THE EFFECT OF ISOQUINOLINE ALKALOID ON SUPEROXIDE DISMUTASE ENZYME ACTIVITY OF RAT HEART MITOCHONDRIA

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Abstract

Superoxide dismutase (SOD) is one of the main enzymes of the antioxidant system. SOD is a group of metalloenzymes that catalyze the dismutation reaction of superoxide anion radicals, keeping their concentration in the cell at a low level and reducing the probability of active singlet oxygen formation. Depending on the metal ion in the active center of the enzyme, several SOD isoenzymes are distinguished, among which Cu-, Zn-SOD has the greatest activity [1].

The harmful effects of the superoxide anion radical are also related to its participation in the formation of the highly reactive hydroxyl radical (Haber-Weiss reaction), which plays a leading role in the lipid peroxidation (LPO) process [2]. In order to maintain bioradicals at a physiological level, a complex multi-component antioxidant defense system including enzymes and low molecular compounds has been formed in the body [1]. An increase in the amount of SOD in heart mitochondria indicates an increase in the generation of free radicals. Bioactive compounds play an important role in increasing the activity of antioxidant enzymes.

Objective:

(1-(4-Methoxylphenyl)-6,7-dimethoxy-1,2,3,4-tetrahydroisoquinoline) (F-4) is to determine the effect of isoquinoline alkaloid on heart mitochondrial SOD enzyme activity.

Research methods. Purebred white rats (200-220 g) were used in the experiments. Researches were carried out under *in vitro* conditions. Isolation of mitochondria from rat heart was performed using the differential centrifugation method. SOD activity was determined by inhibition of auto-oxidation of epinephrine at pH 10.2 and 480 nm. was observed on the basis of the increase in light transmission [3]. A unit of SOD activity was determined as the amount of enzyme required for 50% inhibition of the oxidation of epinephrine to adrenochrome at 480 nm min.-1.

Results

In our experiment, the effect of F-4 isoquinoline alkaloid on SOD enzyme activity of rat heart mitochondria was investigated. According to the obtained results, it was found that SOD activity of heart mitochondria increased by 20.9% and 34.8%, respectively, in the presence of 25 μM and 50 μM concentrations of F-4 isoquinoline alkaloid in the incubation medium. Concentrations of 75 μM and 100 μM of F-4 isoquinoline alkaloid were found to increase SOD enzyme activity of cardiac mitochondria by 53.4% and 58.1%, respectively, compared to the control. The obtained results revealed that F-4 isoquinoline alkaloid increased the activity of SOD enzyme of rat heart mitochondria. So, F-4 isoquinoline alkaloid exhibits the property of neutralizing superoxide radicals in heart mitochondria.

The antioxidant properties of F-4 isoquinoline alkaloids may be realized through the presence of functional groups in their structure. The property of isoquinoline alkaloids to inhibit cardiac mitochondrial membrane LPO, ion transport systems may be related to inhibiting the open conformation of calcium megachannel, acting as an activator on mitoK_{ATF}-channel. This, in turn, allows the use of F-4 isoquinoline alkaloids as a corrective agent in the development of various pathologies.

Conclusions

F-4 isoquinoline alkaloid was found to increase SOD activity of rat heart mitochondria.

References:

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