

Human DNA Analysis

There are roughly 6 billion base pairs in your DNA.

Biologists search the human genome using sequences of DNA bases.

Genetic tests are available for hundreds of disorders.

DNA testing can pinpoint the exact genetic basis of a disorder.

DNA Fingerprinting

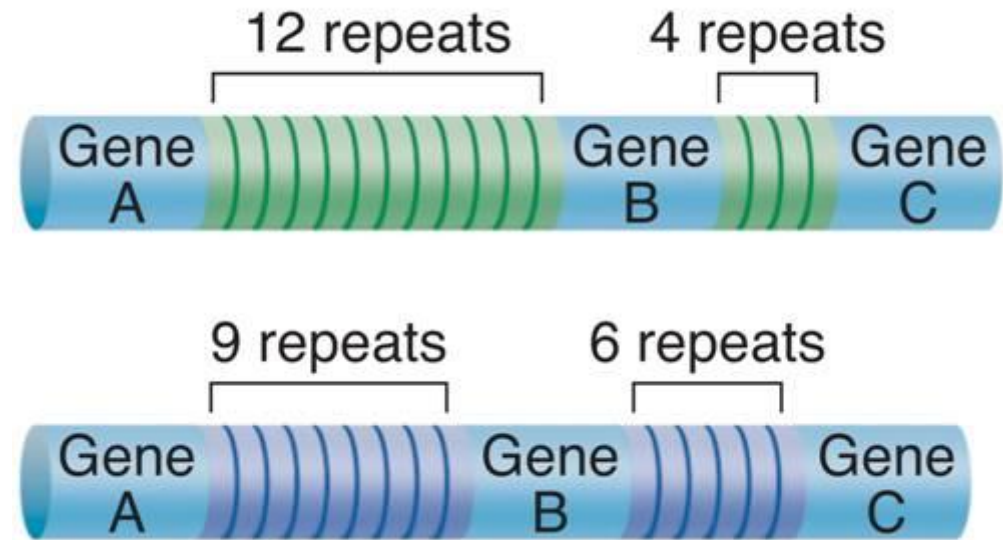
DNA fingerprinting analyzes sections of DNA that have little or no known function but vary widely from one individual to another.

Only identical twins are genetically identical.

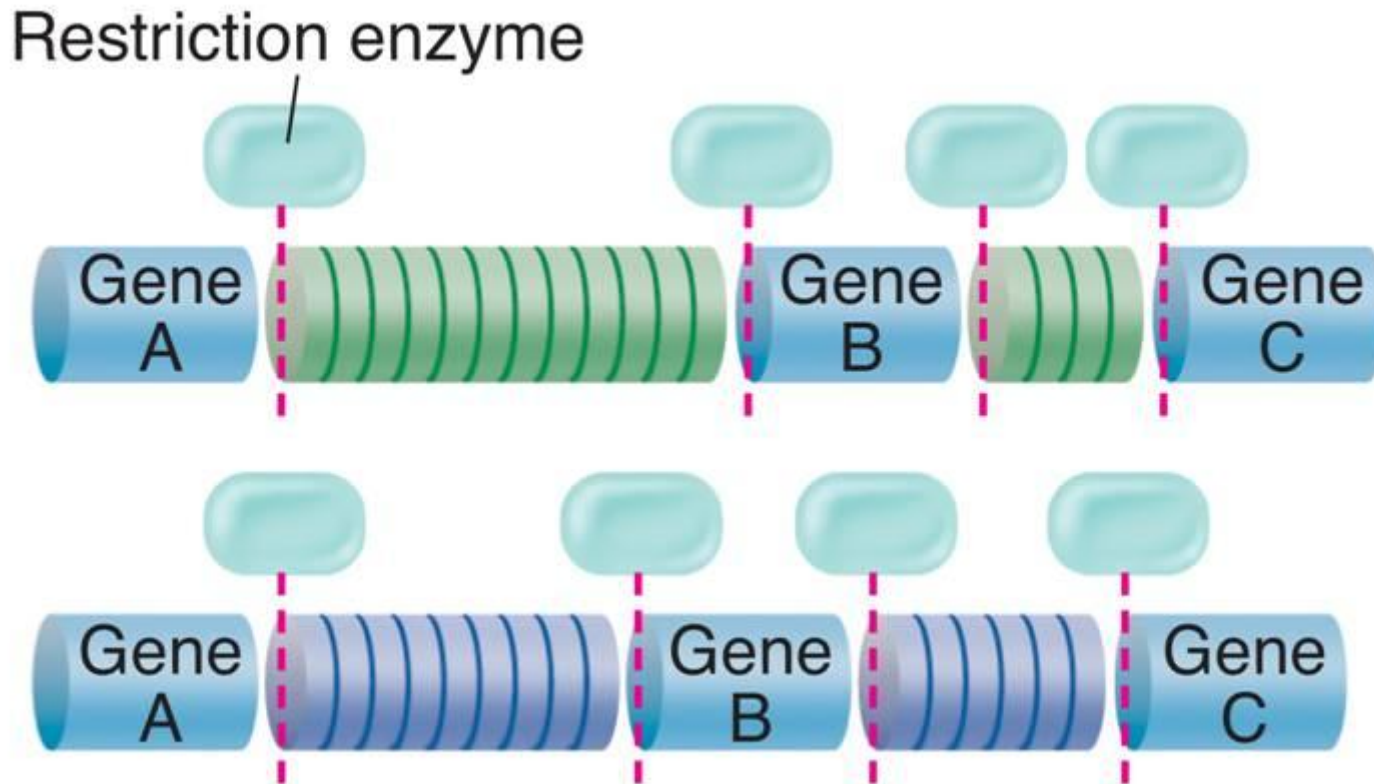
DNA samples can be obtained from blood, sperm, and hair strands with tissue at the base.

