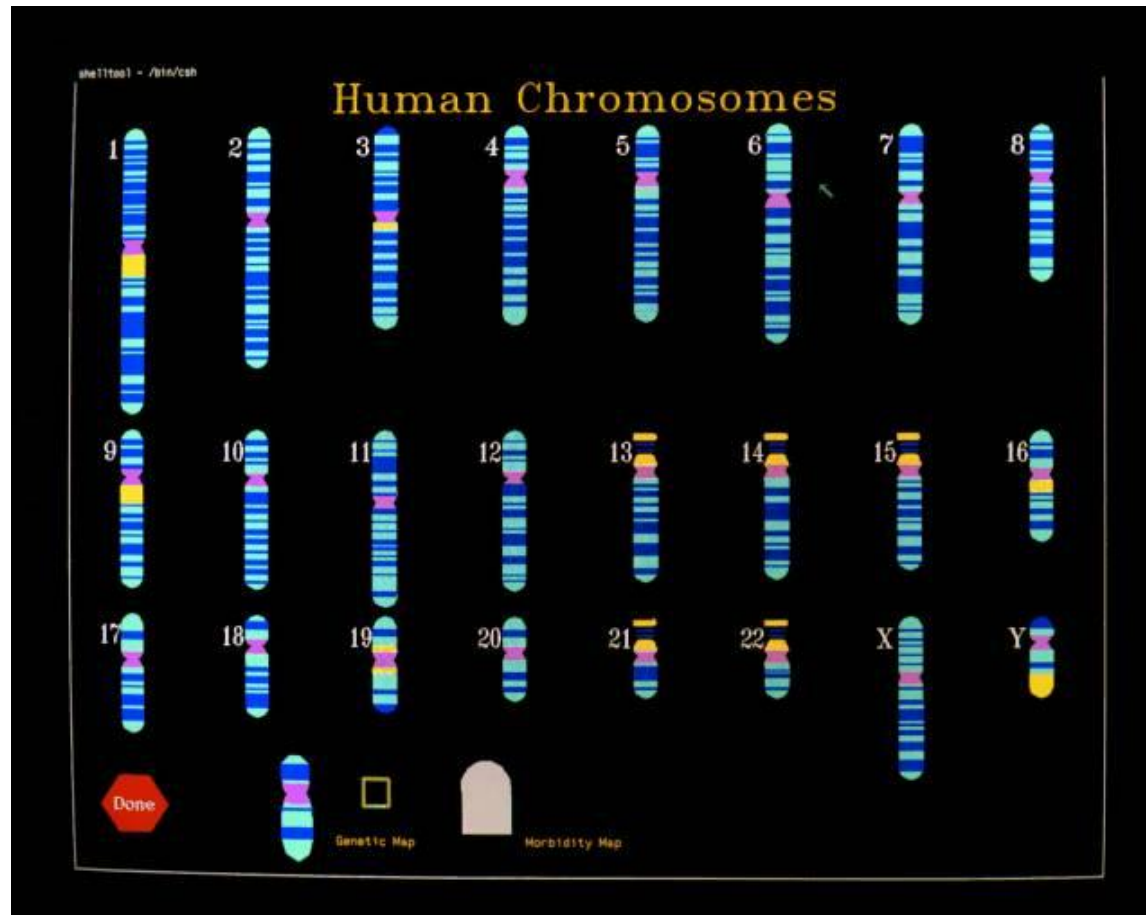


DNA Technology

Uses in Agriculture, Forensics,
and Medicine

Genome

- All the genetic material of an organism



Human Genome Project

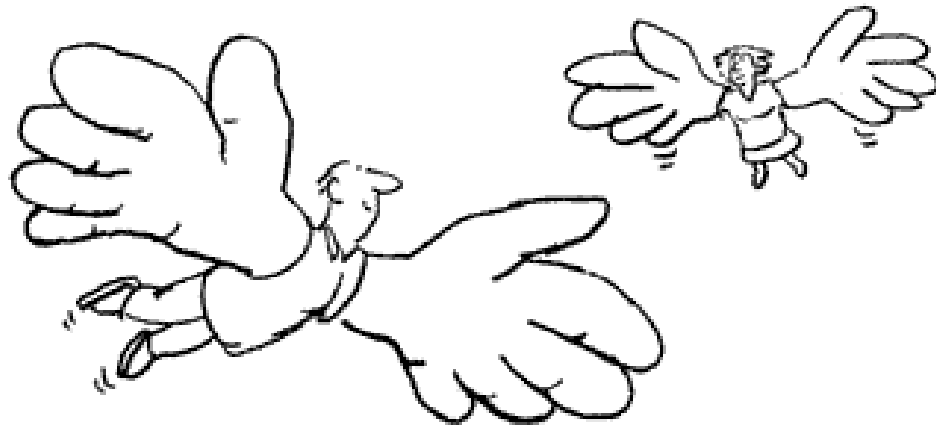
- Scientists sequenced the entire human genome (2.9 billion base pairs)
- Findings:
 - Humans have few genes
 - Most of our DNA is noncoding
 - Many genes are identical to other species
 - All humans are genetically close

