

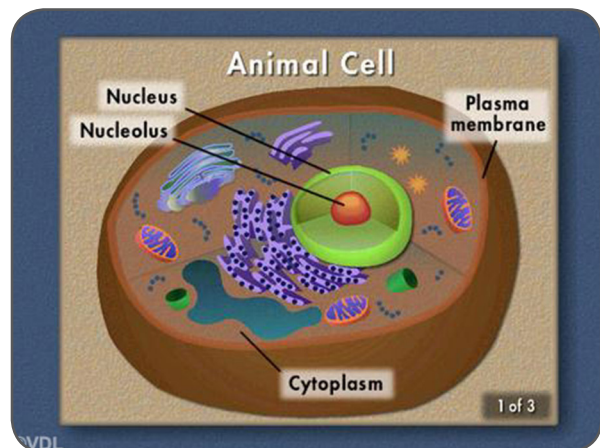
## Getting to Know: Eukaryotes and Cell Differentiation

The human body is made up of many different kinds of cells. For example, the cells that make up your brain are very different from the cells that make up your muscles. Have you ever thought about how many different kinds of cells make up your body? What makes them different? How does the body make different kinds of cells? Do other organisms contain different types of cells?

Most multicellular organisms are made of specialized kinds of cells. Multicellular organisms, and some single-celled organisms, are made up of *eukaryotic* cells. Eukaryotic cells can become specialized to perform different tasks. The formation of specialized cells is called *cell differentiation*.

### What are eukaryotic cells?

Eukaryotic cells are more complex than prokaryotic cells. For example, prokaryotic cells such as bacteria do not have nuclei. All animal and plant cells have nuclei and are therefore eukaryotic. Each eukaryotic cell contains membrane-bound cell structures called organelles. The organelles are found inside the cell's cytoplasm. A eukaryotic cell's genetic material is contained within its nucleus. A cell membrane surrounds a eukaryotic cell and all its contents. Some types of eukaryotic cells such as plant cells also have a cell wall outside the membrane.



Eukaryotic cells such as animal cells contain a plasma membrane, a nucleus, cytoplasm, and a number of organelles.



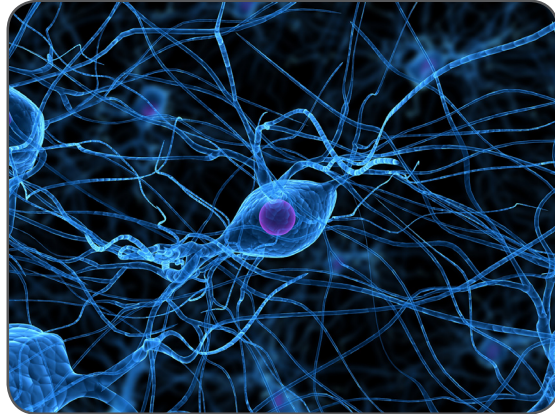
### Misconception 1: *I thought plants were made of simpler cells than animals.*

Plants and animals are both made of eukaryotic cells. Like animal cells, plant cells contain a nucleus, cytoplasm, cell membrane, and organelles. Also like animals, plants contain many kinds of specialized cells.

## Why are animals and plants so different if they are made of the same kind of cell?

Remember that eukaryotic cells can become specialized. Plants and animals both contain many different types of specialized cells. That's how plants and animals can have such different specialized structures, like flowers and leaves, or brains and bones.

Plant cells and animal cells differ in some consistent ways. Plant cells have a cell wall surrounding the outer cell membrane. The cell wall helps give the plant support, because plants don't have a skeleton or shell. Specialized leaf cells contain organelles called *chloroplasts*, which perform photosynthesis. Only the green parts of plants contain these chloroplasts. Specialized cells in roots and flowers contain other structures to perform other functions.



A nerve cell is one kind of specialized cell. Nerve cells are very different from muscle cells.

## How do specialized cells form?

Specialized cells form through a process called *differentiation*. Remember that multicellular organisms begin life as a single cell. That cell divides into two; the two new cells divide to form four cells, and so on. The new organism eventually becomes an embryo.

As the embryo continues to develop, certain cells, called *stem cells*, begin to produce new kinds of cells by gaining or losing certain structures. In other words, they differentiate to form specialized cells. These specialized cells then divide to form specialized tissues, like nerve, blood, bone, and muscle tissue.



**Misconception 2:** *I thought that human embryos contain all the different specialized cells in the human body.*

That's incorrect. In the earliest stages, the cells in an embryo are nearly identical. Differentiation occurs later in embryonic development, when some of the cells start to gain or lose structures to form specialized cells.

Now you know a little about eukaryotic cells and cell differentiation. Get ready to learn more as we begin our lesson.