Chromosomes contain large amounts of DNA called repeats that do not code for proteins.

This DNA pattern varies from person to person.



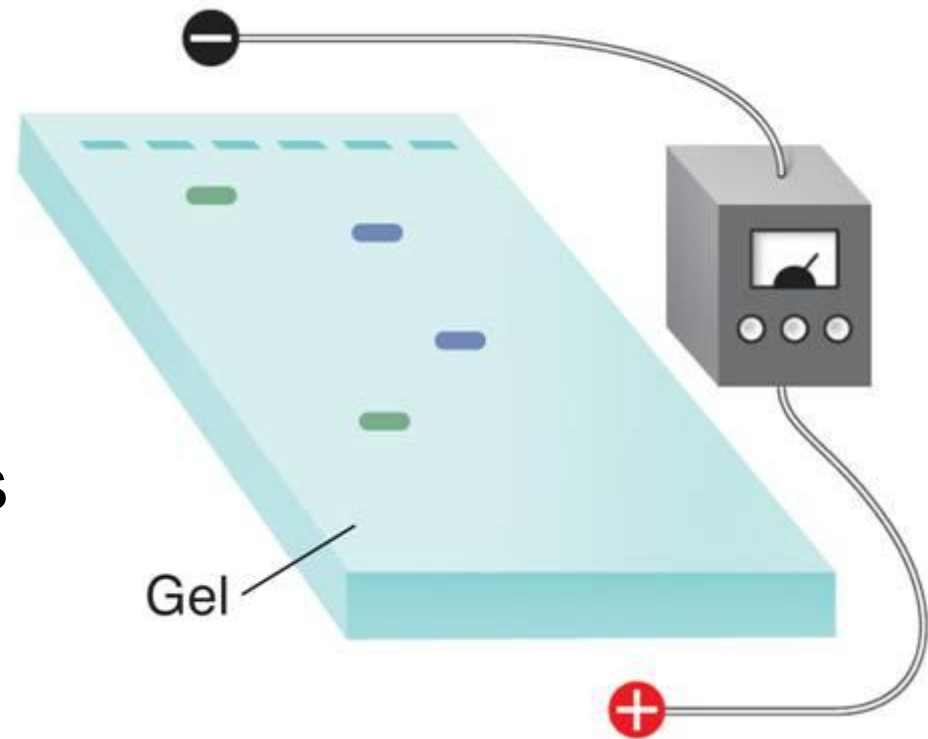
Restriction enzymes are used to cut the DNA into fragments containing genes and repeats.



