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## NATIONAL SEMINAR ON DRUG DISCOVERY AND DEVELOPMENT

"PREFORMULATION: IT'S IMPACT ON DRUG DELIVERY"

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## Abstract Book

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# "PREFORMULATION: ITS IMPACT ON DRUG DELIVERY"

## ABOUT THE PROGRAM

Formulation studies involve developing a preparation of the drug which is both stable and acceptable to the patient. Preformulation involves the characterization of a drug's physical, chemical, and mechanical properties in order to choose what other ingredients should be used in the preparation. Preformulation studies are essential component of drug development, wherein, they support the development of formulations, for different stages of clinical trials. It provides the scientific basis for formulation development. Preformulation focuses on those physicochemical factors, which can affect the drug performance and efficacy of the dosage form. By considering the regulatory guidelines stipulated by various countries, now it has become mandatory to determine the drug properties, stability and compatibility with the excipients. In simplest way, the preformulation investigations may merely confirm that there are no significant barriers to the compound's development. Thorough preformulation work is the foundation of development of robust formulations.

# PROFILES OF RESOURCE PERSONS

## Prof (Mrs) Kamla Pathak, M Pharm, PhD

Prof Kamla Pathak obtained her graduate, post graduate and doctoral degrees from Panjab University, Chandigarh. Has more than 22 years of teaching and research experience. She is a member of various professional bodies like IPA, IHPA, APTI, ISTE and IPGA. Actively engaged in research on oral controlled /modulated/targeted and topical drug delivery systems has over 170 publications in various reputed international and national peer reviewed journals, 3 patents (filed), book chapter and more than 90 papers presented in scientific forums to her credit. Credited as reviewer of national and international journals of repute in the field of Pharmaceutics, has h-index of 14 and is a member Editorial Advisory Board of AAPS Pharm Sci Tech. She has guided 3 PhDs, 110+ postgraduate theses and is currently guiding 5 PhDs and 8 M Pharm projects. The niche areas include development of oral controlled and targeted drug delivery systems. She is also credited as reviewer of scientific projects, Knowledge Foundation, Sweden; Israel Science foundation, Israel and is an invited member of American Nano Society. Awards bestowed upon include Dr RL Nicore award 2012, for Best Research Paper in Pharmaceutics published in IJPER at 17th APTI Convention, Manipal; Eminent Teacher Award, 2012, First Annual conference of SPER and for various poster presentations at National Pharmacy conferences held in India. She is associated with Pharmaceutical industry in the capacity of scientific consultant. She is presently working as Professor and Dean, Department of Pharmaceutics, Rajiv Academy for Pharmacy, Mathura, India.

## Mr Dhananjay Singare, M Pharm (PhD)

Mr Dhananjay Singare has obtained his M Pharm from IPER, Wardha and submitted his PhD to Karpagam University, Coimbatore. He has 10 years of experience in formulation development research in industry. Many of the products developed by him are in Indian and global market. He has published several papers in international and national journals of repute with good impact factors, presented papers in various conferences such as AAPS. He also has a WIPO patent to his credit. He is presently working as Scientist, Formulation Development, Piramal Pharmaceutical Development Services Pvt. Ltd., Ahmedabad.

## Mr Rajendra Awasthi, M Pharm, (PhD)

He has completed B Pharm from Uttar Pradesh Technical University, Lucknow, and M Pharm from Annamalai University, Chidambaram. He has submitted his doctoral thesis to Jawaharlal Nehru Technological University, Hyderabad. Has 8 years of industrial, research and teaching experience. Published 20 research and review papers in various peer reviewed National and International journals with total 70 citations, H index 5, and i10 index 1. Total Impact: 12.486. Working as peer reviewer and editorial board member for various peer reviewed international journals. Presented 13 research papers in various National and International conference. Attended 05 Conference / Workshop/ Seminar as delegate. His areas of research include: Gastroretentive drug delivery system, Buccal drug delivery systems, Ocular drug delivery systems, Novel drug delivery systems, Microparticulate drug delivery Systems. He is presently working as Associate Professor in Laureate Institute of Pharmacy, Kathog, HP.

# DETAILS OF TECHNICAL SESSION

| Time | Event Details |
|---|---|
| 09.30-10.30 | Spot Registration |
| 10.30-11.15 | Inauguration |
| 11.15-11.30 | High Tea |
| 11.30-12.15 | Lecture-1: Mr Dhananjay Singare, (PhD), Scientist, Formulation Development, Piramal Pharmaceutical Development Services Pvt. Ltd., Ahmedabad<br><br>Topic: Formulation Strategies of NCE Molecules |
| 12.15-13.00 | Lecture-2: Dr Kamla Pathak, Professor and Dean, Department of Pharmaceutics, Rajiv Academy for Pharmacy, Mathura<br><br>Topic: In vitro Dissolution - Preformulation Tool for Assessing Drug Delivery |
| 13.00-13.45 | Lecture-3: Mr Rajendra Awasthi, (PhD), Associate Professor, Laureate Institute of Pharmacy, Kathog, Dehra, HP<br><br>Topic: Pharmaceutical Product Development - Preformulation Techniques and Perspectives |
| 13.45-14.15 | LUNCH |
| 14.15-15.30 | Poster Session |
| 15.30-16.15 | Valedictory Session with prize distribution |

# ABSTRACTS OF INVITED SPEAKERS

**Invited Lecture-1**

## FORMULATION STRATEGIES OF NCE MOLECULE

**Dhananjay Singare**
Scientist, Formulation Development,
Piramal Pharmaceutical Development Services Pvt. Ltd., Ahmedabad

New chemical entities (NCEs) are compounds which emerge from the process of drug discovery. NCE's are developed to fulfill the unmet medical needs, improve the quality of human life and reduce the downstream medical cost. Discovering and developing a new drug has been linked to searching needle in a haystack. After identifying a suitable drug candidate from the preclinical study the drug moves into the clinical trial phase which is completed in four steps i.e. Phase I, II, III and IV.

Drug development is an increasingly long and costly process. Clinical trial and drug approval phases take ~ 8 years on average, and cost's ~US$1 billion from discovery till market launch. However, the productivity of pharmaceutical R&D is low because of high attrition rates in clinical development. ~90% of all new drugs fail after first-in- human studies. An analysis of the causes of attrition showed that, in the year 2000, toxicity and lack of clinical safety accounted for 30% of the failed drug development programs. The other major hurdle in initial early phase of drug development is the amount of NCE available for product development; it ranges from few mg to few hundred grams.

The formulation development of NCE molecules is an ongoing process during every phase of clinical development. The prime objective of a Phase I, clinical trial is to provide information on drug pharmacokinetic and pharmacodynamics in humans and to determine the appropriate dose to be taken into further clinical studies. Therefore these formulations are to be designed as simple as possible. These formulations are called as first time in human (FTIH) or first-in-man (FIM) or First Human Dose (FHD). Considering the available time for development, cost and the amount of NCE molecule, it is necessary to select a right formulation development strategy for FTIH formulations.

The formulation development strategy for FTIH should balance speed of development, minimal drug substance requirement, dosing flexibility, and finally resemblance to final dosage form. A tablet dosage form therefore may be inappropriate during early stages of clinical development. The typical formulation strategies for FTIH mainly includes, powder in bottle, drug in capsule, platform granules or blend in bottle, formulated capsules and finally tablet.

