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3.3.3 Number of books and chapter is edited volume/ books published and paper published in national / international conferences proceedings as per teacher during published per teacher during the year

S. No	Title of chapter/ Book	Name of the author/s	Department of the teacher	Name of Book	Year of publication	ISBN number	Link to the recognition in UGC enlistment of the Journal /Digital Object Identifier (doi) number		
							Link to website of the Book	Link to Chapter	Is it listed in UGC Care list/Scopus/Web of Science/other, mention
1	Textbook of pathophysiology	Dr. Praveen Sharma	Pharmacology	Textbook of pathophysiology	2024	978-3-031-66420-5			Print
2	Regulatory insight into artificial intelligence in drug delivery and medical devices	Nayany Sharma, Rekha Bisht	Pharmaceutics	In innovation in drug delivery and	2024	199-228	https://www.sciencedirect.com/book/9780443156069/marine-biopolymers	https://www.eurekaselect.com/chapter/23749	Bentham Books
3	Artificial intelligence in clinical Trial: The present scenario and future prospects	Praveen Sharma	Pharmacology	In innovation in drug delivery and	2024	229-257	https://www.eurekaselect.com/chapter/23749	https://www.eurekaselect.com/chapter/23749	Bentham Books
4	Marine biopolymers in cancer therapeutics	Dr. Rupesh Gautam	Pharmacology	Marine Biopolymer	2024	426-440	https://www.sciencedirect.com/book/9780443156069/marine-biopolymers	https://doi.org/10.1016/B978-0-443-15606-9.00003-6	Elsevier
5	Marine biopolymers in implants	Dr. Rupesh Gautam	Pharmacology	Marine Biopolymer	2024	125-145	https://www.sciencedirect.com/book/9780443156069/marine-biopolymers	https://doi.org/10.1016/B978-0-443-15606-9.00014-0	Elsevier
6	Nanostructured marine biopolymers in therapeutics and their toxicity	Dr. Rupesh Gautam	Pharmacology	Marine Biopolymer	2024	61-104	https://www.sciencedirect.com/book/9780443156069/marine-biopolymers	https://doi.org/10.1016/B978-0-443-15606-9.00005-X	Elsevier
7	Advancements in nanofabrication of marine biopolymers	Dr. Rupesh Gautam	Pharmacology	Marine Biopolymer	2024		https://www.sciencedirect.com/book/9780443156069/marine-biopolymers	https://doi.org/10.1016/B978-0-443-15606-9.00003-6	Elsevier
8	Unveiling Therapeutic Targets: Targeting Mitochondrial ROS for Anticancer Therapy	Rupesh K. Gautam	Pharmacology	Role of Autophagy and Reactive Oxygen Species in Cancer Treatment	2024	978-3-031-66420-5	Role of Autophagy and Reactive Oxygen Species in Cancer Treatment	ink.springer.com/chapter/10.1007/978-3-031-66421-2_3#citeas	Scopus
9	Synergistic Effect of Vaccines and Chemotherapeutic Agents in Combating Different Carcinomas	Rupesh K. Gautam	Pharmacology	Cancer Vaccination and Challenges	2024	9.781E+12	https://www.taylorfrancis.com/chapters/edit/10.1201/9781003503071-6/synergistic-effect-vaccines-chemotherapeutic-agents-combating-different-carcinomas	https://www.taylorfrancis.com/books/edit/10.1201/9781003503071/cancer-vaccination-challenges-rishabha-malviya-bhupendra-prajapati-sonali-sundram?refId=abb0dd6e-4b21-4b4f-945c-9c7b64b1267e&context=ubx	Scopus

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10	Advance Drug Delivery System for Targeting Carcinomas	Rupesh K. Gautam	Pharmacology	Cancer Vaccination and Challenges	2024	9.781E+12	https://www.taylorfrancis.com/chapters/edit/10.1201/9781003503071-3/advance-drug-delivery-system-targeting-carcinoma	https://www.taylorfrancis.com/books/edit/10.1201/9781003503071/cancer-vaccination-challenges-rishabha-malviya-bhupendra-prajapati-sonali-sundram?refId=abb0dd6e-4b21	Scopus
11	Synthetic DNA Delivery System	Dr. Pritesh Paliwal, Dr. nadeem Farooqi	Pharmaceutics and Pharmacognosy	Future Trends in biotechnology	2024	e-ISBN: 978-93-6252-862-9	https://doc-0c-8k-apps-viewer.googleusercontent.com/viewer/secure/pdf/o8qneuai0n9q2hsgmpkuj77dagn2utuq/cbdqnd80hb00f4ntepqhkuc1auh9q2m/1733912400000/gmail/	https://doc-0c-8k-apps-viewer.googleusercontent.com/viewer/secure/pdf/o8qneuai0n9q2hsgmpkuj77dagn2utuq/cbdqnd80hb00f4ntepqhkuc1auh9q2m/1733912400000/gmail/	IIP Series
12	Nanotechnology in neurogerenation	Dr. Rupesh Gautam	Pharmacology	Neurodegeneration Nanotechnology in Neurodegenerative Diseases	2024	ISBN: 978-1-0364-1171-8	file:///C:/Users/IIP/Downloads/Neurodegeneration%20Nanotechnology%20in%20Neurodegenerative%20Diseases_hard_man_v1.pdf	file:///C:/Users/IIP/Downloads/Neurodegeneration%20Nanotechnology%20in%20Neurodegenerative%20Diseases_hard_man_v1.pdf	Scopus
13	Nanotechnology AN Emerging Arsenal Against Neurogenrative Disease	Dr. Rupesh Gautam	Pharmacology	Neurodegeneration Nanotechnology in Neurodegenerative Diseases	2024	ISBN: 978-1-0364-1171-8	file:///C:/Users/IIP/Downloads/Neurodegeneration%20Nanotechnology%20in%20Neurodegenerative%20Diseases_hard_man_v1.pdf	file:///C:/Users/IIP/Downloads/Neurodegeneration%20Nanotechnology%20in%20Neurodegenerative%20Diseases_hard_man_v1.pdf	Scopus
14	Liposomal system in neurogeneration	Dr. Rupesh Gautam	Pharmacology	Neurodegeneration Nanotechnology in Neurodegenerative Diseases	2024	ISBN: 978-1-0364-1171-8	file:///C:/Users/IIP/Downloads/Neurodegeneration%20Nanotechnology%20in%20Neurodegenerative%20Diseases_hard_man_v1.pdf	file:///C:/Users/IIP/Downloads/Neurodegeneration%20Nanotechnology%20in%20Neurodegenerative%20Diseases_hard_man_v1.pdf	Scopus
15	The Role of Tissue Engineering in the Treatment of Degenerative Diseases	Rupesh K. Gautam	Pharmacology	Computational Approaches in Biotechnology and Bioinformatics	2024	eBook ISBN978100335 4437	Computational Approaches in Biotechnology and Bioinformatics : Pranav (taylorfrancis.com)	https://www.taylorfrancis.com/chapters/edit/10.1201/9781003354437-6/role-tissue-engineering-treatment-degenerative-diseases-hitesh-malhotra-sweta-kamboj-amrit-sarwara-rudraksh-tanu-devi-rupesh-gautam?context=ubx&refId=18e61e41-86b1-4a42-8df4-770a7c3bb88a	Scopus