Human Genome Project

- Applications
 - Learn more about the body
 - Diagnose and prevent disease
 - Treat disease
 - Identify individuals – criminals and relatives

Genetic engineering

- Deliberate alteration of the genetic makeup of an organism – transferring genes from one organism to another



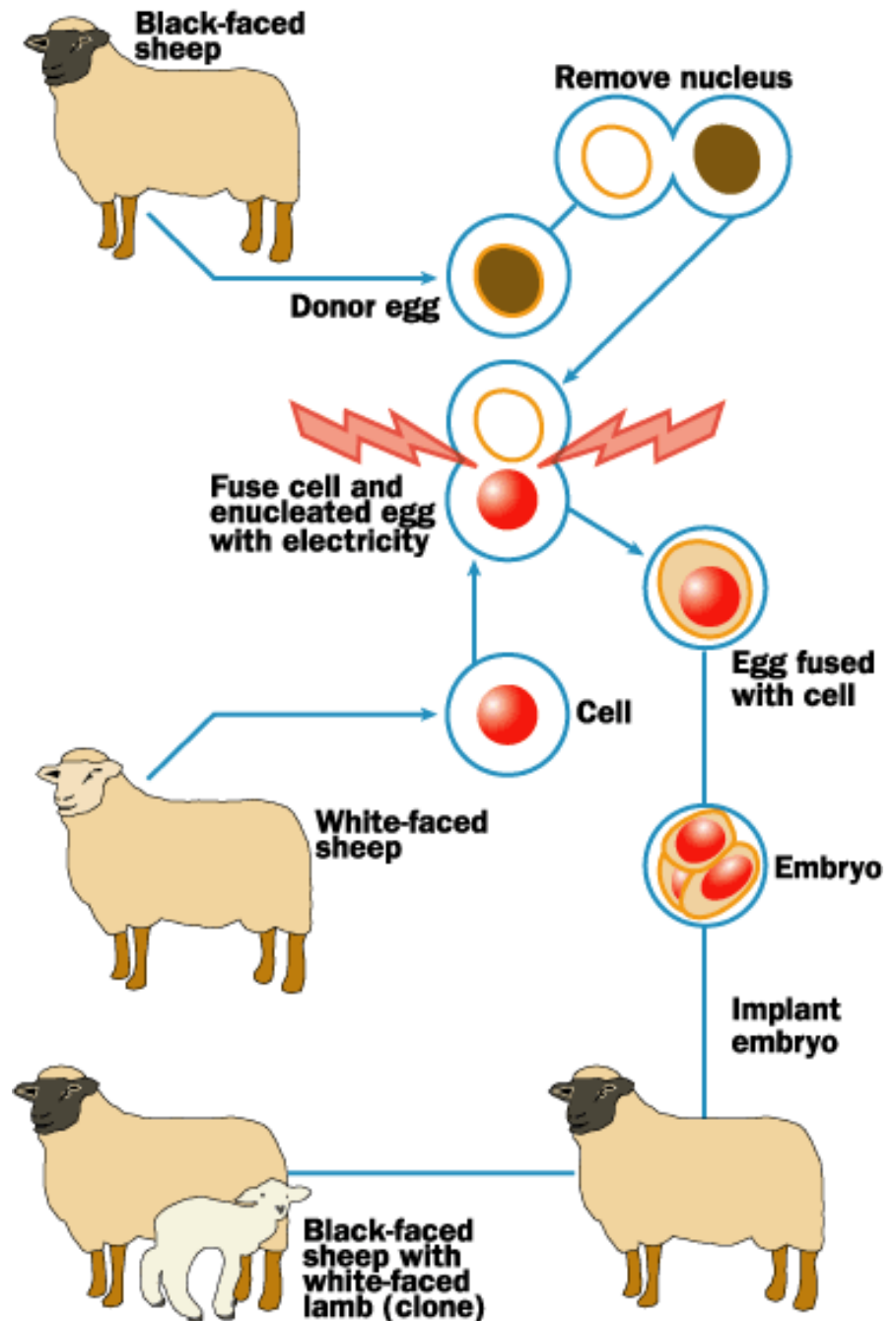
SCIENTISTS ARE HOPING TO ISOLATE
A **BIG HAND GENE** TO GIVE PEOPLE
THE POWER OF FLIGHT.



