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THE EFFECT OF ACETYLSALICYLIC ACID ON PROTEIN GLYCO-OXIDATION AND ASSESSMENT OF ITS ANTIOXIDANT ACTIVITY IN IN VITRO STUDIES

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Relevance. Acetylsalicylic acid (ASA) is one of the most commonly used drugs in the world due to its anti-inflammatory, analgesic, and antipyretic properties. Furthermore, the chronic administration of ASA prevents coronary thrombosis, heart attacks, and stroke due to the antithrombotic effect. Nevertheless, our findings indicate that this drug also has other mechanisms of action. Recent studies confirm the involvement of glycation and oxidation processes in the development of numerous common diseases. Our research suggests that ASA antyglycooxidative activity may have beneficial effects in various cardiovascular, metabolic, and neurodegenerative disorders.

Target: to evaluate the potential effect of acetylsalicylic acid on protein glyco-oxidation as well as antioxidant activity in an in vitro model.

Materials and methods. In this study, we used an in vitro model of oxidized bovine serum albumin (BSA) and glucose as a glycation agent. 0,09 mM BSA and 1 mM ASA were incubated for six days with 0,5 M glucose. Experiments were performed in duplicate and repeated three times. We assessed the antioxidant properties of albumin (ferric reducing antioxidant power and 2,2-di-phenyl-1-picrylhydrazyl radical scavenging capacity), the intensity of protein glycation (advanced glycation end products and Amadori products), and glyco-oxidation (thioflavin T, dityrosine, kynurenine, N-formylkynurenine and tryptophan) as well as the content of protein oxidation products (advanced oxidation protein products and carbonyl groups). We compared the effectiveness of ASA with recognized protein glycation inhibitors (aminoguanidine and metformin) as well as free radical scavengers (Trolox, captopril, lipoic acid and reduced glutathione).

Results and their discussion. In the presence of ASA, concentrations of glycation and protein oxidation products were significantly lower comparing to control. Moreover, albumin antioxidant activity was significantly higher in those samples. We have demonstrated that acetylsalicylic acid enhances the antioxidant properties of albumin and prevents protein oxidation and glycation under the influence of glucose. Notably, the drug's action was comparable to commonly known antioxidants and antiglycation agents, such as metformin, aminoguanidine, Trolox, N-acetylcysteine, or lipoic acid. Further research is needed to confirm it, as reduction of protein oxidation and glycation may increase anti-inflammatory treatment effectiveness or prevent cardiovascular disease development.

Findings. The conducted experiment proves that ASA can ameliorate protein glycation and oxidation in vitro in various conditions. Potential pleiotropic effects of ASA may result in an extension of drug usage guidelines, taking into consideration the oxidative stress etiology of numerous diseases.