EFFECT OF 1-(4-METHOXYLPHENYL)-6,7-DIMETHOXY-1,2,3,4-TETRAHYDROISOQUINOLINE ALKALOID ON POTASSIUM CHANNEL ACTIVITY OF HEART MITOCHONDRIA

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Abstract

Oxidative stress causes an imbalance between the oxidation and antioxidant systems of mitochondria. Active forms of oxygen (reactive oxygen species - ROS) and reactive nitrogen species can be harmful or beneficial for cells. An increase in the concentration of free radicals changes the conductance value of mitochondrial ion channels. One such ion transport system is ATP-dependent potassium channel (mitoK$_{ATP}$-channel) located in the inner membrane of mitochondria [1; 2]. Most of the drugs available today target mitochondrial ion channels [3]. Under conditions of oxidative stress, the damage in mitochondria can be corrected by biologically active substances. Currently, intensive scientific research is being conducted in this regard. However, no studies have been conducted on changes in the activity of cardiac mitoK$_{ATP}$.channel in rats under conditions of oxidative stress and the effect of 1-(4-methoxyphenyl)-6,7-dimethoxy-1,2,3,4-tetrahydroisoquinoline (F-4) alkaloid on them.

Objective: To study the effect of F-4 isoquinoline alkaloid on mitoK$_{ATP}$-channel activity of rat heart in oxidative stress induced by $PbCl_2$.

Research methods. The experiments were carried out in vivo. $PbCl_2$ salt was used to form oxidative stress model in experimental animals. After the formation of oxidative stress in rats, F-4 isoquinoline alkaloid 30 mg/kg was added to the food of experimental animals once a day for 10 days. Rat heart mitochondria were isolated using differential centrifugation. Kinetics of mitochondrial degradation, i.e., the change in the optical density of its suspension (0.5 mg protein/ml) was recorded using a spectrophotometer V-5000 at a wavelength of 540 nm.

Results. According to the obtained results, the permeability of heart mitoK$_{ATP}$-channel of healthy group I rats was 0.08 Δ540, min x 10 optical density. It was found that the activity of mitoK$_{ATP}$-channel of the heart of group II rats induced by oxidative stress was inhibited by

43.75% compared to the control group. Therefore, ATP-dependent K+ ion permeability value of rat heart mitochondria decreased under oxidative stress conditions. Inhibition of MitoK_{ATP}-channel conductance leads to restriction of entry of K^+ ions into the matrix. This can cause the volume of the mitochondrial matrix to be controlled and the potential value to change.

It was found that the permeability of liver mitoK_{ATP}-channel of group III rats treated with pharmacotherapy with F-4 isoquinoline alkaloid increased by 60.0% compared to group II indicators.

Thus, F-4 isoquinoline alkaloid increases the activity of cardiac mitoK_{ATP}-channel. In turn, mitoK_{ATP}-channel activation can play an important role in protecting cells from oxidative stress damage.

References

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