

# Small Solutions to Big Problems

## The Handbook of Nanomedicine

By Kewal K. Jain.

*Humana Press, Totowa 2008. XXIII+404 pp., hardcover €92.95.—ISBN 978-1-60327-318-3*

The book consists of 18 chapters that showcase this exciting field to a much broader audience. The topics range from an "Introduction" in Chapter 1 that covers the understanding of nano-length scale and the appreciation of the parallel developments in nanoscale technologies with the medical need for development of better diagnostic, imaging, and therapeutic systems. The convergence of these two areas is nicely highlighted. In Chapter 2, the author further expands on the introductory theme with discussion of various nanotechnologies useful in biology and medicine. Specific emphasis is placed on micro- and nanoarrays, fluidics, various sensing and imaging techniques, and inorganic and organic nanosystem fabrication and characterization.

In Chapters 3 to 6, the author broadly highlights nanotechnology for diagnostic and therapeutic applications. Chapter 3 focused on diagnostic applications ranging from use of gold nanoparticle-based assays developed by Mirkin's group at Northwestern University, to cantilever technologies and quantum dots used in early disease detection. Chapter 4 is on "Nanopharmaceuticals" with emphasis on various nanotechnologies used for drug discovery and delivery. Specific discussion on nano-sized drugs, such as nanocrystals, that improve bioavailability and pharmacokinetic properties is missing from this chapter on nanopharmaceutical. Application of nanotechnology for delivery of biological molecules, such as genes and siRNA, is addressed in Chapter 5. Although this is a very rapidly moving field, the author has done a good job in covering the breadth of this field. Chapter 6 covers additional medical applications of nanotechnologies, such as thin films as implant coatings.

Disease or medical condition-specific nanotechnology applications are addressed in Chapters 7 to 14. Cancer, which is clearly an area that has received the most attention from nanotechnology-based diagnostics, imaging, and therapeutic applications, is discussed in Chapter 7. Although the general crux of the science is described, the newer generation of multifunctional nanosystems for cancer has not been addressed. Chapter 8 goes into "Nanoneurology" with emphasis specifically on technologies used to enhance blood–brain barrier (BBB) penetration. Neural implants and various nano–brain interface technologies are also described. In Chapter 9, the author focused on cardiovascular diseases and nanotechnology with emphasis on stent systems and drug delivery. Several elegant molecular diagnostic and imaging systems have also been developed for cardiovascular applications, but these have not received as much attention. Nanotechnology in orthopedic applications is briefly reviewed in Chapter 10, with emphasis on coating systems for orthopedic implants. Chapter 11 focuses on the antimicrobial applications of nanotechnology with emphasis on disease detection and treatment using nano-sized antimicrobials, such as silver nanoparticles. The use of nanotechnology for ophthalmic diseases is discussed in Chapter 12 with emphasis on drug-delivery systems. Chapter 13 goes into regenerative medicine and tissue engineering application of nanotechnology. Again this is a very rapidly evolving area, but the lack of any discussion on stem cells in regenerative medicine was disappointing. Lastly, Chapter 14 superficially covers other medical applications, such as wound healing, dentistry, and nutrition.

An important area of "Ethical, Safety, and Regulatory Issues" is addressed in Chapter 15. It is nice to see that the author has done a remarkable job in covering this critical area that tends to

be less focused in other nanomedicine-related treaties. The regulatory issues are highlighted primarily from the perspective of the Food and Drug Administration (US) and the European Agency for the Evaluation of Medicinal Products (EU). It would have been nice to see additional information, especially from Asian (Japanese, Korean, Chinese, Indian, etc) regulatory authorities, where nanomedicine efforts are clinically further ahead than those in the US and European countries. Chapter 16 discusses commercialization of nanotechnologies and the lack of large pharmaceutical companies to engage in this enterprise at this time. The role of nanomedicine education, especially in the US universities, is starting to be noticed and this is briefly discussed in Chapter 17. Finally, Chapter 18 focuses on the future potential of nanomedicine. The outlook, according to the author, is fairly bright as there are great expectations and problems that need to be addressed.

Overall, the "Handbook of Nanomedicine" is a good treaty for nonscientists and entry-level students who are interested in this area. As discussed above, the book covers a very broad scope and so it is difficult for the author to cover each area in depth. As such, scientists and those well aware of the field will find most of the chapters in the book to be superficial. Some of the text reads more like a press release rather than a well-balanced perspective and so the educational value is limited. Based on this analysis, the book is recommended to those who are new to the field. Instructors may consider adopting this book for a general nanotechnology-based course where biomedical applications are covered in part. Lastly, library patrons will find the book useful as an introductory guide to the field.

*Professor Mansoor M. Amiji*  
Northeastern University (US)  
DOI: 10.1002/cmdc.200800397