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Colon Cancer Diagnosis and Therapy

Volume 1

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Colon Cancer Diagnosis and Therapy

Volume 2

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Antineoplastic Effects of Curcumin Against Colorectal Cancer: Application and Mechanisms

Vivek Kumar Soni, Arundhati Mehta, Yashwant Kumar Ratre, Chanchal Kumar, Rajat Pratap Singh, Abhishek Kumar Srivastava, Navaneet Chaturvedi, Dhananjay Shukla, Sudhir Kumar Pandey, and Naveen Kumar Vishvakarma

Abstract Curcumin is one of the major bioactive metabolites of turmeric, a spice component common in southeast Asia. Curcumin is known for its anti-inflammatory and antineoplastic activities against malignancies of a variety of origins. Colorectal cancer is one of the major deadly malignancies. Various strategies have been implemented to treat colorectal cancer; however, they have their own limitations, ranging from nonspecific toxicities to onset of chemoresistance. Drugs of herbal origins have some advantages over conventional therapeutic approaches. Colorectal cancer is no exception; herbal drugs (including curcumin) have proven to be effective for therapeutic applications. Curcumin can alter the molecular expression profile and halt the rapid pace of cell division in colon malignancies. Metabolic alterations driven by curcumin modulate cellular physiology in neoplastic cells. Curcumin can alter the cell cycle and expression of cell death regulatory molecules. Curcumin has been shown to have a chemosensitizing action in colorectal cancer. Epigenetic modifications by curcumin in colon cancer cells can lead to inhibition of colon cancer

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Bacterial Cancer Therapy: Promising Role in the Treatment of Colon Cancer

Rishi Srivastava, ~~Sweta~~ Sonam, Naveen Kumar Vishvakarma, Rajesh Sharma, and Shree Prakash Tiwari

Abstract Bacterial colonization and subsequent inflammatory consequences have been associated with the onset of colon carcinogenesis. However, recent shreds of experimental evidence suggest that bacteria and their products can be implemented for therapeutic benefit in malignant disorders including those of colon origin. The use of bacteria or their components for antineoplastic therapy is known as bacterial cancer therapy. Limitations associated with conventional antineoplastic therapeutic approaches like surgery, chemotherapy, and radiotherapy include nonspecific toxicities, chemoresistance, and immunosuppression. Therefore, recently bacterial cancer therapy gained attraction among oncologists. A diverse range of mechanisms has been suggested for underlying antineoplastic activities of bacterial cancer therapy. Direct cytotoxicity to neoplastic cells and preferred colonization in the hypoxic core of tumors are few among suggested. Further, mobility of bacteria makes them independent of blood circulation, which is one of the major limitations for the delivery of chemotherapeutic agents to poorly vascularized regions of malignant tissues. Bacteria and their components also induce an anticancer immune response and elicit protective immunity to reduce the incidences of cancer. The living nature of bacteria makes them a suitable vector for the on-site production of metabolites having anticancer potential. Moreover, through genetic manipulation techniques, bacteria can be engineered to achieve optimal anticancer effects. Besides whole bacteria ~~and~~ their metabolites (enzymes, toxins, and others) also constitute component of bacterial cancer therapy which have a promising role in the therapeutic management of colon cancer. This chapter will discuss the potential application of bacterial cancer therapy in the clinical management of colon cancer along with their mechanisms. Prospects on improving the efficacy and eliminations of associated limitations are also discussed. Collectively, it is being suggested that further investigations will

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CHAPTER

14

c0014

Glutamine metabolism in liver cancer: role in progression and potential therapeutic targeting

AU:1

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AU:2

Abbreviations

s0010

p0015	**Angs**	angiopoietins
p0020	**ASCT2**	alanine serine cysteine transporter 2
p0025	**CAFs**	cancer-associated fibroblasts
p0030	**CB-839**	calithera biosciences-839
p0035	**ECM**	extracellular matrix
p0040	**ECs**	endothelial cells
p0045	**EMT**	epithelial−mesenchymal transition
p0050	**GLS**	glutaminase
p0055	**GS**	glutamine synthetase
p0060	**GSH**	glutathione
p0065	**HCC**	hepatocellular carcinoma
p0070	**HGF**	hepatocyte growth factor
p0075	**HIF-2α**	hypoxia inducible factor-1
p0080	**HIFs**	hypoxia inducible factors
p0085	**Hyp**	hydroxyproline
p0090	**iCCA**	intrahepatic cholangiocarcinoma
p0095	**LRH-1**	nuclear receptor homolog 1

* Yashwant Kumar Ratre and Arundhati Mehta contributed equally to this work as first authors.

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Role of Tumour-Associated Macrophages in Colon Cancer Progression and Its Therapeutic Targeting

Arundhati Mehta, Vivek Kumar Soni, Yashwant Kumar Ratre, Ajay Amit, Dhananjay Shukla, Ajay Kumar, and Naveen Kumar Vishvakarma

Abstract Cancer tissues are invariably infiltrated by cells of the immune system, and macrophages constitute the major portion of these. Experimental pieces of evidence demonstrated that macrophages highly infiltrate the tumour tissues of colorectal cancer. Although these tumour-associated macrophages (TAM) are sought to exert their function to control tumour growth, under influence of the unique constitution of the tumour microenvironment (TME), they start favouring various hallmarks of cancer. Contributing to angiogenesis, metastasis, matrix remodelling, and chemoresistance, these TAM also hinder the antitumour immune response of other immune cells. Targeting approaches have been devised to break the contribution of TAM in tumour progression. Moreover, despite their functional activation, TAMs preserve their plasticity and responsiveness to various stimulants. Reprogramming of TAM is achieved through blocking the pro-tumour TAM favouring signals or stimulating the antitumour activating receptors. Nevertheless, epigenomic and microRNAs manipulation also achieve reprogramming of antitumour macrophage activation. Even TME manipulative strategies split immunosuppressive conduct of tumour tissue. Collectively, the versatile nature of macrophages makes it a good candidate for targeting in therapeutic interventions. Targeting TAM not only improves the immune response of macrophages and other immune cells but it also cooperates with chemotherapeutic interventions.

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Chapter 10
Short-Chain Fatty Acids as Therapeutic Agents in Colon Malignancies

Arundhati Mehta, Vivek Kumar Soni, Yashwant Kumar Ratre, Rajat Pratap Singh, Dhananjay Shukla, Naveen Kumar Vishvakarma, Rakesh Kumar Rai, and Navaneet Chaturvedi

Abstract Colon cancer has taken a large number of lives worldwide and stands among the few topmost killer malignancies. Although several approaches to combat the detrimental effects of neoplastic cells have been implemented in preclinical and clinical settings, these transformed cells display aggressive and recalcitrant behaviour during progression as well as treatment. Natural metabolites of microbial origin have recently attracted the biomedical investigators to owing to vast diversity and bioactivity. Short-chain fatty acids (SCFA) are products of fermentative metabolism of the microbiota of the gut. They contain fewer than six carbons and include butyrate, propionate, acetate, and lactate. SCFA are known for their ability to hinder the process of oncogenesis at the earliest and can serve as therapeutic agents. Apart from their metabolite nature, SCFA butyrate and propionate can stimulate cell surface receptors and alter the phenotypic behaviour of affected cells. Dedicated but ambiguous transporters for these SCFAs are known, and their cellular presence has a distinct consequence on metabolic modulation of normal as well as transformed cells. Further, SCFA can modulate the key enzymes governing the epigenetic state of cells. Targeted members of epigenetic machinery include, but not limited to,

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Chapter 15
Therapeutic Targeting of Glutamine Metabolism in Colorectal Cancer

Yashwant Kumar Ratre, Henu Kumar Verma, Arundhati Mehta, Vivek Kumar Soni, Subash Chandra Sonkar, Dhananjay Shukla, Alka Ekka, Santosh Kumar Prajapati, Shakuntala Mahilkar, and Naveen Kumar Vishvakarma

Abstract Colorectal cancer is one of the most commonly diagnosed incurable multifactorial malignancies in the world. To date, there are no promising noninvasive therapeutic tools that have achieved CRC prognosis, survival, and recurrence in clinical settings. We are now very familiar with the most famed term "metabolic reprogramming" that cancer cells preferably employ to meet their rapid bioenergetic and ATP synthesis requirements. Glutamine is the most abundant amino acid in human blood plasma and is known for its significant pleotropic role in the metabolic network.

Here, we exposed the metabolic distortion associated with the metabolism of glutamine in the CRC. Classically, findings have shown that dysregulated glutamine metabolism is significantly associated with CRC growth, survival, metastases, and recurrence. As a result, blocking signaling pathways, enzymes, and transporters associated with glutamine metabolism could be a gold standard strategy to hijack the development of CRC. We hope that this strategy will help to systematically target, manage, and cure CRC.

Yashwant Kumar Ratre and Henu Kumar Verma contributed equally to this work as first authors.

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EGCG as Anti-Obesity and Anticancer Agent 11

Shiv Govind Rawat, Rajan Kumar Tiwari, Pratishtha Sonker, Rajendra Prakash Maurya, Naveen Kumar Vishvakarma, and Ajay Kumar

Abstract

EGCG, the most abundant catechins of green tea exhibits several beneficial impacts on human health and helps in the amelioration of various pathological conditions including cardiovascular diseases, obesity, and cancer. The anti-obesity potential of EGCG depends on its potent antioxidant property, lipid metabolism modulatory action, and adipogenesis inhibitory ability. Moreover, EGCG also exhibits promising anticancer activity against cancer of different origins by inhibiting various features of tumorigenesis such as proliferation, evasion of apoptosis, angiogenesis, invasion and migration, and multidrug resistance through altering various signaling pathways. Taken as a whole, in this book chapter, we have discussed the detailed known mechanisms of anti-obesity and anticancer activities of EGCG and have also provided information about several novel targets of EGCG.

Keywords

Anticancer · Anti-obesity · Antioxidant · Adipogenesis · Chemosensitization · EGCG · Fat metabolism

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Chapter 2

From gene to genomics: tools for improvement of animals

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2.1 Introduction

All animals possess a linear double-stranded DNA molecule as the genetic material without exception. Small segments of DNA that are able to form primary transcript or functional proteins are known as genes. Genes are the source of phenotypic variation in all living organisms. Complete set of DNA, including its entire gene, represent the genome of an organism. Genomes vary in size. The smallest known genome of a bacterium contains about 600,000 DNA base pairs, while human genomes have some three billion DNA base pairs. All human cells except for mature erythrocytes, possess a complete genome. More than 65 years have been completed since the 1953 landmark description of the DNA double helix by Watson and Crick. The individual work of the Human Genome Project and Celera Genomics has successfully sequenced the human genome (Venter et al., 2001; Lander et al., 2001) and opened the door for the postgenomic era (Guttmacher and Collins, 2003). As we know that only 1.1% of the genome consists of exons coding for proteins, 24% is intronic sequences, and the remaining 75% consists of intergenic DNA. Thus more than 98% human genome is without a known function, and it is considered as intron champion. In comparison with evolutionary lower organisms, it was found that human beings have only two to three times as many genes as the fruit fly and the mustard plant. This indicates the functional complexity rather than the absolute number of genes is required for the human phenotype.

2.2 Genes

The fundamental physical and functional unit of heredity is the gene. It consists of a specific sequence of nucleotides that code for a specific protein. The size of genes in higher eukaryotes varies greatly. Genes consist of three types of regions:

- Noncoding regions, called introns, which do not specify amino acids and are removed (spliced) from the mRNA molecule before translation (Fig. 2.1).
- Coding regions, called exons, which specify a sequence of amino acids and collectively determine the amino acid sequence of the protein product. These portions of the gene are represented in the final mature mRNA molecule.
- Regulatory sequences, which play an important role in regulation of gene expression

Genes are made up of deoxyribonucleic acid (DNA) and act as instructors to make molecules called proteins. Genes vary in size due to numbers of nucleotides that vary from gene to gene, which may be a few hundred DNA bases to more than two million bases. Most of the portion of a gene in higher eukaryotes consists of noncoding DNA that interrupts the relatively short segment of the coding DNA. The Human Genome Project estimated that humans have nearly 20,000 to 25,000 genes located on 46 chromosomes (23 pairs) (Phillips, 2008; Finegold, 2017). These genes are collectively known as the human genome. The number of genes in an organism's genome varies significantly between species. For example, the human genome contains an estimated 20,000 to 25,000 genes, whereas the genome of the bacterium *Escherichia coli* contains 5416 genes. In eukaryotes (animals, plants, and fungi), genes are mainly located within the cell nucleus, but

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Role of Food Additives and Intestinal Microflora in Colorectal Cancer

Vivek Kumar Soni, Ajay Amit, Vikas Chandra, Pankaj Singh, Pradeep Kumar Singh, Rudra Pratap Singh, Girijesh Kumar Patel, and Rajat Pratap Singh

Abstract Colorectal cancer (CRC) is one of the most common cancers all around the world with a high mortality rate. Lifestyle differences and environmental factors such as high intake of fat and protein, red meat, and contaminations could increase the risk of CRC. Different food additives are used to improve the taste, flavor, texture, appearance, and preservation of food products. Some of these food additives have negative health impacts on human beings. These food additives can be mutagenic and carcinogenic. Consumption of food additives containing food products increases the risk of cancer including colorectal cancer. The intestinal microflora is also associated with carcinogenesis of CRC. The dysbiosis in gut microbiome due to dietary and environmental changes might be linked with the development and progression of CRC.

