

## **THE POSSIBILITIES OF NANOTECHNOLOGY IN MEDICINE**

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Nanotechnology is the study, design, creation, synthesis, manipulation, and application of materials, devices, and systems at the nanometer scale (One meter consists of billion nanometers). In medicine, materials nanostructured surface can be used for replacement of tissues. Cells recognize such materials as their own and are attached to their surface. Thanks to its special properties of nanomaterials can be used in the future for growing artificial organs and tissues. Currently, progress has been made in the manufacture of nanomaterials that mimic natural bone. Interest and develop materials that possess opposite property: do not allow cells to attach to surfaces. The use of materials with nanoscale surface structure to control the processes of proliferation and differentiation of stem cells is a vast field for research. Membranes with nanopores can be used in the microcapsules for drug delivery and filtering fluids of the body from harmful substances and viruses. The range of possible applications of funds on the basis of carbon nanospheres C60 with orderly arranged on their surface chemical groups is extremely wide. It includes the fight against viral diseases such as influenza and HIV, cancer and neurodegenerative diseases, osteoporosis, vascular disease. Adduct fullerene with polyvinylpyrrolidone (PVP) is well soluble in water, and a cavity in its structure similar to the size of the C60 molecules. Oral is easily filled with fullerene molecules, and the result is a water-soluble adduct with high antiviral activity. In terms of fullerene its effective dose of about 5 µg/ml, significantly lower than the corresponding rate for rimantadine (25 µg/ml), traditionally used in the fight against influenza virus. Unlike rimantadine, which are the most effective in the early period of infection, the adduct C60/PVP steady action throughout the breeding cycle of the virus. Another distinguishing feature is constructed of the drug is its effectiveness against influenza a - and b-type, whereas rimantadine is valid only on the first type. Nanospheres can be used in diagnostics, for example, as a radio-opaque substance attached to the surface of certain cells and showing their location in the body. Dendrimers represent a new type of polymers having not familiar linear and branching structure. The last time the dendrimers are increasingly mentioned in the context of their nanomedical applications. This is due to a number of special properties, which have gendarmerie connection. Among them: a predictable, controlled and reproducible with great accuracy the size of the macromolecules, the macromolecules of channels and pores having a well reproducible shapes and sizes; the ability to highly selective encapsulation and immobilization of low molecular weight substances with the formation of supramolecular structures of the guest-host. Drug delivery to the desired location of the body can be used for a small (~1 µk) capsules with nanopores. Already tested such microcapsules for delivery and physiologically regulated insulin secretion in diabetes of the 1st type. Use pore size of about 6 nm helps to protect the contents of the capsule from the effects of the body's immune system. This gives you the opportunity to put in capsules insulin-producing cells of the animal that would otherwise be rejected by the body. Microscopic capsules relatively simple design can take the duplicate and expand the natural abilities of the body. An example of this concept can be respirocyte - artificial carrier of oxygen and carbon dioxide, significantly exceeding its capabilities as red blood cells and existing products. The use of micro - and nanotechnology allows to improve the detection and analysis of minute amounts of various substances. One option for this kind of device is a lab-on-chip. This record, on surfaces of which are orderly placed receptors to the desired substances, such as antibodies. The attachment of the molecule to the receptor is detected by electric or by fluorescence. One of the plates can be placed sensors for many thousands of substances. Such a device capable of detecting literally individual molecules can be used to determine the sequence of DNA bases or amino acids (for the purposes of identification, identification of genetic or cancer), detection of infectious agents, toxic substances. A device the size of a few millimeters can be placed on the skin surface (for analysis of substances excreted through sweat) or inside the body (in the oral cavity, gastrointestinal tract, under the skin or into the muscle). Moreover, it will be able to report the status of the internal environment of the body, to indicate any suspicious changes. Prospects of development of nanotechnologies great. It is argued that in the near future, with the help of them, you will not only overcome any illness, but also to prevent its occurrence.