Chris Madden

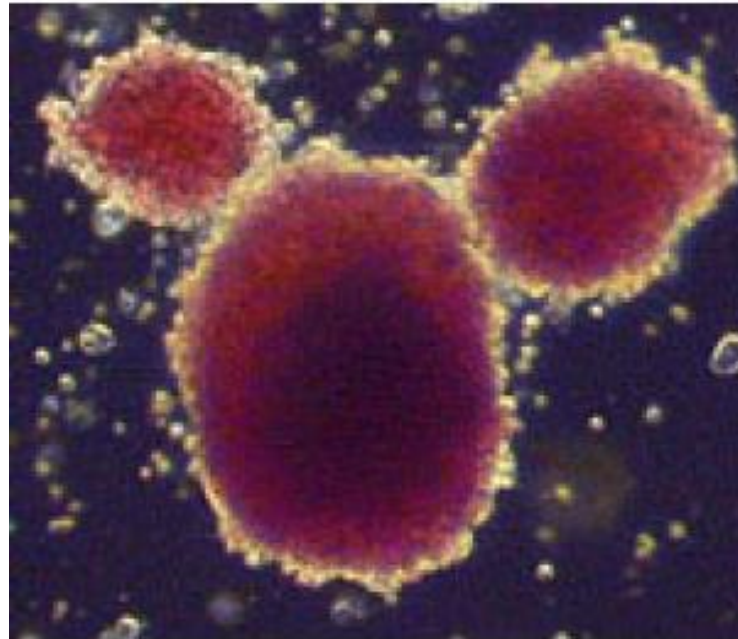
Cloning

- Form of asexual reproduction that isolates the nucleus of one cell and inserts it into an empty egg cell
- Then the egg is allowed to grow and develop a new organism genetically identical to the donor



