Nanotechnology in Drug Delivery
Biotechnology: Pharmaceutical Aspects

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Volume X: *Nanotechnology in Drug Delivery*
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Nanotechnology in Drug Delivery

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Nanotechnology, a multidisciplinary scientific undertaking, involves creation and utilization of materials, devices, or systems on the nanometer scale and is currently undergoing explosive development on many fronts. It is expected to spark innovation and play a critical role in various biomedical applications, especially in drug delivery, as is shown by the wealth of information presented in this book particular, advances in nanotechnology that enable drugs to preserve their efficacy while being delivered to precise therapeutic targets are creating a host of opportunities for drug developers. In addition, by combining nanotechnology-based target-specific drug therapy with methods for early diagnosis of pathologies, we are getting closer to creating the ultimate functional drug carrier.

This book is primarily designed to be a reference textbook on the application of nanotechnology in the development of drug delivery systems and to highlight some of the most exciting developments in this field. For this purpose, the reader is introduced to various aspects of the fundamentals of nanotechnology-based drug delivery systems and the application of these systems for the delivery of small molecules, proteins, peptides, oligonucleotides, and genes. How these systems overcome challenges offered by biological barriers to drug absorption and drug targeting is also highlighted. To best do this the text is divided into the following sections: Fundamentals of Nanotechnology in Drug Delivery; Biopharmaceutical, Physiological and Clinical Considerations for Nanotechnology in Drug Delivery; Nanotechnology for the Delivery of Small Molecules, Peptides, Proteins, and Nucleic Acids; and A Look to the Future of Nanotechnology in Drug Delivery.

The reason for putting the book together this way can be found in the purpose of any drug delivery system, which is to enhance or facilitate the action of any active moiety by using sound scientific and therapeutic principles. Most current methods of drug delivery are direct descendents of ancient practices that have changed little over the last few centuries. However, advances in the fields of drug discovery, biotechnology, and molecular biology have resulted in the discovery of large numbers of novel molecules with the potential to revolutionize the treatment of disease if severe delivery and targeting obstacles can be overcome. This means that using these new armaments in the war against disease must stimulate the development of new strategies for drug and vaccine administration. One such development is the explosion in nanotechnology research geared toward improving drug delivery and targeting.
As shown in this text, a variety of nanostructures are being investigated as functional drug carriers for treating a wide range of therapies, most notably cardiovascular defects, autoimmune diseases, and cancer. While the concept of nanoparticles in drug delivery is not new, the number of research programs and active drug development projects in this field has escalated as funding for nanotechnology has increased. The result is the emergence of a host of novel nanotechnologies tailored to meet the physicochemical and therapeutic requirements of drug developers. With all this potential for advanced drug delivery and targeted therapy, with reduced side effects, nanotechnology-based drug delivery systems hold the promise of significantly improving quality of life through “nanomedicine”.

We hope that this book will help to bring these technologies and the underlying fundamental science together in one text for the reader. One or more distinguished authors from each relevant field wrote each chapter, and ample use of figures and tables has been included to help demonstrate the most important aspects.

The successful completion of this text was made possible by the assistance of a large number of people to whom we are very grateful. We extend special thanks to the individual chapter contributors. We also want to thank the publisher and in particular Melanie Wilichinsky for her support.

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