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17	practical hand book of Pharmaceutical Microbiology	Nayany Sharma, Shivani Vishwakarma	Pharmaceutics	Pritam Publication	2024	ISBN No.978-93-5735-920-7	Print	pritam+publications&oq=pritam+publication&gs_lcrp=EgZjaHJvbWUqBwgAEAAYgAQyBwgAEAAYgAQyBggBEEUYOTIICAIQABgWGB4yCAgDEAAYFhgeMg0IBBAAGIYDGIAEGIoFMg0IBRAAGIYDGIAEGIoFMg0IBhAAGIYDGIAEGIoFMgoIBxAAGIAEGKIE0gEJOTQ5MGowajE1qAIIsAIB	Print
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19	Biobased Nanomaterials in Biomedical Applications	Dr. Rupesh Gautam	Pharmacology	Biobased Nanoparticals	2024	337-362	https://link.springer.com/chapter/10.1007/978-981-97-0542-9_6	https://www.taylorfrancis.com/chapters/edit/10.1201/9781003354437-6/role-tissue-engineering-treatment-degenerative-diseases	Springer link
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22	Biomedical Applications of Chitosan and Its Derivatives	Rupesh K. Gautam	Pharmacology	Biopolymers for Biomedical Applications	2024	Online ISBN:9781119865452	Biopolymers for Biomedical Applications | Wiley Online Books	https://doi.org/10.1002/9781119865452.ch2	Scopus

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26	Synergistic Effect of Vaccines and Chemotherapeutic Agents in Combating Different Carcinomas	Dr.Rupesh K. Gautam	Pharmacology	Cancer vaccination and challenges	2024	9.781E+12	1. https://link.springer.com/chapter/10.1007/978-3-031-66421-2_3/2. https://www.taylorfrancis.com/chapters/edit/10.1201/9781003503071-3/advance-drug-delivery-system-targeting-carcinomas-hitesh-malhotra-sweta-kamboj-ashna-gupta-kartik-babbar-rupesh-gautam?context=ubx&refId=005f9200-7040-4350-a52d-78e39874c739.3. https://www.taylorfrancis.com/chapters/edit/10.1201/9781003503071-6/synergistic-effect-vaccines-	https://www.taylorfrancis.com/chapters/edit/10.1201/9781003503071-6/synergistic-effect-vaccines-chemotherapeutic-agents-combating-different-carcinomas-hitesh-malhotra-rohit-kamboj-amrit-sarwara-sumit-arora-rupesh-gautam	Scopus
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29	A Textbook of Pharmacology-III (Book)	Dr. Praveen Sharma, Dr. Santosh D. Ghule, Dr Pritesh Paliwal, Dr Upendra Singh Bhadoriya	Pharmacology	A Textbook of Pharmacology-III	2023	978-81-19425-12-9	wwwshinebookpublishing.com	NA	
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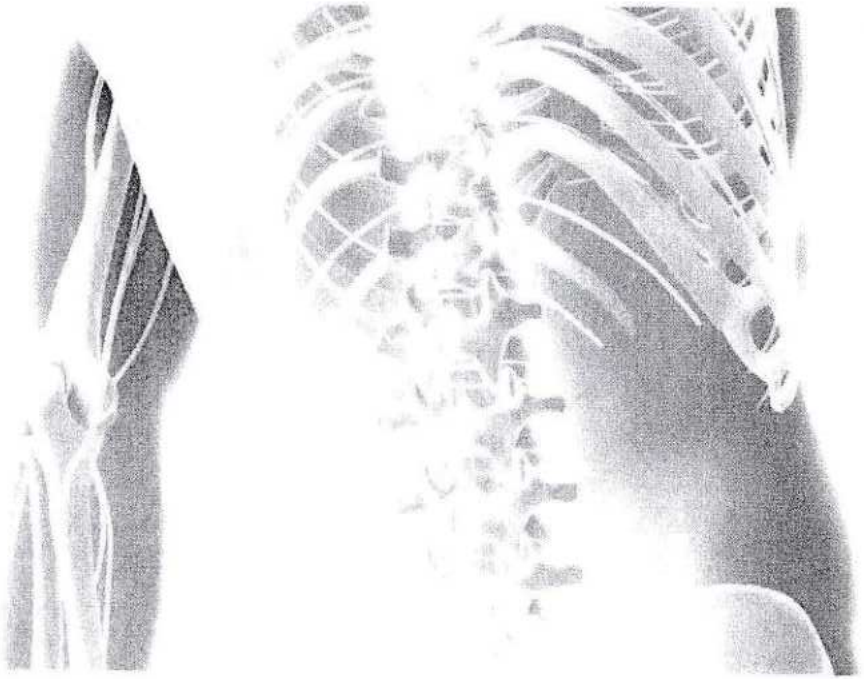

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CHAPTER 9

Regulatory Insights into Artificial Intelligence in Drug Delivery and Medical Devices

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Abstract: The pharmaceutical industry is grappling with challenges that impede the sustainability of drug development programs, primarily due to escalating research and development costs coupled with diminishing efficiency. This chapter explores the potential of leveraging artificial intelligence (AI), particularly machine learning (ML) and its subset, deep learning (DL), to bring about a transformative impact on the drug development process. ML, characterized by its capacity to learn from data with or without explicit programming, holds promise for addressing the complexities inherent in pharmaceutical research. DL, employing artificial neural networks (ANNs) as a multi-objective simultaneous optimization technique, has demonstrated efficacy in optimizing drug delivery systems. AI has the potential to transform drug discovery, clinical trials, drug delivery, and medical devices, emphasizing alignment with regulatory guidelines. However, challenges such as data quality and model complexity limit its transformative impact on medicine delivery and device development.

This chapter is structured into three parts, each addressing a distinct aspect of AI in the pharmaceutical landscape. The first part provides a foundational introduction to AI in the pharmaceutical industry, elucidating its role in overcoming inherent challenges. The second part delves into the diverse applications of AI-based tools and systems, encompassing drug discovery, various drug delivery systems, and the development of medical devices. Finally, the third part of the chapter sheds light on the regulatory challenges associated with AI-based drug delivery and medical device development, offering insights into the evolving regulatory landscape.

Keywords: Artificial intelligence, Drug delivery, Dosage design, Drug development, Deep learning, Drug discovery, Medical devices, Machine learning, Regulatory.

