Cells and the versatile functions of their parts

By National Geographic Society, adapted by Newsela staff on 04.01.19
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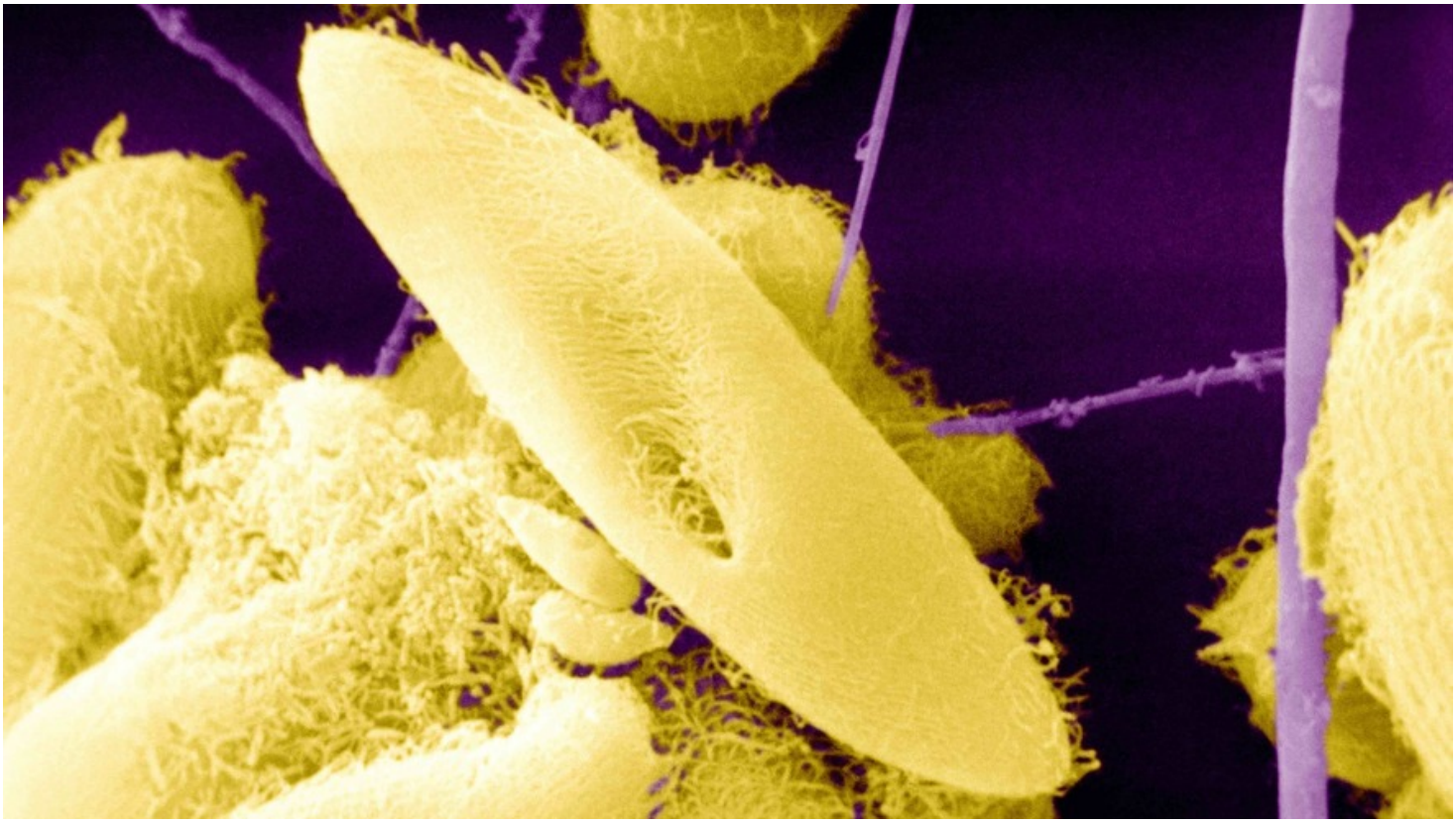


Image 1. Microscopic view of paramecia, single-celled organisms often found in ponds. Paramecia feed on other small organisms, such as bacteria. Each component of these tiny creatures, from the genetic material in its nucleus to the cilia it uses to swim, performs special functions that allow it to survive. Photo by: BSIP/UIG Via Getty Images

Cells are the basic building blocks of all life. These impressive, tiny structures can perform many tasks. This is true from the tiniest bacteria up to a human being. We're made up of trillions of cells.

