

# Preface

The efficient delivery of a drug is function of numerous biopharmaceutical as well as physiochemical characteristics. This has posed obstacles to the development of diverse drug delivery systems by researchers from academia and industry. There is need to customize the dosage forms according to biological and physical variables. The science of drug delivery technology is ever evolving with introduction of new systems with progress in time. We are witnessing the journey of techniques from conventional to novel ones. Several of such novel drug delivery systems have been found to overcome the pit falls associated with their customary counterparts. Novel drug delivery systems is an approach of delivering a drug, can have a significant effect on its efficacy. Some drugs have an optimum concentration range within which maximum benefit is derived, and concentrations above or below this range can be toxic or produce no therapeutic benefit at all. On the other hand, the very slow progress in the efficacy of the treatment of severe diseases, has suggested a growing need for a multidisciplinary approach to the delivery of therapeutics to targets in tissues. From this, new ideas on controlling the pharmacokinetics, pharmacodynamics, non-specific toxicity, immunogenicity, biorecognition, and efficacy of drugs were generated. Nevertheless, it would be appropriate to comment that novel drug delivery systems are also not devoid of limitations like cost, intricacies involved in development, bio-toxicity profile of materials employed etc. Therefore, the exercise of caution while using novel drug carriers is desired. The natural as well as synthetic carriers are reported to be explored as drug carriers.

The current book project was driven by the ever going quest to have an updated pool of research information scattered over diverse facets of science. It has attempted to cover the innovations being introduced while keeping the merits offered by the traditional dosage forms. This book offers an overview of the therapeutic application of drug delivery strategies, polymeric systems, nanotechnology, nanomedicine, biosimilar, pharmacogenetics, proteomics and genomics, bioinformatics, nutraceuticals and phytopharmaceuticals, cosmeceuticals and herbals 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 13 chapters and divided into 8 sections.

Section 1 has Chapter 1, “Personalized Approach in Nanomedicine: Understanding Adverse Effects and Their Risk Assessment,” written by Maria Vlasova and Boris V. Smirin from Finland illustrates possible reasons behind an individual physiological response to a given nanomedicine, such as type and stage of disease, physiological conditions and lifestyle of a patient. This chapter illustrates possible reasons behind an individual physiological response to a given nanomedicine, such as type and stage of disease, physiological conditions and lifestyle of a patient. The different approaches of nanoformulations have been summarized at the end of the chapter.

Section 2 has two chapters. Chapter 2, “Drug Delivery Strategies for Tolerogenic Therapy for Autoimmune Diseases in an Antigen-Specific Manner,” is written by Kevin J Peine, Naihan Chen, Eric Bachelder and Kristy Ainslie from USA, demonstrates the emerging field of inducing tolerance through microparticle-based therapies can limit therapeutic side-effects and increase patient quality of life by providing for long-term suppression of autoimmune disorders without compromising systemic immune function. The chapter describes an attempt to increase the efficacy of these therapies, recent work has utilized microparticulate delivery vehicles for the induction of immune tolerance. Microparticles are capable of increasing the solubility and circulation of cargo. In addition, their ability to passively target macrophages and dendritic cells increases their capacity for modulating the immune response. Recent work has shown microparticles fabricated with disease-associated antigens have limited disease progression and severity in animal models of Multiple Sclerosis, Type 1 Diabetes and Rheumatoid Arthritis. Chapter 3, “Cancer Drug Delivery: Pharmacogenetics, Biomarkers, and Targeted Therapies,” by Jai N. Patel and Jeryl Villadolid from USA, reviews biomarker classifications and pharmacogenetics in anti-cancer therapy and supportive care. Advancements in cancer drug delivery have led to the development of personalized oncology care through molecularly-driven targeted therapies. Understanding molecular and cellular mechanisms which drive tumor progression and resistance is critical in managing new treatment strategies which have shifted from empiric to biomarker-directed therapy selection. Examples of biomarker-directed therapies and clinical assays, in addition to future directions of molecular profiling in oncology therapy management are discussed.

Section 3 has Chapter 4, “Genomics and Proteomic Approach in the Treatment of Various Human Diseases: Application of Genomics and Proteomics,” written by Urmila Jarouliya and Raj K. Keservani from India, has dealt in genomics and proteomic approach will make easier to study all aspects of genes, gene products and signaling pathways so that the objective of personalized molecular medicine can be achieved. World wide genomic analysis is beginning to move from the laboratories of basic investigators to large-scale clinical trials. The potential of this technology is to improve diagnosis and tailored treatment of various human diseases.

Section 4 has Chapter 5, “Bioinformatics and Its Therapeutic Applications,” written by Sarvesh Kumar Gupta, Kamal Kumar Chaudhary and Nidhi Mishra from India, describes introduction of bioinformatics and its applications in medicine and health care. Bioinformatics has emerged as a major element in contemporary biomedical and pharmaceutical region. Bioinformatics deals with growth in biological data and has led to development of many databases. A number of applications could be customized to help the ailing mankind by exploring the principles of bioinformatics in drug delivery. This may prove beneficial to the patients by offering an alternative to existing synthetic analogues.

