Nanotheranostics

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Nanotheranostics

Applications and Limitations



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Preface

Theranostics is an emerging area, where therapeutic and diagnostic platforms are integrated together to perform disease diagnosis and therapy simultaneously. It provides a noninvasive method to determine the targeted delivery of drugs and to evaluate drug efficacy as well. Targeted delivery not only aids in reducing the therapeutic dose but also helps in minimizing dose-related side effects. Theranostic approaches have already been proposed for conditions like cancer, inflammatory diseases, and infections. Nonetheless, the practical form of theranostics can be achieved through the application of nanotechnology. Owing to certain unique properties of nanoparticles like large surface area, miniscule size, enhanced retention capability and minimal off-target accumulation, surface functionalization, and the ability to escape host defenses, they may provide a basis for personalized medicines. Nanotheranostics can consequently encourage stimuli-responsive release and may provide a basis for siRNA co-delivery and oral delivery of peptides. They can also be used for delivery across the blood–brain barrier. They may play a remarkable role in combating multidrug-resistant pathogens.

It is generally believed that early diagnosis promotes cure, and this is the basic philosophy behind nanotheranostics: to diagnose diseases before infected individuals start to show symptoms. However, there are certain limitations and problems to achieve this goal. This book is specifically designed to provide information about various nanocarriers developed under nanotheranostics for a sustained, controlled, and targeted co-delivery of diagnostic and therapeutic agents. In addition, diverse theranostic applications of nanotechnology and their limitations have also been addressed.

This book is highly interdisciplinary and is very useful for a diverse group of readers including pharmacologists, nanotechnologists, microbiologists, biotechnologists, clinicians, cancer specialists, and those who are interested in development of nanoproducts used in therapeutics. Students should find this book useful and reader friendly.

This book has been divided into various chapters as follows: Nanotheranostics: an emerging nanoscience; Nanoparticles in nanotheranostics applications; Nanotheranostics approaches in antimicrobial drug resistance; Theranostic nano platforms as a promising diagnostic and therapeutic tool for *Staphylococcus aureus*; Current status and prospects of chitosan: metal nanoparticles and their applications as theranostic agents; Nanomaterials for selective targeting of intracellular pathogens; Nanoformulations: a valuable tool in the therapy of viral diseases attacking humans and animals; The potential of gold and silver antimicrobials: nanotherapeutic approach and applications; Theranostic potential of aptamers in antimicrobial chemotherapy; Current and future aspects of smart nanotheranostic agents in cancer therapeutics; Biosynthesized metallic nanoparticles as emerging cancer therapostics agents; Superparamagnetic iron oxide nanoparticles for cancer theranostic applications; Theranostic applications of nanobiotechnology in cancer; Magnetic/ superparamagnetic hyperthermia as an effective noninvasive alternative method for therapy of malignant tumors; Emerging role of aminolevulinic acid and gold nanoparticles combination in theranostic applications; Gold nanorods as theranostic nanoparticles for cancer therapy. All chapters are written by experts in the field and provide the latest in nanotheranostics in a reader-friendly style. Readers will be enriched by emerging nanotheranostics, and their applications.

We would like to thank the authors, who have made noteworthy contributions to this book: to Carolyn Spence, senior publishing editor, and Priyadharsini, project co-ordinator, Springer Nature for their generous co-operation and patience during the whole process of editing the book. We also express our gratitude to the reviewers for their particular informative comments and suggestions on these book chapters. MR thankfully acknowledges the financial support rendered by CNPq Brazil (process number 403888/2018-2).

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