

Drug Delivery Nanoparticles Formulation And Characterization Drugs And The Pharmaceutical Sciences

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*Drug Delivery
 Nanoparticles
 Formulation And
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 Sciences*

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*Application of Nanotechnology in Drug
 Delivery Elsevier*

Abstract: Among various drug delivery systems, nanoparticles have shown some unique advantages. In this dissertation, a series of lipid and polymer-based nanoparticle systems were designed and prepared for the objective of improved drug delivery efficiencies and enhanced therapeutic efficacies. The development of nanoparticle formulation for nucleic acid

drugs are described in Chapter 2, 3 and 4. In Chapter 2, a lipid-based, transferrin receptor (TfR)-targeted nanoparticle formulation containing protamine (Tf-LN) was developed to deliver antisense oligodeoxynucleotide G3139 against Bcl-2 to leukemia cells. Compared to free G3139 and non-targeted formulation (LN), Tf-LN showed increased cellular uptake and enhanced target gene downregulation. In Chapter 3, the effects of different components and composition on green fluorescence protein (GFP) gene delivery efficiency were investigated and provided useful information for further development of PEI and lipid-containing nanocrystal formulation of G3139 in Chapter 4.

Chapter 4 described the development of a novel lipid-based nanoparticle formulation containing cationic lipid, PEI2000 and calcium, designated as nanocrystal (NC), for delivery of antisense oligonucleotide G3139 to KB cells. ODN G3139 delivery by NC resulted in much higher cellular uptake and target gene downregulation in vitro. However, the downregulation was not observed in treated mice tumor, suggesting the other unknown factors in vivo may affect the antisense effect of G3139 nanocrystal. In this dissertation, we also developed nanoparticle delivery systems for chemotherapy drugs. In Chapter 5, a liposomal formulation of flavopiridol was developed to address the

issues of solubility, high plasma protein-binding and side effects. Pharmacokinetic study in mice after i.v. bolus injection showed that the liposomal flavopiridol had an increased elimination phase half-life, decreased clearance and increased area under the plasma concentration-time curve compared to the free drug. This indicates a significant and potentially beneficial change in flavopiridol PK for the liposomal formulation. In Chapter 6, a TfR-targeted liposomal formulation of bortezomib was developed. The results showed that liposomal bortezomib was less toxic to leukemia cells than the free drug. There was increased cellular uptake of drugs delivered by TfR-targeted liposomes compared to free drugs. Meanwhile, enhanced chemosensitivity of cells to doxorubicin was observed after sensitizing cells by subtoxic concentration of bortezomib. These data indicated the improved bortezomib delivery efficiency and chemo-sensitizing efficacy by TfR-targeted liposome delivery. These liposomal formulations of chemotherapy drugs are potential for the enhanced therapeutic efficacies compared to free drugs.

Nanomedicine in Drug Delivery Springer Science & Business Media

Nanotechnology has revolutionized the approach to designing and developing novel drug delivery systems. The last two decades have seen a great interest in the use of nanotechnology to offer efficient ways of delivering new and existing drugs and macromolecules. The focus of this book is the application of nanotechnology to deliver drugs and biological agents by the mucosal routes of administration i.e. nasal, pulmonary, buccal, and oral routes. It provides an overview of nanotechnology in drug delivery with a description of different types of nanoparticles, methods of preparation and characterization, and functionalization for site-specific drug delivery. The emphasis is on the use of nanoparticles in treating various cancers and infectious diseases. It broadens the use of nanoparticles by including biologics, including vaccines and immunotherapies, apart from drugs and acknowledges the concerns around the potential toxicity of nanoparticles to the host; several chapters will discuss the biodistribution of these nanoparticles when mucosal routes of administration are employed. Further, the interaction of nanoparticles with the host's immune cells is discussed. Moreover, it reviews the regulatory aspects of nanotechnology in product development, especially when delivered by the mucosal route of administration. Lastly, discusses the challenges and opportunities to

manufacture nanoparticles on an industrial scale. This book is the first of its kind to focus on the design, development and delivery of nanoparticles when administered by different mucosal routes.