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AI INNOVATIONS IN DRUG DELIVERY AND PHARMACEUTICAL SCIENCES; ADVANCING THERAPY THROUGH TECHNOLOGY

Editors:
Kuldeep Vinchurkar
Sheetal Mane

Bentham Books

CHAPTER 10

Artificial Intelligence in Clinical Trials: The Present Scenario and Future Prospects

Praveen Sharma[1], **Leena Pathak**[1], **Rohit Doke**[2,*] and **Sheetal Mane**[3]

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Abstract: The completion of clinical trials represents a critical phase of 10 to 15 years, with 1.5–2.0 billion USD spent during the drug development cycle. This stage not only consumes significant financial resources but also carries the weight of substantial preclinical development costs. The failure of a clinical trial results in a staggering loss ranging from 800 million to 1.4 billion USD, underscoring the high stakes involved in drug development. Two primary contributors to the elevated trial failure rates are suboptimal patient cohort selection and recruiting methods, along with challenges in effectively monitoring patients throughout trials. Remarkably, only one out of every ten compounds entering a clinical trial successfully makes it on the market. AI holds the promise to revolutionize key aspects of clinical trial design, ultimately leading to a substantial increase in trial success rates. By leveraging AI, improvements can be made in patient cohort selection, refining recruitment techniques, and enhancing real-time monitoring during trials. The integration of AI in these pivotal stages of clinical trials offers a pathway to mitigate the financial risks associated with trial failure, fostering a more efficient and effective drug development process. This book chapter delves into the application of AI techniques, including DL, NLP, DeepQA technology, DRL, HMI, and other advanced methodologies in the context of clinical trials. This abstract provides an overview of how AI interventions can reshape the landscape of clinical trials, offering a glimpse into the present scenario and prospects at the intersection of artificial intelligence and drug development.

Keywords: Artificial Intelligence, AI in healthcare, Clinical trials, Cohort composition, Clinical trial automation, Drug development, Deep learning, Machine learning, Medical imaging, Patient selection, Patient monitoring.

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Kuldeep Vinchurkar & Sheetal Mane (Eds.)

Marine Biopolymers
Processing, Functionality and Applications
2025, Pages 441-468

Chapter 15 - Marine biopolymers in cancer therapeutics

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Abstract

Conventional cancer chemotherapy has some drawbacks, including low bioavailability, a superior rate of drug degradation, nontarget distribution, systemic toxicity, and drug resistance in cancer cells. In cancer therapy, these restrictions frequently result in therapeutic failure. The drug delivery platforms based on marine biopolymers have gained attention as a viable method to get around the drawbacks of traditional chemotherapy techniques. Marine biopolymers' adaptability and multifunctionality endow them with bio-responsive properties. They display changes in the size of chain, shape, solubility, dimensions, intermolecular interactions, secondary structures, etc., in response to a variety of physiological stimuli. The compounds from the ocean play a significant and

including fucoidan, alginate, polysaccharides, carrageen, chitosan, and porphyrin exhibited significant anticancer activities. The main commercial sources of chitosan, a partly deacetylated derivative of chitin, are the shells of marine crustaceans such as crab and shrimp. This chapter presents a thorough analysis of the function of marine biopolymer in the delivery of anticancer drugs.

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Marine Biopolymers
Processing, Functionality and Applications
2025, Pages 423-440

Chapter 14 - Marine biopolymers in implants

Isha Goyal [1], Raghav Tandon [1], Pooja Mittal [1], Ramit Kapoor [2], Rupesh K. Gautam [3], Shakeel Ahmed [4 5]

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Abstract

Biopolymers are nontoxic, biodegradable, biocompatible and have excellent flexibility properties, which are for medical purpose and implantable medical devices. Several research studies have been undertaken to demonstrate the potential of biomaterials in tissue engineering, tissue regeneration, promote healing, systems for drug delivery, and therapeutic implants as the need for them grows. Implants are devices that mimic a biological component and are employed to replace a destroyed organ in order to maintain normal body function. While materials such as metals, ceramics, and polymers are employed in the creation of medical implants, they have drawbacks such as immunologic rejections by the body, high cost. Bacteria, insects, crabs, and shrimp produce marine biopolymers in the marine environment. Marine resources have become more well-known and sought-after as having to cut resources for the production of biopolymers such as proteins and polysaccharides. Biopolymers including such proteins, polyesters, cationic polysaccharide, anionic carbohydrates, natural polysaccharides, and others are abundant in marine species such as plants, animals, algae, and certain microbes. This chapter focuses on marine biopolymers, which are employed or can be utilized to create implants, despite the fact that silk, polylactic acid, alginate, chitosan, and gelatin are all biopolymers that can be employed in the healthcare system. The approach of these biopolymers in several medical devices utilized in various medical sectors such as cardiology, dermatology, orthopedics, and ophthalmology is also discussed here.

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Marine Biopolymers
Processing, Functionality and Applications
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Chapter 5 - Nanostructured marine biopolymers in therapeutics and their toxicity

Hitesh Malhotra [1], Pooja Mittal [2], Shakeel Ahmed [3 4], Rupesh K. Gautam [5]

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Abstract

Materials that make up marine animals have a wide variety of qualities and traits that could support their prospective use in the biomedical industry. The commercial exploitation of marine-derived materials, such as those acquired through the processing of food, not only ensures the sustainable utilization of organic water resource but also provides an intriguing platform for the development of innovative biomaterials with favorable environmental and economic implications. In addition to ensuring the sustainable use of organic water resource, the commercial exploitation of materials from marine source, like those acquired through the processing of food, offers a particularly exciting source for novel biological materials development with favorable environmental as well as economic implications. intriguing platform for the development of innovative biomaterials with favorable effects on the economy and the environment. According to this viewpoint, a growing number of various sorts of substances are being extracted from aquatic creatures and converted into valuable medical products, such as advanced drug delivery system. Alginates, agar, chitosan, carrageenans, chitin, glycosaminoglycans, collagen, and biosilica are highlighted in this chapter. The final section of this chapter examines the usage of the aforementioned products in particular biomedical applications, particularly their contribution to the creation of tissue engineering scaffolds and precise drug delivery systems.

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Marine Biopolymers
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2025, Pages 61-104

Chapter 3 - Advancements in nanofabrication of marine biopolymers

Usha Singh [1], Manisha Bhatia [2], Manish Kumar [3], Rupesh K. Gautam [4], Pankaj Popli [5]

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https://doi.org/10.1016/B978-0-443-15606-9.00003-6

Abstract

From the beginning of human civilization, there has been an unavoidable reliance of human beings on man-made polymers for various purposes ranging from food packaging to clothing, medicines, building furniture, and much more. Uncontrollable exploitation of synthetic polymers without proper disposing creates adverse impacts on our surroundings and environment, which ultimately leads to different types of pollution and other serious hazards. Keeping these problems in mind, researchers from different fields focused their approach on biopolymers, which are obtained from natural sources. Among them, biopolymers obtained from marine sources are gaining more attention these days as they cause very little or no harm to environment and can get easily decomposed. These biopolymers are obtained from different marine organisms like bacteria, algae, seaweeds, mollusks, crustaceans, fungi, and fishes. Variety of polymers including proteins, polysaccharides, agar, cellulose, chitin, chitosan, fucoidans, gelatin, and alginates, are extracted from above-mentioned marine organisms by various techniques. These polymers possess a range of benefits, like eco-friendly nature, self-degradability, and sustainable sources. Apart from these merits, marine biopolymers on coupling with nanofabrication techniques prove to be advantageous over conventional forms of polymers. These nanofabricated structures hold greater benefits having higher entrapment efficiencies, enhanced surface area, resemblance to natural extracellular matrix structure. Rigorous research in nanotechnological aspect of these biopolymers leads to the development of various nanofabricated structures like nanofibers, nanoparticles, nanotubes, nanohybrids, nanocomposites, quantum dots and dendrimers. These nanostructures can be employed in diverse fields involving biomedical applications, tissue engineering, drug delivery

to achieve greater benefits for the welfare of the mankind.