Selecting a right strategy for FTIH oral dosage form is also dependent on the physicochemical properties and stability of the NCE molecule. Among all the mentioned strategies API in capsule is one of the preferred strategies for molecules with sufficient solubility and dose. However formulated capsules could be the second preferred approach for molecules with density and dose concerns. In case of powder in bottle, API and excipients are dispensed in individual vial and shipped to clinical site. These components are mixed by the pharmacist before dosing to humans. This strategy is preferred for molecules with stability concerns.

The drug product used in clinical testing must have acceptable shelf -life at the recommended storage conditions. The shelf life assessment is based on stability studies of development batches preferably at ICH conditions in the desired packaging configuration. However stability data is generated concurrently on the clinical batch while clinical study is in progress. When 10,000 new molecules passes preclinical test, 100 suceeds in phase I, 10 clicks phase II study, 3 enters in phase III campaign and hardly 2 enters the market. NCE formulation development includes lots of challenges right from the amount of API availability to design the FTIH formulation. The formulation scientist should select the formulation approaches with lower developability barrier using novel formulation approaches and should meet quality standards.

**Invited Lecture-2**

# IN VITRO DISSOLUTION: PREFORMULATION TOOL FOR ASSESSING DRUG DELIVERY

**Kamla Pathak**
Professor and Dean
Rajiv Academy for Pharmacy, Mathura

A strong collaboration between discovery and formulation group is essential for selecting right NCEs in order to reduce attrition rate in the late stage development. Physicochemical and biopharmaceutical characterization of NCEs is a decisive parameter during product development. Early prediction of these properties helps in selecting suitable physical form (salt, polymorph, etc.) of the candidate. In vitro dissolution studies forma an integral part of the physicochemical characterization of NCEs. While the realization of its importance in evaluation of dosage forms was established in 1970s, rapid development in this area has led to various advancements. Dissolution testing over the years expanded beyond ordinary Tablets and Capsules, first to Extended-release and Delayed-release (enteric-coated) articles, then to transdermals, Multivitamin and Minerals products, and to Class Monographs for non-prescription drug combinations. The emergence of dissolution specifications in the framework of Biopharmaceutical Classification system is yet another milestone in dissolution technology concepts that ensures the discriminating nature of the test and helps in predicting bioavailability. Finally, experience has demonstrated that where a clinically significant difference in bioavailability has been found among supposedly identical articles, a dissolution test has been efficacious in discriminating among these articles and can be used for IVIVC determination.

**Invited Lecture-3**

# PHARMACEUTICAL PRODUCT DEVELOPMENT: PREFORMULATION TECHNIQUES AND PERSPECTIVES

**Rajendra Awasthi**
Associate Professor,
Laureate Institute of Pharmacy, Kathog 177 101,
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Preformulation is the phase of formulation development in which the physicochemical and biopharmaceutical properties of drug molecule are characterized. Preformulation studies focus on those physiochemical properties of the compounds that affect the drug performance and development of an efficacious dosage form. A thorough understanding of these properties, ultimately provide a rationale for formulation design. The common goals of preformulation study are to establish the necessary physicochemical parameters of new drug substances, to determine kinetic rate profile, to establish physical characteristics and to establish compatibility with common excipients. The physicochemical properties of candidate drugs can influence their subsequent development. There are many traditional approaches to conduct preformulation study such as analytical, physical analysis and physiochemical.

# ABSTRACTS OF POSTER PRESENTATIONS

## SECTION-1: PHARMACEUTICS

### PCEU-01
### NANOPARTICULATE CARRIER SYSTEMS FOR ANTICANCER DRUG DELIVERY: A REVIEW

Madhvi Ghadge[1],*, Tuman P. Rai1, Dipaayan Purakayastha1, Sarthak Jain[2], Nitendra K. Sahu[1]

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Nanoparticles are particulate dispersions or solid particles with a size in the range of 10-1000nm. The drug is dissolved, entrapped, encapsulated or attached to a nanoparticle matrix. Depending upon the method of preparation, nanoparticles, nanospheres or nanocapsules can be obtained. Nanoparticles have been investigated as drug carriers, because they provide a great opportunity due to their advantageous features: (i) various formulations using organic/inorganic materials, (ii) easy modification of targeting molecules, drugs or other molecules on them, (iii) effective delivery to target sites, resulting in high therapeutic efficacy and (iv) controlling drug release by external/internal stimuli. Because of these features, therapeutic efficacy can be improved and unwanted side effects can be reduced. Nanoparticles are particulate dispersions or solid particles with a size in the range of 10-1000nm. The drug is dissolved, entrapped, encapsulated or attached to a nanoparticle matrix. Depending upon the method of preparation, nanoparticles, nanospheres or nanocapsules can be obtained.

Key Words: Nanoparticles; nanotechnology; drug delivery; cancer; theranostic nanoparticles

### PCEU-02
### PHARMACEUTICAL PREFORMULATION: AN IMPORTANT STAGE IN DRUG MANUFACTURING

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Pharmaceutical preformulation is a step of drug development in which the physicochemical properties of active pharmaceutical ingredients are characterized. Drug molecules are hardly ever administered alone. They are administered as formulations or dosage forms. Preformulation assists scientists in selection of lead candidates based on their biopharmaceutical and physicochemical properties. Early forecast of these properties helps in selecting suitable physical form of the candidate. Preformulation is considered as critical decision-making tool during drug discovery and development phase. The overall purpose of preformulation studies is to develop bioavailable and stable and sustained release dosage forms. Preformulation is to provide and understand information about the, bioavailability, degradation process, pharmacokinetics. Thus Preformulation studies have a significant role in development of suitable drug delivery formulation.

Key Words: Preformulation, Drug Delivery, Physicochemical Properties

**PCEU-03**

## ADVANCEMENT IN MICROSPONGE DRUG DELIVERY SYSTEM: PREPARATION METHODS, PATENTS AND COMMERCIAL UTILITY

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The Microsponge Delivery System (MDS), a unique technology, as beautiful flowers in the landscape of drug delivery systems (DDS), for the controlled release of topical agents and consists of macroporous beads, typically 10-25 microns in diameter, loaded with active agent. Microsponge delivery system is the most evolving area of research with controlled release of drugs onto the epidermis which assures that the drug remains primarily localized and does not enter systemic circulation in significant amounts. Microsponge is a porous, polymeric microsphere mainly used to deliver skin care products. Microsponges, a porous polymeric delivery system, with their distinctive features and versatile nature, are the most acceptable delivery systems now a day. This study gives the idea about the preparation methods, mechanism of action, mechanism of drug release, evaluation parameters, applications, patents and their marketed preparations. In the present scenario, it has been also used for oral administration and for topical administration and designed to deliver pharmaceutically active ingredients efficiently at minimum dose and to enhance stability, improve and modify drug release with reduced side effects. This article deals with advancement in microsponge delivery system with significant patents and marketed value.

