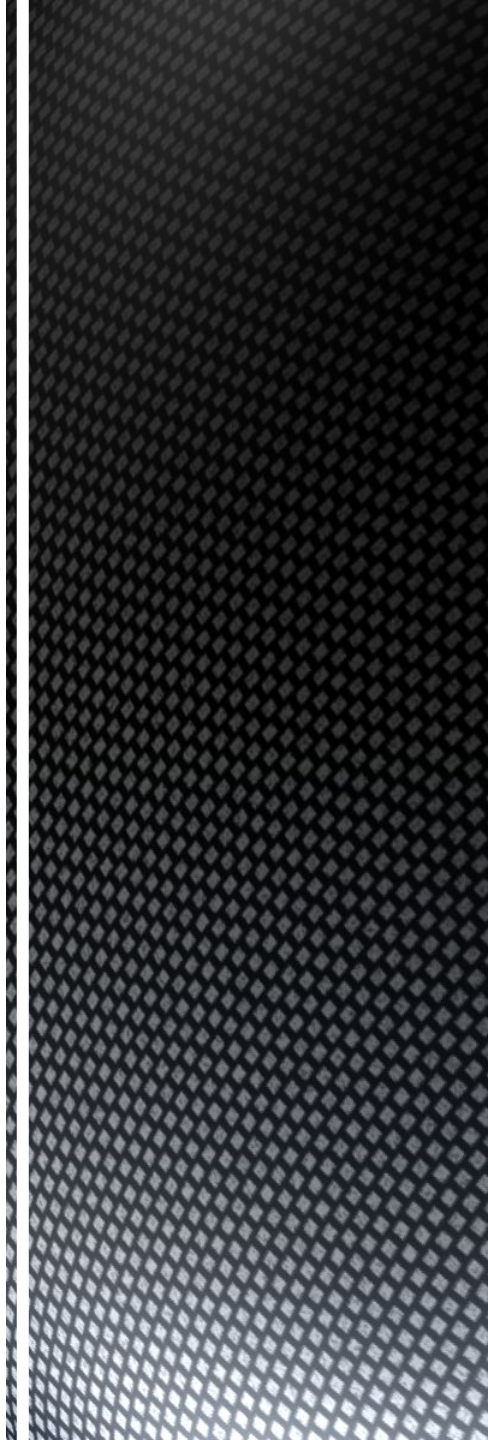


Chapter 11

Gene Technology (Biotechnology)



CLONING IS ALL VERY WELL IN THEORY
BUT DO YOU HAVE ANY PROOF IT CAN ACTUALLY WORK?



Genetic Engineering

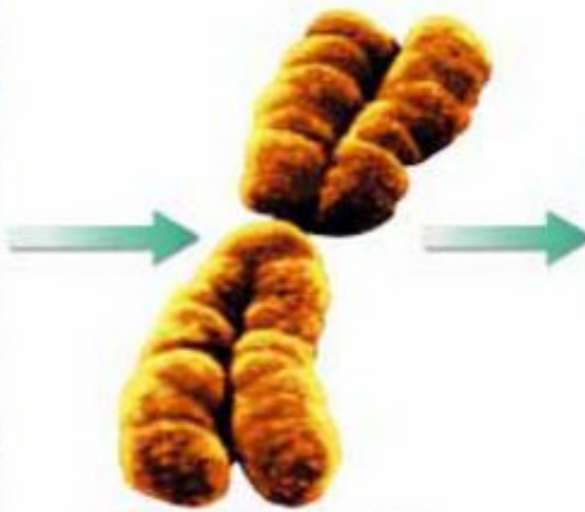
- The process of **manipulating genes** for practical purposes
- Recombinant DNA
 - DNA made from **two or more** organisms
- Example – First Genetically Altered Organism
 - Bacteria produced frog rRNA

Figure 1 Genetic alteration of an organism

Cohen and Boyer produced the first genetically engineered organisms.



