

Institution's Innovation Council (IIC)

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INTELLECTUAL PROPERTY RIGHTS CELL

STANDARD OPERATING PROCEDURES (SOPs)

Recognizing the importance of Intellectual Property Rights (IPRs) amongst innovators, researchers, industries, etc. is an important mandate of the National IPR Policy, 2016. The foundation of this has to be laid at the grass-root level by initiating programs for the youth, especially in academic institutions. In order to engage students/ personnel and motivate them to work in the field of IPRs, a first step would be through the creation of “IP cells” in the academic institution.

The Intellectual Property Rights (IPR) cell is focused to recognize the importance of generation of intellectual property by faculty and students. The cell needs to encourage the creativity and innovations of its people which lead to generation of Intellectual Property (IP). The cell is committed to support and guide the students and staff not only in protecting their innovative and creative ideas but also in safeguarding the interests of inventor in creation and commercialization of intellectual property with legal support, wherever necessary. They also envision creating an environment for acquiring new knowledge through innovation, developing an attitude of prudent IP management practices and promoting an IPR culture compatible with the educational mission of the academic institution.

IP cell functions with the prime focus of enabling students, researchers and professors to identify, generate and protect their intellectual property through filing procedures for rights like patents, copyrights, trademarks, designs, etc. It will also cater to commercialization of intellectual property, which will further foster the creation of a fruitful dynamic system between universities, investors and industries.

This document provides guidelines as regards the roles, responsibilities and functioning of the IP cells in the academic institution. The ultimate goal these guidelines propose to achieve is to promote student-led startups and entrepreneurial ventures that protect and respect intellectual property. The use of these guidelines is intended to complement the existing intellectual property laws of India.

OBJECTIVES:

- To create an awareness about IPR for faculties and students of the Institution.
- To conduct workshops, seminars and training programs on IPR and patent filing processes.
- To disseminate knowledge on patents and registration methods in India and abroad.
- To encourage faculty members and scholars towards patentable works and innovation.
- To coordinate between Inventors, IP consultants, Attorneys and PEC authorities for filing and managing patents.
- To educate the faculty on obtaining copyrights for their publications.
- To provide awareness to the public through IP Road Shows, IP Street Play and various competitions.

WORKING OF THE CELL

- The IPR Cell will report to Principal of the Institution. It will seek the guidance of IQAC in discharging its responsibilities
- The Intellectual Property Rights Cell arranges for the speedy processing and filling of applications for patents and to effectively implement the policy and guidelines of the Institute in respect of Intellectual Property Rights
- Strategic perspective plans need to be submitted by the committee along with estimated budget or event based budget prior to the commencement of the academic year
- The Coordinator along with the committee members will take the necessary steps to implement the proposed list of activities for the academic year.
- The necessary preparations for the execution of the programs/activities are made in consultation with the Head of the institution.
- The committee may also suggest improvements in the existing research policy, to enhance the research output.

MEETINGS

- The committee would formally meet at the start of the academic year to plan for the year's activities and submit a strategic perspective plan.
- There would be a meeting at the end of the academic year to review the activities facilitated and the progress of the committee.

- The committee would formally and informally meet as many times as required depending on the need or in emergency situations.
- Minutes of informal meetings will be maintained.

RESPONSIBILITIES OF THE COORDINATOR

- The Coordinator of the committee is expected to convene the meetings and set an agenda for the discussion.
- The Coordinator of the committee is responsible for ensuring that each member has submitted and has maintained the relevant documents.
- Cell coordinator should submit proposal to the Principal and IQAC/Principal for the approval of cell activities for the academic year.

IPR CELL ACTIVITIES

The IPR activities are organized to introduce the principal areas of Intellectual Property (IP) such as Patents, Copyright, and Trademark among students and staff members.

- IPR seminars
- IPR competitions (eg. Quiz)
- IPR FDPs
- IPR awareness programmes

DOCUMENTS MAINTAINED BY THE IPR CELL

- Copy of strategic perspective plans submitted
- Minutes of meetings of meetings for every formal meeting
- Circulars sent by the Cell
- Circulars from IQAC/Principal/HODs linked to events organized
- All documents generated by the IPR Cell
- Brochures / Invitations
- Annual/ Individual event budget submitted
- Report on every event/activity conducted (minimum 500 words)
- Photographs of the event
- Certificates issued (if any)
- Copy / Photos of press release



A handwritten signature in green ink, appearing to be "S. J. Srinivas", written over a horizontal line.

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Chapter 22 - Bioinformatics approaches to the understanding of Notch signaling in the biology of stem cells

Achala Anand¹, N.S. Amanda Thilakarathna¹, B. Suresh Pakala², Ahalya N.³, Prashanthi Karyala¹, Vivek Kumar^{4,6}, B.S. Dwarakanath⁵

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Abstract

Notch is highly conserved signaling pathway throughout the evolution, which regulates tissue homeostasis in wide range of adult tissues as well as many aspects of embryonic development. Moreover, it plays a crucial role in the progression of numerous disease processes, including cancer during the carcinogenesis associated with cancer stem cells, as well as cancer progression and response to therapies. Our knowledge of the molecular characteristics of Notch signaling and pathways has substantially improved with the rise and development of accurate and reliable mass data collection tools. However, these technological developments have also made it more challenging to accurately analyze and interpret these ever-expanding datasets. Fortunately, the field of bioinformatics has evolved along with technologies, enabling the development of biological databases. These databases have offered a condensed resource of organized information that is easy to comprehend and retrieve. This has led to the development of theoretical models of information flow of Notch signal transduction from transmembrane receptor systems to physiological and pharmacological outcomes. In this chapter, we discuss the contribution of various bioinformatics and computational tools to the understanding of Notch signaling in the stem cells biology. Moreover, we also give a brief insight into how this knowledge has influenced the development of various diagnostic tools and therapeutic compounds targeting Notch signaling in malignancies.

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Nanotechnology to Monitor, Remedy, and Prevent Pollution

Micro and Nano Technologies

2024, Pages 439-451

Chapter 18 - Nanotechnology for removal of personal care products and related compounds

Ramya Kumari Balakuntahalli Sakappa^{1,2}, Sikandar I. Mulla¹, Basheerabegum Faniband³,
Dilshad Begum Golgeri M.^{1,4}, Luiz Fernando Romanholo Ferreira⁵, Abbas Rahdar⁶, Ram Naresh Bhargava⁷,
Juliana Heloisa Pinê Américo-Pinheiro^{8,9}, Paul Olusegun Bankole¹⁰

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Abstract

In the current scenario, the pharmaceuticals and personal care items (PPCPs), including cosmetics and toiletries, cause pollution in various water bodies. In fact, it was found that extremely small amounts of these chemicals have negative effects on the environmental surroundings especially on living organisms. To understand the level of such problem(s), around the world, numerous research investigations have been conducted and reported on occurrence, effects, destiny, and removal processes of pharmaceutical compounds, personal care products (cosmetics and toiletries), natural water (all type water including lake, river, and sea), and wastewater produced by industries. The accidental existence of such useful chemicals (PPCPs) in various aquatic streams at lower concentrations capable of damaging aquatic creatures have observed more and more since last two decades. This has become a significant problem towards various organisms due to widespread and expanding use of PPCPs by human and also in veterinary medicine which eventually releases these chemicals into the environment. Hence, some of these chemicals listed as priority contaminants by the European Union and the US Environmental Protection Agency. Different research group have made a strategy to tackle this kind of problem. Here, this chapter discusses toxic effect and their removal using different methods. The chapter will provide information which is helpful to environmental engineering streams.

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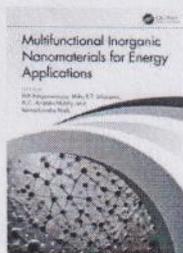


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Chapter



Sustainable Approach in the Treatment of Industrial Dyes Based on Inorganic Nanomaterials

By N.G.R.H.R. Senevirathne ([/search?contributorName=N.G.R.H.R. Senevirathne&contributorRole=author&redirectFromPDP=true&context=ubx](/search?contributorName=N.G.R.H.R.Senevirathne&contributorRole=author&redirectFromPDP=true&context=ubx)), M. Dilshad Begum Golgeri ([/search?contributorName=M. Dilshad Begum Golgeri&contributorRole=author&redirectFromPDP=true&context=ubx](/search?contributorName=M.DilshadBegumGolgeri&contributorRole=author&redirectFromPDP=true&context=ubx)), Soumya V. Menon ([/search?contributorName=Soumya V. Menon&contributorRole=author&redirectFromPDP=true&context=ubx](/search?contributorName=SoumyaV.Menon&contributorRole=author&redirectFromPDP=true&context=ubx)), Asha Kademane ([/search?contributorName=Asha Kademane&contributorRole=author&redirectFromPDP=true&context=ubx](/search?contributorName=AshaKademane&contributorRole=author&redirectFromPDP=true&context=ubx)), Yashwanth Narayan ([/search?contributorName=Yashwanth Narayan&contributorRole=author&redirectFromPDP=true&context=ubx](/search?contributorName=YashwanthNarayan&contributorRole=author&redirectFromPDP=true&context=ubx)), K.M. Nikhileshwar ([/search?contributorName=K.M. Nikhileshwar&contributorRole=author&redirectFromPDP=true&context=ubx](/search?contributorName=K.M.Nikhileshwar&contributorRole=author&redirectFromPDP=true&context=ubx))

Book [Multifunctional Inorganic Nanomaterials for Energy Applications](https://www.taylorfrancis.com/books/mono/10.1201/9781003479239/multifunctional-inorganic-nanomaterials-energy-applications?refId=ef2da5a3-43b7-4b8c-95b3-c85cb7c47f52&context=ubx) (<https://www.taylorfrancis.com/books/mono/10.1201/9781003479239/multifunctional-inorganic-nanomaterials-energy-applications?refId=ef2da5a3-43b7-4b8c-95b3-c85cb7c47f52&context=ubx>)

Edition	1st Edition
First Published	2024
Imprint	CRC Press
Pages	24
eBook ISBN	9781003479239

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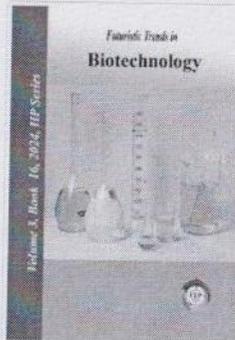
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Futuristic Trends in Biotechnology Volume 3 Book 16

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Publisher : Iterative International Publishers (IIP), Selfypage Developers Pvt Ltd.

