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Effect of gold and silver nanoparticles on the enterocytes cell death in mice

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The gastrointestinal epithelial cell-renewal is under the strict control of cell-cell and cell-extracellular matrix interactions. Anoikis is a programmed cell death induced upon cell detachment from extracellular matrix, behaving as a critical mechanism in preventing growth and attachment to an inappropriate matrix. Initiation and execution of anoikis can be caused by different pathways, which finally converge in the activation of caspases and DNA fragmentation. Thus, anoikis is a physiologically significant process for development and intestinal epithelium homeostasis. Gold and silver nanoparticles in a polymer matrix attract attention because they can become new preventive and therapeutic agents in the treatment of various immune and systemic disorders. **Aim.** To assess the effect of five times treatment with gold and silver nanoparticles on the enterocytes cell death of the iliac section of the small intestine in mice. **Methods.** The male mice of the Alba line (20–25 g) were treated with gold and silver nanoparticles intravenously at a dose of 10 mg/kg (0,3 ml into the tail vein) once a day 5 times. The nanoparticles were synthesized as described earlier [1]. The characteristics of nanoparticles: gold nanoparticles (AuNPs) were 4–11 nm and 16–20 nm in size, spherical in polymer composition; silver nanoparticles (AgNPs) were 2–5 nm and 10–15 nm in size, spherical in polymer composition. The enterocytes were isolated according to the method reported previously [2]. Cell viability was studied using the method of intravital double staining with fluorescent nucleic acid dyes Hoechst 33342 and propidium iodide. **Results.** Our experiments

demonstrated, that under the conditions of AuNPs treatment, the number of living cells decreases by 1,16 times, the number of cells with signs of anoikis increases by 1,44 times, and the number of cells with signs of necrosis increases by 2,60 times compared to the corresponding values in the control ($p < 0.01$). It was also found that under conditions of treatment with AgNPs, the number of living cells decreased by 1,54 times, the number of cells with signs of anoikis increased by 2,05 times, and the number of cells with signs of necrosis increased by 7,36 times compared to the corresponding values in the control ($p < 0.01$). **Conclusions.** It was found, that the treatment with both gold and silver nanoparticles results in increase of death of enterocytes of the ileum of the small intestine in mice. Therefore, further research is needed to clarify the dose, frequency and method of treatment with such nano-systems.

Keywords: enterocytes, cell death, anoikis, gold and silver nanoparticles.

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