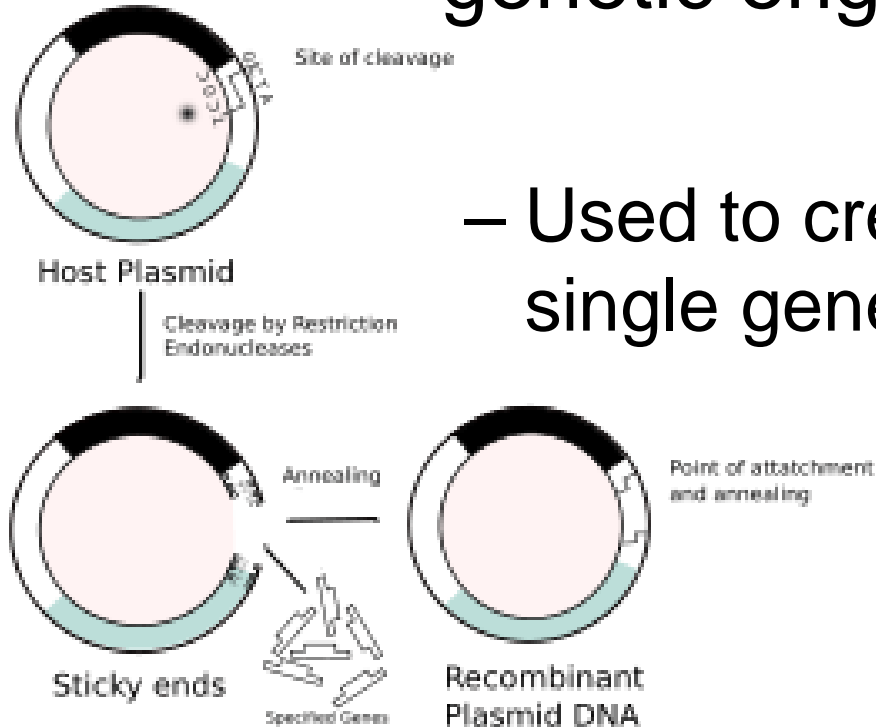
Stem cells

- Cells that can continuously divide and differentiate (specialize) into various types of cells

