APPLICATION OF GYBRID NANOPARTICLES FE3O4-AU IN THE DIAGNOSIS OF CROHN'S DISEASE

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Crohn's disease is a recurrent inflammatory disease of the gastrointestinal tract, in which the intercellular distance in the epithelial layer of the terminal fragment of the small and large intestine increases [1]. Various techniques are known to diagnose the Crohn's disease, such as magnetic resonance imaging, computer tomography, confocal endoscopy, ultrasound, positron emission tomography, and biomarkers. [2]. In this work we propose the method of Crohn's disease diagnosis based on using ferromagnetic Fe3O4-Au nanoparticles.

In our experiment, we used wild-type mice. The group of laboratory animals was divided into the control group of mice and the group of mice with intestinal diseases imitating the symptoms of the Crohn's disease. The symptoms were induced using Sigma Aldrich's oral sodium dextran sulfate solution. Mice were separated into subgroups depending on the Fe3O4 diameters (*d*=5 nm, 15 nm, and 25 nm) of the introduced nanoparticles. The aim was to determine a possible penetration of nanoparticles into the intercellular distance in the intestinal wall. The goal of this work was to determine the metabolic elimination time of hybrid Fe3O4-Au nanoparticles in feces, blood, and liver samples. Mice of both types received a solution of Fe3O4-Au nanoparticles at a concentration of 200 μg/ml through the esophagus.

Magnetic properties of nanoparticles were studied with the vibration sample magnetometry (VSM). Optical properties of nanoparticles were investigated by the transmission coefficient spectrometry and demonstrated an absorption peak in the wavelength region of 750-850 nm. Magnetic properties of dehydrated liver, blood and feces samples were also studied by the VSM. The feces samples of mice which did not receive a dose of nanoparticles show diamagnetic behavior typical for biological tissues. For the group of control mice, the highest magnetic moment of nanoparticles with the diameter of5 nm in the feces was detected after 8 hours of their injection. For nanoparticles with the diameter of 15 nm - after 24 hours of their injection. For the samples with of 25 nm, the highest magnetic moment was also observed after 24 hours. Nanoparticles were also found in the feces of sick mice. Preliminary results indicate penetration of nanoparticles into the intercellular space of the intestinal wall. No particle signal was detected for either the group of healthy mice or the group of sick mice in the liver samples. Preliminer results show detection of the particle signal in a blood of sick mice.

[1] Baumgart D. C., Sandborn W. J. Crohn's disease //The Lancet. – 2012. – Т. 380. – №. 9853. – С. 1590-1605.

[2] Beaugerie L. et al. Predictors of Crohn’s disease //Gastroenterology. – 2006. – Т. 130. – №. 3. – С. 650-656.