Volume : 3-2024

AIM & SCOPE

Biotechnology is one of the emerging fields that can add new and better application in a wide range of sectors like health care, service sector, agriculture, and processing industry to name some. This book will provide an excellent opportunity to focus on recent developments in the frontier areas of Biotechnology and establish new collaborations in these areas. The book will highlight multidisciplinary perspectives to interested biotechnologists, microbiologists, pharmaceutical experts, bioprocess engineers, agronomists, medical professionals, sustainability researchers and academicians. This technical publication will provide a platform for potential knowledge exhibition on recent trends, theories and practices in the field of Biotechnology. The content of the book is as follows

PART 1

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VALORIZATION OF GRAPE WINERY WASTE FOR VALUE ADDITION IN THE WINE INDUSTRY

Abstract

Wine is the most celebrated beverage due to its property of promoting health benefits, producing polyphenols and non-flavonoid compounds. The possible ways of valorization of grape agro-waste into productive bioactive compounds are dependent on the type of waste material obtained. All liquid waste extracted during the process of pressing contains high amounts of antioxidants. Techniques like solvent-based and pressurized liquid-based extractions are eco-friendly. The most important wastes produced while wine production includes pomace (64%), stalk (15%), lees (12%), and water waste (10%). Most of these wastes are used to produce by-products like methane, oil, and polyphenols whilst others undergo composting and result in the formation of biofertilizers. The process of wine-making or vinification has been discussed elaborately in this article, followed by the wastes obtained and the various methodologies implemented to improve the waste product for capitalization. The applications of the newly formed products across all fields have also been discussed. This current review aimed to provide an overview of the extensive research done from 2005 to 2022 on the conversion of vinification by-products into high-value-added products. These value-added products can be used for commercialization in agrochemical, industrial, and nutraceutical arenas and for the minimization of the pernicious effects. These products otherwise would have caused detrimental effects on the environment and the economy of the consistently developing human population.

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HENRIK CRIST

PATHOGENESIS AND CONVENTIONAL REMEDICATION FOR T2DM

Abstract

Diabetes is a chronic metabolic disorder affecting greater than 400million people across the world. Type 2 Diabetes Mellitus (T2DM) is caused by two important factors such as defective insulin secretion by pancreatic β -cells of islets of Langerhans and the development of insulin resistance. Insulin resistance refers to when cells of the body including the muscle, liver and fat cells fail to respond to insulin eventhough adequate amount of insulin is secreted by β -cells. In fat cells, triglycerides are broken down to produce free fatty acids for energy; muscle cells are deprived of an energy source and liver cells fail to build up glycogen stores. To maintain glucose homeostasis, it is important to regulate the mechanism of insulin synthesis and release. Defects in the mechanisms results in metabolic imbalance which leads to the development of T2DM. It is characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism with its characteristic symptoms like thirst, polyuria, blurring of vision, weight loss and polyphagia. Present day survey states that there are 77 million people in India have Diabetes mellitus. Researchers disclosed that this statistical data will increase to 134 million by end of 2045 due to heredity and life style of the people. Ayurveda is a Science of life. Presently there is an ever-increasing demand for robust research work on traditional medicine to enhance the core competency of Ayurveda without compromising its fundamental principles. Since thousands of year's traditional Ayurvedic medicine has been used to treat various human diseases including diabetes. Many medicinal plants, natural products and food additives are potential treatments for diabetic control. Hence, this chapter is intended to observe the

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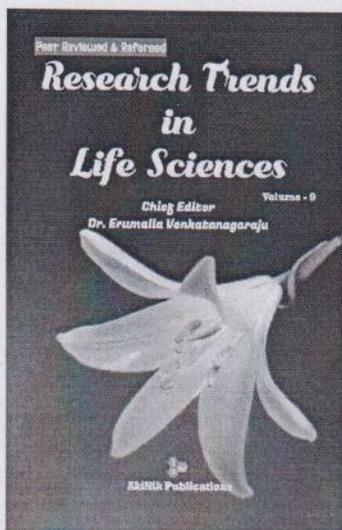


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Chief Editor : **Dr. Erumalla Venkata Nagaraju**

Paperback ISBN : 978-93-6135-876-0

Publisher : AkiNik Publications

Language : English

Pages : 116

Publication Year : 2024

Binding : Paperback

DOI : <https://doi.org/10.22271/ed.book.2621>

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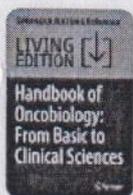
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Advanced Therapeutic Approaches in Cancer Therapy

| Living reference work entry | First Online: 11 October 2023

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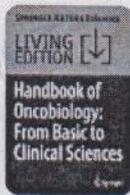
Recent advancements in cancer research have led to improved methods for early detection, prognostic monitoring, and innovative therapeutic interventions, resulting in a reduction in overall mortality rates among cancer patients. The identification of crucial proteins, metabolites, and miRNAs that play a significant role in the regulation and proliferation of cancer cells has revolutionized the clinical approach to cancer treatment. The utilization of nucleotide sequencing, gene targeting/editing, cell and tissue engineering, and bioinformatics has provided novel perspectives in comprehending this multifaceted ailment. The promising treatment of various solid tumors and hematopoietic malignancies has been attributed to metabolic alterations and immune checkpoint inhibitors. This chapter presents a comprehensive survey of contemporary advancements in cancer treatment. These include innovative therapies such as gene editing, immunotherapy, and nanomedicine. The observed progressions have been attributed to a reduction in mortality rates and instill optimism for the eventual eradication of cancer.

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Abstract

This chapter takes the readers through a comprehensive journey through the multifaceted landscape of cancer with insights into the fundamental differences distinguishing normal cells from their malignant counterparts, exploring the intricate web of common and rare cancer types. The discussion then extends to the intricate relationship between epidemiology and etiology, unravelling the factors that shape cancer development across ages, genders, and lifestyles. Additionally, the discussion encompasses molecular insights, unearthing the mechanisms behind tumorigenesis, the fascinating world of cancer genomics, and the dynamic role of epigenetics and cancer stem cells.

Pushpa Reddy



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Abstract

Embarking on the dynamic landscape of oncology, this chapter navigates the interface between emerging concepts and transformative advancements in cancer research. It delves into the intricate symbiosis of viruses and cancers, spotlighting the diverse roles of small DNA tumor viruses, RNA oncoviruses, and their diagnostic potential. Additionally, the discourse examines the evolving vistas of cancer genetics, accentuating the significance of oncogenes and their interactions with energy metabolism pathways. By traversing these complex dimensions, the chapter contributes to an enriched understanding of contemporary oncobiological paradigms.

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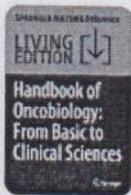
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Technological Advancements in Cancer Diagnosis and Prognosis

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Abstract

Cancer diagnostics and prognosis, propelled by cutting-edge technologies, navigates the evolution from traditional methods to innovative approaches that revolutionize how we detect and predict cancer. The discussion encompasses various facets of modern diagnosis, starting with fluid biopsy and molecular profiling, which offer noninvasive insights into cancer's molecular signatures. Next-generation sequencing opens windows into the genetic landscape, facilitating personalized treatment strategies. The role of MRI as a robust diagnostic tool is explored, while advanced sensing systems like electrochemiluminescence (ECL) nanosensors and aptasensors present novel avenues for early detection. Beyond diagnostics, the chapter delves into staging and grading, vital components for prognosis. The significance of the TNM staging system is highlighted. As precision medicine becomes central, these staging methods empower clinicians to tailor interventions and anticipate disease progression accurately. This exploration underscores the critical role of



Epigenetics in Organ Specific Disorders

Volume 34 in Translational Epigenetics

2023, Pages 545-563

Chapter 22 - Epigenetics of radiation-induced GI damage: Role of protein modifications

Noopur Gupta ^a, Anu Prakash ^a, Paban K. Agrawala ^a, B.S. Dwarakanath ^b

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Abstract

Radiation-induced gastrointestinal syndrome (RIGS) remains one of the significant limiting factors in employing tumoricidal doses in the radiotherapy of intestinal malignancy. It also restricts the endurance of casualties in an unplanned exposure to higher radiation doses. Ionizing radiation (IR) could affect various processes within exposed cells and specifically cause changes in gene expression and interruption of cell cycle arrest, leading to immune imbalance and apoptotic cell death. Emerging evidence points towards the significant role of epigenetic regulation and biological processes induced by exposure to radiation in different types of cancers. Epigenetic systems, which include DNA and histone alterations, bring about the heritable silencing of genes without an alteration in their coding sequence. There is a great potential for the development of “epigenetic therapies” that comprise inhibitors targeting enzymes that modulate epigenetic modifications, specifically DNA methyltransferases and histone deacetylases, which have demonstrated promising radiomitigative effects. In addition, as this process is reversible and accompanied by a plethora of deregulated enzymes, inhibiting those histone-altering enzyme activities and modulating their level has been thought of as a potential path for radiation injury treatments. This chapter provides insight into the basic information of histone modification as well as modification of other key proteins and its application in the radiation-induced gastrointestinal syndrome treatment, thereby offering new potential targets for the treatment of radiation injuries.

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Chapter - 4
Unravelling the Microbial Symphony Within: A Comprehensive Review of Gut Microbiota

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Chapter - 4

Unravelling the Microbial Symphony Within: A Comprehensive Review of Gut Microbiota

Sidra Khouzin, M.P. Sandhya and Dr. S. Anu Kiruthika

Abstract

The gut microbiota is a complex ecosystem of microorganisms, including bacteria, viruses, fungi, and archaea, that inhabit the human gastrointestinal tract. This microbial consortium plays a crucial role in various physiological processes and has gained increasing attention in recent years. The gut microbiota's functions extend beyond digestion, contributing to nutrient metabolism, immune system development, and protection against pathogens. The balance and composition of gut microbiota are regulated by factors such as diet, host genetics, and environmental influences. Disruptions in this balance can lead to health issues. A diverse gut microbiota is associated with better health outcomes. The links between microbiota diversity and conditions like obesity, diabetes, and autoimmune diseases are discussed, with potential therapeutic implications. External and internal factors, such as dietary choices, antibiotic use, and stress, significantly impact gut microbiota composition. Imbalances in the gut microbiota, known as dysbiosis, have been implicated in a range of diseases, including inflammatory bowel disease, allergies, and mental health disorders. Understanding the composition, functions, and regulation of the gut microbiota provides opportunities for innovative therapeutic interventions. Future research holds promise for advancing our understanding of the gut microbiota's role in health and disease. This comprehensive review article offers insights into the gut microbiota, providing a foundation for future research and therapeutic developments.

