

Project of Investigation - Neurotransmitter

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Abstract

The present work describes the importance of neurotransmitters for the proper functioning of the central nervous system because it is composed of highly differentiated cells since they receive sensory information and transform it into electrical impulses to share the information with other differentiated cells. The functional unit of the nervous system is the neuron because it is a nerve cell that has two main functions: The propagation of the action (PA) by means of a nerve signal transmitted through the axon, and its transmission to other neurons or to effector cells to induce a response. Driving an impulse through the axon is a physical phenomenon caused by the exchange of Na^+ and K^+ ions along the membrane.

In contrast, the transmission of the impulse from one neuron to a different or to a non-neuronal effector cell depends on the action of specific neurotransmitters (NT) on also specific receptors.

Neurotransmitters reflect the true importance for the organism and how it influences the proper functioning of the human body and the emotions that the brain makes us express, however, it is necessary to know each favorable or unfavorable aspect of each of them through the synthesis of most of these. However we will focus on the main neurotransmitters the limes are acetylcholine, dopamine, serotonin, amino acids (GABA), glycine, and norepinephrine because they protect the Central Nervous System from the serious pathological states that occur in the case of decreased production of said neurotransmitters. In many laboratories around the world, studies dedicated to reducing massive neuronal death are carried out to decrease the development of neurodegenerative diseases. Some of these serious disorders are Alzheimer's disease, Parkinson's disease, schizophrenia, and depression.

Mental illnesses are more common than is believed. They are not something that we can see physically, but that does not mean that they are less dangerous or that the people who suffer from them are "crazy" and this itself leads to the creation of various stereotypes regarding these diseases and those who suffer from them. For this reason, this research focuses on neurotransmitters and their functions because they are the main factors to understand and control brain disorders, structural or functional processing alterations of the Central Nervous System that produce cognitive, emotional, or motor responses. aberrant. Brain disorders are associated with various pathological processes, including degenerative, ischemic, and psychological disorders. Most Central Nervous System drugs correct an imbalance of neurotransmitters or their receptors.

Nanotechnology, as the center of biotechnology, plays a significant role in this regard as they are able to interact with biological systems on a molecular level and this involves the discovery of particles to be used as drug delivery systems, emulsions, and transporters. The objective of this research is to define the characteristics and structures of neurotransmitters, their location in the human body, deduce what their function is, and how it is synthesized in our body. Neurotransmitters are usually produced from the metabolism of proteins, that is, from essential amino acids obtained from the diet and always in the presence of enzyme cofactors that facilitate the biochemical reaction. Acetylcholine is the neurotransmitter responsible for muscle stimulation. It is responsible for activating motor neurons and participates in various areas of the brain responsible for learning, attention, memory, or excitation. Furthermore, acetylcholine is considered as an ally against neurological deterioration. Dysfunctions associated with an acetylcholine deficiency: Alzheimer's disease and Parkinson's disease are related to a deficiency in Acetylcholine. In Alzheimer's patients, up to 90% loss of Acetylcholine is observed in the brain. Dopamine is considered the neurotransmitter of pleasure and is associated with pleasure and a feeling of relaxation. Dopamine correlates with Deficit due to lack of attention and hyperactivity, since deficits in this neurotransmitter cause problems and lack of concentration. In relation to bipolar disorder, an increase in Dopamine has been shown in the mania and hypomania phases. Schizophrenia and Parkinson's are also associated with this neurotransmitter. In the case of schizophrenia due to an excess of dopamine in the frontal lobes, and in the case of Parkinson's disease due to a deficiency of Dopamine in the motor areas, causing uncontrollable tremors.

Norepinephrine is also known as the stress hormone, and it is due to its dual function, as a hormone and as a neurotransmitter. Among its functions is responsible for the regulation of the state of mind, and physical and mental excitement. A deficit in this type of neurotransmitter is correlated with depressive disorders and mood disorders. Stress tends to deplete our deposits, while some drugs such as amphetamines or speed dramatically increase their levels. The GABA neurotransmitter fulfills an inhibitory function in the nervous system, preventing us from becoming over-excited, avoiding anxiety, or fear reactions. Alcohol and drugs can influence the function of the GABA neurotransmitter, producing a feeling of subjective control. When there are low levels of the GABA-type neurotransmitter in our body, anxiety disorders can be suffered, and its total absence correlates with epileptic episodes.

Serotonin is also known as the hormone of happiness, and commonly abbreviated as 5-HT. That is to say, it fulfills two functions in our organism; as a hormone and as a neurotransmitter. Serotonin deficiency in our body is related to diseases such as depression, obsessive-compulsive disorders (OCD), aggressiveness, drug or alcohol dependence, eating disorders, and insomnia. Glutamate is the main excitatory neurotransmitter in the cortex in humans. It is related to the neurotransmitter GABA, and is the most abundant in the Central Nervous System, being essential for memory processes. Paradoxically, an excess of glutamate has toxic effects for our body, causing neuronal death. Low glutamate levels are associated with motor neuron disease. The first associated disorder is excitotoxicity, a process by which neurons are severely damaged or destroyed by excess activation. Excitotoxicity correlates with strokes, neurodegenerative diseases are associated.

Drug release in the brain remains difficult for the treatment of EC and PE. The development of new practical treatments for the treatment of neurodegenerative diseases is currently a very active area of research. Due to a large number of protective barriers around the System Nervous Central. There is an urgent need for an effective treatment for patients living with neurodegenerative diseases.

Biography

He hold a Bachelor of Medical Science degree and Honour's in Physiological Science. Both these qualification were obtained at Walter Sisulu University. He also submitted and potentially graduating for Master's in Nanoscience (Nanobiomedical science) in April 2020. These Master's were carried out in two cooperating university, University of Western Cape (for the first year of course work) and Nelson Mandela University (for research). In the process, He has done research in different fields. This includes cardiology research (investigating arterial stiffness), respiratory research (investigating the effects of smoking and exercise) and cancer research (using nanotechnology to study colorectal cancer). He have worked as an academic and laboratory intern, employed by National Research Foundation (NRF) placed at Nelson Mandela University in the department of Biochemistry, Microbiology and Physiology. That includes basic lab safety measures, cleaning of lab equipment, centrifuging, autoclaving, mixing of chemicals, synthesizing and characterizing nanoparticles, and following laboratory protocols.