Drug Delivery Aspects CRC Press

After the drug discovery and development process, designing suitable formulations to safely deliver the optimum dose, while avoiding side effects, has been a constant challenge, especially when drugs are very toxic and have poor solubility and undesirable clearance profiles. With recent advances in synthetic technologies, nanoparticles can be custom-made from a variety of advanced materials to mimic the bioenvironment and can be equipped with various targeting and imaging moieties for site-specific delivery and real-time imaging. **Drug Delivery Using Nanomaterials** covers advancements in the field of nanoparticle-based drug-delivery systems, along with all the aspects needed for a successful and marketable nanoformulation. **FEATURES** Offers a general overview of the entire process involved in the synthesis and characterization of pharmaceutical nanoparticles. Covers a broad range of synthetic materials for developing nanoformulations customized for specific disease states, target organs, and drugs. Every chapter sequentially builds, providing a progressive pathway from classical nanoparticles to the more advanced to be used as a full drug product by consumers. Provides information in a bottom-up manner in that definitions and explanations of relevant background information serve as a framework for understanding advanced concepts. This user-friendly reference is aimed at materials engineers, chemical engineers, biomedical engineers, pharmaceutical scientists, chemists, and others working on advanced drug delivery, from academia as well as industry.

Nanopharmaceuticals BoD – Books on Demand

Pharmacotherapy is often limited by the inefficient activity and severe toxicity of drug molecules. Nanotechnology offers a revolutionary and definitive approach for the efficient delivery of drug molecules to non-healthy tissues and cells. This first volume of a series of two volumes analyzes the basics in the development of drug-loaded nanopatforms, the so-called nanomedicines. Special attention is given to physicochemical engineering, pharmacokinetics, biocompatibility and biodegradability, representative nanopatforms (based on lipids, polymers, cyclodextrins, metals, carbon, silica, iron oxides, etc.), and advanced nano-

engineering strategies for passive, ligand-mediated, and/or stimuli-sensitive drug delivery and release.

Volume 2: Expectations and Realities of Multifunctional Drug Delivery Systems CRC Press

With the advent of analytical techniques and capabilities to measure particle sizes in nanometer ranges, there has been tremendous interest in the use of nanoparticles for more efficient methods of drug delivery. **Nanoparticulate Drug Delivery Systems** addresses the scientific methodologies, formulation, processing, applications, recent trends, and e Nanotechnology for Oral Drug Delivery BoD – Books on Demand

"Cardiovascular diseases are the leading cause of mortality across the globe. Of the various cardiovascular diseases, congestive heart failure is the most prevalent. Heart failure has no permanent cure, yet certain treatments and lifestyle changes can help enhance the patients' quality of life. Congestive heart failure is commonly treated by delivering drugs which lower the blood pressure and improve the heart's pumping action. However, their use has limitations such as lack of specificity, toxicity, low retention time in the body along with side effects such as hypotension, arrhythmia, nausea, vomiting etc. It is anticipated that the targeted delivery of drugs would help address and overcome these limitations. This thesis focuses on the design and development of a nanoparticle-based formulation for the targeted delivery of the drug, milrinone, for congestive heart failure treatment. The action of milrinone helps in improving the contraction ability and functioning of the failing heart. The nanoparticles were prepared from the protein, human serum albumin, which was surface functionalized to bind the angiotensin II type 1 (AT1) peptide. The peptide-tagged nanoparticles were designed to target the AT1 receptors, found to be overexpressed on the myocardium under heart failure conditions, therefore facilitating higher nanoparticle uptake and drug delivery to the heart. The nanoparticles were spherical with a particle size between 100-200 nm and negative surface charge, indicating high physical stability. The in vitro characterization studies showed that the nanoparticle formulation was target-specific, biodegradable, biocompatible and suitable for use in vivo. The in vivo pharmacokinetics and tissue distribution studies of the targeted nanoparticle formulation revealed superior drug delivery and release, with improvement in the retention time of milrinone compared

to the non-targeted drug. The treatment efficacy of this formulation was validated using a rat model of congestive heart failure, where it was found to be safe and effective in improving the cardiac function and contractility. Therefore, this targeted nanoparticle formulation delivering milrinone exhibits immense potential for use in congestive heart failure and related cardiovascular disease"--