Key Words: Microsponge, Microsphere, Skin care, Stability

**PCEU-04**

## STANDARDIZATION AND ASSESSMENT OF PREFORMULATION PARAMETERS OF HERBAL TABLET

Gupta D.K., Sharma R.D., Tyagi Sachin, Sharma K.K., Sharma Ritu

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Herbal tablet is a polyherbal preparation recommended as a tonic. It contains Amla, Gokhru and Galo in equal proportion. This preparation is generally marketed in the form of churna and tablet with several problems in weight variation, hardness, disintegration time and friability. The present work is based on the Standardization of individual ingredients and formulation of herbal tablets with improved formulation parameters in order to compare it with the marketed formulation. Pharmacognostical parameters were also checked for individual crude drugs and marketed tablets like ash value, extractive value, loss on drying and powder microscopy. The preformulation parameters like bulk density, tap density, Carr's index, Hausner's ratio and angle of repose were also checked for laboratory granules. The tablets were prepared by wet granulation technique using sucrose (55 % solution) and starch (20 % solution) as binder. The designed formulations were evaluated for thickness, diameter, hardness, friability and disintegration time. The designed formulation was in conformity to the properties evaluated for the tablets and is discussed in detail.

Key Words: Herbal tablet, wet granulation, density, Carr's index

**PCEU-05**

## FORMULATION AND EVALUATION OF MUCOADHESIVE ORAL THIN FILM OF ZOLMITRIPTAN USING SAGO PEARL STARCH

Garima Bansal*[1,2], V K Garg[2], N. Kumar

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Starch has been used in various industrial applications for many years. The main components of starch are linear amylose and highly branched amylopectin, the ratio of amylose and amylopectin in the starch may affect starch behavior in properties of the end product. This also leads to difference in film forming properties of starch. When used alone as a film forming polymer starch is way too brittle and cracks easily, thus it must be plasticized. In the present work we investigated the film forming property of Indian sago pearl starch obtained from *Manihot esculenta* and its application in oro-transmucosal drug delivery using zolmitriptan as a model drug which is a suitable candidate due to its small dose, moderate lipophillicity and tendency to undergo first pass metabolism. The investigation revealed that blank translucent sago starch film can be prepared by semisolid casting technique where gelatinization of starch suspension is optimum when heated at 90ºC for at least 10 min, glycerol is used as plasticizer in concentration of 25% w/w of polymer and film is dried at 50 ºC overnight in an oven. The optimized film loaded with the drug zolmitriptan exhibited not only good film properties like good tensile strength, folding endurance ,surface morphology but also good mucoadhesion uniformity of content , drug release and stability. Thus we can conclude that Indian sago starch can be further explored as a biodegradable, cheap and eco-friendly film forming polymer for the drug delivery.

Key Words: Sago Starch, Mucoadhesion, Oral Film

**PCEU-06**

## STEADY SHEAR FLOW PROPERTY OF ABELMOSCHUS MOSCHATUS MUCILAGE AND EFFECT OF VARIABLES ON ITS ABSOLUTE VISCOSITY

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The present work described steady shear flow properties of Abelmoschus moschatus stems mucilage, as a function of concentration and particle size. Power law model described that mucilage aqueous solution, exhibited non-Newtonian pseudoplastic flow property at all concentration and particle size. The consistency coefficient (k) was found to increase with increase in concentration and particle size. The Arrhenius model well described temperature dependency of viscosity, since activation energy (Ea) was found to decrease from 7858.86 J/mole to 4548.86 J/mole with increase in concentration. The apparent viscosity was suddenly dropped by the addition of Na+, K+, Mg2+ and Ca2+ salts and was found to be highest at pH 7. However, acidity was found to affect the apparent viscosity significantly as compared to alkalinity of media. Thermal treatment of mucilage solution showed a remarkable reduction in viscosity whereas methyl paraben was found to be suitable preservative with least change in apparent viscosity.

Key Words: Abelmoschus moschatus, rheology, Brookfield Rheometer, pseudoplastic, steady shear behaviour.

**PCEU-07**
**PREFORMULATION – A FOUNDATION FOR FORMULATION DEVELOPMENT**

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Activities done prior to formulation development are called as preformulation studies. It provides the scientific basis for formulation development. Preformulation studies can be broadly classified into two classes – (i) fundamental properties and (ii) derived properties. Fundamental preformulation properties are specific to the drug molecule and are dependent on the chemical structure of the drug molecule. In contrast, derived preformulation pre-formulation properties are carried out to learn about the issues related to development of a particular dosage form like solid oral, liquid oral or parenteral. Fundamental preformulation properties include – Solubility, dissociation constant (pKa), salt formation, partition or distribution coefficient, pH solubility profile and dissolution kinetics, permeability, solid state properties like polymorphism, stability profile etc. Derived preformulation properties are specific to the intended dosage form to be developed. The last activity performed in pre-formulation studies is the compatibility studies, wherein the physical and chemical stability of the drug molecule is studied in presence of excipients. Obviously, the choice of excipients is dictated by the type of dosage form to be developed. By comparing the physicochemical properties of each drug candidate with in a therapeutic group, the preformulation scientist can assist the synthetic chemist to identify the optimum molecule, provide the biologist with suitable vehicles to elicit pharmacological response and advise the bulk chemist about the selection and production of the best salt with appropriate particle size and morphology for subsequent processing.

Key Words: Fundamental properties, derived properties, physicochemical properties

**PCEU-08**
**ADVANCEMENT IN MICROSPHERE PREPARATION USING NATURAL POLYMERS AND RECENT PATENTS**

Uzma Farooq*, Rishabha Malviya, Pramod Kumar Sharma

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Gums and mucilages are widely used as a natural polymer for conventional and novel dosage forms. Natural polymers are generally safe for pharmaceutical formulation. Microspheres are novel drug delivery approach to control release of drug as per patient need. Microsphere of these polymers has been prepared by several techniques like coacervation phase separation method, emulsion polymerization method, modified quasi-emulsion solvent diffusion method, water in oil (w/o) type emulsion cross-linking method, thermal denaturation method, emulsification solvent evaporation, spray drying method and suspension polymerization method. Present article deals with various modern approaches to prepare microsphere using natural polymers with their patents.

Key Words: Natural Polymers, Microspheres, Gums, Mucilages

**PCEU-09**

# PHARMACOVIGILANCE OF HERBAL MEDICINES – ADDRESSING QUALITY SAFETY AND EFFICACY ISSUES

Vaibhav Srivastava[1]*, Shyam Bihari Sharma[2], Ashish Mishra[3], Varun Chaddha[4]

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There is an increasing awareness at several levels of the need to develop pharmacovigilance practices of herbal medicines. The current model of pharmacovigilance and its associated tools have been developed in relation to synthetic drugs, and applying these methods to monitoring the safety of herbal medicines present unique challenges in addition to those described in conventional medicines. The term pharmacovigilance is vibrant and is emphasized in all major texts. The Major goal of pharmacovigilance is to improve patient care and safety in relation to drug use, and thus promote rational drug use is recurrent themes of ayurvedic pharmacology (dravyaguna vigyan) and therapeutics (chikitsa). The purpose of pharmacovigilance is to detect, assess and understand and to prevent adverse effects or any other possible drug related problem related to herbal, traditional and complementary medicines. Pharmacovigilance forms the backbone of the product life cycle due to the demand created by the need of new drugs and their regulation. Lack of quality control and assurance in manufacture of ayurvedic medicines, which act as a confounding factor in diagnosis of adverse reaction. The success of pharmacovigilance is in the ability to prevent further adverse reaction by understanding and using the information collected with ayurvedic medicines, and emphases more in spreading the information related to quality, safety and efficacy issues of herbal medicines globally. This review focuses herbal pharmacovigilance which should be implemented in Indian herbal regulatory system to access various aspects of ADR, acute or delayed toxicities, allergies etc associated with single herb and/ or polyherbal formulation

Key Words: Pharmacovigilance, adverse effects, quality, safety, efficacy, Indian herbal regulatory system.

