LexiMed
Medicolegal Specialists

The Brain and Nervous System

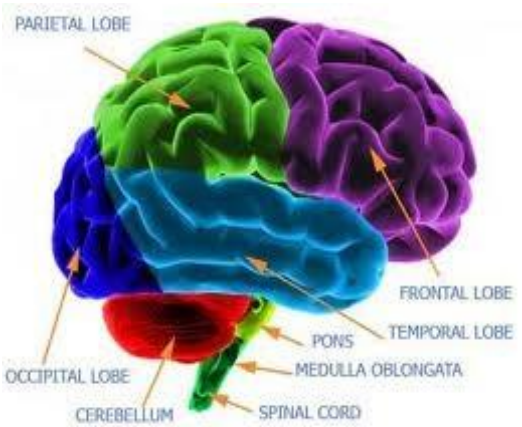
The brain and the rest of the nervous system make up a control centre for the human body. All actions, both voluntary and involuntary, occur due to electrical and chemical signals being passed between the brain and the nervous system, the musculoskeletal system and the sensory organs. The nervous system carries out a complex array of tasks including the control of body movements, operation of internal organs, perception of various smells, production of speech and storing and accessing memories.

The Brain and Spinal Cord

The human brain is the most complex of any living creature on earth. The average adult brain weighs one and a half kilograms. The size of the brain can differ greatly from person to person, although this is not an indicator of intelligence.

The brain is divided into a number of different areas.

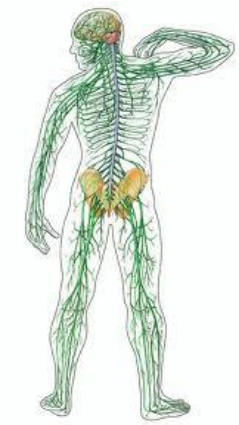
Frontal Lobe	Associated with reasoning, planning, parts of speech, movement, emotions, and problem solving.
Parietal Lobe	Associated with movement, orientation, recognition and perception of stimuli.
Occipital Lobe	Associated with visual processing.
Temporal Lobe	Associated with perception and recognition of auditory stimuli, memory and speech.
Cerebellum	Associated with regulation and coordination of movement, posture, and balance.
Medulla Oblongata	Functions primarily as a relay station for the crossing of motor tracts between the spinal cord and the brain.



The spinal cord is approximately forty two to forty five centimetres long and has a diameter of approximately two centimetres. It extends from the lower part of the brain down through most of the spine. Along the way, nerves branch out to the entire body. These nerves are called the peripheral nervous system. The brain and spinal cord are surrounded by cerebrospinal fluid, a clear, colourless fluid that cushions and protects these important structures from injury.

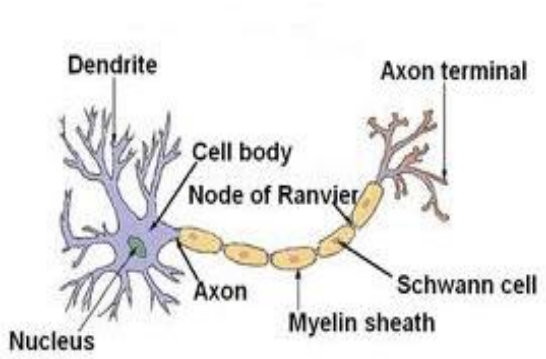
The Nervous System Overview

The human nervous system contains over one hundred billion nerve cells, also known as neurons. The neurons are the building blocks that make up the nerves which collectively form the nervous system. There are two main types of neurons. Motor neurons take messages away from the brain to the rest of the body and sensory neurons take information from the eyes, nose, ears, tongue and skin back to the brain. Along with neurons, the nervous system contains other specialised cells called glial cells or simply glia, which provide structural and metabolic support to neurons.



Neurons

A neuron consists of a nerve cell body which has various extensions, known as dendrites. The term dendrite means little tree, and these are the receiving or input portions of a neuron. The axon is the 'electrical wiring' of the neuron and it conducts nerve impulses and has specialised endings or axon terminals to transfer these impulses to other neurons, muscles or gland cells. The gap between the axon terminal of one cell and the dendrite of another is called a synapse. Synapses allow either electrical or chemical signals to pass from one neuron to a neighbouring neuron.



Breakdown of the Nervous System

The nervous system is divided into two main parts, the central nervous system and the peripheral nervous system. The central nervous system consists of the brain and spinal cord. The peripheral nervous system consists of nerves outside the central nervous system and it is further divided into the somatic and autonomic nervous systems. The autonomic nervous system is then broken down into the sympathetic and parasympathetic nervous systems. This diagram shows this breakdown clearly.

Human Nervous System

The Central Nervous System – The brain and spinal cord.

The Peripheral Nervous System – The nervous system outside of the brain and spinal cord.

Autonomic Nervous System – Involuntary input from internal stimuli, output to smooth, involuntary, muscle and glands, e.g. regulation of heartbeat.

Somatic Nervous System - Voluntary movements and input from sense organs, output to skeletal muscle, e.g. kicking a ball.

Sympathetic Nervous System – Fight or flight responses stimulated by adrenaline, e.g. feeling fear and having a physical reaction such as churning stomach and goose bumps.

Parasympathetic Nervous System – Relaxing responses, e.g. feeling sleepy after Christmas dinner.

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