Salient features of the book:

- This book provides a complete guide for the students of pharmacy.
- The content of the book is easy to understand and will help the students to elucidate the pathophysiology of various diseases and disorders.
- A student-centric approach is adopted while writing this book by making the content lucid and concise; yet striking a balance in depth of the content.
- The tables and illustrations are provided throughout the book to get a clear insight into the subject.
- The book stands as a good reference for both students and faculty.

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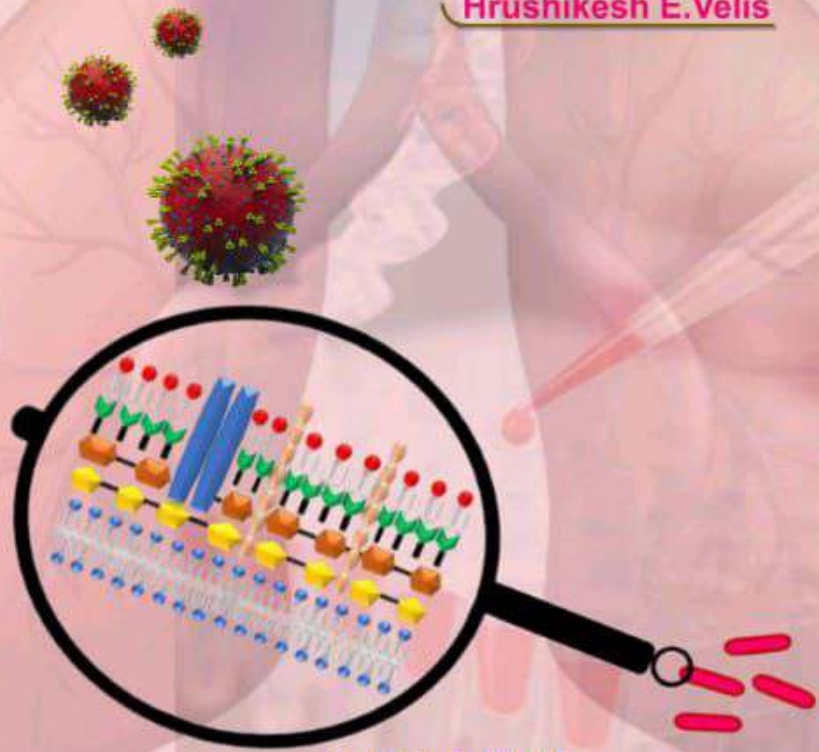

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Preface

Pathophysiology is an important subject in the pharmacy education. The subject of pathophysiology is not only a combination of two words but also two distinct branches, Pathology and Physiology. It is a branch of medical science that deals with the study of causes, effects, mechanisms, and nature of disease or disorder. The knowledge of pathophysiology is necessary to understand the pharmacology of various classes of drugs. This ultimately helps the students to practice medicines safely, confidently, rationally, and effectively.

To understand the pathophysiology, the students must get acquainted with the fundamental concepts of the subject. The objective of the book is to provide a complete guide for every student. This book covers the relevant aspects of the pathophysiology of various disease conditions considering their pharmacological applications. The book attempts to simplify the complex concepts involved in the pathogenesis of the disease conditions.

We have adopted a student-centric approach while writing this book by making the content lucid and concise; yet striking a balance in depth of the content. This will address the level of understanding of students with different intellects.

The content of the book is easy to understand and will help the students to elucidate the pathophysiology of various diseases and disorders. National and international journals, books, and authentic sources like the WHO, have been referred to write the book.

The highlights of the book are the simplified definitions, epidemiology, etiology, signs and symptoms, pathogenesis, complications, diagnosis, and management of the disease conditions. The tables and illustrations are provided throughout the book to get a clear insight into the subject. For simplification, the framework of the book is divided into five units comprising14 chapters. Each chapter ends with a short exercise for self-evaluation and improvement. The book stands as a good reference for both students and faculty.

We will be happy to accept any suggestions given by our readers, which will be incorporated into future editions.