## SECTION-2: PHARMACEUTICAL CHEMISTRY

### PCHE-01
### MACROCYCLIC COPPER (II) COMPLEXES: SUPEROXIDE SCAVENGING ACTIVITY, STRUCTURAL STUDIES AND CYTOTOXICITY EVALUATION

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Synthetic superoxide dismutase mimetics have emerged as a potential noval class of drug for the treatment of oxidative stress related to diseases. Among these agents, metal complexes with macrocyclic ligands constitute an important group. In this work we synthesized six macrocyclic copper (II) complexes and evaluated their ability to scavenge the super oxide anions generated by the xanthine-xanthine oxidase system. Two different endpoints were used, the nitro blue tetrazolium (NBT) reduction assay (colorimetric method) and the dihydroethidium (DHE) oxidation assay (fluorimetric method). IC50 values in the low micromolor range were found in 5 out of six macrocyclic complexes studied , demonstrating their effective ability to scavenge the superoxide anion. The IC50 values obtained with the NBT assay for the macrocyclic copper (II) complexes, were consistently higher, approximately three fold, than those obtained with the DHE assay. Spectroscopic and electrochemical studies were performed in order to correlate the structure features of the complexes with their superoxide scavenger activity. Cytotoxicity assays were also performed using the MTT method in MCF-7 breast cell lines and we found that the complexes, in the range of concentrations tested in the superoxide scavenging assays were not considerably toxic. In summary, some of the present macrocyclic copper (II) complexes, especially those with a high stability constant and low IC50 appear to be promising superoxide scavenger agents, and should be considered for further biological assays.

Key Words: Superoxide scavenging activity; Macrocycles; Copper (II) complexes; Superoxide dismutase; Antioxidant; Cytotoxicity evaluation.

### PCHE-02
### PHOTOCHEMICAL OXIDATION OF NAPROXEN IN WATER BY PHOTO-FENTON PROCESS

Raghwendra Pratap, Vishal Singh, Prateek Rathore, Sonal Kewat, Mumtaj Shah

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In this study, photochemical degradation of naproxen utilizing the photo-Fenton reaction in a annular batch reactor was investigated. Effects of operating variable on the degradation efficacy of Fenton reagent was studied by applying classical one factor at a time experimental design. Three operating variables namely; pH of solution, hydrogen peroxide dose, and Fe (II) ion concentration were selected for degradation experiment. The concentration of naproxen at the end of degradation was determined by spectrophotometeric method. The degradation study showed that the degradation of naproxen was favoured under acidic conditions and higher rate of degradation of naproxen can be achieved in a very short UV-irradiation time. The degradation reaction was also influenced by the initial $H_2O_2$ dose and the amount of the iron catalyst. The results showed that an optimum of 94.32% mineralization of p-naproxen can be obtained from photoreactor under the operating conditions at 0.5g catalyst, a pH value of 3 and $H_2O_2$ dose of 1 ml. The photo-Fenton process proves itself an effective method for wastewater treatment.

Key Words: Naproxen, Fenton process, Photochemical process, OFAT

**PCHE-03**
**SYNTHESIS, CHARACTERIZATION AND ANTIMICROBIAL ACTIVITY OF NOVEL 5-SUBSTITUTED ARYL-2,7-DIPHENYL-1,3,4-THIADIAZOLO-[3,2-a]-1,3,5-TRIAZINE DERIVATIVES**

Deepak Kumar Basedia*, Birendra Shrivastava[1], B. K. Dubey[2], Pankaj Sharma[1]

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A new class of heterocyclic compounds 1,3,4-thiadiazolo[3,2-a]-s-triazine have been synthesized as schiff's base of 1,3,4-oxadiazole mix with ammonium acetate and various aromatic aldehyde treated in MW irradiation at 480 W. Reaction is based on microwave mediate multi-component reaction (MCRs). The structures of these compounds have been elucidated by spectral (IR, NMR & Mass) analysis. The title compounds were then evaluated for their in-vitro microbial activity against 2 gram –Ve bacteria (*E.coli, K. pneumoniae*), 2 gram +Ve bacteria (*S.aerues, B.subtilis*) and 1 fungal specie (*A.niger*). The some newly synthesized compounds have shown promising antimicrobial activity.

Key Words: 1,3,5-Triazine, 1,3,4-Thiadiazole, Thiosemicarbazone, Schiff's base, Antibacterial, Antifungal, Multi-component reaction (MCRs)

**PCHE-04**
**GREEN SOLVENTS FOR PRODUCTION OF PHARMACEUTICALS**

Pooja Bhadauria, Satvika Upadhyay, Shivani Nikhra, Anita Singh

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Solvents though essential to carry out most reactions, whether in laboratory or in industrial processes, generally have various harmful effects on the environment. The solvents that are currently in use for the production of pharmaceuticals are a major source of pollution in the environment. These are one of the largest sources of volatile organic compounds (VOCs) in the atmosphere that in turn may be responsible for global warming. This article has taken a look at the various ways in which solvents affect the environment. Alternatives to the common solvents currently in use have also been explored from the point of view of advantages in manufacturing processes as well as environmental preservation.

Key Words: Green Solvents, Pharmaceutical production, global warming

**PCHE-05**
**IN SILICO DRUG DESIGNING FOR HIV 1 GP120 VIRUS**

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HIV infection and AIDS are one of the leading challenges for immunologist and pharmacologist to work upon. During the last one decade, the no. of hiv positive cases has increased considerably. The varying nature and dynamic structural changes causes additional intricacies to the drug designers. Traditional hit and trail methods for the drug development proven to be time taking and cost intensive. The recent development in rational drug design method and computer aided drug design (cadd) have overcome the above-mentioned anomalies to a great extent. In present study we have tried to find out a possible drug candidate by using bioinformatics tools for CADD. Study start with the identification of one of the drug target gp120, a glycoprotein present on the surface of HIV and is responsible for the entry of the virus into the cell. BMS 806 was one of the ligand capable to bind with gp120. The drug likeliness of the ligand was checked and was found suitable. With the help of several server based and client based software's it was possible to match the inhibitor with the Leu 491 residue. Using bioinformatics and cheminformatics tools we designed drug candidate BMS 806, a gp120 inhibitor demonstrated strong antiviral activity in vitro against HIV-1. It seems to interfere with the function of gp120 during the initial step of HIV-1 life cycle. BMS 806 selectively inhibited the binding of gp120 with CD4 and thus prevents the entry of hiv in the cell. The result obtained was satisfactory. The designed Drug 1-[(2R)-4-benzoyl-2-methyl piperazin-1-yl]-2-(4-methoxy-1H-pyrrolo[2,3-b]pyridin-3-yl)ethane-1,2-dione (BMS-806) fulfilled Lipinski's rule of 5 and was able to bind stably to LEU491 of gp120 protein of HIV 1. After docking the energy of the protein and ligand compound is E-total: -153.99, E-shape: -153.99, E-force: 0.00 E-air: 0.00 Vshape: 0.00 Vclash: 0.00. But the thing that needs to be highlighted is that bioinformatics studies are based on predictions. So, with help of bioinformatics tools we have predicted the activity of designed ligand as a drug. By this analysis we predict that BMS 806 is a potential drug candidate.