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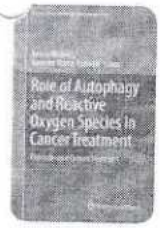
Unveiling Therapeutic Targets: Targeting Mitochondrial ROS for Anticancer Therapy

| Chapter | First Online: 01 September 2024

| pp 47–71 | Cite this chapter



Role of Autophagy and Reactive Oxygen Species in Cancer Treatment

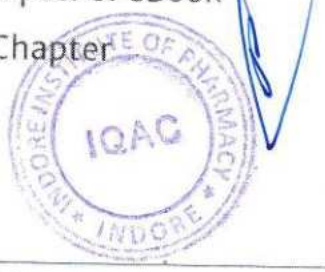
Rakesh Pahwa, Karan Wadhwa, Rohil Panwar, Jasmine Sagwal, Gurvirender Singh, Hardeep Singh Tuli & Rupesh K. Gautam

Part of the book series: Cancer Drug Discovery and Development ((CDD&D))

Abstract

Despite energy metabolism, apoptosis regulation, and cell signaling; mitochondria are also indispensably accountable for cancer initiation and progression, as affirmed by several studies. Furthermore, mitochondria are the most important site for the generation of

reactive oxygen species (ROS), responsible for the preservation of redox balance; its overproduction also endorses cancer growth by modulating gene expressions and participation in various signaling pathways, thereby inducing genomic instability. Since tumor cells have long been found to reveal altered mitochondrial structure and function, thus, targeting mitochondria has emerged as a possible intervention for cancer therapies. Nonetheless, numerous stratagems have been proposed to date for selective delivery to mitochondria. Due to the low efficacy and toxicities of currently using mitochondria-targeting anticancer agents as an effective anticancer therapy, mitochondria-targeting nanotechnologies have emerged as a novel approach that has been demonstrated to be effective in cancer therapies in both in vitro and in vivo studies. Currently, numerous types of nanomaterials including polymeric, lipid, metallic, magnetic, silica, semiconductor, and graphene oxide nanoparticles have been fabricated for mitochondria-targeted cancer therapies to augment cancer cell destruction. In consistent, the present book chapter aims to abridge the possible role of mitochondrial ROS on cancer progression and gives a summary of the possibilities to target mitochondria for anticancer therapies.



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Chapter

Synergistic Effect of Vaccines and Chemotherapeutic Agents in Combating Different Carcinomas

By Hitesh Malhotra (/search?contributorName=Hitesh Malhotra&contributorRole=author&redirectFromPDP=true&context=ubx), Rohit Kamboj (/search?contributorName=Rohit Kamboj&contributorRole=author&redirectFromPDP=true&context=ubx), Amrit Sarwara (/search?contributorName=Amrit Sarwara&contributorRole=author&redirectFromPDP=true&context=ubx), Sumit Arora (/search?contributorName=Sumit Arora&contributorRole=author&redirectFromPDP=true&context=ubx), Rupesh K. Gautam (/search?contributorName=Rupesh K. Gautam&contributorRole=author&redirectFromPDP=true&context=ubx)

Book Cancer Vaccination and Challenges (https://www.taylorfrancis.com/books/mono/10.1201/9781003503071/cancer-vaccination-challenges?refId=4fc5f63d-eb5b-4b1e-a36c-ce4a5955e340&context=ubx)

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ABSTRACT

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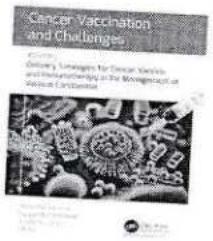

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Advance Drug Delivery System for Targeting Carcinomas

By Hitesh Malhotra (/search?contributorName=Hitesh Malhotra&contributorRole=author&redirectFromPDP=true&context=ubx), Sweta Kamboj (/search?contributorName=Sweta Kamboj&contributorRole=author&redirectFromPDP=true&context=ubx), Ashna Gupta (/search?contributorName=Ashna Gupta&contributorRole=author&redirectFromPDP=true&context=ubx), Kartik Babbar (/search?contributorName=Kartik Babbar&contributorRole=author&redirectFromPDP=true&context=ubx), Rupesh Gautam (/search?contributorName=Rupesh Gautam&contributorRole=author&redirectFromPDP=true&context=ubx)

Book Cancer Vaccination and Challenges ()

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ABSTRACT

The development of innovative vaccine delivery techniques, such as colloidal immunostimulatory delivery systems, is a multidisciplinary scientific field that is currently experiencing rapid progress through immunotherapy and gene therapy-based treatment. Due to the weak immunogenicity of tumor antigens (TAs), formulation strategies for cancer vaccines (CVs) play a crucial role. A colloidal vaccine delivery system can alter the kinetics, body distribution, uptake, and release of the vaccine. This chapter examines recent studies focusing on the development of colloidal vaccine delivery systems for more precise cancer therapies. Various carrier systems, including viruslike particles (VLPs), polymeric micro- and nanoparticles (NPs), liposomes, and archaeal lipid liposomes, are utilized. Additionally, several technologies for drug delivery have been developed to enhance lymphatic channels and lymph node uptake, resulting in a targeted immune response for cancer control. Numerous antigens associated with malignancies serve as excellent targets for immunotherapy and vaccine development. To achieve superior therapeutic outcomes, optimally developed CVs should combine the most effective TAs with the best immunotherapy drugs and delivery techniques. Alongside NPs, platforms for vaccine delivery are gaining increasing interest. Furthermore, NP-based vaccine distribution technology holds great potential for enhancing vaccine immune-gene city. Consequently, this chapter encompasses a variety of dosage forms currently used to administer chemotherapeutic drugs to patients with different types of carcinomas.

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SYNTHETIC DNA DELIVERY SYSTEM – A BRIEF OVERVIEW

Abstract

The development of synthetic DNA delivery systems has revolutionized various fields of science and medicine, enabling precise control over the delivery of genetic material for therapeutic, research, and biotechnological applications. This brief overview highlights the key concepts and advances in synthetic DNA delivery systems. It explores the principles of designing and optimizing these systems, the challenges they address, and the potential they offer in gene therapy, genome editing, and synthetic biology. By examining the diverse techniques and innovations in this domain, this abstract provides a foundational understanding of the crucial role synthetic DNA delivery systems play in the advancement of modern science and medicine.

