NERVOUS SYSTEM

CENTRAL NERVOUS SYSTEM

The central nervous system consists of the brain and the spinal cord. The brain has two sides called hemispheres. It is like having a left and right brain. The cerebral cortex is in charge of learning. The learning pathways are found in the cerebral cortex. It performs thinking and reasoning. The brain has specialized areas for different functions such as vision and speech.

Corpus callosum

The corpus callosum connects the left and right brains. Something learned in one hemisphere is sent to the other. The exception to this is speech.

The right hemisphere controls the left side of the body. It learns with the left hand and the left eye. The left hemisphere controls the right side of the body. It learns with the right hand and eye. This is why, in the case where an individual has a stroke that paralyzes the right side of the body, the doctors look on the left side of the brain for the blood clot.

Cerebral dominance

The “talking hemisphere” is the dominant one. The speech center is in the left brain about 90% of the time. This is independent of left- and right-handedness, which is controlled by different genes. The non-talking hemisphere contains the three-dimensional perception center.

Cerebellum

The cerebellum integrates and coordinates muscle action. It helps maintain balance and posture. It is located in the back of the brain. Body position is determined by nerve transmissions from the semicircular canals in the inner ear.

Medulla oblongata

The medulla oblongata controls the autonomic nervous system. It contains centers to regulate body temperature, heartbeat, breathing, and other basic functions.
Brain stem

The brain stem (pons) provides integration of auditory, visual and cerebral mechanisms. This is important for such activities as writing, speech and playing musical instruments.

Thalamus

The thalamus processes sensory information from the body and all of the sense organs except the sense of smell. The processed information is then sent to the cerebrum (cerebral cortex).

Hypothalamus

The hypothalamus regulates activities associated with basic needs and emotions. It also controls secretion of hormones by the pituitary. This provides a link between the nervous system and the endocrine system.

PERIPHERAL NERVOUS SYSTEM

The neuron

The neuron is the cell of the nervous system. There is a cell body (cyton), an axon, and terminal branches. A sheath of membranes surrounds the axon. The nerve cell conducts electrical impulses. In a motor neuron, the terminal branches end in a muscle or a gland.

Nerve fiber

A nerve fiber is made up of the axons of many nerve cells. Axons are often very long. The cytons for the nerves of the legs are located in the spinal cord and the axons travel the entire length of the legs.

Propagation of impulses

The nerve cell has a positive charge on the outside and a negative charge on the inside. The nerve impulse causes a temporary change in the charge of the cell membrane resulting from the inflow of sodium ions. After the impulse has passed, the membrane restores its original charge during the "refractory" period.

The space between two nerve cells is called a synapse. Nerve cells do not touch each other so they cannot transmit nerve impulses electrically between cells. To send a nerve impulse between cells, the nerve that is sending the impulse produces
acetylcholine, which is a neurotransmitter that causes the recipient nerve to fire and continue propagating the impulse. When the process is completed, the acetylcholine is destroyed by cholinesterase, a special enzyme, to prevent the same nerve impulse from being transmitted repeatedly.

Sensory neurons

The sensory neurons carry impulses from the sense organs to the central nervous system. When a sensory receptor is stimulated, it sends impulses to the brain or spinal cord using a sensory neuron.

Motor neurons

Motor neurons carry impulses from the central nervous system to organs, muscles and glands. A shortcut from a sensory neuron to a motor neuron is known as a reflex arc.

Reflex motion

In a reflex arc, a sensory neuron transmits an impulse to an associative neuron (interneuron) in the spinal cord. From there, the impulse is transmitted to a motor neuron. The result is a response by the organ that was stimulated by the motor neuron.

THE AUTONOMIC NERVOUS SYSTEM

The autonomic nervous system (ANS) has special nerves for internal organs. The sympathetic division of the ANS uses noradrenalin as the neurotransmitter. This stimulates the activity of the organs. Acetylcholine is the neurotransmitter for the parasympathetic division of the ANS. It causes the internal organs to slow down. See Table XIII-1.

Table XIII-1. Neurotransmitters of the autonomic nervous system.

<table>
<thead>
<tr>
<th>Division</th>
<th>Neurotransmitter</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sympathetic</td>
<td>Noradrenalin</td>
<td>Speeds up the organs</td>
</tr>
<tr>
<td>Parasympathetic</td>
<td>Acetylcholine</td>
<td>Slows down the organs</td>
</tr>
</tbody>
</table>

The result is a balance between the divisions of the ANS. The response of the organs will depend upon which neurotransmitter is received.

Ganglion cells

Ganglion cells are the special nerve cells of the autonomic nervous system. The cell bodies of ganglion cells are located outside of the central nervous system. The organs affected by the autonomic nervous system will respond according to which neurotransmitter they receive from the ganglion cells.