

Chapter 6 Section 3

"DNA"

What is DNA?

- A cell uses a code in its hereditary material.
- This code is a chemical called deoxyribonucleic acid, or **DNA**.
- DNA** contains information for an organism's growth and function.
- DNA is stored in cells that have a nucleus.
- When a cell divides, the DNA code is copied and passed to the new cells.
- In this way, new cells receive the same coded information that was in the original cell.

DNA'S Structure

- 1952 Rosalind Franklin discovered that DNA is two chains of molecules in a spiral form-by using an X-ray technique , Dr. Franklin showed that the large spiral was probably made up of two spirals.
- 1953 James Watson and Francis Crick made a model of a DNA molecule.

A DNA Model

- According to the Watson and Crick DNA model, each side of the ladder is made up of sugar-phosphate molecules.
- The rungs of the ladder are made up of other molecules called nitrogen bases.
- Four kinds of nitrogen bases are found in DNA-the are represented by letters.
 1. **adenine** --**A**
 2. **thymine** --**T**
 3. **cytosine** -**C**
 4. **guanine** -**G**
- The amount of cytosine in cells always equals the amount of guanine, and the amount of adenine always equals the amount of thymine.
- Adenine always pairs with thymine and guanine always pair with cytosine.

Copying DNA

- When chromosomes are duplicated before mitosis or meiosis, the amount of DNA in the nucleus is doubled.
- The two sides of DNA unwind and separate.
- Each side then becomes a pattern on which a new side forms.
- The new DNA has bases that are identical to those of the original DNA and are in the same order.

Genes

- Most of your characteristics, such as the color of your hair, your height, and even how things taste to you, depend on the kinds of proteins your cells make.

- DNA in your cells store the instructions for making these proteins.
- Proteins build cells and tissues or work as enzymes.
- The instructions for making a specific protein are found in a **gene**, which is a section of DNA on a chromosome.
- Each chromosome contains hundreds of genes.
- Proteins are made of chains of hundreds or thousands of amino acids.
- The gene determines the order of amino acids in a protein.
- Changing the order of the amino acid makes a different protein.

Making Proteins

- Genes are found in the nucleus, but proteins are made on ribosomes in cytoplasm.
- The codes for making proteins are carried from the nucleus to the ribosomes by another type of nucleic acid called ribonucleic acid or **RNA**.

Controlling Genes

- In many-celled organisms like you, each cell uses only some of the thousands of genes that it has to make proteins.
- Each cell uses only the genes that direct the making of proteins that it needs. For example, muscles proteins are made in muscle cells but not in nerve cells.
- Cells must be able to control genes by turning some genes off and turning other genes on.
- Sometimes the DNA is twisted so tightly that no RNA can be made.
- Other times, chemicals bind to the DNA so that it cannot be used.
- If the incorrect proteins are produced, the organism cannot function properly.

Mutations

- If DNA is not copied exactly, the proteins made from the instructions might not be made correctly.
- These mistakes, called **mutations**, are any permanent change in the DNA sequence of a gene or chromosome of a cell.
- Outside factors such as X rays, sunlight, and some chemicals have been known to cause mutations.

Results of a Mutation

- Genes control the traits you inherit.
- Without correctly coded proteins, an organism can't grow, repair, or maintain itself.
- A change in a gene or chromosome can change the traits of an organism.
- Mutations add variety to a species when the organism reproduces.
- Many mutations are harmful to organisms, often causing death.
- Some mutations do not appear to have any effect on the organism, and some can even be beneficial.