

# Biology 10 - Introduction to Biology

West Valley College - Norris

Biotechnology (Genetic Engineering)

## I. Definitions

- A. Genetic Engineering
- B. Recombinant DNA

## II. Genetic Engineering

### A. The Old Way

### B. The New Way

#### 1. The Tools

- a. Restriction Enzymes
- b. Ligases
- c. Plasmids

#### 2. How It Works - One Example

Step 1: Create a DNA Library (a collection of cells each with a different piece of DNA)

##### 1. Cleavage

- a. Cut up the DNA containing the gene of interest using restriction enzymes (produces fragments of DNA unique to every individual = DNA fingerprinting)
- b. Cut up a batch of plasmids with the same restriction enzymes

##### 2. Recombination

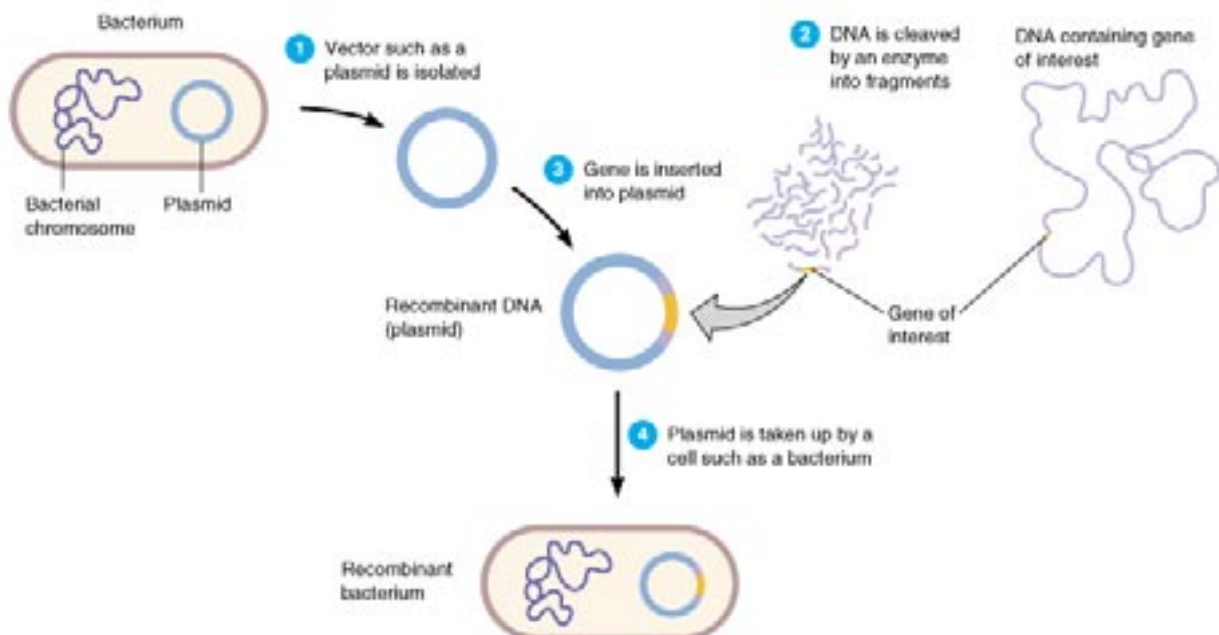
- a. Mix the cut cell and plasmid DNA fragments, use ligase enzyme to join complementary ends of fragments, hopefully forming plasmids with incorporated pieces of cell DNA

##### 3. Cloning

- a. Mix "recombined" plasmids with bacteria - plasmids will be taken up by the bacteria
- b. Select for bacteria with plasmids (using antibiotic resistance)

Step 2: Screening - Select for bacterial cells containing the gene of interest (radioactive "probe")

Step 3: Grow the selected bacteria and collect the protein produced by the bacteria due to the inserted gene (i.e. human insulin)



### III. Uses of Genetic Engineering

#### A. Agriculture

#### B. Medicine

1. Production of Drugs
2. Gene Therapy

### IV. Concerns (Myths vs. Reality)

### V. Additional Selected Key Terms

ligase      plasmid      recombinant DNA      restriction enzyme

### **Study Questions – Biotechnology (Genetic Engineering)**

1. In general, what is “genetic engineering”?
2. What is “recombinant DNA”?
3. How does the new process of “genetic engineering” by way of biotechnology differ from the old ways? How are they the same?
4. What is “artificial selection”?
5. What are “restriction enzymes”, “ligases” and “plasmids”?
6. What is a “sticky end”? What is the significance of “sticky ends”?
7. What is a “DNA fingerprint”? How are they produced?
8. Why is it possible to mix DNA from different organisms?
9. Can a living organism know that it contains recombinant DNA?
10. What can recombinant organisms do that makes them unique from “natural” organisms of the same species?
11. What are some benefits of recombinant DNA technology?
12. What are some risks of recombinant DNA technology?

*“Genetic engineers don't make new genes, they rearrange existing ones.”*  
Thomas E. Lovejoy