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Chapter 14

Dye Removal From Waste Water Using Metal Organic Frameworks

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Chapter outline

Abstract

Rapid industrial growth has resulted in immoderate use of synthetic dyes in various industries, namely, paper, textile, lather, plastic, food, cosmetics, and pharmaceuticals to color the products, leading to continuous discharge of dye contaminants into the water bodies causing water pollution. Several synthetic dyes are known to cause diseases, namely, cancer, asthma, etc. Most of these synthetic dyes are non-degradable while some produce carcinogenic, mutagenic, and other toxic by-products on degradation. High concentrations of dyes in water bodies interfere with sunlight to penetrate and reduce reoxygenation capacity of water bodies leading to disturbance in the process of photosynthesis in aquatic ecosystems. It is difficult to treat dye contaminated water using traditional wastewater treatment techniques since light, heat, and oxidizing agents are not able to disintegrate these. Adsorption is one of the prominent, economical and efficient methods to treat dye contaminated waste water. It is needed to develop low cost recyclable adsorbents to meet the growing demand for low-cost and effective treatment methods. Due to tunable pore size, high porosity and large surface area metal organic frameworks are considered as potential adsorbents for adsorptive removal of pollutants including dyes. This chapter presents a review of dye removal applications of MOFs as well as various challenges and future prospects. Review of literature re-

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CHAPTER

c0145

Role of processing parameters in solution routes for controlling size, shape, and morphology of chalcogenide nanoparticles

5

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s0010

1 Introduction

p0010

Inorganic metal chalcogenides have drawn considerable attention in recent decades because of their active properties. As a chalcogenide, copper sulfides (Cu_xS with $x = 1–2$) are important p-type transition metal sulfides that have been rarely investigated in comparison to other chalcogenides such as CdS or CdSe (Durga et al., 2018). Copper sulfide shows a direct band gap between 1.2 and 2.0 eV depending on the stoichiometric ratio of Cu and S (Jiao et al., 2006). Optical band gap E_g of Cu_xS increases with a decrease in the x value. An estimated optical band gap is 1.2 eV for Cu_2S, 1.75 eV for $Cu_{1.8}S$, and 2.2 eV for CuS (Basu et al., 2010; Wu et al., 2008). Copper sulfides have excellent optical and electrical properties, and its metallic conductivity transforms to a superconductor at 1.6 K (Liang and Whangbo, 1993). Copper sulfide forms compounds of variant stoichiometries from copper-rich to sulfur-rich such as Cu_2S (chalcocite), $Cu_{1.75}S$ (anilite), $Cu_{1.85}S$ (digenite), $Cu_{1.95}S$ (djurlite), and CuS (covellite), which are stable at room temperature (Premala et al., 2017). The physical and chemical properties of nanoparticles were controlled by varying their size, shape, structure, and stoichiometric compositions, which have important characteristics applicable in the field of biosensors (Pagan et al., 2015), optoelectronic devices (Zeinodin et al., 2021), solar controllers and solar radiator absorbers (Nair et al., 1991), Li-ion batteries (Zhang et al., 2019), thermoelectric cooling materials (Shen et al., 2009), catalysts (Hosseinpour et al., 2019), gas sensors (Sagade and Sharma, 2008), nanometer-scale switches (Sukamoto et al., 2003), optical filters (Chen et al., 2009), tissue imaging (Ku et al., 2012), light-emitting diodes (Zhu et al., 2004), drug delivery (Hou et al., 2017), nonlinear optical materials (Roy and Srivastava, 2006), photosensors (Husea et al., 2017), molecular imaging (Ku et al., 2012), fuel cells (Li and Nguyen, 2018), photothermal imaging (Li et al., 2010a, 2010b), hydrogen

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Rishi Paliwal · Shivani Rai Paliwal

Advances in Nanochemoprevention

Controlled Delivery of Phytochemical Bioactives

This book discusses the recent progress and advances in nanochemoprevention. Chemoprevention utilizes natural dietary compounds and has regained interest due to larger safety window and proven efficacy of such molecules in cancer treatments. Nanotechnology has revolutionized drug delivery through passive as well as active targeting. This book provides a comprehensive overview of phytochemical bioactives that are used in chemoprevention. It gives a comprehensive overview of the variety of natural molecules and types of nanoparticles as well as mechanistic aspects of their superior efficacy over plain drug molecules. The book concludes with summarizing the progress of pre-clinical results of developed formulations for cancer treatment using nano-chemoprevention.

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Advances in Nanochemoprevention

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Advances in Nanochemoprevention

Controlled Delivery of Phytochemical Bioactives

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CHAPTER

12

Nanomedicine-based multidrug resistance reversal strategies in cancer therapy

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12.1 Introduction

The clinical efficacy of chemotherapy of cancer cells is limited due to many factors, including the undesired distribution of cytotoxic drugs to healthy vital cells, low bioavailability in the tumor microenvironment, and the development of multidrug resistance (MDR). Biedler and Riehm (1970) reported the concept of MDR in chemotherapy way back in the 1970s. Briefly, MDR in cancer cells can be defined as the resistance of cells to any anticancer agent accompanied by other chemotherapeutic drugs, which possess different structures and functional moieties, or it can also be defined as a condition of resilience against structurally and functionally dissimilar drugs (Harris & Hochhauser, 1992).

The MDR phenomenon is a consequence of multiple factors, including p-glycoprotein pump mediation, the upregulation of adenosine triphosphate (ATP)-binding cassette (ABC) transporter proteins, hypoxia, xenobiotics factors, and p53 gene mutation, etc. MDR can be classified into various groups according to the associated mechanisms such as increased drug efflux by efflux pumps, decreased influx, and increased concentration of metabolizing enzymes such as cytochrome p450 that rapidly metabolize and inactivate internalized chemotherapeutic agents, increased DNA repair, and the termination of the

*Equal contributions to the chapter.

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13 Utility of Nanomaterials in Nanomedicine for Disease Treatment

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15 Reverse Engineering in Pharmaceutical Product Development

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CONTENTS

ABBREVIATIONS

AAS:	Atomic absorption spectroscopy
ANDA:	Abbreviated new drug application
API:	Active pharmaceutical ingredient
FTIR:	Fourier transform infrared spectroscopy
GPC:	Gel permeation chromatography
HPLC:	High-performance liquid chromatography
NMR:	Nuclear magnetic resonance spectroscopy
Q1:	Qualitative
Q2:	Quantitative
RLD:	Reference listed drug
TEM/SEM:	Transmission electron microscopy/scanning electron microscopy
TGA:	Thermogravimetric analysis

15.1 INTRODUCTION

Reverse engineering process or also called deformulation is quite common when one has to investigate the composition of an unknown product or a competitive product. In the pharmaceutical industry, it is helpful in the examination of various steps of product development and unit operations of scale-up and in the identification of unknown or hidden properties of excipients used like impurities or functional groups, stability and degradation product and other related substances (Bansal and Koradia 2005, Bhatti, Syed, and John 2018). Reverse pharmaceutical engineering further helps in understanding the features of polymers like molecular weight distributions, degree of substitution, monomer ratio and substituent distribution (Bhatti, Syed, and John 2018).

To develop a generic product, the pharmaceutical deformulation process starts even before the expiry of the patent. The reverse engineering process involves an exhaustive analysis to identify, quantify and characterise active pharmaceutical ingredient (API) and excipients of the original product (Oliveira et al. 2015). Since it is a time-consuming process, formulation scientist or reverse engineer has to start long before the patent expiry so that generic product development company is ready for submitting the details of their abbreviated new drug application (ANDA) product to the United States Food and Drug Administration (USFDA) as quickly as possible (Pražnikar and Škerlj 2006). As experienced by many formulators, reverse engineering is a

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Chapter 19
Nanomaterials Used for Delivery of Bioactives

Akhlesh Kumar Jain and Umesh Gupta

19.1 Introduction

Progression in genetic engineering has led to propagation of gigantic diversity of bioactives which demands effective means of carriers for intracellular delivery in order to achieve specific objectives such as selective tumor targeting, genetic vaccination, regenerative medicine, and treatment of functional loss. Generally, these biologics are prone to enzymatic degradation and deactivation. Hence, immense arrangement of efforts has been made to develop nanometric size vehicles which could not only deliver the medicaments to the desired site of action but also protect for unwanted degradation. In this regard, nanoparticles have been shown great promise as a delivery vehicle for smaller molecules, plus large bioactives, i.e., proteins, peptides, vaccines, or nucleotides by either restricted or tissue-specific delivery. In addition, formulation scientists are fascinated about nanocarriers as a delivery vehicles as proportion of quantity of surface atoms or molecules to the total count of atoms or molecules enhanced drastically hence effective surface area multiplied exponentially (Hadjipanayis et al. 2010). Further, nanoparticles are in great number and could access regions of poor access such as injured tissues, tumor cells, inflamed organs, etc. due to their tiny size (Jong and Borm 2008). Nanotechnology concentrates on encapsulating drugs in bio-friendly nanocomposites, i.e., polymeric nanoparticles, nanoliposomes, solid lipid nanoparticles, micellar systems, and bioconjugates. A schematic diagram of different varieties of nanocarriers used for delivery of bioactives is depicted in Fig. 19.1. These carriers are usually explored to enhance oral bioavailability, to sustain medicament release

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Chapter 13
Solid Lipid Nanoparticles

Akhlesh Kumar Jain and Suresh Thareja

13.1 Introduction

The area of Novel Drug Delivery System is getting wider day by day in expanded area of biomedical science, bioengineering and nanotechnology (Ekambaram et al. 2012). Most of the latest delivery techniques explore nanosize-based particles, i.e. nanocarriers having the API (Shah et al. 2011). Few important drug carriers developed using nanotechnology-based approaches are nanoemulsion, nanosuspension, nanocrystals, nanoparticles and solid lipid nanoparticles (Jain 1997). Recent advances in the development of nanocarriers have started a new era in Formulation Science. Solid lipid nanoparticles (SLNs) were reported in 1991 as an unconventional carrier system to typical colloidal carriers such as emulsions, microemulsions, self micro-emulsifying drug delivery system, micellar systems, liposomes, polymeric microparticles and nanoparticles (Ramteke et al. 2012).

SLNs mingle advantages of the conventional carriers along with circumventing some of their major disadvantages. SLNs showed potential applications in drug, gene and vaccine delivery along with controlled and site-specific drug targeting. SLNs are effortlessly made nanoparticles composed of biodegradable polymers of high stability devoid of significant toxicity as well as commercially economic and could incorporate wide variety of drugs for effective targeting. SLNs are novel lipid-based formulations constituted exclusively of biodegradable lipids such as highly purified triglycerides, monoglycerides, complex glyceride mixtures, hard fats or even waxes, which turn solid at room temperature. Solid lipid nanoparticles are nanometre-sized particles that range from 50 to 200 nm and made of solid hydrophobic core which are suspended in aqueous phase containing surfactant.