Dr. Vandana S. Nade
Mr. Hrushikesh E.Velis

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We would like to express our profound gratitude to Dr. Milind P. Wagh, for his catalytic role who provoked us to write this book.

We would like to express special thanks to Dr. Laxmikant Kawale, for his generous support and encouragement.

We would like to thank Mrs. Rupali Velis for her untiring support and patience, and Master Siddhesh Velis for providing his critical feedback.

For patience, love and support during the writing of this book and accomplishment of our goals, we would like to acknowledge with gratitude our family members. This book would not have been possible without them.

Thanks to everyone of the Pharma Career Publication team, who helped us so much. Special thanks to Mrs. Sarika Deshmukh, Mr. Sudhanva Tipare, Mr. Vaijnath Bhagwat, Mrs. Prerana Dani and staff of Pharma Career Publications for their outstanding co-operation for publishing this book.

We are grateful to the readers for their honest feedback.

Dr. Vandana S. Nade
Mr. Hrushikesh E.Velis

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REGULATORY AFFAIRS

(MPH 104T)

Dr. Vivek S. Tarate

Dr. Upendra C. Galgatte

Dr. Sachinkumar D. Gunjal

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Authored By: **Dr. Vivek S. Tarate, Dr. Upendra C. Galgatte, Dr. Sachinkumar D. Gunjal, Dr. Shilpa S. Kolhe**

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PREFACE

A Regulatory Affair is a one-of-a-kind collaboration between internal departments of an industry and regulatory bodies that begins with the conceptualization of the product to be developed by that industry and ends with the marketing of that product. It is a crucial and noticeable aspect of pharmaceutical product development. This chapter discusses the regulatory affairs, regulatory requirements for product approval, and documentation in the pharmaceutical industry, with a focus on the master formula record, drug master file, and distribution records.

The book's chapters provide an overview of the regulatory affairs field, information about different regulatory authorities, how these professionals work, and the various roles and responsibilities of regulatory affairs professionals. This book also discusses the various skills required for a career in regulatory affairs, as well as the employment opportunities available in various sectors. We go over typical tasks, required skills, the ins and outs of the submission process, critical knowledge, and much more. Are you drowning in acronyms? We've got your back. Not sure how regulatory plays a role in pharmaceutical development? We describe the procedure.

Following Chapters are including:

1. Documentation in Pharmaceutical industry
2. Regulatory requirement for product approval
3. CMC, post approval regulatory affairs
4. Nonclinical drug development
5. Clinical trials

SCOPE:

Course designed to impart advanced knowledge and skills required to learn the concept of generic drug and their development, various regulatory filings in different countries, different phases of clinical trials and submitting regulatory documents: filing process of IND, NDA and ANDA

- To know the approval process of
- To know the chemistry, manufacturing controls and their regulatory importance
- To learn the documentation requirements for
- To learn the importance and

OBJECTIVES:

Upon completion of the course, it is expected that the students will be able to understand

- The Concepts of innovator and generic drugs, drug development process
- The Regulatory guidance's and guidelines for filing and approval process
- Preparation of Dossiers and their submission to regulatory agencies in different countries
- Post approval regulatory requirements for actives and drug products
- Submission of global documents in CTD/ eCTD formats
- Clinical trials requirements for approvals for conducting clinical trials
- Pharmacovigilance and process of monitoring in clinical trials.

Abbreviations

Abbreviated New Drug Application (ANDA)

Absorption, Distribution, Metabolism, and Excretion (ADME)

Active Implantable Medical Device Category (AIMD)

Active Pharmaceutical Ingredient (API)

Active Pharmaceutical Ingredients (APIs)

Advance Notice of Proposed Rule Making (ANPRM)

Advanced Therapy Medicinal Products (ATMPs)

Agência Nacional de VigilânciaSanitária (ANVISA)

Association of Pharmaceutical Scientists (AAPS)

Australian Register of Therapeutic Goods (ARTG)

Batch Manufacturing Records (BMR)

British Pharmacopoeia (BP)

