Many faces of nanomedicine

Vladimir Torchilin

Published online: 2 May 2013
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It is already clear that the application of nanotechnology for solution of various health- and medicine-related problems can resolve many serious issues and provide new and highly effective means and procedures to fight a broad variety of diseases and health conditions. Nanomedicine is already a huge and continuously growing area of research, investment, industrial development, and clinical trials. Still, the field is relatively young and many unanswered questions remain. This is why the publication of a special issue of DDTR completely devoted to nanomedicine prospects and challenges is timely and important.

The issue as it is assembled shows many faces of contemporary nanomedicine—from materials for nanomedicine and their biological properties to the preparation of nanomedicines and their testing, and from the use of nanomedicines for HIV therapy and gene delivery to cutting edge research on making new multifunctional nanopreparations.

Preparation of novel dosage forms is the first step of nanomedicine development. Naturally, it attracts a lot of attention from investigators, which is well reflected in this issue. Shedaran and coauthors describe the fabrication of isradipine nanosuspension using the combination of microprecipitation and high-pressure homogenization, while Bramhane et al. describe the development and characterization of a supersaturated triglyceride free drug delivery of lornoxicam. One more paper, written by Chavan et al., presents the preparation and characterization of a budesonide nasal spray based on solid lipid nanoparticles.

Characterization of nanoparticulate drug delivery systems is another important area of nanomedicine, and the paper by Shen and Burgess analyzes in vitro dissolution testing

strategies for nanomedicines required to ensure the product quality and performance.

Pharmacokinetics of nanomedicines could be significantly different from that of free drugs, especially, low molecular weight drugs, and requires a special analysis. This is why the paper by Dhapte et al. dealing with in vivo pharmacokinetic studies of pyrimethamine nanosuspension is of great interest. Using this particular example, the authors show what pharmacokinetic parameters are important to estimate the bioavailability of drugs used in nanoparticulate form.

The issues of toxicity and safety of nanocarriers are addressed in the paper by Soni et al., who considers a special case of genotoxicity of lipid–polymer hybrid nanoparticles upon their intravenous administration. Despite the fact that this paper is considering a rather special case, it also brings to light a more general question regarding potential side effects of nanoparticles. These effects are now studied by the whole new area of nanomedicine, namely, nanotoxicology.

The analysis of cells and tissues in order to evaluate the distribution and delivery of various drugs by nanomedicines requires a set of novel methods allowing for tissue solubilization without affecting the biological activity of tissue constituents. The paper by Hwang et al. describes the optimization of lysis buffer reagents for solubilization and preservation of proteins from cells and tissues, which is of clear importance for the evaluation of drug disposition.

Use of nanosystems for delivery of nucleic acids is a central subject of two papers in this issue. Alex and Sharma are considering nanomedicines for gene therapy. The fact that the most active vectors for gene delivery, viral vectors, do not provide sufficient safety made researchers to look for non-viral vectors, and various nanopreparations are tested for this purpose, especially taking into account the possibility of including various functionalities into such

V. Torchilin (✉)
Center for Pharmaceutical Biotechnology and Nanomedicine,
Northeastern University, Boston, MA 02115, USA
e-mail: v.torchilin@neu.edu

preparations. Pranatharthiharan and coauthors concentrate their attention on inorganic nanovectors for the delivery of nucleic acids, a particular class of therapeutic nanocarriers attracting an increasing attention over last few years.

The specific case of using nanopreparations for HIV therapy is addressed in the paper by Chopra et al., who are reviewing the use of liposomes as nanocarriers for such therapy. Taking into account a well-developed technology of liposome preparation on an industrial scale, the use of liposome-based nanomedicine in HIV treatment is of clear interest and importance.

The paper by Agrawal and coauthors aims to analyze the trends in the development of multifunctional nanomedicines causing a continuously growing interest in scientific community. Although, many developments in this area are still at their early stages, the huge potential of the approach is already quite evident, and addressing the current status and future directions in the development such preparation seems to be timely and well suited for this issue.

No doubts that this special issue of DDTR will attract attention of broad readership from many areas expressing interest in further development of exciting area of nanomedicine.