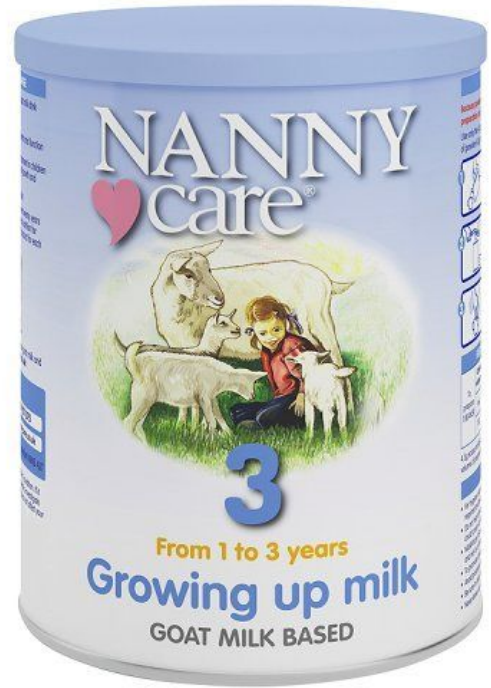
1. Cohen and Boyer used an African clawed frog as their experimental organism.



2. They isolated an rRNA gene from one of its chromosomes.



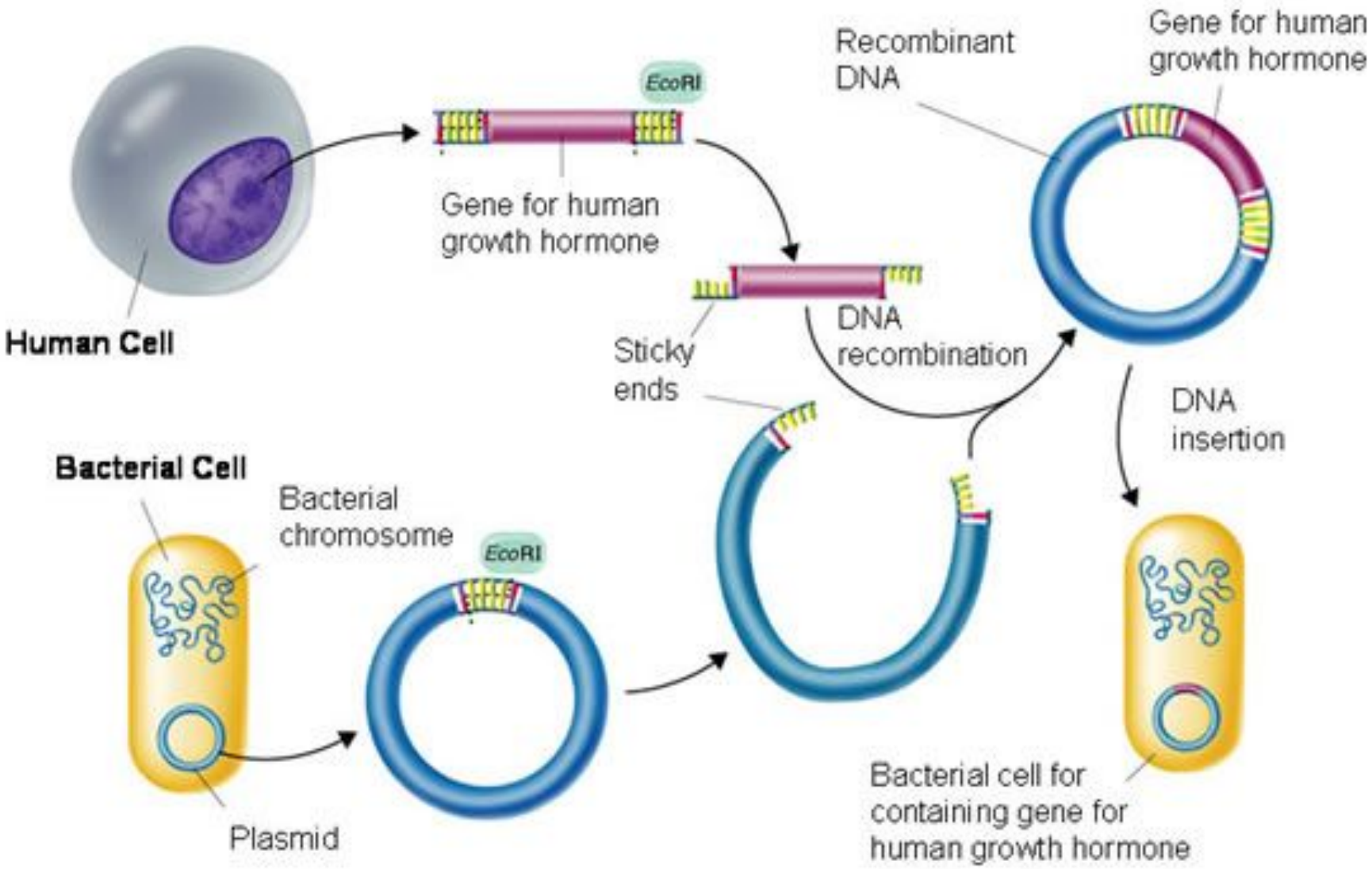
3. They inserted the gene into bacteria. The bacteria produced frog rRNA.