Carboxymethylcellulose (CMC)

Center for Biologics Evaluation and Research (CBER)

Center for Devices and Radiologic Health (CDER) (CDRH)

Center for Drug Evaluation and Research (CDER)

Central Drugs Standard Control Organization (CDSCO)

central nervous system (CNS)

Change Being Effected (CBE)

chemistry, manufacturing, and control (CMC)

Clinical Trial Applications (CTAs)

Code of Federal Regulations (CFR)

Committee on Genetic Manipulation (RCGM)

Common Good Manufacturing Practise (GMP)

Common Technical Document (CTD)

Common Technical Document (CTD)

Contract Research Organizations (CRO)

Council for International Organizations of Medical Sciences (CIOMS)

Degree of Substitution (DS)

Department of Health and Human Services (DHHS)

Development and Reproductive Toxicology (DART)

Drug Controller General of India (DCGI)

Drug Master File (DMF)

Drug Regulatory Authority (DRA)

Drugs and Health products (DHP)

Electronic Submissions Gateway (ESG)

European Union (EU)

Federal Food, Drug, and Cosmetic Act (FDCA)

Food and Drug Administration (FDA)

General Practice Research Database (GPRD)

Global Harmonization Task Force (GHTF)

Good Clinical Practices (GCP)

Good Laboratory Practice principles (GLP)

Good Laboratory Practices (GLP)

Good Manufacturing Practise (GMP)

Government Publishing Office (GPO)

Health Authority (HA)

Human Factor (HF)

Human Research Ethics Committee (HREC)

Institutional Review Board (IRB)

International Conference of Harmonization (ICH)

International Conference on Harmonization (ICH)

International Conference on Harmonization Good Clinical Practice (ICH-GCP)

Investigational Medicinal Product (IMP)

Investigational Medicinal Product (IMP)

Investigational Medicinal Product Dossier (IMPD)

Investigational Medicinal Products (IMPs)

Investigational New Drug Application (IND)

Investigator's Brochure (IB)

Market Authorization Group (MAG)

Marketing Authorization Applications (MAA)

Marketing Authorization Applications (MAA)

Master Formula Record (MFN)

Material of Construction (MOC)

Monitoring and Compliance Group (MCG)

Mutual Recognition Agreement (MRA)

National Archives and Records Administration's (NARA)

National Institutes of Health (NIH)

New Drug Application (NDA)

Non-Observed Adverse Effect (NOAEL)

Novel Drug Delivery System (NDDS)

Office of Combination Products (OCP)

Office of Regulatory Integrity (ORI)

Office of the Federal Register (OFR)

Pan American Health Organization (PAHO)

Pan American Health Organization (PAHO)

Patient Information Leaflets (PILs)

Pharmaceuticals and Medical Devices Agency (PMDA)

Pharmacodynamics (PD)

Pharmacokinetic/Toxicokinetic (PK/TK)

Pharmacokinetics (PK)

Pharmacovigilance (PV)

Pharmacovigilance Risk Assessment Committee, or PRAC

Post-Marketing Surveillance (PMS)

Prior Approval Supplement (PAS)

Proposed Primary Mode of Action (PMOA)

Public Health Services Act (PHS Act)

Quality Control (QC)

Request-for-Designation (RFD)

Roszdravnadzor (RZN)

Scaleup and Post-Approval Change (SUPAC)

Scale-Up and Post-Approval Changes (SUPAC)

Standard Operating Procedures (SOPS)

United States Pharmacopeia-National Formulary (USP-NF)

US Pharmacopeia (USP)

World Health Organization (WHO)

World Intellectual Property Organization (WIPO)

World Trade Organization (WTO)

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PHARMACEUTICS – I

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As per PCI Syllabus

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PREFACE

This textbook explores the fundamental physicochemical attributes and processes important for understanding how a drug, usually in the form of a crystal, is transformed into a usable product that is administered to a patient to reach its pharmacological target and then leaves the body in the spirit of understanding how drugs work. It brings me great pleasure to present my humble work on PHARMACEUTICS I - (THEORY) to a broad community of pharmacy students, written in compliance with the most recent syllabus prescribed for as per PCI Syllabus. Our goal in developing this book is to present basic theory to pharmacy students on modern lines. Keeping in mind the needs of both students and teachers, this book has been prepared to cover all topics within the constraints of the specified syllabus. I hope the book is useful and fits the needs of pupils.