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TABLE OF CONTENTS

CHAPTER ONE

NANOTECHNOLOGY IN NEURODEGENERATION

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Abstract

Neurodegenerative illnesses, such as Parkinson's disease, multiple sclerosis, epilepsy, and Alzheimer's disease, affect about 1 million people. Due to the brain's complexity, CNS issues are of the utmost importance. To treat neurodegenerative diseases and address issues with toxicity, specificity, and delivery, a variety of medications are available. The blood-brain barrier (BBB), for example, poses a problem because it prevents therapeutic drugs from passing through and reaching their intended target. The BBB is a barrier that prevents drugs from reaching target sites, so researchers have been looking for ways to open it up. These challenges underscore the necessity of utilizing nanotechnology to manipulate or regulate diverse cellular processes to attain the desired traits. Nanoparticles are a potent substitute for drug administration and other methods because they can cross the BBB due to their nanosize. Nanotechnology has the potential to enhance CNS disorder diagnostic and therapeutic approaches, as well as facilitate efficient drug delivery. With the aid of nanoengineering, medications can be modified to perform tasks such as crossing the BBB, targeting particular cells, modifying signaling pathways, transferring beneficial genes, and promoting nerve cell regeneration and preservation. With a particular emphasis on potential future applications, this chapter

focuses on the most cutting-edge current nanotechnology applications in the treatment and diagnosis of the most prevalent ND.

Keywords: Neurodegenerative diseases; Nanoparticles; CNS issues; Blood-brain barrier; Nanotechnology

Introduction

The progressive loss of a neuron's structure or function, which is frequently accompanied by neuronal death, is the hallmark of neurodegenerative diseases (ND). Examples include prion disease (PrD), Alzheimer's disease (AD), Parkinson's disease (PD), and amyotrophic lateral sclerosis (ALS).

There are still a few effective early diagnosis and treatment options for many ND, despite notable advancements and a wealth of research on the subject. One of the most important barriers is the blood-brain barrier (BBB), which prevents the majority of drugs and imaging agents from entering and having side effects outside the brain. Current options for diagnosing and treating brain diseases are frequently determined by vascular lesions and BBB leakage (Gabathuler, 2010, 50). An innovative and promising technique is nanotechnology, which makes use of materials or devices that are created on a scale of 1 to 100 billionths of a metre (1-100 nm) (Fernandes et al., 2010, 166). The use of NM (nanofibres, nanotubes, nanoparticles, and nanogels) in biomedicine is currently widespread, with a wide range of physicochemical properties.

Because of their adaptability, engineered nanomaterials (NM) are appealing to the biomedical sector. While chemical functionalization can provide targeting specificity, their physical properties, for instance, can be used for tissue engineering and regeneration as well as diagnosis and/or therapy. NM can function to help drugs and/or contrast agents penetrate the BBB or can cross it on their own (Fernandes et al., 2010, 166). Additionally, NM can be administered orally, inhaled, or parenterally and may contain both hydrophilic and hydrophobic molecules. With a particular emphasis on potential future applications, this chapter focuses on the most cutting-edge current nanotechnology applications in the treatment and diagnosis of the most prevalent ND.

CHAPTER EIGHT

NANOTECHNOLOGY: AN EMERGING ARSENAL AGAINST NEURODEGENERATIVE DISEASES

POOJA MITTAL[1], RAMIT KAPOOR[2], RUPESH K. GAUTAM,[3] SHAKEEL AHMED[4,5] AND HIMANSHU SHARMA[1]

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Abstract

The nanotechnology field especially in case of healthcare, has become a revolutionary concept with enormous potential for diagnosing and treating neurodegenerative disorders. Alzheimer's, Parkinson's, and Huntington's illnesses and many more blood brain barrier related problems are among the examples of the neurodegenerative conditions which causes serious risks to public health. By providing effective and personalized solutions for illness detection and treatment, the nanotechnology-based approach provides the awesome solutions to these problems and the tolls are approachable and promising too. The development of extremely sensitive and targeted diagnostic tools for illness detection has been made

possible by nanotechnology. To get the disease-specific biomarkers and facilitate early diagnosis, functionalized nanoparticles nanoparticles attached with a particular ligand/ antibody can pave the role. Moreover, nanosensors and nanoprobes provide real-time monitoring of disease development and therapeutic response. In conclusion, the diagnosis and treatment of neurodegenerative disorders show enormous promise for nanotechnology. Researchers are paving the path for more precise diagnostics, targeted therapeutics, and regenerative techniques by using the special characteristics of nanotechnology.

Key words: Nanotechnology, Neurodegerative disease, Parkinson's disease, Huntington's disease, detection etc.

1. Introduction

Science and engineering are rapidly advancing in the field of nanotechnology. It entails the manipulation of matter at the atomic and molecular level, as well as the design, production, and use of materials and devices with sizes ranging from a few nanometers to several hundred. The diameter of a human hair is around a thousand times larger than this size.

Because of their small size, nanomaterials have special properties that can be superior to those of their bulk counterparts in terms of mechanical, optical, magnetic, and electronic capabilities. These characteristics have made a wide range of prospective applications in numerous industries possible, including electronics, healthcare, energy generation, and environmental remediation. (Barbosa et al., 2019; Kabanov & Gendelman, 2007; Mohid & Bhunia, 2020; Silva et al., 2015)

The study of nanotechnology is a multidisciplinary field that integrates concepts and methods from physics, chemistry, materials science, and engineering. It also entails creating fresh methods for studying and interacting with materials at the nanoscale, such as molecular self-assembly methods and scanning probe microscopy. (Silva et al., 2015)

As with any rapidly developing technology, there are potential risks and ethical issues with nanotechnology, such as the potential toxicity of particular nanomaterials and the effects of their widespread use. Nevertheless, ongoing investigation and regulation are aimed at addressing these issues and ensuring the responsible and safe advancement of nanotechnology. (Röthlisberger et al., 2017; Srikanth & Kessler, 2012)

Medicinal delivery using nanotechnology has been used to improve the efficacy and security of medicinal therapy. Drugs can be delivered to specific cells or tissues in the body by creating nanoparticles, which boosts

CHAPTER ELEVEN

LIPOSOMAL SYSTEM IN NEURODEGENERATION

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Abstract

Due to the ageing of the global population during the past ten years, neurodegenerative (ND) illnesses have become significantly more prevalent. Despite the extensive research supported by the scientific community, no effective treatment has yet been proposed. The majority of medications are only able to reduce the severity of symptoms; whether they are administered orally or intravenously, their effectiveness is severely constrained by their inability to cross the blood brain barrier and reach the central nervous system (CNS). To stop or reverse cognitive decline, new medications that target important diseases are needed. However, typical small molecule medications or biological treatments have had a shockingly high failure rate in clinical studies. A practical and prospective drug delivery method for ND that has not yet entered clinical trials is targeted nanoliposomes. They have the ability to transport a wide range of therapeutic compounds via the blood-brain barrier (BBB) and into brain cells because they are biocompatible, extremely flexible, and biocompatible. They can be adapted to lengthen blood circulation time and can be focused on a single diseased target or a number of them. Currently, there is a lot of scientific interest in creating multifunctional liposomes by combining different changes. This chapter focuses on current liposomal methods for treating ND, including the mechanisms that help them penetrate the BBB.

Keywords: Alzheimer disease, Blood Brain Barrier, Lipososmes, Nanocarriers, Neurodegeneration, Parkinson disease.

