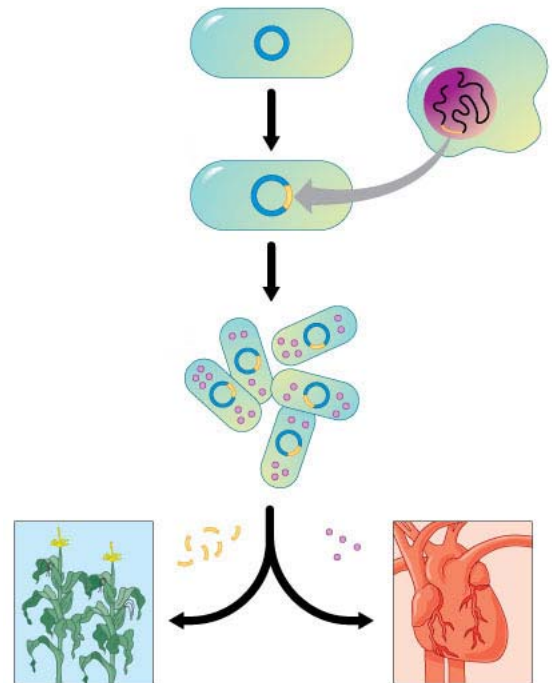


# CHAPTER 12A DNA Technology

## RECOMBINANT DNA TECHNOLOGY

- \_\_\_\_\_ is a set of techniques for combining \_\_\_\_\_ from different sources into a single \_\_\_\_\_
- An \_\_\_\_\_ that carries \_\_\_\_\_ DNA is called a \_\_\_\_\_ (GM) organism
- \_\_\_\_\_ DNA technology is applied in the field of \_\_\_\_\_
  - Biotechnology uses various \_\_\_\_\_ to perform \_\_\_\_\_
  - Be able to fill in and explain following figure; →



## From Humulin to Genetically Modified Foods

- By transferring the \_\_\_\_\_ for a desired \_\_\_\_\_ product into a \_\_\_\_\_, proteins can be produced in large \_\_\_\_\_
- In 1982, the world's first \_\_\_\_\_ engineered \_\_\_\_\_ product was produced
  - Humulin, human \_\_\_\_\_, was produced by genetically modified \_\_\_\_\_
- Prior to the development of \_\_\_\_\_, diabetes was treated using \_\_\_\_\_ from cows and \_\_\_\_\_
  - These types of \_\_\_\_\_ can cause adverse \_\_\_\_\_ in recipients due to a reaction of the \_\_\_\_\_ system
- \_\_\_\_\_ was the first recombinant DNA drug approved by the \_\_\_\_\_

## Genetically Modified (GM) Foods

- Today, \_\_\_\_\_ technology is quickly replacing traditional \_\_\_\_\_ programs
  - In 2002, roughly \_\_\_\_\_ of the American \_\_\_\_\_ of soybeans and \_\_\_\_\_ were \_\_\_\_\_ in some way
- \_\_\_\_\_ has been genetically modified to resist \_\_\_\_\_ infestation
  - This non-GM corn has been \_\_\_\_\_ by the European \_\_\_\_\_
- "\_\_\_\_\_ " is normal rice that has been \_\_\_\_\_ modified to contain \_\_\_\_\_