Abbreviations

Active Pharmaceutical Ingredients (API)

All India Council of Technical Education (AICTE)

Banaras Hindu University (BHU)

British Pharmacopoeia Commission (BPC)

Carboxymethylcellulose (CMC)

Education Regulations (ER)

Expert Advisory Groups (EAG)

High Performance Liquid Chromatography (HPLC)

Indian Pharmacopoeia (IP)

Medicines and Healthcare products Regulatory Agency (MHRA)

New Chemical Entities (NCEs)

Oil-In-Water (O/W)

Pharmacy Council of India (PCI)

Polyethylene Glycol (PEG)

Transdermal drug delivery systems (TDDS)

United States Agency for International Development (USAID)

United States Pharmacopeia (USP)

United States pharmacopoeia and the National Formulary (USP-NF)

USP's Drug Quality and Information (USP DQI)

Water-In-Oil (W/O)

World Health Organization (WHO)

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TEXTBOOK ON PHARMACEUTICAL INTELLECTUAL PROPERTY RIGHTS

INTELLECTUAL PROPERTY RIGHTS OF PHARMACEUTICALS

Dr. Anasuya Patil | Dr. Nayyar Parvez
Dr. Sachinkumar Dnyaneshwar Gunjal
Prof. Madhusmruti Khandai
Dr. Rajni Arora | Ms. Nagam Santhi Priya

Textbook On Pharmaceutical Intellectual Property Rights

Intellectual Property Rights Of Pharmaceuticals

Dr. Anasuya Patil, Dr. Nayyar Parvez, Dr. Sachinkumar Dnyaneshwar Gunjal, Prof. Madhusmruti Khandai, Dr. Rajni Arora, Ms. Nagam Santhi Priya

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Part IV

About the Book :

The laws and regulations governing the pharmaceutical industry were adopted to protect the consuming public by attempting to provide drugs of constituent quality, purity, and efficacy. The Food, Drug and Cosmetic Act (the Act) is a living document in that it is amended frequently and interpreted constantly. The act may be imperfect, but careful attention to its provisions plus an effort of good faith by all persons concerned with drug manufacturing can produce the type of product for which the Act and its regulations strives. Even though the applicable laws and regulations may change with regard to specifics, there are, nonetheless, many constant applicable generally. This book serves an overview of the more significant laws, regulations and Acts. This text book describes the Food, Drug and Cosmetic Act, treats briefly regulations bearing on pharmaceutical manufacturing, looks at the structure, powers, and duties of the Food and Drug administration (FDA), describes state and local laws and regulations, and finally, covers the protection of industrial property and product liability.

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Dr. SACHINKUMAR D. GUNJAL
Dr. SHASHI ALOK
Mr. AVINASH JORIYA
Dr. MOHAMMAD SALMAN

SIPH

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Any attempt at any level can't be satisfactorily completed without our students' collaborative effort, resulting in our Book being unique.

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Dr. Mohammad Salman training as clinical Pharmacist at Alshifa College Of Pharmacy, Kerala University of Health Science, Melethil House, Kadungooth, Koottilangadi, Malappuram Kerala. He is persuing Ph.D. He has an excellent track record in academic institution of actively engaged in teaching, research and administration . He has to his credit of 4 research and review publication in reputed National and International journal having impact factor. He has published 1 indian patent. He has guided 66 B. Pharm students for their research and project works.He has completed his 6 years of Degree PharmD at shifa College at Kerala University of Health Sciences. He has noticed that there's an emerging importance and emergency in society and industry for the field of medicine. He has published two research works with his peer groups. Also, he got a chance to be a part of a book publication and an Indian patent, which will be out within a few weeks. He was also honored to be a part of a UK patent publication and 2 other works are in process to be published. He has done internship in India Kerala at NABH accredited hospitals at Kims Alshifa Hospital and Aster Mims Hospital to explore in depth as part of his Pharm D course.

