Preface

Particle technology is a term used to refer the science and technology related to the handling and processing of particles. The production of particulate materials, with controlled properties is of major interest to a wide range of applications, including chemical, food and pharmaceutical industries.

Nanoparticle technology appears to be promising nanotechnology in many engineering and industrial fields including nanomedicine in drug delivery, biotechnology and tissue engineering.

This book focuses on novel particulate carriers for the purpose of drug delivery to humans. Nowadays, macro- and nanoscale particles are being investigated for targeted delivery of small and large biological macromolecules. The targeting of drugs can minimize the dosage regimen and reduce dose-related potential toxicity of drug molecules, which in turn may lead to increased patient compliance. Various types of organic, inorganic and polymer particles are currently being investigated and attracted a lot of attention of the research workers in the field of drug delivery science and technology.

The purpose of this book is to discuss state of the art of some novel particle technology for the delivery of therapeutics.

In the introductory chapter, the need for the development of polymer-based micro- and nanoparticulate systems and other particulate systems designed so far have been described along with their fabrication technology and an overview of their therapeutic applications.

Cancer is one of the leading causes of death worldwide. Though a number of anticancer drugs are available, the development of effective delivery strategies still poses a problem for the pharmaceutical scientist. Therefore, the delivery of anti-cancer therapeutics represents an important area of current research. The scientists are putting their utmost effort to deliver effective anti-cancer therapeutics using particulate carriers. Therefore, Chapters "The Development and Achievement of Polymeric Nanoparticles for Cancer Drug Treatment" and "Nanotechnology Based Immunotherapeutic Strategies for the Treatment of Cancer" have been devoted to the discussion on polymeric nanoparticles and immunotherapeutic strategies for cancer drug treatment.

Because cancer stem cells (CSCs) can initiate and repopulate tumours, failure to control CSCs can potentially lead to tumour regrowth, even though the bulk tumour

may have been treated successfully. Nanocarriers have recently been employed to deliver therapeutics for reducing the population of CSCs at the tumor site with great success. In Chapter "Nano-therapeutic Approaches for Targeting Cancer Stem Cells", various nanotherapeutic strategies meant for targeting signalling pathway and subsequently the cancer stem cells have been discussed.

The core–shell structures of dendrimer have enabled to entrap numerous of various drugs in their core and thus provides an opportunity to deliver drugs by designing different nanoscale polymer-based dendrimers. An overview of dendritic nanostructure towards application in drug delivery is given in Chapter "Dendrimers as Nanostructured Therapeutic Carriers".

Nowadays a great deal of attention has been paid to the development of natural polymer-based particulate systems due to their biodegradable, biocompatible and nontoxic nature. Chitosan is the most widely studied biomaterial in drug delivery. Hence, Chapter "Chitosan Based Nanoparticulate Systems: Implication Towards Therapeutics Application" has been dedicated to illustrate the updated information emphasizing its potential therapeutic applications. Sometimes, native natural polymers are not found suitable for designing hydrogel particles in an aqueous media. Hence, chemical modifications of their structures are required for hydrogel preparation. In particular, carboxymethyl derivatives have been investigated in details. Hydrogel are 3D polymer network that are being considered as an effective delivery devices. The hydrogel allows controlling the release of drug in response to variable pH of gastrointestinal tract. Chapter "Carboxymethyl Polysaccharide-Based Multiunit Hydrogel Systems for Drug Delivery" has been introduced to cover this aspect.

Lipids possess a solid lipid core matrix that can solubilize lipophilic molecules. Colloidal lipid carrier-based strategies have been developed for the delivery of drugs to intestinal lymphatic. Chapter "Lipid Carriers: Role and Applications in Nano Drug Delivery" highlighted the design of lipid nanoparticles as controlled drug release carriers.

More than 40% of the drugs suffer from poor water solubility and thereby cause erratic absorption of drug. In recent days, nanocrystal technology has been emerged as a viable option for improving their solubility and bioavailability. Chapter "Nanocrystals for Delivery of Therapeutic Agents" discusses the recent development in nanocrystals technology.

In Chapter "Inorganic Nanocomposites—A New Paradigm in Drug Delivery", the preparation, characterization and drug delivery aspects of inorganic nanocomposites such as mesoporous silica, Quantum dots, carbon nanotube, Iron oxide nanoparticles, etc., are described.

Currently, a popular area in nanomedicine is the implementation of plasmonic gold nanoparticles for cancer diagnosis and photothermal therapy, attributed to the intriguing optical properties of the nanoparticles. Gold nanoparticles have emerged as promising agents for cancer therapy and are currently being investigated as drug carriers and other medical applications. The biomedical applications of gold nanoparticles have been detailed in Chapter "Green Synthesized Gold Nanoparticles for Future Biomedical Applications".

With the advent of biotechnology a number of macromolecules are available to their unprecedented level of purity, which are believed to be non-immunogenic, but their cellular targeting is a challenge for the pharmaceutical scientist. Cationic polymers have been found useful as vector for gene targeting. Hence, this subject entitled "cationic polyelectrolyte vectors in gene delivery" is discussed in Chapter "Cationic Polyelectrolyte Vectors in Gene Delivery". In the last chapter, the impact of nanoparticulate system to our defense system has been included in Chapter "Nanoparticulate Immunotherapy: An Intelligent Way to Tailor Make Our Defense System".

The book is useful for the students, researcher scholars, industry personnel and scientists in the area of pharmaceuticals, biological and material science.

We express our sincere gratitude to all the authors for their contribution to edit this book. We also thank to the publisher for their continuous support for completion of this reference book.

Asansol, India Prof. Sougata Jana
Amarkantak, India Prof. Subrata Jana



http://www.springer.com/978-981-10-3646-0

Particulate Technology for Delivery of Therapeutics

Jana, S.; Jana, S. (Eds.)

2017, XV, 451 p. 35 illus., 31 illus. in color., Hardcover
ISBN: 978-981-10-3646-0