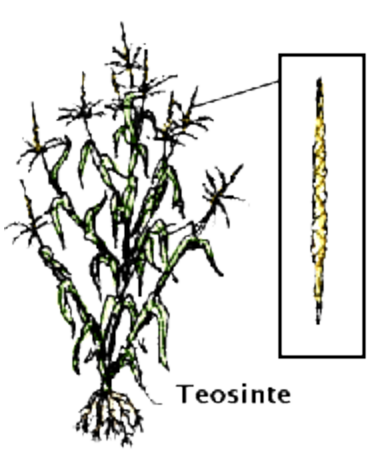
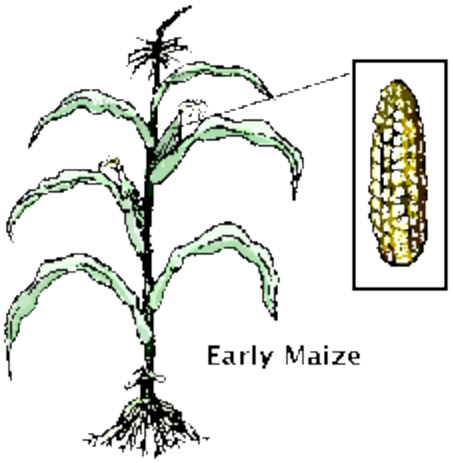
Genetic Engineering

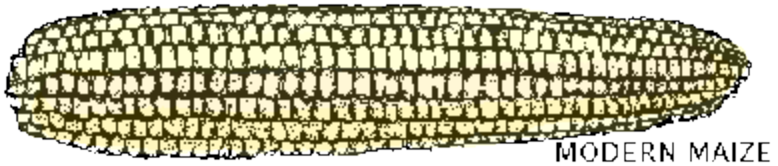
Chapter 13

Selective Breeding

- Breed only animals with desired characteristics
- Horses, dogs, cattle, etc.
- Crops: beans, corn, wheat,







Risks of selective breeding

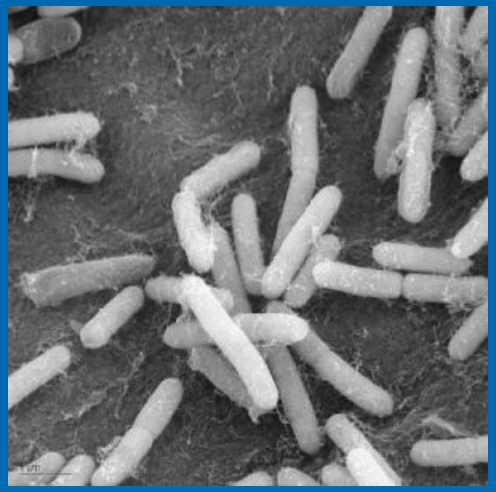
- Parents are too similar
- Chance of passing two recessive alleles to offspring that cause a defect
- Monoculture: the entire crop is genetically identical
  - None are disease resistant
  - Irish potato famine

Hybridization

- Crossing two different organisms
- Results in offspring with best of both parents
- Drought tolerant + greater yield
- Color + fragrance

Increasing variation

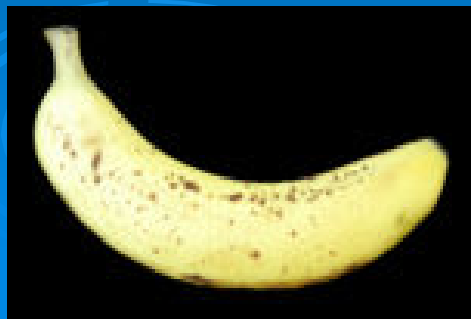
- Inducing mutations increases variation
- Radiation and chemicals increase mutation rate
- Still totally random
- Easier to do in bacteria



  - certain strain can turn oil into biodegradable plastic
- Also helps us understand the function of certain genes

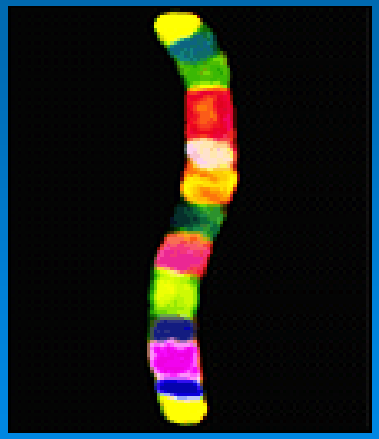
Polyploid

- Plants can have extra copies of chromosomes
  - Diploid vs polyploid
- Harmful for animals
- Leads to bigger fruit in plants
- Most polyploids are sterile = seedless

