Peptide Nanoparticles Marked for in Vitro Visualization

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The work was conducted under the auspices of the Russian Foundation for Basic Research and organizations-participants of the BRICS framework program in science, technology and innovation; the grant title is "Nanosized peptide-based biomaterials for photodynamic diagnostics of tumors".

Project lead, Chief Research Associate of KFU's Bionanotechnology Lab Rawil Fakhrullin commented on the results, "The development of materials for theranostics (simultaneous early diagnosis and therapy of diseases) is one of the most urgent tasks in modern chemistry and biomedicine. A feature of such materials is the combination of at least two functions: sensory and therapeutic. Various nanoparticles capable of targeted drug delivery into cells and tissues are used as carrier particles in theranostic formulations. The most promising are organic nanoparticles. Peptide nanomaterials are now actively used as drug delivery vehicles. The interest in peptide complexes is stimulated by their biological compatibility and safety, as well as the modification of their properties using various covalently attached ligands."

Using covalent self-assembly, the team managed to synthesize new functional supramolecular systems based on dipeptides and genipin (a cross-sewing agent derived from plant material). The particles are polymer spheres 200-300 nanometers in diameter.

"The obtained peptide complexes are highly stable, have a low level of auto-fluorescence and can be used for in vitro labeling of cells, for example, to detect migration, including the integration of stem cells into the damaged area and distribution in multicellular clusters," said Fakhrullin. "The specifics of this work was the use of hyperspectral microscopy for visualization of nanoparticles in human cells and the body of Turbatrix aceti nematodes. We have established that peptide nanoparticles have the ability to efficiently scatter light and can be identified by characteristic spectral curves in visible light. This property of peptide nanoparticles makes possible their visualization without the use of fluorescent labels in living

cells and organisms, without lengthy sample preparation and specific coloring.”

He also said that studying the interactions between peptide nanomaterials and cells or organisms is crucial for understanding the biological function and the mechanism of action of peptide materials. This is very important for further clinical practice.

Read the original article on Kazan Federal University.