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Social And Preventive Pharmacy

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Mrs. Priyanka Namdeo
Ms. Raman Kumari

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Preface

The opportunity to prepare a book on "Social and Preventive Pharmacy" provided us the occasion to serve the students of B. Pharmacy. Many new concepts have arisen and much more modifications have been incorporated over the past strategies. The book enunciates the principles and components of Primary health care and National health policies to achieve the goal of "Health for all". It provides entire information about the National Health Programs with particular emphasis on maternal and child health programs, family welfare planning.

The book allows for the lucid understanding of different health and disease conditions. This book introduces communicable diseases, causative agent, mode of transmission and prevention of various diseases.

All the topics of the textbook are described in detail for the benefit of the student community. The text book has been designed to give the students rapid and easy access to all the information in a syllabus wise format by presenting the subject in a clear, understandable and logically organized way.

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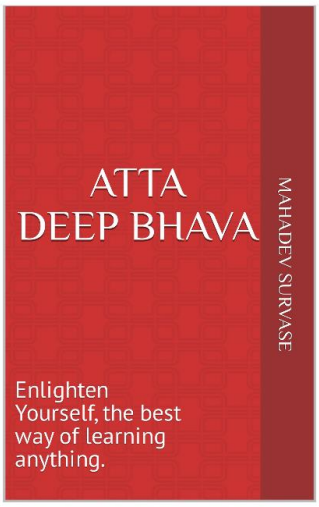

ATTA DEEP BHAVA: ENLIGHTEN YOURSELF, THE BEST WAY OF LEARNING ANYTHING.

Hello Friends,

So, I've been thinking about writing this book for a while now. I'm no genius student—I went through school and college just like you, facing all the challenges that come with learning. I get it. We all want that magical trick or superpower to remember everything effortlessly.

I tried all sorts of things to boost my memory—medications, herbal stuff, even though exercising more might make me smarter. But, nope, none of it worked. But in the struggle to learn, remember, and recall, I stumbled upon something cool—the world is full of different ways to learn stuff that actually work.

It was like finding hidden treasures. These methods are surprisingly simple. If only I had known about them back in my student days, things might have been way easier. We can't time travel, but the good part is, I can share these secrets with you now.

This book isn't just about memorizing things; it's also about being creative and using what you know in real life. I want to show you lots of ways to learn, clear up any wrong ideas that might be holding you back, and, most importantly, make learning fun. Let's start this awesome journey together. In these pages, I'll help you beat the fear of learning and discover your real potential.

As we dive into the cool world of learning, let's remember something important: the first step to knowing stuff is understanding ourselves.

We're all different, right? So, find out what you're awesome at, where you need a bit of help, and mold your learning adventure to fit you. In a world full of tips and tricks, knowing yourself is like having a compass to navigate through all the info out there.

This book isn't just about learning tricks; it's also about getting to know you better. When you understand yourself, you open the door to learning in a way that's not just smart but feels really good too.

Cheers to the awesome journey of discovering yourself through self-learning!

Mahadev

"To Aai and Dada, who taught me so much with their love and wisdom.

To my amazing wife, Sonali, and our sons, Aarav and Advik, your endless support and love inspire every word in this book.

To my dear family, friends, and everyone who's been a part of my life, your influence has shaped this journey in ways beyond words.

This book is a tribute to each of you, the pillars of my life, whose belief and encouragement have guided me in exploring the world of memory. Thank you for being an essential part of this heartfelt journey."

Index

Sleepy Mistakes

Ever tried to learn something when you're super tired? It's like trying to swim through peanut butter! When you're sleepy, your brain struggles to focus and remember things. That's because it hasn't had its nightly maintenance time.