Steps of Genetic Engineering

Step 1 – Cutting DNA

- Genes of interest cut by restriction enzymes
- **Restriction Enzymes:**
 - Bacterial enzymes that recognize and bind to specific nucleotides
- **Vector**
 - An agent used to carry the gene of interest to another cell
- **Plasmids**
 - Circular DNA that replicate independently



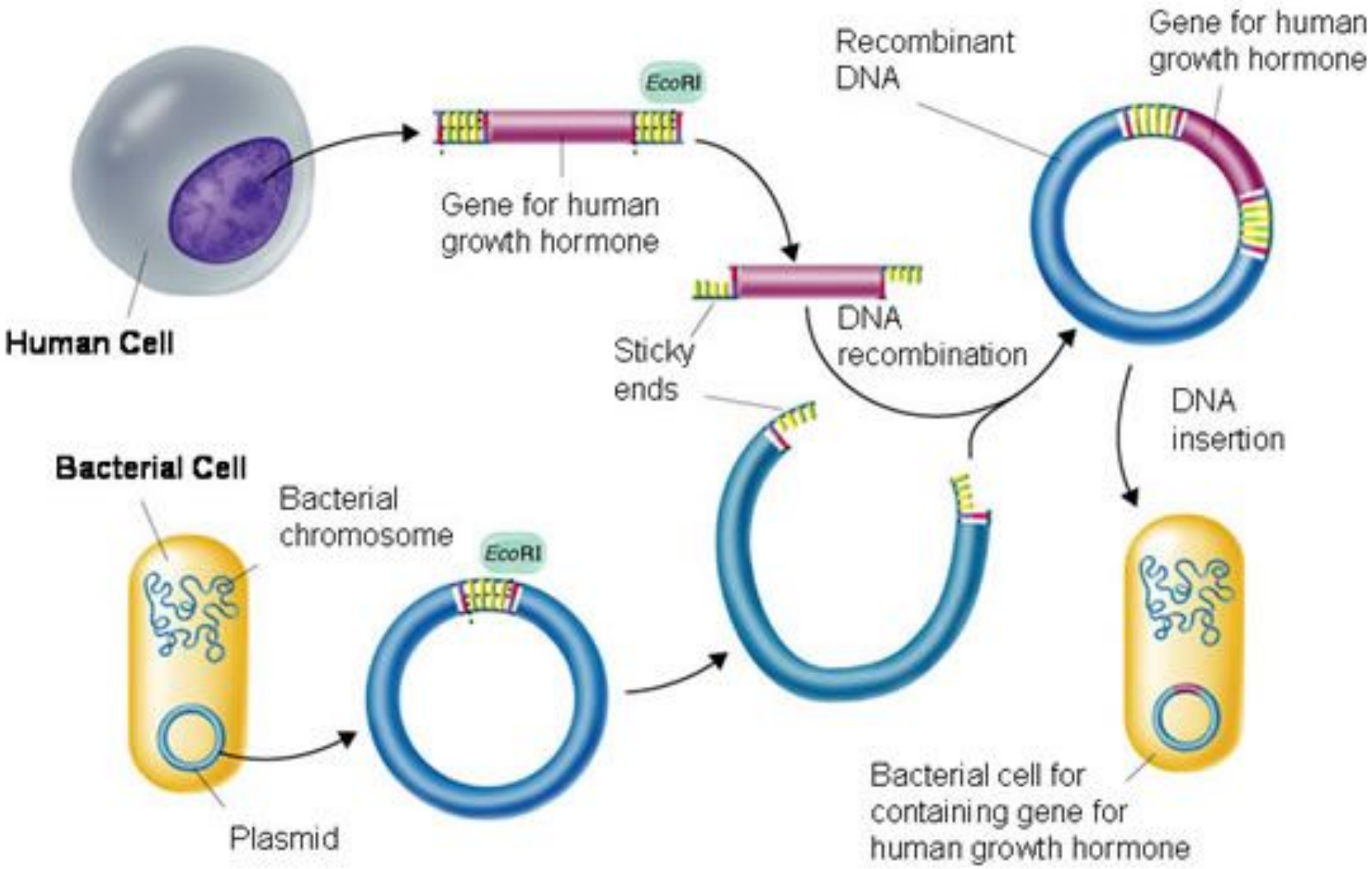
End of Day 1

<https://www.youtube.com/watch?v=7TmcXYp8xu4>

Steps of Genetic Engineering

Step 2 – Making Recombinant DNA

- Genes of Interest + Vector = Recombinant DNA
- **Transgenic organism**
 - The organism produced through genetic engineering
- **DNA Ligase:**
 - Bonds (glues) the DNA fragments together
 - Host cells take up the recombinant DNA to pass on the genetically modified DNA



