

The influence of cardioprotective compound nitroxysuccinate 3-hydroxy-6-methyl-2-ethylpyridinium on ion channels of cardiomyocytes**Научный руководитель – Фролова Шейда Рауф кызы***Ali Deeb R.¹, Коваленко С.Г.²*

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Currently, the study of arrhythmias' formation and ways to combat them is a relevant issue. One of the causes of arrhythmias may be heart ischemia. Ischemia often leads to oxidative stress, during which free radicals oxidize the lipids of cardiomyocyte membranes. Thus, damaging the membrane, oxidative stress leads to cell hypoxia, consequently, to heart ischemia. To prevent diseases associated with oxidative stress, drugs with antioxidant activity can be used. A new compound, synthesized at the Institute of Chemical Physics Problems of the Russian Academy of Sciences, nitroxysuccinate 3-hydroxy-6-methyl-2-ethylpyridinium [3], a pyridoxine derivative, possesses antioxidant properties, increasing nitric oxide production in heart cells and protecting the iron-sulfur centers of the respiratory chain of heart, brain, and liver mitochondria tissues in animals from oxidative stress [1].

Since ion channels play a significant role in generating action potential for conducting excitations in the cardiovascular system, this study aimed to investigate the influence of the new antioxidant compound nitroxysuccinate 3-hydroxy-6-methyl-2-ethylpyridinium on voltage-gated ion channels of cardiomyocytes, which play a crucial role in action potential formation.

The aim of the research was to verify whether this compound affects the activity of ion channels and in which concentrations. Using the electrophysiological patch-clamp method in the whole-cell configuration on isolated neonatal rat cardiomyocytes, INa, ICa L-type, and IKs under the influence of this compound were studied.

The results showed that at therapeutic doses (20-160 μM) [2], antioxidant compound does not affect the activity of the ion channels. However, at concentrations of 1 mM and above, it has significant inhibitory effects: there is approximately 35% decrease in INa current, the amplitude of ICa, L decreased by $\sim 31\%$ after the addition of compound and IKs decreased by approximately 40%. Due to these identified properties, nitroxysuccinate 3-hydroxy-6-methyl-2-ethylpyridinium can be safely used as a cardioprotective drug in therapeutic doses (less than 1 mM) without side effects on the voltage-gated ion channels of cardiomyocytes.

References

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