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Foreword

Therapeutic delivery methods: concise overview of emerging areas

Beom-Jin Lee

Efficacy and safety are crucial issues for drug-therapy management. In recent years, pharmaceutical research has focused on delivering pharmaceuticals that achieve rapid and effective treatment of diseases or targeting of disease sites. However, the bioavailability and therapeutic efficacy of new, and indeed all, pharmaceuticals are underestimated due to the limited availability of information on the inherent physicochemical properties of drugs, and the hurdles and biological barriers in the body when they are administered. Pharmaceutical scientists recognize these factors, such as drug properties, biopharmaceutical parameters, pharmacokinetics/pharmacodynamics, design of drug-delivery systems, and formulation strategies for maximizing bioavailability and efficacy, while minimizing side effects and potential toxicity. Over several decades, various dosage forms and delivery systems have been investigated to optimize drug therapy with better patient compliance and fewer side effects, and then marketed for disease treatment. By focusing on therapeutic-based designs of delivery systems for disease treatment, clinicians are able to use medicines and treat disease conditions more effectively and quickly for better patient outcomes. Furthermore, novel concepts of therapeutic-based technologies will be continuously emerging for many reasons, such as better clinical benefits, patient compliance and development of drug-delivery systems, as well as for economic considerations. The goal of this book is to provide a concise overview of

emerging areas in therapeutic delivery methods for readers who have preliminary backgrounds of pharmaceutical sciences, drug delivery or formulation.

The following is a short summation of the chapters appearing in the book.

Basic principles in drug delivery

Chapter 1 depicts the absorption mechanism and complexity of the gut wall. This is a key topic, since the characterization and classification of drugs according to their physicochemical (solubility) and physiological properties is becoming more and more important in the preclinical development of new drugs, and in the development of controlled-release dosage forms.

Chapter 2 provides an overview of mechanism-based pharmacokinetic/pharmacodynamic modeling techniques for drug absorption, and its potential clinical applications in formulation and drug delivery. Mechanism-based pharmacokinetic/pharmacodynamic modeling can be used to guide formulation development and drug delivery for optimal therapy.

Therapeutic oral delivery

Chapter 3 discusses emerging oral drug-delivery technologies, such as sustained release, solubilization, the gastro-retentive system, targeted delivery, chronotherapeutic-based delivery and oral protein delivery, in addition to their therapeutic usefulness in pharmaceutical sciences.

Smart polymeric drug delivery

Chapter 4 outlines emerging controlled-release systems required for the clinical uses of proteins and peptides to overcome their physicochemical properties, low bioavailability and therapeutic limitations, based on polymer–protein conjugations and polymeric nano- or micro-particles

Chapter 5 explores the most common internally responsive and stimuli-sensitive polymeric systems, based on temperature, pH and redox chemistry, to enable on-demand drug delivery or to overcome the challenges associated with current delivery methods.

Nanosystem-based drug delivery

Chapter 6 describes an emerging field of nanotechnology in drug delivery, focusing on the preparation methods of various types of multifunctional nanosystems and their potential applications in clinical therapies.

Chapter 7 outlines the mechanisms and possibility of drug targeting using smart and emerging polymeric nanocarriers across biological barriers for the clinical benefits of patients.

Chapter 8 focuses on the promising features of solid–lipid nanoparticles over other colloidal drug carriers, including their preparation, characterization, biodistribution according to the routes of administration and pharmaceutical applications.

Theranostics & immunotherapeutics in delivery

Chapter 9 describes the principles and applications of various noninvasive and imaging methods and cutting-edge techniques, such as MRI, ultrasound imaging, matrix-assisted laser desorption ionization, time-of-flight raman imaging and PET, to cover cellular internalization and trafficking pathways, multifunctional imaging architectures for diagnosis, image-guided delivery and targeted treatments, monitoring of therapies, and evaluation of the performance of drug-delivery systems.

Chapter 10 discusses issues related to the site of administration for vaccines, adjuvants and immunotherapeutic drugs, using biocompatible formulation and delivery systems with no difficulties in balancing efficacy with safety and public acceptability.

These chapters reflect the multidisciplinary nature of the emerging research into therapeutic-based drug-delivery systems. A book dealing with a truly interdisciplinary topic in therapeutic delivery methods can help not only pharmaceutical scientists to educate people in their work place, but also all the other scientists who are involved in research and development in drug formulation, dosage form design and drug delivery for therapeutic goals.

We hope that this book will provide a helpful and insightful update for those engaged in pharmaceutical research and development, as well as students of pharmaceutical sciences and therapeutic-based drug delivery and formulation.

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