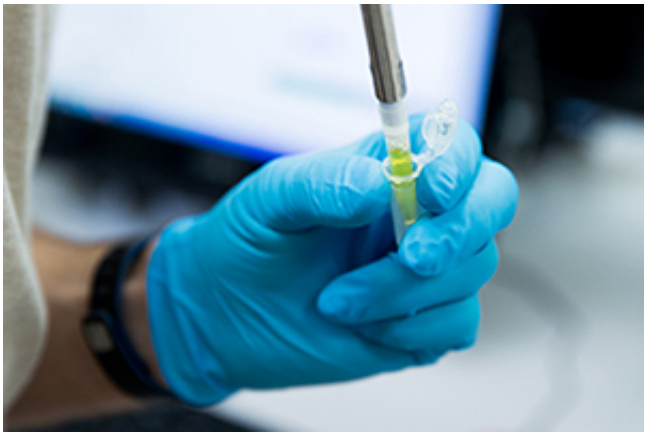
New method to diagnose cancer

January 18 2017



Credit: National Research Nuclear University

An international group of scientists has created a new approach to the diagnostics of breast cancer with the help of nanoparticles of porous silicone.

A relatively new term for modern science, nanoteranostics is a conjunction of nanoscale diagnostics and therapeutic methods. One of the prospective methods of nanoteranostics is using nanoparticles of porous silicone for the detection of damaged cells.

Silicone nanoparticles (SiNPs) have a lot of advantages in comparison with other nano-sized particles used for tumour detection and treatment. They are biocompatible, with low cytotoxicity and genotoxicity. SiNPs are biodegradable, which is essential for their complete removal from

living cells and tissues. Furthermore, they exhibit useful properties for brachi- and photodynamic therapy on silicon nanostructures.

Porous silicon nanoparticles could be used as a solute and nano-drug delivery container. These unique properties have pushed scientists to conduct extensive research of these nanoparticles and the prospects for their use in cancer theranostics.

In the laboratory, they found that complete removal of the porous silicon from the body is possible in a few weeks without any signs of toxicity. However, the speed of SiNPs degradation depends on many factors, including particle size, porosity and pH. Therefore, this period can vary from a few days to several months.

Typically, the time length of the biodegradation is determined by its concentration in the blood plasma. Alternatively, doctors can use histological methods or analysis of the silicon content in the tissues. However, these assay methods are inaccurate, slow and very labor intensive. New methods for monitoring the biodegradation of porous silicon nanoparticles are therefore required.

Scientists from MEPhI, together with colleagues, have described a new approach for the in vitro study of intracellular behavior of SiNPs, localization and biodegradation in breast cancer cells by micro-Raman spectroscopy. The research results were published in the prestigious scientific journal *Nanomedicine: Nanotechnology, Biology and Medicine*.

"Thanks to the combined efforts of specialists representing a new branch of science, nanoteranostics, we are able to optimize cancer treatment outcomes and other serious diseases," said Professor of MEPhI Laboratory of bionanofotonics Viktor Tymoshenko.

New methods pave the way for the destruction of cancer cells and

tumors with subcellular accuracy, and nanoparticles used in this process will be removed from the body after the procedure without any undesired secondary effects. "Nanoteranostics allows our patients to avoid the effects of chemotherapy and radiotherapy, whose harm is much greater than the disease itself," said the expert.

According to the scientist, nanoteranostics is the future, because it combines non-invasive diagnosis and therapy.

Provided by National Research Nuclear University