Keywords: Gut microbiota, microbial diversity, host-microbiota interaction, dysbiosis, gut-brain axis

Introduction

Microbiome refers to the collective genomes of the microorganisms in a particular environment, and microbiota is the community of micro organisms themselves. The human gastrointestinal system contains 100 trillion

**Molecular docking studies on the interaction of
phytocompounds exploring the antifungal potency
against *Candida* spp.**

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Introduction

Given the convergence of prevalent ecological, socioeconomic, and demographic conditions, India unaccountably suffers from the burden of infectious diseases. It is critical to explore for new medications because the prevalence of multidrug resistant infections has significantly decreased the efficacy of current antibiotics and the future of antimicrobial treatments is still unclear. Opportunistic fungal infections are spreading more quickly worldwide. Despite the availability of a wide variety of medications for their treatment, invasive fungal infections are of great concern for people since they are linked to a high mortality rate that frequently exceeds 50%. Due to this, there is an ongoing and urgent need to find new antimicrobial agents with unique chemical structures and modes of action. Globally, the clinical *Candida* species that causes candidemia continues to be the most important source of opportunistic mycoses. The invasive fungal infections (IFI) with the highest prevalence are invasive candidiasis and candidemia. Despite the fact that *Candida albicans* predominates among all *Candida* species, new findings indicate that non-albican species, such as *Candida tropicalis*, *Candida glabrata*, and *Candida parapsilosis* are increasingly producing invasive infections, particularly in immune-compromised individuals. Among the non-albican species of *Candida* that are responsible for these nosocomial infections, *Candida tropicalis* and *Candida glabrata* are reported to be the most prevalent. *Candida tropicalis* and *Candida glabrata* were frequently found in bone marrow transplant recipients who were neutropenic, as well as in nosocomial UTI cases, meningitis-causing pathogens, and infections in cancer patients. The ongoing development of multi-drug resistant (MDR) fungus strains has forced

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Progesterone and Its Relevance - A Multifaceted Hormone with Widespread Implications

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Abstract

Progesterone is a steroid hormone that plays a vital role in various physiological processes in both males and females. Progesterone primarily produced in the ovaries of females and the testes and adrenal glands of males, holds a prominent position in the field of endocrinology due to its multifaceted nature and widespread implications. Originally recognized for its involvement in reproductive functions, progesterone has been found to exert a wide range of effects beyond reproduction, including neuroprotective, anti-inflammatory and immunomodulatory actions. In the realm of reproduction, progesterone is essential for successful pregnancy. It prepares the endometrium for implantation, supports the maintenance of pregnancy by inhibiting uterine contractions, and facilitates the development of the mammary glands for lactation. Furthermore, progesterone plays a pivotal role in regulating the menstrual cycle and is intricately involved in the process of ovulation. The broad implications of progesterone opens up avenues for therapeutic interventions and sheds light on the complex interplay between hormones and diverse physiological process. This chapter provides a comprehensive overview of the multifaceted role of progesterone across various physiological systems and highlights its therapeutic potential.

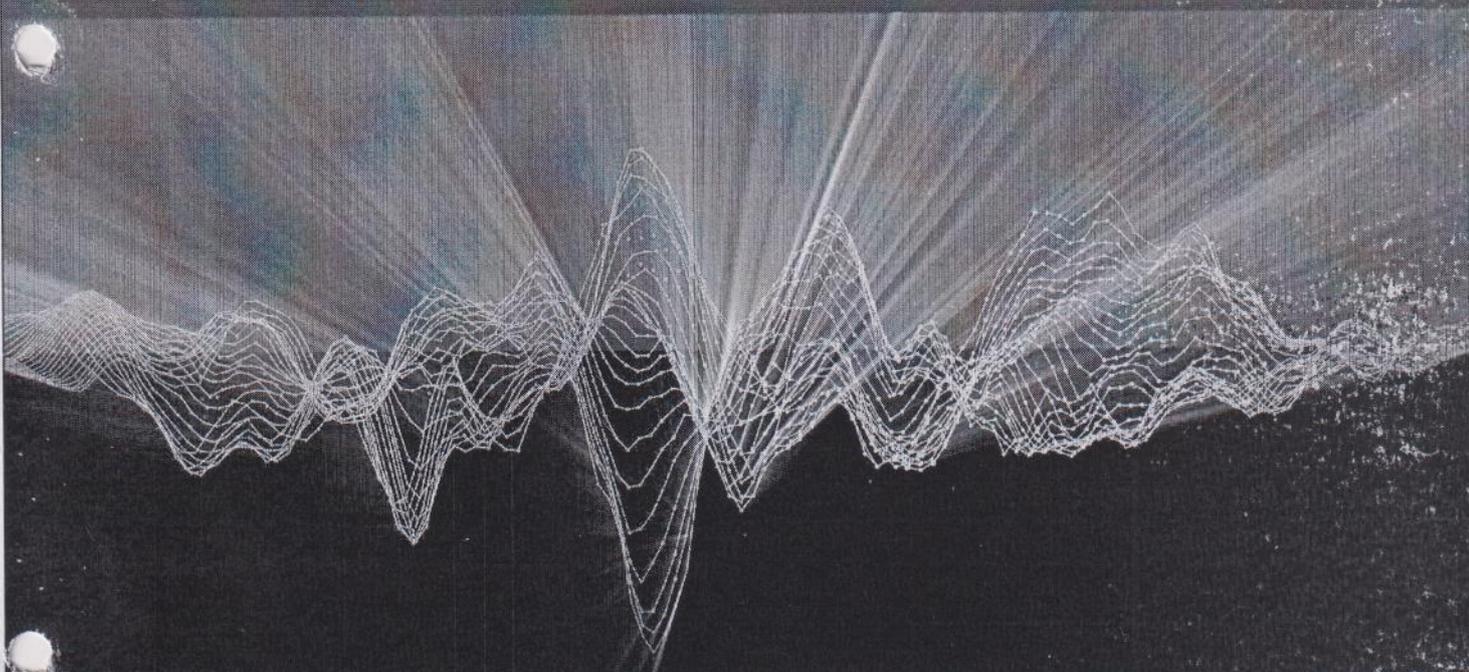


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ISBN: 978-93-88901-55-0

TRENDS IN INTERDISCIPLINARY RESEARCH

VOLUME II



Editor:

Dr. Vanitha G. Ramesh

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Bhumi Publishing, India



First Edition: May 2023



BIOENGINEERING STRATEGIES THAT BRIDGE MEDICINE AND TECHNOLOGY

Abstract

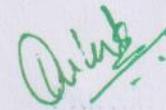
Biomedical engineering is emerging as a unifying bridge between two evolving fields, medicine and engineering. It has been instrumental in combatting diseases and ailments by advancing tools like biosensors, biomaterials, computational imaging, and artificial intelligence. These technologies empower medical professionals in their research, diagnosis, and treatment efforts. This chapter highlights the pivotal role that technological advancements in medicine have played in shaping the modern healthcare system and underscores the contributions of biomedical engineers within the healthcare delivery system.

Keywords: bioengineering, bionanotechnology, Biomimetic nanomaterials, bioprinting

Authors

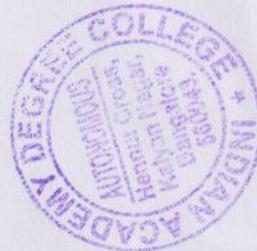
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Chapter - 4

Alginate Production by Solid State Fermentation of Marine Algae

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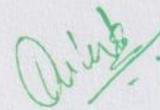
Research Trends in Life Sciences

Volume - 10

Chief Editor

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Anti-atherogenic role of green tea (*Camellia sinensis*) in South Indian smokers

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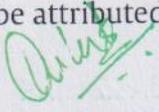
Highlights

- Green tea is consumed as a beverage worldwide due to its beneficial effects.
- Green tea consumption lowers oxidative stress and normalizes lipid profile in smokers.
- Molecular docking studies revealed green tea catechins' inhibitory activity on HMG-CoA reductase and SREBP1c.
- *In vitro* studies revealed that green tea possesses anti-platelet aggregation and anti-thrombotic functions.
- The protective effects reported can be attributed majorly to catechins.

Abstract

Ethnopharmacological relevance

Green tea (*Camellia sinensis*) is a popular beverage consumed all over the world due to its health benefits. Many of these beneficial effects of green tea are attributed to polyphenols, particularly catechins.


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Study of Post Covid-19 Complications Based on Epidemiological Survey

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ABSTRACT:

The COVID-19 era officially began in 2019. Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) is another name for it. The number of infections continues to rise even after COVID-19 immunizations. Patients who are afflicted have the most typical symptoms, including fever, weakness, coughing, and loss of taste and smell. The symptoms that are least often are a sore throat, headache, diarrhoea, aches and pains, etc. Age, sex, comorbid diseases, duration and year of COVID-19 infection, acute COVID-19 characteristics, history of hospitalization (type & severity of disease, length of hospital stay, need for respiratory supports, and need for intensive care unit [ICU]), duration since symptoms began, presence of persistent symptoms and vaccination were the details about the patients that were included in the questionnaire. The causes of receiving medical aid and the causes of being readmitted to the hospital were both questioned. This investigation includes a 100-person epidemiological survey on "Post COVID Complications" over one month. In conclusion, our survey and the data from the study indicate that among 100 people, more females than males had COVID-19 infection. The most frequent side effects following COVID-19 were loss of taste (54%), loss of smell (44%), weight loss (28%) and other issues. We deduced from the facts and statistics that people were somewhat aware of post-COVID-19 complications.

Keywords: COVID-19, Epidemiological survey, Post COVID Symptoms, Loss of smell, Sore throat.

INTRODUCTION

The year 2019 marked the beginning of COVID-19. It is also known as Severe Acute Respiratory Syndrome CoronaVirus (SARS – CoV). Even after vaccinations against COVID-19 the number of people infected goes on increasing. The infected patients show most common symptoms such as fever, weakness, cough, loss of taste and smell etc. The least common symptoms include sore throat, headache, diarrhoea, aches and pains etc. The symptoms of acute COVID-19 are shortness or difficulty in breathing, loss of speech or mobility or confusion, chest pain. These patients require hospitalization and some serious cases may even lead to death. The recovery from COVID-19 takes about 1 week to 4 week depending on individuals; it is also followed by some post COVID-19 complications in most people [1].

Long-term breathing issues, cardiac issues, chronic renal damage, stroke, and Guillain-Barre syndrome, a condition that causes momentary paralysis, are a few examples of long-term health impacts that may occur in some individuals. After receiving COVID-19, some adults and kids develop multisystem inflammatory syndrome.

Post COVID symptoms are also known as "long COVID", "post acute COVID syndrome" and "post – acute sequelae of SARS – CoV-2 infection". The exact cause of post COVID-19 conditions is not well understood. But it is hypothesized to be secondary to virus specific patho-physiological changes, prolonged inflammatory responses to acute infection and sequelae of post intensive care illness. Even people who did not have symptoms in the days or weeks after they were infected can have post COVID-19 conditions. These post COVID complications present as different types and combinations of health problems for different lengths of time. Increased risk of seeing these symptoms are in older patients who have underlying health conditions [2]. The post COVID-19, makes conditions serious for people with heart problems, diabetes, blood pressure, respiratory troubles etc. way before COVID. Post COVID complications include fatigue, loss of taste and smell, weight loss, muscle aches, difficulty in breathing, confusion etc [3].

OBJECTIVES

- To conduct a survey on POST COVID-19 Complications.
- To collect data on diseases and their distribution in the population.
- To correlate the diseases/complications with respect to age group.
- To propose positive preventive measures for POST COVID-19 Complications.