Nanotechnology-Based Approaches for Targeting and Delivery of Drugs and Genes CRC Press

This book introduces the reader to drug delivery with specific emphasis on the use of nanoparticles. It covers properties, characterization, and preparation of different types of nanoparticles and discusses recent advances in their structural design and biomedical application, as well as the issues and challenges associated with their design and use. Some of the topics covered include the potential application of nanoparticles in biomedical fields, hazards associated with use of nanoparticles for drug delivery, size-dependent factors in drug delivery applications, different organic, inorganic and their hybrid systems used in drug delivery, etc. It also highlights use of nanoparticles in controlled and targeted drug delivery, and their application in stimuli-responsive, especially pH-responsive, drug release. Additionally, it also focuses on biomimetic nanoparticles, challenges faced in the designing of nanoparticles for drug delivery in cancer, viral and bacterial diseases. The contents of this volume will be useful to researchers and professionals working on advances in targeted drug delivery systems.

Volume 1: Expectations and Realities of Multifunctional Drug Delivery Systems CRC Press

Nanomaterials in Clinical Medicine: Case Studies in Nanomedicines focuses on the nanomaterials that can be formulated as drug delivery vehicles, such as liposomes, micelles, nanoemulsions and nanogels. Their physicochemical, morphological, thermo-dynamical and nanotoxicological properties are analyzed with respect to the design and development of drug delivery nanosystems for the encapsulation of an active pharmaceutical ingredient and its controlled release. Each chapter covers basic properties, the nanosystem (e.g., liposomes), the added value in drug delivery and targeting, and future perspectives. Case studies and examples of how nanomaterials are being used in clinical medicine, including marketed liposomal medicines and medical utility and regimens are also

included. Particular attention is given to new nanocarriers, such as elastic liposomes, lipid polymeric hybrid nanoparticles, organogel, nanofibers carbon nanomaterials, quantum dots and inorganic nanoparticles. This book is an important information source for those wanting to increase their understanding of what major nanomaterials are being used to create more effective drug delivery systems. Summarizes the major nanomaterials used in clinical medicine, explaining how their properties make them suitable for this purpose Explains how nanomaterials are used to create increasingly efficient drug delivery vehicles Includes real-life examples, demonstrating how nanomaterials are being used in medical practice

Development of Nanoparticle Systems for Therapeutic Drug Delivery CRC Press

Drug Delivery Aspects reviews additional features of drug delivery systems, along with the standard formulation development, like preclinical testing, conversion into solid dosage forms, roles of excipients and polymers used on stability and sterile processing. There is a focus on formulation engineering and related large scale (GMP) manufacturing, regulatory, and functional aspects of drug delivery systems. A detailed discussion on biologics and vaccines gives insights to readers on new developments in this direction. The series Expectations and Realities of Multifunctional Drug Delivery Systems examines the fabrication, optimization, biological aspects, regulatory and clinical success of wide range of drug delivery carriers. This series reviews multifunctionality and applications of drug delivery systems, industrial trends, regulatory challenges and in vivo success stories. Throughout the volumes discussions on diverse aspects of drug delivery carriers, such as clinical, engineering, and regulatory, facilitate insight sharing across expertise area and form a link for collaborations between industry-academic scientists and clinical researchers. Expectations and Realities of Multifunctional Drug Delivery Systems connects formulation scientists, regulatory experts, engineers, clinical experts and regulatory stake holders. The wide scope of the book ensures it as a valuable reference resource for researchers in both academia and the pharmaceutical industry who want to learn more about drug delivery systems. Encompasses engineering and large-scale manufacturing of nanocarriers Considers preclinical, regulatory and ethical guidelines on nanoparticles Contains in-depth discussions on delivery of biologics,

vaccines and sterilisation Industrial view on solid dispersions, milling techniques

