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Proceedings

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Guest speakers

Dr. Sharad Bhartiya
Professor
Indian Institute of Chemical Technology, Bombay, India

Mr. Amit Gaurav
Manager
Sun Pharmaceuticals
Gujarat, India

Judges

Dr. Balaji S	- Associate professor-Senior & HOD
Dr. V.Thivaharan	-Associate professor-Senior scale
Dr. Ritu Raval	-Associate professor
Dr. Fayaz SM	-Assistant professor-Sel. Grade
Dr. Archana Mahadev Rao	-Assistant professor-Senior

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Itinerary - 11th November

Timings	Event
9:30 AM - 10:00AM	Inauguration ceremony
10:00 AM - 11:00AM	**Talk by Dr.Sharad Bhartiya** Professor at the Dept of Chemical Engineering at IIT Bombay, Mumbai, India **"Simulated Moving Bed Chromatography: Coverting Batch Downstream Separation to Continuous Processes"**
11:00 AM - 12:30PM	Paper & Poster Presentations
12:30 PM - 1:30 PM	Lunch Break
1:30PM - 2:30 PM	**Talk by Dr. Amit Gaurav** **(R&D(downstream) Manager at Sun Pharmaceuticals** **"Strategies for purification of Monoclonal Antibodies and challenges associated with it"**
2:30PM - 5:00PM	Paper & Poster Presentations
5:00 PM - 5:30 PM	Closing and Valedictory Ceremony

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Itinerary - 12th November

Timings	Event
9:00 AM - 9:30 AM	Inauguration ceremony
9:30 AM - 10:00AM	Refreshment Break
10:00 AM - 11:30 AM	Workshop Session 1 Basic introduction to machine learning methods: Regression and Classification
11:30 AM - 11:50 AM	Refreshment Break
11:50 AM - 1:00 PM	Workshop Session 2 A first introduction to ML in python
1:00 PM - 2:00 PM	Lunch Break
2:00 PM - 4:00 PM	Workshop Session 3 Practical problems from biotechnology using ML
4:00 PM - 5:00 PM	Refreshment + Closing and Valedictory Ceremony

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MAHE

Manipal, today, is a knowledge powerhouse and a brand name in higher education. Over five and half decades ago, one man, Dr Tonse Madhava Anantha Pai, had a vision which ensured that everything he did then, was consigned to posterity, making sure that generation after generation of students enjoy the fruits of his labour till eternity on this lateritic plateau. And the students will, forever, have one name on their lips, that of Manipal. Manipal Academy of Higher Education (MAHE) is a name to remember, not just across the length and breadth of India, but worldwide. The fact that students from 52 countries are studying here is a testimony to this fame. Fired by the desire to provide health care and other essential services to the people of this region, Dr TMA Pai transformed the plateau into what it now is. He turned the wilderness into a sanctuary of education.

In 1953, he set up Kasturba Medical College, the first private medical college in the voluntary sector. And, with that began the story of MAHE. Then, in 1957 came the engineering college, the dental college, Pharmacy College and so on and so forth. Initially, these institutes were affiliated to different universities. Dr TMA Pai passed on the baton of leadership to his son, Dr Ramdas M Pai who is the present President and Chancellor of the University. Located on the west coast of South India, Manipal was a barren wasteland, a plateau with wild animals. It was this plateau that Dr TMA Pai decided to change. His vision for Manipal covered a wide spectrum of interests because he himself donned many hats. He was a physician, an educationist, a banker and above all, a philanthropist at heart. Then in 1993, MAHE was accorded a deemed university status under Section 3 of the UGC Act 1956, by the Ministry of Human Resource Development, Government of India. At the time of receiving the deemed university status, only five professional institutions existed. Today, it has 20 constituent institutions comprising medical, dental, engineering, architecture, nursing, allied health, pharmacy, management, communication, information science, hotel management, biotechnology, regenerative medicine etc. The university offers Bachelors', Masters' and Doctoral degrees in various specialties.

ncouraged by the new status, MAHE grew by leaps and bounds. The emphasis has always been and still is, on quality education, which is why the degrees offered by the university are recognized the world over. MAHE provides excellent educational facilities to over 17,000 students in its constituent colleges. It also has an active alumni base of over 65,000 students across the world. With all the experience gained from producing several thousands of graduates, backed by experienced faculty, excellent academic and clinical facilities, MAHE boasts of an educational environment with a touch of world-class.

