THE SIGNAL SYSTEM IN BRAIN

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***Abstract*—** The brain is a command centre that controls and regulates the body and mental functions. The brain consists of an average of 100 billion nerve cell networks. These neurons in the brain regulate information communication with the muscles, other nerves and gland cells in the organism. Neurons in the brain provide this information transfer both electrically and chemically. Neurons perform signal communication just like electronic networks in computers. While neurons are similar to other cells in highly structured organisms, they are distinguished from other cells by their unique electrochemical ability to transfer information within milliseconds. Communication network established by neurons provides people to learn, speak, run, eat, drink. This study aims to get to know the brain in general and to give information about the signal system in the brain.

***Keywords*—** *Brain, Nervous System, Neuron, Glia.*

1. INTRODUCTION

THE human body is a whole of different systems in a balanced communication from top to bottom. The central nervous system ensures coordination with each of the different systems in the body. The Central Nervous System (CNS) evaluates impulses from other parts of the body and develops appropriate responses to these impulses. The nervous system consists of two parts, the central and peripheral nervous systems [1].

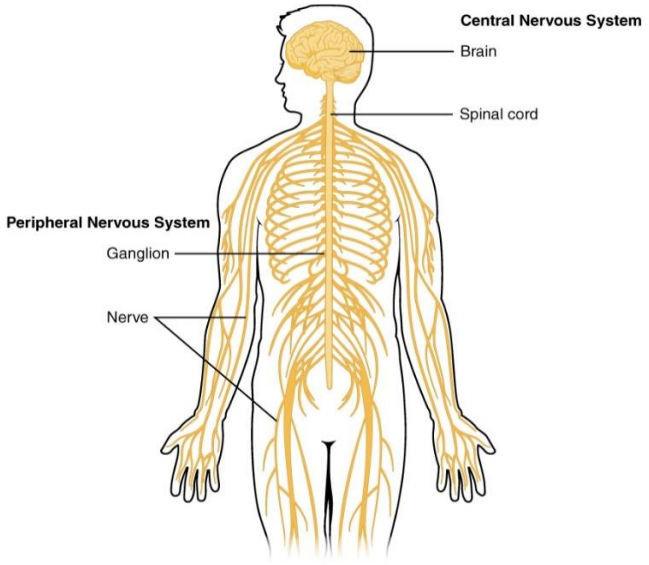

Fig.1 Central and Peripheral Systems [2].

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The Central Nervous System consists of two parts, the brain and the spinal cord. The brain is the part of the central nervous system inside the skull. The spinal cord is the structure in the spine that connects the brain and the peripheral nervous system and controls the reflexes. Internal and external events are perceived by the sense organs. Sense organs transmit information to the central nervous system with the help of a large number of neural networks in the spinal cord at the back of the brain [1,3].

In addition to being the most important organ in our body, the brain is the organ where we have the least information about its functions. The functions of the regions in the brain are only understood as a result of some arousal and injury in the brain cortex.

2. BRAIN, STRUCTURE AND FUNCTIONING

The brain is the most important and complex part of the central nervous system. It is located in the anterior and upper part of the skull cavity and is present in all vertebrates. Inside the brain, the skull is located in a transparent fluid called spinal fluid, which maintains it both physically and immunologically [1,4]. The function of the brain as part of the CNS is to regulate the majority of body and mind functions. Respiration, heart rate regulation, thinking, talking, etc. all life functions are the task of the CNS.

Although the brain is classified into three parts by scientists: forebrain, midbrain and posterior brain, it is an organ that is more complex and difficult to categorize [3,5]. This complex structure consists of various regions. These regions undertake different tasks. Seeing, hearing, tasting, motion controls, perception and speech are controlled from different parts of the brain.

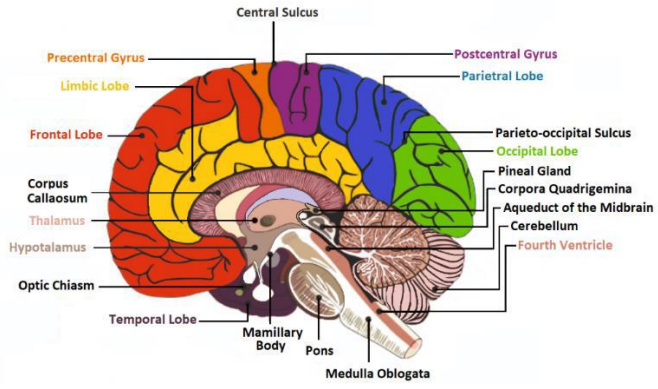

Fig.2 Internal parts of the brain [5].

