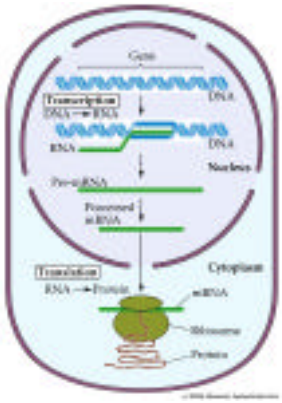
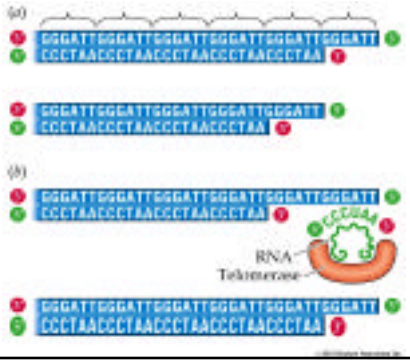
Chapter 15, 17 and 18

Eukaryotic gene regulation, Biotechnology, and Molecular Biology

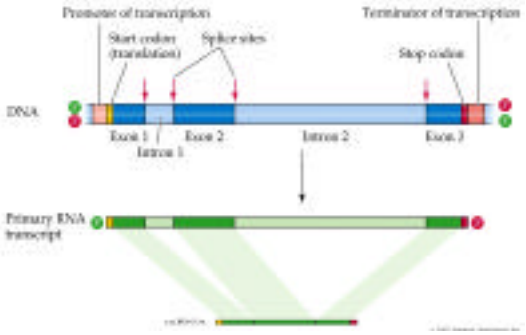
Eukaryotic mRNA processing



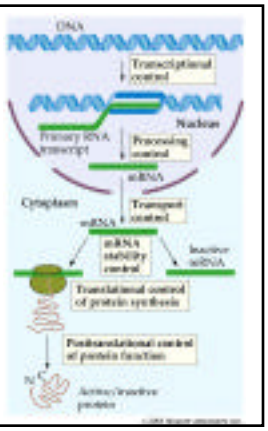
Telomerase

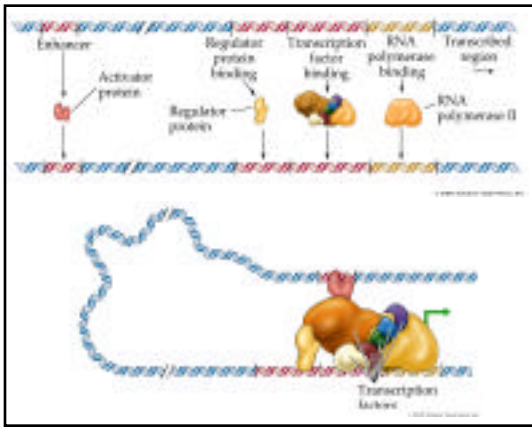


Exons



Points of gene regulation in eukaryotes



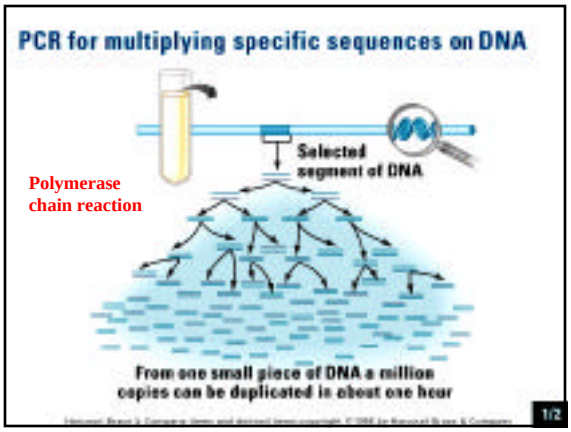


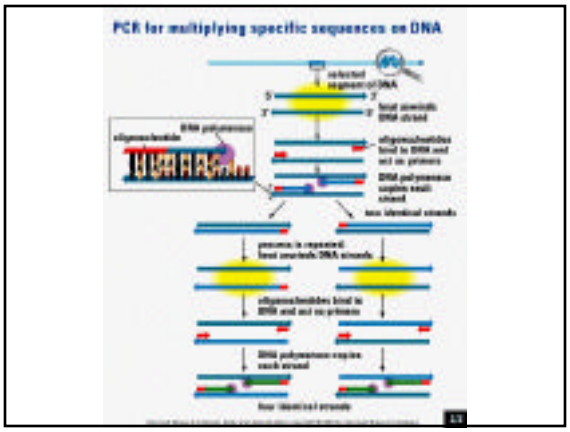
Gene terms

- Mobile genes
  - Transposons (jumping genes)
    - Genetic material (genes) that can move from place to place.
  - Viruses
    - They are not alive, but replicate and release new viruses
  - Plasmids
    - Circular DNA that replicates independent of the host.