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MAHE has branch campuses in Bangalore, Malaysia, Dubai and Antigua in the Caribbean Island. There is also a campus in Mangalore with a medical college, a dental college and a nursing college with attached teaching hospitals. MAHE has an international academic collaboration for twinning programmes in engineering with universities in the US, UK, Australia and other countries. Manipal Group institutions are located on scenic campuses, which provide a high-quality lifestyle and ideal environment for study. All campuses have excellent infrastructure for academic activities, sports and other extracurricular activities. The infrastructure includes air-conditioned lecture halls, a skills lab, air-conditioned hostels, and a multi-cuisine food court. The state-of-the-art health sciences library is fully air-conditioned, accommodates 1300 learners and has over 62,000 books and over 600 journals. The library facilities include Medline, Proquest medical library of online databases, audio-visual, Cochrane library, e-learning, computer and Internet services. The Skills Lab and Anatomy Museum are considered amongst the best in the world. The latest addition to the facilities, a Simulation Lab with computer-driven mannequins, is an achievement, which the university is proud of. It is of considerable help to students in the field of health care.

MAHE believes in providing the finest in infrastructure and facilities to its students when it comes to learning and research. In fact, some of the facilities, like the Innovation Centre, have served as a valuable 'incubation centre' for industry and research. The state-of-the-art innovation centre bridges the gap between universities and industries for industrial-academic research.
Other facilities on the campus include a gym, swimming pools, and football and cricket grounds.

The new indoor sports complex is perhaps one of its kind in Asia. The complex has five badminton courts, four squash courts, three tennis courts, a basketball court, gymnasiums and a walking track. Besides being an ISO 9001:2008 and ISO 14001: 2004 certified University, it is home to many top 10 ranked institutions of India. MAHE has won the prestigious IMC Ramkrishna Bajaj National Quality Award and International Asia Pacific Quality Award during 2007- 2008. MAHE attained the Institute of Eminence by MHRD in 2018.

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MANIPAL INSTITUTE OF TECHNOLOGY

Manipal Institute of Technology (MIT), one of the Premier Engineering Institutes in India, was among the first self – financed engineering colleges in the country. It was started in 1957 by Padmashree late Dr.T.M.A Pai, as Manipal Engineering College with an undergraduate course in Civil Engineering. In 1965, the institute got affiliated to the University of Mysore from Karnataka University. In 1974, it was renamed as Manipal Institute of Technology (MIT). In 1980 it got affiliated to the University of Mangalore. After the creation of the Visveswaraiah Technological University (VTU), MIT along with a number of other engineering colleges in the state got affiliated to the VTU in 1998. As the Manipal Academy of Higher Education (MAHE) had acquired a Deemed University status, MIT became a constitution institution of MAHE in May 2000.

In 2003, MIT obtained full academic autonomy and adopted credit system with 10 point grading. In 2007 MAHE was renamed as Manipal University and MIT retained its status as a constituent institution of Manipal University. With total student strength of over 7500, MIT has emerged as the largest institute of University. MIT currently offers undergraduate programs (B.TECH) in 16 disciplines and postgraduate courses (M.TECH/MCA) in 24 different streams and Doctoral programs (Ph.D) in all streams of engineering, basic sciences, humanities and management. Academic programs offered by institute are approved by AICTE and have been accredited by the National Board of Accreditation (NBA). The institution plays a vital role in producing world – class engineers tuned to the demands of a fast changing global village.

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DEPARTMENT OF BIOTECHNOLOGY

The Department of Biotechnology, MIT, Manipal was founded in the year 2005. The department has state-of-the-art Infrastructure, well defined and updated curriculum, and wide range of electives to encourage interdisciplinary research. The faculty are highly qualified and experienced with research interests in diverse and emerging areas of biotechnology. The department has received up to 2 crores in research grants from various funding agencies.

The vision of the department: Excellence In teaching-learning process and research.

The mission of the department: To impart and disseminate knowledge, develop competencies and to produce industry- ready and academically enriched engineers for the emerging areas of applied biotechnology.

