

Preface

What really knocks me out is a book that, when you're all done reading it, you wish the author that wrote it was a terrific friend of yours and you could call him up on the phone whenever you felt like it. That doesn't happen much, though. – J.D. Salinger

This book i.e., Novel approaches for drug delivery systems was motivated by the desire we and others have had to further the evolution of the core course in Pharmaceutical Science. This book has novel aim for novel drug delivery system and covers maximum part of novel drug delivery systems to provide scattered information in gathered form under one roof. This book offers an overview of the therapeutic application of drug delivery strategies, liposomes, niosomes, pharmacosomes, transfersomes and pro-transfersomes, red blood cells (resealed erythrocytes), liquid crystals, dendrimers, polymeric system, nanotechnology, nanomedicine, biosimilars with special emphasis on their pharmaceutical applications in different disease which really helps authors and readers.

The content of these chapters is written by highly skilled, experienced and renowned scientists, researchers across all over the world with updated knowledge to provide drug delivery information to readers, researchers, academicians, scientists and industrialists around the globe.

CHAPTER COMPOSITION

This book has 15 chapters and divided into 10 sections. Section 1 comprises of Chapter 1, “An Overview of Therapeutic Applications,” structured by Sandeep Waghulde and Pravin Naik from India, provides an overview of therapeutic applications with great emphasis on drug delivery. The authors have also revealed that the drugs can improve the strength of pharmacological action and reduce the ill effect all over the body, for they release in the target organs. There has been an attempt to compile information concerned to variety of drug carriers encompassing target specific drug delivery systems. The adequate drug carriers are described in detail availing their pros and cons. The chapter also entails regarding safety profile of different polymers/ materials used. The chapter has provided a general description of several drug carriers with their possible applications in therapeutics.

Section 2 has two chapters, Chapter 2, “Liposomes: Properties and Therapeutic Applications,” written by Ljiljana Djekic from Serbia, describes formulation methodologies, lipids employed in preparation and evaluation of liposomal vesicular drug delivery system. Further, the authors have strived to put together facts pertaining to progress in optimizing physicochemical features with emphasis on safety of this drug carrier. The vesicular carrier might be a viable substitute for traditional drug delivery system

which sometimes lacks the specificity to deliver the drug at target site. Moreover, the lipids employed in preparations also enhance their acceptability by biological system as these are physiological lipids in chemical composition which is akin to natural ones. Chapter 3, “Liposomes: Concept and Therapeutic Applications,” written by Mangal Shailesh Nagarsenker and Megha Sunil Marwah from India provides historical developments of liposomes concept and its therapeutic applications in drug delivery and have offered an overview of primary therapeutic and diagnostic applications and a brief insight into the in vivo behavior of liposomes. The authors have taken the scale up potential of liposomes during manufacturing into consideration. The feasibility assessment of scale may help in commercialization in effective fashion. Moreover, it may lower the cost of such products.

Section 3 contains Chapter 4, “Non-Ionic Surfactant Vesicles (Niosomes) as New Drug Delivery Systems,” well written by Abbas Pardakhty from Iran about the non-ionic surfactant vesicles (niosomes) as new drug delivery systems with its various method of preparation and its application in the field of pharmaceutical science. This chapter presents a detailed discussion about niosomes forming components, methods of preparation and routes of administration. Many examples for drug delivery potential of niosomes are also available in this review. This drug carrier system could administer via injection, oral, pulmonary, vaginal, rectal, ophthalmic, nasal or transdermal routes with penetration enhancing potential. The topical drug delivery mediated by niosomes could bypass the side/adverse effects linked with oral drug application in case of several drugs.

Section 4 has Chapter 5, “Vesicular Drug Delivery Systems: A Special Emphasis on Pharmacosomes,” structured by Preeti Khulbe from India gives significance of pharmacosomes in the field of drug delivery. This special carrier covalently binds with drug molecules thus, ensuring maximum drug encapsulation. This chapter includes the basic introduction, applications, methods of preparation, characterization, advantages, some research experiences and future prospects of pharmacosomes. These vesicular carriers are similar to others except for covalent binding with the drug molecules. The pharmacosomes are promising candidates for organ specific drug targeting.

Section 5 has only one chapter on transfersomes and protransfersome, Chapter 6, “Transfersomes and Protransfersomes: Ultradeformable Vesicular System,” written by Bhusan Rajendra Rane and Nayan Ashok Gujarathi from India shared that vesicular system brings several possible advantages over conventional route of drug delivery system via this chapter. The deformability possessed by these vesicles is the highlight of this chapter which has conferred them the ability to traverse through gaps/pores present on bio-membranes. By virtue of this these vesicles can act as a carrier for wide variety of drugs.

In Section 6, Chapter 7, “Biosimilars: Concept and Regulation,” written by Anil K. Sharma, Raj K. Keservani, and Rajesh K. Kesharwani, from India, describes biosimilar overview and introduces the fundamentals of biologics and to explain how they are different and what these differences mean for pharmacists. This chapter is an attempt to make its readers familiar about alternatives of synthetic drugs prevalent in the market in the form of biologicals as future drugs. The chapter has given a list of such products which are marketed recently. The global perspectives of such products are discussed with appropriate examples. Further, the regulations prevailing for these products in different countries have been described.