Key Words: HIV, AIDS, BMS 806, In silico, Drug Design

## SECTION-3: PHARMACOLOGY

### PCOL-01
### THERAPEUTIC POTENTIAL OF *ALLIUM SATIVUM* AGAINST $CCL_4$ INDUCED TOXICITY IN RATS

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*Allium sativum* has the ability to act as an antioxidant, antihypertensive, antitumour and hypolipidemic properties. The aim of this study was to evaluate the therapeutic efficacy of *Allium sativum* against carbon tetrachloride ($CCl_4$) induced toxicity. Female albino rats were administered $CCl_4$ (1.5 ml/kg, *i.p.*), followed by the oral administration of *Allium sativum* at different doses once only. Animals of all groups were sacrificed after 48 h of last treatment. Significant rise was observed in the serum transaminases whereas hemoglobin percentage was decreased which indicated the hepatic damage. Significant increase in LPO and decrease in level of GSH, SOD, Catalase and ATPase was observed after $CCl_4$ exposure, indicated oxidative stress in liver and kidney. Therapeutic agent prevented the leakage of AST and ALT indicating stabilization of plasma membrane as well as repair of hepatic tissue damage. Thus the extent of lipid peroxidation was decreased and the total glutathione content was increased in liver and kidney. Enzymatic activity of ATPase was towards normal indicating regeneration in cell organelles. The histopathological patterns of liver and kidney treated with *Allium sativum* extract showed hexagonal hepatocyte in liver and well-formed bowman's capsule in kidney.

Key words: $CCl_4$, *Allium sativum*, Liver, Kidney

### PCOL-02
### PHARMACOLOGICAL EFFECT OF SOME NATURAL PRODUCTS ON BERYLLIUM INDUCED HEPATORENAL TOXICITY

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Pharmacological effect of *Aloe vera* and *Moringa oleifera* in combination with piperine and curcumin were investigated against beryllium induced toxic challenges in rats. Female albino rats were administered beryllium nitrate at doses of 1 mg/kg *i.p.* once a day for 35 consecutive days followed by combination treatment of *Aloe vera (*150 mg/kg *p.o.*) with piperine (2.5 mg/kg *p.o.*) and *Moringa oleifera* root extract (150 mg/kg p.o.) with curcumin (5mg/kg p.o.). Beryllium toxicity was recorded by oxidative stress, hepatorenal dysfunction and altered histoarchitecture of liver and kidney. Administration of beryllium nitrate induced oxidative stress resulting in elevation of lipid peroxidation, reduction in GSH with decreased activities of SOD and catalase in liver and kidney. Beryllium nitrate disturbed liver function by elevation of serum level of ALT, AST with decrease in SALP activity, kidney function was disturbed by significantly increase in serum level of urea, uric acid and creatinine. Heme biosynthesis was disturbed by decreased activity of ALAD and hemoglobin in blood with increased activity of ALAS and serum bilirubin. A significant fall was observed in activitities of alkaline phosphatase, adenosine triphosphatase with increased activity of acid phosphatase in liver and kidney due to beryllium toxicity. Beryllium also disturbed the histoarchitecture of liver and kidney and increased beryllium burden in vital organs of rats. Comet assay was assessed for DNA damage and found negative result, showed no DNA damaging potential of beryllium at these doses. Combination therapy of *Aloe vera* with piperine was found to be most effective in prevention of beryllium induced oxidative stress, maintained hemoglobin level and

hepatorenal function towards normal together with almost normal histoarchitecture of liver and kidney. *Aloe vera* with piperine was also found to be better in detoxification and prevented the deposition of beryllium from vital organs of rats.

Key Words: Natural products, Beryllium, oxidative stress, histopathology, beryllium body burden.

**PCOL-03**
**Over dosing of Drugs and its Toxicity**

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Drug-induced liver injury is a frequent side effect of many drugs, constitutes a significant threat to patient health and has an enormous economic impact on health care expenditures. Numerous efforts have been made to identify reliable and predictive markers to detect the early signs of drug-induced injury to the liver, one of the most vulnerable organs in the body. These studies have, however, not delivered any more informative candidates than the serum aminotransferase markers that have been available for 30 years. Acetaminophen (paracetamol in British literature) is a metabolite of phenacetin which has become increasingly popular as a substitute for salicylates. The popularity of acetaminophen has been encouraged by the medical profession because it is allegedly safer than aspirin. However, experience in Britain indicates that acute acetaminophen overdosage is both common and significantly more toxic than of salicylates. It is axiomatic that if you do not look for something you will not diagnose it. This may provide the answer as there is apparently a general lack of knowledge in the United States concerning the toxicity of acetaminophen. Using acetaminophen overdose-induced liver injury in the mouse as a model system, observed highly significant differences in the spectrum and levels of microRNAs in both liver tissues and in plasma between control and overdosed animals. Based on survey of microRNA expression among normal tissues, some of the microRNAs, like messenger RNAs, display restricted tissue distributions. A number of elevated circulating microRNAs in plasma collected from acetaminophen-overdosed animals are highly expressed in the liver. We have demonstrated that specific microRNA species, such as mir-122 and mir-192, both are enriched in the liver tissue and exhibit dose- and exposure duration-dependent changes in the plasma that parallel serum aminotransferase levels and the histopathology of liver degeneration, but their changes can be detected significantly earlier. These findings suggest the potential of using specific circulating microRNAs as sensitive and informative biomarkers for drug-induced liver injury. There has been a great effort to study the fate, the occurrence and the ecotoxicology of emerging pollutants in the aquatic environment. Recently, several articles have focused on degradation products of emerging pollutants and the study of their toxicological effects. We review the fate and the ecotoxicology of emerging pollutants, especially focusing on their metabolites and transformation products (TPs) in the aquatic environment, including pharmaceuticals, hormones, perfluorinated compounds, by-products of drinking-water disinfection, sunscreens or UV filters, benzotriazoles and naphthalenic acid.

Key Words: Toxicity, Overdose, Liver Injury, Acetaminophen

## SECTION-4: PHARMACOGNOSY

### PCOG-01
### ISOLATION AND CHARACTERIZATION OF PHYTOCONSTITUENTS OF *BLUMEA LACERA (BURM F)* D.C.

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The plant B. lacera (Burm. F) D.C. (Fam. Compositae) has been studied to compare and give report on pharmacognostical, preliminary phytochemical investigation. The pharmacognstical studies made on whole plant of B. lacera like macroscopic characters behavior of crude powder with different chemical reagents, extractive values (aqueous and alcoholic), quantitative estimated value. This will help for correct identification of these plants for future references. The entire plant (whole plant and seeds) has been used Stimulant, carminative, anticatarrhal, anticutaneous, parasitic, and as an antipyretic, the leaf juice is taken internally for colic and stomach- aches, roots is used as appetizer. The leaves are used to treat cancer, tumors. Jamaica it is said to be of use in nervous, kidney disorders. Use fresh leaf juice on cuts and wounds as antiseptic. The preliminary phytochemical investigation showed the presence of alkaloid, carbohydrate, steroids phenol, flavonoids, and glycosides in different extracts further TLC was performed for various Extracts for identification of constituents and compound were isolated from ethanolic extract, chloroform soluble fraction by using column chromatography and the spectral analysis (NMR, IR) indicate that the isolated fraction having constituents may be phytosterols, primary and secondary amide and polyphenol.