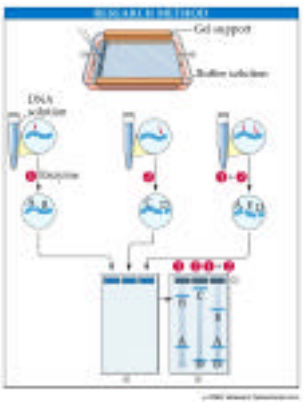
Key terms

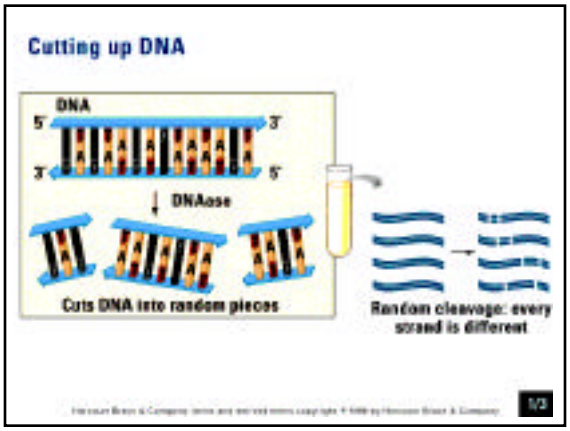
- Recombinant DNA
  - Consist of two or more DNA that are not found together in nature
- Restriction enzymes
  - Cut DNA at specific sites
    - Creates a rough map of the genes or genes
- Vector
  - A plasmid or virus that help to move a gene with hosts





