

## Book reviews

**Ram I. Mahato (Ed.), Biomaterials for Delivery and Targeting of Proteins and Nucleic Acids (2005, CRC Press, Boca Raton, FL, USA) 669 pp, \$ 189.95, ISBN 0-8493-2334-7**

Recent advances in molecular biology and biotechnology have stimulated the development of protein and nucleic acid-based therapeutics. The clinical utilization of these sensitive and high molecular weight drug candidates is hampered by the fact that carrier systems or vectors are necessary to deliver these compounds to the desired site of action. Such delivery systems often rely on novel biomaterials facilitating delivery into specific cells or tissues, a strategy which has been designated as “drug targeting” by Paul Ehrlich almost a century ago.

The multi-authored book edited by R.I. Mahato intends to provide a bridge between different disciplines involved in drug delivery systems for proteins and nucleic acids, most prominently materials sciences and basic biology. Aspects such as design of polymers, biocompatibility, drug delivery, biological barriers and intra-cellular sorting are discussed in 22 chapters written by some of the leading experts in the field of drug delivery. Both introduction and latest developments are highlighted, providing “a valuable reference for both the novice student and the practicing scientist” as the publishers describe in the blurb.

Basic concepts of polymer science in biomaterials are described in the first four chapters, starting with the description of biomaterials and their characterization (*Nan, Gander*), discussion of polymerization mechanisms (*Pawar, Domb*), structure and properties of copolymers (*K. Park et al.*), as well as properties of polymer solutions, micelles and hydrogels (*Ooya, K. Park*). There is some overlap between the respective chapters but they offer a good introduction to polymer science and its application to drug delivery.

The following chapters deal with pegylation and cross-linking of proteins (*Hinds*) and injectable colloidal drug carriers (*Passirani, Benoit*). Especially strategies to affect the distribution of protein conjugates and colloidal carriers by conjugation with PEG are discussed in great detail, including consequences such as complement activation. Then biology takes over and biological membranes and barriers are presented (*Omid, Gumbleton*), followed by biodistribution of polyplexes (*Fischer*), and the subcellular fate of colloidal carriers (*Oupicky*). These contributions are very informative and offer detailed insight into the biological fate of polymeric carriers. One should add a note of caution, however, that the

presentation of information is more “targeted” to the expert scientist than to the novice in the field of drug delivery.

In the remaining chapters, more recent advances are discussed such as stability of proteins and nucleic acids (*Lu*), formulation aspects (*Frokjaer et al.*), micro- and nano-encapsulation (*Barman, Hedley*), liposomes (*Torchilin*), multi-drug resistance and colloidal carriers (*Minko*), epithelial transporters (*Tamai*), protein transduction domains (*Ricordi et al.*), therapeutic nucleic acids (*Schätzlein*), delivery of antisense oligonucleotides (*Mahato et al.*), chaperons (*Maruyama*), plasmid-based gene delivery (*Lee, S.W. Kim*) and finally design elements of polymeric gene carriers (*Choi, J.S. Park*).

The book offers an excellent overview over the challenges and opportunities associated with protein and nucleic acid delivery systems. Common problems encountered with multi-authored books are extend of overlap between chapters and omissions of important aspects. While the repetition of polymer characterization can be considered as potentially helpful, the lack of a contribution dedicated to biocompatibility and biocompatibility testing is somewhat puzzling.

In the preface to this book, the editor emphasizes the interdisciplinary nature of drug delivery and he certainly succeeded to convey this message by providing excellent examples from all areas of drug delivery. His expectation that both a novice student and an expert may find an easy-to-read access to drug delivery is overly optimistic in my opinion. The book requires profound understanding of polymer science, biology and drug delivery to enjoy the pearls of wisdom provided in many contributions. The novice will be frustrated by a lack of definitions and explanations, a frugal index and the lack of colour figures and schemes. For advanced graduate students, academic and industrial researchers this book provides an up-to-date overview and an excellent source of reference.

Thomas Kissel\*

Department of Pharmaceutics and Biopharmacy,  
Philipps-University Marburg, Ketzlerbach 63, D-35032  
Marburg, Germany  
E-mail address: [kissel@staff.uni-marburg.de](mailto:kissel@staff.uni-marburg.de)

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