Nanomaterials for Drug Delivery and Therapy Academic Press

There is a clear need for innovative technologies to improve the delivery of therapeutic and diagnostic agents in the body. Recent breakthroughs in nanomedicine are now making it possible to deliver drugs and therapeutic proteins to local areas of disease or tumors to maximize clinical benefit while limiting unwanted side effects. Nanomedicine in Drug Delivery gives an overview of aspects of nanomedicine to help readers design and develop novel drug delivery systems and devices that build on nanoscale technologies. Featuring contributions by leading researchers from around the world, the book examines: The integration of nanoparticles with therapeutic agents The synthesis and characterization of nanoencapsulated drug particles Targeted pulmonary nanomedicine delivery using inhalation aerosols The use of biological systems—bacteria, cells, viruses, and virus-like particles—as carriers to deliver nanoparticles Nanodermatology and the role of nanotechnology in the diagnosis and treatment of skin disease Nanoparticles for the delivery of small molecules, such as for gene and vaccine delivery The use of nanotechnologies to modulate and modify wound healing Nanoparticles in bioimaging, including magnetic resonance, computed tomography, and molecular imaging Nanoparticles to enhance the efficiency of existing anticancer drugs The development of nanoparticle formulations Nanoparticles for ocular drug delivery Nanoparticle toxicity, including routes of exposure and mechanisms of toxicity The use of animal and cellular models in nanoparticles safety studies With its practical focus on the design, synthesis, and application of nanomedicine in drug delivery, this book is a valuable resource for clinical researchers and anyone working to tackle the challenges of delivering drugs in a more targeted and efficient manner. It explores a wide range of promising approaches for the diagnosis and treatment of diseases using cutting-edge nanotechnologies.

From Concept to Applications Springer

This contribution book collects reviews and original articles from eminent experts working in the interdisciplinary arena of novel drug delivery systems and their uses. From their direct and recent experience, the readers can achieve a wide vision on the new and ongoing potentialities of different smart drug

delivery systems. Since the advent of analytical techniques and capabilities to measure particle sizes in nanometer ranges, there has been tremendous interest in the use of nanoparticles for more efficient methods of drug delivery. On the other hand, this reference discusses advances in the design, optimization, and adaptation of gene delivery systems for the treatment of cancer, cardiovascular, diabetic, genetic, and infectious diseases, and considers assessment and review procedures involved in the development of gene-based pharmaceuticals.

Drug Delivery with Targeted Nanoparticles
Springer

Focusing on nanoparticulate nanocarriers and recent advances in the field of drug delivery, the volume begins with chapters that provide an informative introduction to polymeric nanoparticles—their general physicochemical features and characteristics, their applications in drug delivery systems, and the challenges involved. Specific applications are discussed, with attention paid to treatment of particular diseases and disorders and the targeting of specific organs. Part 2 looks at more specific applications and techniques of nanoparticulate nanocarriers for drug delivery, such as the use of magnetic nanoparticles, gold nanoparticles in therapeutics, and superparamagnetic iron oxide nanoparticles (SPIONs) for the treatment of cancer. Part 3 discusses lipid-based nanoparticulates for various applications, including skin care. The last section of the book explores some of the newer nanoarchitectures, including dendrimers in gene delivery and carbon nanotubes for drug delivery. Together, the insightful research presented here provides valuable information for those involved in this area, including scientists and researchers and faculty and upper-level students, as well as for industry professionals.

In Vitro and In Vivo Evaluation Methods
William Andrew

Basic Fundamentals of Drug Delivery covers the fundamental principles, advanced methodologies and technologies employed by pharmaceutical scientists, researchers and pharmaceutical industries to transform a drug candidate or new chemical entity into a final administrable drug delivery system. The book also covers various approaches involved in optimizing the therapeutic performance of a biomolecule while designing its appropriate advanced formulation. Provides up-to-date information on translating the physicochemical properties

of drugs into drug delivery systems Explores how drugs are administered via various routes, such as orally, parenterally, transdermally or through inhalation Contains extensive references and further reading for course and self-study