Section 7 has two chapters. Chapter 8, “Liquid Crystalline System: A Novel Approach in Drug Delivery,” by Nayan Ashok Gujarathi, Bhushan Rajendra Rane, and Raj K. Keservani from India, has described applications of liquid crystal technology in several areas of pharmacy, science and engineering, as well as device technology. The chapter dealt with detailed discussion about liquid crystals, their morphology, preparation and evaluation of formulations in particular drug delivery science. Besides these

other applications are also covered in present chapter. As a novel type of drug delivery system, liquid crystals are explored and examined, definitely achieve mounting significance in industrial and scientific purposes. The advent of liquid crystals has opened many avenues for variety of applications. These structures are able to carry both hydrophilic and hydrophobic molecules for therapeutic purposes. This feature has made them carriers of choice for topical drug delivery. Chapter 9, “Liquid Crystal Systems in Drug Delivery,” written by Kamal Kumar Chaudhary, Pooja Kannoja and Nidhi Mishra from India provides in-depth information of pharmaceutical crystal technology. It deals with cubic and hexagonal liquid crystal and their applications in drug delivery system exclusively. The formulation and evaluation relevant to pharmacy has been covered exhaustively in present chapter. The applied aspect has been reinforced by adequate examples wherever necessary.

Section 8 dealt with Chapter 10, “Multifunctional Dendrimers for Drug Nanocarriers,” by Tingbin Zhang, Chunqiu Zhang, Jinfeng Xing, Jing Xu, Chan Li, Paul C Wang, Ling Peng and Xing-jie Liang from China, describing dendrimers as drug nanocarriers and provide the ideas for designing the dendrimers based nanocarriers for controllable drug delivery and let more people know the development of dendrimers for drug delivery in recent years. The chapter has discussed genesis of dendrimers, synthesis schemes for different generations along with their testing for drug delivery ability. The enhanced permeation effect (EPR) exhibited by these nanocarriers in cancers is one of the most significant utility in the pharmaceutical field. The inherent structure of dendrimers provides space for hydrophobic as well as hydrophilic molecules thereby facilitating their delivery in single carrier. The sizes of magnitudes of nanometric range have enabled the entry of such carriers to interiors of the body artifacts. The surface of dendrimers may be designed to impart them acceptable biopharmaceutical characteristics.

Section 9 has two chapters. Chapter 11, “Smart Hydrogels for Pharmaceutical Applications,” is by Snezana S Ilic-Stojanovic, Ljubisa B Nikolic, Vesna D Nikolic and Slobodan D. Petrovic from Serbia, well written and describes smart hydrogels with different physical and chemical properties, chemical structure and technology of obtaining, show great potential for application in the pharmaceutical industry. The application of smart hydrogels is very promising and at the beginning of the development and exploitation. The hydrogels being hydrophilic can absorb up to 50% of their original weight. Further, stimulus responsive hydrogels have added new dimensions to the attributes of hydrogels conferring them nomenclature of smart hydrogels. The stimulus may be pH, temperature etc. The drug effect is a function of behavior exhibited by hydrogels under the influence of certain stimuli. Based on this the drug delivery may be optimized. Chapter 12, “Rational Design of Polymeric Micelles for Cancer Therapy,” is written by Yixian Huang, Jingjing Sun, Song Li from USA states that clinical application of anticancer drugs is limited by problems such as low water solubility, lack of tissue-specificity and toxicity. Formulation development represents an important approach to these problems. This book chapter provides a brief review of recent advancements in developing environmentally responsive micellar systems for controlled delivery of chemotherapeutic agents to tumor tissues. The emphasis is placed on the discussion of several dual functional nanomicellar systems that were recently developed in our laboratory as well as a new strategy of improving micellar formulations via incorporation of an interfacial drug-interactive motif(s). This is a known fact that micelles are responsible for improvement in solubility of drug molecules over their critical content. The retention of actives in tumor cells is of prime concern while developing a robust drug delivery strategy. The micelles because of the zwitterion nature may act to facilitate increased residence in tumor cells.

Section 10 has three chapters. Chapter 13, “Pharmaceutical and Medical Applications of Nanofibers,” by Khosro Adibkia, Shadi Yaqoubi and Solmaz Maleki Dizaj from Iran deals with several investigations

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on therapeutic nanofibers and their processing methods are also summarized. Nanofibers as a main group of nanoparticles have a vast range of applicability for therapeutic purposes, due to their outstanding attributes such as very large surface to volume ratio and high porosity. These types of nanoparticles are more known as tissue scaffolds and drug delivery carriers. Nanofiber-based carriers are able to control the release pattern of drugs. The utility of such fibers is discussed with suitable instances relevant to drug delivery. Chapter 14, “Application of Nanoparticles as a Drug Delivery System,” by Vijay Kumar Singh and Raj K. Keservani from India demonstrates nanoparticles and its different approaches for the treatment of diseases. Preparation of nanoparticle as a drug delivery system is one of the most widely accepted approach since the preparation of nanoparticle were easy and convenient to scale up. Their high stability and conveniently easy to freeze-dried preparations provide some additional advantages to choose nanoparticles as a good drug delivery system. These nanostructures are capable of targeting to variety of tissues or organs. Chapter 15, “Therapeutic Applications of Nanobiomaterials,” is written by Anuj Garg from India and summarized commercial prospects and future challenges in development of nanobiomaterials particularly for drug delivery. The chapter has discussed type of nanobiomaterials, general biological barriers for therapeutics, surface functionalization of nanobiomaterials and their therapeutic application. The nanobiomaterial encompasses natural ones as well as derived from synthesis. These are mostly able to control drug release and are devoid of toxicity.

This book presents recent technology and future prospective and different drug delivery in addition highlighted its pharmaceutical and medical application. The present endeavor does not boast that this has been one of its kinds but it enriches the pool of scientific information already present. We are quite hopeful that this particular compilation would receive the interest of its target audience. The editors are an email away to accept any suggestion, comment or critics. In last section book contains compilation of references, list of contributors and subject index.

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