

# Future of Pharmaceutical Sciences

Convergence of Technology, Biology, and Medicine



Brajesh Kumar Mishra, Vidhi Dhaduk *Editor*

 DeepScience

# Future of Pharmaceutical Sciences: Convergence of Technology, Biology, and Medicine

**Brajesh Kumar Mishra**

Department of Chemistry, Om Shri Vishwakarma Ji Mahavidyalaya, Kanpur Dehat, (CSJM University Kanpur) India

**Vidhi Dhaduk**

Shantabaa Medical College and General Hospital, Gujarat



**DeepScience**

*Published, marketed, and distributed by:*

Deep Science Publishing, 2025  
USA | UK | India | Turkey  
Reg. No. MH-33-0523625  
www.deepscienceresearch.com  
editor@deepscienceresearch.com  
WhatsApp: +91 7977171947

ISBN: 978-93-7185-179-4

E-ISBN: 978-93-7185-248-7

<https://doi.org/10.70593/978-93-7185-248-7>

Copyright © Brajesh Kumar Mishra and Vidhi Dhaduk, 2025.

**Citation:** Mishra, B. K., & Dhaduk, V. (Eds.). (2025). *Future of Pharmaceutical Sciences: Convergence of Technology, Biology, and Medicine*. Deep Science Publishing. <https://doi.org/10.70593/978-93-7185-248-7>

This book is published online under a fully open access program and is licensed under a Creative Commons Attribution-Non-Commercial 4.0 International License (CC BY-NC 4.0). This open access license allows third parties to copy and redistribute the material in any medium or format, provided that proper attribution is given to the author(s) and the published source. The publishers, authors, and editors are not responsible for errors or omissions, or for any consequences arising from the application of the information presented in this book, and make no warranty, express or implied, regarding the content of this publication. Although the publisher, authors, and editors have made every effort to ensure that the content is not misleading or false, they do not represent or warrant that the information-particularly regarding verification by third parties-has been verified. The publisher is neutral with regard to jurisdictional claims in published maps and institutional affiliations. The authors and publishers have made every effort to contact all copyright holders of the material reproduced in this publication and apologize to anyone we may have been unable to reach. If any copyright material has not been acknowledged, please write to us so we can correct it in a future reprint.

## Preface

Pharmaceutical sciences are at a historical point in their history. The development of a scientific breakthrough that has been accelerated by rapid scientific advancements as well as the unparalleled advancement in technology has changed the manner through which medicines are discovered, developed, manufactured and delivered. What was previously a field of study dominated by chemistry and biology has today turned into an actual interdisciplinary field where technology, data science, genomics, artificial intelligence, and digital healthcare intersect to transform the modern approach of medicine. This is an edited book that amicably has been put together to portray this current transformation. The overall driving force behind this book is to offer an in-depth and futuristic view on the impact of the emerging technologies on the research and practice of pharmaceuticals. The banding of various scientific methods has become necessary as well as lucrative because the issue of healthcare has increasingly become more personal and multidimensional.

This book is the compilation of the academic work of the researchers and scholars operating in the fields of pharmaceutical science and its corresponding areas. The topics discussed in the chapters are fundamentally integrated, including technology convergence, and the omics-driven drug development, artificial intelligence in drug discovery and design, pharmaceutical processes digitalization, and novel treatment approaches. The interdisciplinary cooperation, which is accelerating innovation, increasing precision, and efficiency in the pharmaceutical value chain, is also outlined in each chapter, instead of treating technology and biology as independent variables. Contributions have shown common ground in the way convergence is facilitating safer, faster and more effective therapeutic responses through precision medicine and targeted drug delivery, to data-driven clinical decision-making. The information has been delivered in a systematic, but user-friendly way that will serve postgraduate learners, psychologists in their doctoral research, academicians, professionals in the industry, as well as policy stakeholders, among others.

Besides the scientific advancement, the book gives a credit to the larger implication of technological convergence, such as regulatory issues, ethical obligation, integrity of data, and readiness to workforce. The volume is likely to promote balanced and accountable innovation in the pharmaceutical sciences through tackling the opportunities and challenges to achieve this goal.

I would like to personally thank all the participating authors, as well as the publisher, who took part in the project and provided their expertise along with financial assistance to the distribution of the work in an open-access environment. In my opinion, the book will make a significant contribution to the field of education, research, as well as innovation in pharmaceutical sciences in the years to come.

Dr. Brajesh Kumar Mishra

Vidhi Dhaduk

# Table of Contents

**Chapter 1: Pharmaceutical Sciences and Technology Convergence: An Overview** .....1

Dr. Vishavjeet Rathee

**Chapter 2: Omics Technologies in Advancing Drug Development**.....15

Ritesh Raj

**Chapter 3: The Role of Artificial Intelligence in Drug Discovery and Design**.....29

Dr. Sunil Kumar Sahu

**Chapter 4: Nanomedicine and Advanced Drug Delivery Systems: Innovations and Applications** .....43

Lalita Sahu

**Chapter 5: Genomics, Proteomics, and Personalized Medicine: Advances and Implications**.....55

Hridya Ramesh<sup>1</sup> and Manju Shahare<sup>1\*</sup>

**Chapter 6: CRISPR and Gene Editing in Drug Development** .....67

Ritesh Raj

**Chapter 7: Digital Health Innovations: Enhancing Patient-Centered Care with Smart Devices**.....80

Mr. Vikas Kumar Sahu

**Chapter 8: Pharmacovigilance and Drug Safety in the Digital Era**.....91

Dr. Gunanidhi Sakthivel<sup>1\*</sup> and Dr. Vijayakumar Thangavel Mahalingam<sup>1</sup>

**Chapter 9: Green Pharmacy and Sustainable Drug Development: Principles, Strategies, and Future Perspectives .....104**

Dr. Brajesh Kumar Mishra