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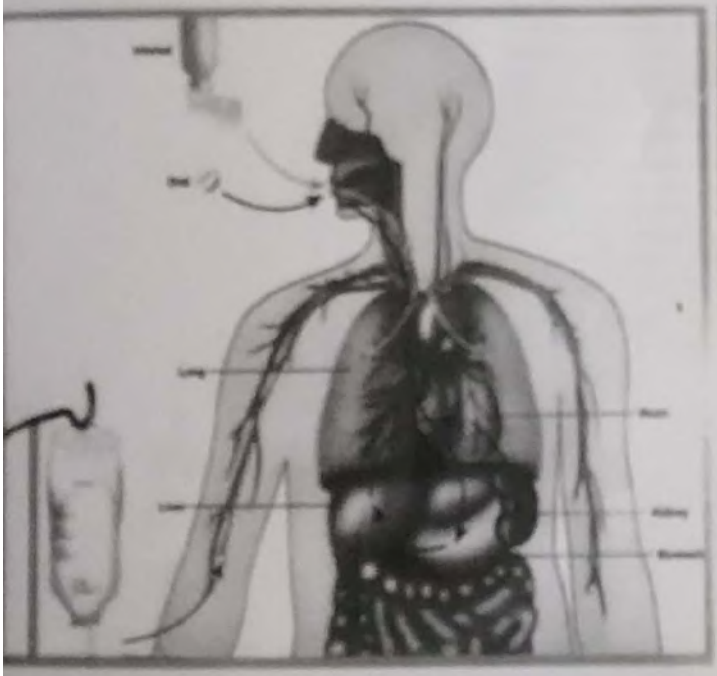

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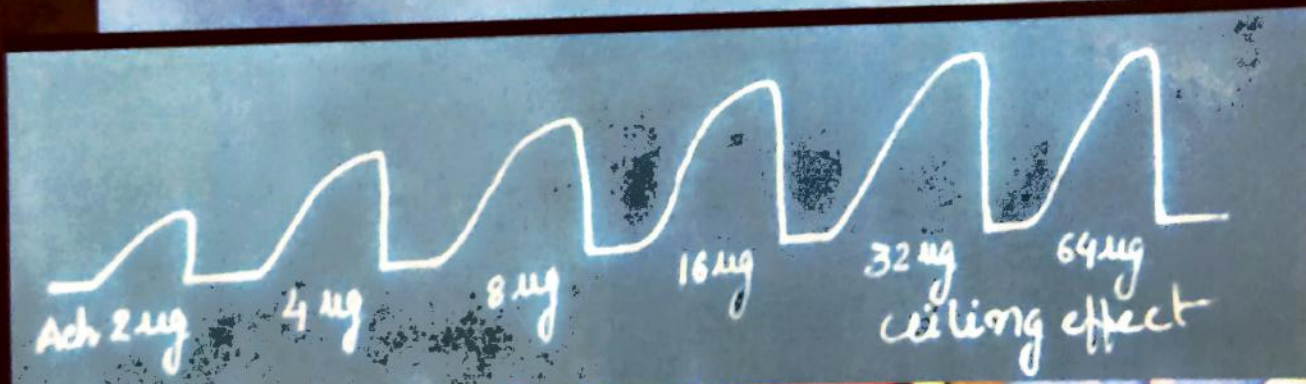

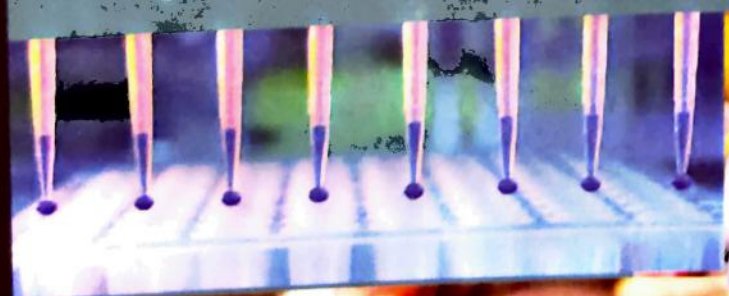

BOOK CHAPTER-2

Isatin Derivatives as Human Intestinal Carboxylesterase Inhibitors: An Approach towards 3D-QSAR, Pharmacophore and Molecular Docking

Sanmati K. Jain ; Piyush Ghode ; Achal Mishra

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Abstract

Carboxylesterases (CEs) metabolize numeral drugs and their inhibitions extend the bioactivity or may decrease the harmfulness of compounds that are triggered by these enzymes. Isatin derivatives which were reported as carboxylesterase inhibitors selected in order to establish structure activity relationship quantitatively by using k-nearest neighbour molecular field analysis (kNN MFA). The dataset comprised of 49 compounds and sphere exclusion (SE) algorithm was applied for the division of the data set into training and test set. The models were generated using different values of dissimilarity levels, of which, the best model was obtained (dissimilarity value 3.75) showed cross validated correlation coefficient (q2) 0.8564 and predicted correlation (pred_r2) 0.8106 with test set of 9 compounds. kNN-MFA methodology with stepwise (SW) forward-backward, was used for building the QSAR models. The kNN-MFA contour plots showed relationship between structural features of substituted isatin derivatives and their activities which may be used to design newer potential CE inhibitors.

Pharmacophore studies reveals common two aromatic (AroC) and two hydrogen bond acceptors (HAc) features obtained from Molsign and Pharmagist approaches. The present work may be useful for further lead optimization and designing of potent carboxylesterase inhibitors. Molecular docking study was performed to identify potential interactions of the compounds with carboxylesterase active site. For this purpose the pdb id 2hrq (crystal structure of human carboxylesterase with soman) was chosen. Compound 62 exhibits a comparable docking score and bind into the active site of enzyme.

Keywords: 3D-QSAR; kNN-MFA; pharmacophore analysis; docking; carboxylesterases inhibitors; isatin derivatives

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DR. SANMATI KUMAR JAIN

BOOK CHAPTER-1

Study on Synthesis and Appraisal of Some 2,5-Disubstituted-1,3,4-Thiadiazoles as Diuretic Agents

Sanmati K. Jain ; Pradeep Mishra

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Abstract

Acetazolamide and Methazolamide are well known 1,3,4-thiadiazole derivatives exhibiting diuretic activity. Therefore, some newer 2,5-disubstituted-1,3,4 thiadiazoles were prepared and screened for diuretic activity. A few of the compounds namely IVa_1, IVb_2 and IVc_2 showed good diuretic activity comparable with the standard drug acetazolamide. Properties of the synthesized compounds were calculated by using the software Osiris property explorer (peo). Morphilino analogs (IVa_3 – IVd_3) showed higher Druglikeness and Drug Score as compared to other analogs. Among morphilino analogs IVa_3 is the most active compound therefore selected for bioisosteric approach for newer analog design using molopt software.

Keywords: 1,3,4-thiadiazoles; diuretic activity; bioisosteric approach

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CHAPTER

7

The role of nanoparticles in the treatment of gastric cancer

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7.1 Introduction

Cancer was first exposed in 1500 BCE. Since then, various approaches have been introduced and utilized to fight it, but still, no significant success has been attained (Sudhakar, 2009). In context of gastric cancer (GC), it is ranked as the fourth most frequently occurring type of cancer, and also proves to be a leading cause of mortality, predominantly in East Asia (Leake et al., 2012). Numerous factors (Fig. 7.1) that are linked are responsible for this deadly cancer. Moreover, GC may be host linked, environment related, or from bacterial sources. A few ethnic groups might be highly prone to it compared to other groups (Piazuelo & Correa, 2013). Further, GC is a kind of localized-tumor with locoregional metastasis, which is a most important negative prognostic factor (Imano et al., 2012). It is difficult to cure GC as most patients are only diagnosed at advanced stages. In clinical practice, apart from early diagnosis, it is also important to diagnose a cancer at diverse stages and to ensure proper planning of surgical resection. However, techniques for diagnosis as well as available approaches for the treatment of GC are inadequate. Nevertheless, surgery has been regarded as one of the most recognized methods to treat GC to date. In this context, further innovative approaches are required to deal with GC (Orditura et al., 2014). The diagnosis of GC includes (1) tumors imaging (i.e., regular systemic as well as locoregional imaging) in GC, (2) the detection of tumors in the primary stage using the endoscopy method or GC associated biomarkers, and (3) the detection of circulating tumor cells (CTCs) of GC.

The exceptional physicochemical aspects of nanomedicine have made it a vital candidate in theranostics applications. The incorporation of nanotechnology in medical applications is termed as nanomedicine. Moreover, illnesses in the stomach have been treated via many novel drug carrier systems such as microspheres (Jain, Patel, Rajpoot, & Jain, 2019; Patrey, Rajpoot, Jain, & Jain, 2016), microbeads (Jain, Kumar, Kumar, Pandey, & Rajpoot, 2016; Jain, Prajapati,

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CHAPTER 11

Promising Anticancer Potentials of Natural Chalcones as Inhibitors of Angiogenesis

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ABSTRACT

This chapter focuses on the budding perspective of chalcone (prop-2-ene-1-one)-based natural inhibitors (isoliquiretigenin, butein, garcinol, hydroxysafflor yellow A, broussochalcone A, 2,4-dihydroxy-6-methoxy-3,5-dimethylchalcone, 4′-hydroxy chalcone, and Parasiticin-A, -B, and -C) and synthetic inhibitors (4-(*p*-toluenesulfonylamino)-4′-hydroxy chalcone, 4-maleamide peptidyl chalcone, and quinolyl-thienyl chalcone) that will prevent angiogenic switching (fibroblast growth factor angiogenin, TGF-β) by directly inhibiting the three vital therapeutic targets: vascular endothelial growth factor, vascular endothelial growth factor receptor-2, and matrix metalloproteinases-2/9, which will block neovascularization, vascular formation, and network formation by completely depriving the cells from the required nutrients, fluid, signaling molecules, and oxygen. The highlighted studies will positively motivate young minds, medicinal chemists, future researchers, and allied scientists for developing or exploring

CHAPTER 6

Pharmaceutical Natural and Synthetic Colorants, Pigments, Dyes, and Lakes: Applications, Perspectives, and Regulatory Aspects

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6.1 INTRODUCTION

The vibrant field of pharmaceuticals and cosmeceuticals shares a distinct relationship with colors and coloring agents [1]. It has a complex artistic, physiological, symbolic, psychological, and associative role for humans [2]. The modern researches have suggested that product color also influence the therapeutic efficacy. It has been known from the evidence that "warm colors"; the colors in the red area of the color spectrum drastically evoke emotion, produce anger, discomfort, and hostility. In contrast, the "cool colors"; blue, green, purple, etc., have been perceived to calm the mind, produce sadness or other mixed-feelings [3]. The implementation or translation of the net obtained study results into modern medications has its own consequence [4].

The significance of colorants in a number of pharmaceutical dosage forms such as tablets (core or coating), hard or soft gelatin capsule shells, oral liquids, ointments, gels as well as in the cosmetic preparations such as creams, toothpastes, etc., lies in the swift identification of various strength of drug or formulations with physicochemical characteristics, provides

(13)
(5)

CHAPTER 8

Recent Advancements in the Pharmacotherapeutic Perspectives of Some Chalcone Scaffold Containing Natural Compounds as Potential Anti-Virals

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ABSTRACT

In spite of the development of significant elementary acquaintance regarding a variety of pathogens, the existing chemotherapy is still unacceptable as a result of imperfect effectiveness, long-term action, high cost, and unwanted side-effects. Natural products have been found to express numerous pharmacological activities. Several alcoholic, hydroalcoholic, and aqueous extracts along with phytoconstituents are reported to exhibit anti-infective effects by modulating the number of pharmacotherapeutic targets. The present chapter focuses on the therapeutic perspectives of chalcone based natural compounds in exhibiting antiviral activity against rhinovirus, human immunodeficiency virus (HIV), influenza virus, poliovirus, dengue virus, and tobacco mosaic

CHAPTER 5

Heat Shock Protein 90 (Hsp90) Inhibitory Potentials of Some Chalcone Compounds as Novel Anti-Proliferative Candidates

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ABSTRACT

Cancer is one of the most deadly diseases that have affected mankind. After cardiac diseases, it is known to be the next demon that caused mortality

CHAPTER 7

1,3-Diphenyl-2-Propene-1-One-Based Natural Product Antidiabetic Molecules as Inhibitors of Protein Tyrosine Phosphatase-1B (PTP-1B)

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ABSTRACT

The chapter has comprehensively focused on some very unknown natural chalcone compounds (kuwanon J, kuwanon R, kuwanon V, isoliquiritigenin, xanthoangelol, xanthoangelol D, xanthoangelol E, xanthoangelol F, xanthoangelol K, 4-hydroxyderricin, 5,4′-dihydroxy-6,7-furanbavachalcone, licochalcone A, licochalcone B, licochalcone C, licochalcone D, licochalcone E, echinatin, laxichalcone, broussochalcone, maedentichalcone, (2*E*)-1-(5,7-dihydroxy-2,2-dimethyl-2*H*-benzopyran-8-yl)-3-phenyl-2-propen-1-one, (2*E*)-1-(5,7-dihydroxy-2,2,6-trimethyl-2*H*-benzopyran-8-yl)-3-(4-methoxyphenyl)-2-propen-1-one, and abyssinone-VI-4-O-methyl ether) having tremendous potential to exhibit antidiabetic activity

CHAPTER 1

Chalcone (1,3-Diphenyl-2-Propene-1-One) Scaffold Bearing Natural Compounds as Nitric Oxide Inhibitors: Promising Antiedema Agents

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ABSTRACT

Nitric oxide (NO) is a short-lived, small, highly diffusible, reactive, free radical gas, ubiquitous bioactive molecule, and is derived from L-arginine (a well-known amino acid). This constituent was discovered 30 years back as "endothelium-derived relaxing factor." In mammalian cells, NO acts as a mediator and is believed to play a crucial function in several biological processes. The current chapter comprehensively highlights the emerging perspectives of natural chalcone-based nitric acid inhibitors such as sofachalcone, brussochalcone A, cardamonin, flavokawain B, dimethyl cardamonin (2′,4′-dihydroxy-6′-methoxy-3′,5′-dimethylchalcone), mallotophilippens, Hidabeni chalcone, okanin, sappanchalcone, 3-deoxysappanchalcone, 2′,4′,6′-tris(methoxymethoxy) chalcone, butein, and