Key Words: Blumera lacera, phytochemical, Extractive value, Spectral Analysis

### PCOG-02
### PARTIAL PURIFICATION AND BIOCHEMICAL CHARACTERIZATION OF PEROXIDASE (E.C. 1.11.1.7) FROM *CATHARANTHUS ROSEUS*

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The Madagascar periwinkle *Catharanthus roseus* is a tropical plant belonging to family Apocynaceae which produces the dimeric monoterpenoid indole alkaloids vincristine and vinblastine. These compounds are also powerful cytostatic drugs used in cancer chemotherapy but are produced by the plant leaves in very low amounts (0.0003% dry weight). A crucial step in the synthesis of vincristine and vinblastine is the coupling of catharanthine and vindoline to produce the dimeric precursor α-3',4'-anhydrovinblastine (AVLB). Though a putative peroxidase bearing an AVLB synthase activity has been implicated to be involved in the coupling reaction, direct proof of the existence of a peroxidase in leaves able to couple catharanthine and vindoline has not been produced. The present study reports the purification and characterization of enzyme peroxidase from leaves of *C. roseus*. For characterization of peroxidase from *C. roseus*, kinetic properties, viz., Km value with respect to substrate $H_2O_2$ as well as the optimum pH, optimum temperature etc. were determined.

Key Words: Periwinkle, Peroxidase, Purification, Ion-exchange chromatography, SDS-PAGE

**PCOG-03**
**REVIEW ON PHARMACOLOGICAL ASPECTS OF *ANDROGRAPHIS PANICULATA***

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*Andrographis panculata* (Acanthaceae) is widely used as a medicinal plant in china, South Africa, South Asia, India. A number of evidence has been accumulated to demonstrates promising potential of medicinal plants used in various traditionally complementary and alternative system. In recent year, a medicinal plant *A. Paniculata* and its major active phytochemical have been extensively studied for several pharmacological activities. It contain andrographolide, 14-deoxyandrographolide, 14-deoxy 12-methxyandrographolide, 14-deoxy 11,12-didehydroandrographolide. It used in various aliment like throat infection, dysentery, cancer, hepatotoxicity, cough, cold, headache, antibacterial, antifungal, antiviral, choleretic, hypoglycemic, hypocholesterolemic, pharyngolaryngitis, snake bites. The present reviews is attempt to provide recent updates on phytochemical and pharmacological profile of *A. Paniculata.*

Key Words: Phytochemical, Pharmacological, Cancer, Hepatotoxicity, Antifungal

**PCOG-04**
**PHARMACOGNOSTIC STUDY, PHYTOCHEMICAL SCREENING AND ANTI-MICROBIAL ACTIVITY OF *FUMARIA VAILLANTII LOISEL***

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*Fumaria vaillantii Loisel* leaves belonging to family Fumariaceae[1]. Phytochemical screening was conducted on *Fumaria vaillantii Loisel* Leaves. It revealed that the presence of crude protein, Carbohydrates, Sitosterol, Glycosides, Stigmosterol acetate, Tannins and Flavonoids. Effect of crude extracts of *Fumaria vaillantii Loisel* leaves were evaluated on common microflora viz: Streptococcus mutans, Lactobacillus acidophilus and Candida albicans. The alcoholic extract of leaves at 100 mg/ml was assayed by Kirby-Bauer cup-well agar diffusion method. Present work on Pharmacognostical studies on leaves of *Fumaria vaillantii Loisel.* T.S., L.S, Power microscopy shows the presence of pholem, xylem & stomata significantly. These findings suggest that *Fumaria vaillantii Loisel* leaves show antimicrobial activity.

Key Words: *Fumaria vaillantii Loisel*, Sitosterol, Tannins, Flavanoids, Kirby-Bauer Cup Well Agar Diffusion

**PCOG-05**
**REVIEW OF TECHNIQUES FOR THE EXTRACTION OF BIOACTIVE COMPOUNDS FROM MEDICAL PLANTS**

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Essential oils are the volatile component of aromatic or aroma bearing crops which gives aroma due to their volatility. Aromatic plants are very significant for environmental conservation, as the aroma saturated atmosphere is considered to be efficacious to combat bacteria, virus, fungi, insects etc.

Extraction of these bioactive compounds from the plants and herbs and their use for various purposes is an age old practice. Many extraction methods have been developed, each with its advantages and drawbacks. This work is a try to summarize the various extraction methodologies for bioactive compounds.

Key Words: Bioactive compounds, Extraction, essential oils, distillation.

**PCOG-06**
**Significance of Herbal Drugs for Natural Care of Diabetes**

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Diabetes is a metabolic disorder where in human body does not produce or properly uses insulin, a hormone that is required to convert sugar, starches, and other food into energy. Human body has to maintain the blood glucose level at a very narrow range, which is done with insulin and glucagon. Though there are various approaches to reduce the ill effects of diabetes and its secondary complications, herbal formulations are preferred due to lesser side effects and low cost. Over 400 traditional plant treatments for diabetes have been reported, although only a small number of these have received scientific and medical evaluation to assess their efficacy. A list of medicinal plants with proven antidiabetic and related beneficial effects and of herbal drugs used in treatment of diabetes is compiled. These include, *Allium sativum*, *Eugenia jambolana*, *Momordica charantia Ocimum sanctum*, *Phyllanthus amarus*, *Pterocarpus marsupium*, *Tinospora cordifolia*, *Trigonella foenum graecum* and *Withania somnifera*.The natural herbs for diabetes treatment focus on lowering blood sugar and reducing the damaging effects of the disease. Herbal supplements for diabetes has been a part of a holistic approach to treatment that addresses proper nutrition, a good exercise program, and continued monitoring of blood glucose level. Herbal remedy for diabetes containing a collection of medicinal herbs and other natural ingredients known to support pancreatic health, promote systemic balance and the healthy functioning of the Islets of Langerhans in the pancreas which is responsible for insulin production. There are some natural herbs used for treatment of diabetes are Cinnamon, Bitter melon, Gymnema Sylvestre, Goldenseal, Panax Ginseng.

Key Words: Diabetes, Blood glucose level, Insulin, Natural herbs for diabetes, Herbal supplements, Islets of Langerhans, Cinnamon.

**PCOG-07**
**MICROWAVE ASSISTED EXTRACTION AND CHEMICAL CHARACTERIZATION OF LEMONGRASS OIL**

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Lemongrass is an important member of the grass family grown mostly as a source of citral in its essential oil, which is widely for the production of artificial vitamin A. In this study, essential oil of lemongrass was extracted by microwave-assisted hydrodistilation (MAHD) and the individual effects of process parameters; microwave power and irradiation time. Results showed that oil yield increases with increasing microwave power and irradiation time The maximum oil yield in MAHD was 1.72% for 90 minutes. Longer irradiation time resulted in inferior quality of essential oil. Microwave assisted extraction can

significantly reduce the extraction time, resulting in better extraction efficiency as compared with conventional extraction methods.

Key Words: Lemongrass, essential oil, microwave-assisted hydrodistilation

**PCOG-08**
**STRATEGY FOR ISOLATION OF NATURAL PRODUCTS**

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Plants have been used as medicine since ancient times. Nowadays, the medicinal and aromatic plants are processed using different extraction procedures for incorporation into different formulations. Extraction of plant components results in a complex mixture and may consist of volatile/essential or ethereal oils, alkaloids, saponins, triterpenoids, carbohydrates, etc. Separation of individual component is a typical and tedious process, which requires sound knowledge of nature of raw materials, physicochemical properties of chief components and interfering components. There are several processes like distillation, enfleurage., maceration, expression, solvent extraction and fluid extraction available for extraction of plant components. Several chromatographic methods are also available for isolation of a single component. This review summarizes the strategies for isolation and purification of phytoconstituents, their physicochemical characters, choice of solvents, influence of solvents, extraction strategy, procedures for extraction of herbal drugs and treatment of drug residue after extraction.