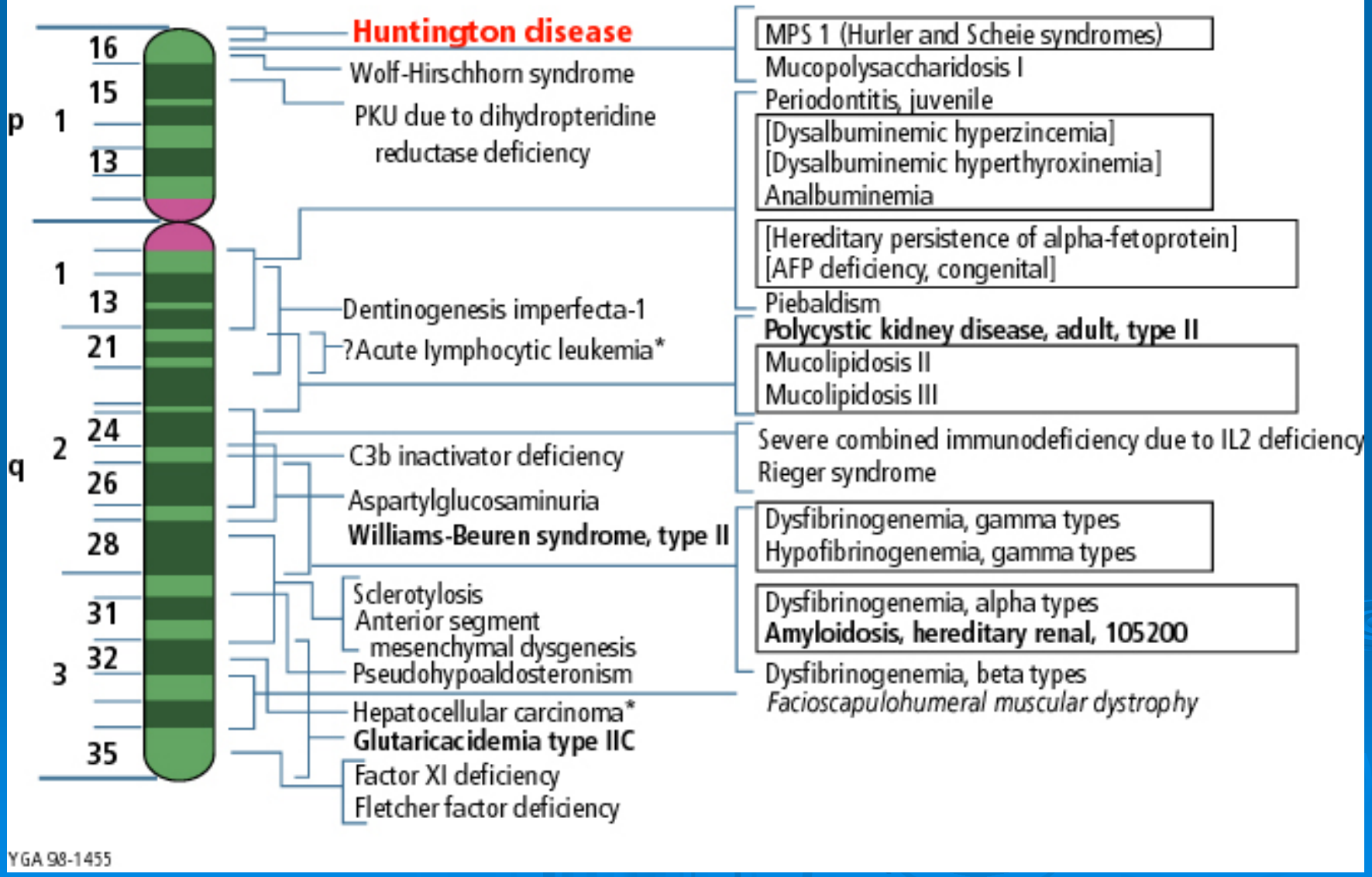


Genetic Engineering

- Scientists can study and alter genes on a chromosome
- Human Genome project
- Learn more about disease and resistance