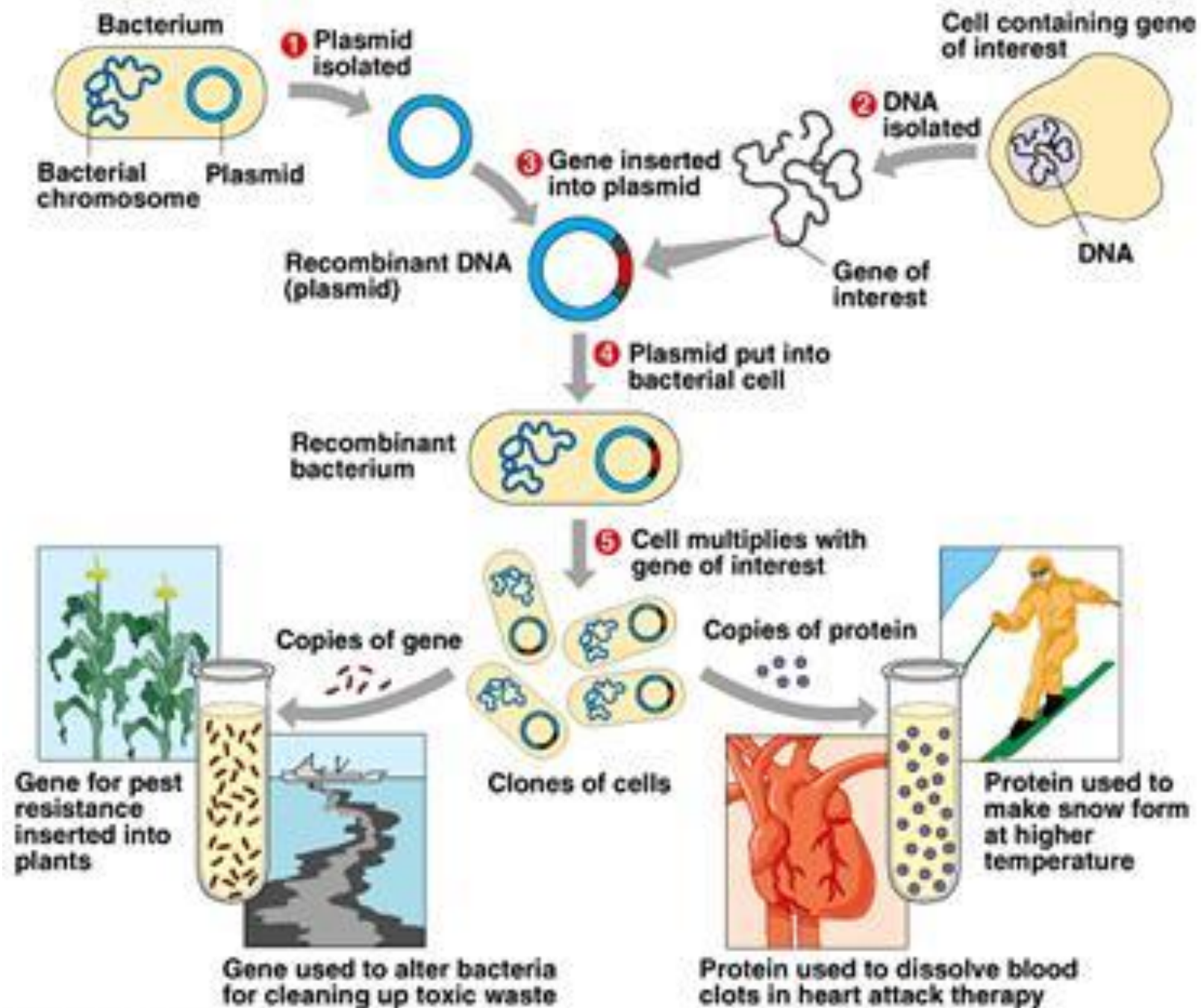


Recombinant DNA

- DNA that has been recombined by genetic engineering

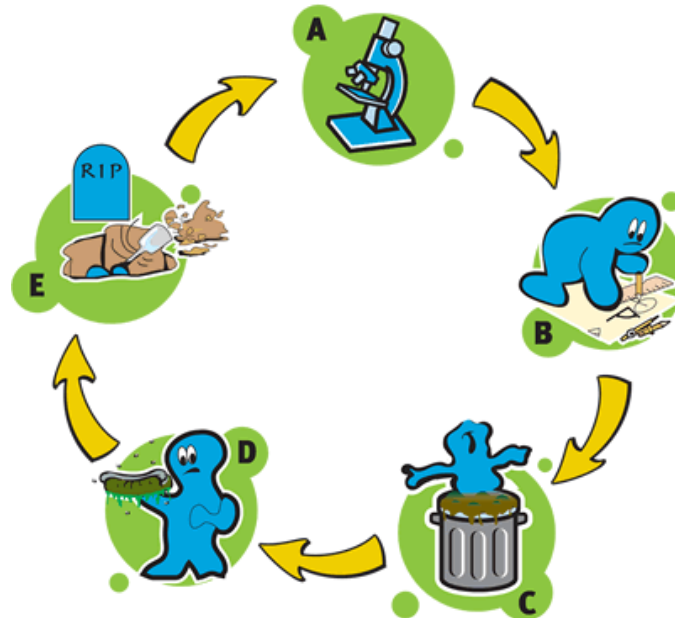


– Used to create large amounts of a single gene (insulin production)



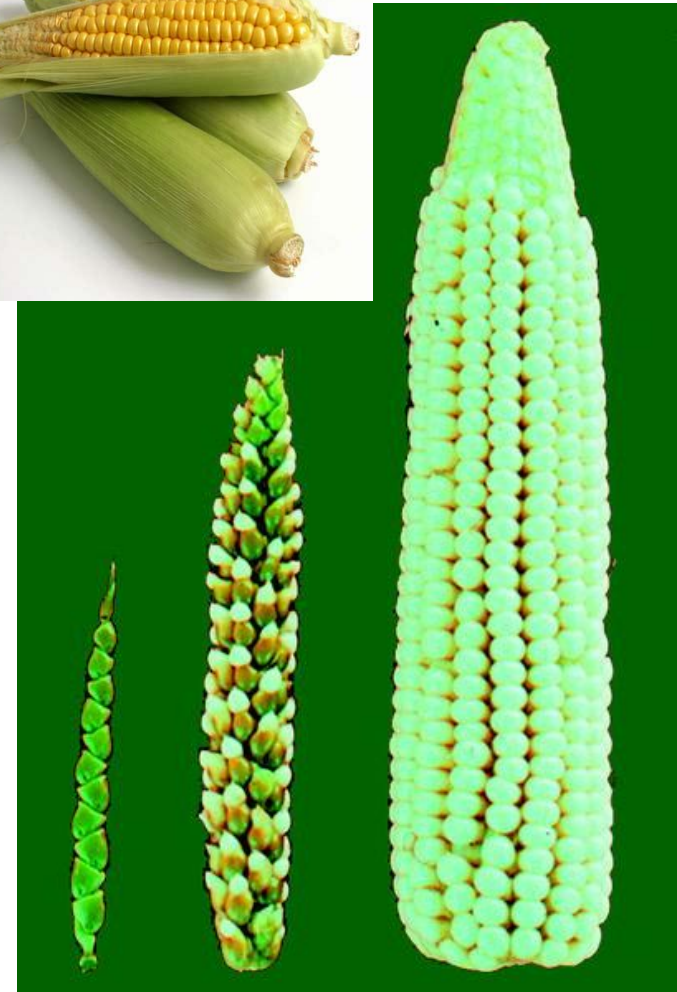
Genetically Modified Organisms

- Organisms with recombinant genes
- Bioremediation: Using genetically modified microbes for environmental cleanup