Section 5 has four chapters. Chapter 6, “An Overview and Therapeutic Applications of Nutraceutical and Functional Foods,” written by Raj K. Keservani, Anil K. Sharma and Rajesh K. Kesharwani from India, discussed about the health benefit of recently introduced nutraceutical and functional food products. With the modernised, competitive lifestyle and ever increasing stressful conditions this prod-

## **Preface**

uct is the need of the day. The chapter entails the therapeutic benefits of food beyond its basic roles. The fundamentals of nutrition and pharmaceuticals are clubbed together to impart cure to the human beings. There are nowadays various concerns over the safety of synthetic drugs used, the nutraceuticals majority of them are considered to be safe, could substitute a few drug applications. There is need to explore the clinical evaluation of nutraceutical products in order to ascertain their innocuousness in biological milieu. Chapter 7, “Phytoparmaceuticals and Its Applications in Therapy,” written by Alejandra Hernández-Ceruelos, Sergio Muñoz-Juarez and Patricia Vázquez-Alvarado from Mexico demonstrates phytoparmaceuticals and its applications in therapy. Henri Leclerc introduced the terminology of phytotherapy into medical science and this concept refers to study of the use of extracts of natural origin as medicines or health-promoting agents. The use of herbs for treatment has been in parlance from the beginning of civilizations. A wide number of plants products may be used to treat diverse diseases/disorders. Chapter 8, “A Perspective on the Phytopharmaceuticals Responsible for the Therapeutic Applications,” by Rajesh K. Joshi from India, has summarized use of phytopharmaceutical agents for the treatment of disease, most of the plant based drugs are quite safe and have lesser adverse effects and are claimed that it works as synergistic effects. Several plants in the different forms have been reported in traditional medicine and to find a rational for the treatment of various diseases than to isolated single compounds. Chapter 9, “Phytopharmaceutical Applications of Nutraceutical and Functional Foods,” written by Charu Gupta and Dhan Prakash from India, concluded phyto-pharmaceutical applications of nutraceuticals and functional foods and would lay emphasis on its importance for future generations for their well-being. The applications of nutraceuticals derived from plants are enumerated in the present chapter. Further, the future prospects are also discussed.

Section 6 has two chapters. Chapter 10, “Cosmeceuticals: Safety, Efficacy, and Potentials Benefits,” is written by Long Chiau Ming, Wei Chern Ang, Quan Yang, Premrutai Thitilertdech, Tin Wui Wong and Tahir Mehmood Khan from Malaysia discussed about health care professional and pharmaceutical scientists a resource that would aid to educate patients in using evidence-based cosmeceuticals to enhance their appearance and alleviate dermatological problems. The chapter has described several products used to beautify human skin employing principles of pharmaceuticals to make a viable formulation. The present chapter would provide information to the manufactures to exploit the advantages associated with cosmetic formulations. As we all are aware that good looks have been in fresh demand irrespective of gender, ethnicity or country specific limitations. Chapter 11, “Camel and Other Milk for External Drug Delivery,” written by Reuven Yagil from Israel, discussed cosmeceuticals prepared from camel and other milk for natural skin maintenance and massage therapy has been shown to improve flexibility and range of motion and strengthen the immune system. The chapter has quoted interesting case studies by which camel milk has been found to heal lesions associated with the skin. The readers may find this fascinating as it provides clinical evidences for each of the use of camel milk. The chapter has beautifully described the utility of ship of the desert’s milk.

Section 7 has Chapter 12, “Resealed Erythrocytes as Drug Carriers and Its Therapeutic Application,” by Prabahkar Singh, Sudhakar Singh and Rajesh K. Kesharwani from India has described about application potential of the resealed erythrocytes and explained the different method of drug loading for resealed erythrocytes, their characterization, and applications in various therapies and associated health benefits. The use of such biocompatible drug carrier appears fascinating for the researchers worldwide. The limitations linked with various synthetic and natural carriers may be overcome by employing RBCs as drug carriers. However, the cost and immunogenicity in certain cases should be taken into account while going for manufacturing RBC products.

Section 8 has one chapter. Chapter 13, “New Herbal Approaches for the Treatment of Diabetic Kidney Diseases and Its Therapeutics Implications,” is written by Durgavati Yadav, Vivek Pandey, Shivani Srivastava and Yamini Bhusan Tripathi from India, explains the involvement of different phytochemicals in biological pathway associated with the kidney damage. The kidney damage is manifested as secondary complications while progression of diabetes. Herbal drugs in this modern era are preferred due to its lesser side effects. As the diabetes type 2 being associated with modern day lifestyle is usually worsen upon progression. The alternate therapy approaches originated from nature could prove as a boon to the patients.

The present book will be helpful to add the set of specific research updates to the existing ocean of science. This could be assumed as collection of few drops collected from the contributors spread over the earth to the repository of the knowledge. We all are aware that honing of the skills, knowledge is warranted in order to keep pace with the advancing world. This all comes through variety of sources which enables its end user with ability to withstand the challenges whatsoever they are. The editors humbly submit here that this is not all about the developments taking place in modern world, it is merely a beginning. We are quite hopeful that this particular compilation would receive the interest of its target audience. This book presents recent technology and future prospective and different drug delivery in addition highlighted its pharmaceutical and medical application. In last section book contains compilation of references, list of contributors and subject index. This should be taken as primary move similar to early steps taken by the toddlers. The editors are an email away to accept any suggestion, comment or critics.

*Raj K. Keservani*  
*Rajiv Gandhi Proudyogiki Vishwavidyalaya, India*

*Anil K. Sharma*  
*Delhi Institute of Pharmaceutical Sciences and Research, India*

*Rajesh K. Kesharwani*  
*National Institute of Technology, Warangal, India*