The cerebellum is located at the back of our heads. The cerebellum helps keep our body in balance. Also, the muscles are compatible with each other. The most basic task of the cerebellum is to provide balance and to evaluate the warnings from the eye [1,6].
The spinal cord is the posterior brain portion located between the spinal cord and the pons. The spinal cord on dandruff, just like in the cerebellum and spinal cord substances are available. The motor nerves in the brain are also distributed diagonally across the spinal cord. The most important tasks of spinal cord bulb; Digestive, respiratory, circulatory and excretory systems to ensure the operation. Also, controlling and regulating the blood sugar of the liver controls vital reflexes such as swallowing, sneezing, coughing and vomiting [3,5].
Brain in humans is one of the most advanced and complex among all animal species. It is not only bigger but also twisted and folded, creating grooves and layers in itself, which gives it a wrinkled appearance. The human brain weighs about 1.5 kilos. The weight of the brain constitutes 2% of the weight of human weight. It has excellent cell management. The human brain is approximately 1.4-1.5 kilos (3.3 lbs), and its volume is approximately 1130 cc in women and 1260 cc in men. The majority is composed of glial cells and neurons [4].

3. Cells of the Brain

The brain consists of two types of cells: neurons and glia cells.

3.1. Neurons

Although neurons generally have different shapes, basically all of them have a cell body, dendrites and axon. Neurons exchange information through electrical and chemical signals in living organisms, just like circuits in computers. Our brain evaluates millions of signals from our body through neurons and compares them with previous information in our memory, selects them, and consequently establishes new connections between neurons [3,7].
There are spaces between the neurons where signal communication and energy transfer are provided, and these spaces are called synapses. Synapses are the main actors of intercellular communication [8,9].
In the structure of a neuron, there are multiple structures called dendrite that first detect the signals from other nerve cells. This multi-armed structure is similar to an antenna that receives radio signals. Signals received through the dendrites are transferred to what is called the cell body. The structure of this part, also called soma cell, contains basic cellular organelles such as cell nucleus, endoplasmic reticulum, ribosome and mitochondria. The main function of Soma cells is the centre where these transmitted signals are controlled, the cell DNA is stored and also the energy required for cell activity is produced and stored. The signals that are decided to be evaluated and transmitted in Soma cells are transferred to the nerve extension called an axon, which resembles an electrical cable. Some axons perform signal transmission within milliseconds, as they are covered with an oily structure called myelin, which increases the speed of information transfer, just like fibre cables used in today's technology [1,3,10].

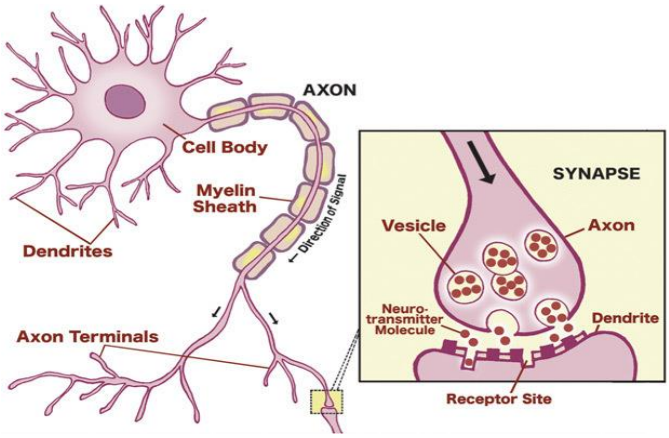

Fig.3. The structure of the nerve cell [11].

As we have already mentioned, signal transmission in nerve cells occurs not only through electrical elements but also through chemical elements. These chemicals are called neurotransmitter substances [10]. Neurotransmitter substances are stored near the synapse region of axons, when this part is stimulated with an action potential, it is released into the synapse cavity and signal communication from one cell to another by binding by receptors in the dendrites of the other recipient cell. Examples of neurotransmitters are dopamine, serotonin, oxytocin, etc. for example [3,9,10].

3.2. Glia cells

Glia cells, which means glue in Greek, are the most abundant cell types in the brain. Glia cells do not play a role in direct electrical signal transmission like neurons, but they act indirectly. By means of these cells, another cell of the brain is protected, fed, and the axons are coated with myelin, which accelerates the signal transmission of neurons [12,13].
Basically, as a result of the numerous scientific studies conducted with the above-mentioned tasks in the brain, it has been understood that it is more active in brain functional function. There are many types of glia cells in the nervous system. Microglia, for example, protect the brain against invading invaders and remove any debris that has formed. Oligodendrogilia synthesizes the myelin, which provides the rapid transmission of electrical messages. Astrocytes allow the connection of molecules and nutrients to neurons in the functioning of the blood-brain barrier. They control the protection of the damaged area, neuronal defence, and repair of damage against effects caused by external influences in the brain [1,3,12,14].

4. Conclusion

The working system of the brain is based on neurons and communication between them. As the number of information (stimulants) from the external environment increases, the number of connections between neurons continues to increase rapidly. Thus, with this communication network between neurons, it enables people to walk, run, hear, see and use their memory effectively.

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BIOGRAPHIES

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