glutathione as a consequence of reduced antioxidant protection of cells during intoxication and increased non-enzymatic oxidation of reduced glutathione by activating reoxidation processes.

Ferenchuk Ye.O.

EFFECT OF GLUTATHIONE ON THE LEVELS OF OXIDATIVE MODIFICATION OF PROTEINS IN THE BLOOD BY NEPHROPATHY

Department of Bioorganic and Biological Chemistry and Clinical Biochemistry
Bukovinian State Medical University

The kidney diseases cause an imbalance between free radicals' production and antioxidant capacity. Oxidative stress damages molecules and cellular structures, disorients functions of organs and systems. Lipid and protein oxidation products are metabolized by nonenzymatic and enzymatic mechanisms to eliminate oxidative stress of the organism. So, the objective of the study was to examine the effect of glutathione on the levels of oxidative modification of proteins in the blood on the experiment of kidney disease.

The experiment was conducted on 131 male albino rats with the bodyweight of 0.16-0.18 kg. Experimental nephropathy was modelled by injection of a single intraperitoneal dose of folic acid (250 mg/kg). Glutathione was introduced daily (100 mg/kg) by the intragastric way for 3 and 7 days after the injection of folic acid. All manipulations with animals were carried out according to the European Convention for the Protection of Vertebrate Animals used for Experimental and Other Scientific Purposes and the law of Ukraine "On protection of animals from cruelty". In the blood plasma the levels of oxidative modification of proteins (OMP) were determined. The degree of oxidative modification of proteins was evaluated in the blood by the level of aldehyde and ketone derivatives of neutral (OMP370) and basic (OMP430) composition. The type of distribution was estimated using the Shapiro-Wilk test. Significant differences between groups were evaluated by using the Wilcoxon test and Kolmogorov–Smirnov test with $p < 0.05$ considered.

Oxidative modification of proteins is associated with the damage of both the polypeptide chain and individual amino acids with the formation of several types of radicals. The process of oxidative modification of proteins has a complex and specific nature, which is established by the amino acid composition of proteins. The level of OMP370 in rats with nephropathy was higher by 36% on the third day of the experiment compared to rats in the control group. The glutathione decreases the level of OMP370 by 24 % on the third day of the experimental period compared with the group of animals without introduction of tripeptide. According to our study results, the indices of oxidative modification of proteins of the aldehyde and ketone derivatives of the neutral character were without significant changes on the seventh day.

The level of OMP430 in the blood of rats with nephropathy was higher by 14.6% on the third day of the experiment than of those rats in the control group. On the seventh day in animals with nephropathy the activation of processes of oxidative modification of proteins was confirmed by an increase (32.6%) of indices of the aldehyde and ketone derivatives of the basic character in the serum. The increase of oxidative modification of proteins is one of the pathogenetic links in the development of pathological conditions due to oxidative stress. The glutathione decreases the level of OMP430 to the control value on the third day and by 15 % on the seventh day of the experimental period compared with the group of animals without introduction of tripeptide.

Oxidative modification of proteins can change amino acid residues, a valence and coordination of metals which leads to disruption of protein structure and facilitate proteolysis processes. Consequently, the intensity of oxidative modification of proteins can be a marker of the degree of peroxide processes and a factor that affects the state of the antioxidant system.

Our results show the potential role of glutathione in reducing complications of kidney diseases. The main function of exogenous glutathione is suppressing lipid peroxidation which occurs in the plasma membrane and damages the membrane's structure and permeability.