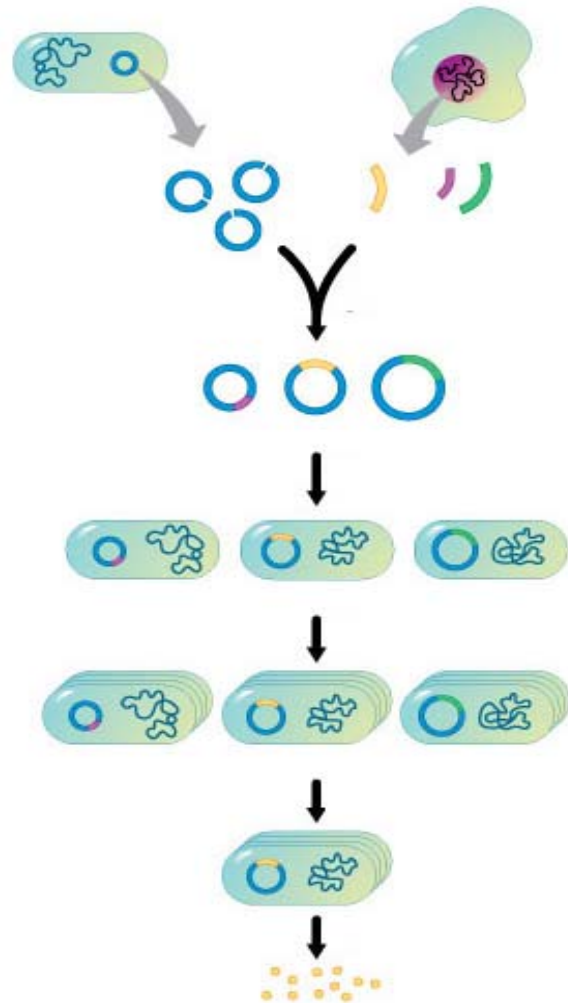
- Our bodies use \_\_\_\_\_ to make vitamin \_\_\_\_
- Beta carotene is normally found in \_\_\_\_\_

**Farm Animals and "Pharm" Animals**

- While genetically modified \_\_\_\_\_ are used today as commercial products, \_\_\_\_\_ whole animals are currently only in the \_\_\_\_\_ phase
- These transgenic \_\_\_\_\_ carry a gene for a human \_\_\_\_\_ protein
  - This \_\_\_\_\_ may help in the treatment of \_\_\_\_\_
- GM \_\_\_\_\_ are not yet used for \_\_\_\_\_

**Recombinant DNA Techniques**

- \_\_\_\_\_ are the workhorses of modern \_\_\_\_\_
- To work with \_\_\_\_\_ in the laboratory, biologists often use \_\_\_\_\_
  - \_\_\_\_\_ are small, circular \_\_\_\_\_ molecules that are \_\_\_\_\_ from the much larger bacterial \_\_\_\_\_
- Plasmids can easily incorporate \_\_\_\_\_
- Plasmids are readily taken up by \_\_\_\_\_
  - Plasmids then act as \_\_\_\_\_ (DNA carriers that move \_\_\_\_\_ from one cell to \_\_\_\_\_)

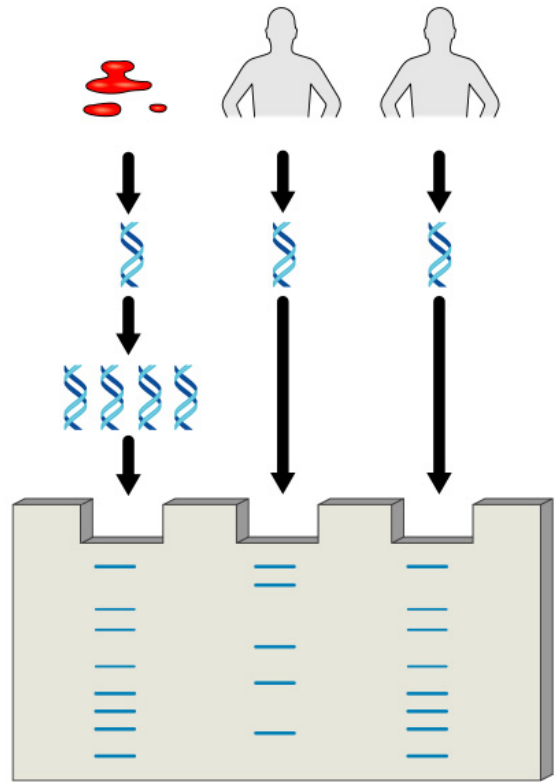


**DNA FINGERPRINTING AND FORENSIC SCIENCE**

- DNA technology has rapidly revolutionized the field of \_\_\_\_\_
  - \_\_\_\_\_ is the scientific analysis of evidence from \_\_\_\_\_ scenes
- DNA \_\_\_\_\_ can be used to determine whether or not two samples of \_\_\_\_\_ material are from the same \_\_\_\_\_
- Be able to fill in and explain this figure →

