Scientists at Polytechnic University have improved technology to combat cancer

A scientific team from the Institute of Biomedical Systems and Biotechnologies of SPbPU has increased the effectiveness of photothermal therapy in the treatment of malignant tumors. The scientists proposed simultaneous application of selenium and gold nanoparticles and created special capsules for their delivery to tumor cells. A scientific article on the results of the study, conducted as part of the Priority 2030 program, was published in Elsevier, a journal of colloid and interface science.

Photothermal therapy is a method of treating tumors with thermal energy. Its advantages are minimal invasion and the possibility of local impact on cancer cells.

SPbPU scientists propose to inject not a drug substance, but selenium and gold nanoparticles, which have unique individual properties. There are free electrons on the surface of gold nanoparticles sized 80-100 nanometers, which are heated during light irradiation and destroy the cell due to high temperature. Selenium nanoparticles sized 10-20 nanometers help the gold retain heat longer, which increases the effectiveness of the procedure. Where the gold fails, the anti-tumor

properties of selenium work, which causes the mitochondria to secrete reactive oxygen species in large quantities. This leads to membrane rupture and cell death. The nanoparticles are inside the capsule, so they have no negative effects on the body, but only work within the tumor cells.

We evaluated not only tumor tissue, but also healthy organs. The samples we received were given for histology to detect metastases and to determine the effectiveness of our therapy in the tumor. As a result, no adverse effects on vital organs were detected. We managed to prove the effectiveness of our method, said Anna Rogova, laboratory researcher at the Laboratory of Nano- and Microencapsulation of Biologically Active Substances at St. Petersburg Polytechnic University.

The scientists have two main tasks — to improve the targeting of the capsules and to reduce their size by 10 times in order to get a higher percentage of carrier penetration into the cell. An application for a patent has already been sent.

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