



Neurotransmitters, Their Effects on the Human Organism

Edith María Beltrán Molina*, Ana Beatriz Peña mantilla and Oreste Hernández Perera

Department of Natural Sciences, University of Sancti Spíritus José Martí Pérez, Cuba

Submission: March 29, 2017; Published: April 04, 2017

*Corresponding author: Edith María Beltrán Molina, Department of Natural Sciences, Assistant Teacher, University of Sancti Spíritus José Martí Pérez, Cuba, Email: ebeltran@uniss.edu.cu

Abstract

The present work refers to certain neurotransmitters and their incidence in the pathogenesis of a great number of neurological, muscular and psychiatric diseases, originated as a consequence of defects in the synthesis, release, degradation or function of these chemical messengers.

Introduction

The synapse is a specialized intercellular junction between neurons or between a neuron and an effector cell (almost always glandular or muscular). It is a process by which the nervous system connects and controls all systems of the body. In these contacts the transmission of the nervous impulse is carried out, which begins with a chemical discharge that causes an electric current in the membrane of the presynaptic cell (emitter cell); Once this nervous impulse reaches the end of the axon (the connection with the other cell), the neuron itself secretes a type of chemical compound or neurotransmitter that is deposited in the synaptic space (space between this transmitting neuron and the postsynaptic neuron or Recipient). These secreted substances are responsible for exciting or inhibiting the action of the other cell called post-synaptic cell.

The correct functioning of the brain requires adequate amounts of chemical messengers or neurotransmitters, alteration in the necessary proportions or even a small lesion in sensitive areas can have negative effects on the way of thinking, acting, reacting, and feeling. When the production of neurotransmitters is excessive, deficient or non-existent certain diseases that significantly affect the balance of the organism can cause mental problems such as schizophrenia, Parkinson's, Alzheimer's, trigger periods of inappropriate behavior such as unexpected moments of euphoria or feeling of anguish without apparent motive, followed by depressive states. Next we will expose some neurotransmitters of great significance whose absence, scarcity or increase can bring with it certain pathology in the human organism [1-3].

Development

Acetylcholine was the first discovered neurotransmitter; Is responsible for stimulating the muscles, allowing them to contract, including the muscles of the gastro-intestinal system. It is also found in sensory neurons and in the autonomic nervous system, and participates in the REM sleep programming (sleep phase during which the most intense dreams happen). There is a loss of about 90% of the acetylcholine in the brains of people suffering from Alzheimer's so there is a link between this chemical messenger and the disease that weakens the body. An increase in this neurotransmitter causes a reduction in heart rate and an increase in saliva production.

Acetylcholine deficiency causes a symptomatology of motor dysfunctions. One of the diseases it causes is myasthenia gravis, characterized by muscle weakness and fatigue. It occurs when the body improperly produces antibodies against acetylcholine receptors, and thus inhibits the transmission of acetylcholine signals. Drugs that inhibit acetyl cholinesterase (e.g. neostigmine or physostigmine) are effective in the treatment of this condition. Another illness is dystonia characterized by permanent muscle contraction. It can be caused by an excess of acetylcholine at muscle level.

Norepinephrine is strongly associated with the "high alert" setting of our nervous system. It is prevalent in the sympathetic nervous system, and increases the heart rate and blood pressure. Our adrenal glands release it into the bloodstream, along with epinephrine. An increase in norepinephrine levels of the

sympathetic nervous system increases the rate of contractions. As a stress hormone, it affects parts of the brain such as the brain tonsil where attention and responses are controlled. Along with epinephrine, norepinephrine also underlies the fight or flight response, directly increasing heart rate, triggering the release of glucose from energy stores, and increasing blood flow to skeletal muscle and brain oxygen supply. Norepinephrine can also suppress neuro-inflammation when it is released diffusely in the brain by the locus coeruleus (anatomical region in the brain stem involved in the response to panic and stress ...) [4].

Norepinephrine, along with dopamine, has been recognized for playing an important role in attention and concentration. Differences in the neurotransmitter system are implicated in depression. Dopamine is an inhibitory neurotransmitter, which means that when it finds its way to its receptors, it blocks the tendency of that neuron to fire. It is strongly associated with reward mechanisms in the brain, is related to motor functions, emotions and feelings of pleasure. Drugs such as cocaine, opium, heroin, and alcohol promote the release of dopamine in addition to nicotine.

