

Section 7.3

Eukaryotic Cell Structure

North Carolina Objectives Objective 2.02 Investigate and describe the structure and functions of cells including: Cell organelles

Before You Read

In this section you will learn about the various parts of eukaryotic cells. For cells to function correctly, each part does its job. Think of a group that you belong to. On the lines below, list the members of the group. Consider how well the group functions when all members work together.

Read to Learn

STUDY COACH

Mark the Text

Restate the

Main Point Highlight the main idea in each paragraph. As you read this section, stop after every few paragraphs and put what you have just read into your own words.

Reading Check

- Which organelle in the nucleus makes ribosomes?

Cellular Boundaries

As you have already learned, the plasma membrane acts as the flexible boundary of the cell. In plant cells, fungi, bacteria, and some protists, there is an additional boundary—the cell wall. The **cell wall** is a rigid wall outside the plasma membrane. It gives extra support and protection to the cell.

The Nucleus and Cell Control

The nucleus directs the activity of a cell's organelles. It also contains directions to make proteins. Strands of DNA called **chromatin** are located within the nucleus. The chromatin tells the cell what kinds of proteins to make. When a cell divides, the chromatin condenses and becomes chromosomes.

How do ribosomes make protein?

The **nucleolus** inside the nucleus is an important organelle. It makes ribosomes. **Ribosomes** are where the cell makes protein according to the DNA directions. Ribosomes are not bound by a membrane. They are made up of RNA and protein. ☺

To make protein, ribosomes move out of the nucleus and into a thick fluid in the cell called **cytoplasm**. The nuclear envelope is the boundary between the nucleus and the cytoplasm. It is a membrane of two phospholipid bilayers. Ribosomes and copies of the DNA pass through this nuclear envelope on the way to the cytoplasm.

Assembly, Transport, and Storage

A eukaryotic cell contains the endoplasmic reticulum (ER). The ER is a series of tightly folded membranes floating in the cytoplasm.

What is the purpose of the ER?

The **endoplasmic reticulum** is the site of cellular chemical reactions. There are two types of ER. The areas where ribosomes in the cytoplasm attach to the ER's surface are called **rough endoplasmic reticulum**. The ribosomes' job is to make proteins. Each protein the ER makes has a specific job. Other ribosomes float freely in the cytoplasm and carry out specific tasks.

The surface of the ER that does not have ribosomes attached is called the **smooth endoplasmic reticulum**. The smooth ER also performs chemical activities. For example, it makes and stores lipids. ☞

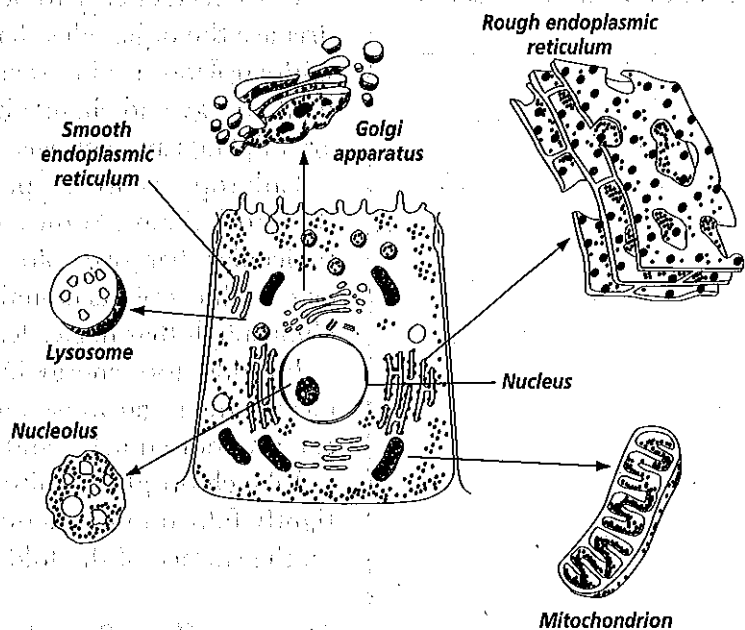
What tasks are performed by other organelles?

Once the proteins are created, they move to another organelle, the **Golgi (GAWL, jee) apparatus**. The **Golgi apparatus** sorts proteins and then packs them into structures called **vesicles**. The vesicles are then sent to where they are needed.

Another important part of the cell is the **vacuole**. A **vacuole** is a sac inside a membrane. Inside the **vacuole**, materials needed by the cell are temporarily stored. Some vacuoles store food and enzymes. Others store waste products until they can be removed from the cell.

