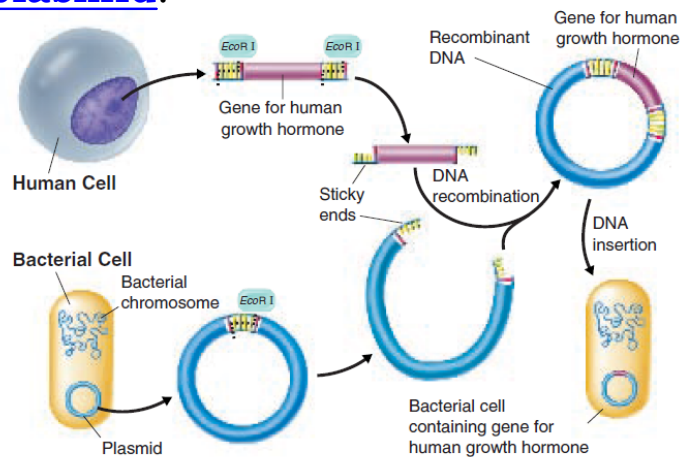


13-3 Cell Transformation

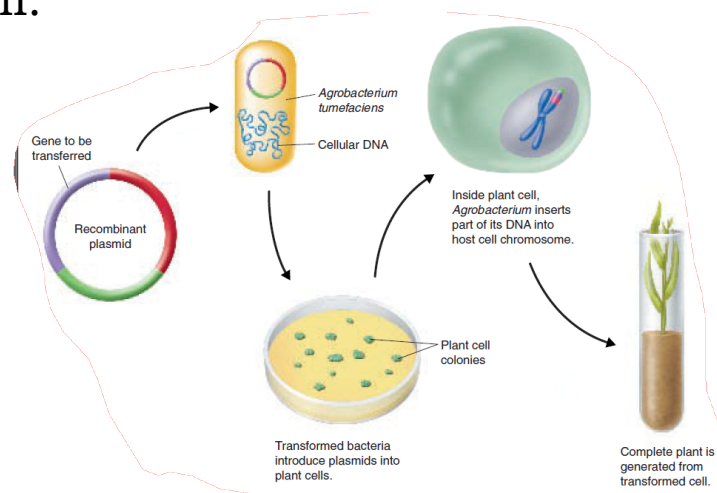
Transforming Bacteria

- During **transformation**, a cell takes in DNA from outside and incorporates it into its own DNA.
- In the lab, foreign DNA is joined to small circular piece of DNA called a **plasmid**.



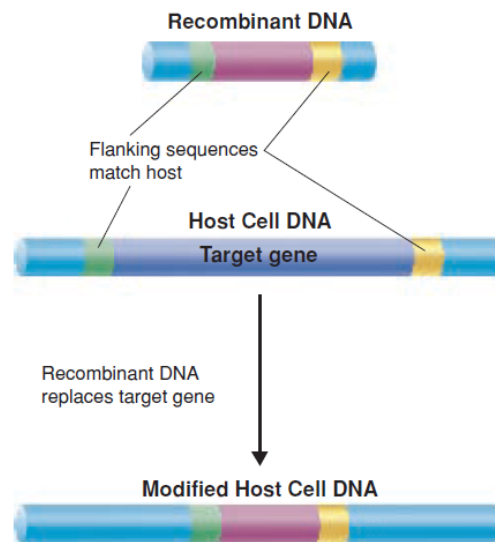
Transforming Plants

- Bacteria can be used to incorporate genes into plant cells.
- If **transformation** is successful, the **recombinant DNA** is integrated into one of the chromosomes of the plant cell.



Transforming Animals

- Animal cells can use some of the same methods, or some egg cells are large enough to inject DNA directly.



13-4 Applications of Genetic Engineering

- **Genetic Engineering** makes it possible to transfer DNA from one organism to another.



e.g. genes that create bioluminescence in fireflies were isolated and injected into tobacco plants.

The result: glowing tobacco!

Figure 13 - 12, p. 331

Transgenic Organisms

- **GMO's** (Genetically Modified Organisms): organisms whose genetic material has been altered
- **Transgenic organisms** contain genes from other species.
- **Biotechnology**, as it exists today, is largely dependent on transgenic organisms, and experiments done in this area of study.



