

## Types of Neurons (Nerve Cells)

The human body is made up of trillions of cells. Cells of the nervous system, called nerve cells or **neurons**, are specialized to carry "messages" through an electrochemical process. The human **brain** has about 100 billion neurons.

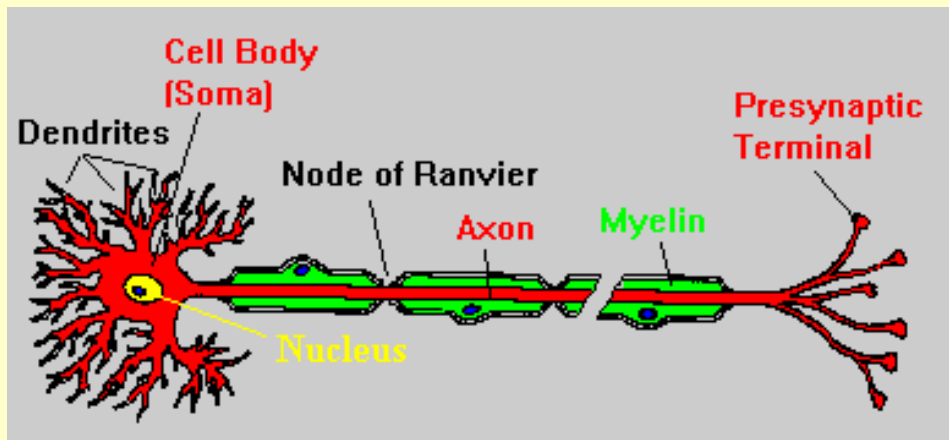
Neurons come in many different shapes and sizes. Some of the smallest neurons have cell bodies that are only 4 microns wide. Some of the biggest neurons have cell bodies that are 100 microns wide. (Remember that 1 micron is equal to one thousandth of a millimetres!!).

Neurons are similar to other cells in the body because:

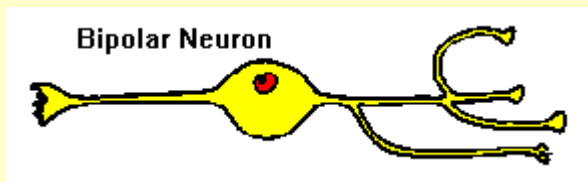
1. Neurons are surrounded by a cell membrane.
2. Neurons have a nucleus that contains genes.
3. Neurons contain cytoplasm, mitochondria and other organelles.
4. Neurons carry out basic cellular processes such as protein synthesis and energy production.

However, neurons differ from other cells in the body because:

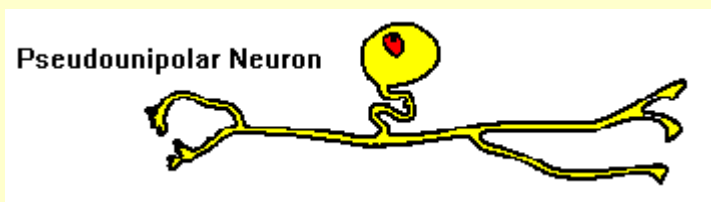
1. Neurons have specialized extensions called **dendrites** and **axons**. Dendrites bring information to the cell body and axons take information away from the cell body.
2. Neurons communicate with each other through an electrochemical process.
3. Neurons contain some specialized structures (for example, synapses) and chemicals (for example, neurotransmitters).



One way to classify neurons is by the number of extensions that extend from the neuron's cell body (soma).



**Bipolar neurons** have two processes extending from the cell body (examples: retinal cells, olfactory epithelium cells).



**Pseudounipolar cells** (example: dorsal root ganglion cells). Actually, these cells have 2 axons rather than an axon and dendrite. One axon extends centrally toward the spinal cord, the other axon extends toward the skin or muscle.



**Multipolar neurons** have many processes that extend from the cell body. However, each neuron has only one axon (examples: spinal motor neurons, pyramidal neurons, Purkinje cells).

There are several differences between axons and dendrites:

#### **Axons**

- Take information away from the cell body
- Smooth Surface
- Generally only 1 axon per cell
- No ribosomes
- Can have myelin
- Branch further from the cell body

#### **Dendrites**

- Bring information to the cell body
- Rough Surface (dendritic spines)
- Usually many dendrites per cell
- Have ribosomes
- No myelin insulation

Branch near the cell body

What is inside of a neuron? A neuron has many of the same "organelles," such as mitochondria, cytoplasm and a nucleus, as other cells in the body.

- **Nucleus** - contains genetic material (chromosomes) including information for cell development and synthesis of proteins necessary for cell maintenance and survival. Covered by a membrane.
- **Nucleolus** - produces ribosomes necessary for translation of genetic information into proteins
- **Nissl Bodies** - groups of ribosomes used for protein synthesis.
- **Endoplasmic reticulum** (ER) - system of tubes for transport of materials within cytoplasm. Can have ribosomes (rough ER) or no ribosomes (smooth ER). With ribosomes, the ER is important for protein synthesis.
- **Golgi Apparatus** - membrane-bound structure important in packaging peptides and proteins (including neurotransmitters) into vesicles.
- **Microfilaments/Neurotubules** - system of transport for materials within a neuron and may be used for structural support.
- **Mitochondria** - produce energy to fuel cellular activities.

