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which show that a new combination of biochemical reactions arising during evolution, as a rule, included more ancient metabolic links and complemented them with newly formed links [4, 5]. This is also seen by way of the example of cellular bioenergetics of higher organisms, the striking conservatism of which appears to have been a result of the universality of bioenergetics reached by the moment when a differentiation began. In fact, nature never rejects solutions once successfully found, but it does not afford any luxuries either, which seems to be a reflection of one of the general principles that could be called *the pun, the least action for biological systems* [4]. Realization of these principles is especially reasonable when there is a sharp deficiency of oxygen and energy, which takes place in hypoxia (especially at the initial stage of it), on functional loading, as well as during the development of pathological processes (in the acute phase), for instance, brain and heart ischemia, when activation of NO synthase systems, oxidizing L-arginine to NO can in structural and energetic aspects be a too expensive way of obtaining nitrogen oxides. Here it is noteworthy that inducible NO synthase can be activated upon the adaptation to hypoxia as well as in some forms of pathology. Our conception is in a good agreement with data of the literature.

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THE ROLE OK HYDROGEN SULFIDE IN REGULATION OF SMALL INTESTINAL CONTRACTILITY

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Hydrogen sulfide (H2S) - a gas. well-known for its toxic effects associated with impaired oxidative phosphorylation in the cell. H2S endogenously produced in mammalian tissues and plays a major role in physiological and pathological processes. Traditionally known as a toxic gas it is also an important gaseous messenger. Like other gasotransmitters, H2S has a relaxing effect on the smooth muscle in the cardiovascular system, gastrointestinal tract, reproductive system. In a number of studies the relaxing effect of H2S in various parts of the gastrointestinal tract in different animal species was found. However, it was also

shown that H2S could produce different effects on smooth muscle motility dependent on concentration.

The aim of our study was to determine the effect and mechanisms of action of H2S on contractile activity in smooth muscle of rat intestine.

Experiments were performed on isolated segments of jejunum from rat. In control the rat jejunum segment spontaneously contracted with average frequency 0,45 ± 0,01 Hz and amplitude - 0,57 ± 0,5 g (n - 20).

Hydrogen sulfide causes a dose-dependent decrease in the amplitude, basic tension and frequency of spontaneous contractions of rat jejunum segment. For detection of endogenous synthesis of hydrogen sulfide in the intestinal cells, we used its endogenous donor and inhibitors of synthesis. The results show that the substrate of H2S synthesis — L-cysteine, reduced the spontaneous contraction parameters as H2S donor, probably due to endogenous synthesis of gas. Inhibitor of enzyme that catalyzing the synthesis of H2S causing the opposite effect.

It is known that κ · -channels play a key role in maintaining of the tone of smooth muscles, are involved in the control of gastrointestinal smooth muscle contraction, affecting the membrane potential, slow waves of depolarization, duration of the action potential. K+-channels may be the targets of the effects of hydrogen sulfide.

After blocking the voltage-dependent and calcium-activated potassium channels by tetraethylammonium effects of NaHS on basic tension, amplitude and frequency of spontaneous contractions was the same as in control experiments.

It has been shown, that in vascular smooth muscle cells the effects of NaHS were mediated through activation of K(ATP)-channels. In the term of blocking ATP-sensitive K-channels NaHS causes an increase in basic tension, whereas against the background of an activator of ATP-sensitive K-channel effect of NaHS on basic tension was not shown.

H2S can act synergistically with NO-system in vascular smooth muscle cells. To inhibit endogenous synthesis of NO on rat jejunum we used L-NAME. Blocking of enzymes of endogenous NO production is not affected to the effects of NaHS.

NaHS reduces carbachol induced contraction of rat jejunum segment. Against the background of NaHS. the effect of carbachol is reduced, which suggests the involvement of signaling pathways triggered by carbachol in the effect of the gas. In particular, the decrease of carbachol action may be related to the blocking of release of intracellular calcium under the action of NaHS, and with the activation of myosin light chain phosphatase responsible for relaxation of smooth muscle cells.

To study the effect of hydrogen sulfide on intracellular calcium level was measured amount of free intracellular Ca2+ in isolated smooth muscle cells of the small intestine using the fluorescent dye Fura-2. It was found that application of NaHS caused an increase in intracellular Ca2+ concentration.

It can be assumed that the change in the intracellular calcium concentration is a key factor in determining the inhibitory effect of NaHS on contractile activity of smooth muscle cells of the small intestine. Effect of NaHS may be mediated by the activation of potassium channels, as well as changes in intracellular calcium release from the SERCA or the entry of calcium through voltage-dependent calcium channels, or the influence on the contractile proteins of smooth muscle cells.

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