Nano-revolution in Vector-Borne disease management: Exploring control strategies and mechanisms

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Abstract

Vector-borne diseases (VBDs) are complex socio-ecological systems that have an impact on many facets of our planet and go well beyond human health. Even though previous study has focused on the direct consequences of vector-borne illnesses on human health and death, it is evident that these diseases are part of a complex web of interactions. The environment, ecology, diseases, and societal reactions are closely associated with vector-borne diseases, resulting in feedback loops that facilitate the spread of disease. As a result, they have permanently altered the course of human history. The application of nanoparticles produced by various processes as novel insecticides has attracted a lot of interest. Silver nanoparticles plays a crucial role along with gold, zinc oxide and other nanoparticles in the control of (VBDs). Many research have examined the toxic effect against a variety of pests and insect vectors, with a focus on mosquitoes. Using nanoparticles as cutting-edge insecticides is a promising line of inquiry in the battle against VBDs. This review encompasses around the various nanoparticles (NP's) and their mode of action and various control strategies against vectors.

Keywords: Vector borne diseases (VBDs), Nanoparticles (NP's), Silver nanoparticles, mode of action, control strategies

Introduction

A rise in human mobility, globalization, and climate change has resulted in the ecological spread of highly invasive species. These invading species, which include arthropods, can produce fatal diseases that spread like epidemics or pandemics. The most significant in that respect are mosquitoes (Diptera: Culicidae), which serve as carriers of numerous dangerous parasites and infections. The most dangerous of these are the genera *Anopheles*, *Aedes*, and *Culex*, which are the carriers of the most significant infections and are responsible for diseases like Dengue, malaria, yellow fever, filariasis, Japanese encephalitis, and Zika [1]. In the past and present, vector-borne diseases (VBDs) like malaria, dengue, Zika, Chikungunya, and Japanese encephalitis have had a significant global impact on public health. Although many illnesses cannot spread directly from person to person, they can spread when circumstances allow germs, hosts, and the environment to interact. The threat posed by insect-borne diseases to human health has grown in recent years due to changes in social and environmental conditions, including global climate change and international trade, which have led to the reproduction and spread of these diseases. In 2020, there were an anticipated 241 million malaria cases and 627,000 malaria deaths globally, according to WHO's most recent World Malaria Report. This translates to roughly 69,000 extra deaths and 14 million more illnesses in 2020 compared to 2019. In addition, dengue was endemic in Pakistan during September 2019 to November 2021, with 102,404 cases recorded, including 278 deaths (case fatality ratio, or CFR): 0.27%). Thus, we must address the key VBDs that are emerging and reemerging as well as the difficulties in controlling them. In this review, three main categories of nanoparticles (NPs) were discussed. (Fig 1). Type 2 NPs are nonmetal-based (like Si and Ca), Type 3 NPs are some complex polymers (like chitosan and plant extract), and

Type 1 NPs are metal-based (like Ag, Cu, and Ti), which are the most commonly employed to repel insects. Due to its significant effect on insect antioxidant and detoxifying enzymes, which results in ROS-mediated apoptosis, DNA damage, and autophagy, Ag has the highest proportion among Type 1 reagents. For Type 1, this is how most metals function. But Type 2's primary insecticidal principle is different; for instance, desiccation, abrasion of the body wall, and obstruction of the spiracles are the reasons for SiO₂ NPs' toxicity. Furthermore, the various functions of nanoparticles used as pesticides can be used to classify them. Metal-based NPs are most frequently used in Type 1, which primarily consists of NPs for direct use as insecticides. When it comes to Type 2, NPs operate as carriers for the active substances that suppress insects [2].

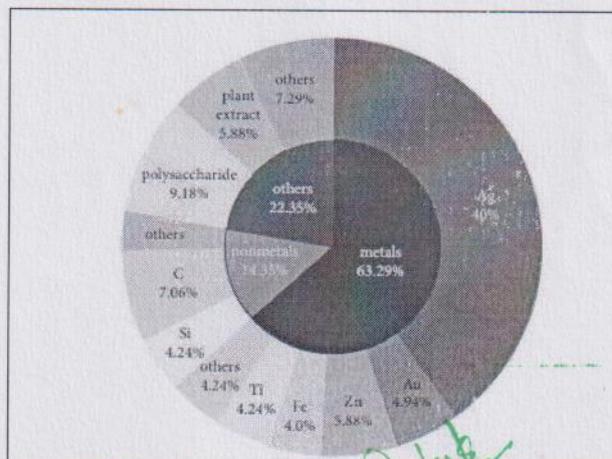


Fig 1: Classification of NP's. Based on various attributes, NPs used as insect repellent can be broadly categorized into three groups. Of them, nonmetal-based NPs like Si- and C-based make up just 14.35%, while metal-based NPs make up the largest percentage at 63.29% [2].



Toxicology Mechanisms and Methods >

Volume 34, 2024 - Issue 4

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Research Articles

Alcohol-induced hormonal and metabolic alterations in plasma and erythrocytes—a gender-based study

Daisy Kunnathuparambil Lonappan, Gouthami Kuruvalli, Althaf Hussain Shaik, Ananda Vardhan Hebbani , Hymavathi Reddyvari, Vaddi Damodara Reddy & ...show all

Pages 350-358 | Received 05 Sep 2023, Accepted 27 Nov 2023, Published online: 15 Dec 2023

“ Cite this article <https://doi.org/10.1080/15376516.2023.2290071>

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Abstract

Purpose

This study aimed to understand the gender-specific alcohol-induced biochemical changes and TBARS association with the endocrine system.

Methods

Human male and female subjects ranging from 35 ± 10 years old with an 8-10-year drinking history were included in the study.

Results



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POTENTIAL INHIBITORY ACTIVITIES OF *CATHARANTHUS ROSEUS* ALKALOIDS ON PTP-1B IN RELATION TO ENHANCING INSULIN USAGE FOR TYPE II DIABETES TREATMENT

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(Received 10 February 2024, Revised 3 April 2024, Accepted 11 April 2024)

ABSTRACT : Even with the emergence of hypoglycaemic drugs, diabetes mellitus remains one of the major endocrine and metabolic disorders, affecting approximately 10% of the global population. It stands among the top five global causes of death. Type II diabetes has been managed by using a variety of plant extracts. Due to the side effects of taking insulin and oral hypoglycaemic drugs, patients are growing more and more interested in natural products with antidiabetic properties. Ancient societies made widespread use of *Catharanthus roseus* (*C. roseus*) and other herbal plants as therapeutic therapies to treat Type-II Diabetes mellitus. *C. roseus* extract has been demonstrated in several tests to dramatically lower blood glucose levels. Studies examining the genetic make-up of people, animals and cells have shown that Protein Tyrosine Phosphatase-1B (PTP-1B) is an enzyme that functions as a negative regulator of the insulin signalling pathway by removing phosphate groups from certain tyrosine residues on insulin receptor substrates (IRS). PTP-1B inhibitors have been examined in an effort to boost glucose metabolism and insulin sensitivity. This study focuses on the alkaloid which exhibits the most potent activity in hampering PTP-1B and less cytotoxicity in overseeing the insulin signaling pathway. It also uses Auto Dock bioinformatic tools for demonstrating the mechanism of potential inhibitory activities of four alkaloids of *C. roseus* in the active sites of PTP-1B, namely vindoline I, vindolidine II, vindolicine III and vindolinine IV.

Key words : Type – II Diabetes mellitus, *Catharanthus roseus*, Protein Tyrosine Phosphatase – 1B (PTP-1B), Vindoline I, Vindolidine II, Vindolicine III and Vindolinine IV.

How to cite : Vanitha G. Ramesh (2024) Potential inhibitory activities of *Catharanthus roseus* alkaloids on PTP-1B in relation to enhancing insulin usage for Type II Diabetes treatment. *Biochem. Cell. Arch.* **24**, 929-933. DOI: <https://doi.org/10.51470/bca.2024.24.1.929>



INTRODUCTION

Catharanthus roseus is known as *C. roseus*, it is a significant medicinal plant that grows in several nations. It is a beautiful shrub that is widely utilized for a variety of uses throughout the world. It is also referred to as *Madagascar periwinkle* or *Vinca rosea*. In many parts of the world, this plant has been used to cure type 2 diabetes mellitus, gonorrhoea, stomach aches and various forms of cancer. The primary emphasis of this investigation was its antidiabetic efficacy. Numerous compounds found in *C. roseus* have a variety of biological actions, including anticancer, antidiabetic, antibacterial and antifungal effects. In many countries, it has a long history of use as folk medicine (Don, 1999) such as South Africa, China, India, Mexico (Patel *et al*, 2012) and Malaysia (Ong *et al*, 2011), where it is applied as a treatment to lessen issues related to diabetes (Li *et al*,

2004). Rather of using the pure bioactive components, crude extracts (Nammi *et al*, 2003; Ohadoma *et al*, 2011; Gacche *et al*, 2011; Ganga *et al*, 2012) have been used in the majority of the research activities on this plant's antidiabetic efficacy. The plant's extract demonstrated hypoglycaemic action in a streptozotocin-induced diabetic rat model (Ganga *et al*, 2012; Ethnopharmacol *et al*, 2001).

PTP-1B and the insulin signalling pathway

Insulin is essential for preserving glucose homeostasis as well as controlling the metabolism of proteins, fats, and carbohydrates. Insulin binds to its receptor on insulin target tissues (adipose, liver and muscle) to initiate a cascade of signalling events that cause the hormone to exhibit its pleiotropic physiologic effects (Soon Huat Tiong *et al*, 2013).





Comparative Analysis of *Bacopa monnieri* and *Withania somnifera* in *Drosophila melanogaster* Neurodegeneration Models: Memory, Locomotion, Fertility, and Lifespan

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Received: 30 Sep 2023

Revised: 20 Nov 2023

Accepted: 13 Jan 2024

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ABSTRACT

This study delves into the manifestation of neurodegeneration-like symptoms in *Drosophila melanogaster*, particularly focusing on memory and locomotion impairments, as well as decline in fertility and reduced lifespan. It also explores the potential for mitigating these symptoms through treatment with *Bacopa monnieri* and *Withania somnifera*. To investigate potential variations in neurodegenerative responses and therapeutic effectiveness, we conducted a comparative analysis between *Drosophila* Oregon K-Type and hybrid fly strains. *Drosophila melanogaster*, a widely recognized model organism, serves as a valuable platform for probing neurodegenerative mechanisms. We induced neurodegeneration-like symptoms by exposing flies to paraquat herbicide, replicating oxidative stress conditions. Subsequently, we assessed memory and locomotion deficits as behavioural indicators of neurodegeneration. Additionally, our observations revealed a substantial decrease in fertility and a shortened lifespan among Paraquat-exposed flies in comparison to the control group. These findings underscore the detrimental impact of Paraquat on both reproductive and aging processes in *Drosophila melanogaster*. Our research findings have revealed significant impairments in memory and locomotion in *Drosophila* flies exposed to paraquat, mirroring symptoms commonly associated with neurodegenerative diseases. Specifically, we observed a reduction in memory index from 100% to -26.5% and a decrease in locomotion from 100% to 45.5%. Furthermore, these exposed flies exhibited diminished fertility, decreasing from 100% to 72%, and a shortened lifespan, declining from 100% to 86%. However, the administration of *Bacopa monnieri* and *Withania somnifera* extracts showed promising potential for alleviating these symptoms. In the case of



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ORIGINAL ARTICLE

Exploring the Phosphorus-Enhancing Potential: Isolation, Identification, and Characterization of Phosphate-Solubilizing Bacteria from Rhizospheric Soil

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ABSTRACT

Phosphate-solubilizing microbes (PSMs) play a crucial role in converting insoluble phosphates into soluble forms, thereby enhancing phosphorus availability to plants. In this study, we aimed to isolate and identify PSMs collected from rhizospheric soil. The isolated strain was identified as *Serratia* based on colony characteristics and biochemical analysis. Furthermore, we explored the phosphatase activity of 77.26 ± 0.46 U/ml, optimization of growth conditions for crude acid phosphatase was found to be temperature of 45°C , pH was 5 and glucose and ammonium sulphate served as good substrates for carbon and nitrogen sources. Partial purification of acid phosphatase by salt precipitation and dialysis gave a yield of $36.68 \pm 0.05\%$ compared to crude. Acetic acid was vigorously produced by the isolate, reaching concentrations of 40.41 ± 0.35 mg/L compared to other organic acids analysis by GC-MS. The production of other plant growth-promoting enzymes and hormones were identified. The antagonistic activity as biocontrol agent of the isolate was performed on plant pathogens. These findings contribute to our understanding of microbial-driven processes for sustainable agriculture and highlight the potential application of PSMs in enhancing phosphorus availability and plant growth in agricultural systems.

