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THE INFLUENCE OF MONOSODIUM GLUTAMATE ON REACTIVE OXYGEN SPECIES PRODUCTION IN RATS

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Introduction. One of the most common food additives in Ukraine and in Europe is monosodium glutamate (MSG, $C_5H_8NO_4NaH_2O$). Encoded E621, it is a food additive from a group of flavor enhancers, used in a wide range of foods, such as soups, sauces, mixed condiments, chips, meat products, and puddings. Despite its widespread use and generally considered safety, some questions regarding the impact of MSG on general health have arisen. There are studies that MSG intake at a dose of 3 g per day is dangerous to human health. The aim of our study was to investigate the effect of monosodium glutamate administration at "safe" (allowed) dose on the content of reactive oxygen species (ROS) in leukocyte blood suspension of rats.

Methods. Experimental studies were conducted on 16 nonlinear, white male rats weighing 180-200 g. MSG was purchased from Sigma-Aldrich (USA). Laboratory animals were divided into 2 groups. The first group was administered MSG at a dose of 30 mg/kg body weight (corresponds dose 2 g per day in humans) for 30 days. The control group of animals was given normal saline. Analysis of cell samples to determine ROS was evaluated by the flow laser cytometry method on flow cytometer Epics XL (Beckman Coulter, USA), using 2.7-dichlorodihydrofluorescein diacetate. The value of the studied parameter was expressed as a percentage (the ratio of the number of leukocytes with increased intracellular content of ROS (ROS+ cells) to the total number of cells).

Results. We have established that MSG administration at a "safe" dose can induce oxidative stress. Content of ROS increased in leukocyte blood suspension by 40.3% vs control group ($P < 0.05$).

Discussion. Excess generation of ROS in cells is known to damage DNA, lipids, and proteins resulting in several biological effects, ranging from alterations in signal transduction, gene expression, mutagenesis, and apoptosis. Moreover, the activation of lipid peroxidation processes (direct effect of increased generation of ROS) is an important biochemical mechanism for the development of endogenous intoxication. Excessive lipoproxidation is accompanied by the accumulation of peroxide oxidation products and the depletion of antioxidant system reserves, which causes hyperenzymemia and accumulation of toxic substances.

Conclusions. Thus, our results indicate that administration of MSG at a dose of 30 mg/kg body weight was associated with development of excessive ROS production in leukocytes of rats. Therefore it is advisable not only to investigate the established dangerous doses of E621, but also to study the molecular mechanisms of the "safe" (allowed) doses of MSG effect on a living organism.

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