

Editorial

Biomedical nanotechnologies

Nanotechnology, in particular Biomedical Nanotechnology/Nanomedicine, is an emerging field of the life sciences, expected to significantly change the status quo in modern medicine. It is estimated that this scientific field will have an enormous impact especially on molecular imaging, drug delivery techniques, and tissue engineering. In the foreseeable future, the advances in medical applications of different nanotechnologies are expected to provide both the personalized diagnostic tools and the patient-specific treatments.

The articles of this special issue illustrate the recent efforts in the field of Nanomedicine: Schwarz et al. outline the development of molecular imaging techniques implementing various nanoparticles for the detection and follow-up monitoring of human diseases. Magnetic nanoparticle-based drug and gene delivery systems are in the focus of the paper by Dürr et al. as a novel approach to cancer therapy. In the further articles, the multiple applications of nanotechnologies in tissue engineering are presented, with a special focus on nanofiber synthesis for bone, muscle and vascular tissue regeneration in the article by Bigdeli et al., and the possible applications of collagen/silica nanocomposites in bone tissue engineering and controlled drug and gene delivery, as reviewed by Sarker et al. Extensive efforts to implement nanomedical approaches in the diagnosis and treatment of cardiovascular diseases in order to overcome the disadvantages of the current treatment strategies are the topic of the article by Cicha et al. Finally, the paper by Youkhanna et al. underscores the need of disease-focused interdisciplinary collaborations in order to advance the therapy and diagnosis of particular disorders.

Beside all these prospects, however, the medical applications of nanotechnologies must also be discussed critically. For example, there are concerns related to nanoparticle delivery, biodistribution, cytotoxicity, and clearance which demand attention to ensure patients' safety. Compared to the free drugs, nanosystems are extremely complex constructs and the lack of their comprehensive standardized characterization is a serious obstacle to overcome before they can enter clinical practice.

Furthermore, one of the biggest challenges in Biomedical Nanotechnologies/Nanomedicine is the translation of the basic research results into the clinical trials. Scientific, clinical, legal and financial aspects must be considered to ensure a safe and rapid implementation of the new techniques in clinical practice. Moreover, the acceptance of the industry is required in order to place them on the market.

Taken together, Biomedical Nanotechnologies/Nanomedicine offers a unique platform for novel approaches to the diagnosis and therapy of human diseases. This special issue presents an overview of this exciting field from different biomedical perspectives and closes with an article emphasizing the importance of the disease-oriented rather than material-oriented nanotechnologic solutions in order to improve the patients' outcomes.

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