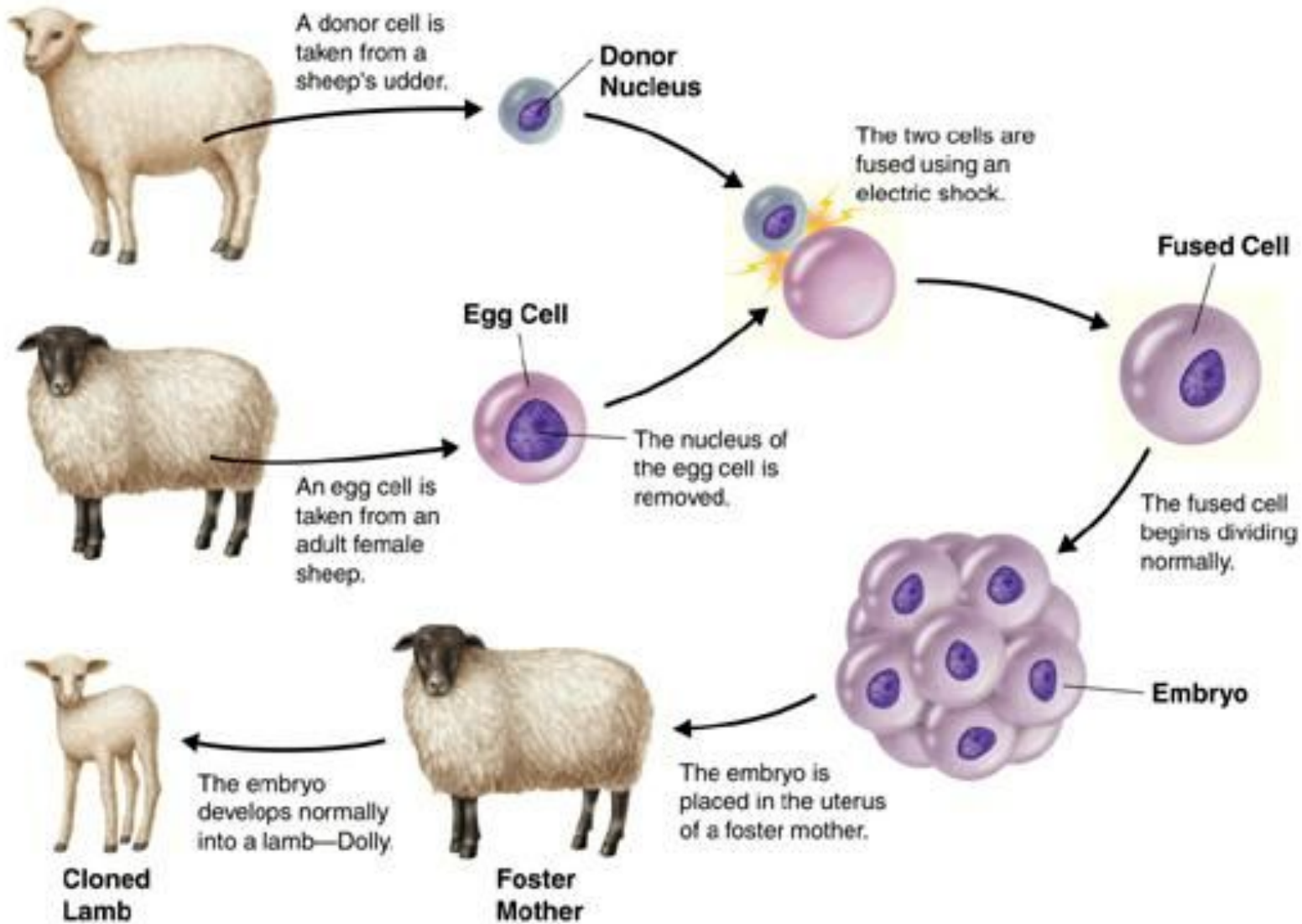
Steps of Genetic Engineering

Step 3 – Cloning

■ Gene Cloning:

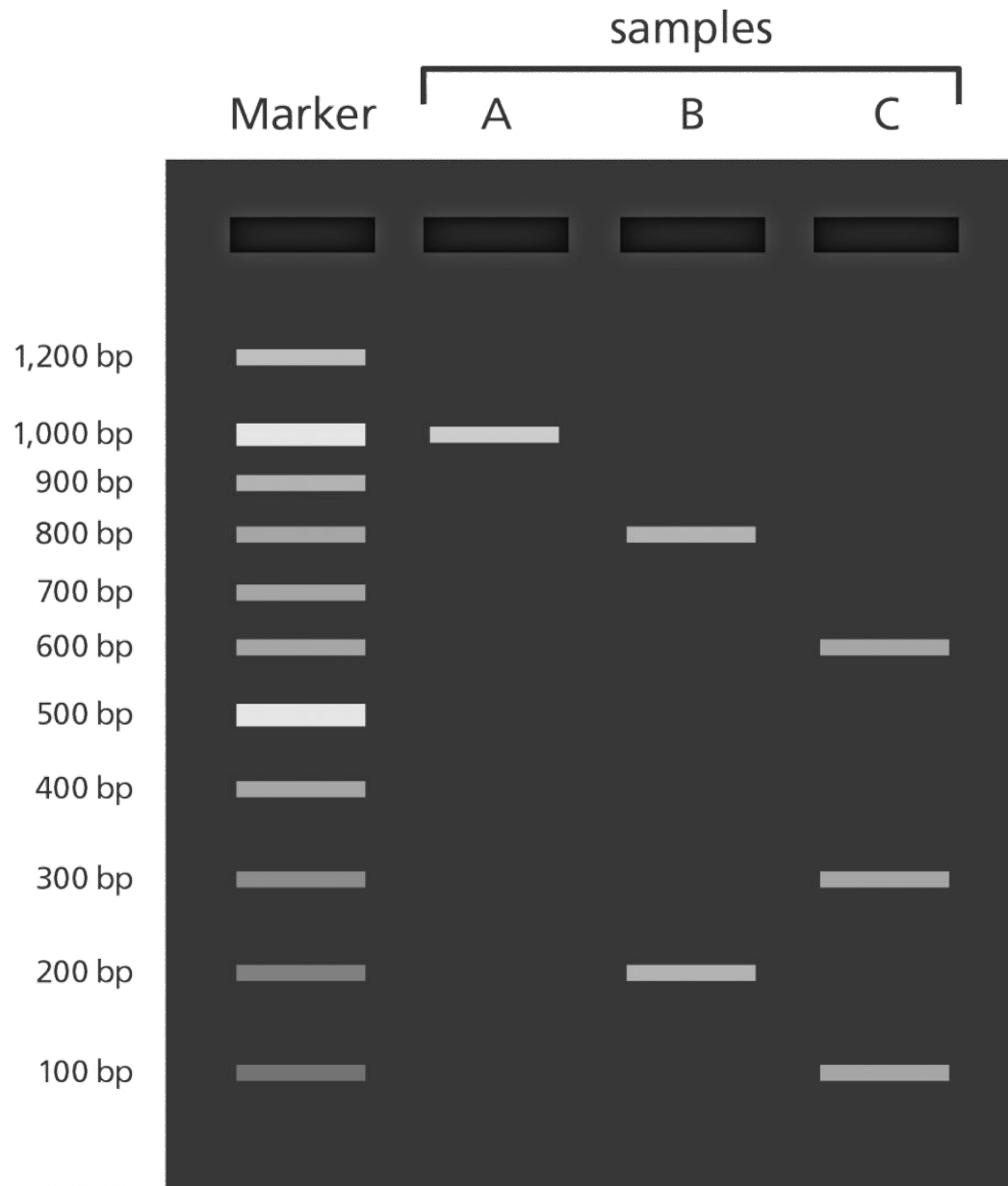
- As host cell reproduces – exact copies of the genes of interest are replicated
- Gene of interest and plasmid are both replicated

Cloning



Gel Electrophoresis

- Electric field that separates molecules by size
- Small bands move the fastest - top or bottom?
- DNA is separated into single strands by gel
- DNA is negatively charged – migrates to positive pole
 - Top = Negatively charged
 - Bottom = Positively charged
-



DNA Fingerprinting

- A pattern of dark bands on X-ray film
- Purpose:
 - Make a sample of DNA to **compare** to another sample
- Uses:
 - **Forensics (blood evidence)**
 - **Paternity tests**