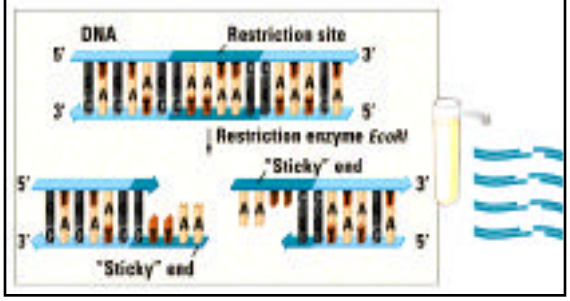
Gel electrophoresis



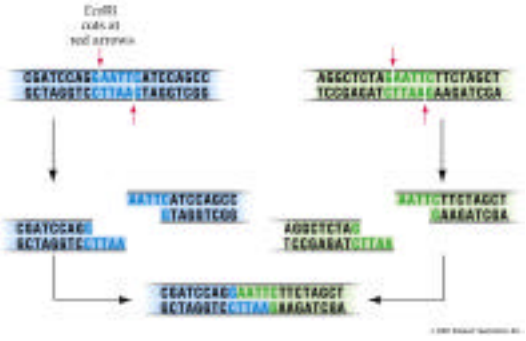


Restriction enzyme cut the DNA is specific sites

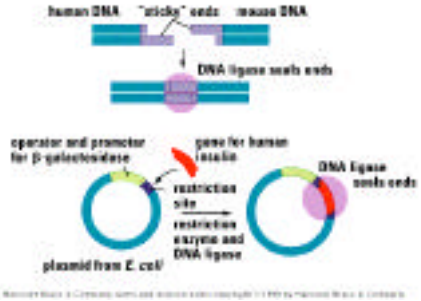
Cutting up DNA



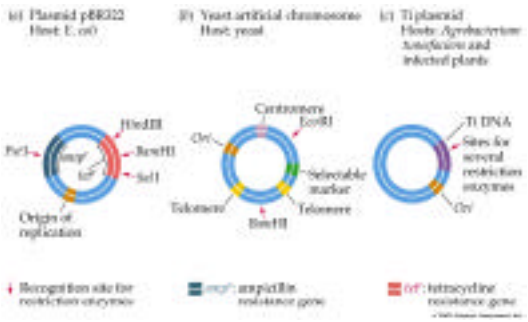
Restriction endonucleases

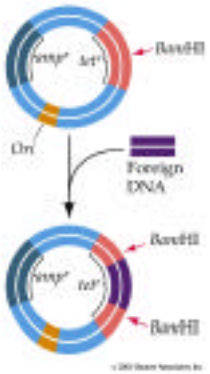


Sticky ends enable researchers to join pieces of unrelated DNA



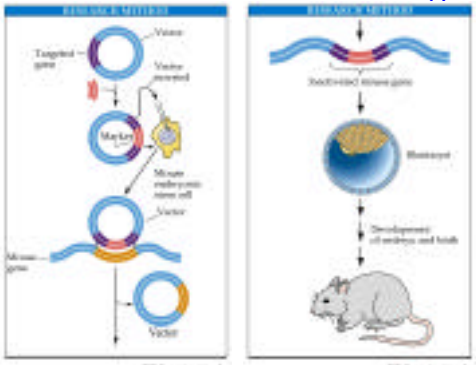
Plasmids carry foreign DNA





Gene library using plasmids

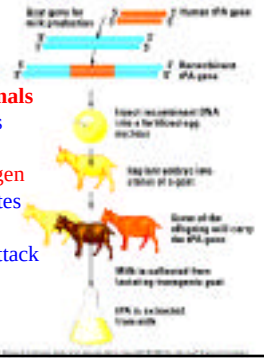
Knockout mice lack functional genes



17.1 Some Medically Useful Products of Biotechnology

PRODUCT	USE
Brain-derived neurotropic factor	Stimulates regrowth of brain tissue in patients with Lou Gehrig's disease
Colony-stimulating factor	Stimulates production of white blood cells in patients with cancer and AIDS
Erythropoietin	Prevents anemia in patients undergoing kidney dialysis
Factor VIII	Replaces clotting factor missing in patients with hemophilia A
Growth hormone	Replaces missing hormone in people of short stature
Insulin	Stimulates glucose uptake from blood in some people with diabetes
Platelet-derived growth factor	Stimulates wound healing
Tissue plasminogen activator	Dissolves blood clots after heart attacks and strokes
Vaccine proteins: Hepatitis B, herpes, influenza, Lyme disease, meningitis, pertussis, etc.	Prevent and treat infectious diseases

Transgenic animals carry foreign genes that they can pass on to their own offspring

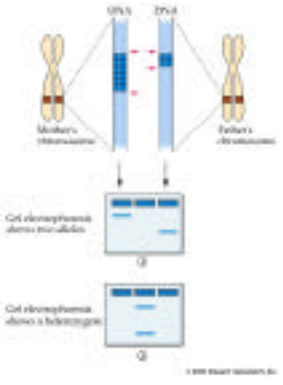


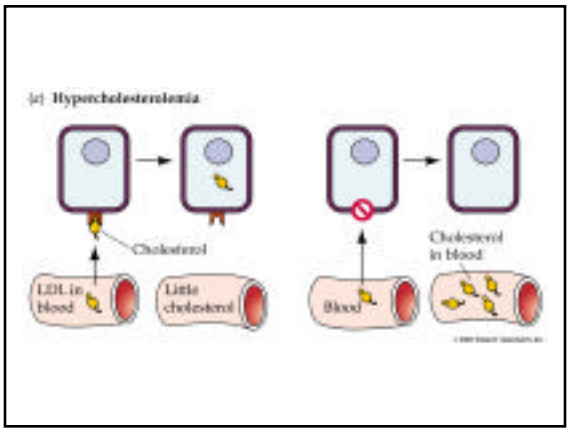
Transgenic animals
Produce products faster and easier
Tissue plasminogen activator - activates the anticlotting factors in heart attack patients

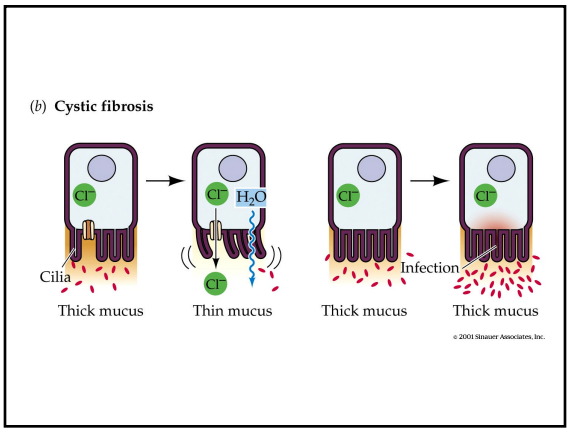
17.2 Agricultural Applications of Biotechnology under Development