Tips for a Memory-Boosting Sleep

Want to make the most of your sleep for learning and memory? Here are some tips:

Consistent Routine: Try to stick to a regular sleep schedule.

Comfort Matters: Make your sleep space cozy and comfortable.

Screen Break: Give your brain a break from screens before bedtime.

Relaxation Rituals: Start calming activities before bed, like reading or listening to soothing music.

A Textbook of

Herbal Drug Technology

(As per PCI Syllabus Sub code: BP603T)
[Third year B. Pharmacy Sem V]

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- Dr. G. D. Ghangale
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HERBAL
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PREFACE

The **Herbal Drug Technology** book teaches the basics of the herbal drug industry, such as raw material quality, quality guidelines for herbal drugs, Ayurvedic formulations, herbal cosmetics, natural sweeteners, nutraceuticals, and so on. It also discusses herbal drug good manufacturing practises (GMP), patenting, and regulatory issues. This book is written strictly according to the **PCI syllabus,** with clear explanations and simple language, and is a must-read for **B.Pharm and M.Pharm students**. You'll learn about drug evaluation according to WHO and ICH guidelines, herbal drug stability testing, and the patenting and regulatory requirements of natural products. Students will also understand the significance of raw materials as a source of herbal drugs, from cultivation to herbal drug products.

This book covers biodynamic agriculture, Indian systems of medicine, herbal drug and herb—food interactions, herbal excipients, herbal formulations, natural product patenting and regulatory requirements, regulatory issues, general introduction to the herbal industry, and good manufacturing practises of Indian systems of medicine. Apart from general topics, it strikes a balance between essential and advanced areas of knowledge. The subject is comprehensive, written in simple language, with well-labeled diagrams and important tables in both the theoretical and practical sections.

"Herbal Drug Technology": From Plant to Medicine"" is an essential resource for anyone interested in herbal medicine, whether a student or a layperson. With its thorough coverage and simple language, you'll gain a thorough understanding of the fascinating world of herbal medicine and its role in modern healthcare.

Abbreviations

Active Pharmaceutical Ingredients (APIs)
Associated Chambers of Commerce and Industry of India (ASSOCHAM)
Atomic Energy Agency (IAE)
Ayurvedic Drug Manufacturers' Association (ADMA)
Ayurvedic Drug Manufacturing Association (ADMA)
Ayurvedic, Siddha and Unani (ASU)
Banaras Hindu University (BHU)
Buyer-Seller Meetings (BSMs)
Carboxylic Acid (-COOH)
Cardiovascular Diseases (CVD)
Central Council for research in Ayurveda and Siddha (CCRAS)
Central Council for Research in Unani Medicine (CCRUM)
Central Council for Research in Unani Medicine (CCRUM)
Central Drug Research Institute (CDRI)
Central Drug Standard Control Organization (CDSCO)
Central Institute for Medicinal and Aromatic Plants (CIMAP)
Conservation Agriculture (CA)
Control Drugs Laboratory (CDL)
Docosahexaenoic Acid (DHA)
Drug Consultative committees (DCC)
Drug Delivery Systems (DDS)
Drug Technical Advisory Board (DTAB)
Eicosapentaenoic Acid (EPA)
Fingerprint Evaluation of Herbals (FEH)
Food and Agricultural Organization (FAO)
Food and Drug Administration (FDA)
Foreign Trade Policy (FTP)
Foundation for Revitalization of Local health Traditions (FRHLT)
Gastrointestinal (GI)
Good Agricultural Practices in Cultivation (GACP)

Good Manufacturing Practice (GMP)

Herbal Medicinal Product (HMP)

Indian Council for Medical Research (ICMR)

Indian Council for Scientific and Industrial Research (CSIR)

Indian Institute of History of Medicine and Medical Research (IHMMR)

Indian Medical Practitioners Co-operative Pharmacy and Stores ltd. (IMPCOPS)

Indian System of Medicine (ISM)

Intellectual Property (IP)

Intellectual Property Rights (IPRs)

International Association for the study of Traditional Asian Medicine (IASTAM)