Chromosome 4



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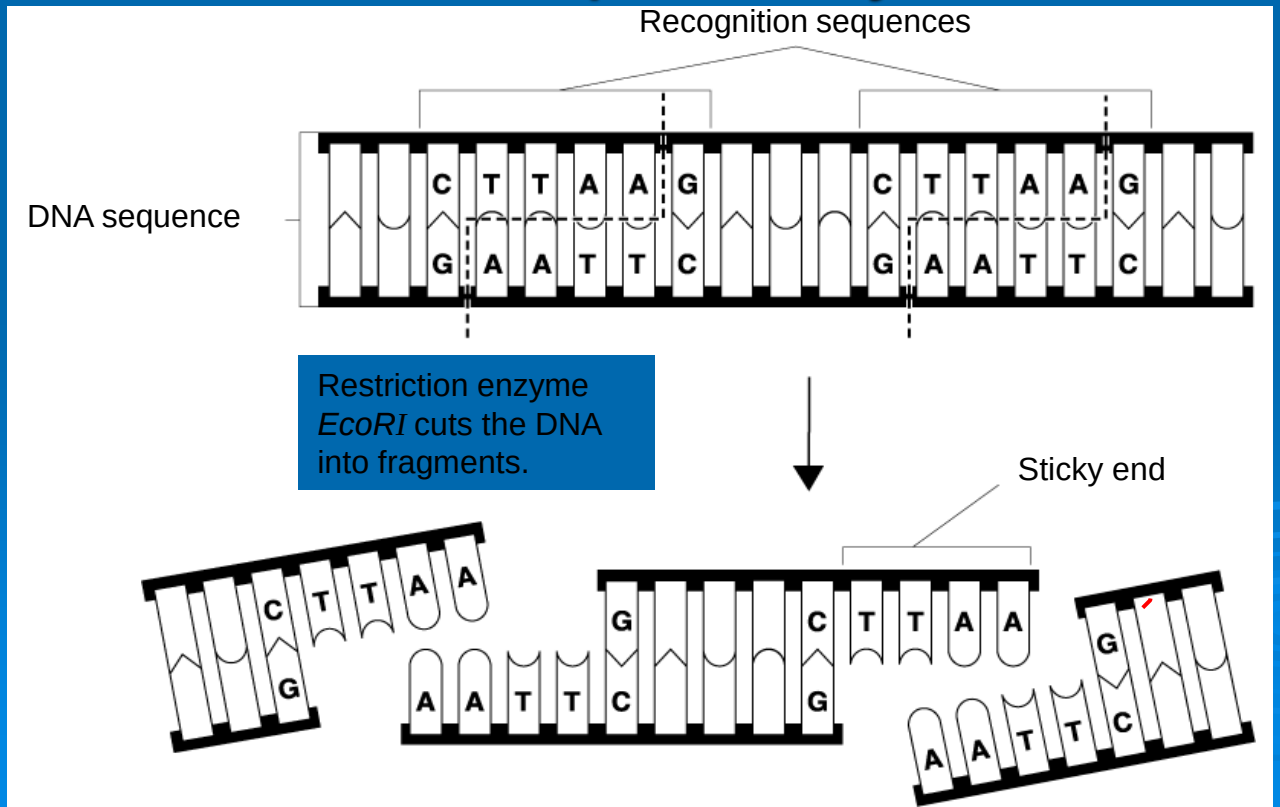
Cutting DNA

- Restriction enzymes cut DNA at specific points
- Only cuts where the DNA nucleotide sequence matches perfectly



Separating DNA

- Gel Electrophoresis
- DNA is cut into fragments
- Filtered through a gel
- Fragments separate out by size
- Used to compare DNA of different individuals

