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# CHOLINERGIC RECEPTOR SYSTEM MEDICATIONS

***Aminova Mohinur Normurod qizi***
*minovamohinur133@gmail.com*

***Shermatova Nodira Baxodir qizi***
*nodirashermatova90@gmail.com*

***Yuldasheva Hilola Shokir qizi***
*hilolayuldasheva759@gmail.com*

***Saidov Bekzod Ahmad o'g'li***
*bekzodsaidov844@gmail.com*

***Urokova Vazira Xamidovna***
*vazira.urokova@mail.ru*

***Termez branch of Tashkent Medical Academy***

**Abstract:** Cholinergic receptors (acetylcholine receptors) are transmembrane receptors whose endogenous agonist ligand is acetylcholine. Acetylcholine is present in both pre- and postganglionic synapses of the parasympathetic system, as well as in preganglionic sympathetic synapses, a number of postganglionic sympathetic synapses, neuromuscular synapses (somatic nervous system), and also serves as a neurotransmitter in some parts of the central nervous system. Nerve fibers that secrete acetylcholine from their ends are called cholinergic fibers**.** This article provides information on drugs for the cholinergic system.

**Keywords:** cholinergic receptors, acetylcholine, nicotinic acid, protein subunits.

The cholinergic receptor refers to the postsynaptic membrane that reacts with the mediator acetylcholine. In general, the polarized postsynaptic membrane that acts on the mediator acetylcholine is called the cholinergic receptor. As a result of the change in polarity of the postsynaptic membrane under the action of acetylcholine, its ionic permeability is increased. In organs where acetylcholine has a stimulating effect (contraction of smooth muscles, increased secretion of glands, etc.), sodium ions penetrate into the cytoplasm of the cell by separate pathways and depolarize cholinergic receptors (polarity change). Potassium ions go outside the cell and hyperpolarize the membrane. This causes an inhibitory effect of acetylcholine on organ activity. It should be noted that the amounts of sodium and potassium ions inside and outside the cell are different. For example, the concentration of sodium ions outside the cell is 150 mmol and inside the cell is 13 mmol. In contrast, the amount of potassium inside the cell is 140 mmol and outside the cell is 2.5 mmol. For this reason, sodium ions accumulated on the outer surface of the membrane attract anions and make the inner surface of the membrane negatively polarized, while the outer surface becomes positive. Thus, under the influence of acetylcholine or other substances, the potential of the postsynaptic membrane is disturbed. As a result, a local

biocurrent is formed between the polarized and intact parts of the membrane. This current spreads to the entire cell surface, where various effects are observed. The sodium and potassium ions that have traveled are then returned to their places. This is done by the "sodium" and "potassium pumps" at the expense of ATP energy (one macroergic binding of ATP removes 2-3 sodium ions from the cell). Thus, the resting state of the cholinergic receptor is restored (repolarization).

Acetylcholine is synthesized in the cytoplasm of nerve endings; its stores are stored as vesicles in presynaptic endings. The occurrence of a presynaptic action potential causes the release of the contents of several hundred vesicles into the synaptic cleft. Acetylcholine released from these vesicles binds to special receptors on the postsynaptic membrane, which increases its permeability to sodium, potassium, and calcium ions and leads to the generation of an excitatory postsynaptic potential. The action of acetylcholine is limited by its hydrolysis by the enzyme acetylcholinesterase. In the region of preganglionic synapses of the parasympathetic and sympathetic systems, the action of acetylcholine can be enhanced by the administration of nicotine alkaloid; hence, all autonomic ganglia are called nicotine ganglia. Nicotine-like transmission of nerve impulses also occurs in neuromuscular junctions, the central nervous system, the adrenal medulla, and some sympathetic postganglionic areas.

Nicotinic cholinergic receptors are ionotropic and sodium channels. They consist of five protein subunits, usually two of which have acetylcholine binding sites. Cholinerceptors on the plasma membrane of organs and cells distinguish three sites (center or part). One is the anion field, which attracts the positively polarized nitrogen atom (and other compounds) in the acetylcholine molecule by electrostatic force. This field is often referred to as an acceptor. The second part of the cholinergic receptor is called the esterophilic center. It forms electrostatic and hydrogen bonds with the acidic group of acetylcholine. Considering that the sensitivity of the hydrophobic sites between these two centers to chemicals is different, they are divided into two groups, as suggested by academician S.V. Anichkov:

- Muscarinic-sensitive M-cholinoreceptors
- Nicotine-sensitive N-cholinoreceptors

M-cholinoreceptors are located in the postsynaptic membrane near the termination of postganglionic fibers of the parasympathetic nerve, and H-cholinoreceptors are located in the nodes of autonomic nerves (ganglia, MNT) and other places (motor nerve terminations, carotid sinus, adrenal glands of the medulla oblongata, etc.). It has been established that M-cholinoreceptors located in the brain differ in their structure and sensitivity to chemical substances (M1-M2-M3-cholinoreceptors). Such drugs can be used to restore organ function altered by disease or to eliminate disease. Thus, understanding cholinergic receptors is important for potential recruits. To understand cholinergic agents, we must first look at how acetylcholine acts in different parts of the nervous system. The nervous system is divided into the central nervous system (CNS), consisting of the brain, cerebellum, and spinal cord, and the peripheral nervous system, consisting of the somatic and autonomic nervous systems. The somatic nervous system transmits signals from external stimuli and the central nervous system to the skeletal muscles and mediates hearing, vision, and touch. The autonomic nervous system is divided into the sympathetic and parasympathetic nervous systems.

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