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Application of special nanomaterials for substituting bone tissue defects

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Opinion

Extensive research of biomaterials at nanoscale has led to development of novel medical technologies including prosthetic devices and new surgical material and methods. In many cases, however, biomechanical properties and health impacts of nanomaterials are poorly understood. The FDA (U.S. Food and Drug Administration) has even established a separate group within the Agency to develop better knowledge of interactions of nanomaterials with biological systems, and to assess the adequacy of testing approaches for evaluating safety, effectiveness, and quality of products containing nanomaterials. Here we present three key innovations used in treatment of severe bone injuries among veterans and athletes: (i) Prof. Ilizarov's apparatus, (ii) 'Perftorun', known as 'blue blood' therapy discovered by Prof. Beloyartsev in Russia, (iii) 'Litar', an artificial bone technology invented by Prof. Litvinov - Krasnov that is used to replace bones defects. Prof. Petrov, a coauthor of this paper, has extensive experience in implementation of novel technologies for health protection and safety including the use of the above mentioned technologies.[1]

The main thematic results are presented in details in our last articles with X-ray patterns and different microphotographs.[2] Further we present our analysis of key challenges that hinder commercialization of new biomedical technologies and limit the use of such technologies in human patients. By way of example, we will illustrate how suboptimal regulatory approval process for new biomedical devices can substantially increase the time and cost of technology translation from bench to bedside and will discuss the importance of technology's patent protection in attracting private investment required for commercialization of biomedical technologies. Lastly, using the three above-mentioned innovations as our case studies, we will suggest approaches for improving the outcomes of biomedical technology translation. Nan world is a very amazing creation. It is not a simple significant reduction in the surrounding objects, but lives and functions according to its own laws, according to which our civilization was conceived by the World Creator. We are trying in our researches to get as close as possible to the intentions of the Creator. Including through the correct choice of medical materials and the architecture of their construction in muscles and bone tissues. We also analyzed in details and present some our new achievements, connected with advanced materials, such as bio and medical ceramics, that today used in implant dentistry in Russia. In State Medical University in Tver city, under Prof. Valery Strelnikov direction the long-term systematic researches are conducted on the use of biochemical markers of ostaclenogenesis in dental implantation and directional bone regeneration.[3,4] Details are considered in the thesis. prof. Strelnikov "Forecast of results of orthopedic treatment of patients with loss of teeth" on January 14, 2014.[4]

Currently, indications for the study of markers of bone metabolism are the following diseases: postmenopausal and senile osteoporosis; glucocorticoid-induced osteoporosis; diseases with a local increase in resorptive activity; monitoring of osteoprotegerin therapy; arthritis; oncological diseases. In[5] there are a lot of thematic information, devoted to the theme of this article, including mechanics of living systems with the wide spectra of the real examples, used in its applications in medicine, sports and ergonomics, when developing human security systems and are protected from harmful mechanical influences. Also the detail analysis of some functions of these systems is presented here. Using of the early known and our own thematic results.[5–9] we may do the following conclusions:

I. Biomedical innovators in Russia need much longer time to successfully commercialize new technologies than innovators in the US and Europe. The technology commercialization examples presented here suggest the following typical reasons that may inhibit commercialization of biomedical innovations in Russia:

II. The system of government and private support towards commercialization of biomedical and health-related innovation is not sufficiently established.

III. The Russia's largest scientific centers are weakly connected with manufacturing companies and hospital system.

IV. Highly productive innovators are rarely appointed to managerial roles or decision-making positions.

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Conflicts of interest

Authors declare that there is no conflict of interest.

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