PROBLEM	TECHNOLOGY/GENES
Improving the environmental adaptations of plants	Genes for drought tolerance, salt tolerance
Improving breeding	Male sterility for hybrid seeds
Improving nutritional traits	High-lysine seeds
Improving crops after harvest	Delay of fruit ripening; high-solids tomatoes; sweeter vegetables
Using plants as bioreactors	Plastics, oils, and drugs produced in plants
Controlling crop pests	Herbicide tolerance; resistance to viruses, bacteria, fungi, insects

DNA fingerprinting

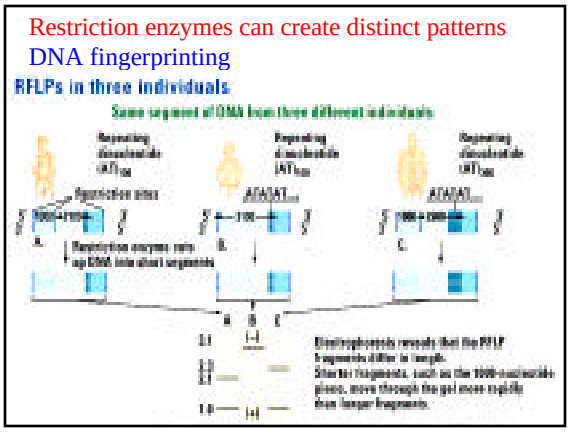




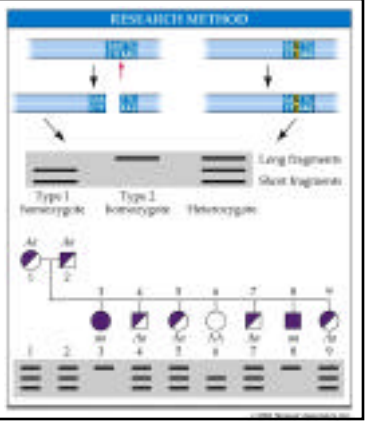


Restriction enzymes can create distinct patterns

DNA fingerprinting

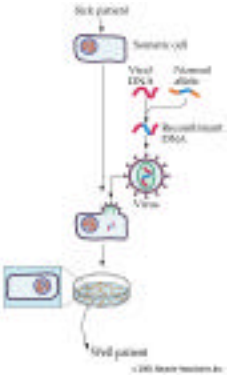


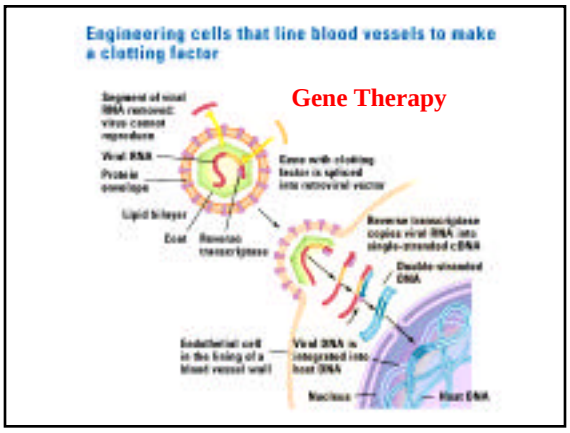
RFLPs

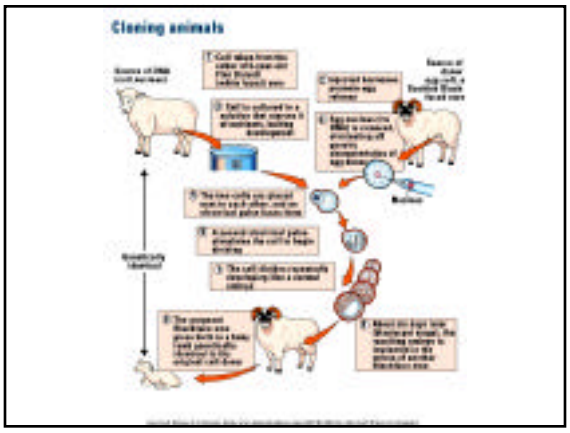


Screening for phenylketonuria

Gene therapy




Engineering cells that line blood vessels to make a clotting factor
Gene Therapy
Viral RNA
Protein envelope
Lipid bilayer
Coat
Reverse transcriptase
Reverse transcriptase copies viral RNA into single-stranded cDNA
Double-stranded DNA
Endothelial cell in the lining of a blood vessel wall
Viral DNA is integrated into host DNA
Nucleus
Host DNA


Cloning animals