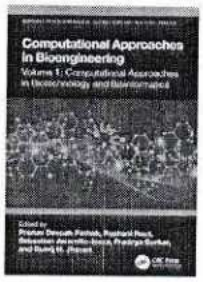
1. Introduction

Pharmacological research aims to create innovative and effective pharmaceutical ways to treat diseases while also improving patients' life quality. Considering that a drug's efficacy is entirely dependent on the route of administration and its inherent capacity to access the organs and tissues at the right times and in the right amounts, numerous studies aim to discover novel medications. Drug retention is especially difficult in specific region of the body, like CNS (central nervous system), where the presence of a BBB (blood brain barrier) is a significant obstacle. The BBB frequently hinders neuro-reparative and neuro-protective medicines that should operate pharmacologically directly at the intended location. As indicated by the latest accessible information, neurological illnesses will affect 10% of the world's population, regardless of geography or socioeconomic status (WHO, 2006). As a result, the World Health Organisation urged that tremendous efforts must be made to address the challenges in the administration of brain medications. Monoclonal antibodies, recombinant proteins, and genes, among other medications used to treat neurological conditions, are believed to be unable to successfully cross BBB. This is because of their high molecular weight, polarity, and inability to utilize specialized transport mechanisms (Pardridge, 2012). As a result, the BBB's regulation mechanisms are critical for the development of new therapeutics for wide groups of brain disorders such as neurodegenerative illnesses.

2. Neurodegenerative Diseases

Age-related illnesses are becoming more common, in part due to an increase in the older population in recent years (Heemels, 2016). Parkinson's illness, Alzheimer's infection, Amyotrophic horizontal sclerosis, Huntington's sickness, frontotemporal dementia, and spinocerebellar ataxia are instances of neurodegenerative issues. These pathologic properties however are related with cognitive decline, mental weaknesses, and other adverse consequences, for example, a powerlessness to move, inhale, or speak (Abeliovich, 2016). These issues are recognized by particular neuronal powerlessness and degeneration of specific mind districts; additionally, an aberrant protein deposit (extracellular or intracellular) develops in neurons or other types of brain cells (Ross, 2004).

Chapter



The Role of Tissue Engineering in the Treatment of Degenerative Diseases

By Hitesh Malhotra (/search?contributorName=Hitesh Malhotra&contributorRole=author&redirectFromPDP=true&context=), Sweta Kamboj (/search?contributorName=Sweta Kamboj&contributorRole=author&redirectFromPDP=true&context=), Amrit Sarwara (/search?contributorName=Amrit Sarwara&contributorRole=author&redirectFromPDP=true&context=), Rudraksh (/search?contributorName=Rudraksh&contributorRole=author&redirectFromPDP=true&context=), Tanu Devi (/search?contributorName=Tanu Devi&contributorRole=author&redirectFromPDP=true&context=), Rupesh K. Gautam (/search?contributorName=Rupesh K. Gautam&contributorRole=author&redirectFromPDP=true&context=)

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ABSTRACT

Tissue engineering is a developing branch as a science and as an industry. Tissue engineering works on a biomaterial frame; obtained from any tissue part or entire organism. Tissue engineering is beyond the field of research in the regeneration of tissues, employing a platform modifiable physiologically with the improvised capacity, novel therapeutics into the clinical therapeutics by forming an understanding of the concept of molecular biology, anatomy, physiology and structural biology. Tissue engineering is also involved in regenerative medicines along with self-healing. The terms "tissue engineering" and "regenerative medicine" had become largely interchangeable. Modifications in screening tools are made that identify important parameters of components for applications that need detailed fusion of structure functions. The study describes various current advancements in neurological disorders and mainly on animal and human translation for scaffolding technology in multiple neurodegenerative diseases. Thus analyse the ongoing status and processes that decreases trials and error more based on rational design. This plays a main role in driving future applications in regenerative medicine.

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16

Chapter

Significance of Artificial Intelligence in the Recognition, Characterization, and Prediction of Hepatocellular Carcinoma

By Smriti Parashar (/search?contributorName=Smriti Parashar&contributorRole=author&redirectFromPDP=true&context=ubx), Rupesh K. Gautam (/search?contributorName=Rupesh K. Gautam&contributorRole=author&redirectFromPDP=true&context=ubx)

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ABSTRACT

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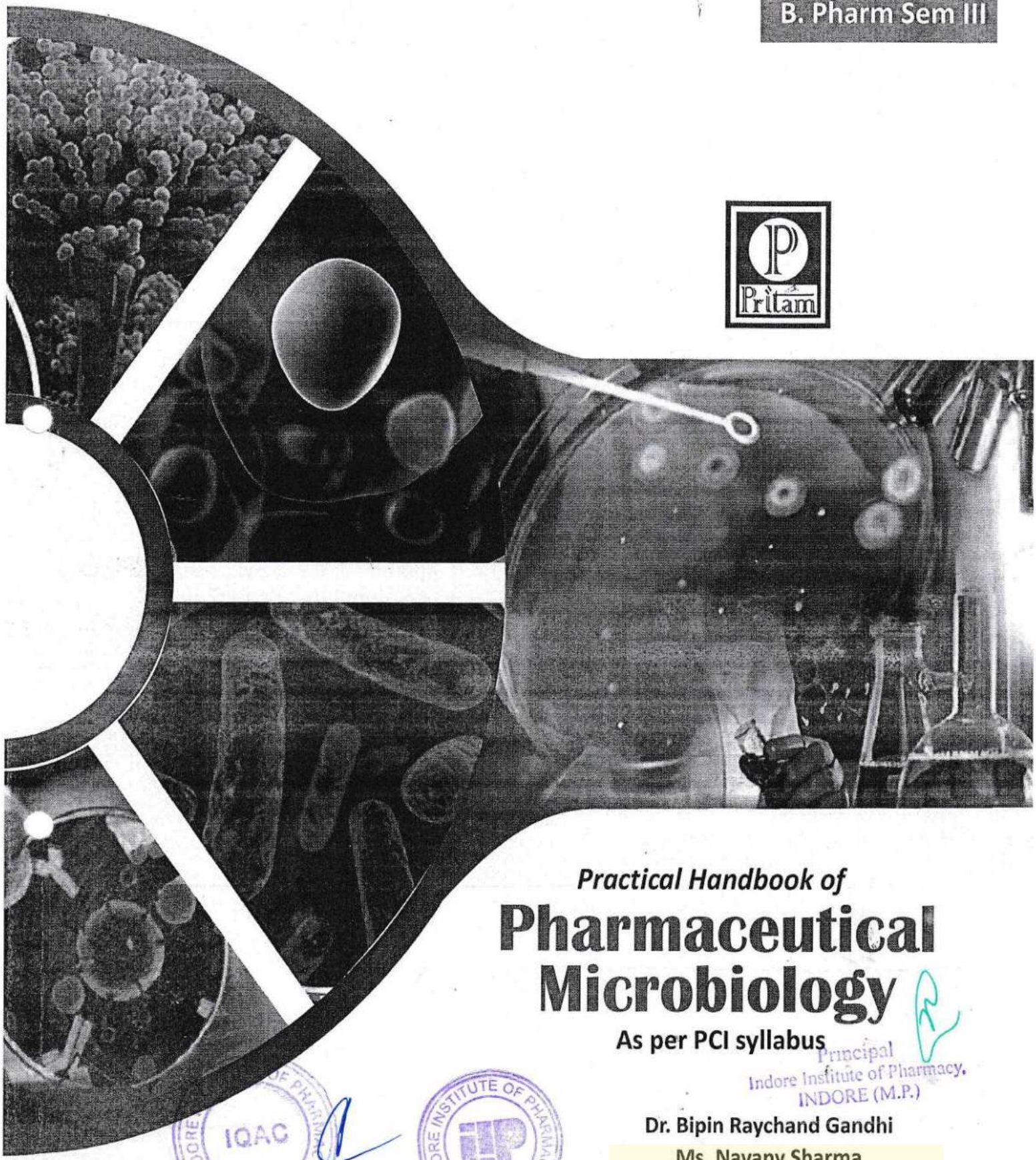