**Murder, Paternity, and Ancient DNA *The First Case***

- In \_\_\_\_\_ and again in \_\_\_\_\_, young girls were raped and murdered near Narborough, England
  - The killer left behind few clues, except for \_\_\_\_\_
  - A man confessed to the \_\_\_\_\_, but denied committing the \_\_\_\_\_
- Police turned to a professor who had recently developed the first \_\_\_\_\_
- He compared \_\_\_\_\_ from samples collected at both \_\_\_\_\_ scenes and concluded that both murders had been committed by the same \_\_\_\_\_
- Surprisingly, \_\_\_\_\_ from the suspect \_\_\_\_\_
- The case was finally broken using \_\_\_\_\_ and the killer was brought to justice



**Crimes and Other Investigations**

- Since its introduction in \_\_\_\_\_, DNA fingerprinting has become a standard part of \_\_\_\_\_
  - This type of \_\_\_\_\_ has been used in many cases
  - It can prove \_\_\_\_\_

**Identifying remains**

- \_\_\_\_\_ has also been used to identify victims of the World Trade Center attack
- In \_\_\_\_\_ research, this technique has been used to study \_\_\_\_\_ pieces of DNA, such as that of The \_\_\_\_\_ found near Italy and Egyptian \_\_\_\_\_

**DNA Fingerprinting Techniques *The Polymerase Chain Reaction (PCR)***

- The polymerase chain reaction (\_\_\_\_\_) is a technique by which any segment of \_\_\_\_\_ can be amplified (\_\_\_\_\_)
  - Through PCR, scientists can obtain enough \_\_\_\_\_ from even minute amounts of \_\_\_\_\_ or other tissue to allow \_\_\_\_\_

**DNA fingerprinting; How to**

- \_\_\_\_\_ is first broken up into \_\_\_\_\_ using \_\_\_\_\_

- \_\_\_\_\_ - is a method for sorting \_\_\_\_\_ fragments based on their \_\_\_\_\_ and electrical \_\_\_\_\_
- The DNA fragments are visualized as “\_\_\_\_\_” on the \_\_\_\_\_
  - The bands of different \_\_\_\_\_ samples can then be \_\_\_\_\_
  - Is this suspect guilty? \_\_\_\_\_

### **Review Questions:**

1. DNA technology is quickly replacing traditional human breeding programs T/F
2. In 2002 about what percent of the corn and soybean crops were GM?
3. What is one ability that genetically modified corn has that traditional corn does not?
4. What is the name for the scientific analysis of evidence from crime scenes?
5. Why is “golden rice” golden?
6. How did DNA fingerprinting in England free one man and catch another?
7. In the PCR technique, DNA is;
8. Humulin was the first recombinant DNA drug approved by the FDA; T/F
9. What do we use beta carotene in our bodies for?
10. If beta carotene is found in carrots, why put it in rice? (you will have to think a bit, or ask)
11. What is the difference between farm animals and “pharm” animals? (*think*)
12. In what fields are recombinant DNA applied (there are *several*, **think, look at notes**);
13. The hamburger that you might get at In-n-Out probably has some GM beef in it; T/F
14. What organisms can produce Humulin?
15. What was the first genetically engineered pharmaceutical product produced?
16. DNA technology has rapidly revolutionized what field of crime investigation?
17. An organism that carries recombinant DNA is called a;
18. How has DNA fingerprinting been used in evolution research?
19. Why is Humulin better than insulin that comes out of cows and pigs?
20. DNA fingerprinting can prove innocence or guilt T/F
21. Transgenic sheep carry a gene to produce a protein that helps people with the disease;
22. What are the workhorses of modern biotechnology?
23. What is a set of techniques for combining genes from different sources into a single DNA molecule?
24. How can you sort DNA fragments based on their size and electrical charge?
25. What are small, circular DNA molecules that are separate from a bacterial chromosome?
26. Why are plasmids so handy to work with?
27. What do you call a piece of DNA that can move genes from one cell to another?
28. Biotechnology uses organisms like bacteria to do biochemical work, like making proteins T/F