GloFish



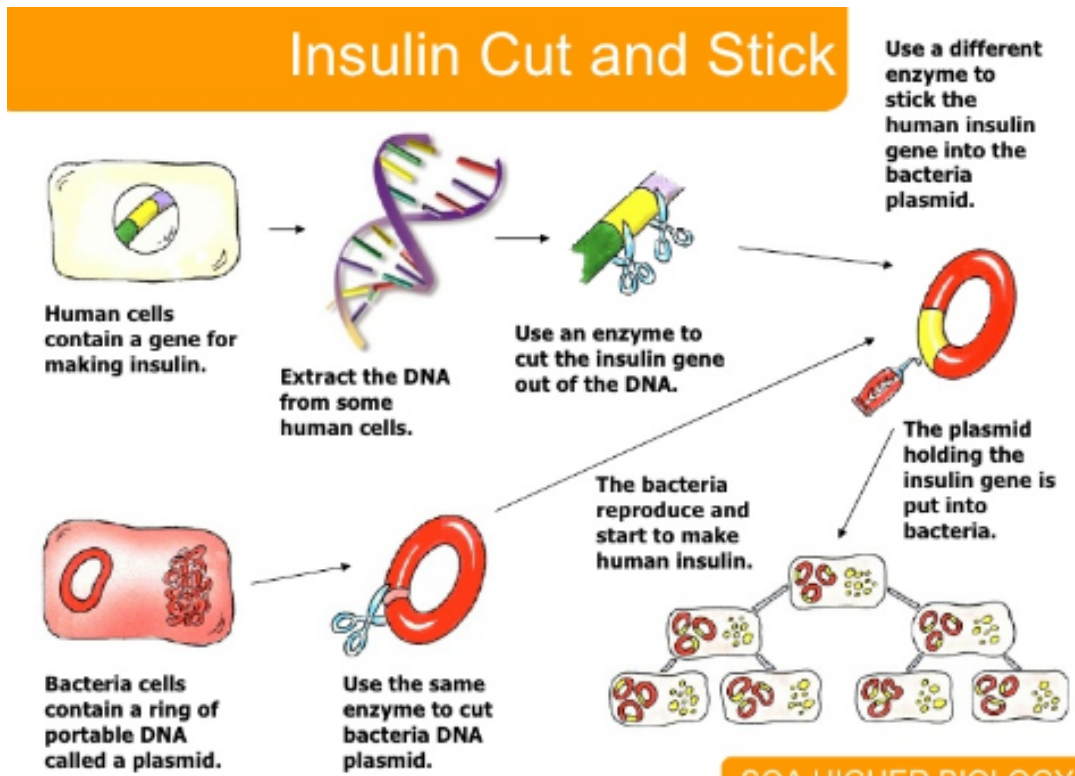
Enviro Pig

Transgenic Microorganisms

- Bacteria reproduce quickly and are simple (and cheap!) to grow.
- Human proteins, such as insulin for diabetics and clotting proteins for hemophiliacs have been successfully produced.
- Human genes are inserted into bacterial DNA and the "product" protein is collected.



Production and packaging of insulin pens



Transgenic Animals

- Many transgenic animals are currently being used as test-subjects to study genes and improve the food supply

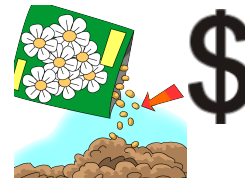
e.g. rodents created to have an immune system similar to humans will react the same way we would to infections.

e.g. salmon grown in farms that have genes designed to make them grow fatter and faster.



Transgenic Plants

- **Transgenic plants** have been available on the market for over two decades.
- They contain genes that produce chemicals to prevent insect attack, or chemicals to resist weed-killing sprays used by the farmers.
- Some plants are being created to contain more nutrition, such as vitamin A, or even human antibodies that would help us fight infection.



Cloning

- A **clone** is a member of a population of genetically identical cells produced from a single cell.
- For many years, biologists were unsure if it would be possible to clone more complex organisms like mammals.
- In 1996, Ian Wilmut successfully cloned "Dolly" the sheep from an adult cell.
- **Pros:** cloning transgenic animals, saving endangered species, etc.
- **Cons:** controversial; cloned animals may suffer from genetic defects and health problems.