Dr. Balaji S
Head Of Department
Organizing Secretary, SymBiot'22

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Abstracts

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Paper and Poster Presentation

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2	Mass Transfer coefficient of oxygen absorption in biorector-	Isha Santosh, Shreshta Verma, Abhishek Chhallani, Deepak Prabu, Baidurja Biswas, Christina Rashmi K, Runjhun Singh, Shivani Raj, Neha Naveen
3	Enzyme Immobilisation by Adsorption	Rahil Ummar Faruk Abbu, Naomi Ann Thomas, Akhiya Shinde, Kashish Dilip Jain, Ruby Roy, Rohit Harikumar, Rohit Manikantan, Eeshaan Koundinya
4	Crystallisation of Antibiotics-A review-	Renuka Manjunath Basawa, Dnyanada Anil Khile, Avani Ashwin Hegde, Vaibhav Anand Revankar, Shaan Chirag Ganatra, Prakyath H.P, Suhani Kabra.

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Paper and Poster Presentation

5	Lyophilization of Protein Pharmaceuticals	Riddhi Agrahar, Saranya Vanapalli, Shreya Sivaram, Garv Agarwal, Lavanya G. S, Serin Joby Parekkadan, Nava Bharati Manickam
6	The intriguing persona of carcinogenesis: A review on gut microbiota and cancer	Harshil Jain, Rushil Dalal
7	Multistaged gene expression profiling reveals potential genes and the critical pathways in kidney cancer	Harini S, Kamalavarshini B, P.K.Praveen Kumar
8	Steam Distillation for Production of Essential Oils	Aman Navin Kumar, Dlya Chakravarthy, Kashish Hemang Dagli, Meenakshi Harikumar, Punya Hirawat, Pratham Joshi, Vani Sharma
9	Review of the multiple facets of HPLC in Lipase purification	Adrij
10	Analysis of Ion Exchange Chromatography and Its Application in Biotechnology Industries	Amith R. , Indrayani D. , Khushi A. , Arjun S. , Amanda B. , Shekhar R.P. , Ishita B. , Troyee D

Application of Size Exclusion Chromatography in Purification of Different Enzymes

Rachana Anand, Divyadarshini Valavan, Shraddha Shetty, Antarya Edpuganti, Basavaraj Shettar, Sanjeta Manivannan, Ashutosh, Alan Aranha

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Enzymes are proteins that act as biocatalysts for biological reactions in an organism. Isolated enzymes are used for the treatment of several disorders and ailments. The process of isolating enzymes requires separation techniques with chromatography being one of the most suitable modes of separation due to its ability to yield products of higher purity and higher specific activity. For instance, Peroxidase extracted from wheat bran is used in bioremediation, Esterase, taken from a bacterial source, plays a major role in the degradation of natural materials, and industrial pollutants and also provides an immense contribution to the eco-friendly approaches in various industrial applications. Pancreatic enzymes like lipase are extracted using chromatographic techniques. Several chromatographic techniques are utilized to separate enzymes with SEC used for separating enzymes majorly based on molecular size. Most SEC techniques involve salting out of the substrate before undergoing chromatography. The technique involves filtering through a suitable gel, which contains porous spherical beads of specific size where separation occurs when components are either included or excluded based on their size in the gel matrix. Along with gel, beads and components used, column size and flow rate plan a vital role in the separation. A major advantage of gel filtration is the ability to alter the parameters of separation to vary the type of sample or its requirements for further purification analysis. Minimal volume of eluate gives a good separation of larger molecules from the smaller molecules can be obtained. This purification process leads to good sensitivity of yield due to its short and narrow bands, there is no solute-stationary phase interaction resulting in sample loss and the activity and stability of the molecules are maintained without compromising their resolution which depends on flow rate, particle pore size, sample volume, and column length, a higher resolution can be obtained by increasing the flow rate along with the suppression of sample diffusion which results in a sharper peak. Common consensus through studies indicates that the longer the column, the higher the resolution and moderate flow rate yields the most optimum results, but can be changed based on the media used. Reviewing studies that were opted for based on selection criteria, SEC is most commonly used to obtain purified enzymes of high specific activity.