CHAPTER

GUM-BASED HYDROGELS IN DRUG DELIVERY

25

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1 INTRODUCTION

Hydrogels are three-dimensional cross-linked network structures generally composed of hydrophilic polymeric systems, which are capable of holding high volume of aqueous fluids devoid of altering the structure (Hoffman, 2002). In swollen condition, hydrogels are accountable for the rubbery and soft characteristics. However, these are not able to dissolve swiftly in the aqueous solutions resembling with the living tissues and demonstrating exceptional mechanical capabilities (Hoffman, 2002; Nayak and Pal, 2016a). In 1894, the term "hydrogel" was used first time as hydrogel was used to elucidate a colloidal gel (Bemmelen, 1894). Usually, hydrogels swell due to absorptions of large amount of water, which make these as valuable materials for various biomedical uses (Nayak and Pal, 2016a; Pal et al., 2018). Due to the exceptional mechanical strength, chemically cross-linked hydrogels are identified as the biomedical material of great demand (Mishra and Mishra, 2016; Nayak and Pal, 2016a). The hydrogel structure comprises the covalent junction among the polymeric structures that can be attained via the cross-linking methodologies such as physical method, chemical method, enzymatic method, high-energy irradiation, photochemical reaction, and grafting (Singhal and Gupta, 2016). During past few decades, different kinds of hydrogels get the technical values well in various important commercial healthcare as well as biomedical applications employing tablets, tissue expanders, contact lenses, osmotic devices, implantable devices, inserts, etc. (Mawad et al., 2012; Mishra and Mishra, 2016). Currently, hydrogels have gained the exceptional attention in the controlled release drug delivery applications where the drugs are dispersed all through the hydrogel matrices and are capable of delivering the drug candidates at the steady rate over a longer time (Hua et al., 2010; Pal and Nayak, 2015b). (Fig. 25.1)

Recently, different types of hydrogels are prepared by employing several natural, semisynthetic and synthetic polymers for utilizations in the applications in drug delivery area (Mishra and Mishra, 2016). Among these, hydrogels made of natural gums have been considered as more advantageous in terms of biodegradability, biocompatibility, material cost, ease of production, wide array of applications, etc. (Pal et al., 2018; Rana et al., 2011). Considering these advantages, in the recent years, numerous gum-based hydrogels made of chitosan (Pal et al., 2018), alginate (Pal and Nayak, 2015a,b), gellan

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Chapter 4

PYRAZOLE AND ITS ANALOGUES AS POTENTIAL ANTI-ANGIOGENESIS AGENTS

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ABSTRACT

Angiogenesis (Angs) is a movement by which unique veins are formed from set up vasculature. Whereas, it is a key rate constricting an integral part in tumour reinforcement so fresh recruit's vessels are important to expand tumour size. The mixtures of heterocyclic (He_{TC}) are managed as hostile to the Angs specialists. Pyrazole (P_{AZ}) is one of the bottlenecks than any other He_{TC} compounds. Over time, a few P_{AZ} based associates are directed in Phase II and III preliminaries & opened a new target. It is especially credible that the advancing of the two decades will trigger the uncovering and employment of extra P_{AZ}s whose enemy of the Ang profile will situate them in the front line of the clash of different malignancies. P_{AZ} is a five-membered (F_{MEB}) heteroaromatic two nitrogen atoms with immense significance. Presence of this nucleus in the pharmacological agents have shown diverse therapeutic potency as anti-anxiety, anti-inflammatory, anti-psychotic, anti-cancer (CA_{NB}), anti-obesity, analgesic, anti-pyretic agents, etc. It has made an indispensable anchor for the design and development of new pharmacological agents.

Keywords: heterocycles, pyrazole, pharmacological activity, angiogenesis, cardio vascular disease

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Chapter 10

ROLE OF PYRAZOLE RING IN NEUROLOGICAL DRUG DISCOVERY

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ABSTRACT

Pyrazole is one of the 5-membered heterocyclic ring systems with two consecutive nitrogens. The molecular formula of the ring system is $C_3H_3N_2H$ with the systematic name of 1, 2-Diazacyclopenta-2,4-diene. Substituted/fused/linked pyrazole molecules are observed with the greater neuroprotective property. Various pyrazole derivatives such as:3-substituted-N-aryl-6,7-dimethoxy-3a,4-dihydro-3H-indeno[1,2-c] pyrazole-2-carboxamide was observed with protection against maximal electroshock seizure; 3,5-Diaryl-N-substituted-4,5-dihydro-1H-pyrazole-1-carbothioamide. 3-(4-Fluorophenyl)-5-aryl-N-substituted-4,5-dihydro-(1H)-pyrazole-1-carbothioamide. N_1-propanoyl-3,5-diphenyl-4,5-dihydro-(1H)-pyrazole were observed with remarkable inhibition against human monoamine oxidase enzyme; 5-(furan-2-yl)-3-(4-methylphenyl)-N-(propan-2-yl)-4,5-dihydro-1H-pyrazole-1-carboxamide showed dual inhibition of monoamine oxidase and acetylcholinesterase enzymes; 3-(3-(ethoxycarbonyl)-1-phenyl-1H-pyrazol-5-yl)phenyl cyclohexylcarbamate showed greater inhibition of human fatty acid amide hydrolase; curcumin fused pyrazole showed proper inhibition of fibrils aggregation fibrils and modulate toxicity due to α-Synuclein; tricyclic pyrazole carboxamides observed with cannabinoid-2 receptor inhibition; another pyrazole moiety JNJ-28583113 observed with Transient receptor potential melastatin type 2 inhibitor; another set of pyrazole derivatives were observed with β/γ secretase inhibition; newer pyrazole derivative as 2-

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Chapter 9

PYRAZOLE AND ITS DERIVATIVES, PREPARATION, SAR AND USES AS ANTIOXIDATIVE AGENT

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ABSTRACT

Pyrazole is a five-membered heterocyclic ring system with two nitrogen atoms in N_1 and N_2 positions. The molecular formula of the ring system is $C_3H_4N_2$. Substituted/fused/linked pyrazole molecules are capable of the greater antioxidative property. Antioxidants inhibit the generation of reactive oxygen species formation using DPPH, hydrogen peroxide, nitric oxide, peroxynitrite radical scavenging activities and ABTS radical cation decolorization assay. Total radical trapping antioxidant parameter method, ferric reducing-antioxidant power assay methods. In this development indazolyl pyrazole, pyrazolone schiff base, tetrahydropyrazolopyrazolone, pyrimidinopyrazole, sulfonamide linked pyrazole, pyrazolochalcone, coumarinopyrazole/indenone pyrazole, curcumin linked pyrazole/aryl pyrazole, oxazolyl/thiazolyl sulfonyl methyl pyrazole, benzofuran linked pyrazole and pyrazolocarboxamide with greater antioxidative properties with specialized horseradish peroxidase chemiluminescence inhibition, inhibition of lipooxygenase and nitrous oxide generation, also a group of molecules showed inhibition of lead nitrate induced oxidative stress generation with specialized activity on mitochondria preservation through NrF2 signaling pathway. These data reflected the importance of pyrazole molecule to conquer the free radical generation,

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Chapter 14

DEVELOPMENT IN CHEMISTRY AND SYNTHESIS OF PYRAZOLE DERIVATIVES AS POTENTIAL ANTICANCER AGENTS

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ABSTRACT

Now a days, for management of various health issue, heterocyclic compounds play a vital role in the development of effective drugs. Pyrazole, the five-membered nitrogen-containing heterocycle is an important scaffold possessing amenable to extensive, promising biological activities. Due to potential applications of pyrazoles, many recent novel routes for synthesizing pyrazoles is developed for the treatment of disease. As a consequence, in this chapter covering advances in the synthesis and application of pyrazoles for treatment of cancer in the past decades. This advancements on pyrazole synthesis will draw a clear picture to the researchers' lobby for the development of active pyrazoles scaffold with improvement in current methodologies.

Keywords: pyrazole, heterocyclic compounds, synthesis, cancer

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Chapter 16

SCAFFOLD OF PYRAZOLE DERIVATIVES FOR ENZYME INHIBITION

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ABSTRACT

Pyrazole, a five membered heterocyclic ring containing two nitrogen atoms, has unique place in medicinal chemistry. It is an indispensable core scaffold present in many natural (1-pyrazolyl-alanine) and synthetic biologically important compounds. In 1883, first time Ludwig Knorr coined the term 'Pyrazole' in the field of heterocyclic chemistry. Pyrazole derivatives have displayed broad spectrum of pharmacological and biological activities such as anti-microbial, anti-fungal, antitumor, anti-tubercular, antiviral, anti-inflammatory, antidepressant, anticonvulsant, antihyperglycemic, cholecystokinin-1 receptor antagonist, estrogen receptor (ER) ligand activity, and enzymes inhibitory activities. This chapter features an important synthesis of pyrazole derivatives as the enzyme inhibitors with an emphasis on recent developments. Enzyme inhibition includes carbonic anhydrase, acetylcholine esterase, Plasmodium falciparum dihydroorotate dehydrogenase, cyclooxygenase, tyrosinase, α-glucosidase, etc.

Keywords: pyrazole derivatives, scaffold, enzyme inhibitors

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Chapter 20

PYRAZOLE AND ITS DERIVATIVES AS ANTI-DIABETIC AGENTS

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ABSTRACT

It has been already reported that compounds having pyrazole ring or moiety plays a key role to show various biological activities such as anticancer, anticonvulsant, antimicrobial, anti-diabetic,etc. As for instance, compounds having pyrazole moiety such as 4-(4-ethyl benzyl)-5-trifluoromethyl)-1H-pyrazol-3-ol show SLGT (sodium-dependent glucose co-transporters) inhibitory action. Others are ethyl-2-para nitrophenyl-2,3-dihydro-1H-pyrazol-3-one-4-carboxylate and ethyl-2-meta nitrophenyl-2,3-dihydro-1H-pyrazol-3-one-4-carboxylate which act as hypoglycemic agent and play a very essential role in the treatment of diabetes. The main purpose of this chapter is to show the compounds having pyrazole moieties as potent anti-diabetic agent(s) by collecting various literature works that have been published by the different researchers around the globe.

Keywords: pyrazole, anti-diabetic agent, SLGT inhibitors, hypoglycemic agent

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Chapter 1
Elicitor Signal Transduction Leading to the Production of Plant Secondary Metabolites

Supriyo Saha and Dilipkumar Pal

Abstract Plant metabolites are highly effective as medicine with a higher efficacy and lower adverse effect. Two basic metabolites are obtained from nature, namely primary metabolites and secondary metabolites. Alkaloids, glycosides, terpenoids, flavonoids are the principal secondary metabolites, and also the primary source for the drug discovery and development. Elicitors are the substances which under stress conditions induce the biosynthesis of secondary metabolites of plants. Both biotic and abiotic elicitors are used in the process. Most common secondary metabolites Ferulic acid, cinnamic acid, vanillin, coumaric acid, silymarin, aflinin, hypocrellin A, steroiside, menthone, piperitone, glycyrrhizic acid, colchicine, thiocolchicoside, phenolic acid, gymnemic acid, flavonoids are utilized the elicitation technique. Elicitors are two types such as: abiotic and biotic. Abiotic elicitors such as salicylic acid, methyl jasmonate, hydrogen peroxide, lanthanum, different hormones, light, gamma rays and controlled temperature are used to generate secondary metabolites of wheat grass, *Thymus vulgaris*, *Silybum marianum*, *Shiraia bambusicola*, *Ajuga bracteosa*, broccoli plant, etc. Biotic elicitors like chitosan, rhizobacteria, *Rhizobium leguminosum*, *Aspergillus tenius*, *Agrobacterium tumefacians*, carrageenan, Streptomyces, *Rhizopus*, dextran, yeast are used to develop or improvise secondary metabolites of Khus, *Mentha pulegium*, *Tavernia cuneifolia*, chickpea, *Vitis vinifera*, *Rumex gmelini* Turez, *Cupressus lusitanica*, etc. Some secondary metabolites of *Coleus aromaticus* Benth, *Rhododendron tomentosum*, *Fagonia indica*, *Rauwolfia serpentine*, *Solanum khasianum*, *Ocimum tenuiflorum*, *Stevia rebaudiana* etc. are used both abiotic and biotic elicitors.

