

Organelles

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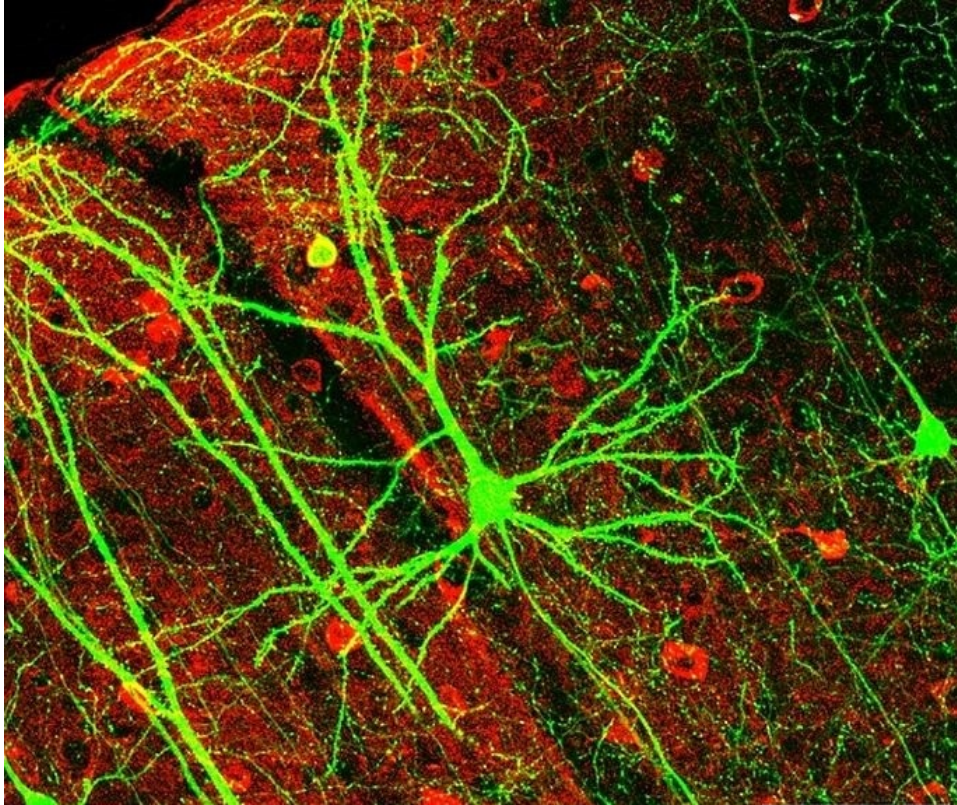
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CONCEPT 1

Organelles

- To discuss the functions of the various organelles of the cell.



Do brain cells have the same internal structures as your other cells?

Yes. Although brain cells look quite different from your other cells, they have the same internal structures as other cells. They need the same structures because they need to perform the same tasks, such as making proteins and obtaining energy.

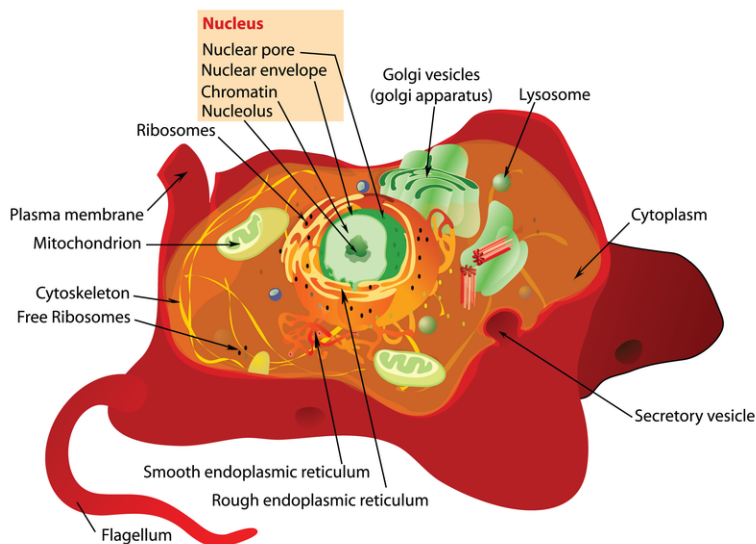
Organelles

Eukaryotic cells have many specific functions, so it can be said that a cell is like a factory. A factory has many machines and people, and each has a specific role. Just like a factory, the cell is made up of many different parts. Each part has a special role. The different parts of the cell are called **organelles**, which means "small organs." All organelles are found in eukaryotic cells. Prokaryotic cells are "simpler" than eukaryotic cells. Though prokaryotic cells still have many functions, they are not as specialized as eukaryotic cells. Thus, most organelles are NOT found in prokaryotic cells.