Practical Handbook of

Pharmaceutical Microbiology

As per PCI syllabus

Dr. Bipin Raychand Gandhi
Ms. Nayany Sharma
Mrs. Shivani Vishwakarma
Mr. Sandeep Singh Bhadoriya

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18

Home > Biobased Nanomaterials > Chapter

Biobased Nanomaterials in Malignancy

Chapter | First Online: 14 May 2024
pp 137–362 | Cite this chapter

Biobased Nanomaterials

Hitesh Malhotra & Rupesh K. Gautam

Abstract

Bio-based nanomaterials have received a lot of interests in the field of cancer therapy due to their strong properties, including homologous pharmaceuticals, synergistic properties, biological compatibility, biodegradability, and biological safety. The five main types of bioactive compounds for cancer and their applications in biobased nano-formulation for

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Biobased Nanomaterials in Biomedical Applications

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Biobased Nanomaterials

Pooja Mittal, Himanshu Sharma, Ramit Kapoor, Rupesh K. Gautam, Nitika Garg & Sanchit Dhankhar

Abstract

Biobased materials are goods whose primary ingredients were first taken from living things. The hybrid science known as nanobiotechnology, which was created by the fusion of the two potent technologies of nanotechnology and biotechnology, is a reflection of science's expanding capacity to conduct research at scales higher than the molecular one and produce useful outcomes. The significance of all of them is shown in the large number of research articles on nanocomposites and bionanomaterials. Their naturally formed, biocompatible, biodegradable aqueous polymeric and benign substrates make them ideal for a wide range of biomedical applications. Certain tissues and living organisms are considered to be a representative example of a nanocomposite, which is the reason nanostructured materials are believed to play a significant role in biomedical research. Tissue engineering and implants as well as nanomedicine are two areas where nanobiotechnology is useful. Research and development in several fields of nanobiotechnology aims to provide extremely effective biosensors, nanoscale microchips, molecular switches, and tissue analogs for the skin, muscles, bones, and other human organs. Many biomedical applications, including innovative tissue engineering scaffolds, focused drug delivery systems, biosensors, etc., have been researched for metallic, ceramic, polymeric, and composite nanomaterials in-depth. Tissue engineering and health care cover the identification, management, and avoidance of diseases with a long-term objective of improving people's quality of life by developing modern facilities materials and therapies based on scaffolds and drug delivery. The main objective of this review is to give the readers an overview of the application of bio-based nanomaterial.

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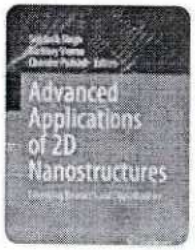

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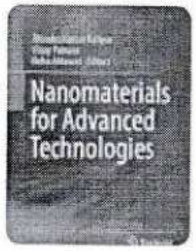

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Biodegradability and Sustainability of Biobased Nanomaterials

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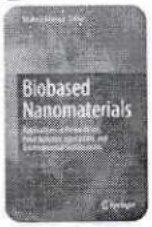

Biobased Nanomaterials

Deepshi Arora, Manish Kumar, Shailendra Bhatt, Rupesh K. Gautam & Yugam Taneja

Abstract

Biobased nanomaterials have garnered increasing attention in recent years due to their potential for reducing the environmental impact of materials. To ensure that these materials are sustainable and biodegradable, it is important to consider both their biodegradability and sustainability. Biodegradability refers to the ability of a material to be broken down into simpler, nontoxic substances, while sustainability refers to the ability of a material to be produced and used in a way that does not harm the environment. Biobased nanomaterials have the potential to be more sustainable than traditional materials because they can be

derived from renewable sources and have a lower carbon footprint. However, it is important to consider the entire life cycle of the material to ensure its sustainability. Researchers are exploring various strategies for promoting the biodegradability and sustainability of biobased nanomaterials, such as using biodegradable polymers or designing materials that can be broken down by specific enzymes. Overall, it is important to continue developing and promoting sustainable and biodegradable biobased nanomaterials to reduce the environmental impact of materials and promote a more sustainable future.

21

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DATA INTEGRITY - A CRUCIAL REQUIREMENT FOR PHARMACEUTICAL INDUSTRIES REGULATORY COMPLIANCE

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Abstract:

In the dynamic realm of pharmaceuticals, the assurance of data integrity emerges as a linchpin for achieving and sustaining regulatory compliance. This book chapter meticulously explores the multifaceted dimensions of data integrity, dissecting its significance within the stringent frameworks governing the pharmaceutical industry. Acknowledging data as the lifeblood of drug development and production, the chapter scrutinizes the profound impact that lapses in data integrity can exert on the quality, safety, and efficacy of pharmaceutical products. Navigating through the complex terrain of regulatory requirements, the chapter elucidates key concepts underpinning data integrity, ranging from the fundamental principles to the intricacies of implementation. It delves into the challenges inherent in maintaining data integrity throughout the product life cycle, addressing issues such as data accuracy, completeness, and consistency. Practical insights are offered on establishing robust data management systems that not only meet regulatory expectations but also elevate overall operational efficiency. With a focus on proactive measures, the chapter outlines best practices for data governance, validation, and documentation. Case studies and real-world examples underscore the tangible consequences of inadequate data integrity, emphasizing the critical need for a steadfast commitment to regulatory compliance. By synthesizing theoretical frameworks with practical guidance, this chapter serves as a comprehensive resource for pharmaceutical professionals striving to fortify their systems against data integrity vulnerabilities. Ultimately, the pursuit of data integrity is portrayed not merely as a regulatory obligation but as a fundamental ethical imperative, safeguarding public health and reinforcing the industry's commitment to the highest standards of quality and transparency.

