

THE ACUTE TOXICITY OF THE SILVER NANOPARTICLES

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Nowadays, the silver nanoparticles are used as antibacterial/ antifungal/ antiviral/ anti-inflammatory agents in biotechnology and bioengineering, textile and electronic engineering, bio-sensing, food industry, paints, sunscreen products, cosmetics, medical devices, in water processing, as well as daily consumer goods [1]. The pace of its multilateral use is in a permanent increase and its potential ecotoxicological effects are not fully evaluated, though there are various studies that report the potential adverse effects on humans and the environment [2]. The purpose of the study was the determination of the silver nanoparticles acute toxicity.

The study was performed on 20 male rats, divided 5 per each dose according to the body weight. The acute toxicity in the following doses were tested: 60, 80, 100, 200, 300 mg/kg of body weight with the animal subsequent supervision for 7-14 days. Two hours after the intraperitoneal administration of the colloidal solution in all doses, the symptoms of inhibition, softness, drowsiness, lack of appetite and lack of thirst appeared. Rats were huddled with ruffled fur. Their breath intensified. These symptoms were more pronounced in animals that received high doses of solution - 200-300 mg/kg of body weight. In the next 6-8 hours the state of the animals to which the substance was administered at the doses of 60-100 mg/kg normalized gradually. In 24 hours the intoxication symptoms disappeared and the general state stabilized. The lethality of rats at a dose of 300 mg/kg was 100% and this occurred in 2-3 day after the administration of the substance. The lethality of rats at a dose of 200 mg/kg was 50% and this occurred in 7-8 day after administration of the substance. The determination of the acute toxicity of the solution was carried out by the arithmetic Karber method outlined below:

$$LD_{50} = DL_{100} - \sum \frac{a \cdot b}{n}$$

In which:

LD₅₀ – the median lethal dose

DL₁₀₀ – the lethal dose, namely the smallest dose at which all the animals

a – the difference between two successive doses of administered substance;

b – the average number of animals in two successive batches;

n – the number of animals in a batch.

Since all the rats died only at the administration of dose of 300 mg/kg of the solution, the LD₅₀ of the substance in case of single administration for rats is 100 mg/kg.

Conclusions. The lethality of male rats at a dose of 300 mg/kg was 100% and this occurred in 2-5 day after administration of the drug substance. The median lethal dose (LD₅₀) of the substance in single intake for rats is 100 mg/kg. Therefore, it has been found that the colloidal solution of nanoparticles of silver refers to the group of substances less toxic (the LD₅₀-50-500 mg/kg).

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