Keywords Secondary metabolites · Abiotic elicitor · Biotic elicitor · Phenolic compounds · Silymarin · Aflinin · Hypocrellin A

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Chapter 3
Plant Polysaccharides in Pharmaceutical Applications

Amit Kumar Nayak, Md Saquib Hasnain, Amal Kumar Dhara, and Dilipkumar Pal

Abstract Plant polysaccharides are the by-products of photosynthesis within the plants and are being extracted from different parts of the plants, such as leaves, pods, fruits, seeds, cereals, stems, roots, rhizomes, corms, exudates, etc. The important advantages for the uses of plant polysaccharides include easy availability from the nature as plant resources are abundant, sustainable and low cost production, biodegradability, biocompatibility, water solubility, swelling ability, etc. Since long, numerous plant polysaccharides have already been explored and exploited as excipients in a variety of common pharmaceutical dosage forms, such as suspensions, emulsions, gels, tablets, capsules, beads, microparticles, nanoparticles, liposomes, transdermal formulations, buccal formulations, nasal formulations, ophthalmic formulations, etc. The current chapter presents a brief review on the pharmaceutical applications of various plant polysaccharides.

Keywords Plant polysaccharides · Biopolymers · Excipient · Pharmaceutical applications · Drug delivery

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Chapter 6
Natural Compounds Extracted from Medicinal Plants and Their Immunomodulatory Activities

Vinod Kumar Gurjar and Dilipkumar Pal

Abstract The fight against cancer cells in the human body involves a defense system that is comprised of the innate and adaptive immunities which are controlled by a series of immune responses mediated by different immune cells (ICs) and their secretory substances including cytokines and chemokines. Natural substances, synthetic compounds, and antibody elements are used as immunostimulating and immunosuppressive agents. But here are certain restrictions to the overall use of these compounds, such as the increased risk of infection and generalized effect throughout the immune system. The use of plants and plant products as immunomodulators is still in a developing stage. At non-cytotoxic concentrations, the phytoconstituents exhibited three types of immunomodulation including type 1 of PHA, ConA, and quercetin (increased lymphocyte activation and IFN-γ secretion); type 2 of isopimpinellin (enhanced lymphocyte activation) and type 3 of rutin, bergapten and xanthotoxin (elevated IFN-γ secretion). The augmentation of lymphocyte proliferation was closely correlated to an increase in the number of lymphocyte cells including T-helper lymphocytes ($CD4^+$), $CD8^+$ T cells and activated PBMC, whereas elevation of IFN-γ secretion was due to the activated $CD8^+$ T cells. The present chapter revealed the immunomodulating activity, which could be explained the traditional use of medicinal plant extract worldwide.

Keywords Immunomodulatory activities · T-helper lymphocytes · IFN-γ · $CD8^+$ T cells · $CD4^+$ T cells

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Chapter 17
Biological Activities of Marine Products and Nutritional Importance

Dilipkumar Pal and Khushboo Raj

Abstract Bioactive compounds, also known as phyto-nutrients are those compounds which enhance or we can say that promote good health. They are found in a limited amount in plants, animals, marine, and other natural food sources which help in the prevention of many diseases e.g. cancers, cardiac disorders, diabetes, etc. It is well known to us that nearly half of the worldwide biodiversity is constituted by different types of marine species and as a result, oceans, sea are enriched with valuable natural bioactive compounds such as proteins, peptides, amino acids, fatty acids, sterols, oligosaccharides, vitamins, and minerals, etc. These agents also help to enhance the nutritional as well as the therapeutic value of the food products. Every year nearly thousands of new compounds are isolated from a marine organism which further help in the discovery of new leads for the development of new drugs to treat or diagnose human diseases like cancer, viral diseases, inflammation, etc. For example, thyrsiferol, which is isolated from marine red algae (genus: Laurencia) on the experimental studies shows potent anti-viral and anti-tumour activities. Another example is marine sponge (genus: Insignia) which is a good source of terpenoids consisting of tetronic acids which act as anti-inflammatory agent, analgesic, and antibiotics. There are numerous examples of such marine products that are enriched with nutritional values and show many potent biological activities. In this article, we are going to discuss different marine products one by one with their biological and nutritional importances and also their role in the development of new drugs in the treatment of various human diseases.

Keywords Bioactive compounds · Cancers · Cardiac disorders · Diabetes · Marine organism · Thyrsiferol · Anti-viral

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Chapter 21
Tannins and Polyphenols Extracted from Natural Plants and Their Versatile Application

Suvadeep Mal and Dilipkumar Pal

Abstract From the beginning of lives on earth, nature is contributing different products to the system constantly and endlessly. Plants synthesize a large number of organic compounds, which are commonly known as primary and secondary metabolites with various applications. Tannins are one of the secondary metabolites solely obtained from the natural or plant sources where it present in the woods, barks, leaves, fruits, cell sap or in vacuoles. Chemically, they are polyphenolic colloidal solutions with complex astringent properties and it has the ability to tan or convert the skin of animals into leather. Depending on the complexity of chemical nature, tannins are classified into two types i.e., hydrolysable tannins and condensed tannins. More than 8000 different tannins of free or bound forms have been detected which can be used in various sector. Despite of its astringent property, tannins and polyphenols can show their identity with different applications with properties like anti-oxidant, anti-inflammatory, anti-microbial, anti-aging, stomachic, cardio-tonic, diuretics, laxatives, hypoglycemic, anti-corrosive or in photography, food, neutraceuticals or cosmeceuticals. In this review, we discuss about different tannins and polyphenols obtained from different sources, their types, about important chemicals and their remarkable applications in different fields of the system.

Keywords Secondary metabolite · Colloidal solution · Tannins · Hydrolysable tannin · Condensed tannin · Astringent · Polyphenols · Laxative · Cardio-tonic · Anti-oxidants · Anti-inflammatory · Anti-microbial · Diuretics · Neutraceuticals · Cosmeceuticals

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Chapter 22
Piperine: Sources, Properties, Applications, and Biotechnological Production

Neetu Sachan, Dilipkumar Pal, and Phool Chandra

Abstract From ancient times, phytopharmaceuticals have played an important role in the management of human health. Piperine, an alkaloid with the piperidine nucleus was discovered and isolated by Hans Christian Ørsted, from the fruits of *Piper nigrum*. Piperine forms is slightly water soluble and forms monoclinic needles and possess a strong pungent taste. Piperine contains plentiful established health effects and beneficial therapeutic properties. Cells and enzymes are key elements in biotechnological processes to carry out a wide variety of very specific reactions under judicious conditions to produce piperine and their products. Piperine also serves as bio-enhancers in conjunction with drugs to stimulate drug molecules' activity across different routes by improving the drug's bioavailability across the membrane, raising the drug's effect across conformational interaction, and working as a drug receptor. In recent years, there has been significant interest in the use of piperine to treat many illnesses, its health-beneficial effects, and its work as bio-enhancers. Due to their biological activity, piperine has the potential to be used in health and medicine.

Keywords Piperine · Alkaloid · Piper nigrum · Bio-enhancers · Therapeutics · Phytopharmaceuticals

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Chapter 23
Protein and Enzymes Isolated from Plant Sources and Their Utilization in Pharmaceutical Field

Om Prakash Panda, Sitansu Sekhar Nanda, Dong Kee Yi, Dilipkumar Pal, and Souvik Mukherjee

Abstract For transporting out original $B^{D}{}_{Y}$ functions, minerals, $V^{i}{}_{T}$, carbohydrates, $p^{R}{}_{t}$ and fibres necessitated, received from animal or $P^{l}{}_{T}$ sources or both. $p^{R}{}_{t}$ reckoned as important compounds among all nutrients for the $H^{u}{}_{M}$ $B^{D}{}_{Y}$ because they facilitated in cells to build up and tissues repair in the $B^{D}{}_{Y}$. The $B^{D}{}_{Y}$ used $p^{R}{}_{t}$ for energy production in the shortage of carbohydrates and fats, is essential for the $B_{u}{}^{Ld}$ of $M^{us}{}_{L}$ mass. An active $E^{z}{}_{m}$ is extracted from any living organism. Sources of $E^{z}{}_{m}$ are fungi, yeast, bacteria, animals and $P^{l}{}_{T}$. A very much larger number of $E^{z}{}_{m}$ is found its use in diagnosis and chemical analysis. Non-microbial sources provided a larger proportion of enzyme. $E^{z}{}_{m}$ prevailed from $P^{l}{}_{T}$ sources are bromelain, actinidin, ficin, a-amylase-amylase, papain, $L_{ip}{}^{ox}{}_{se}$. Application of $E^{z}{}_{m}$ finds its way in industries for food and beverage processing, animal feed, detergents biosensors, Pharmaceuticals, wastewater treatment and recent biofuels.

Keywords Protein · Nutrient building muscle mass · Enzyme · Chemical analysis · Chemical diagnosis · Bromelanin · Ficin · Lipooxygenase

Abbreviations

$A_{L}{}^{B}{}_{M}$	Albumins
$A_{m}{}^{a}$	Amino acid
$B^{D}{}_{Y}$	Body
$B_{u}{}^{Ld}$	Building
$C_{o}{}^{Nj}{}_{T}$	Conjugated
$D^{i}{}_{se}$	Diseases
$E^{z}{}_{m}$	Enzymes

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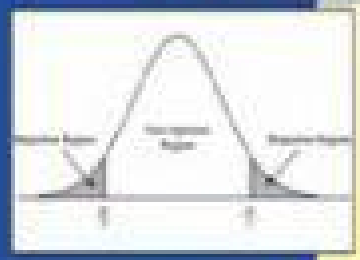

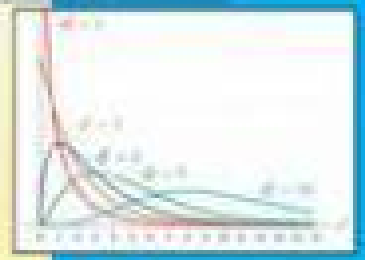

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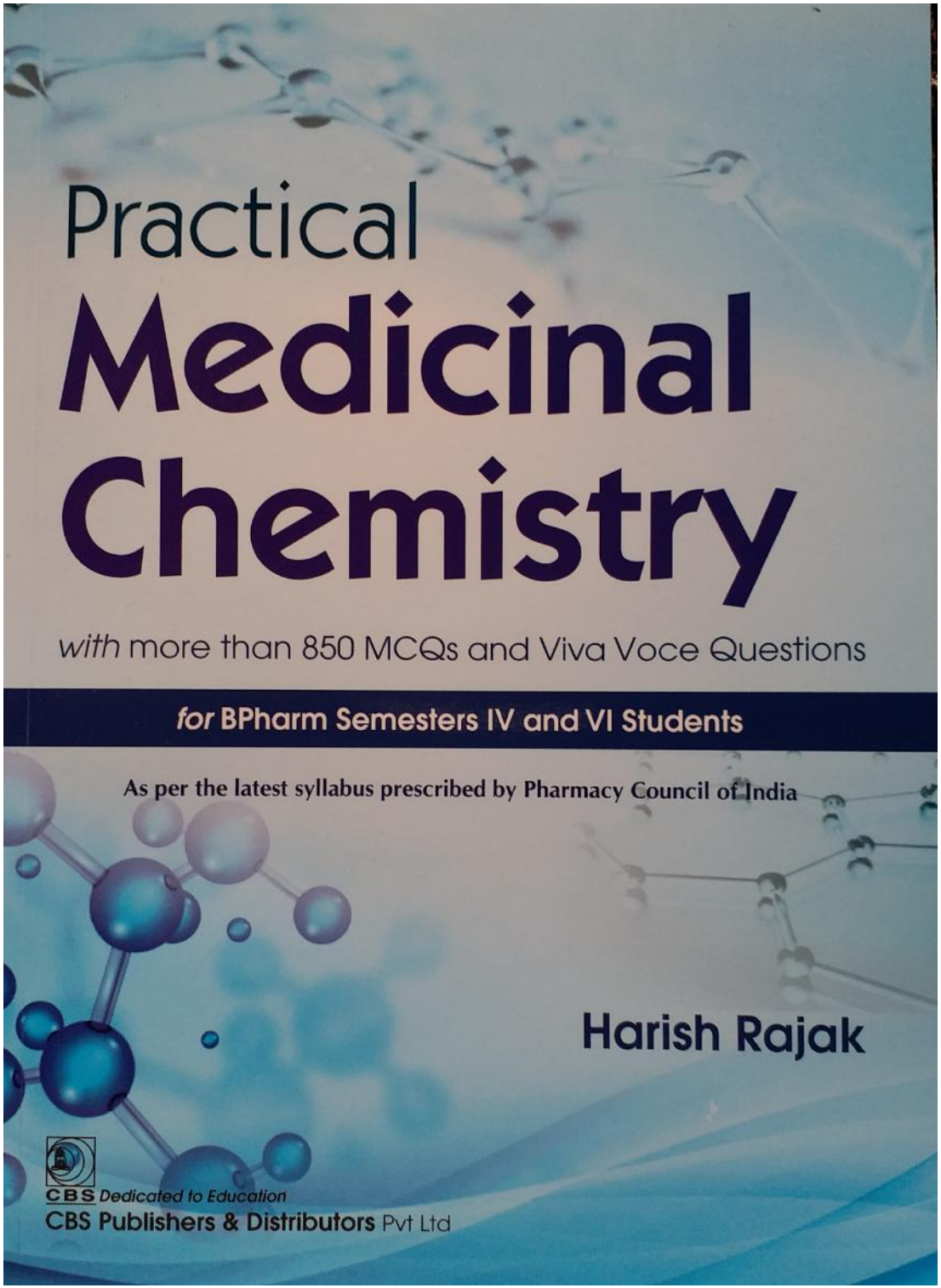
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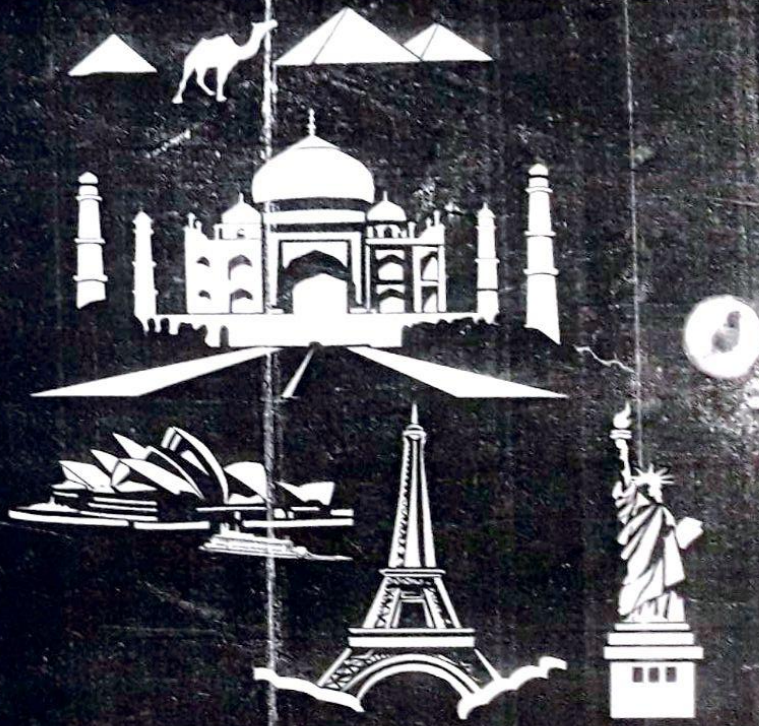