Nanotechnology and Drug Delivery, Volume One Elsevier

Lipid Nanocarriers for Drug Targeting presents recent advances in the area of lipid nanocarriers. The book focuses on cationic lipid nanocarriers, solid lipid nanocarriers, liposomes, thermosensitive vesicles, and cubosomes, with applications in phototherapy, cosmetic and others. As the first book related to lipid nanocarriers and their direct implication in pharmaceutical nanotechnology, this important reference resource is ideal for biomaterials scientists and those working in the medical and pharmaceutical industries that want to learn more on how lipids can be used to create more effective drug delivery systems. Highlights the most commonly used types of lipid nanocarriers and explains how they are applied in pharmacy Shows how lipid nanocarriers are used in different types of treatment, including oral medicine, skin repair and cancer treatment Assesses the pros and cons of using different lipid nanocarriers for different therapies

Academic Press

Silk proteins show excellent biocompatibility, controllable biodegradability and non-immunogenicity, and as such are studied extensively worldwide for biomedical applications. In particular, there is increasing interest in their use for drug delivery systems. This focussed book on silk proteins for drug delivery systems, delves into a key emerging area to outline the concepts and define the field. Covering spider silk and silk worm cocoons, the editors elucidate the extraction, structure and properties of silk sericin and silk fibroin. Showing how these proteins are employed in micro and nano drug delivery systems, their use in pre-clinical and clinical trials, and closing with chapter on sustainability- driven innovation in the pharma industry, this book is ideal for graduates and researchers in biomaterials science and pharmaceutical science.

Surface Modification of Nanoparticles for Targeted Drug Delivery Academic Press

Characterization and Biology of Nanomaterials for Drug Delivery: Nanoscience and Nanotechnology in Drug Delivery describes the techniques successfully employed for the application of nanocarriers loaded with the antioxidant enzyme, catalase, and thus

targeted to endothelial cells. Methods of nanocarrier synthesis, loading within various systems, and the characterization of nanocarriers for targeting activities are covered, as are their advantages, disadvantages and applications. Reflecting the interdisciplinary nature of the subject matter, this book includes contributions by experts from different fields, all with various backgrounds and expertise. It will appeal to researchers and students from different disciplines, such as materials science, technology and various biomedical fields. Enables readers from different fields to access recent research and protocols across traditional boundaries Focuses on protocols and techniques, as well as the knowledge base of the field, thus enabling those in R&D to learn about, and successfully deploy, cutting-edge techniques Explores both current and emerging classes of nanomaterials, along with their fundamentals and applications *Mucosal Delivery of Drugs and Biologics in Nanoparticles* BoD - Books on Demand Many newly proposed drugs suffer from poor water solubility, thus presenting major hurdles in the design of suitable formulations for administration to patients. Consequently, the development of techniques and materials to overcome these hurdles is a major area of research in pharmaceutical companies. Drug Delivery Strategies for Poorly Water-Soluble Drugs provides a comprehensive overview of currently used formulation strategies for hydrophobic drugs, including liposome formulation, cyclodextrin drug carriers, solid lipid nanoparticles, polymeric drug encapsulation delivery systems, self-microemulsifying drug delivery systems, nanocrystals, hydrosol colloidal dispersions, microemulsions, solid dispersions, cosolvent use, dendrimers, polymer- drug conjugates, polymeric micelles, and mesoporous silicananoparticles. For each approach the book discusses the main instrumentation, operation principles and theoretical background, with a focus on critical formulation features and clinical studies. Finally, the book includes some recent and novel applications, scale-up considerations and regulatory issues. Drug Delivery Strategies for Poorly Water-Soluble Drugs is an essential multidisciplinary guide to this important area of drug formulation for researchers in industry and academia working in drug delivery, polymers and biomaterials.