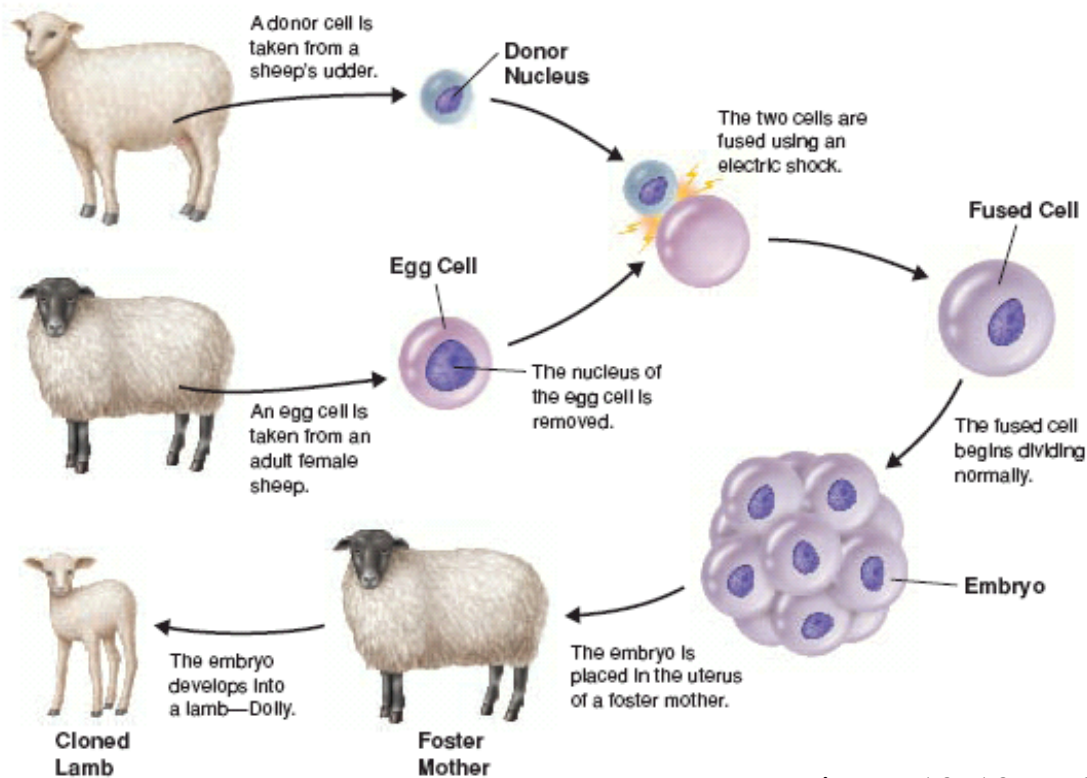


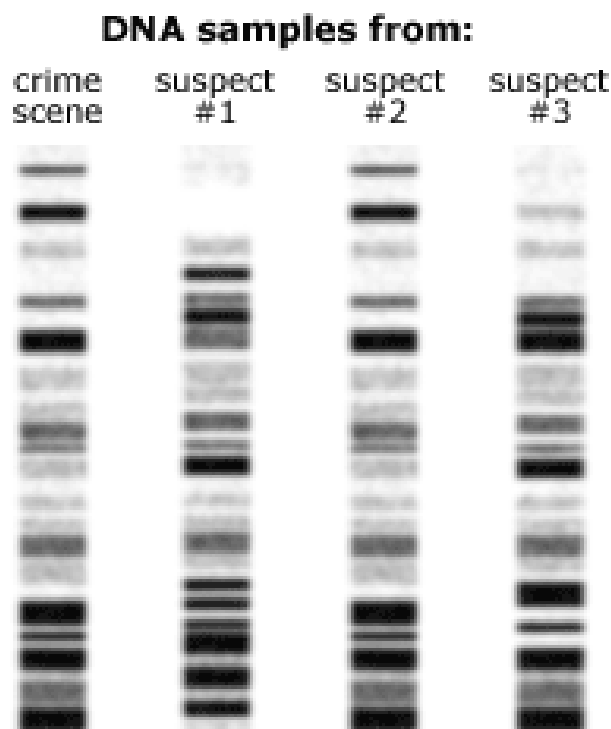
Figure 13-13, p. 332

Gene Therapy

- In **gene therapy**, a faulty or absent gene can be replaced by a healthy one, allowing the recipient to start producing the protein they were lacking.
- Researchers are hopeful that many diseases will be cured by this technique, but it is still in its early stages, and long term effects are unknown.

DNA Fingerprinting

- Although DNA is over 99% identical among all humans, the differences give each person a unique genetic profile.
- DNA fingerprinting is used to establish links between suspects and crime scene evidence, to help find missing persons, and to identify the father in paternity cases.



Attachments

It_All_Started_with_a_Sheep_Named_Dolly__The_Process_of_Cloning.asf