Lysosomes have the job of removing the waste. They are organelles filled with digestive enzymes. Lysosomes join a vacuole and send their enzymes into it. The enzymes digest the contents.

The Eukaryotic Cell



STUDY COACH

Mark the Text **Identify the Parts** Place a check mark beside each part of the eukaryotic cell in the diagram above after you have read about it.

✓ Reading Check

2. What are the two types of endoplasmic reticulum?

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Eukaryotic Cell Structure, continued **Reading Check**

3. What do chloroplasts do?

 **Reading Check**

4. What is the job of microtubules and microfilaments?

Energy Transformers

Cells need energy to do their work. Chloroplasts and mitochondria are the organelles that provide the energy that cells need.

Chloroplasts are in green plants and some protists. They capture light energy and change it into chemical energy. **Mitochondria** are in plants and animals. They also transform energy for cells. ☛

Chloroplasts are a type of plastid. **Plastids** are plant organelles that store things. Some store food, some store pigments—molecules that give color. In fact, plastids are named for their color. Chloroplasts contain **chlorophyll**, a green pigment. It is chlorophyll that makes leaves and stems green.

Plastids store energy in sugar molecule bonds. Mitochondria change the sugar molecule bonds into other bonds that organelles can use more quickly and easily to get their energy.

Like chloroplasts, mitochondria have an outer membrane and a tightly folded inner membrane. Molecules for storing energy are on the surface of the folds.

Organelles for Support and Locomotion

Inside the cell is the **cytoskeleton**, which supports the organelles in the cytoplasm. The cytoskeleton can be taken apart in one place and put back together in another. When this is done it changes the cell's shape.

How does the cytoskeleton help cells move?

The cytoskeleton is a network of microtubules and microfilaments. **Microtubules** are tiny cylinders of protein. **Microfilaments** are even smaller solid protein fibers. They support the organelles and help materials move around the cell. Animal and protist cells also contain pairs of centrioles. Centrioles are made of microtubules. They are very important in cell division. ☛

Two other organelles made of microtubules are cilia (SIH lee uh) and flagella (fluh JEL uh). These organelles help the cell to move and to feed. **Cilia** are short projections that look like hairs. They move in a wavelike motion. A cell has many cilia. **Flagella** are longer projections that move in a whip-like motion. A cell usually has one or two flagella. In one-celled organisms the cilia and flagella are the most important ways of moving.

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Eukaryotic Cell Structure, *continued***After You Read****Mini Glossary**

cell wall: rigid wall outside the plasma membrane for additional support and protection

chlorophyll: green pigment that traps light energy and gives leaves and stems their green color

chloroplast: organelles that capture light energy and convert it to chemical energy

chromatin: strands of DNA containing directions for making proteins

cilia: short, hair-like projections on a cell's surface, with an oar-like motion

cytoplasm: clear, jelly-like fluid inside a cell

cytoskeleton: cell support structure within the cytoplasm

endoplasmic reticulum: site of cellular chemical reactions

flagella: longer projections on a cell's surface, with a whip-like motion

Golgi apparatus: an organelle that sorts proteins into packages and packs them into vesicles

lysosome: organelles that remove waste from the cell

microfilament: tiny, solid protein fibers that are part of the cytoskeleton

microtubule: thin hollow cylinders made of protein that are part of the cytoskeleton

mitochondria: organelles in plants and animals that transform energy for the cell

nucleolus: organelle within the nucleus that makes ribosomes

plastid: a plant organelle used for storage

ribosome: site where DNA makes protein

vacuole: membrane-bound compartments for temporary storage of materials

1. Read the key terms and definitions in the Mini Glossary above. Highlight the name of an organelle that is found in plants but not animals. Then, in the space provided, explain what the organelle does.

2. Choose two structures that work closely together in the cell to perform an important task or tasks. In your own words, describe in the space below what the structures do and how they do it. Be sure to tell how the work of one structure relates to the work of the other.

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Eukaryotic Cell Structure, continued

3. Use the chart to help you review what you have learned. Identify the structure and specific task for the various parts of a eukaryotic cell.

Eukaryotic Cell Structure		
Cell Part	Structure	Task
cell wall		
chromatin		
nucleus		
nucleolus		
ribosomes		
cytoplasm		
nuclear envelope		
endoplasmic reticulum		
Golgi apparatus		
vacuole		
lysosome		



Visit the Glencoe Science Web site at science.glencoe.com to find your book and learn more about eukaryotic cell structure.