Irritable Bowel Syndrome (IBS)

Lipid-Rich (LDL)

Low-Density Lipoprotein (LDL)

Market Access Initiative (MAI)

National Botanical Research Institute (NBRI)

National Bureau of plant Genetic Resources (NBPGR)

National Chemical Laboratory (NCL)

National Institute for Mental Health and Neurosciences (NIMHANS)

National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)

National Institute of Science Communication (NISCOM)

National Institutes of Health's (NIH)

Nicholas Piramal Research Centre (NPRC)

Novel Drug Delivery System (NDDS)

Organisms (GMOs)

Pharmaceutical Education and Research Development (PERD Centre)

Pharmaceuticals Export Promotion Council (PHARMEXCIL)

Plant Breeders Rights (PBR)

Plant Variety Rights (PVR)

Plant-Incorporated Protectants (PIPs)

Polyvinylpyrrolidone (PVP)

Regional Medical Research Centre (ICMR)

Regional Research Laboratory (RRL)

Relative Humidity (RH)

Reverse Buyer-Seller Meetings (RBSMs)

Rheumatoid Arthritis (RA)

Shellac & Forest Products Export Promotion Council (SHEFEXIL)

Standard Operating Procedure (SOP)

Traditional Knowledge (TK)

Tropical Botanical Garden and research Institute (TBGRI)

World Health Organization (WHO)

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Fabrication of Cu_2O-TiO_2 nanocomposite and its photo catalytic efficiency for Congo red dye degradation

D. P. Hase[1], S. A. Musmade[4], B. K. Uphade[4], K. S. Bhavsar[2], J. S. Khedkar[3], A. R. Gavit[4], A. S. Vikhe[4], S. M. Patel[1], V. V. Vikhe[1], S.K. Kadu[1], H.S. Kharde[1], V. D. Murade[1]*

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Abstract: Water pollution is one of the major and serious issue that cause neurological, cardiovascular and respiratory disorders in humans and aquatic animals. Day by day the water resources get polluted by poisonous and cancer-causing nature of dyes in effluents. So today it is very essential to develop an efficient and effective method for waste water treatment using a highly active and reusable catalyst. In present study, we report the synthesis of heterogeneous catalyst Cu_2O-TiO_2 composite by surfactant assisted precipitation method. It was characterized by UV-visible diffused reflectance spectroscopy (UV-DRS), X-ray diffraction (XRD), Scanning electron microscopy (SEM), and Transmission electron microscopy (TEM) techniques. These characterization techniques confirmed the structure of Cu_2O/TiO_2. The photo catalytic performance was studied for the decolourization of Congo red dye under ambient conditions and 89±0.5 % degradation was observed within 110 min using 1mg/L Congo red dye solution with 9mg/L of Cu_2O/TiO_2 composite.

Keywords: Heterogeneous, Photocatalyst, degradation, Photoexcitation.

INTRODUCTION: In recent years semiconductor material as a photo catalyst has been attracted enormous attention for energy storage and in environmental fields [1-2]. It has a great potential to solve the energy and pollution related issues. The attainment of semiconductor performance is strongly depending on its structural factors viz., shape, size and crystallization [3]. It has been reported that the performance of photo catalysts can be enhanced by controlling the shape and size of material since these factors affect the quantitative measurement of atoms located at the edges, corners and surfaces [4]. Polyhedron with highly reactive surfaces exhibits much higher catalytic activity than the regular ones [5]. By taking this into account we can synthesize highly efficient and effective photo catalyst. The metal oxide such as Cu_2O is a p-type semiconductor with direct band gap of ~2.1 eV and is widely used as photo catalyst due to its large abundance and non-toxicity and it is easy to synthesize [6,7]. Since last few years, the shape and size-controlled Cu_2O was synthesized in the form of various polymorphs such as nanocubes [8], octahedra [9], nanowires [10], cuboctahedra [11]. In addition to structural factors the surface potential and electronic properties of the (100), (110) and (111) surfaces of nanostructures are analysed by using high-resolution Kelvin probe force microscopy [12] which shows the surface energy order as 110>111>100 [13]. Among these (110) is a higher

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Perspectives of Pharmacologically Significant Chalcone-Based Heterocycles for their Medicinal Applications and Various Cumulative Synthetic Approaches – An Overview.