Excessive amounts of dopamine in the frontal lobes of the brain are linked to the serious mental illness called schizophrenia, to help people with the disease use drugs that block dopamine. The scant amount of this messenger in the motor areas of the brain is responsible for Parkinson's disease, which involves uncontrollable body tremors and muscle stiffness. In this disease, dopamine-producing neurons slowly degenerate, some cases seem to be related to the toxicity of certain chemical compounds, such as pesticides. Another type of inhibitory neurotransmitter is gamma-aminobutyric acid (GABA), which acts as a brake on excitatory neurotransmitters that lead to anxiety. People with low GABA tend to suffer from anxiety disorder, and medications like Valium work by increasing the effects of GABA. If it is absent in some parts of the brain, epilepsy occurs.

Serotonin is synthesized in serotonergic neurons in the Central Nervous System (CNS) and enterocromaffin cells (Kulchitsky cells), in the gastrointestinal tract of animals and humans; Plays an important role as a neurotransmitter, in inhibiting anger, aggression, body temperature, mood, sleep, vomiting, sexuality, and appetite. These inhibitions are directly related to symptoms of depression. Particularly, antidepressants are concerned with modifying serotonin levels in the individual. Glutamic acid, or in its ionized form, glutamate, mediates most excitatory synapses of the Central Nervous System (CNS) [5,6]. It is the main mediator of sensory, motor, cognitive, emotional information and is involved in memory formation and recovery, also involved in neuroplasticity, learning processes and is the precursor of GABA.

All neurons contain glutamate, but only a few use it as a neurotransmitter. It is potentially excitotoxic, so there is complex machinery so that the levels of these substances are always regulated. It is related to various neurodegenerative pathologies (such as Alzheimer's disease), which has become a potent pharmacological target in various diseases. Histamine acts as a neurotransmitter. It is synthesized and released by neurons of the central nervous system that use it as a neuromodulator of both the humoral and cellular immune response as well as the major mediator of immediate hypersensitivity reactions [1,7].

An excess of histamine may be related to a permanent contraction of a muscle or group of muscles causing dystonia (disorder in tone and muscle movement). In addition to its role in physiological functions, it has been shown that histamine is involved in neuronal degeneration and neurotoxicity. Small doses of histamine trigger broncho intense constriction in humans with bronchial asthma and other lung diseases that in healthy people the effect is less intense; In addition it has been discovered that half of the patients diagnosed with schizophrenia have low blood histamine levels.

Conclusion

The complex functions of the nervous system are a consequence of the interaction between networks of neurons, and not the result of the specific characteristics of each individual neuron. The transmission of nerve impulses from one neuron to another or to effector cells depends on the action of specific neurotransmitters on also specific receptors. Neurotransmission may increase or decrease to generate a function or to respond to physiological changes. Many neurological and psychiatric disorders are due to an increase or decrease in the activity of certain chemical messengers and many drugs can modify it; some (e.g. hallucinogens) produce adverse effects and others (e.g. antipsychotics) may correct some pathological dysfunctions.

References

1. Álvarez Freire, Enriqueta (2004) Fundamentals of Human Anatomy and Physiology for Teachers. Editorial People and Education, Havana, Cuba.
2. Cardellá Rosales, Lidia (2007) Human Biochemistry tome I. Editorial Medical Sciences, Havana, Cuba.
3. Collective of authors (2015) Morphophysiology II. Editorial Medical Sciences, Havana, Cuba.
4. Antich Choir, Frank (1982) Cellular Physiology and Control Systems. Editorial. People and Education, Havana, Cuba.
5. Estrada Rafael, Jesús Pérez (1984) Functional Neuroanatomy. Editorial People and Education, Havana, Cuba.
6. Guyton, Arthur, Hall, John E. Treatise on Medical Physiology. Journal of Neurology.
7. Wikipedia (2012) Neurotransmitters.



This work is licensed under Creative Commons Attribution 4.0 License
DOI: [10.19080/APBIJ.2017.02.555581](https://doi.org/10.19080/APBIJ.2017.02.555581)

Your next submission with Juniper Publishers will reach you the below assets

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats (Pdf, E-pub, Full Text, Audio)
- Unceasing customer service

Track the below URL for one-step submission

<https://juniperpublishers.com/online-submission.php>