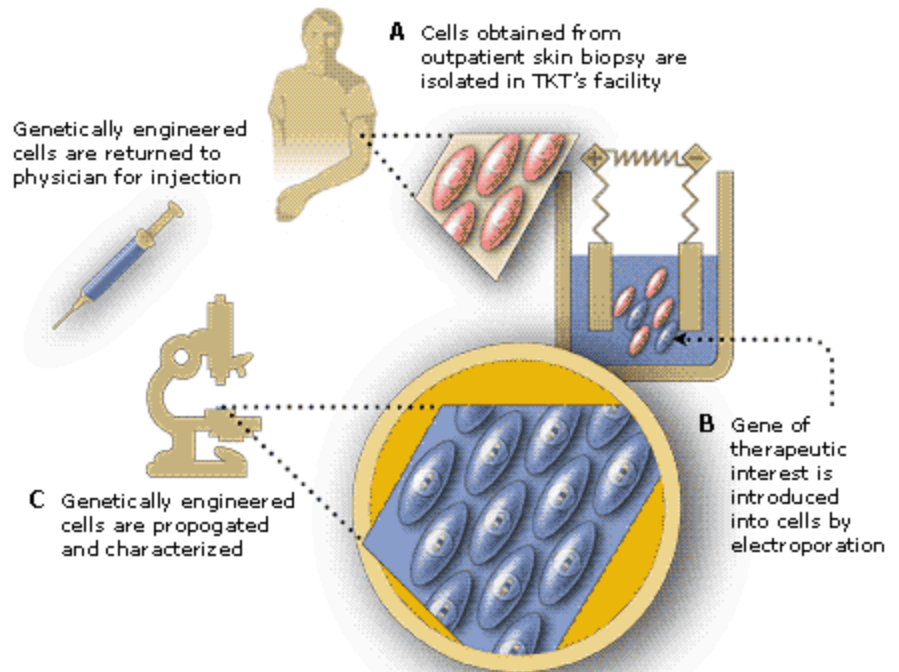
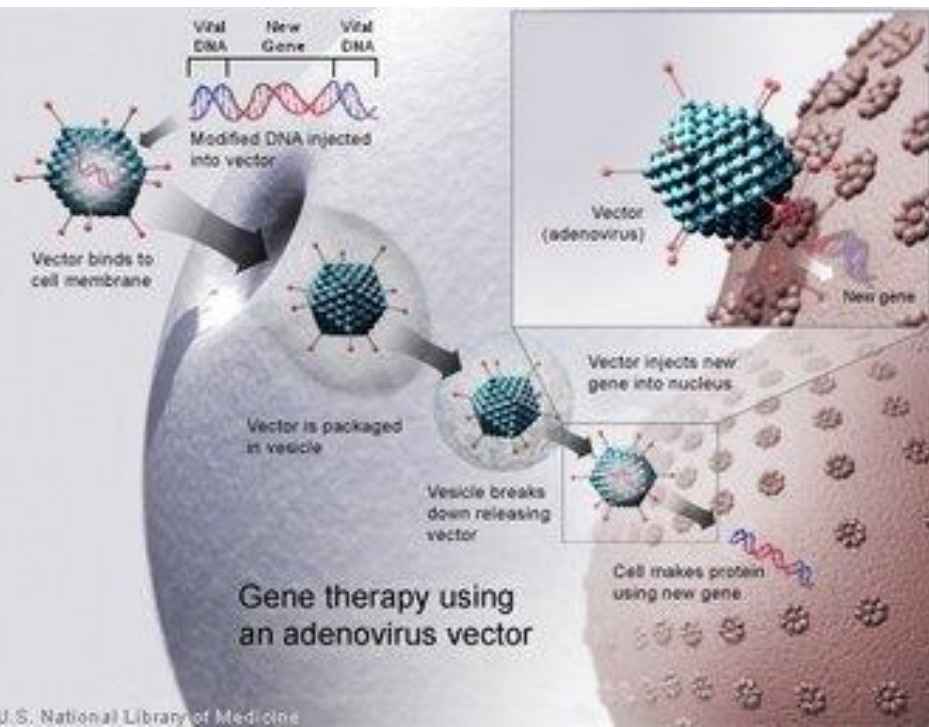
Genetically Modified Organisms

