COMPARATIVE STUDIES OF THE ANTIOXIDANT PROPERTIES OF DIOSMIN AND QUERCETIN IN THE MODEL SYSTEM OF DOPAMINE OXIDATION

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Parkinson's disease (PD) is a common neurodegenerative disorder. It is associated with the degeneration of dopaminergic neurons and is characterized by tremor, postural instability, rigidity, and hypokinesia. The treatment of PD primarily involves symptomatic therapy, which includes administering levodopa, which is converted to dopamine in the brain [1]. However, treating PD with levodopa is problematic because both levodopa and its metabolite dopamine can be oxidised, usually by oxidative stress. Therefore, additional administration of antioxidants is needed to prevent oxidation of levodopa and dopamine.

Flavonoids are a well-known group of antioxidants, which are biologically active phenolic substances found in various plants. Recent studies have shown that some flavonoids can protect dopaminergic neurons by inhibiting dopamine oxidation and modulating antioxidant signaling pathways [2-3].

The study examined the effect of two well-known bioflavonoids, diosmin and quercetin, on the rate of dopamine oxidation and compared their antioxidant activity in this system. Kinetic studies were conducted using the spectrophotometric method, which recorded the increase in the optical absorption of the reaction mixture over time at a wavelength of 500 nm. The rate of dopamine oxidation was determined by calculating the first-order reaction rate constant.

Analyzing the dependence of the first-order reaction rate constant of dopamine oxidation on the concentration of diosmin in the system, it can be argued that a dose-dependent effect of oxidation inhibition is observed. When diosmin was added to the system at a concentration of 25 μM, the rate of dopamine oxidation significantly decreased by 3.07 times: $K^1_{H(0)}$= (3.90±0.03)×10^{-3} 1/s and $K^1_{H(25)}$=(1.27±0.04)×10^{-3} 1/s ($p \leq 0,05$); with an increase in concentration to 50 μM the rate of dopamine oxidation decreased by 4.02 times: $K^1_{H(50)}$= (0.97±0.08)×10^{-3} 1/s, and at a concentration of 100 μM – 5.57 times: $K^1_{H(100)}$=(0.70±0.05)×10^{-3} 1/s.

Instead, when quercetin was added to the system at a concentration of 25 μM the rate of dopamine oxidation decreased significantly by only 1.35 times: $K^1_{H(0)}$=(3.90±0.03)×10^{-3} 1/s and $K^1_{H(25)}$= (2.88±0.04)×10^{-3} 1/s ($p \leq 0,05$). When the quercetin concentration is increased to 50 and 100 μM the oxidation rate decreases by 1.65 and 3.02 times, respectively: $K^1_{H(50)}$=(2.36±0.06)×10^{-3} 1/s and $K^1_{H(100)}$=(1.29±0.03)×10^{-3} 1/s.

It has been established that the bioflavonoids diosmin and quercetin exhibit antioxidant properties in relation to dopamine oxidation. However, diosmin is a more effective inhibitor of dopamine oxidation. Therefore, it is advisable to prefer diosmin when modelling a pharmaceutical composition for use in combination therapy with levodopa drugs for the treatment of Parkinson's disease.

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