDNA are to be transformed. E.g:- The best example for host cell is *E. coli.*

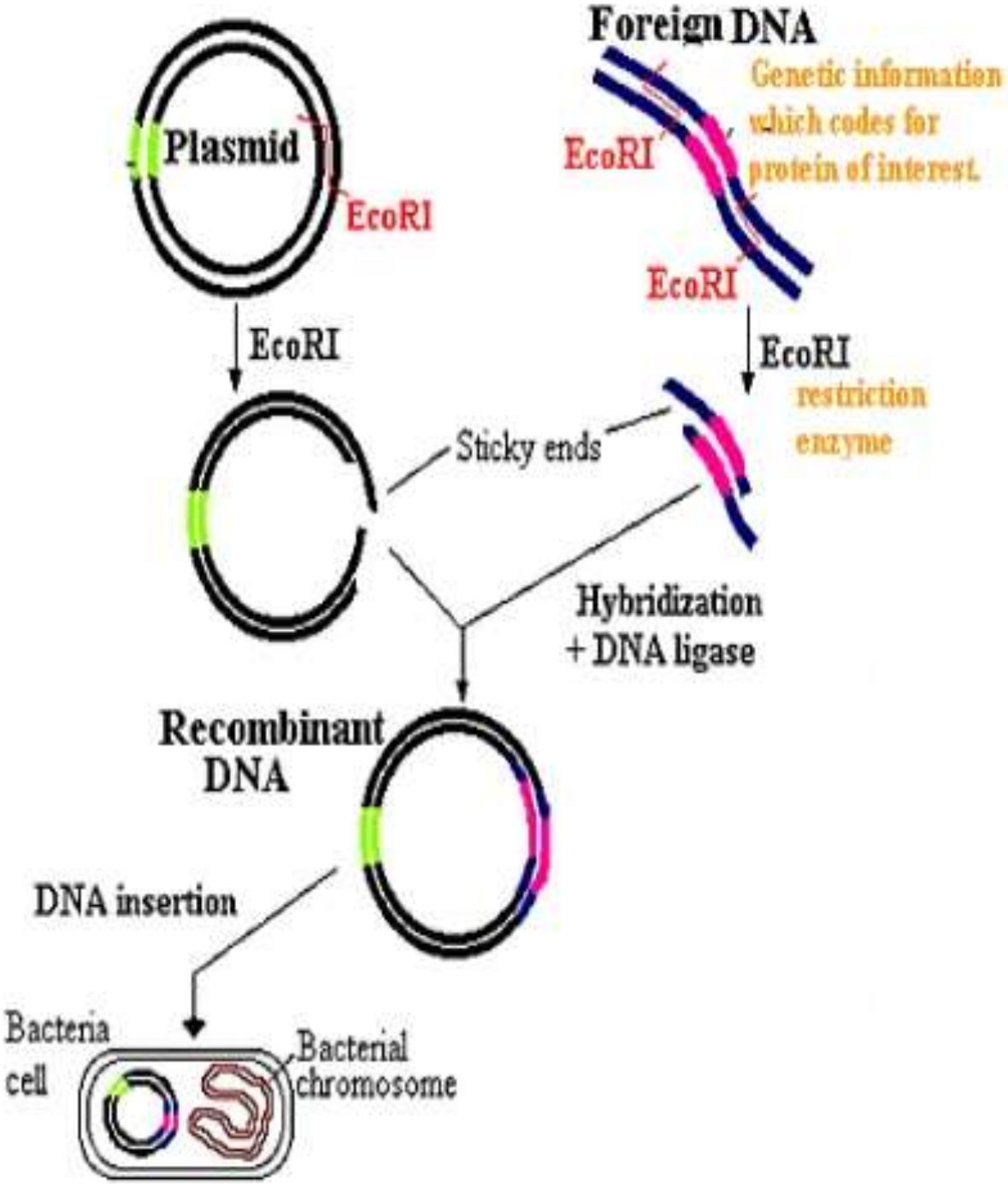
Properties of good vector:

1. Easy to transform.
2. Support the replication of rDNA
3. Lack active restriction enzyme

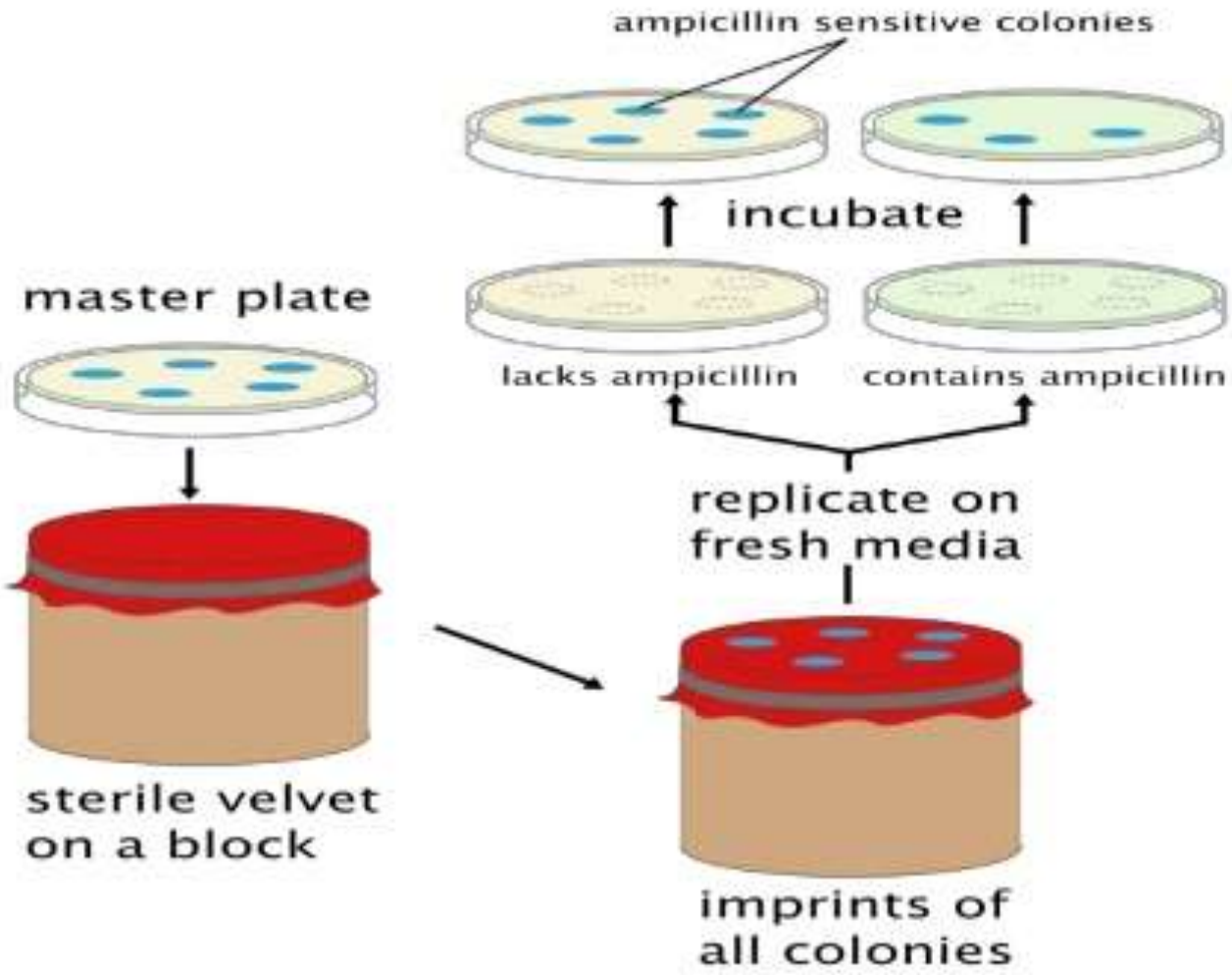


PROCEDURE

- Isolation of desired DNA fragment(gene of interest) with the help of restriction enzymes.
- Isolation of DNA vector.
- Construction of rDNA. In this gene of interest is inserted into the vector.
- Introduction of vector containing recombinant into the host cell.
- Multiplication of Host cells containing recombinant DNA.
- Expression of cloned gene.
- Selection of Recombinant cells.


Foreign DNA
Genetic information which codes for protein of interest.
EcoRI
EcoRI
Plasmid
EcoRI
EcoRI
EcoRI
restriction enzyme
Sticky ends
Hybridization + DNA ligase
Recombinant DNA
DNA insertion
Bacteria cell
Bacterial chromosome

Selection of transformed cell



APPLICATION

- **Agriculture**

  Improved crops

  High yield

  Resistant

  High nutritional value

  Long storage

- **Medicine**

  Production of insulin and human growth hormone

- **Animal husbandry**

  High milk production

  High yield of wool


Thank you!