

## Book reviews

### **Controlled Drug Delivery – Challenges and Strategies**

Kinam Park (Ed.), 1997, American Chemical Society Professional Reference Books, Washington; 700 pp., US\$ 145; ISBN 0-8412-3418-3

The book combines information on diversified subjects related to controlled drug delivery. Most of its 29 review-type chapters focus on parenteral delivery, a few deal with oral applications. Almost all the chapters, written by well-known authors in the field, are nicely set up, easy to read, and well structured.

After a brief historic overview, the section ‘intracellular delivery and targeting’ covers five very different chapters: (1) intracellular delivery of peptides and proteins, (2) DNA delivery vectors, (3) targetable polymeric drugs, (4) particle engineering of biodegradable colloids for site-specific drug delivery and (5) site-specific drug delivery. Intended to introduce future challenges, the chapters present specific problems in different aspects without forming a homogeneous unit. Whereas, ‘targetable polymeric drugs’ would be more appropriate for a non-existing section about modifications of the drug molecules, chapter 6 covers ‘site-specific drug delivery in the gastrointestinal tract’, albeit the rest of the book, except for chapter 13 on oral immunization using microparticles, covers parenteral delivery.

The following section on ‘self-regulated drug delivery’ is stronger and more organized in itself. These systems coupled to environmental signals either chemical or physical is given more space. Chapter 7 gives an introduction into the possibilities of achieving modulated or triggered devices. Thus, chapter 8 dealing with different chemical and physical stimuli, many of them less likely to be realized in vivo, appears unnecessary. Chapter 9 focuses on overcoming in vivo challenges for a long-term insulin device such as encapsulation. Since research on self-regulated devices has been largely confined to the academic environment this chapter demonstrates the step to a final product.

Chapters 10–14 form a well-rounded section on delivery of peptide and protein drugs structured into general formulation aspects (10), stability (11), delivery from implantable polymeric systems (12), oral immunization (13) and applications in animal health (14). Starting with a general introduction into peptide and protein formulation by S. Nail, the

section further develops into a competent and condensed summary on stability. In chapter 12 you also find an introduction into some of the polymers used and their application. Two specific aspects of controlled drug delivery for oral immunization and veterinary applications specifically of growth hormones are presented in further detail. Studying the complete section makes you wonder why both the overviews on implantable polymeric systems and the veterinary applications discuss details which are also covered by the chapter on protein stability.

In ‘tissue engineering and gene therapy’ the authors look at these expanding fields specifically from the drug delivery aspect. Chapter 15 gives an introduction into protein delivery by microencapsulated cells, presenting solutions to the first steps along the way. Chapter 16 gives a brief introduction into cells and materials for tissue replacement and chapter 17 expands these two chapters into genetically engineered cell implants. Whereas these three chapters go well with each other, ‘ribozymes as antiviral agents’ (chapter 18) stays for itself. It is more related to the intracellular delivery of chapters 1 and 2 to overcome the obstacle of RNase attack by formation of complexes with ionic polymers.

In the section on ‘new biomaterials for drug delivery’ various groups present their approaches to answer the demands for new biomaterials. The initial three chapters (19–21) cover polymers based on polyaminoacid or protein structure. Chapter 22 introduces antiviral and antitumoral activities of anionic and cationic polymers but leads away from biomaterial towards drugs. Chapter 23 presents another new set of biodegradable polymers based on elastomeric poly(phosphoester urethane)s. In the final chapter A.S. Hoffmann describes intelligent polymers which respond to physical, chemical and also biological stimuli, closely related to the section on self-regulated drug delivery. An introduction to the current status of polymers applied is strongly missed. The advanced reader can receive some information by looking into chapters 5 and 12.

The ‘modeling of controlled drug delivery’ section (chapters 25–27) splits up into two critical reviews which present mathematical solutions to describe self-regulating oscillatory drug delivery and the fundamentals of swelling-, diffusion- and chemically-controlled systems. A short presentation of a computational simulation follows.

Two short contributions conclude the book, first about the FDA regulations which researchers should be aware of. Finally, seven pages cover pharmacodynamic and pharmacokinetic considerations. Even though some aspects of controlled release would exceed the scope of the book, this fundamental subject ought to be presented on a central stage, not at the very end and on an insufficient level.

