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Editorial

Functional Activity of the "Guest" Brain, Motility

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Introduction

Preservation of physiological functions, stable tissue homeostasis involves a huge variety of physiologically active compounds (FAS) of hormones, neurotransmitters, cytokines (FAS). The goal is to determine the role of FAS in maintaining homeostasis in the intestinal mucosa (IM), whose activity is subordinated to the central and peripheral nervous systems, MALT, APUD and the enteric nervous system (ENS). Represents a highly organized peripheral diffuse immunoneuroendocrine complex I in the IM. As a result, the IM takes on the function of a local regulatory center, as the "intestinal" brain is now called, which produces neurotransmitters, hormones, and tissue hormones. In a healthy body, it is a self-regulating and self-restoring system that takes part in the implementation of functions at the level of an organ, tissue, cell and inside the cell. Diseases cause failure in this system. At the initial stage, compensatory mechanisms are triggered, which are incorporated in duplication into the system of regulation of the functional properties of the organ, creating temporarily existing combinations of different FAS, if their combination is unsuccessful, then the stage of decompensation and autonomization, the activity of the gastrointestinal tract, more specifically, the ordering of the mechanisms of work digestive system. The SOC is constantly "working" in it, a complex multifaceted work takes place. Neuroendocrine cells are involved in this work, new associative connections are created, and the study of impulse transmission pathways is of great interest. In the IM, everything is simpler and more complicated. The IM has its own local centers of regulation and can do without CNS signals, being limited to the spinal cord, or even more simply, its "intestinal" brain; to solve local problems, it is enough to have its own nervous system of the gastrointestinal tract, which belongs to the metasomatic nervous system (MNS) in the IM, entering the autonomous the nervous system of the IM, consisting of microganglionic formations, more precisely intramural ganglia, located on the surface or in the thickness of the organ, the connection of nerves and individual neurons is carried out. The internal organs communicate with each other via the MHC, bypassing the brain, its role is played by the ganglia. Such relationships of neural relationships can be demonstrated as a simple reflex arc. In this case, the organs can work without the participation of the central nervous system. Functional regulation in the gastrointestinal tract has general principles of integration of neurotransmitters and hormones, which form dynamically changing systems of multi-loop regulation. It may be in the form of a cascade of neuroendocrine interactions, but also be two-link. In any case, the cooperative effect of neurogenic and hormonal factors on the target cell can be potentiated or inhibited. Combining two or more information signals on the membrane of the same effector cell is of particular interest for studying FAS interactions.

Purpose of the Study

To study the phenomenon of potentiation or inhibition of the combined action of acetylcholine (Ach)↔serotonin (5-HT) (Ach↔5-HT) on the local peristaltic effect in the body and antrum of the stomach and duodenum.

Material and Methods

White Wistar rats, females, weighing 180 - 220g were used. Drugs administered to intact animals - Ach at a dose of 100 mg/kg; 5-HT (serotonin creatine phosphate) - 1.25 mcg / kg; atropine - 0.1%, 0.2 ml/200g administered 10 minutes before administration Ach or 5-HT. In the mucous membrane of the body and antrum of the stomach and duodenum, the content of Ach was determined by the method of Hestrin, 5-HT-Sadovanquvad. The rate of movement of the body → antrum → duodenum was measured by the movement of the stained contents, the tone of smooth muscles was assessed according to the scoring system: systole +5, diastole -5, normotonus + 1 points.

Results and Discussion

In intact animals, the content gradient of Ach and 5-HT-body-antrum-duodenum: Ach - 0.42 ± 0.06; 0.65 ± 0.06; 1.6 ± 0.1 mg/g; 5-HT - 1.4 ± 0.2; 4.1 ± 0.7; 3.6 ± 0.6 μg/g, respectively. The Ach concentration increases towards the duodenum ($p < 0.05$). The highest concentration of 5-HT is in the antrum of the stomach ($p < 0.05$). Exogenous administration of Ach increases the concentration of Ach in the tissue by 30-35%; with the introduction of 5-HT - Ach increases by 15 - 20%, and 5-HT by 35 - 40%. When exogenous Ach is administered to intact animals, systole of the body of the stomach is observed, as well as normotonus of the pylorus and duodenum. Ach+ 5-HT - gastric systole and duodenum, normotonus of the pyloric region. Exogenous 5-HT-pylorus systole, gastric normotonus and duodenum. 5-HT then Ach - gastric diastole, pyloric systole and normotonus duodenum. Atropine + 5-HT - gastric diastole, duodenum systole, pyloric normotonus. 5-HT inhibits the action of Ach on the gastric tone and potentiates the action on the pyloric canal and duodenum, reduces the rate of movement of the contents. 5-HT can enhance or attenuate responses induced by other physiologically active compounds (FAS). Its different action on smooth muscle cells depends on the type of receptor with which 5-HT binds, if with 5-HT3 receptors, then relaxation occurs, and with 5-HT4 - contraction of smooth muscle fibers. In turn, binding to the type of receptor depends on the amount of 5-HT and FAS imbalance. We considered some integration processes in the gastrointestinal tract that occur with the participation of structurally and functionally differentiated neuronal circuits (excitatory and inhibitory) of the enteric nervous and diffuse endocrine systems, which have a specific neurotransmitter apparatus that ensures the implementation of a local, peristaltic reflex, in the implementation of which cholinergic and adrenergic mechanisms, but in addition to their smooth muscle relaxation is provided by nitric oxide (NO), which is released from the endothelium under the action of Ach. NO is the mediator for smooth muscle relaxation (Figure 1). It is not clear where exactly NO is formed - in nerve endings or smooth myocytes.