Cite this: *Ankita Bhadoriya, Kuldeep Vinchurkar, Shivangi Patidar, Praveen Sharma, Pritesh Paliwal, Bimlesh Kumar Rathore, "DATA INTEGRITY - A CRUCIAL REQUIREMENT FOR PHARMACEUTICAL INDUSTRIES REGULATORY COMPLIANCE", Futuristic Trends in Chemical Material Sciences & Nano Technology Volume 3 Book 13,IIP Series, Volume 3, May 2024, Page no.164-183, e-ISBN: 978-93-5747-825-0, DOI/Link: https://www.doi.org/10.58532/V3BECS13P2CH2*

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2

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Chapter 2

Biomedical Applications of Chitosan and Its Derivatives

Hitesh Malhotra, Rupesh K. Gautam

Book Editor(s):Annu

First published: 09 April 2024
https://doi.org/10.1002/9781119865452.ch2

Summary

Chitosan is a naturally occurring polymer obtained from chitin after alkaline deacetylation. Chitosan gains importance nowadays in the food and pharmaceutical industry due to its non-toxic, biocompatible, and biodegradable nature. For the past few years, scientists focus on the potential uses of chitosan as well as other possible sources. Moreover, chitosan derivatives were also developed to broaden the therapeutic potential and biocompatibility. This chapter includes the application of chitosan and its derivatives in the medical field. Chitosan is widely employed for the preparation of hydrogels, sponges, films, and transdermal patches which can be used for biomedical purposes. Chitosan possesses a wide array of pharmaceutical applications such as anti-bacterial, anti-tumor, hemostatic, anti- hyperlipidemic, and wound healing. Chitosan is also used as a carrier for drugs and a vector for gene delivery and thus helps in developing a targeted system. Furthermore, due to the unique properties and characteristics, chitosan biopolymer can be used in green chemistry. Thus, the aim of the chapter is to highlight the biomedical application of chitosan and its derivatives with the possible mechanism.

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Biopolymers for Biomedical Applications

Chapter 3

Biomedical Applications of Alginates

Payal Kesharwani, Swapnil Sharma, Vishal Chaudhary, Rajat Goyal, Rupesh K. Gautam

Book Editor(s):Annu

First published: 09 April 2024
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Summary

Alginate is a natural and versatile polymer that has gained significant attention in the biomedical and pharmaceutical industries due to its diverse biological activities and physicochemical properties. Alginate possesses several advantages, such as biocompatibility and ease of gelation, making it suitable for various biomedical applications. Its structural similarity with extracellular matrices of tissues and ability to undergo several critical processes have also contributed to its popularity. The alginate hydrogel's ability to retain a large amount of water provides it with a soft nature, making it effective in wound healing, drug delivery of bioactive molecules, tissue engineering, and other biomedical research and engineering fields. Modern technological advancements in alginate research have led to its potential applicability in the form of a matrix for three-dimensional cell lines, antibiotic adjuvants in cell transplantation, and the management of several ailments, including diabetes or neurodegenerative disorders. This chapter aims to provide an overview of the characteristics of alginates and their existing and potential uses and suggest new avenues for future research. The biological and pharmacological mechanisms of alginates are explained, along with their current use and future promise as a drug delivery approach. In conclusion, alginates' multifunctional nature and biocompatibility make them an attractive option for biomedical and pharmaceutical applications. The review highlights the importance of understanding alginate's unique properties and its potential to address current and future biomedical challenges.

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Biopolymers for Biomedical Applications

Chapter 4

Biomedical Applications of Cellulose

Abhishek Kanugo, Pallavi Chaudhari, Rupesh K. Gautam

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Summary

Cellulose is the most extensively available biopolymer owing to its several sources (wood, plants, bacteria, pulp, and cotton). The utilization of nanotechnology enabled to achieve nanocellulose and its different types of cellulose nanocrystals, bacterial nanocellulose, and cellulose nanofibers. Nanocellulose possesses diverse characteristics such as biocompatibility, biodegradability, high surface-to-volume ratio, marked mechanical strength, cheaper price, non-toxicity, and ease of fabrication, which enable its incorporation in the biomedical field for several purposes. Nanocellulose is a versatile biopolymer and finds extensive applications in the biomedical field such as in drug delivery systems, wound dressing, tissue engineering, antimicrobial, implants, etc. Most of these applications were fulfilled by nanocellulose in the form of hydrogels and nanocomposites. The ultimate aim of this book chapter is to provide the extensive use of nanocellulose in the biomedical field and is the most promising biopolymer satisfying the requirements in several fields.

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5

< Back

Chapter 6

Biomedical Applications of Carrageenan

Hitesh Chopra, Rupesh K. Gautam

Book Editor(s):Annu

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Summary

Carrageenan is a sulfated linear polysaccharide comprising D-galactose and 3,6-anhydro D-galactose extracted from some red seaweeds of the Rhodophyceae family. Carrageenan is derived from these red seaweeds. This chapter's goal is to outline current carrageenan medication delivery system uses. In the pharmaceutical business, carrageenan has been studied as a polymer matrix in oral extended-release tablets, as a new extrusion assist for pellet manufacture, and as a carrier/stabilizer in micro/nanoparticle systems. Because of carrageenan's unique properties, such as its high negative charge and gelling, it has been employed as a gelling agent/viscosity enhancer for controlled drug release and long-term retention. It has also been employed to transport cells and regenerate tissue with medicinal macromolecules like carrageenan. Carrageenan's safety and other possible uses will be investigated in the near future.

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Chapter

Synergistic Effect of Vaccines and Chemotherapeutic Agents in Combating Different Carcinomas

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ABSTRACT

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Important Biomarkers for Better Evaluation of Checkpoint Inhibitors and Other Immunotherapies in Lung Cancer

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Immunotherapy Against Lung Cancer

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Abstract

Immune checkpoint blockade has drastically changed the way that cancer is treated, and it also gives cancer patients hope for the future. However, a sizable proportion of individuals continue to show no improvement after receiving this treatment. To predict the effectiveness of immune checkpoint antagonists, it is necessary to include biomarkers. This chapter provides an overview of the prognostic value of well-known biomarkers, including tumour mutational load, tumour-infiltrating lymphocytes, mismatch repair deficiency, and

programmed cell death ligand 1 (PD-L1) expression level. The predictive value of tumour mutations, circulatory variables, immune-related parameters, and gut flora are all covered in this article along with immunotherapy treatment. Further, fresh developing biomarkers that must be confirmed in future clinical research are addressed, as well as potential indicators for illness that progresses excessively.

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Chapter 9

Protein Delivery by Nanoparticles

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Summary

Protein therapy has a significant influence on the treatment of several serious human illnesses. Many clinical proteins, including enzymes, growth regulators, hormones, and mediators, are immunogenic and have limited biological stability due to their fundamentally fragile structure and susceptibility to enzymatic degradation, which may restrict their positive advantages and, in some cases, their utility. The most effective and direct approach to overcome this limitation is to deliver protein by nanotechnology, which delivers the proteins into the target cell to exchange the dysfunctional protein and keep the balance of the organism. These delivery systems include soluble polymers, microparticles, microcapsules, cells, lipoproteins, liposomes, micelles, and dendrimers. These carriers can be targeted by conjugating them with certain proteins or antibodies targeting a particular area of interest. They are sensitive to pH and temperature changes, and have a slow rate of degradation. This chapter outlines the benefits and drawbacks of commercially available methods to deliver proteins and those still in development. Also, it offers a concentrated summary of major advancements in nanoformulations development technology for the administration of clinical proteins as well as potential prospects.

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