Drug Delivery Using Nanomaterials
Elsevier

Intelligent Nanomaterials for Drug Delivery Applications discusses intelligent

nanomaterials with a particular focus on commercial and premarket tools. The book looks at the applications of intelligent nanomaterials within the field of medicine and discusses their future role. This includes the use of intelligent nanomaterials for drugs used in cardiovascular and cancer treatments and examines the promising market of nanoparticles for biomedical and biosensing applications. This resource will be of great interest to scientists and researchers involved in multiple disciplines, including micro- and nano-engineering, bionanotechnology, biomedical engineering, and nanomedicine, as well as pharmaceutical and biomedical industries. Focuses on applications of intelligent nanomaterials within the field of medicine and discusses their role in the future Discusses intelligent nanomaterials, with a particular focus on commercial and premarket tools Examines the promising market of nanoparticles for biomedical and biosensing applications

Lipid Nanocarriers for Drug Targeting
Academic Press

What are lipid nanoparticles? How are they structured? How are they formed? What techniques are best to characterize them? How great is their potential as drug delivery systems? These questions and more are answered in this comprehensive and highly readable work on lipid nanoparticles. This work sets out to provide the reader with a clear and understandable understanding of the current practices in formulation, characterization and drug delivery of lipid nanoparticles. A comprehensive description of the current understanding of synthesis, characterization, stability optimization and drug incorporation of solid lipid nanoparticles is provided. Nanoparticles have attracted great interest over the past few decades with almost exponential growth in their research and application. Their small

particle size and subsequent high surface area make them ideal in many uses, but particularly as drug carrier systems. Nanoparticles made from lipids are especially attractive because of their enhanced biocompatibility imparted by the lipid. The work provides a detailed description of the types of lipid nanoparticles available (e.g. SLN, NLC, LDC, PLN) and how they range from imperfect crystalline to amorphous in structure. Current thoughts on where drugs are situated (e.g. in the core, or at the interface) and how this can be manipulated are discussed. The many techniques for production, including the author's own variant of microwave heating, are fully discussed. Techniques for measuring arguably the most important characteristics of particle size and polydispersity are discussed, along with techniques to measure crystallinity, shape and drug capacity. Finally, a full chapter on techniques for measuring stability, both in the absence and presence of drugs, is discussed, along with suggestions on how to optimize that stability. This work appeals to students of colloid science, practitioners of research into drug delivery and academics alike.

From Concept to Applications Springer Nature

Delivery of Drugs: Expectations and Realities of Multifunctional Drug Delivery Systems, Volume Two examines the formulation of micro-nanosized drug delivery systems and recaps opportunities for using physical methods to improve efficacy via mechano-, electroporation. The book highlights innovative delivery methods like PIPAC, including discussions on the regulatory aspects of complex injectables. Written by a diverse range of international researchers from industry and academia, the chapters examine specific aspects of characterization and manufacturing for pharmaceutical applications as well as regulatory and policy aspects. This book connects

formulation scientists, regulatory experts, engineers, clinical experts and regulatory stakeholders. This level of discussion makes it a valuable reference resource for researchers in both academia and the pharmaceutical industry who want to learn more about the status of drug delivery systems. Delivery of Drugs examines the fabrication, optimization, scale-up, biological aspects, regulatory and clinical success of various micro and nano drug delivery systems. The volume covers site and organ specific targeting approaches, technologies used in preparation of micro-nanoparticles, challenges of complex type of drug delivery forms and role of physical methods in achieving targeted drug effect. Written by a diverse range of international researchers the chapters examine the specific aspects of characterization and manufacturing of drug delivery system for pharmaceutical application and its regulatory aspects. The series Expectations and Realities of Multifunctional Drug Delivery Systems examines the fabrication, optimization, biological aspects, regulatory and clinical success of wide range of drug delivery carriers. This series reviews multifunctionality and applications of drug delivery systems, industrial trends, regulatory challenges and in vivo success stories. Throughout the volumes discussions on diverse aspects of drug delivery carriers, such as clinical, engineering, and regulatory, facilitate insight sharing across expertise area and form a link for collaborations between industry-academic scientists and clinical researchers. Expectations and Realities of Multifunctional Drug Delivery Systems connects formulation scientists, regulatory experts, engineers, clinical experts and regulatory stake holders. The wide scope of the book ensures it as a valuable reference resource for researchers in both academia and the pharmaceutical industry who want to learn more about drug delivery systems.