Key Words: Secondary metabolites, Phytoconstituents, Enfleurage.

**PCOG-09**
**PRELIMINARY PHARMACOGNOSTICAL AND PHYTOCHEMICAL INVESTIGATION OF *BAMBUSA VULGARIS VAR. STRIATA* HOLTUM**

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*Bambusa vulgaris* has been traditional reported to have medicinal properties. Powdered leaves of *Bambusa vulgaris* were subjected detailed phytochemical analysis, loss on drying, ash and extractive values, fluorescence analysis. Loss on drying was 7.3%, the total ash, water soluble and acid insoluble ash values were 8.5, 5.0 and 3.3 %. Extractive values were 3.5, 6.6, 1.4, 4.1 and 7.5%. Fluorescence characters of different extracts with various reagents were noted in ultraviolet and sun light. The obtained successive cold and soxhlet extraction with Petroleum ether, chloroform, ethyl acetate, methanol and water. The percent yields of extracts were 3.0, 2.5, 2.5, 3.5, 4.0 and 3.5, 4.0, 3.8, 4.5, 4.8. In the preliminary qualitative phytochemical analysis, alkaloids, flavonoids, phytosterols, terpenoids and phenols were found to be present in the chloroform and methanol extracts. These studies provided referential information for correct identification and standardization of this plant material.

Key Words: *Bambusa vulgaris;* pharmacognostical analysis; phytochemical screening.

## SECTION-5: MICROBIOLOGY AND BIOTECHNOLOGY

### MBBT-01
### BIOLOGICAL CONTROL OF SOME PHYTOPATHOGENIC FUNGI THROUGH PIGEON PEA BACTERIAL ENDOPHYTES

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Total of 19 bacterial endophytes isolated from the surface sterilized leaf, stem and root of pigeon pea pulse crop were studied. Strains varied in size, shape, elevation, polysaccharide production, colour, consistency and Growth . All strains were translucent and had slow growth. In an approach to investigate the antagonistic activity against major pathogenic fungi *Aspergillus* species, *Rhizoctonia bataticota* and *Fusarium oxysporum cicer* (FOC), out of 19 strains of bacterial endophytes, 6 strains of bacterial endophytes strongly inhibited the growth of *Aspergillus* species and 13 showed moderately antibiosis against *Aspergillus* species. All the isolated strains showed moderately antibiosis against *Rhizoctonia bataticota* and *Fusarium oxysporum cicer*. Further understanding of the antagonistic activity of the endophyte bacteria will increase possibilities of developing models and strategies for protecting plants as well as humans and animals against the major pathogenic fungi.

Key Words: Antagonistic activity, bacterial endophyte, Pigeon pea

### MBBT-02
### MONOCLONAL ANTIBODIES: A MAGIC BULLET FOR HUMAN HEALTH CARE

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Monoclonal antibodies are derived from a single clone which is specific to an epitope in contrast to polyclonal antibodies which are made from several different clones. These are the special class of epitope specific 'Immunoglobulins' developed by George Kohler and C. Milstein in 1975 through 'Hybridoma Technology'. MAbs are the results of a fusion between B-lymphocytes and Myeloma cells through HAT medium selection, De-novo synthesis, salvage pathways and culture of desired clones. Such type of 'hybridomas' possess immortal growth competence of myeloma cells and memory of B cell to destroy an antigen. These MAbs are found proficient in their action to destroy an antigen because they are developed from malignant cells rather than normally produced polyclonal antibodies which have weak affinity against antigenic determinants. This specific class of antibody has become an important tool in biochemistry, molecular biology and medicinal purposes in the current researches for human health care. These MAbs have wide acceptability for researches, diagnostic, imaging, catalytic proteins, autoantibody fingerprinting and therapeutic agents by utilizing as a 'Magic Bullet' to treat potent antigens like cancer by producing antigen specific MAbs. Among the many monoclonal antibody diagnostic reagents various diagnostic reagents like: pregnancy detecting kits, recognition of microbial pathogenic determinants, measuring of blood levels of various drugs, matching of MHC molecules and specific antigens which are shed by the tumors etc. are widely available now for effective use. More recently, these antibodies are also tagged by Radioisotopes to detect the exact location of tumor antigens in a particular area for the purpose of early diagnosis in patient. In another approach an 'Immunotoxin' made up of tumor specific MAbs coupled with lethal toxins are found valuable potent therapeutic agents for the treatment of cancer.

Key Words: Clones, cell culture, hybridoma, tumor, antigens and antibodies.

**MBBT-03**
**PRODUCTION OF LIPID BY *MORTIERELLA* FUNGI**

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Microbial lipophilic compounds are called single cell oils, which have shown potential role in various fields such as human health and dietary. There is increasing interest in industrial production of various PUFAs (Poly unsaturated fatty acids) such as ARA (arachidonic acid) and DHA (Docosa hexaenoic acid) by the cultivation of various microorganisms like *Mortierella sp.* For production of PUFAs various parameters like isolation of potential strain and optimization of culture and production conditions is of critical significance. In this study a filamentous fungi (*Mortierella sp.*) was isolated from soil of Chambal Ravines which is producing Poly unsaturated fatty acids. The optimum Culture conditions have been studied for this fungus. It grows best at 30$^{o}$C on potato dextrose agar medium. Production of PUFAs has been studied in Submerged Culture fermentation in orbital shaker incubator at 150 rpm for 8 days. The characterization of PUFAs is under study.

Key Words: *Mortierella sp.,* PUFAs, Arachidonic acid

**MBBT-04**
**BIOTECHNOLOGICAL TOOLS: NOVEL APPROACHES TO PHARMACEUTICAL RESEARCHES FOR BETTER HUMAN HEALTH CARE**

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Biotechnology refers to the utilization of biological and engineering principles to enhance researches and Industrial productivity by using microorganisms and their derivatives or modifying products for human welfare. The advanced Biotechnological tools have been widely employed in laboratory researches, industrial productions, medicines, pharmaceuticals, healthcare, agriculture, animal husbandry, environment and food industry etc. Two disciplines; pharmaceuticals and biotechnology have been combined together for many advantages for human welfare in terms of healthcare. Pharmaceutical companies are widely utilizing the tools and techniques of Biotechnology for manufacturing drugs, gene therapy, genetic testing and disease diagnosis etc. Biotech companies are making biotechnology products (more specifically said biotech pharmaceutical products) by manipulating or modifying organisms, usually at molecular level by employing the principles of 'Recombinant DNA technology' and 'Genetic Engineering' which involves genetic manipulation of cells. Recently, 'Animal Cell Culture' added several advantages to the Pharmaceutical Industry for the purpose of drug testing in contrast to previously used practices which involved various laboratory animals. The 'Hybridoma Technology' is used for the production of Monoclonal antibodies as a 'Magic bullet' in the treatment of several diseases. The 'Tissue Engineering' is used for artificial culture of human organs for transplantation and surgery to the injured patients. These products of many Pharmaceutical companies, made through Biotechnological aspects are widely used in prevention, diagnosis or treatment of many diseases. 'Pharmacogenomics' (derived from 'pharmacology' and 'genomics') has wide applications in the potent analysis and treatment of many diseases, refers how genetic inheritance affects individual human body response to drugs. Bio-

