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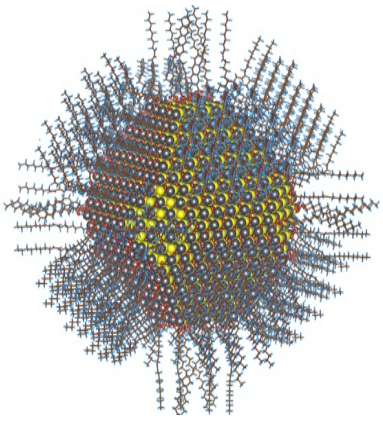
Creating Medical Nanorobots



A team of researchers from the Institute of General Physics of the Russian Academy of Sciences, the Institute of Bioorganic Chemistry of the Russian Academy of Sciences and MIPT have taken an important step towards creating medical nanorobots. The researchers have discovered a way of enabling nano- and microparticles to produce logical calculations through the use of a variety of biochemical reactions.

Information about this project has been published in the journal Nature Nanotechnology. The research is based on the idea of computing using biomolecules. This is because many scientists believe that logical operations inside a cell or in an artificial bimolecular system control biological processes and this could thus be an effective way of creating micro- and nanorobots. These robots could be used for a variety of purposes such as delivering drugs on schedule to those tissues where they might be needed.

According to Maxim Nikitin, a 2010 graduate of MIPT's Department of Biological and Medical Physics and the lead author of this study, calculations using biomolecules inside cells is a promising and rapidly developing branch of science.

Biocomputing uses natural cellular mechanisms. This particular study focuses on extracellular biocomputing and could pave the way for a number of biomedical technologies. In addition, this particular study differs from previous projects in biocomputing because this is the first time a team has proposed and experimentally confirmed a method to transform any type of nanoparticle or microparticle into autonomous biocomputing structures that have the capability to implement a functionally complete set of Boolean logic gates and can bind to target through computation. In addition, this new research uses nanoparticles (of 100nn) and microparticles (3000nm or 3 micrometres) because it is believed that the smaller the size of the particle, the greater its reactivity.

During this study, the researchers coated the nanoparticles with a special layer which disintegrated in different ways when exposed to various combinations of signals. In order to bond the nanoparticles, the researchers selected antibodies. This is a new measure as most previous studies used DNA or RNA for logical operations. By using this method, the research team was able to show that cancer cells could be specifically targeted. In other words, the additional control derived through this technique could help in the accurate destruction of cancer cells with minimal impact on healthy tissues and organs. The team obtained both nanoparticles that could bind to different types of cells as well as particles that look for target cells when both of two conditions are met or when two different molecules are absent or present.

According to Nikitin, while this study is only a small step toward the creation of efficient nanobiorobots, it is a very interesting area of science and opens us new avenues for further research.

Source: Science Daily
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