- Food / Agriculture
 - Corn: modified to carry an insect-killing chemical gene and selective breeding has altered the number of kernals
 - Other foods can be made to have a higher nutritional content or prolong ripening



Gene therapy

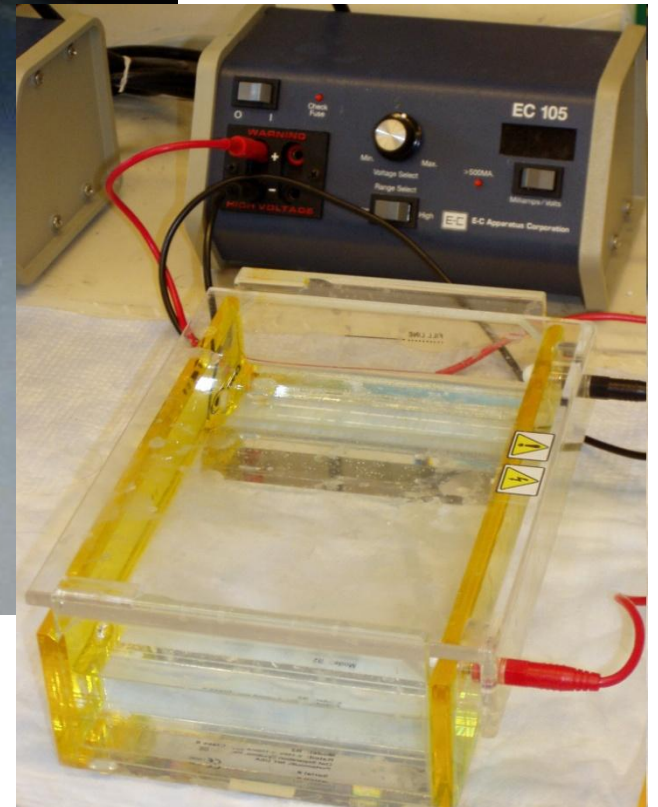
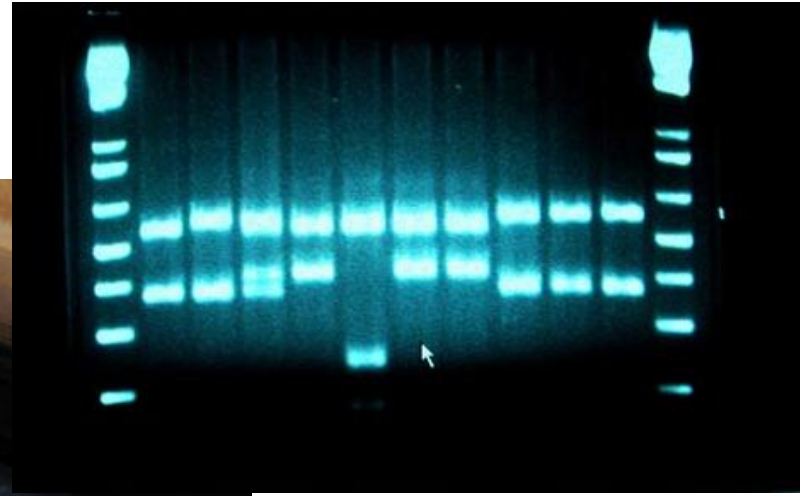
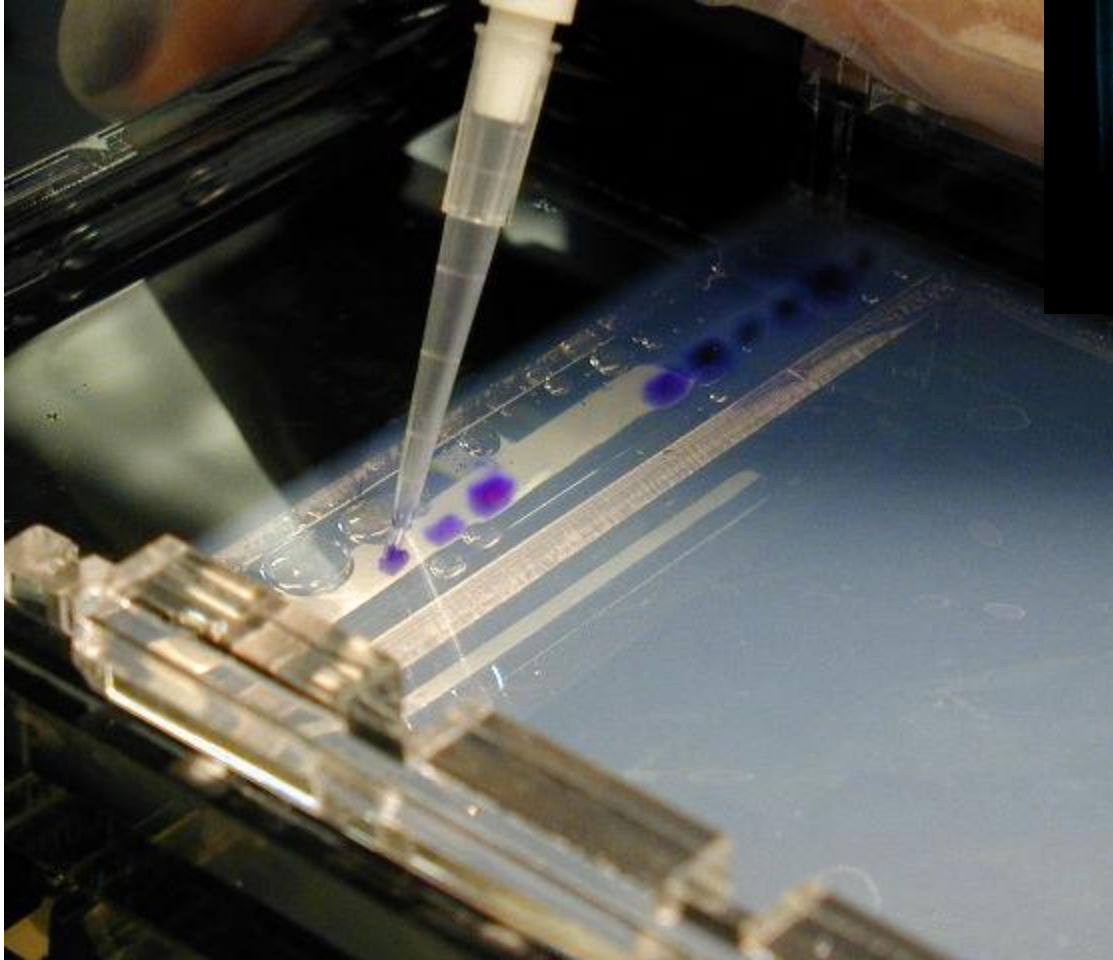
- Inserting functional “replacement” genes into a person’s cells by using a genetically engineered virus – used to cure genetic disorders



Gel Electrophoresis:

- Process by an electric current moves fragments of DNA, that were cut with a restriction enzyme, through a semisolid gel to separate the fragments
 - Negative DNA is repelled by the negative charge at the end of the gel where the wells are located
 - DNA moves towards the positive charge at the opposite end

- Large DNA fragments get stuck in the gel and do not travel very far
- Smaller DNA fragments can move further down the gel
- This separates out all the fragments to create a banding pattern that is unique for each individual



DNA fingerprinting

- Samples of DNA that have been cut, sorted, and tagged to produce a banding pattern for analysis
 - Tagging occurs by washing a fluorescent molecule over the gel and then shining a UV light on it
- This technology uses gel electrophoresis to determine differences between individuals

Polymerase Chain Reaction

- PCR = copying sections of DNA in large amounts in the lab
- Steps:
 - Isolate the DNA you want to copy
 - Unzip the strand with an enzyme
 - Allow another enzyme to add the DNA nucleotides in order
 - Unzip again and continue copying