Keywords: Phosphate-solubilizing microbes (PSMs), phosphatase activity, organic acids, antagonistic activity.

Received 24.08.2023

Revised 11.10.2023

Accepted 21.12.2023

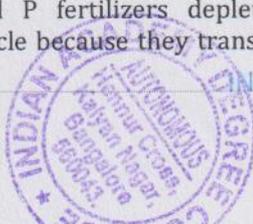
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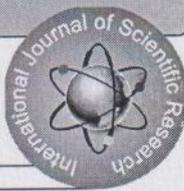
Shashank V, M P Sandhya, Rahul E, S Anu Kiruthika. Exploring the Phosphorus-Enhancing Potential: Isolation, Identification, and Characterization of Phosphate-Solubilizing Bacteria from Rhizospheric Soil. Adv. Biores., Vol 15 (1) January 2024: 49-62.

INTRODUCTION

Phosphorus (P) is one of the most important elements in the nutrition of plants, next to nitrogen (N). It is required for all key metabolic activities in plants, including photosynthesis, energy transmission, signal transduction, macromolecular biosynthesis, respiration, and nitrogen fixation in legumes [1]. P is abundant in soil, both in its inorganic and organic forms, but because it cannot be absorbed by roots, it limits plant development. Following the frequent application of chemical fertilizers, the majority of insoluble mineral complexes containing inorganic P have been found in soil. Plants cannot absorb these insoluble precipitated forms [2] [3].

High P fixing by Al and Fe hydroxides is a prevalent concern in agricultural soils [4]. In the tropics, the soils with the highest P fixing capability cover 1,018 million hectares (ha). As a result, soil P gets fixed and, on the majority of agricultural soils, must be supplemented with artificial P fertilizers [5]. These chemical P fertilizers not only increase agricultural production costs, but they also have significant impacts on soil health and the degradation of terrestrial, freshwater, and marine resources [6]. As a result, greater P levels have been identified as a primary cause to surface water eutrophication, which can lead to algal blooms. The widespread use of chemical P fertilizers depletes soil fertility [7]. Microorganisms are an essential component of the soil P cycle because they transport P across distinct





"NATURE'S DEFENSE: HARNESSING THE POWER OF OCIMUM SANCTUM (TULSI) AND NISIN EXTRACTS FOR ENHANCED FOOD SAFETY AND EXTENDED SHELF LIFE"

Microbiology

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ABSTRACT

Background And Objective: Foodborne pathogen contamination is a severe public health hazard that can lead to foodborne illnesses. Foodborne infections continue to be a global public health issue, with an estimated 600 million people being ill each year. This study thus encompasses around studying the antimicrobial effects of *Ocimum sanctum* and extraction of Nisin from *Lactococcus* sp. for formulation of a product which can enhance the food safety and preservation aspects in food industry. **Materials And Methods:** As a part of the experiment we prepared different concentrations of extract of *Ocimum sanctum* to check the antimicrobial activity against a set of 10 commonly occurring microorganisms of food industry. For easy diffusion of the extract wells were punched in the media and the microorganisms were inoculated, followed by incubation at 37°C for 24 hrs. Second part of the experiment was extraction of Nisin from *Lactococcus* sp. which is known to extend shelf life of food products. The fermented broth was centrifuged at 10,000 rpm for 15 minutes after 24 hours of incubation, and the supernatant was precipitated with 80% ammonium sulphate overnight at 4°C. **Results And Discussion:** Zone of inhibition was observed in the media having the *Ocimum sanctum* extract which indicated its antimicrobial efficacy against all the 10 sets of microorganisms. Nisin was extracted. Further studies were conducted, calculations done regarding the concentrations of the two compounds that can be used to formulate the product. **Conclusion:** Prevention from contamination and an enhanced shelf life can be achieved using the product which can be a breakthrough in enhancing food safety in Food industries.

KEYWORDS

Ocimum sanctum, Nisin, Antimicrobial activity, Shelf life, Food safety.

INTRODUCTION:

Since the birth of civilization, medicinal plants have been used by humans to combat disease. *Ocimum sanctum* has been known for over 2000 years as one of the most versatile medicinal plants, with a wide range of biological activity. It is a well-known sacred plant in the Indian subcontinent. Tulsi is also known as holy basil. Basils are tropical Asian plants that are thought to have originated in India. It is an annual plant that is mainly grown by seeds. It is common in tropical places and can be found at a height of 1800 metres in the Himalayan region. Tulsi variants can be found growing wild in several parts of Asia and Africa (Fig. 1). The species differ from one another in terms of geographical location, chemical constituent type and percentage, and thus have varied pharmacological effects. Tulsi has an antimicrobial, immunomodulatory, antistress, anti-inflammatory, antiulcer, antidiabetic, hepatoprotective, chemoprotective, antihyperlipidemic, cardioprotective, antioxidant, antitussive, radioprotective, memory enhancing, antiarthritic, antifertility, antihypertensive, anticoagulant, anticataract, anthelmintic, and antinociceptive activity index. Potential antimicrobial activity of tulsi has also been shown in recent research which can lead to prevention of food contamination in industries to quite an extent [1].



Figure 1: a) *Ocimum sanctum*, b) *Ocimum basilicum*, c) *Ocimum gratissimum*, d) *Ocimum americanum*, e) *Ocimum canum*[1].

Nisin is an antimicrobial peptide that is produced by Gram-positive bacteria such as *Lactococcus* and *Streptococcus* (Lubelski et al., 2008; de Arauz et al., 2009). Nisin was discovered in fermented milk cultures in 1928 and was first commercially marketed in 1929. It was first used as an antibacterial agent in England in 1953 (Rogers and Whittier, 1928; Delves-Broughton et al., 1996). The Joint Food and Agriculture Organization/World Health Organisation (FAO/WHO) certified nisin as a safe food additive in 1969. Nisin is currently licenced in over 50 countries and has made a considerable impact in the food sector as a natural biopreservative for various types of foods (de Arauz et al., 2009). In the United States (US), the Food and Drug Administration

approved nisin in 1988 and granted it a generally recognised as safe (GRAS) classification for use in processed cheeses (Cotter et al., 2005). The first nisin variation, known as nisin A, is made up of 34 amino acids and is synthesised by *Lactococcus lactis* (Gross and Morell, 1971). Nisin belongs to the Type A (I) lantibiotics class of cationic peptide antimicrobials (Smith and Hillman, 2008). Nisin and other lantibiotics have received a lot of attention because of their potent and broad-spectrum activity, low likelihood of promoting bacterial resistance, and low cellular cytotoxicity at antimicrobial concentrations (Asaduzzaman and Sonomoto, 2009; Van Heel et al., 2011; Cotter et al., 2013). Recent research is focussed on studying the efficacy of nisin extracts as a preservative to extend the shelf life of food products in food industries [2].

MATERIALS AND METHODS:

Collection of plant leaves:

Indian Academy Degree College Autonomous, Bangalore was where the leaves of *Ocimum sanctum* (tulsi) were gathered from. For 4-5 days, leaves were carefully separated, washed, and dried. The leaves were then ground using a mortar and pestle into a coarse powder. Weighed and kept in an airtight container was around 50 g of powder from each leaves.

Preparation of Plant leaf Extracts:

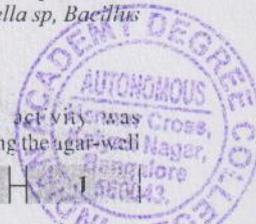
A stock solution of 0.2 g/ml of each leaf powder was created by adding 200 ml of methanol to a separate conical flask along with 50 g of each leaf powder using a cold maceration extraction technique for concentration. The working solution of each extract was then created using the formula " $C_1V_1=C_2V_2$ " at concentrations of 0.2 g/ml, 0.4 g/ml, 0.6 g/ml, and 0.8 g/ml, where C_1 is the stock solution's concentration, C_2 is the new solution's final concentration, V_1 is the stock solution's volume, and V_2 is the new solution's final volume. Then, by combining each extract concentration in a 1:1 ratio, mix solutions of neem and tulsi were also created at concentrations of 0.2 g/ml, 0.4 g/ml, 0.6 g/ml, and 0.8 g/ml [3].

Test Organisms:

The ten bacterial cultures used to check the antimicrobial activity of *Ocimum sanctum* were: *E. coli*, *S. aureus*, *Pseudomonas* sp, *Bacillus cereus*, *Salmonella* sp, *Proteus* sp, *Shigella* sp, *Klebsiella* sp, *Bacillus pumilus*, *Lactococcus* sp.

Antimicrobial Activity Test:

Ocimum sanctum leaves extract's antimicrobial activity was determined. Antibacterial activity were determined using the agar well





Perusal of *Pleurotus Djamor* Growth by Using Different Substrates and Evaluate the Amount of Protein Content.

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ABSTRACT:

Pleurotus djamor is commonly called a pink oyster mushroom. The flavor of the pink oyster mushroom has been described as meaty and fishy. It is a species of fungus in the family Pleurotaceae. It was originally named *Agaricus djamor*. The present study describes the cultivation of pink oyster mushrooms with the utilization of vegetable waste (cabbage, cauliflower and radish leaves) in combination with agro waste (paddy straw and sugarcane bagasse) as substrate. Different ratios of both the substrates were used for the cultivation. When cultivation was carried out on vegetable waste alone, there was absence of mycelium spread and fructification. However, the combination of 50% vegetable waste and 50% paddy straw supported significant growth. It also shows high protein content during the estimation process. Thus the study implies that vegetable waste can prove to be a potent substrate for cultivation of pink oyster mushrooms with high protein content.