Below are the main organelles found in eukaryotic cells (**Figure 1.1**):

1. The **nucleus** of a cell is like a safe containing the factory's trade secrets. The nucleus contains the genetic material—the information about how to build thousands of proteins.
2. The **mitochondria** are the powerhouses of the cell; they provide the energy needed to power chemical reactions. This energy is in the form of ATP (adenosine triphosphate). Cells that use a lot of energy may have thousands of mitochondria.

- Vesicles** are small membrane bound sacs that transport materials around the cell and to the cell membrane.
- The **vacuoles** are like storage centers. Plant cells have larger vacuoles than animal cells. Plants store water and nutrients in their large central vacuoles.
- Lysosomes** are like the recycling trucks that carry waste away from the factory. Lysosomes have digestive enzymes that break down old molecules into parts that can be recycled.
- In both eukaryotes and prokaryotes, **ribosomes** are the non-membrane bound organelles where proteins are made. Ribosomes are like the machines in the factory that produce the factory's main product. Proteins are the main product of the cell.
- Some ribosomes can be found on folded membranes called the **endoplasmic reticulum (ER)**, others float freely in the cytoplasm. If the ER is covered with ribosomes, it looks bumpy like sandpaper, and is called the rough endoplasmic reticulum. If the ER does not contain ribosomes, it is smooth and called the smooth endoplasmic reticulum. Many proteins are made on the ribosomes on the rough ER. These proteins immediately enter the ER, where they are modified, packaged into vesicles and sent to the Golgi apparatus. Lipids are made in the smooth ER.
- The **Golgi apparatus** works like a mail room. The Golgi apparatus receives proteins from the rough ER and puts "shipping addresses" on them. The Golgi then packages the proteins into vesicles and sends them to the right place in the cell or to the cell membrane. Some of these proteins are secreted from the cell (they exit the cell); others are placed into the cell membrane.


FIGURE 1.1

Eukaryotic cells contain special compartments surrounded by membranes, called organelles. For example, notice in this image the mitochondria, lysosomes, and Golgi apparatus.

Also, the **cytoskeleton** gives the cell its shape, and the **flagella** helps the cell to move. Prokaryotic cells may also have flagella.

Vocabulary

- **cytoskeleton**: Framework of the cell that lends support and defines its shape.
- **endoplasmic reticulum**: Organelle that is the site of lipid synthesis and protein modification.
- **flagellum** (*plural flagella*): Tail-like structure that projects from the cell body of certain prokaryotic and eukaryotic cells; functions in helping the cell move.
- **Golgi apparatus**: Organelle that processes and packages proteins.
- **lysosome**: Organelle of the cell that breaks down and recycles old molecules.
- **mitochondrion** (*plural mitochondria*): Organelle of the cell in which energy is generated.

- **nucleus:** Cell structure that contains the genetic material, DNA.
- **organelle:** Structure within the cell that has a specific role.
- **ribosome:** Organelle in which proteins are made (protein synthesis).
- **vacuoles:** A membrane-bound space within the cell used for storage.
- **vesicle:** Small membrane-enclosed sac; transports proteins around a cell or out of a cell.

Summary

- The nucleus stores the genetic information.
- The vacuoles are needed for storage.
- The lysosomes recycle waste.
- The cytoskeleton provides the shape of the cell.
- The ribosomes produce proteins.
- The rough ER is covered with ribosomes and makes proteins, while the smooth ER makes lipids.
- The Golgi apparatus packages proteins.

Practice

Use the resources below to answer the following questions.

- **Organelles** at <http://www.youtube.com/watch?v=LP7xAr2FDFU> (6:53)



MEDIA

Click image to the left for more content.

1. What are the functions of the endoplasmic reticulum? What gives the rough endoplasmic reticulum its "rough" appearance?
2. What are the most abundant organelles in a cell? Where do they occur? What is their function?
3. What is the appearance of the Golgi apparatus? What is the function of the Golgi apparatus?
4. What are lysosomes? What are their functions? Where do they occur?
5. What is the function of mitochondria? What kind of membrane does a mitochondrion have? Do all cells have the same number of mitochondria? How can this situation be explained?
6. Why are mitochondria said to be semi-autonomous in a cell? Be specific and explain your answer as fully as possible.

Go to this site and click on "animal cell."

- **Cell Models** at http://www.cellsalive.com/cells/cell_model.htm.

1. What is cytosol? How does this differ from cytoplasm?
2. What are the primary types of protein filaments that make up the cytoskeleton?
3. What is a peroxisome? What is its function? Where does it occur?
4. What is a secretory vesicle? Where are they made? What is their function?

Review

1. What is the purpose of the Golgi?
2. What is the purpose of the mitochondria?
3. How is the smooth ER different from the rough ER?

References

1. Mariana Ruiz Villarreal (LadyofHats), modified by CK-12 Foundation. . Public Domain