Mass Transfer coefficient of oxygen absorption in biorector

Isha Santosh, Shreshta Verma, Abhishek Chhallani, Deepak Prabu, Baidurja Biswas, Christina Rashmi K, Runjhun Singh, Shivani Raj, Neha Naveen

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The goal of this article is to examine how different elements affect the product's outcome and the coefficient of oxygen absorption during the process of mass transfer in a bioreactor. The growth pattern in microbial and plant cell cultures is frequently studied using the oxygen transfer rate (OTR). In different bioreactors, oxygen availability is considered the most critical factor for microbial development. The production of products in the bioreactors is drastically impacted by changes in the oxygen available to bacteria. There are numerous mass-transfer resistances involved in the mass transfer of oxygen in bioreactors: air qualities, and fluid characteristics like surface tension, viscosity, and density. The Kla value in a bioreactor is affected by the existence of antifoaming agents, concentration, and physical properties of the solution. The hydrodynamic parameters in the bioreactor have a substantial impact on gas-liquid mass transfer in a bioprocess. These circumstances are recognized as the outcome of energy dissipation, which is regulated by the operating parameters, the physicochemical qualities of the culture, the geometrical properties of the bioreactor, and the presence of oxygen-consuming cells.

KEY WORDS
Bioreactor; Oxygen transfer rate; Surface tension; Antifoaming agents; Energy dissipation

Enzyme Immobilisation by Adsorption

Rahil Ummar Faruk Abbu, Naomi Ann Thomas, Akhiya Shinde, Kashish Dilip Jain, Ruby Roy, Rohit Harikumar, Rohit Manikantan, Eeshaan Koundinya

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The forth lying content deals with the enzyme and its immobilization for its better and more efficient interaction with the substrate. There have been several developments in the immobilising enzymes, making it an easily accessible and hasty method for the enzyme-substrate interaction. This newer advancement helps us dwell further upon the possibilities offered by the latest techniques developed. We have a diverse application that comes into the picture with the availability of varied methods. Enzyme substrate reaction has been used in several industries, from pharmaceutical to waste management; this brings into the picture several types of enzymes and various substrates with their unique thermal and chemical properties. This paper deals with several carriers that could be used to immobilise the enzymes by adsorption and multiple techniques through which the enzyme could be immobilised, like physical adsorption, hydrophobic adsorption, and several other methods. The paper further dwells on the application of immobilised enzymes in the biodegradation and adsorption of pollutants and other toxic substances and effluents from industries. The paper touches upon enzymatic membrane reactors and their application. A brief experimental model of immobilising invertase enzymes inside sodium alginate beads is also suggested.

KEY WORDS
Enzyme, adsorption, immobilisation, carriers, bioreactors

Crystallisation of Antibiotics-A review

Renuka Manjunath Basawa, Dnyanada Anil Khile, Avani Ashwin Hegde, Vaibhav Anand Revankar, Shaan Chirag Ganatra, Prakyath H.P, Suhani Kabra.

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Crystallisation has been used in the industry for decades, only proving its viabilityand success. The crystallisation of drugs, especially antibiotics, is vastly explored in theindustry. During the synthesis of most antibiotics, it is crucial to increase the stability,processability, and bioavailability. Different crystallisation settings are employed inconventional crystal engineering to modify the qualities of crystals, frequently enhancing oneproperty at the expense of another or simply maximising both. This review summarisesparameters that affect crystallisation as a process. Crystallisation is a widely popular methodof material separation utilised in many different industries, from extremely generalcompounds that find very niche uses. More than 90% of active pharmaceutical ingredients(API) are created as crystalline products; therefore, it also significantly impacts thepharmaceutical sector. Crystallisation is one of the most crucial purification and separationtechniques used in creating APIs since it may have a substantial direct and indirect impacton the quality of a product

KEY WORDS
Crystallisation, pharmaceuticals, parameters, antibiotics, solvents, temperature

Lyophilization of Protein Pharmaceuticals

Riddhi Agrahar, Saranya Vanapalli, Shreya Sivaram, Garv Agarwal, Lavanya G. S, Serin Joby Parekkadan, Nava Bharati Manickam

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Purifying and producing recombinant proteins is a complex process that has proved difficult because of the instability of most proteins. In order to make proteins stable enough for use as pharmaceuticals, it is often necessary to change them into a solid form. Freeze-drying is a process in which solvents are removed from solutions by sublimation under a vacuum. As the 21st century dawned, developments in lyophilization continued and expanded. This article discusses recent advances and current challenges facing researchers working with this type of freezing method.