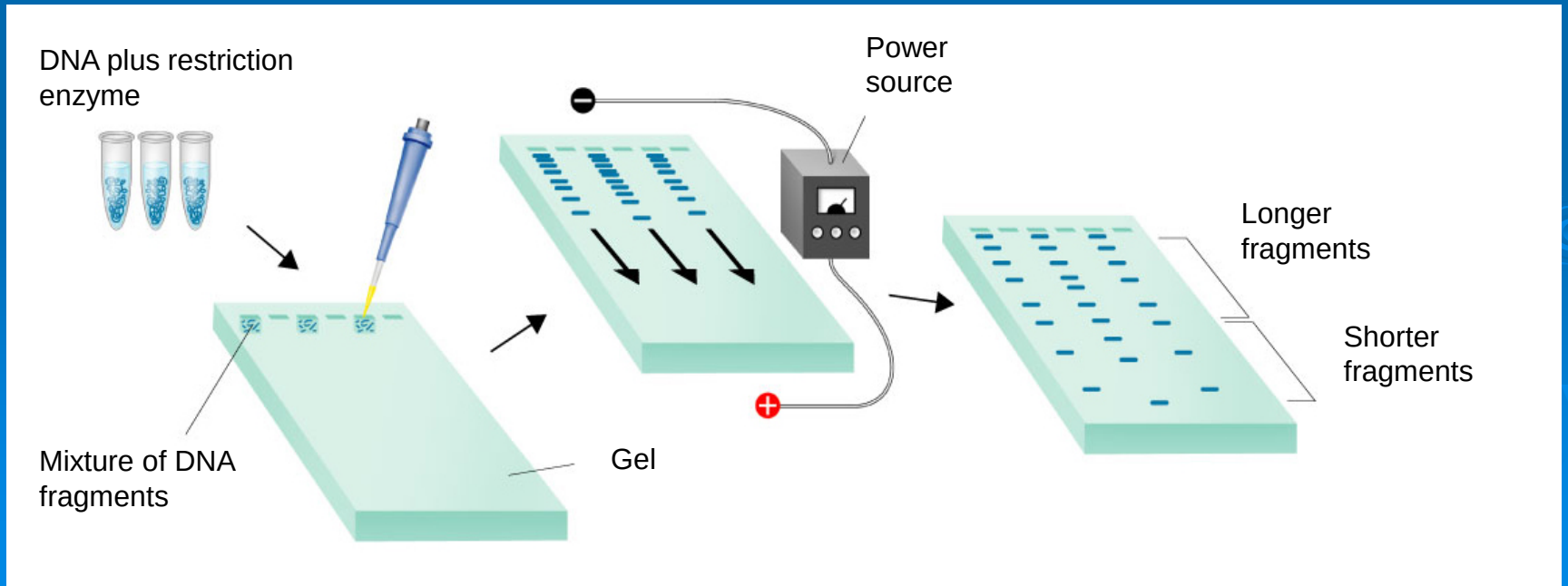
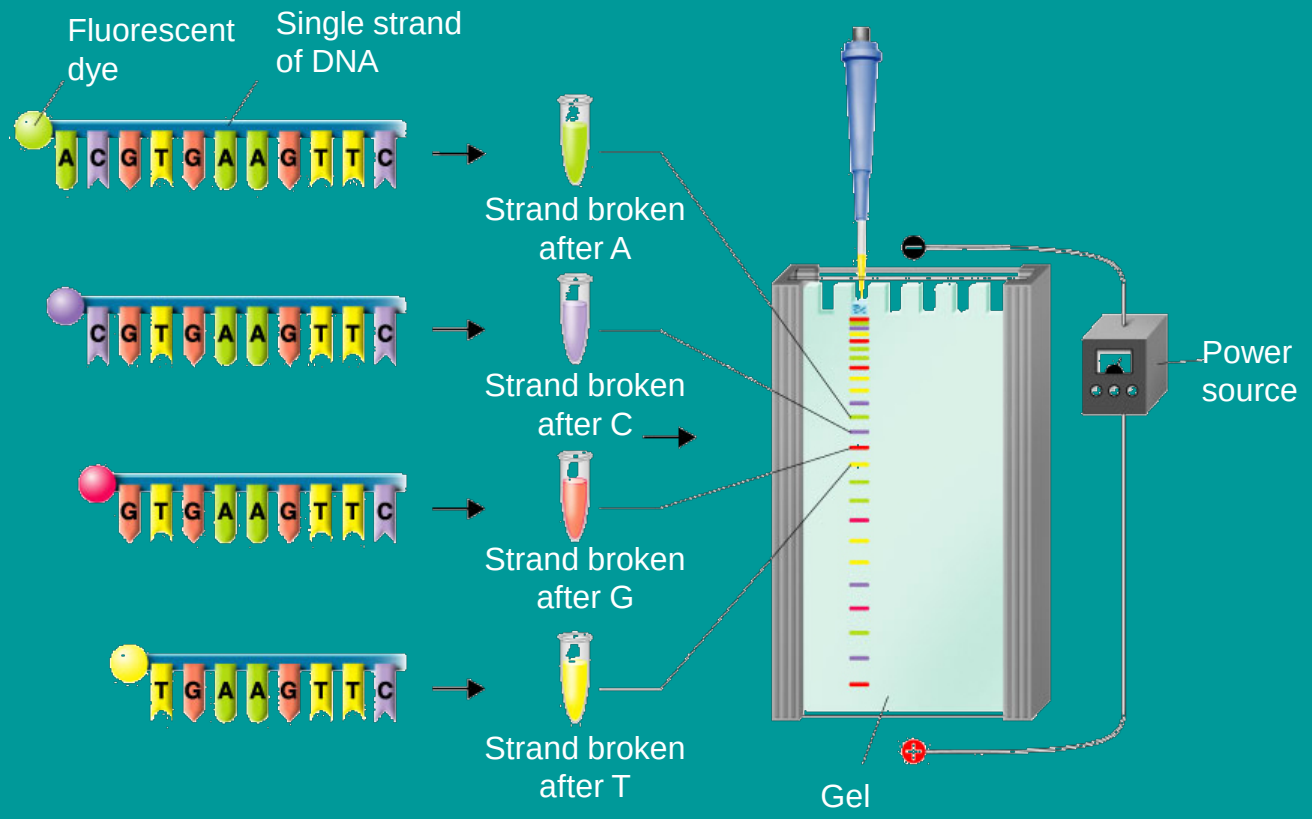