Scientifically all chapters are well founded. Being a multi-author effort, it is sometimes difficult to gather related information which is split up into several chapters without cross-references. Furthermore, you find repetition (the index is handy and helps). The editor's claim to present an overview on 'the next generation of controlled release' cannot free itself from introducing the current status as a basis, for example on pharmacokinetics and polymers. It also has to be mentioned that some of the chapters are similar to reviews published in other books, for example chapter 15 on protein delivery by microencapsulated cells is very much identical to a chapter in 'Microparticulate systems for the delivery of proteins and vaccines' edited by Cohen and Bernstein.

Overall, the book can serve as an introduction for individual industrial and academic scientists who are starting to work in the field. Covering numerous subjects, which have become extensive fields themselves, an interested or experienced reader is referred to more detailed books on microparticulate systems, drug targeting, colloidal drug carriers or protein and peptide delivery. You have to decide whether you want to update your department library with general reviews and introductions. Due to the price, US\$ 145, it cannot be recommended as a reference book for students as the editor also intended.

*Dr. Wolfgang Frieß*

Department of Pharmaceutical Technology,  
Friedrich-Alexander University of Erlangen-Nürnberg,  
Cauerstrasse 4, 91058 Erlangen, Germany

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### **Mechanisms of Transdermal Drug Delivery (Drugs and the Pharmaceutical Sciences, Vol. 83)**

Russel O. Potts, Richard H. Guy (Eds.), Marcel Dekker Inc.  
New York, 1997, ISBN 0-8247-9863-5

Turner and Nonato describe the visualization of the stratum corneum and of the transdermal permeation pathways by autoradiography, light and electron microscopy and the relatively new laser scanning confocal microscopy. Furthermore, they discuss the scanning electrochemical microscopy and the vibrating probe electrode technique as methods to follow the flux of electrochemically active substances (40 pp.). However, the reader should bear in mind that visualization of a drug in a distinct region of the skin is not identical to the identification of the respec-

tive permeation pathway. Binding of the drug to special components of the skin may obstruct a definite conclusion.

The chapter on (small angle) X-ray analysis of the stratum corneum and its lipids (44 pp.) is written by experts in this field: Bouwstra, Gooris and White. They comprehensively review the respective literature. Obviously, the stratum corneum of different species have different lamellar structures.

Naik and Guy give an excellent review on IR-spectroscopic and DSC investigations of the stratum corneum barrier function (75 pp.). ATR-FTIR provides a tool to look for non-uniform distribution of lipids as a function of stratum corneum depth and to study transport kinetics. Both methods offer insight into enhancer action and hydration phenomena.

The application of broad-line  $^2\text{H}$ -NMR for the study of the membrane structures or phases and membrane dynamics is explored by Abraham, Kitson, Bloom and Thewalt (35 pp.). To obtain an unambiguous picture of the organization of the membranes it is necessary to combine the respective results with techniques giving insight into the long range order of the stratum corneum.

Pechthold, Abraham and Potts give a short introduction to the application of fluorescence spectroscopy and Burnette and DeNuzzo to the use of impedance spectroscopy. Small-angle neutron scattering (SANS) and neutron reflectometry mainly applied on monolayers are described by Watkinson, Hadgraft, Street and Richards (p. 34).

Peck and Higuchi review the concept of the porous/polar permeation pathway (23 pp.), discussing their own studies and results from the literature. Not attempting to localize this pathway they focus on its physico-chemical aspects. The iontophoretic transport, most useful for solutes of low molecular weight, and the respective models to describe its dependencies are discussed in the last chapter (58 pp.), written by Roberts, Lai, Cross and Yoshida.

All in all, this book is a perfect guide to different biophysical techniques used to study the nature of the stratum corneum, the permeability barrier of the skin. Special emphasis is put on penetration enhancer-treated stratum corneum. However, the discussed methods are complementary and only the composite of information can yield an adequate view of the stratum corneum as a barrier and the mechanisms of transdermal drug delivery. Although, the title of the book is promising, the reader has to draw his own conclusions after studying the book. To use the rich source of information the index is unfortunately rather small (about 400 entries).

Summary: highly recommended to all researchers interested in biophysical studies of the stratum corneum.

*Prof. B.C. Lippold*

Institut für Pharmazeutische Technologie,  
40225 Düsseldorf, Germany

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