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भारतीय विदेश नीति के विशिष्ट आयाम

अध्यायः 06

भारत की विदेश नीति और दक्षिण एशिया

– डॉ. श्रद्धा गर्ग

विदेश नीति एक निरन्तर चलने वाली प्रक्रिया है, जहाँ विभिन्न कारक भिन्न–भिन्न स्थितियों में अलग–अलग प्रकार से एक दूसरे को प्रभावित करते हैं। भारत की विदेश नीति का सम्बन्ध उसकी सभ्यता की परम्परा, भूराजनैतिक स्थिति, उसकी मिश्रित संस्कृति, देश की सामूहिक अवचेतना और इसके शासकीय नेताओं की नीतियों एवं कार्यक्रमों से रहा है।

भारतीय सभ्यता ने हिन्दू, बौद्ध, जैन, सिक्ख, इस्लाम व ईसाइयत के माध्यम से विश्व जगत को प्रभावित किया है, परन्तु बाहरी सम्बन्धों के सभी क्षेत्रों में भारतीय नेताओं के बीच उपनिवेशवाद ने एक सामंजस्यहीन दृष्टिकोण में योग दिया है। 1947 में भारत को स्वतंत्रता मिली तो भारत की विदेश नीति की प्रारंभिक अवस्था ने उपनिवेशवाद की कड़ी निंदा की। द्वितीय विश्वयुद्ध के तुरन्त बाद शीत युद्ध के उदय से विश्व राजनीति का ध्रुवीकरण हो गया। उस समय भारत की विदेश नीति का प्रमुख उपकरण ''गुटनिरेपक्ष आंदोलन'' था जिसने भारत को बिना अपनी पहचान खोए एवं स्वतंत्र विदेश नीति के साथ अंतर्राष्ट्रीय राजनीति में सक्रिय रूप से भाग लेने और घरेलू विकास कार्यों में ध्यान देने में समर्थ बनाया। समकालीन वर्षों में भारत प्रमुख रूप से अपनी अर्थव्यवस्था के तीव्र विकास के कारण वैश्विक मामलों में आकर्षण का केन्द्र बन गया है। अतः 21वीं शताब्दी में भारत को एक ऐसी विदेश नीति अपनाने की जरूरत है, जो उसे विकासशील देशों में एक उभरती हुई शक्ति और एक परमाणु सम्पन्न राज्य के रूप में वैश्विक और प्रादेशिक उत्तरदायित्वों के निर्वाह में मदद कर सके।

दक्षिण एशिया, भारत के प्रभाव का परम्परागत क्षेत्र रहा है, जहाँ भारत द्वारा बिना किसी संदेह के वैश्वीकरण की प्रक्रिया में जीवन के सभी क्षेत्रों से ऊपर उठकर बाहरी विश्व के साथ भारतीय सम्बन्धों में बढ़ोत्तरी की गई। परन्तु वैश्वीकरण के आगमन के साथ दक्षिण एशिया में बाहरी शक्तियों के हितों में वृद्धि हो रही है। भारत के लिए यह सुरक्षा का सबसे महत्वपूर्ण विषय है। अन्य देशों के

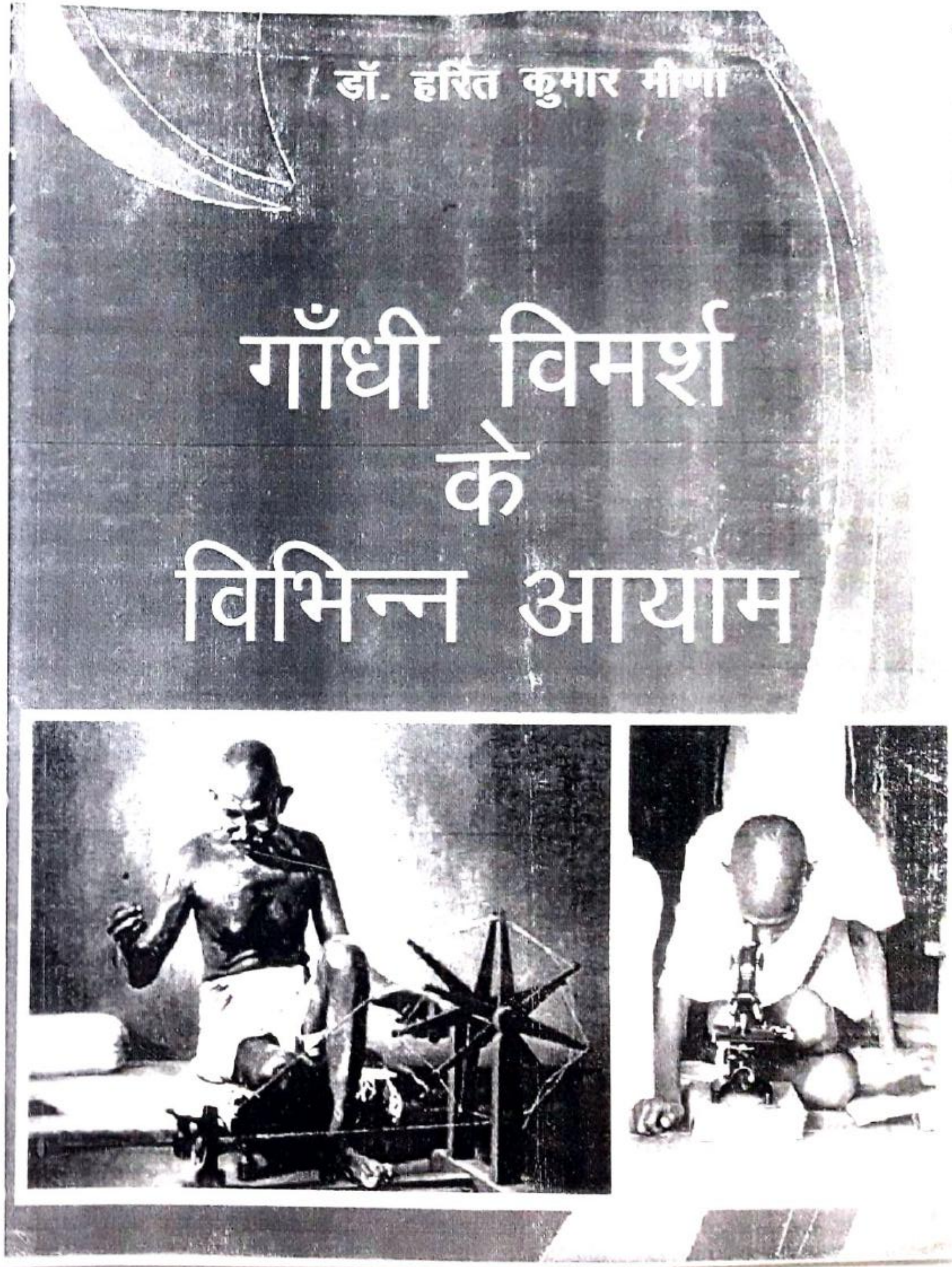
विपरीत भारत, दक्षिण एशियाई क्षेत्रीय सहयोग संगठन (SAARC) को सभी दक्षिण एशियाई देशों के लिए और भारत की समृद्धि एवं व्यापक आर्थिक वृद्धि एवं विकास के लाभ हासिल करने वाला मंच मानता है। संयुक्त राज्य अमेरिका के साथ जन परमाणु सहयोग, यूरोपीय यूनियन के साथ राजनैतिक एवं आर्थिक सहयोग, दक्षिण एशियाई पूर्वी देशों के संघ के साथ ''पूर्व अभिमुखी नीति'' में भागीदारी और चीन एवं पाकिस्तान जैसे परम्परागत प्रतिद्वन्दियों के साथ कुछ विवादास्पद मुद्दों के बावजूद भी सम्बन्ध सुधार के प्रयास आदि वर्तमान में भारत की विदेश नीति के प्रमुख आयाम रहे हैं।

भारत के विदेश नीति एवं दक्षिण एशियाई देशों से सम्बन्ध–

भारत दक्षिण एशियाई क्षेत्र का एक केन्द्रीय राज्य है, जिसने सदैव अपने पड़ोसियों के साथ समान, सहज एवं सहयोगात्मक सम्बन्ध कायम किए जाने पर बल दिया है। भारत ने सदैव इस क्षेत्र में अमन एवं शांति की बात की है। यही कारण है कि उसने अपने तमाम कटु अनुभवों को भूलते हुए पाकिस्तान, श्रीलंका, बांग्लादेश, नेपाल, मालद्वीप, भूटान जैसे अपने पड़ोसी राष्ट्रों के साथ सम्बन्ध सुधार पर बल दिया और इस दिशा में वह आज भी प्रयासशील है।

भारत–पाकिस्तान सम्बन्ध

भारत और पाकिस्तान की घरेलू राजनीतिक समस्याओं ने दोनों देशों के द्विपक्षीय सम्बन्धों पर सीधा प्रभाव डाला है। भारत और पाकिस्तान की दो विभिन्न राष्ट्रीय विचारधारायें हैं, जो दक्षिण एशिया में परस्पर स्वीकृत शक्ति समानता स्थापित करने में असमर्थ है। भारत के बहुलवाद, लोकतंत्र और धर्मनिरपेक्षता तथा पाकिस्तान में इस्लाम की राष्ट्रीय विचारधारायें कांग्रेस और अखिल भारतीय मुस्लिम लीग के बीच स्वतंत्रता पूर्व संघर्ष के दौरान उत्पन्न हुई। आजादी से लेकर अब तक भारत और पाकिस्तान सम्बन्धों की प्रमुख समस्या ''कश्मीर विवाद'' रहा है। भारत को कश्मीर देने की वैधता को सहमति देने के पाकिस्तान के इन्कार ने अक्टूबर 1947 में दोनों देशों में मध्य अघोषित युद्ध को उकसाया। यही समस्या 1965 में भी बनी रही।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कुलपति
Prof. Shri Prakash Mani Tripathi
Vice-Chancellor