Figure 13-7 DNA Sequencing

Section 13-2



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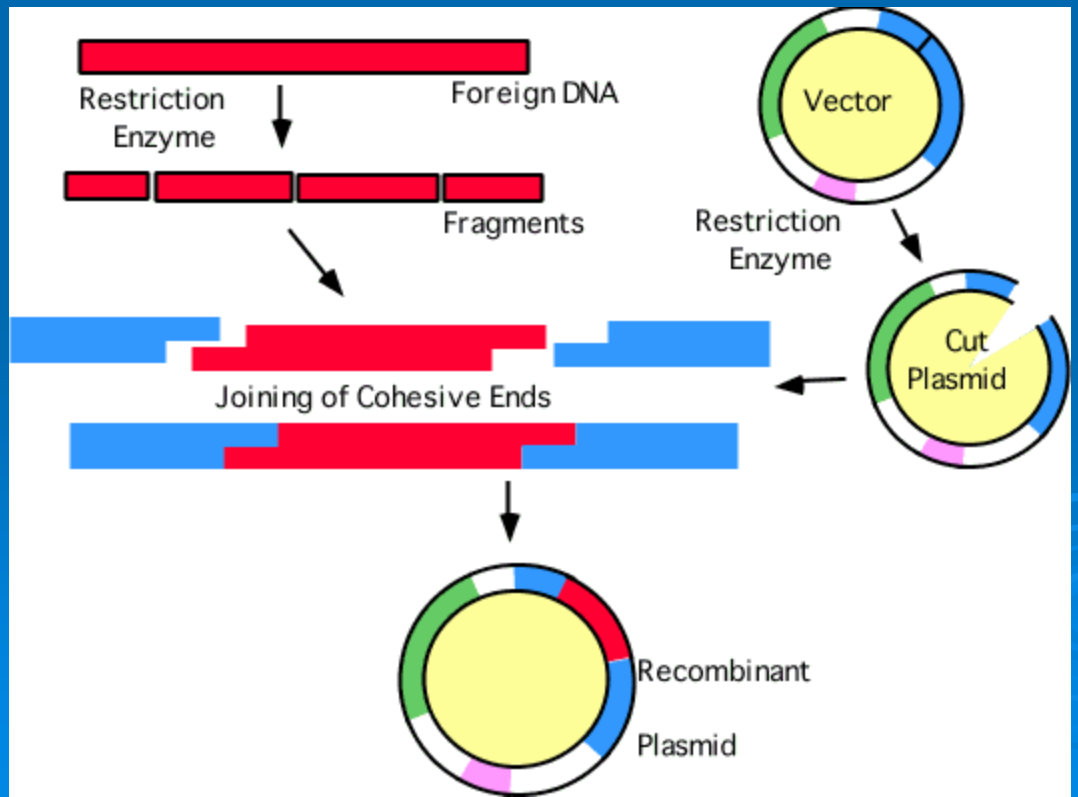
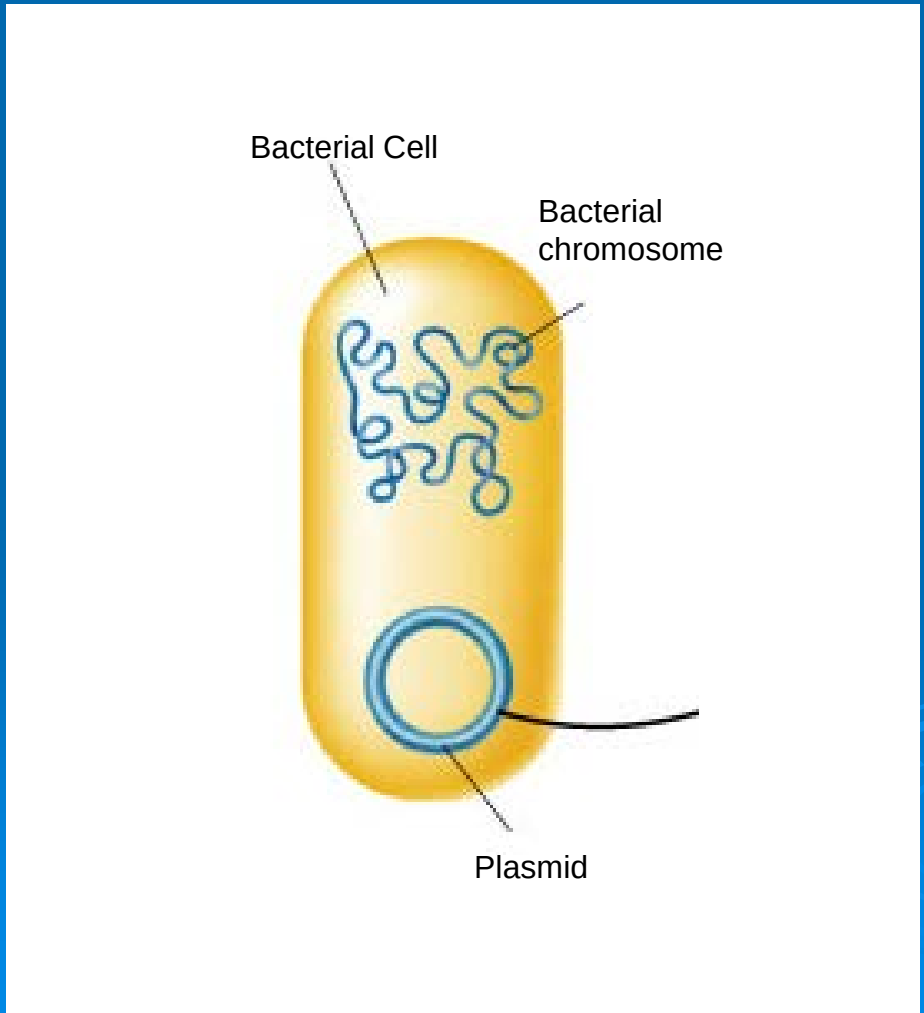
Recombinant DNA