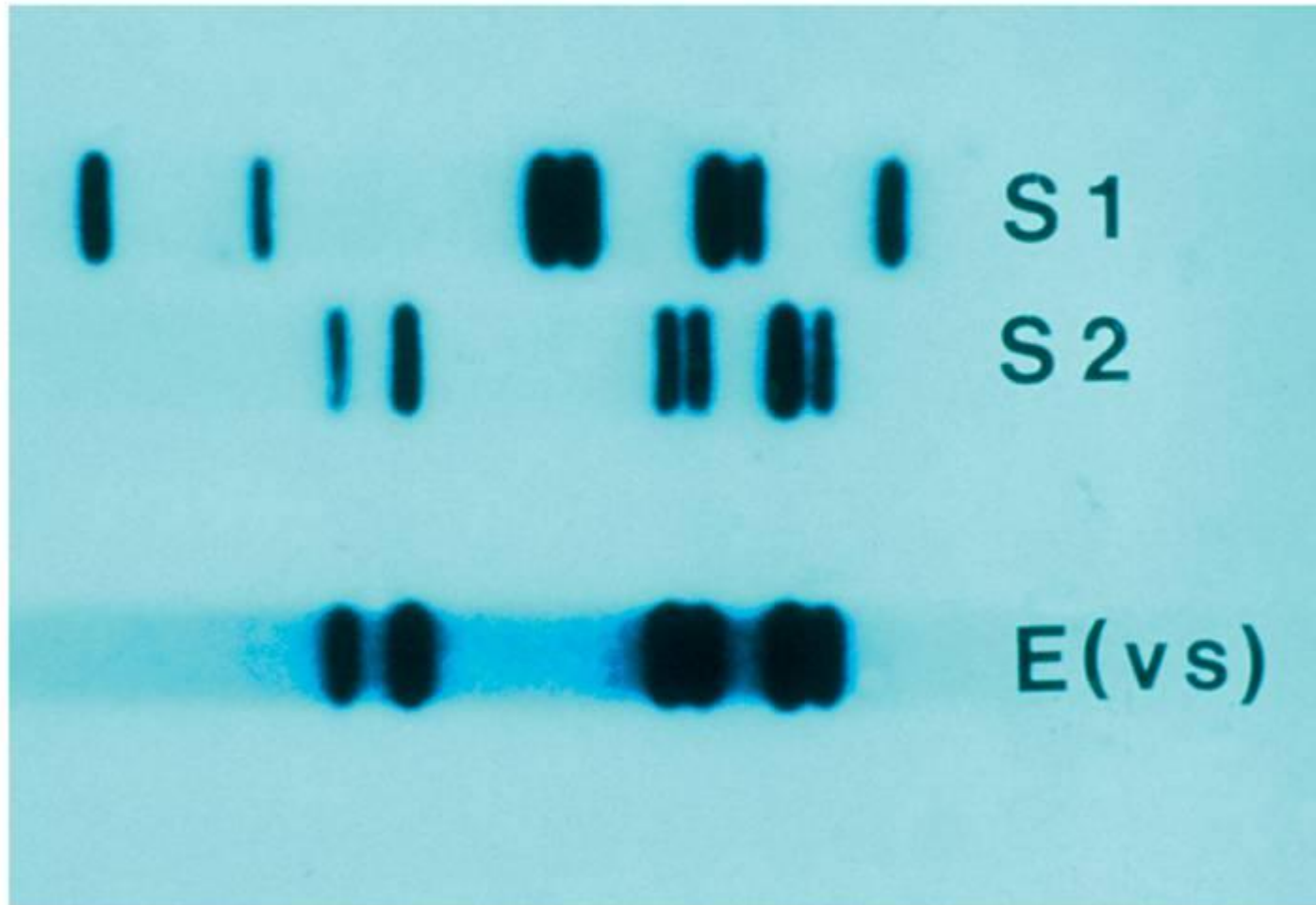
DNA fragments are separated using gel electrophoresis.

Fragments containing repeats are labeled.

This produces a series of bands—the DNA fingerprint.



DNA Fingerprint



The Human Genome Project

In 1990, scientists in the United States and other countries began the Human Genome Project.



