Book Review

The Handbook of Nanomedicine (2nd Edition)

The Handbook of Nanomedicine is an informative account of the current state of nanomedicine, combining descriptions of emerging technologies with examples of their utility. Now in its second edition, Kewal K Jain has thoroughly updated its content to reflect novel advances in the field. As this book was written by a lone author, it maintains a singular focus throughout, a highly advantageous facet not typically seen in similar publications. Topics range from an introduction to nanotechnologies to applications in specific fields, including oncology, cardiology and neurology. Overall, *The Handbook of Nanomedicine (2nd Edition)* was designed in such a manner that it could be easily read by anyone interested in the subject, with specific references selected to provide further, more detailed insight into specific topics.

The Handbook of Nanomedicine, recently released in its second edition, is a one volume compendium of almost every imaginable aspect of nanomedicine. As defined by the book's sole author, Kewal K Jain, "the prefix nano is used liberally and indicates the nanodimension of existing scientific disciplines and medical specialties." This definition casts an all-encompassing net, resulting in the inclusion of topics ranging from nanomaterials in diagnostics and drug delivery to nanomolecular manipulation and imaging. The text is organized in a very straightforward manner, with general introductory material being set forth in the first few chapters, transitioning to applications in specific specialties and concluding with regulatory aspects and future perspectives. Given this structure, nanomaterials and techniques are carried forward from chapter to chapter and their applications are elucidated in different contexts.

The most notable chapters contained within this work include Nanomolecular Diagnostics (Chapter 4), Nano-oncology (Chapter 8) and the Ethical and Regulatory Aspects of Nanomedicine (Chapter 18). Nanodiagnosics is the application of nanobiotechnology in the elucidation, diagnosis and monitoring of human diseases. Chapter 4 includes sections on nanoarrays, the use of nanobarcodes for genotyping and gene expression profiling, and nanobiosensors. This chapter then concludes with real-world applications of nanodiagnosics for the detection of biomarkers, point-of-care use and for the

battlefield and biodefense. Nano-oncology, as can be expected from the amount of research that has been accomplished in the field, is among the longest chapters within the book. The author successfully navigates the literature, utilizing key works to give readers a solid understanding of the application of nanotechnologies to these diseases. Sections include cancer imaging and nanomaterial-based drug delivery, as well as a discussion of nanomaterials that are innately therapeutic. Appropriately, one of the final chapters in the book discusses the ethical and regulatory aspects of the described technologies. This section focuses on common ethical questions that arise with the use of new technologies, but also includes intellectual property considerations and regulation of these materials by the US FDA and regulatory approval in the EU.

Two of the other topics that have received significant attention since the first edition of the book was first published are nanoneurology (Chapter 9) and nanocardiology (Chapter 10). Nanoneurology is the application of nanobiotechnology to the "study and management of disorders of the nervous system." In particular, it "has been applied for neuropsychological studies, diagnosis, neuropharmacology and refinement of surgical tools." Subsections include nanodiagnosis and imaging, drug delivery to the CNS, neuroprotection, regeneration and repair, and neurosurgery. The chapter on nanocardiology focuses mainly on the application of nanomaterials in the diagnosis of cardiovascular

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syndromes, with additional sections on drug delivery and therapeutics.

Although the pace of change in the field of nanomedicine is rapid, this book serves as a potent resource, regardless of the edition, due, in large, to the subject matter that the author has chosen to include. The selected material contained within the book features prominent references, which serve to give the reader the option to explore the material in more depth, making this book a valuable resource to anyone who may be interested in this subject matter.

Sample excerpts

- *“This handbook covers the broad scope of nanomedicine. Starting with the basics, the subject is developed to potential clinical applications, many of which are still at an experimental stage.”* Preface to the first edition.
- *“...since the first edition of the book in 2008 ... most of the advances have occurred in nanodiagnostics and nanopharmaceuticals, particularly drug delivery using nanobiotechnology. Nanooncology remains the major area of clinical application although considerable advances have been made in other therapeutic areas, particularly nanocardiology and nanoneurology. Several new products have been approved, and clinical applications of nanotechnology are progressing. This has required the discussion of some regulatory issues. Combination of diagnosis and therapy is facilitated by nanobiotechnology and fits in with concepts of personalized medicine, which is being increasingly accepted.”* Preface to the second edition.

Reading impressions

As opposed to similar publications, this book was written by a single author. This enables an entire story to be composed about the current state of the field with particular focus on topics deemed most important by a singular source. This editorial control facilitates the continuity of the subject matter. However, this may also be seen as a drawback to some. Just like reading a novel, if a reader does not particularly enjoy the writing style of the author, reading the book in its entirety may become tedious. Another disadvantage is

that the overarching control of every aspect of the subject matter results in certain subjects, particularly nano-oncology, receiving significant attention, while other rapidly expanding fields receive relatively cursory coverage.

The book is well organized, with an overview of the introductory subject matter relating to nanotechnology and its utility in diagnostics and medicine discussed in the initial few chapters. The material then transitions to the uses of nanomedicine in specific diseases and organ systems, including cancer, cardiology, neurology, pulmonology, orthopedics, ophthalmology and microbiology. Finally, the toxicological implications of nanomedicine are considered, as well as its ethical and regulatory aspects and future perspectives. Overall, this layout works to introduce nanomedicine to an audience that may not be expert on this subject matter. However, considering the vastness of the field, this book could be readily expanded into a multi-volume set. In addition, given the layout of the text, various nanomaterials were introduced and reintroduced throughout the text as they are used in multiple applications and diseases. This repetition took away from the overall continuity of the narrative.

Due to the extremely broad nature of the field of nanomedicine, it would have been exceedingly difficult to include the extensive number of citations necessary to fully reference every aspect of the text. Thus, Jain selected seminal references to illustrate the techniques and methodologies discussed. Overall, this approach makes sense and is applied properly throughout the book. Nevertheless, there were many times when a new subject was introduced with limited background information and an appropriate reference was not available for further investigation.

One main critique is regarding the tables that the author chose to include within the text. For the most part, they appear to be generic lists based upon a singular topic, which add questionable value to the book. It would have been highly advantageous for each of the topics within these lists to be associated with references.

Conclusion

It has been four years since the original publication of *The Handbook of*

Nanomedicine, and many significant advances have occurred during that time, particularly with regard to diagnostics and drug delivery. Thus, the current, updated edition of the book is both timely and necessary. Overall, it is exceedingly difficult to give an overview of the state of the field due to its breadth and multidisciplinary nature. However, Jain does an admirable job in giving the reader the essence of the different facets of nanomedicine, supplementing his writing with references selected to give the reader a more detailed insight. If the intention is to refresh this book every 4 years, *The Handbook of Nanomedicine*

will remain a valuable resource for years to come.

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