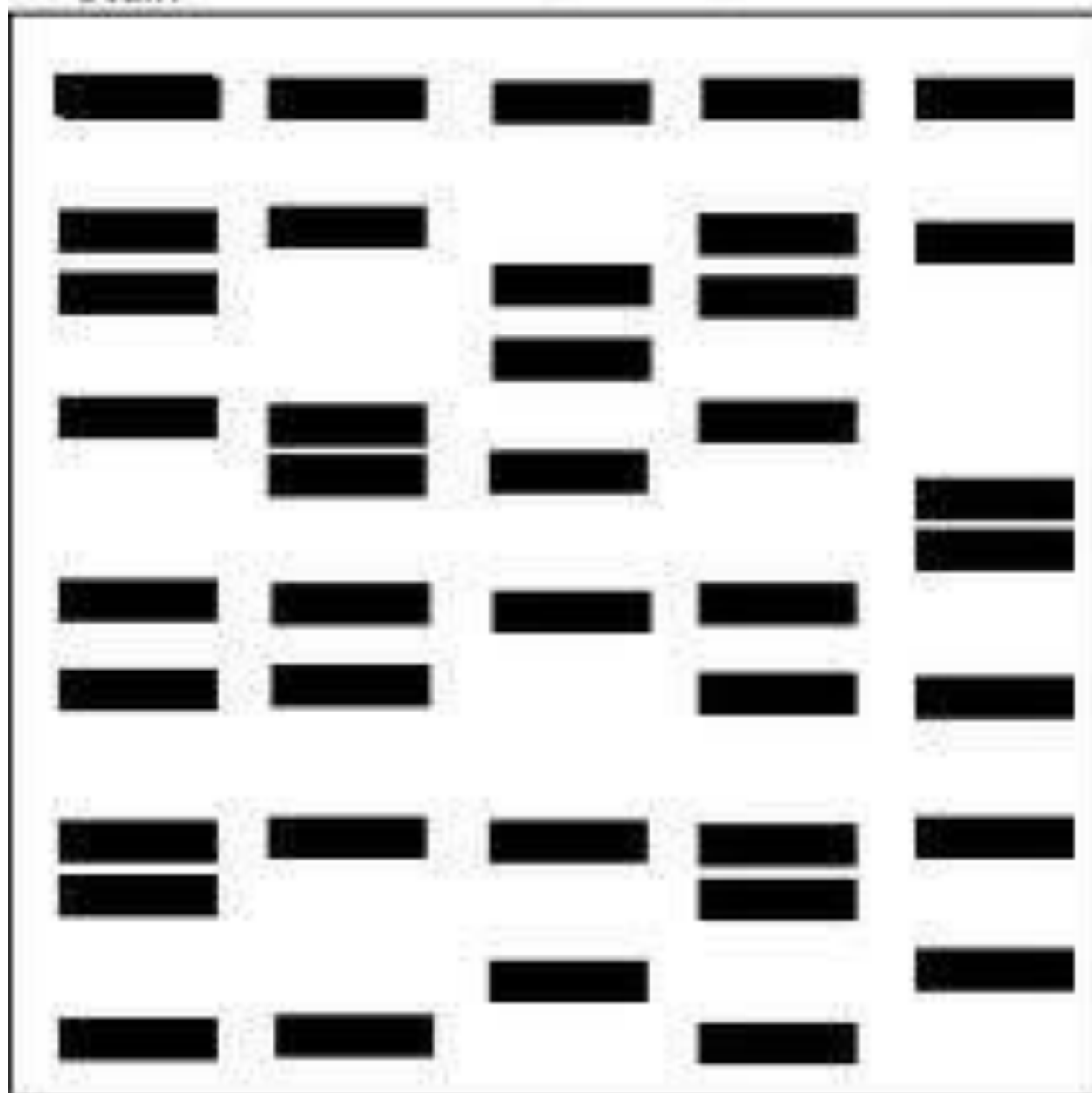
blood
stain

Bob

Sue

John

Lisa



Human Genome Project

- A project that links over 20 genetic labs in six different countries
- The purpose:
 - **Identify all 3.2 billion base pairs of the human genome**
- **Human DNA:**
 - 6 feet long (30,000 to 40,000 genes)

Why do we need to know our genome?

Genetically Engineered Drugs

- Bacteria is the source for many GEDs
- These drugs are universal for all body types and that's why they work



Genetically Engineered Drugs

Genetically Engineered Medicines

Product:

- Erythropoietin
- Growth factors
- Human growth hormone
- Insulin
- Interferons
- Taxol

Used for treatment of:

- Anemia
- Burns, ulcers
- Growth defects
- Diabetes
- viral infections and cancer
- Ovarian cancer

Technology in Animal Farming

Growth Hormone in Cows

- Increases milk production
- Introduced through **bacteria** in their diet
- Now naturally in pigs

Transgenic Organisms

- Human **proteins** introduced to **farm animal** **DNA** to produce **human proteins** in milk

NORMAL



www.skinwellness.ca

NOT NORMAL