पुरोवाक

बीसवीं शताब्दी के प्रारम्भ में प्रथम विश्वयुद्धोपरांत भारतीय स्वाधीनता संग्राम का इतिहास [illegible] के नाम से प्रसिद्ध है। कांग्रेस की बागडोर उनके हाथ में आ जाने से भारतीय राष्ट्रीय आन्दोलन संगठनात्मक स्वरूप तथा कार्यप्रणाली में आमूल रूप से परिवर्तन हुआ। 1918 तक स्वतंत्रता आन्दोलन पुख्यतः मध्यम शिक्षित वर्ग तक ही सीमित था किन्तु दक्षिण अफ्रीका से गाँधीजी के भारत वापस [illegible] उपरान्त स्वातंत्र्य आंदोलन ने जन-आन्दोलन का रूप धारण कर लिया। यह महात्मा गांधी के नेतृत्व में आंदोलनों का ही प्रभाव था जिसके परिणामस्वरूप महिला, कृषक, श्रमिक एवं अल्पसंख्यक वर्गों की राष्ट्रीय आंदोलन में भागीदारी बढ़ी तथा उसके सामाजिक आधार का विस्तार भी अधिक संभव हो सका। उन्होंने अहिंसा, सत्य, सत्याग्रह, स्वराज, सर्वोदय, वर्ग समन्वय जैसी अनेक विचारधाराओं को नवीन आयाम देने के साथ-साथ भेदभाव पर आधारित प्रत्येक सिद्धांत को नकार दिया। इस प्रकार, स्वाधीनता संघर्ष में गांधीजी जनता की केन्द्रीय भूमिका स्वीकार की तथा जनता को राजनीतिक रूप से संगठित-सक्रिय कर उसे साम्राज्यवाद के विरुद्ध संघर्ष के लिए तैयार किया। उन्होंने स्वाधीनता आंदोलन में अहिंसक तरीके से संघर्ष-विराम-संघर्ष की रणनीति अपनाई जिसमें एक ओर लोकतांत्रिक मूल्य आधारित स्वराज्य का विचार था तो वहीं दूसरी ओर भारतीय समाज एवं अर्थतंत्र के रचनात्मक सृजन को भी समाविष्ट किया गया।

गाँधीजी ने स्वाधीनता संघर्ष के साथ साथ *[illegible]* के माध्यम से भारतीय राजनीति एवं सामाजिक-सांस्कृतिक संरचना में उदारता को उत्तरोत्तर पोषित किया। उदारता ही पराये को अपना और अपनों को आत्मीय बनाती है।

गाँधीजी के प्रत्येक क्षेत्र की कार्यप्रणाली उनके जीवन-दर्शन का प्रतिनिधित्व करती है। उन्होंने अंग्रेजी शासन के साथ-साथ बौद्धिक दासता से भी देश को मुक्त कराने के लिए स्वतंत्र रूप से संचालित राष्ट्रीय शिक्षा की आवश्यकता पर बल दिया। 1937 में गाँधीजी द्वारा प्रतिपादित बुनियादी शिक्षा (वर्धा शिक्षा योजना) अथवा नई तालीम का मूल तत्व नई शिक्षा नीति 2020 में प्रतिबिंबित होता है।

डॉ. मीणा ने पुस्तक में विषय-वस्तु को बिंदुवार संकलित किया है ताकि सुधी पाठकगण विषय की तार्किकता एवं क्रमबद्धता से समझ सकें।

डॉ. हरित मीणा को श्रमशील कार्य के लिए बधाई।

(प्रोफेसर श्रीप्रकाश मणि त्रिपाठी)

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गाँधीजी का स्वप्न रामराज्य एवं उसकी वर्तमान प्रासंगिकता

अभिषेक अग्रवाल[1] एवम डॉ. श्रद्धा गर्ग[2]

महात्मा गाँधी आधुनिक भारत के जनक थे। वे एक राजनीतिक दार्शनिक, शैक्षिक, सामाजिक, सास्कृतिक, एवं आध्यात्मिक आदि गुणों से सम्पन्न महापुरूष थे, जिन्होने सभी क्षेत्रों मे पूर्ण निष्ठा, ईमानदारी एवं आस्था के साथ काम किया। उन्होनें एक आदर्श राज्य रामराज्य की अवधारणा रखी।

महात्मा गाँधी ने जीवन भर जिस स्वराज की स्थापना के लिए प्रयास किया, उस स्वराज्य का तात्पर्य ही 'रामराज्य' है। रामराज्य ही उनका स्वराज्य था, उनका मानना था कि केवल विदेशी शासकों को हटाकर देशी नौकरशाहों के हाथ में सत्ता चली जाये तो इतने मात्र से देश का भला नही हो सकता है, जनता को ऐसे राज्य की आवश्यकता है जो सुराज्य हो।

हिन्दू सस्कृति मे राम द्वारा किया गया आदर्श शासन रामराज्य के नाम से प्रसिद्ध है। वर्तमान समय मे रामराज्य का प्रयोग सर्वोत्कृष्ट शासन या आदर्श शासन के प्रतीक के रूप में किया जाता है। रामराज्य लोकतंत्र का परिमार्जित रूप माना जाता है, वैश्विक स्तर पर रामराज्य की स्थापना गाँधीजी की इच्छा थी, गाँधीजी ने भारत में अंग्रेजी शासन से मुक्ति के बाद ग्राम स्वराज के रूप में रामराज्य की कल्पना की थी।

रामराज्य का अर्थ है, विश्व जातीय शान्ति तथा मानवतावादी आधार का साकार होना। इसमे आडम्बर, बर्बरता तथा संघर्ष के लिए कोई स्थान नहीं होगा, परन्तु ईश्वर के साम्राज्य का साकार होना करोड़ो लोगो के भगवान मे सच्चे विश्वास पर निर्भर होगा। स्पष्ट है कि औपचारिक रूप मे वैधानिक संगठन की अपेक्षा राम–राज्य अधिक संयोजनशील होगा।'''

सहायक प्राध्यापक, (इतिहास विभाग) गुरू घासीदास (केन्द्रीय) विश्वविद्यालय, बिलासपुर, छ.ग.
सहायक प्राध्यापक, (राजनीति विज्ञान विभाग), गुरू घासीदास (केन्द्रीय) विश्वविद्यालय, बिलासपुर, छ.ग.

गाँधी की परिकल्पना का रामराज्य, अर्थात् एक आदर्श राज्य एक धर्म विशेष का राज्य नही, बल्कि नीति और मर्यादा पर आधारित एक ऐसा राज्य जिसमें धर्म, लिंग, भाषा और क्षत्र के आधार पर कोई भेदभाव न हो। व्यक्ति के पास राजनीतिक निर्णय में सहभागिता और अभिव्यक्ति का आधार हो और प्रेम सदभाव राज्य का आधार हो।

1929 में यंग इण्डिया में गाँधीजी ने रामराज्य की कल्पना करते हुए लिखा है– 'रामराज्य से मेरा अर्थ हिन्दू राज्य नहीं है, बल्कि मेरा मतलब है, ईश्वरीय राज्य, भगवान का राज्य। चाहे मेरी कल्पना के राम कभी इस धरती पर रहें या नही, लेकिन रामराज्य का प्राचीन आदर्श निःसंदेह सच्चे लोकतंत्र का है, जहाँ सबसे कमजोर नागरिक भी बिना किसी महगी और लम्बी प्रकिया के जल्द से जल्द न्याय के प्रति आश्वस्त हों। मेरे सपनों का रामराज्य राजा और रंक को बराबर का अधिकार देगा।''

गाँधीजी जिस समाज की परिकल्पना करते हैं, उसका शासक स्वहित त्यागकर सर्वहित का पक्षधर और 'सर्वजन हिताय सर्वजन सुखाय' का अनुगमन करने वाला होगा। गाँधी हमारे आदर्श पुरूषोत्तम के रामराज्य की परिकल्पना करते हुए अपने अनुशीलन के माध्यम से यह सिद्ध भी किए कि अभी भी समाज तथा राज्य की स्थापना तथा उनका संचालन उनके आध्यात्मिक, धार्मिक तथा नैतिक विचारों के अनुरूप ही हो सकता है और यदि ऐसा किया जाय तो श्रेयस्कर भी है। रामराज्य की परिकल्पना के लिए उन्होनें कोई नवीन पद्धति विकसित करने का दावा नहीं किया। उनका विचार था कि जिस प्रकार समाज का परिष्कृत कर एक सुदृढ ढाँचा दिया जा सके, हमें वैसा ही विचार विकसित करना चाहिए। उनके धार्मिक तथा दार्शनिक दोनों विचार एक आदर्श की कल्पना पर आधारित है उनमे सदा चाहिए की ओर अनुशंसा रहती है।

गाँधी के रामराज्य की अवधारणा

गाँधीजी ने भारत में रामराज्य की परिकल्पना की थी। गाँधीजी के विचारो का रामराज्य तुलसीदास की रामायण पर आधारित दिखायी देता है। उनका रामराज्य ग्रामीण एव कृषि प्रधान व्यवस्था का परिचायक है। उनका विचार था कि रामराज्य एक ऐसा राज्य होगा जिसमें लोक कल्याण की भावना प्रबल होगी। इसमे सामाजिक दिव्यता का नामोनिशान नहीं होगा। गाँधीजी न्यूनतम शासन के पक्ष मे थे। गाँधीजी द्वारा प्रतिपादित आदर्श राज्य व्यवस्था रामराज्य थी। उनके अनुसार धार्मिक दृष्टि से रामराज्य का अर्थ पृथ्वी पर भगवान का राज्य है, राजनीतिक दृष्टि से यह पूर्ण प्रजातंत्र है जिसमे गरीबी और अमीरी, रग और मत के आधार पर स्थापित असमानताओं का अन्त हो जाता है। रामराज्य में भूमि और राज्य जनता का होता है।

गांधी के अनुसार रामराज्य का अर्थ है– धर्म न्याय और प्रेम का शासन। ऐसा राज्य तभी हो सकता है, जब प्रत्येक नागरिक राष्ट्र के प्रति अपने कर्तव्यों का पालन करे। राम राज्य का अर्थ किसी विशेष धर्म से नही सब धर्म के लिए सम्भाव से और राष्ट्र के लिए स्वेच्छा

भारत में जाति व्यवस्था ने जीवन को [illegible] प्रजनगत समूह होता है, जो [illegible] इतने सालों के बाद भी यहाँ जाति [illegible] के अनुसार यह सब बदल रहा है। [illegible] आधुनिक स्वरूप विकसित हुआ। यह [illegible] लोकतांत्रिक व्यवस्था स्थापित होने पर भारत से जाति [illegible] समाप्त हो जायेगा लेकिन ऐसा नहीं हुआ। जाति [illegible] प्रवेश करके उग्र रूप धारण कर लिया है। [illegible] सामाजिक, सांस्कृतिक, धार्मिक प्रवृत्तियों को [illegible] पूर्ण रूप से प्रभावित किया है। भारत की [illegible] है। इसी पृष्ठभूमि में प्रस्तुत पुस्तक भारत [illegible] विषय पर केन्द्रित है। अध्ययन से प्राप्त [illegible] लोगों, प्रशासकों, समाज वैज्ञानिकों एवं नीति [illegible] विद्यार्थियों, शोधार्थियों के लिए भी सहायक [illegible] सिद्ध होगी।

डॉ. कमलेश पाल

आप वर्तमान में वीर बहादुर [illegible] समाज विज्ञान विभाग के [illegible] परिषद नई दिल्ली द्वारा [illegible] पोस्ट डाक्टोरल फैलो रहे हैं। आपकी विशेष [illegible] अध्ययन, ग्रामीण विकास, अपराध शास्त्र [illegible] से अधिक शोध आलेख राष्ट्रीय एवं [illegible] इसके पूर्व दो किताबें भी प्रकाशित [illegible]

डॉ. अखिलेश पाल

आप वर्तमान में इलाहाबाद विश्वविद्यालय के [illegible] कॉलेज, प्रयागराज में राजनीति शास्त्र के सहायक आचार्य हैं। आप [illegible] गौर केन्द्रीय विश्वविद्यालय, सागर एवं इलाहाबाद विश्वविद्यालय [illegible] कार्य कर चुके हैं। आप म. प्र. सामाजिक विज्ञान शोध संस्थान [illegible] अनुसंधान परिषद का स्वायत्त संस्थान) उज्जैन में [illegible] भारतीय शासन एवं राजनीति, स्थानीय [illegible] विकास आदि है। आपके दो दर्जन से अधिक शोध [illegible] में प्रकाशित हो चुके हैं तथा इसके पूर्व [illegible]