Keywords: spawn, pink oyster mushroom, vegetable waste, agro waste, protein, biuret method.

INTRODUCTION:

Mushrooms are one of the most loved food not only for its exotic taste but also for the benefits with which it comes. It can be consumed in various forms like fresh, pickled, dried, powdered, canned etc. Its farming has picked up a fast pace among contemporary entrepreneurs owing to its nutritional and medicinal benefits and low cost input with high output. Mushrooms are a fleshy fungi (Basidiomycota, Agaricomycetes) having a stem, cap and gills underneath the cap [1]. Because of its medicinal and nutritional benefits, mushrooms have long been valued as a significant dietary item. They are regarded as a good source of carbohydrates and protein. More than 3000 species of mushrooms have been shown to be edible, yet only ten of them are commercially grown. *Agaricus bisporus* is the most widely farmed mushroom in the world. It is followed by *Pleurotus* species, which account for around 27% of all cultivated mushrooms and include 5 to 6 different species [2]. From ancient times, mushrooms are looked upon as a delicacy for human consumption. The importance of consumption of mushrooms is based upon its nutritional benefits on human health. The exotic flavor, fleshy texture, richness of the mushroom makes it one of the most desirable food item for human consumption. Mushrooms are rich source of proteins polyunsaturated fatty acids (PUFA) and many other vital nutrients essential for human body with the advantage of having a low calorific value. Oyster Mushroom (*Pleurotus* sp.) also known as Dhingri in India is a macro lignocellulolytic fungus belonging to basidiomycetes [3]. Cultivation of edible mushrooms with agricultural and agro-industrial residues as substrate is an efficient and economically reliable technology for converting these materials into a valuable protein rich food and a cash crop of commercial interest [4]. It is considered to be unique based upon its ability of rapid mycelial growth and ability to muster its food by secreting some degrading enzymes. It also has a distinctive fruiting body. Tropical and temperate regions provide suitable environmental conditions which favour the growth of *Pleurotus djamor*. The various substrates that can be used for production of *Pleurotus djamor* are vegetable waste (cabbage, cauliflower and radish leaves) in combination with agro waste (paddy straw and sugarcane bagasse). The choice of substrate play an important role in the production of mushroom. It can invariably influence the growth characteristics and yield [5]. There is an increase in demand for production of *Pleurotus djamor* due to its medicinal properties which can play a crucial role in saving people from some life threatening diseases. Few medicinal properties of *Pleurotus djamor* include anticancer, immune modulator effect, anti inflammatory activities [6]. Microbial technology can help in large scale recycling of agro waste in India [7]. An alternative way of use of agricultural residues/wastes is in the use of the organic material in mushroom production [8]. The following study enlightens the aspect of the effect of different substrates on the yield of *Pleurotus djamor*.



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Reviews

A systematic review on potential microbial carbohydrases: current and future perspectives

Dilshad Begum Golgeri M., Sikandar I. Mulla , Zabin K. Bagewadi , Swati Tyagi, Anyi Hu, Swati Sharma, ...show all

Pages 438-455 | Published online: 05 Aug 2022

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Abstract

Various studies have shown that the microbial proteins are often more stable than belongs to other sources like plant and animal origin. Hence, the interest in microbial enzymes has gained much attention due to many potential applications like bioenergy, biofuel production, biobleaching, bioconversion and so on. Additionally, recent trends revealed that the interest in isolating novel microbes from harsh environments have been the main focus of many scientists for various applications. Basically, industrially important enzymes can be categorized into mainly three groups: carbohydrases, proteases, and lipases. Among those, the enzymes especially carbohydrases involved in production of sugars. Carbohydrases include amylases, xylanases, pectinases, cellulases, chitinases, mannanases, laccases, ligninases, lactase, glucanase, and glucose oxidase. Thus, here, an approach has been made to highlight five enzymes namely amylase, cellulase, laccase, pectinase, and xylanase from different sources with special

Mycosynthesis of CuO Nanoparticles Using *Aspergillus niger* and Their Bioefficiency against Human Pathogens

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Received: Oct. 13, 2023; **Revised:** Nov. 25, 2023; **Accepted:** Dec. 15, 2023

Citation: K. Sahithya, A.K. Ekanayake, D. Hemanathan, et al. Mycosynthesis of cuo nanoparticles using *aspergillus niger* and their bioefficiency against human pathogens. *Nano Biomedicine and Engineering*, 2024, 16(2): 264–275.

<http://doi.org/10.26599/NBE.2024.9290062>

Abstract

In the present study, copper oxide (CuO) nanoparticles were biosynthesized from an *Aspergillus niger* cell-free extract (CFE), and several optimal operating parameters that affected the formation and dimensions of the CuO nanoparticles were determined, as follows: 15 mmol/L metal salt and 90 mL of CFE at room temperature for 24 h, to achieve an average size of 77 nm. Spectroscopic studies revealed an association between alcohol, alkene, and amine functional groups and the grain-shaped CuO nanoparticles. The elemental composition of the nanoparticles was confirmed by energy dispersive X-ray spectroscopy (EDX) data. Mycogenic CuO nanoparticles exhibited excellent antibacterial activity against Gram-positive bacterial species compared with Gram-negative bacterial species, i.e., *Streptococcus pneumoniae* MTCC 2672, *Staphylococcus aureus* MTCC 737, *Micrococcus luteus* MTCC 11948, *Pseudomonas aeruginosa* MTCC 424, and *Escherichia coli* MTCC 443, at 200 mg/mL, with inhibition zones of 9.2, 8.3 7.7, 7.2, and 6.1 mm, respectively. Finally, myogenic CuO nanoparticles exhibited good antifungal activity against *Aspergillus fumigatus* and *Aspergillus versicolor*.

Keywords: antibacterial activity; antifungal activity; *Aspergillus niger*; copper oxide (CuO) nanoparticles; human pathogens

Introduction

Over the past few decades, modern science and technology have established their roots in the field of nanotechnology, which has become a major thrust area of research by playing a vital role in the agrochemical, biomedical, cosmeceutical, environmental, pharmaceutical, and biotechnological sectors [1–4]. The development of environmentally friendly engineered nanomaterials with advanced properties is challenging because the process is safe

and ecofriendly [5]. Nanomaterial synthesis is emerging as a growing field because of the effects of the synthetic approaches on the physical and chemical properties of the final products [6, 7]. The green or biological preparation of nanomaterials using plants [8] and microorganisms (including bacteria [9], fungi [10], and algae [11]) has been extensively reported over the last two decades because of their advantages, i.e., biocompatibility, low cost, eco-friendliness, and reliability in nature [12, 13].

The filamentous-fungus-mediated synthesis of



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Comparative Analysis of Penicillin Production Using Various Media Compositions: A Research Study

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ABSTRACT

Background: Penicillin are bactericidal beta-lactam antibiotics that inhibit bacterial cell wall synthesis. A natural product, the penicillin structure has been modified to prepare a variety of semi-synthetic agents and used in pharmaceutical industries. The spectrum of antibacterial activity varies with each class of the penicillin family produced by penicillium species. Penicillin is generally well-tolerated, with hypersensitivity being the major adverse effect. Penicillin is used to treat a variety of conditions including skin infections, urinary tract infections, upper and lower respiratory infections, and endocarditis.

Methods: Preparation of different media compositions to check the increased growth of *Penicillium notatum* and its ability to produce penicillin crystals using the varied compositions. The obtained penicillin from the extract we checked for the antibacterial activity against various microbial species.

Result: We have successfully established that Penicillin can be useful drug for the treatment of serious *Pseudomonas aeruginosa* infections because of its enhanced activity against this organism. This indicates that Penicillin still could serve as medicinal drug and antimicrobial activity in pharmaceuticals for treatment of many pathogenic diseases.

Conclusions: The above research work concludes that high yield of penicillin production can be obtained using Sabouraud dextrose broth medium with wheat bran as the substrate in industrial means. It shows the efficacy of the Penicillin against various infection and can inhibit the growth of some organisms causing infection effectively.

Keywords: Substrate wheat bran, Sabouraud Dextrose Broth, Rose Bengal Broth, Potato dextrose Broth, *Penicillium*, bacterial test organisms.

INTRODUCTION

Penicillin is one of the most important and widely used antibiotics in modern medicine. It is a group of naturally occurring and synthetic antibiotics that are effective against a broad spectrum of bacterial infections. The discovery of penicillin marked a significant milestone in the history of medicine and revolutionized the treatment of infectious diseases. Penicillin was discovered by Sir Alexander Fleming, a Scottish bacteriologist, in 1928 (Borner, 1968). While working at St. Mary's Hospital in London, he accidentally observed that a mold called *Penicillium notatum* had contaminated a bacterial culture plate, leading to the inhibition of bacterial growth around the mold. He identified this mold as the source of a potent antibacterial substance, which he named penicillin (Bodey G P, 1971). Penicillin is an antibiotic, which means it is a type of medication that kills or inhibits the growth of bacteria. It targets the bacterial cell wall, disrupting its formation and weakening the bacteria, ultimately leading to bacterial cell death.

After Fleming's initial discovery, further research was conducted to isolate and produce penicillin in larger quantities. This involved the work of scientists Howard Florey, Ernst Boris Chain, and Norman Heatley at the University of Oxford during the 1940s (Schatz *et al.*, 1944). They successfully developed methods to mass-produce penicillin, which played a crucial role in treating wounded soldiers during World War II. Penicillin and its derivatives have saved countless lives since their introduction into medical practice. Prior to its discovery, bacterial infections were a leading cause of death, and treatment options were limited. Penicillin was a breakthrough in the fight against bacterial diseases like pneumonia, strep throat, syphilis, and various skin infections (Landesman *et al.*, 1981). Over time, various forms of penicillin have been developed to enhance their effectiveness against different types of bacteria and to address issues of resistance. The substrate used for penicillin production is typically a nutrient-rich medium that provides essential nutrients for the growth of the *Penicillium* mold, which is the microorganism responsible for producing penicillin. *Penicillium* fungi require a carbon source, nitrogen source, minerals, and other growth factors to thrive and produce penicillin (Rocha *et al.*, 2019). The primary substrate used for industrial-scale penicillin production is a liquid medium, often based on corn steep liquor or lactose as the carbon source and a nitrogen source such as corn steep liquor, soybean meal, or a combination of both. The medium may also contain various salts, vitamins, and other growth-promoting agents. The process of penicillin production involves fermentation, during which the *Penicillium* mold is grown in large fermentation tanks or bioreactors using the nutrient-rich substrate.



