# Biology Chapter 15: Biotechnology

**Learning Goals**

**Text Section 15.1 Selective Breeding**

1. Explain the purpose of selective breeding.

2. Explain how people use selective breeding and induction of mutations to increase genetic variation.

**Video Clip Super, Super Cow**

1. Explain how breeders have achieved amazing results from selective breeding.

**Text Section 15.2 Recombinant DNA**

1. Explain how scientists manipulate DNA

2. Describe the importance of recombinant DNA

3. Explain how a restriction enzyme cuts DNA

4. Describe how a recombinant bacterial plasmid is constructed.

5. Define *transgenic* and describe the usefulness of some transgenic organisms to humans.

6. Evaluate the benefits and dangers of developing and using transgenic organisms.

**Lab – E.coli Insulin Factory**

1. Evaluate which restriction enzyme will be best to use to cut a DNA sequence given to you.
2. Construct a plasmid vector with an insulin gene from another DNA source.
3. Determine which antibiotic would best show if the DNA plasmid was absorbed or not.

**Text Section 15.3 & 15.4 Applications and Ethics of Genetic Engineering**

1. Summarize the main steps in cloning.

2. Explain the production, use, benefits and controversy of genetically modified foods.

3. Explain how microarrays show important connections between cell biology, DNA, genes, gene expression, transcription, translation, cancer, proteins, and bioethics.

4. Describe the benefits of genetic engineering as they relate to agriculture and industry.

**Movie: NOVA Cracking Your Genetic Code**

1. Evaluate the pros and cons of having your genome sequenced.

2. Explain how gene sequencing has helped cystic fibrosis patients and others.

**Activity: DNA microarrays and Pharmacogenomics**

1. Explain how DNA, gene expression, and enzyme production relate.

2. Use a paper DNA microarray to determine the function of gene variants for the enzyme cytochrome P450 in 3 different “patients”.

3. Evaluate how the genes each patient inherited will affect their level of codeine detoxification and conclude whether or not the patient should be prescribed codeine.

4. Use a paper DNA microarray to compare gene activity of normal and cancerous genes.

5. Use an algorithm to identify which cancer genes tagged in your microarray would be best pursued for further study.

**Lab: DNA Chips – Genes to Diseases**

1. Construct a model microarray.

2. Discover how the results of microarray analysis can be used to study the expression of genes involved in lung cancer.