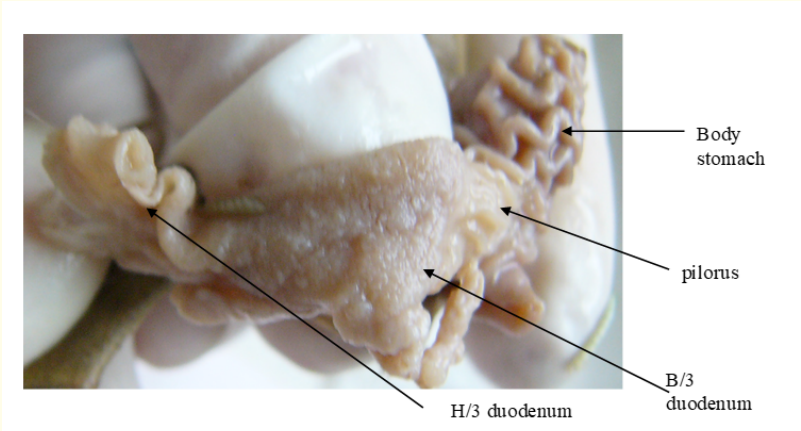

Figure 1: *Relaxation of the circular muscles of the duodenum and pyloric stomach.*

The presence of NO in the peripheral nervous system is necessary for signal transmission by the postganglionic endings of the parasympathetic nervous system to smooth myocytes of internal organs. The release of Ach in these synapses is accompanied by an increase in the concentration of NO in the synaptic region. In their concentration ratios, an oscillatory reaction is triggered, based on the classical direct and inverse ratio of the substrate (mediator) and the enzyme.

Conclusion

Thus, a powerful neuroimmunoendocrine system is localized in the intestinal wall. It is a self-healing, self-regulating system. In the intestine, it duplicates the action of the central nervous system. The preservation of FAS interactions in the intestine is necessary to ensure the vital activity of epitheliolytic, secretory, absorption and motor activity. Studying the subtle mechanisms interaction between the neuroendocrine and immune systems, studying neuroimmunoendocrine interactions will allow us to study the pathophysiological mechanisms of acute and chronic inflammation, autoimmune diseases, their diagnosis and correction in humans. The mechanisms of maintaining dynamic homeostasis are poorly understood, the presence of the "intestinal" brain, its regulatory action requires close attention. The task of the "intestinal" brain is to prevent the exit of the gastrointestinal tract from under the influence of the "intestinal" brain, "leave" for autonomous regulation, which will lead to the death of the gastrointestinal tract.

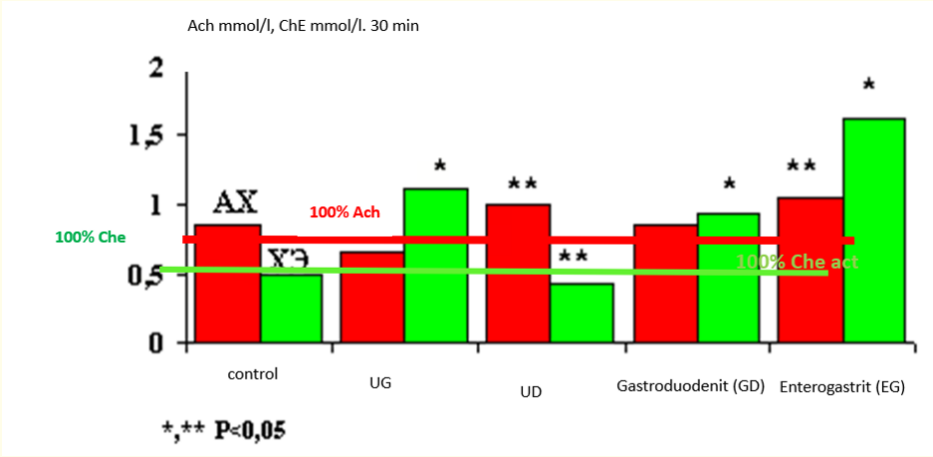

Figure 2: *Ach concentration and Che activity level in diseases of the gastroduodenal zone*

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