The autonomic nervous system

The peripheral nervous system can be divided into the autonomic nervous system and the somatic nervous system (or also the sensory and motor, and within the motor these two). The somatic nervous system is responsible for the movements that you can do with your will, the autonomic nervous system works on its own (without you having to think about it). The autonomic nervous system consists of the sympathetic and parasympathetic nervous system, and also the enteric nervous system. The enteric nervous system contains a large number of neurons and they create a mesh over the gastrointestinal tract. They regulate the chemical and mechanical state of the intestines (e.g. with enzyme secretion, bowel movement control). The enteric nervous system can work autonomously but it can also be controlled by the central nervous system and the other parts of the autonomic nervous system.

The sympathetic and parasympathetic nervous system are the other two parts. They complement each other/are each other's contrasts. Their main purpose/goal is very different. The sympathetic nervous system is in charge of fight or flight responses, so preparing the body for a stressful situation. This means for example accelerating the heart rate, stopping or slowing down digestion, sweating etc. The parasympathetic nervous system is in charge of resting and digesting. It is in charge when the body can rest, it relaxes muscles, maintains homeostasis by slowing the heart rate, allowing blood to flow to the intestines etc. The two systems have different locations in the body as well and reach the target cells in different ways. The parasympathetic systems nerves are located in the cranial part of the spinal cord, including the cranial nerves III, VII, IX, X (which is the vagus nerve and is in charge of the digestive system and the heart, both sensory and motor) and in the sacral spinal cord. It needs two neurons to reach the organs. The point where they meet is close to the organ, for lower organs the second neuron is imbedded into the wall of the organ. This way the length of the first (afferent) axon is long, and the axon of the second (efferent) is short. The system uses acetylcholine as neurotransmitter in both synapses (between the two neurons and between the second neuron and the target cell).

The sympathetic nervous system's nerves are in the thoracic and upper lumbar region of the spinal cord. Most of the time it needs two neurons to reach it's target as well. The two neurons meet in a ganglia, which stores the afferent and efferent nerves, and this is also where the synapse happens. Here the ganglia is close to the spinal cord, so the first neuron's axon is short, and the second's long. Here the neurotransmitter between the two neurons is acetylcholine but the neurotransmitter between the second neuron and the target cell is usually norepinephrine (except for some targets like controlling sweating where it is acetylcholine as well). But there is another way the parasympathetic nervous system can communicate. That is by stimulating the adrenal glands (the first neuron immediately with acetylcholine) so it starts secreting norepinephrine and epinephrine into the bloodstream. Here these are hormones, and this way the system can achieve more widespread effect. It is also interesting how the different receptors play a very important role. Because the smooth muscles usually have alpha receptors (for epinephrine, norepinephrine) so they contract and the blood flow is restricted (e.g. to the digestive system). The skeletal muscles usually have beta receptors and the muscles relax, so the blood can flow more freely.

The structure of the two systems make a lot of sense, because the sympathetic system makes it possible for a signal to reach a lot of organs quickly which is good in a crisis, and the parasympathetic system has more of a specified communication with the different organs when there is time for it.

The autonomic nervous system regulates most organs and blood flow, so a disease in the autonomic nervous system would have effects like high/low blood pressure, problems with urinating, problems with the dialation of pupils, and cardiac problems. A very big problem in today's world is that many people's lives are stressful and the body reacts the way with the sympathetic system as if it was in a life or death situation. Being constantly in this state can cause bad effects (high blood pressure, too much adrenaline in the system, the weakening of the immune system and long-term it can cause cardiac-problems as well).

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