- When you know the sequence of DNA, you can cut out specific genes
- Using restriction enzymes you can cut and paste genes from one organism into another

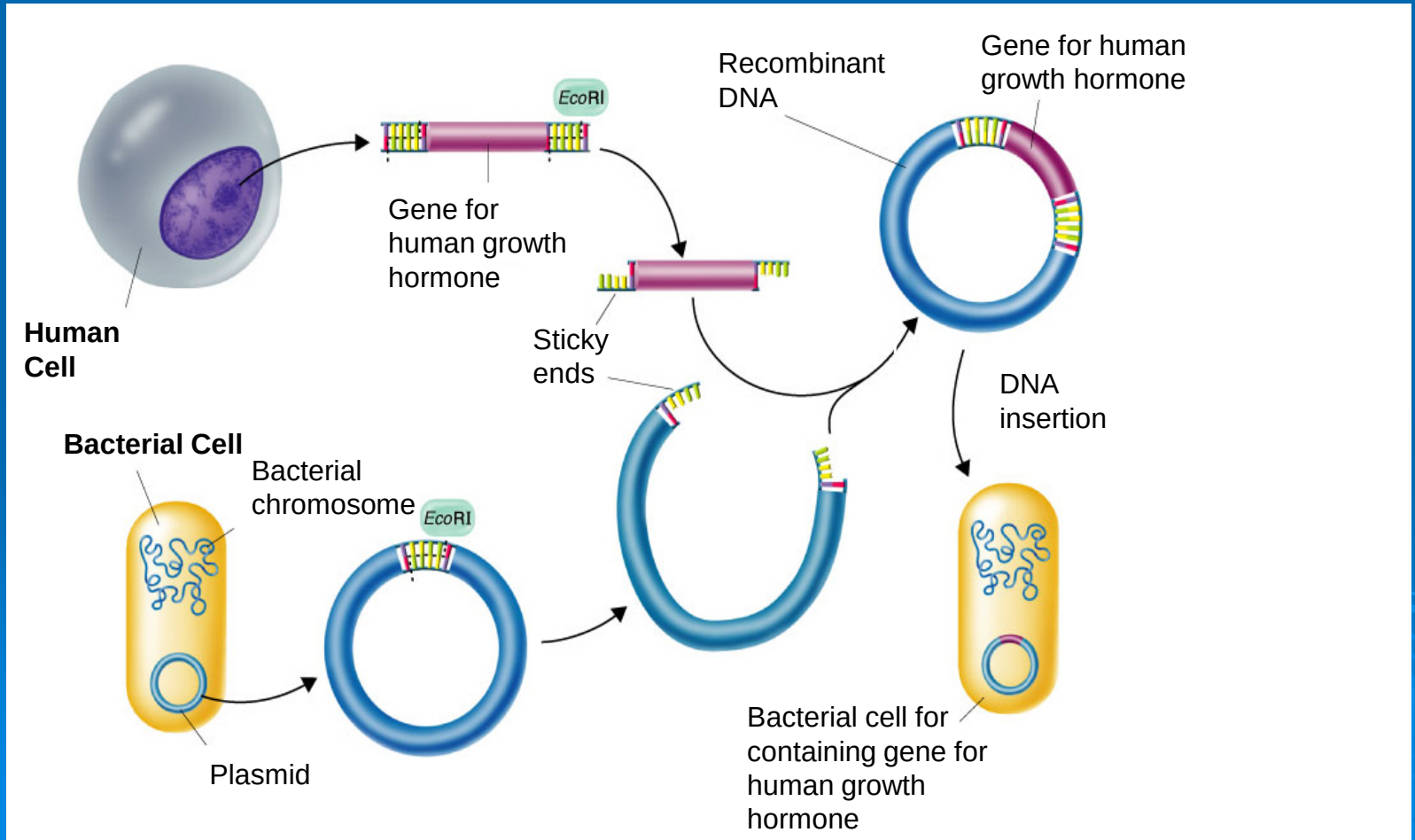


Transforming Bacteria

- Plasmid – small circular “extra” DNA found in some bacteria