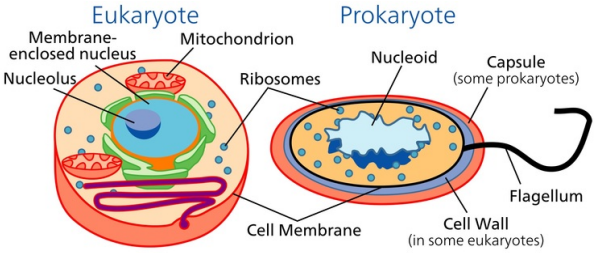
Cells get rid of waste. They help repair tissues. They generate the energy that keeps us alive. These are just some of the many tasks that cells carry out.

Bacteria: Basic Cells

Some organisms consist of a single cell. They have just the most basic cell parts: genetic material (DNA), ribosomes, cytoplasm and a cell membrane.

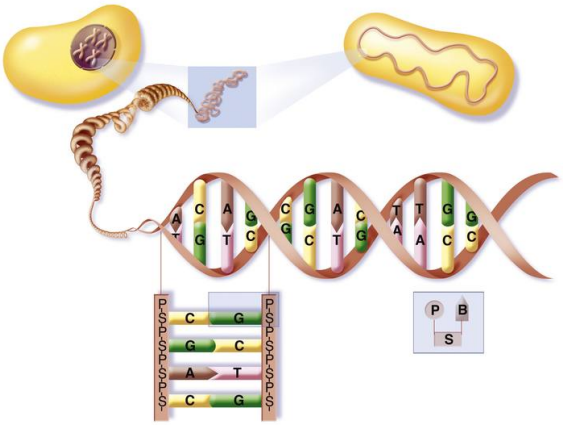
Bacteria mainly consist of these most basic parts of a cell. They may be small, but bacteria can cause human illnesses, from mild food poisoning to deadly tuberculosis. Other bacteria help keep us healthy. Many bacteria live in the human gut. They help us digest and absorb nutrients.

Gene Transfer



DNA contains the instructions for how our bodies grow and work. It is passed on from parents to children. A gene is a section of DNA that tells a specific part of the body how to work.

Genetic material can exist in movable sections. This allows bacteria to exchange portions of DNA through a process called horizontal gene transfer.



In vertical gene transfer, a parent passes on DNA to children. Meanwhile, horizontal gene transfer involves genetic material moving from one living organism to another. It doesn't matter how these organisms are related.

This ability allows many bacteria to quickly resist antibiotics. Humans use antibiotics to fight unwanted bacteria. Some bacteria have genes that let them survive, though. Thanks to horizontal gene transfer, they can pass these genes to others.

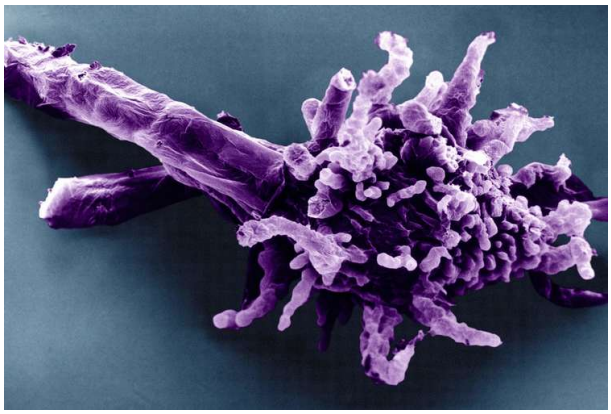
Horizontal gene transfer is more common in single-celled organisms. These organisms are called prokaryotic. They don't have a nuclear membrane, which would protect the organism's DNA from outside DNA.

Yeast, Organelles And Fermentation

More complex single-celled organisms, such as yeast, are eukaryotes. Eukaryotic cells contain a nucleus — a kind of central control station — and other organelles. Organelles are like the cell's organs. They are parts of the cell that are in charge of special tasks.

For example, the organelles in yeast allow it to perform fermentation. Humans have long used fermentation to make bread, wine, and beer. Fermentation is possible because of certain enzymes within yeast that allow it to convert sugars into alcohol. Enzymes are proteins. Like all proteins, they are produced by ribosomes within a cell.

Cellular Slime Molds



Other single-celled organisms can combine to form a multicellular structure. One example is the cellular slime mold, a type of amoeba. When there aren't many nutrients in the environment, these cells band together in a slug-like form. Together, they migrate to find food. The cellular communication between amoebae during this coming together involves many cell parts.

At some point, the amoeba usually splits into stalk cells and spore cells. A large vacuole, or space, forms

within stalk cells as they go through cell death and form a column. In this process, spore cells are lifted and then scattered to a new location.

Many cell parts play a role in this complex behavior of social amoebae. One example is the mitochondria. These are critical to cell movement and organizing the cells within the slug.

Plants, Animals And Specialized Cells

In true multicellular organisms, a variety of organelles allow equally incredible feats. Chloroplasts in plant cells allow the organism to grab the sun's energy and produce food. In a growing animal, for example, the cytoskeleton sorts critical parts and chemicals within the cell. It defines which end of the cell is which. In this way it helps enable specific functions as the tiny animal embryo, at first a tiny bundle of cells, grows and develops.

