

NANOBIOMEDICINE

FUNDAMENTALS AND IMPLEMENTATION IN THERANOSTIC APPLICATIONS

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Bentham Books

Nanobiomedicine: Fundamentals and Implementation in Theranostic Applications

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ISBN (Online): 979-8-89881-312-3

ISBN (Print): 979-8-89881-313-0

ISBN (Paperback): 979-8-89881-314-7

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First published in 2025.

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CHAPTER 7

Artificial Intelligence in Drug Delivery: An Alternative Approach to Traditional Nano-Theranostic Systems

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Abstract: Nanomaterials have been extensively investigated to be used in clinical and pharmaceutical applications due to their unique features, such as shape, size, surface properties, reactive oxygen species (ROS) scavenging, targeted drug delivery, improved cell imaging due to excellent fluorescence property, precise personalized diagnosis, reduced side effects, and excellent sensing property. Despite all advantages, nanomaterials are signified as a potential generator of ROS, a symbol of toxicity. Although some clinical practices utilize ROS to prevent cancer, bacterial infection, *etc.*, non-customized morphology can yield excessive ROS that may cause harm to normal cells. Another disadvantage is the infant research stages; more modulation in design is needed, and evaluation, as well as validation in nanotoxicity, is required. Although there exist a few stories of nano-medicine-mediated theranostic applications, the emerging challenges are increasingly prompting researchers to explore the optimal use of artificial intelligence (AI) in designing personalized drug delivery systems, potentially offering a more effective alternative to traditional nano-theranostic approaches. Accordingly, an elaborate governance framework is needed to develop and implement innovative AI systems successfully in the healthcare sector. The present work provides a comprehensive overview of the role of AI technologies in drug delivery, along with its ethical and regulatory concerns. Additionally, it illuminates the numerous challenges met in the employment of AI systems in clinical practice.

Keywords: Artificial intelligence in drug delivery, AI bot, Drug discovery, Drug delivery, NLP, Toxicity profile.

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