- Desired gene is cut using restriction enzymes
- Plasmid is cut open using same restriction enzymes
- Gene is pasted into plasmid, plasmid is mixed with bacteria

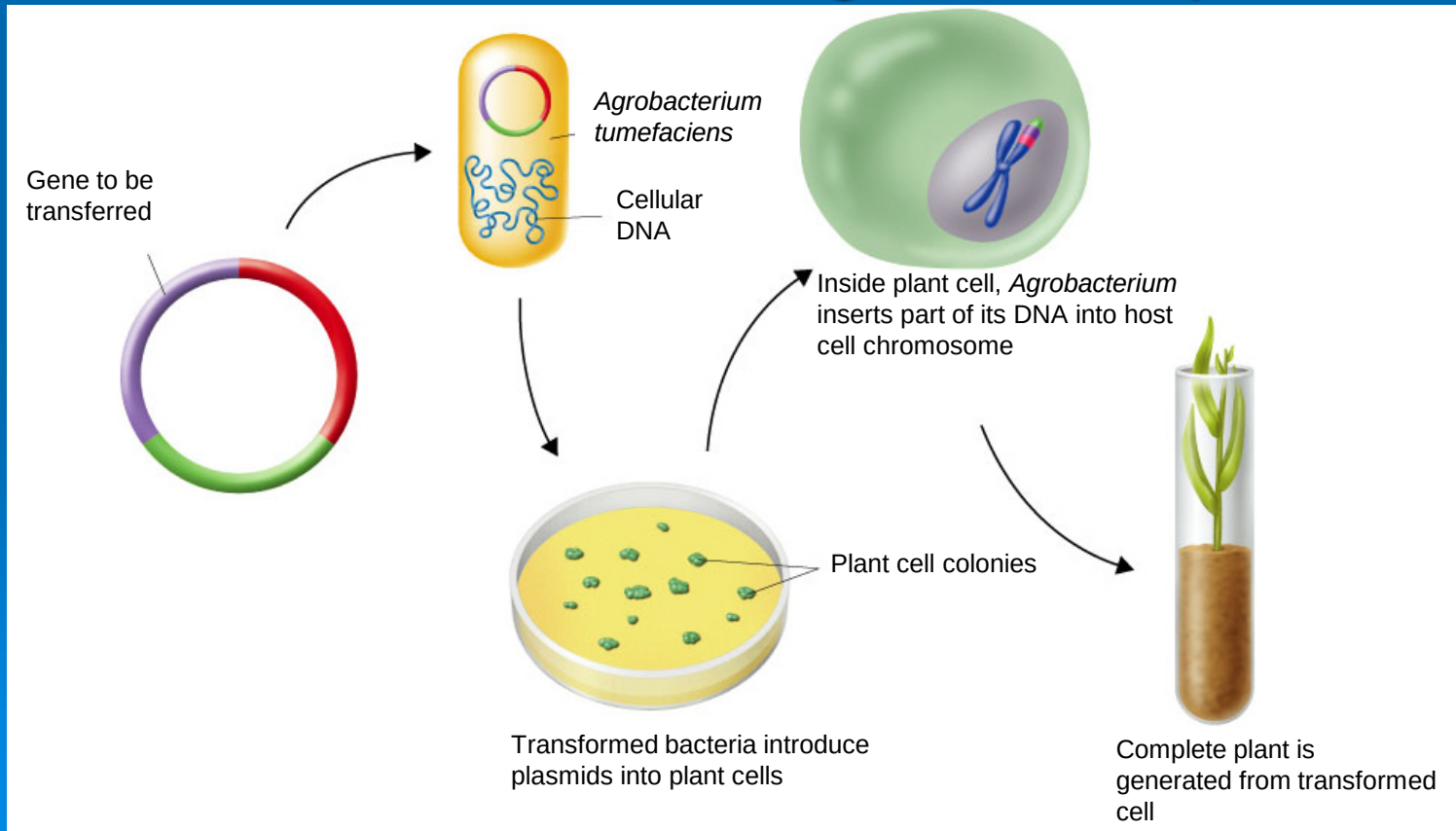


How do you know if bacteria were transformed?