pharmaceuticals, intend to design and produce a drug that are adapted to each person's genetic makeup with minimal harms to host. Thus, pharmaceutical biotechnology companies may develop tailor-made medicines for maximum therapeutic effects which can be given to patients in appropriate doses according to the patient's genesis and metabolism rate for maximum efficiency of the drug. The most important benefit of pharmaceutical biotechnology is in the form of better 'Vaccinal immunization'. Biotechnology plays an important role in human health care by following earnings; Molecular markers based disease diagnosis, Gene therapy, Disease diagnosis, Medical forensics, Pharmaceutical products, Recombinants Proteins, Insulin, Growth hormones, Recombinant vaccines, DNA vaccines, MAbs, Assisted Reproductive Technology (ART), Transgenic Animals, Molecular Farming, Animal Cell Culture, Pregnancy Kits and Transplantation or Grafting etc. Biotech companies are designing and producing safer vaccines by utilizing several organisms which are transformed through genetic engineering by minimizing the risks of infections.

Key Words: Gene, marker, vaccine, drug, cell culture, diagnosis, healthcare

## SECTION-6: ENVIRONMENTAL SCIENCES

### ENVS-01
### GREASE PROOF PAPER BY AGRICULTURE WASTES

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India is an agriculture based country. After the harvesting of crops the agricultural waste is not utilised and thrown. These can be recycled and used for different purposes. Here we have taken a step ahead and try to optimize the agricultural waste and make it useful and valuable to us. Banana stem is easily collected from banana trees after collection of banana fruits. The stem is used as a waste product and used in domestic cooking purpose. Mainly chemical process is used to collect the cellulose from the lignin. Lignin is separated from the lignocelluloses. It is removed after cutting of banana stem in small pieces and then stem is blowing inside the digester at a high pressure and successive use of sodium hydroxide, sodium sulphide and sodium hypochlorite. The fibre is molten and making pulp. Kappa number is used to know the lignin percentage in the pulp. This pulp is used to prepare the tissue, bloating and tracing paper. This process of pulp and paper making is economically viable and it is energy saving as sun ray is used for drying purpose. These banana papers have valuable use in food industries.

Key Words: Banana, Paper pulp, Cellulose

### ENVS-02
### ALTERNATIVE SOURCES OF ENERGY BY CULTIVATING ALGAE

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The world's dependence on the non-renewable energy sources (fossil fuels) but continuously dwindling non-renewable energy sources (fossil fuels) and increasing fuel demand, alternative fuel source that will significantly reduce massive emissions of $CO_2$ in the atmosphere. Among mostly talked about alternative sources are biofuels from edible and non-edible oils. Increased population & social vibes have questioned the use for food crops for biofuels. Diverting the attention to another fuel resource; microalgae, has provided potential results proving it to be the most suitable renewable source to fulfill the future energy demands. But implementation of algal fuel technology faces serious challenges in the form of cultivation of biomass and harvesting contributing to almost 70-80% costing involved in fuel production. Conventional method of cultivation of algae in raceway ponds is associated with several drawbacks demanding technological advancement in the field of photobioreactors and heterotrophic fermenters which could be run in continuous mode providing favorable optimized conditions for the growth of algae. Several cultivations impediments like photo inhibition, transition between dark and light cycle, degassing have been reviewed extensively with possible improvements. The review also highlights the various photo bioreactor technologies implemented in currently operating algae biofuel industries and statistical analysis of productivity improvement.

Key Words: Algae, Fossil fuel, Photobioreactor, Biofuel

**ENVS-03**
## STUDY AND TREATMENT OF PHENOLIC DRUG WASTE IN WATER BY FLUIDIZED BED BIOREACTOR WITH THE HELP OF INTERNAL DRAFT TUBE

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During the time of formation of drug there are various byproducts which are harmful and toxic nature for environment like phenol. If the concentration of phenol in water is greater so it is highly toxic and dangerous for living being. So the present research work reports on the degradation of phenolic drug waste biologically by fluidized bed bioreactor with an internal draft tube using bacterial species like *Pseudomonas putida* immobilized on solid beads. This study was performed at three variable parameters viz flow rate of feed, initial concentration of feed and flow rate of air. With the help of experimental results, rate of degradation of phenol in the form of mass transfer coefficients have been find out. From the results we observe that the degradation rates increases with increase in all three variables like feed flow rate, feed concentration and air flow rate.

Key Words: Phenol, Drug in wastewater, *pseudomonas putida,* fluidized bed bioreactor

**ENVS-04**
## ADVANCE OXIDATION PROCESSES FOR TREATMENT OF PHARMACEUTICAL INDUSTRY WASTE WATER

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Nowadays, due to the increasing presence of pharmaceuticals in the wastewater streams, the conventional biological methods cannot be used for complete treatment of the effluent. A class of efficient, newer technologies has been introduced to degrade these refractory molecules into smaller molecules. This work aims at highlighting five different oxidation processes operating at normal conditions viz. cavitation, photocatalytic oxidation, Fenton's chemistry and ozonation, use of hydrogen peroxide. An effort was made to review the basics chemistry, reactor configuration of these individual processes with a complete overview of the various applications to wastewater treatment in the recent years.

Key Words: Pharmaceutical waste, Oxidation, Fenton Chemistry, Ozonization

**ENVS-05**
## PRODUCTION OF DRINKING WATER IN RURAL INDIA BY SOLAR DISTILLATION AS AN EFFECTIVE TOOL

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An essential component for life is drinking water and good health. On the other hand it can be detrimental as it can also be a source of spreading of diseases, Drinking water if properly not managed, is

responsible for causing severe damage to the environment and affecting the health of people. So it is a challenge to provide the pure drinking water to everyone. For purification of water, many processes are used, like reverse osmosis, electro dialysis and solar distillation etc. but reverse osmosis and electro-dialysis are intensive energy techniques while solar distillation is an attractive process to produce potable water using cost-free solar energy. The basic phenomenon behind the solar distillation is the evaporation and the condensation of the water. As sunlight warms the black bottom and heat is transferred to the water, the top layer of water evaporates and accumulates in a container through the glass cover. In this paper operating principle, its efficiency, various types and applications of solar still has been presented.

Key Words: Solar distillation, Drinking water, Water purification

**ENVS-06**
**ACTIVATED CARBON PREPARATION BY USING AGRICULTURAL AND MUNICIPAL SOLID WASTES**

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Mixed solid wastes like biomass, cartons and polystyrene can be converted to adsorbents like Activated carbon by Copyrolysis at low carbonization temperatures. Adsorption capacity and yield of activated carbon were explored by varying different parameters like carbonization temperature (473K, 573K and 673K) and $ZnCl_2$ solution concentration (0.0, 0.5, 1.0 and 2 M) in case of chemical activation. The results revels the considerable dependency of both parameters like carbonization temperature and the $ZnCl_2$concentration on activated carbon yield. Activated carbon yield decreased as the carbonization temperature was increased from 473K to 673K and increased as the $ZnCl_2$ concentration was increased from 0.0 to 2 M. In the present study we conclude that when solid wastes treated with a low carbonization temperature (473K) followed by chemical activation with $ZnCl_2$ solution, yields AC with a high adsorption efficiency.

Key Words: Biomass, Co-pyrolysis, Carbonization, Zinc Chloride