

NANOCARRIER TECHNOLOGIES

Nanocarrier Technologies: Frontiers of Nanotherapy

Edited by

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Dedication

*This book is dedicated to my
parents Ali and Susan*

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Preface

Nanotherapy in a broad sense is the application of nano-scale technologies, including nano-encapsulation (or nanocarrier) systems, to increase life standards of humans and animals. Advances in nanotherapy and nanopharmaceutical technology have made it possible to target human and animal diseases precisely at their source whilst minimising side effects. These modern scientific fields have encompassed the application of nanoliposomes, niosomes, archaeosomes, nanoparticles, micelles and other carrier systems. Despite the fact that these carrier systems have been recently introduced, intensive scientific investigation has dramatically improved the knowledge base in the field. This, in turn, has paved the way for their potential clinical applications as evidenced by some pharmaceutical, cosmetic and food products, which have already been approved by the regulatory authorities for human use. Nanocarrier systems not only provide protection and controlled release of the incorporated material, but also have the potential to deliver their load precisely to the required site in the body - hence removing the need for consumption of large quantities of drugs and other bioactive agents. The list of materials that can be incorporated to the carrier systems is very exhaustive ranging from amino acid or nucleic acid-based therapeutics to tissue regeneration and weight-loss formulations. Results of numerous pre-clinical and clinical studies show that bioactives, such as antineoplastic agents, encapsulated in carrier systems exhibit reduced toxicities and enhanced efficacies. Given the advantages that nanocarrier systems provide, compared to conventional pharmaceuticals, it is likely that the number of formulations containing these systems approved for human and animal use will increase in the near future.

Nanoencapsulation systems vary in terms of ingredients, rigidity, stability, release properties and ability to incorporate materials with different solubilities. The choice of which carrier system to use depends on the characteristics (size, solubility, charge, etc.) of the bioactive agent to be encapsulated as well as the intended application. In this regard, a general knowledge on currently employed carrier systems will be very useful. Towards this end the present book intends to collate recent advances in the field of nano-encapsulation technologies and their application for treating some of the contemporary human health challenges. Expert reviews on the major types of carrier systems and their role in areas such as cancer, gene therapy, oxidative stress and food nanotechnology provide excellent opportunity to gain insight into the field. Referencing and citation in each chapter was left to the choice of authors to whom I am very much indebted for responding to my invitation to contribute. I am also grateful to Springer for publication of this book.

Thanks to the high quality of the chapters, backed by several years expertise of the authors, I have no doubt regarding the usefulness of this book as an ideal source for researchers, lecturers and scientists in the field of nanotherapy. Hope that future brings more health and peace for our children.

M. Reza Mozafari, PhD

February 2006

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Foreword

Although the prefix “nano” entered impetuously into our lives in the latter decade of the 20th century, penetrating habitual frames/barriers and notions, just a few years ago nobody had even heard about “nanotherapy”. The nanoworld appeared suddenly before our eyes, which had become accustomed to a microworld. Some people, maybe even scientists, believe naively that it is enough just to add the “nano” prefix instead of the common “micro”, to get a new quality. The present volume is not one of those. It is devoted to new and splendid possibilities which the world of nanoparticles grants to people and their beauty and health. It is accepted that the “nanoworld” starts for us from the 100nm size (and less), which is reflected excellently in the present book, being one of the first in the field of nanotherapy. It is not an exhaustive edition (although it is always better to finalize a not perfect volume, than never finish a perfect one), but it covers the most state-of-art nanotechnologies and materials used for nanotherapy. Some topics such as clinical implications are not covered in this volume, but can be found elsewhere.

The Editor, Dr. M. Reza Mozafari, being a young talented scientist, appears already to be an experienced editor. His excellent credentials permit that. He succeeded to choose and collect a number of excellent chapters from bright scientists and top laboratories around the world. The book will without any doubt perfectly fit into the “nano” literature shaping the field.

I am sure that the benevolent efforts of the authors and the editor constructively serve the international scientific community and all of mankind.

Renat Zhdanov, DSc, Professor of Biophysics
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March 2006

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M. Reza Mozafari, PhD
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