- Plasmid also has markers to id transformed bacteria
- Fluorescent markers
- Antibiotic resistance marker

Transforming Plant Cells

- Agrobacterium infects plant cells and makes them produce tumor
- If a gene is put into the plasmid of this agrobacterium, it will insert the gene into plant cells

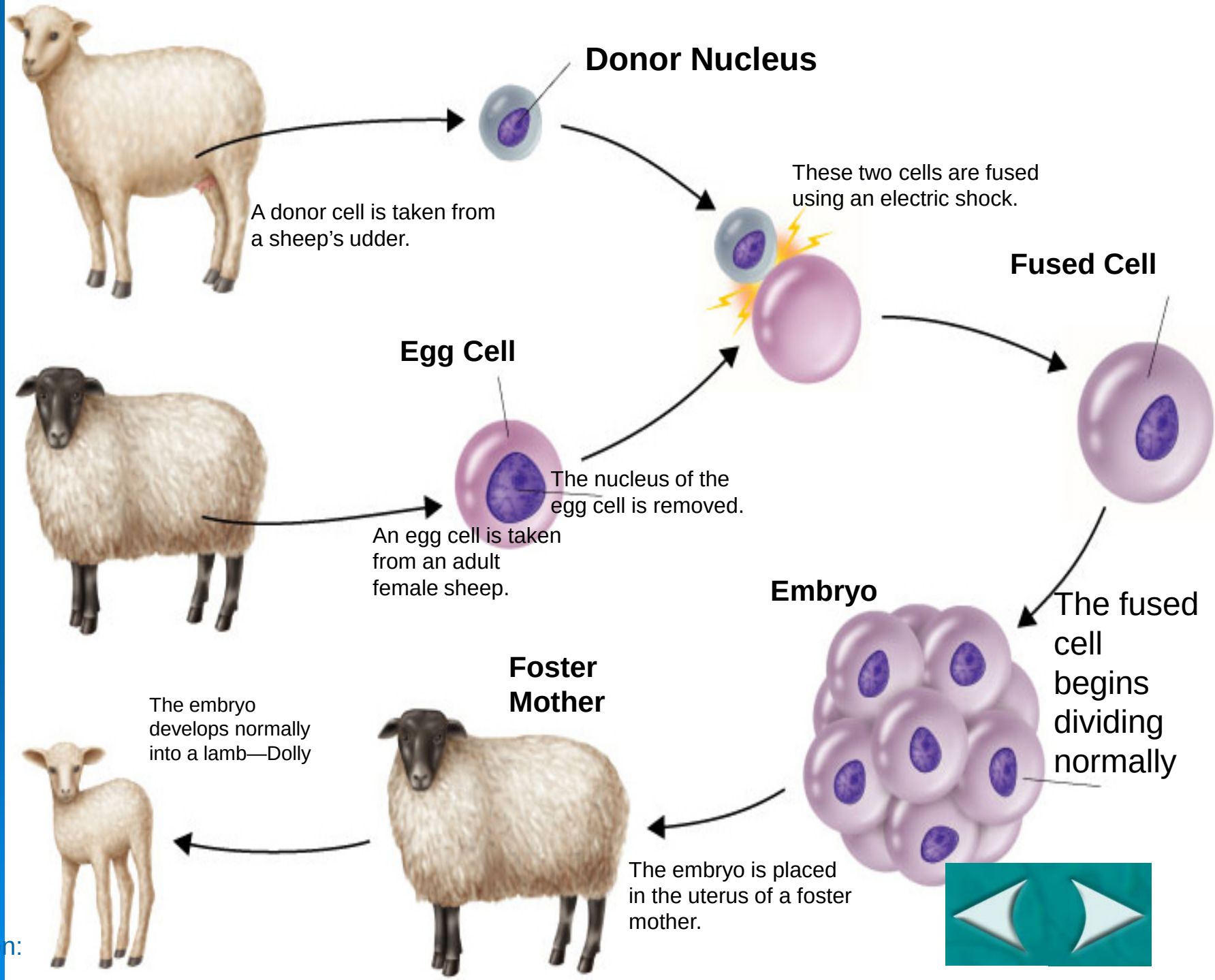


Transgenic Crops

- Strawberries that are resistant to fungus
- Rice that produces vitamin A
- Corn and Cotton that produce natural insecticide
- “Roundup Ready” Crops

Transforming animal cells

- DNA can be injected into egg cells
- Enzymes will incorporate that gene into the chromosome
- Sometimes genes can be replaced
- Gene therapy – possible treatment for genetic diseases
- Stem cell research – can we make replacement organs?
- Cloning – can produce animals for research or medical use



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