Contribution ID: 16

Type: not specified

The role of natural dietary antioxidants in animals under oxidative stress

The harmful effect of the most dangerous environmental heavy metal cadmium (Cd) is accompanied by an antioxidant-prooxidant imbalance in animal organ and tissues. Cd catalyses the formation of reactive oxygen species such as superoxide anions, hydroxyl radicals, and hydrogen peroxide in cell membranes following the oxidative stress and the risk of developing metabolic disorders and diseases. The protective action of nutrients with antioxidative activities in chickens exposed to Cd was investigated. As antioxidant dietary supplements the salts of zinc (ZnCl2) and selenium (Na2SeO2), and vitamin C (ascorbic acid) were used in the experiments with chickens administered orally 100 mcg of Cd (water solution of CdCl2). The antioxidative effect of developed new natural innovative product from red beetroot (fractionated juice) was studied in additional experiment, when chickens exposed to Cd with diet (50 mg /kg). At the end of the experiments the analyses of minerals (trace elements), oxidative stress indices in blood or organs, and parameters of humoral immunity (serum lysozyme and nonspecific circulating complexes) have been undertaken. The results of analyses in Cd-exposed chickens demonstrated the prominent increase of Cd concentration in blood serum, followed by rise of oxidative processes activity as evidenced the increase of malondialdehyde (MDA) and the decrease of antioxidant enzyme glutathione peroxidase (GSH-Px) levels. Suppressive Cd effect also reflected in the change of investigated humoral immune indices. All the experimental antioxidative nutrients demonstrated preventive effect against harmful Cd action. In the first experiment the most pronounced protective action manifested Zn supplement. This effect may be due to synergistic and antagonistic interactions between Cd and Zn at the molecular level. Se and ascorbic acid supplemented in the diet also caused an improvement in the parameters indicating the harmful effects of Cd. It resulted in the decrease of Cd accumulation, balancing the indicators of oxidative processes and immunomodulating effect. The results of the additional experiment showed that administration of fractionated red beetroot juice to Cd-exposed chickens prevented prooxidative impact of this heavy metal in chickens. This effect provided due to the presence of betalain pigments with antioxidative capacities in fractionated beetroot juice.

Experimental results demonstrated the prospect of preventive role of Zn, Se, ascorbic acid and beetroot fractionated juice in the improvement of Cd-induced disorders in the body in case of environmental pollution with heavy metals.

Key words: cadmium, oxidative stress, dietary antioxidants

Primary author: Dr VASILJEVA, Svetlana (University of Latvia, Institute of Biology)

Presenter: Dr VASILJEVA, Svetlana (University of Latvia, Institute of Biology)