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NATURE'S CHROMATIC PALETTE - EXPLORING THE SPECTRUM OF CAROTENOIDS IN FRUITS, VEGETABLES, AND MICROBES FOR HEALTH AND WELLNESS: A REVIEW

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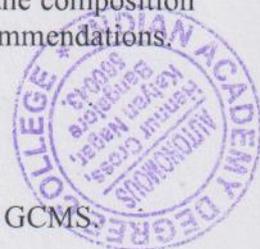
ABSTRACT

Carotenoids, a diverse group of over 700 fat-soluble compounds, are responsible for the vibrant yellow, red, and orange pigments observed in plants, fruits, vegetables, algae, and photosynthetic bacteria. With a staggering assortment of more than 600 types, among which the well-known members of this pigment family are alpha-carotene, beta-carotene, beta-cryptoxanthin, lutein, zeaxanthin, and lycopene. This study aimed to isolate carotenoid-rich microbes from various fruits and vegetables using shadow drying followed by powder formation. Different extraction methods, including the traditional approach, as well as innovative techniques like USAE and MWAE, were employed to extract carotenoids from the microbial samples. The confirmation of successful carotenoid extraction was achieved through the utilization of the sophisticated HPLC technique. The carotenoids were classified into two main groups: xanthophylls and carotenes. Both groups exhibited antioxidant properties, contributing to their potential health benefits. Additionally, certain carotenoids possess the remarkable ability to be converted into vitamin A, a vital nutrient crucial for human growth and overall well-being. These carotenoids, known as provitamin A compounds, namely alpha-carotene, beta-carotene, and beta-cryptoxanthin, fall under this category. Alongside these, non-provitamin carotenoids like lutein, zeaxanthin, and lycopene offer their own distinctive human health benefits. Various fruits and vegetables rich in carotenoids include yams, kale, spinach, watermelon, cantaloupe, bell peppers, tomatoes, carrots, mangoes, and oranges. Understanding the composition and concentration of carotenoids in fruits and vegetables can contribute to improved dietary recommendations.

KEYWORDS

Pigment-producing microorganisms, fruits, vegetables, carotenoids, USAE, MWAE, HPLC, and GCMS.

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Targeting cytokine storm as the potential anti-viral therapy: Implications in regulating SARS-CoV-2 pathogenicity

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Abstract

The latest global pandemic corona virus disease – 2019 (COVID-19) caused by the virus SARS-CoV-2 is still a matter of worrying concern both for the scientific communities and health care organizations. COVID-19 disease is proved to be a highly contagious disease transmitted through respiratory droplets and even close contact with affected individuals. COVID-19 disease is also understood to exhibit diverse symptoms of ranging severities i.e., from mild fatigue to death. Affected individuals' susceptibility to induce immunologic dysregulation phenomena termed 'cytokine storm' seems to be playing the damaging role of escalating the disease manifestation from mild to severe. Cytokine storm in patients with severe symptoms is understood to be characterized by enhanced serum levels of many cytokines including interleukin-1 β , interleukin-6, IP-10/CXCL10, TNF, interferon- γ , MIP-1 α , MIP-1 β and VEGF. Since cytokine production in general is the most important antiviral defense response, understanding the COVID-19 associated cytokine storm in particular and differentiating it from the regular cytokine production response becomes crucial in developing an effective therapeutic strategy. This review focuses on the potential targeting of COVID-19 associated cytokine storm and its challenges.

Graphical abstract



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Neuromicrobiology: Alzheimer's Disease and Gut Microflora

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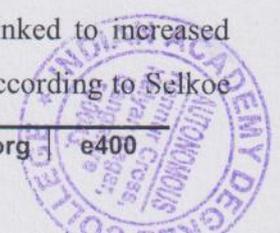
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ABSTRACT: Alzheimer's disease (AD) is a neurodegenerative condition related with ageing and marked by cognitive decline. The cognitive functions include altered behavior, a diminished ability to learn, and memory loss that results in dementia. The hippocampus, cerebral cortex, and other parts of the brain develop beta-amyloid (A) fibrils, oligomers, and neurofibrillary tangles (NFTs), which are the root cause of AD. Studies that are now available indicate that gene mutation, protein aggregation, excitotoxicity, protein aggregates, oxidative stress, and mitochondrial dysfunction are the main mechanisms contributing to the pathogenesis of AD. A collection of microorganisms needed to support the digestive system makes up the gut microbiota. The microbiota-gut-brain axis is a dynamic, bidirectional communication system that connects the functions of the peripheral intestine with cognitive and emotional awareness. This chapter encompasses around the role of gut microflora in Alzheimer's Disease and also the role of probiotics, prebiotics and synbiotics in AD.

Keywords: Alzheimer's disease (AD), beta-amyloid, oxidative stress, microbiota-gut-brain axis, Probiotics.

INTRODUCTION

According to Deture and Dickson (2019), Alzheimer's disease (AD) is a progressive neurological disorder characterised by neuronal degeneration, memory loss, learning disabilities, and major changes in personality and behavioural activities. Although there aren't many cases of AD in young people, it is an age-related disease that has been reported to affect 10% of people between the ages of 65 and 75 and about 32% of people over the age of 80 (Alzheimer's Association, 2016). Due to the complexity of AD's pathogenesis, no treatment has yet been found to stop the disease's progression. One of the causes of cholinergic dysfunction has been linked to increased acetylcholinesterase activity and decreased levels of the neurotransmitter acetylcholine [1]. According to Selkoe





DEGRADATION OF FLOWER WASTE USING MICROBIAL CONSORTIUM: AN APPROACH TOWARDS ENVIRONMENTAL SUSTAINABILITY AND WASTE MANAGEMENT

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ABSTRACT

India is one of the largest flower producing countries in the world. According to the estimates of the national horticulture board, in 2021-2022 the production is 341.63 million tonnes across the country and according to the statistics, floral waste is one of India's biggest pollution, accounting for nearly a third of all solid waste in the country. Floral waste degradation is an extremely slow process compare to degradation of kitchen waste, thus no suitable modes for disposal of this significant organic solid waste. In nature microorganisms do not live isolated, they co-exist with microorganisms establishing relationship that makes the highly complex organic compounds into simpler forms. The present study was taken to develop efficient microbial consortium to degrade the flower waste. Soil samples were collected from different places in which the flower waste were dumped. The isolation and screening of microbes that are capable of degrading the flower waste is performed with the help of flower extract media. A flower-based media was used to develop a microbial consortium for degrading flower waste instead of conventional microbial media. The different enzymatic test was performed to find out the enzymes produced by the organisms to degrade the flower waste. One chamber was created with inoculation of the microbial consortium along with flower waste and another chamber with flower waste without the microbes. Degradation was checked at different time intervals and it showed that the microbial consortium helped in degrading a large amount of flower waste faster.

KEYWORDS: Flower waste, degradation, flower based media, microbial consortium.

PROBIOTICS, PREBIOTICS & SYNBIOTICS – IMPACT ON HEALTH

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ABSTRACT:

Probiotics are live, nonpathogenic microorganisms that are given to patients to help with microbial balance, especially in the digestive system. They are controlled as dietary supplements and foods and are made of *Lactobacillus* and *Bifidobacterium* species or *Saccharomyces boulardii* yeast. Probiotics work to benefit the body through a number of processes, including as reducing intestinal pH, preventing the colonisation and invasion of the body by harmful organisms, and altering the host immune system. Benefits of probiotics linked to a particular species or strain may not apply to others. Probiotics may help prevent conditions such antibiotic-associated diarrhoea, travellers' diarrhoea, irritable bowel syndrome (IBS), ulcerative colitis, Crohn's disease and vulvovaginal infections, hypertension, mental illness although more research is required to fully understand this. A probiotic should normally contain several billion germs to improve the likelihood that proper gut colonisation will occur, but there is no agreement on the minimum quantity of microorganisms that must be consumed to have a positive effect. Probiotics are typically seen to be safe and well tolerated, with bloating and flatulence being the most common side effects. Since systemic infections can infrequently happen, they should be used cautiously in patients who are very ill, highly immunocompromised, or those who have central venous catheters. Probiotics made from bacteria should be taken at least two hours apart from antibiotics.

Keywords: Probiotics, Traveller's diarrhoea, irritable bowel syndrome (IBS), Hypertension.

Introduction

The word "probiotics" is a Greek word that means "for life" Probiotics were described by an expert panel FAO (Food and Agriculture Organisation) and WHO commissiond as "live micro-organisms" which, when provided in sufficient proportions, impart a health benefit on the host. The bacterial genera *Lactobacillus*, *Bifidobacterium*, *Escherichia*, *Enterococcus*, *Bacillus*, and *Streptococcus* are the most frequently employed in probiotic formulations. Additionally, some *Saccharomyces*-related fungal strains have been utilised. Eli Metchnikoff, the 1908 Nobel Prize laureate, proposed that the long life of Bulgarian peasants was due to their consumption of fermented milk products, which is when the idea of probiotics first emerged. Lilly and Stillwell



Dietary Synbiotic as a Supplemental Therapy to Reduce Cancer Symptoms: A Review

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ABSTRACT

The significance of the human microbiome in the pathogenesis of cancer is becoming more widely recognized. Pre-, pro-, and synbiotics are some of the most well-studied ways to alter the microbiota for therapeutic purposes, and there is growing interest in their potential to be used in the diagnosis and treatment of cancer. In this review, we examine how these drugs may preserve the integrity of the intestinal barrier, regulate the immune system, regulate metabolism, and restrict the growth of host cells. We emphasize the epidemiological and trial-based evidence that pre-, pro-, and synbiotics play a role in cancer prevention. In the end, there is more evidence to support the use of these drugs as cancer treatment adjuncts. We go over their roles in enhancing the effectiveness of chemotherapy and radiation and/or reducing their side effects. The use of pre-, pro-, and synbiotics for clinical benefit in oncology patients has tremendous potential, but the discipline is still in its infancy, making it difficult for oncologists to provide their patients the right advice.

Keywords: microbiome, oncology, probiotics, prebiotics, synbiotics.

Received 09.05.2023

Revised 19.05.2023

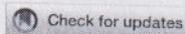
Accepted 30.06.2023

INTRODUCTION

By specifically enhancing the growth and/or stimulating the metabolism of one or more numbers of health-promoting bacteria, a synbiotic product benefits the host by positively impacting the survival and implantation of live microbial dietary supplements in the gut. Because it suggests synergism. The word "synbiotics" should only be applied to products in which the prebiotic compound(s) benefit the probiotic organism(s). This review will examine the possible therapeutic uses of pre-, pro-, and syn-biotic concerning cancer. These agents now constitute the main treatments geared towards positive modification of the microbiota (as opposed to negative manipulation with antibiotics). As our grasp of science has evolved, pre- and probiotic classifications have undergone several changes. 'A substrate that is preferentially used by host microorganisms imparting a health advantage' is the definition of a prebiotic [1]. Numerous molecules fall under this category; the non-digestible oligosaccharides fructo-oligosaccharide (FOS, which may be found in foods like onions and garlic) and galacto-oligosaccharide have received the most research. These substances work by encouraging commensal bacteria to proliferate and/or operate in ways that are advantageous to the host. Probiotics, on the other hand, are "live microorganisms that, when administered in sufficient amounts, confer a health benefit on the host" [2].