Vaishali D. Murade[1], Snehal V. Darandale[1], Kailash R. Kadam[1], Anil G. Gadhave[1], Rupali D. Murade[1], Dilip S. Aute[1], Prashant L Harale[1], Dinesh P. Hase[2]*

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Abstract: Chalcone is one of the most privileged compounds in the pharmacological sector. It is found abundant in plants and it acts as biological forerunners of flavonoids and isoflavonoids. Because of the broad spectrum of biological activities, chalcones is leading molecules for the novel drug improvisation and discovery. The overall intension of this review article is to get thorough and clear idea about chalcones, their properties, various synthetic approaches and their pharmacological applications.

Keywords: Chalcones, pharmacological, synthetic approach.

Introduction: Chalcones are pharmaceutically vital group of compounds that acts as biological pioneers of flavonoids and iso-flavonoids, which are abundant in plants. Chalcones are composed of two aromatic rings linked together via α, β unsaturated carbonyl system. Stereo chemically trans isomer of chalcones is highly stable. Several studies have predicted that the major reason behind the lower redox potential, stability, electron transfer reactions of chalcones is the presence of α, β unsaturated carbonyl system [1]. Out of several characteristic features of chalcones, their smaller size and efficient Michael acceptor nature are making them a centre of attraction for the researchers in the pharmaceutical sector [2]. The biological activity of chalcones varies on the basis of the substituents attached to the aromatic rings, considering this fact nowadays chalcones possessing coumarin (1), indole (2), isoxazoles (3), oxazoles (4), thiazoles (5), phenothiazinyl (6), pyridinyl (7) chalcones etc (Fig. 1) linkages are considered to be of great interest [3-8]. Until now several synthetic methods like Claisen-Schmidt condensation, grinding, microwave irradiation, ultrasound irradiation reaction, Witting reaction, various cross coupling reactions such as Heck reaction, Suzuki reaction, Julia-Kocienski reaction, etc. are being employed for the synthesis of chalcones [9-15]. Chalcones possess variety pharmacological applications including anticancer [16,17], antidiabetic [18], anti-inflammatory [19], anti-tubercular [20], anti-microbial [21], antileishmanial [22], antimalarial [23], antihypertensive [24] etc. These spectacular pharmacological applications of chalcones are making them a supreme nominee for the development of highly efficient drugs against several diseases with lesser side effects.
The overall intension behind this review article is to provide a clear and thorough idea about chalcones and their heterocyclic derivatives in terms of their physiochemical properties, different synthetic routes and medicinal applications.

CHAPTER

8

Importance of functional foods in the management of autism

Sweta Rai[1], *Raj K. Keservani*[2], *Prashant Kumar*[3], *Vikrant Kisanrao Nikam*[4], *Ramanlal N. Kachave*[5], *Yatindra Kumar*[6] *and Rajesh K. Kesharwani*[7]

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8.1 Introduction

Autism spectrum disorders (ASD) are neurodevelopmental conditions whose symptoms often appear within the first three years of life and frequently last a lifetime (Happé, 2015). These conditions have an allegedly puzzling etiology. According to clinical definitions, ASD is characterized by core symptoms such as restrictions on social interaction and communication and repetitive or limited activity patterns (Jukić & Arbanas, 2013). Aggression, anxiety, impulsivity, hyperactivity, tantrums, and self-injury are other prevalent behavioral issues and comorbidities. The prevalence of ASD has increased exponentially worldwide, according to data from the last few decades. ASD affects 1 in every 45 children in the United States, according to recent data (based on a parent survey intended to assess the prevalence of developmental difficulties in children aged 3 to 17 years) (Fombonne, 2009; Fombonne, Quirke et al., 2009;

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