The Human Genome Project is an ongoing effort to analyze the human DNA sequence.

In June 2000, a working copy of the human genome was essentially complete.

Research groups are analyzing the DNA sequence, looking for genes that may provide clues to the basic properties of life.

Biotechnology companies are looking for information that may help develop new drugs and treatments for diseases.

A Breakthrough for Everyone

Data from publicly supported research on the human genome have been posted on the Internet on a daily basis. http://www.ornl.gov/sci/techresources/Human_Genome/home.shtml

You can read and analyze the latest genome data.

Gene Therapy



In gene therapy, an absent or faulty gene is replaced by a normal, working gene.

The body can then make the correct protein or enzyme, eliminating the cause of the disorder.

Viruses are often used because of their ability to enter a cell's DNA.

Virus particles are modified so that they cannot cause disease.

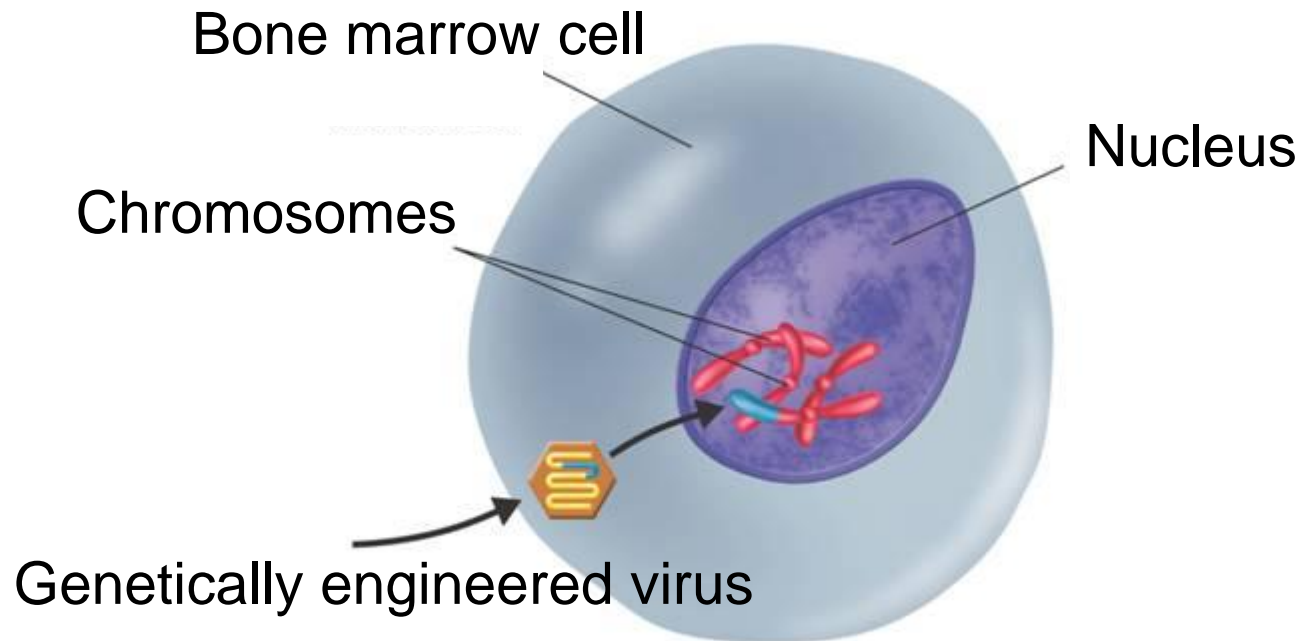
Normal hemoglobin gene



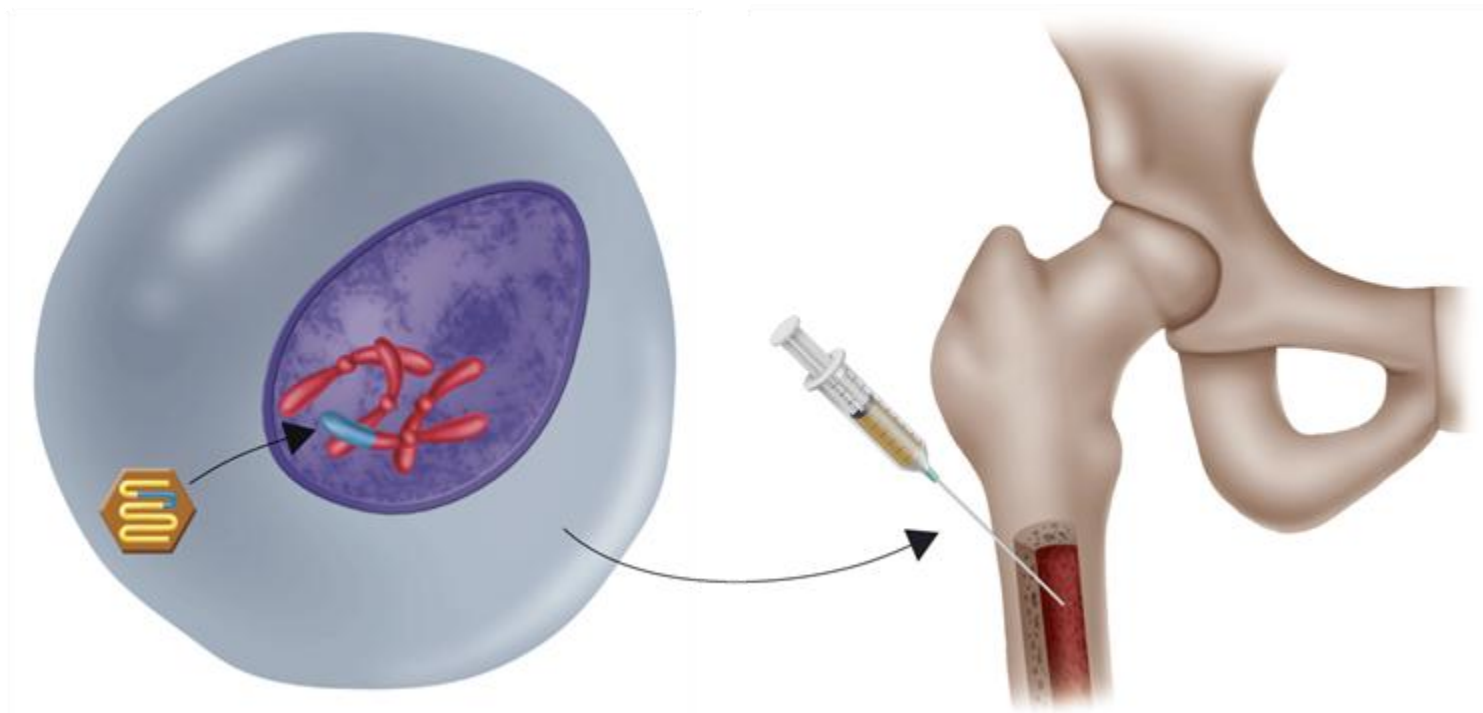
Genetically engineered virus



A DNA fragment containing a replacement gene is spliced to viral DNA.



The patient is then infected with the modified virus particles, which should carry the gene into cells to correct genetic defects.



14-3 Section QUIZ

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Section QUIZ

- or -

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1

DNA fingerprinting analyzes sections of DNA that have

- a. little or no known function but are identical from one individual to another.
- b. little or no known function but vary widely from one individual to another.
- c. a function and are identical from one individual to another.
- d. a function and are highly variable from one individual to another.

14-3 Section QUIZ

2 DNA fingerprinting uses the technique of

- a. gene therapy.
- b. allele analysis.
- c. gel electrophoresis.
- d. gene recombination.

3 Repeats are areas of DNA that

- a. do not code for proteins.
- b. code for proteins.
- c. are identical from person to person.
- d. cause genetic disorders.

4 Data from the human genome project is available

- a. only to those who have sequenced the DNA.
- b. to scientists who are able to understand the data.
- c. by permission to anyone who wishes to do research.
- d. to anyone with Internet access.

5 Which statement most accurately describes gene therapy?

- a. It repairs the defective gene in all cells of the body.
- b. It destroys the defective gene in cells where it exists.
- c. It replaces absent or defective genes with a normal gene.
- d. It promotes DNA repair through the use of enzymes.