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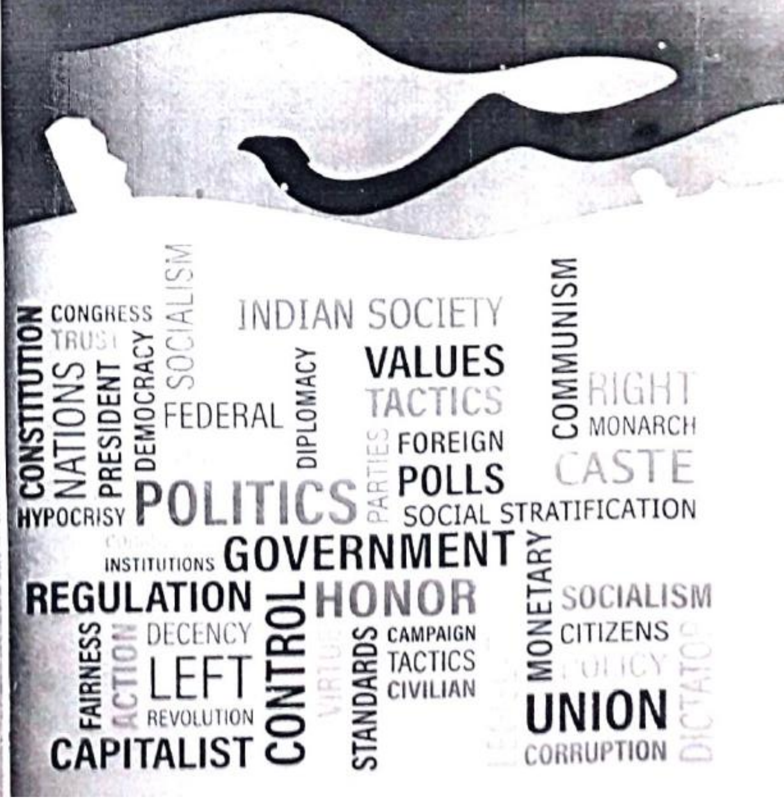
कमलेश पाल डॉ. अखिलेश पाल



भारत में
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विविध आयाम

सम्पादक

डॉ. कमलेश पाल

डॉ. अखिलेश पाल

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प्रस्तावना

भारतीय समाज की संरचना जाति पर आधारित है। भारतीय समाज में जाति व्यवस्था जन्म के आधार निर्धारित होने वाला व्यवस्था है। जिसका मूल धर्म एवम् धर्मग्रन्थ माने गए हैं। प्राचीन काल में उपयोगिता व आवश्यकता के आधार पर श्रम का विभाजन हुआ। जातियों का वर्गीकरण उनके व्यवसायों के अनुसार किया गया। जाति व्यवस्था भारतीय समाज का अटूट अंग रही है और इसने जीवन के सभी पक्षों को प्रभावित किया है। जाति एक वंशानुगत समूह होता है जो अपने सामाजिक स्थिति को परिभाषित करता है।

आजादी के इतने सालों के बाद भी यहाँ जाति पर आधारित सीमांकन आज भी होता है। हालांकि समय के अनुसार यह सब बदल रहा है। जाति व्यवस्था स्थिर नहीं रही है जाति व्यवस्था में परिवर्तन होते रहे हैं। संस्कृतिकरण की प्रक्रिया काफी लम्बे समय तक नीची जातियों द्वारा अपनी स्थिति को ऊँचा उठाने का प्रभावशाली मॉडल उपस्थित कर रहा है। एक प्रक्रिया के रूप में इतिहास में हर शताब्दी में संस्कृतिकरण की प्रक्रिया चलता रही है भारत में यह जातीय अधिक्रम न केवल हिन्दू समाज में अपितु मुस्लिम आदि समाजों में भी विद्यमान हैं।

स्वाधीनता प्राप्ति के पश्चात् भारतीय राजनीति का आधुनिक स्वरूप विकसित हुआ। यह संभावना व्यक्त की जाने लगी कि देश में लोकतांत्रिक व्यवस्था स्थापित होने पर भारत से जाति, जाति व्यवस्था अथवा जातिवाद समाप्त हो जायेगा लेकिन ऐसा नहीं हुआ, वरन जातिवाद ने न केवल समाज में बल्कि राजनीति में भी प्रवेश करके उग्र रूप धारण कर लिया है। भारत में जातिवाद ने न केवल यहाँ की आर्थिक, सामाजिक, सांस्कृतिक, धार्मिक प्रवृतियों को ही प्रभावित किया है, वरन् राजनीति को भी पूर्ण रूप से प्रभावित किया है। भारत की राजनीति में जाति ने महत्वपूर्ण भूमिका निभाई है। इसी पृष्ठभूमि में प्रस्तुत पुस्तक भारत में जाति व्यवस्था एवं राजनीतिः विविध आयाम पर केन्द्रित किया गया है।

प्रस्तुत पुस्तक कुल बीस अध्यायों में विभाजित है। प्रथम अध्याय में भारत में जाति का उद्भव एवं विकास द्वितीय अध्याय मे जाति का ऐतिहासिक एवं परम्परागत स्वरूप तृतीय अध्याय भारत में जाति व्यवस्था का ऐतिहासिक स्वरूप चतुर्थ में जाति व्यवस्था के ऐतिहासिक और परम्परागत रूप पंचम अध्याय में मध्यकालीन समाज में जाति व्यवस्था एवं स्तरीकरण षष्ठ समाज, संस्कृति और सामाजिक संरचना के प्रमुख अंग की बात करता है। सातवां अध्याय जाति विहीन समाज की सोचः एक परिकल्पना अथवा वास्तविकता पर है। आठवां अध्याय राष्ट्र निर्माण व लोकतन्त्र पर जाति की राजनीति के प्रभाव का अध्यन है। नौवां अध्याय लोकतंत्र और राष्ट्र पर जाति की राजनीति का प्रभावका आकलन के निर्माण

दसवां अध्याय भारतीय लोकतंत्र में जातिवाद के प्रभाव अध्ययन है। इग्यारहवां लोकतंत्र और राष्ट्र पर जाति की राजनीति का प्रभाव के आकलन का निर्माण बारहवें अध्याय में जाति की राजनीति और दलित का अवलोकन है। तेरहवें अध्याय में दलित उभार चौदहवें में स्थानीय निकाय का चुनाव के संदर्भ में जाति और चुनावी राजनीति पर है। पन्द्रहवें अध्याय में जाति और चुनावी राजनीति के मुद्दे, चुनौतियाँ और सम्भावनाएँ, स्थानीय निकायों के सन्दर्भ में है। सोलहवें अध्याय में जातिगत चुनावी राजनीति और शिक्षा सत्रहवें में राज्य पुर्नगठन के बाद झारखण्ड की स्थिति का पड़ताल है। अठारहवें अध्याय में भारत की जातिगत राजनीति का राम मनोहर लोहिया की दृष्टि में अध्ययन है। उन्नीसवें अध्याय में जातीयता की राजनीति का उभार और उत्तर प्रदेष की राजनीति में पिछड़े वर्गों की भागीदारी तथा बीसवें अध्याय में जाति की राजनीति का लोकतंत्र और राष्ट्र निर्माण पर प्रभाव है।

अध्ययन से प्राप्त आगत जाति और राजनीति में रूचि रखने वाले लोगों, प्रशासकों, समाज वैज्ञानिकों एवं नीति निर्माताओं के लिए उपयोगी है, साथ ही विद्यार्थियों, शोधार्थियों के लिए भी सहायक होगा तथा भविष्य में शोध की सम्भावनाओं के सन्दर्भ में भी सहायक सिद्ध होगी, ऐसा हम सब का पूर्ण विश्वास है।

डॉ. कमलेश पाल

डॉ. अखिलेश पाल

लेखक मंडल

डा. रवि प्रताप सिंह, असिस्टेंट प्रोफेसर, राजनीति शास्त्र विभाग शिया पी.जी. कॉलेज, लखनऊ।

श्वेता द्विवेदी, असिस्टेंट प्रोफेसर, समाजशास्त्र विभाग, आर.आर. पी. जी. कॉलेज, अमेठी।

डॉ. श्रद्धा गर्ग, सहायक प्राध्यापक, राजनीति विज्ञान विभाग, गुरू घासीदास केन्द्रीय विश्वविद्यालय, बिलासपुर, छ.ग.।

अभिषेक अग्रवाल, शोध छात्र, इतिहास विभाग, गुरू घासीदास केन्द्रीय विश्वविद्यालय, बिलासपुर, छ.ग.।

उदय कुमार मेहता, राजनीतिक विज्ञान विभाग, विनोबा भावे विश्वविद्यालय, हजारीबाग, झारखण्ड।

डॉ0 अर्चना सिंह, असिस्टेन्ट प्रोफेसर, मध्यकालीन इतिहास विभाग, आर्य कन्या डिग्री कालेज, प्रयागराज।

प्रियंका कुमारी, सहरसा, बिहार।

डॉ0 पूर्णिमा सिंह, पोस्ट डॉक्टोरल फैलो, ए. एन. सिन्हा इन्स्टीट्यूट पटना।

डॉ. रोहताश जमदग्नि, भूतपूर्व विभागाध्यक्ष, राजनीतिक विज्ञान, जी. डी.सी.एम., पी.जी, महाविद्यालय, बहल, भिवानी, हरियाणा।

आशीष कुमार सिंह, शोधार्थी, राजनीति विज्ञान विभाग, विनोबा भावे विश्वविद्यालय हजारीबाग, झारखण्ड।

पूनम कुमारी, राजनिति विभाग विनोबा भावे विश्वविद्यालय, हजारीबाग, झारखण्ड़।

कृष्णा बैंठा, शोधार्थी राजनीति विज्ञान विभाग विनोबा भावे विश्वविद्यालय, हजारीबाग, झारखण्ड।

करती है। राजनीतिक दल सत्ता प्राप्त करने के लिए जातीय संगठन उपयोग अपने राजनीतिक लाभ के लिए करते हैं। इससे यह हुआ कि जाति का राजनीति पर हावी होने के कारण जाति का राजनीतिकरण हो गया है। वर्तमान समय में एक जाति की प्रधानता होने के कारण वह जाति दूसरी जाति के साथ पक्षपात पूर्ण व्यवहार करने लगी है। यह दुर्भाग्य की बात है कि हमारे राजनीतिक जीवन में जाति व्यवस्था इस प्रकार से स्थितियों का निर्धारण करती है। जात–पात बहुल भारतीय समाज में यह उपेक्षा भी नहीं की जा सकती है कि वह चमत्कारी रूप से व्यापक परिवर्तन लाये। भारत में जाति वाद का होना वास्तव में एक सामाजिक बुराई है।

इस सच्चाई को कोई कितना भी नकारे मगर आज भी भारतीय जनतंत्र की मुख्य राजनीतिक धुरी नागरिक नही 'जाति' ही है। यह आगे भी होगी। माना कि सामाजिक दर्जा उसकी योग्यता से नही अपितु उसके जन्म से निर्धारित होता है। इन्हीं बातों का ध्यान में रखकर ही जय प्रकाश नरायण ने कहा था कि "भारत में जाति स्वयं में एक दल है।"

संदर्भिका

श्री धर केतकर– द हिस्ट्री ऑफ कास्ट इन इंडिया।

क्षितिमोहन सेन– भारत वर्ष में जाति भेद।

श्री यस0 बंएल दोषी, पी0सी0 जैन–भारतीय समाज संरचना और परिवर्तन।

प्रो0 गुप्ता डा0 शर्मा– समाजशास्त्र।

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भारत में जाति व्यवस्था का ऐतिहासिक स्वरूप

डॉ. श्रद्धा गर्ग, अभिशेक अग्रवाल

सारांश

जाति व्यवस्था विशेषतः भारतीय समाज में जन्म के आधार निर्धारित होने वाली व्यवस्था है। जिसका मूल धर्म एवम् धर्मग्रन्थ माने गए हैं। "जाति एक ऐसी सोपानबद्ध समाजव्यवस्था मानी जाती रही है, जिसके मूल उस धार्मिक सिद्धान्त में समाहित है, जो सामाजिक समूहों को जन्मजात पवित्र या अपवित्र प्रस्थिति प्रदान करता है और इन स्थितियों की वैधता सिद्ध करने के लिए कर्म के सिद्धान्त का सहारा लेता है। जाति व्यवस्था भारतीय समाज में जन्म के आधार निर्धारित होने वाली व्यवस्था है। जिसके बीज प्राचीन काल से देखने को मिलते है, किन्तु इसकी वर्तमान विकृत व्यवस्था आधुनिक काल की देन है। भारत जाति–व्यवस्था के कारण ही अलग–अलग इकाईयों में बंटा हुआ है।

मुख्य शब्दः जाति व्यवस्था, भारतीय समाज, इतिहास, स्वरूप

ऋग्वैदिक कालीन समाज में जाति व्यवस्था के उदाहरण नही मिलते हैं, यद्यपि इस काल में वर्ण–व्यवस्था का प्रारम्भ हो चुका था, जो कर्म पर आधारित व्यवस्था थी।उत्तर वैदिक काल में वर्णों में कठोरता आने लगी थी और अब वे 'जाति' के रूप में परिणत होने