Although many fermented foods (like kimchee, tempeh, kombucha, sauerkraut, probiotic yogurt or kefir) contain live organisms, the majority are not considered probiotics because the food itself confers the health benefit rather than the organisms, and they frequently do not contain enough organisms to be classified as probiotics. Synbiotics are a preparation that combines pre- and probiotics. Probiotics are a group of certain microorganisms that may be found in the *Lactobacilli* or *Bifidobacteria* genera and are available as single agents or multi-strain formulations. Probiotics are typically consumed orally and are made to survive transit to the lower gastrointestinal (GI) tract, whether they are consumed in the form of yogurt, freeze-dried live organisms taken as a powder, or in capsule form. [3] By competitive exclusion, direct antagonistic action, neutralization of pathogenic bacterial toxins, and preservation of intestinal barrier function, they may lessen the impact of pathogenic organisms on the host. Short-chain fatty acid (SCFA) generation, bile acid metabolism, vitamin biosynthesis, and carcinogen neutralization are only a few of the metabolic impacts of probiotics [4-6].





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RECEIVED 27 March 2023

ACCEPTED 05 June 2023

PUBLISHED 23 June 2023

CITATION

Prabhakaran P, Hebbani AV, Menon SV, Paital B,
Murmu S, Kumar S, Singh MK, Sahoo DK and
Desai PPD (2023) *In silico* generation of novel
ligands for the inhibition of SARS-CoV-2 main
protease (3CL^{pro}) using deep learning.
Front. Microbiol. 14:1194794.
doi: 10.3389/fmicb.2023.1194794

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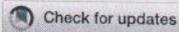
In silico generation of novel ligands for the inhibition of SARS-CoV-2 main protease (3CL^{pro}) using deep learning

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The recent emergence of novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) causing the coronavirus disease (COVID-19) has become a global public health crisis, and a crucial need exists for rapid identification and development of novel therapeutic interventions. In this study, a recurrent neural network (RNN) is trained and optimized to produce novel ligands that could serve as potential inhibitors to the SARS-CoV-2 viral protease: 3 chymotrypsin-like protease (3CL^{pro}). Structure-based virtual screening was performed through molecular docking, ADMET profiling, and predictions of various molecular properties were done to evaluate the toxicity and drug-likeness of the generated novel ligands. The properties of the generated ligands were also compared with current drugs under various phases of clinical trials to assess the efficacy of the novel ligands. Twenty novel ligands were selected that exhibited good drug-likeness properties, with most ligands conforming to Lipinski's rule of 5, high binding affinity (highest binding affinity: -9.4 kcal/mol), and promising ADMET profile. Additionally, the generated ligands complexed with 3CL^{pro} were found to be stable based on the results of molecular dynamics simulation studies conducted over a 100 ns period. Overall, the findings offer a promising avenue for the rapid identification and development of effective therapeutic interventions to treat COVID-19.

KEYWORDS

SARS-CoV-2, recurrent neural network, deep learning, 3CL^{pro}, admetINDIAN ACADEMY DEGREE COLLEGE
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RECEIVED 10 May 2022
ACCEPTED 20 April 2023
PUBLISHED 10 May 2023

CITATION
Pandey S, Anang V, Singh S, Seth S,
Bhatt AN, Kalra N, Manda K, Soni R,
Roy BG, Natarajan K and Dwarakanath BS
(2023), Dietary administration of the
glycolytic inhibitor 2-deoxy-D-glucose
reduces endotoxemia-induced
inflammation and oxidative stress:
Implications in PAMP-associated acute
and chronic pathology.
Front. Pharmacol. 14:940129.
doi: 10.3389/fphar.2023.940129

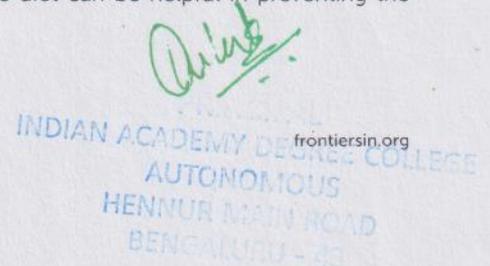
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Dietary administration of the glycolytic inhibitor 2-deoxy-D-glucose reduces endotoxemia-induced inflammation and oxidative stress: Implications in PAMP-associated acute and chronic pathology

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Pathogen-associated molecular patterns (PAMPs) like bacterial cell wall components and viral nucleic acids are known ligands of innate inflammatory receptors that trigger multiple inflammatory pathways that may result in acute inflammation and oxidative stress-driven tissue and organ toxicity. When dysregulated, this inflammation may lead to acute toxicity and multiorgan failure. Inflammatory events are often driven by high energy demands and macromolecular biosynthesis. Therefore, we proposed that targeting the metabolism of lipopolysaccharide (LPS)-driven inflammatory events, using an energy restriction approach, can be an effective strategy to prevent the acute or chronic detrimental effects of accidental or seasonal bacterial and other pathogenic exposures. In the present study, we investigated the potential of energy restriction mimetic agent (ERMA) 2-deoxy-D-glucose (2-DG) in targeting the metabolism of inflammatory events during LPS-elicited acute inflammatory response. Mice fed with 2-DG as a dietary component in drinking water showed reduced LPS-driven inflammatory processes. Dietary 2-DG reduced LPS-induced lung endothelial damage and oxidative stress by strengthening the antioxidant defense system and limiting the activation and expression of inflammatory proteins, viz., P-Stat-3, NfκB, and MAP kinases. This was accompanied by decreased TNF, IL-1β, and IL-6 levels in peripheral blood and bronchoalveolar lavage fluid (BALF). 2-DG also reduced the infiltration of PMNCs (polymorphonuclear cells) in inflamed tissues. Altered glycolysis and improved mitochondrial activity in 2-DG-treated RAW 264.7 macrophage cells suggested possible impairment of macrophage metabolism and, therefore, activation in macrophages. Taken together, the present study suggests that inclusion of glycolytic inhibitor 2-DG as a part of the diet can be helpful in preventing the



Enhanced Glycolysis Confers Resistance Against Photon but Not Carbon Ion Irradiation in Human Glioma Cell Lines

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Purpose: Metabolic reprogramming is a key hallmark in various malignancies and poses a challenge in achieving success with various therapies. Enhanced glycolysis is known to confer resistance against photon irradiation while the tumor response to carbon ion irradiation (CII) has not been investigated. This study aimed to investigate the effects of enhanced glycolysis on the response of human glioma cell lines to CII compared to the response to X-rays.

Material and Methods: Glycolysis was stimulated using Dinitrophenol (DNP), a mild OXPHOS inhibitor, in three human glioma cell lines (U251, U87, and LN229) and assessed by monitoring glucose uptake and utilization as well as expression of regulators of glycolysis (glucose transporter protein type 1 (Glut1), hexokinase-II (HKII), and Pyruvate Kinase-2 (PKM2). Radiation (X-rays and CII) induced loss of clonogenic survival growth inhibition and perturbations in cell cycle progression (G₂+M block), cytogenetic damage (micronuclei formation), apoptosis, necrosis (reflecting interphase death), and cell migration (Scratch assay) were investigated as parameters of radiation response.

Results: DNP (1 mM) enhanced the expression levels of GLUT1, HKII, and PKM2 by 30–60% and glucose uptake as well as usage by nearly 3 folds in U251 cells suggesting the stimulation of glycolysis. Enhanced glycolysis attenuated the loss of clonogenic survival with D₁₀ doses increasing by 20% to 65% in these cell lines, while no significant changes were noted following CII. Concomitantly, dose-dependent growth inhibition, and cytogenetic damage as well as apoptosis and necrosis induced by X-rays were also reduced by elevated glycolysis in U251 and LN229 cells by 20–50%. However, stimulation of glycolysis enhanced the X-ray-induced cell migration, while it had negligible effect on migration following CII.

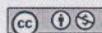
Conclusion: Our results suggest that enhanced glycolysis confers resistance against X-ray-induced cell death and migration, while it may not significantly alter the cellular responses to carbon ion irradiation.

Keywords: carbon ion radiotherapy, metabolic-reprogramming, radio-resistance, Warburg effect, glucose metabolism, X-rays irradiation

Plain Language Summary

Radiotherapy is widely used for treating more than 50% of all malignancies. A major challenge in achieving success in radiotherapy is the development of radioresistant cancer cells partly linked to a reprogramming of the metabolism in the form of enhanced glucose dependency and utilization called the "Warburg effect" that occurs in most tumors. Treatment of tumors with a form of particle therapy using carbon ion- has been shown to be more effective against solid tumors.

Here, in this work, we have for the first time investigated the response of three human brain tumor (glioma) cell lines (U251, LN229, and U87) stimulated for enhanced glucose utilization (using OXPHOS modifier 2-dinitrophenol, DNP) to carbon ion irradiation (CII). Our results show that stimulation of glycolysis reduces radiation-induced cell death (mitotic, apoptotic and necrotic) growth inhibition in all three glioma cell lines, while it did not alter these responses significantly in carbon ion irradiated cells.



Technological advancements in cancer diagnostics: Improvements and limitations

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Funding information

NCI-SBIR, Grant/Award Numbers: 75N91019C000016, 75N91019C000043

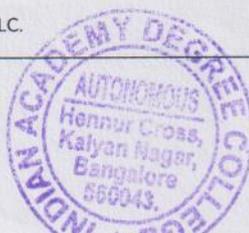
Abstract

Background: Cancer is characterized by the rampant proliferation, growth, and infiltration of malignantly transformed cancer cells past their normal boundaries into adjacent tissues. It is the leading cause of death worldwide, responsible for approximately 19.3 million new diagnoses and 10 million deaths globally in 2020. In the United States alone, the estimated number of new diagnoses and deaths is 1.9 million and 609 360, respectively. Implementation of currently existing cancer diagnostic techniques such as positron emission tomography (PET), X-ray computed tomography (CT), and magnetic resonance spectroscopy (MRS), and molecular diagnostic techniques, have enabled early detection rates and are instrumental not only for the therapeutic management of cancer patients, but also for early detection of the cancer itself. The effectiveness of these cancer screening programs are heavily dependent on the rate of accurate precursor lesion identification; an increased rate of identification allows for earlier onset treatment, thus decreasing the incidence of invasive cancer in the long-term, and improving the overall prognosis. Although these diagnostic techniques are advantageous due to lack of invasiveness and easier accessibility within the clinical setting, several limitations such as optimal target definition, high signal to background ratio and associated artifacts hinder the accurate diagnosis of specific types of deep-seated tumors, besides associated high cost. In this review we discuss various imaging, molecular, and low-cost diagnostic tools and related technological advancements, to provide a better understanding of cancer diagnostics, unraveling new opportunities for effective management of cancer, particularly in low- and middle-income countries (LMICs).

Recent Findings: Herein we discuss various technological advancements that are being utilized to construct an assortment of new diagnostic techniques that incorporate hardware, image reconstruction software, imaging devices, biomarkers, and even artificial intelligence algorithms, thereby providing a reliable diagnosis and analysis of the tumor. Also, we provide a brief account of alternative low cost-effective cancer therapy devices (CryoPop[®], LumaGEM[®], MarginProbe[®]) and picture archiving and communication systems (PACS), emphasizing the need for multi-disciplinary

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