After development, specialized cells perform specific tasks to support the body. For example, mature red blood cells in mammals are cells with no nucleus. This helps clear out as much space as possible for a protein called hemoglobin. This protein allows the cell to carry oxygen from the lungs to the rest of the body.

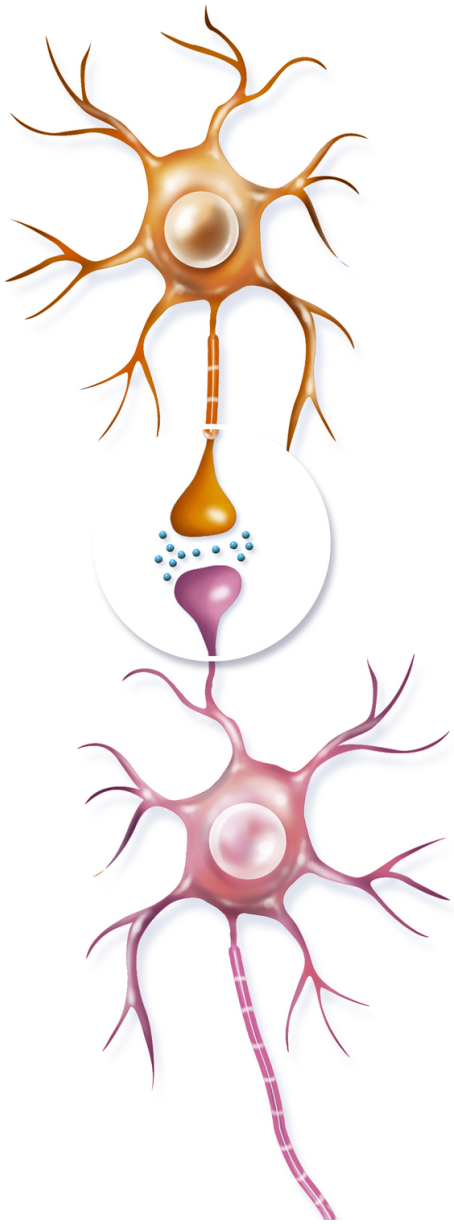
White blood cells are part of the body's immune system. The immune system is a group of cells and organs that fight to protect the body. White blood cells use lysosomes to smother and destroy bacteria. This helps prevent infection and disease.

Neurons And The Brain

Neurons are cells in the human brain that allow problem solving, memory, and emotion. A neuron's cell parts are critical to these functions.

Neurons respond to something in the environment — say, a feeling of pain. They then release neurotransmitters. Organelles called Golgi bodies control when neurotransmitters are released. They can make special vesicles, or sacs, to transport neurotransmitters outside the neuron.

Neurons have a long axon fiber, which extends from the cell. Neurons send their chemical signals out through their axons. They also receive signals from neighboring cells. They receive signals through finger-like catches called dendrites.



Quiz

1 Read the paragraph from the section "Gene Transfer."

> *This ability allows many bacteria to quickly resist antibiotics. Humans use antibiotics to fight unwanted bacteria. Some bacteria have genes that let them survive, though. Thanks to horizontal gene transfer, they can pass these genes to others.*

Which word from the paragraph helps the reader understand the meaning of "resist"?

(A) unwanted

(B) survive

(C) horizontal

(D) transfer

2 Read the following selection from the section "Cellular Slime Molds."

> *When there aren't many nutrients in the environment, these cells band together in a slug-like form. Together, they migrate to find food. The cellular communication between amoebae during this coming together involves many cell parts.*

What is the meaning of the word "migrate" as it is used in the selection above?

(A) flee from danger

(B) become very hungry

(C) wander without a goal

(D) go to another spot

3 Look at Image 5 in the section "Neurons And The Brain" and read the selection below.

> *Neurons have a long axon fiber, which extends from the cell. Neurons send their chemical signals out through their axons. They also receive signals from neighboring cells. They receive signals through finger-like catches called dendrites.*

How does the image support the information in the selection above?

(A) It shows why neurons' finger-like axons send signals instead of touching.

(B) It illustrates how neurons send chemical signals through the axons.

(C) It shows how neurons make special sacs inside of their organelles.

(D) It highlights how neurons help the brain to solve a problem or remember something.

4 Use the images and information from the article to select the TRUE statement.

(A) Eukaryotic cells and prokaryotic cells both have ribosomes and a cell membrane.

(B) Paramecia is an organism that contains multiple cells and lives in ponds.

(C) Single-celled organisms are incapable of doing a horizontal gene transfer.

(D) Red blood cells keep the body healthy by destroying bacteria using lysosomes.