KEY WORDS
Lyophilization; Cryoprotection; dehydration; excipients; formulation; freeze-drying; protein stability

The intriguing persona of carcinogenesis: A review on gut microbiota and cancer

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As the second-highest cause of death worldwide, studies into the multifaceted pathology of cancer have been conducted for decades. Recently, the role of gut microbiota in cancer regulation and carcinogenesis has been a topic of increasing interest to researchers. The influence of the gut microbiota on other parts of the body, in the form of the gut-lung axis, gut-brain axis, and gut-blood barrier, among others, is extensively studied. Disturbances in the composition and function of the gut microbiome, or dysbiosis, have the potential to cause or contribute to various conditions, cancer being a critical component of the same. For example, the intestinal mucus layer created by mucin can be used by the commensal and pathogenic gut microbiota to promote their proliferation, form a biofilm, and colonise in the intestine. Endothelial cells and dendritic cells in mucosal tissues interact to a large extent to control the immune cascade. Normal consequences of mucosal barrier disruption include dysbiosis of the microbiota and host immunologic activation. Dysbiosis of the gut microbiota is frequently detected in cancer patients. It has been shown that certain gut bacteria play a role both locally and systemically in the beginning and development of carcinogenesis at epithelial barriers.

Additionally, the formation, advancement, and response to cancer therapy are all correlated with the gut microbiome and its local and systemic interaction with tumour cells. Locally, there are multiple mechanisms via which the gut microbiota is directly linked to colorectal carcinogenesis and its progression. Systemically, various bidirectional communication channels such as the gut-brain axis lay the pathway for carcinogenesis when dysbiosis is present. As cutting-edge research continues in this field, there is no doubt that further understanding of the subject will pave the way to novel and effective therapeutic approaches to cancer.

KEY WORDS

Carcinogenesis, Gut Microbiome, Dysbiosis

Multistaged gene expression profiling reveals potential genes and the critical pathways in kidney cancer

Harini S, Kamalavarshini B, P.K.Praveen Kumar

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Renal cell Carcinoma is the sixth-leading cause of cancer death, and to better understand such a complex disease, high-throughput data are generated at a large scale, which assists in scientific research and diagnosis. Although large datasets provide valuable insight into cell phenotypes and disease pathophysiology, extrication of meaningful information from them remains a trivial task. Molecular events that lead to disease onset and progression have not been clutched yet. In order to accomplish this, publically available gene expression data are retrieved for two different stages (I and II) of renal cell carcinoma. Furthermore, the clinical relevance understanding was based on the TCGA and cBioPortal databases. The differentially expressed genes as well as the pathways enriched by these genes have been analysed using a computational approach.

KEY WORDS
Renal Cell Carcinoma, TCGA, cBioPortal Databases, Computational Approach

Steam Distillation for Production of Essential Oils

Aman Navin Kumar, DIya Chakravarthy, Kashish Hemang Dagli, Meenakshi Harikumar, Punya Hirawat, Pratham Joshi, Vani Sharma

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Using saturated or superheated steam as a separation and energy agent, steam distillation is a technique used to extract volatile molecules with a high boiling point from inert and complex matrices, whether they be solid or liquid. It is a technique used by analysts to isolate essential oils from various plants, herbs, flowers, etc. The distribution of all organic components between the water and oil phases of the distillate is crucial for the recovery of all organic components during the steam distillation of essential oils. In most cases the oil forms the upper layer of the distillate by virtue of beingless dense than water.

KEY WORDS
Steam Distillation, Essential Oils, Superheated steam, Microwave steam distillation, yield vs. energy savings.

Review of the multiple facets of HPLC in Lipase purification

Adrij

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In recent years HPLC has seen an exponential increase in being used as a purification technique. This is due to its versatility and resolution. This paper aims to dissect the components of HPLC and understand the key parameters that make the technique efficient. We seek to understand the conditions that lead to high purification folds and the trade-off between the product yield and the purification factor. The process of lipase purification is viewed as a whole, and this paper analyses the impact of other separation techniques on HPLC. The underlying principle of reversed-phase HPLC has been discussed as it is one of the more prominent techniques used to purify polar molecules such as lipase. In this paper, modern trends of HPLC have also been discussed, such as the recent shift towards mass spectrophotometry from current UV detectors and the development of columns optimized for much higher pH conditions that exhibit better overall properties. This paper seeks to break down and identify the elements of HPLC that continue to impact purification significantly and can be developed shortly.

KEY WORDS
Steam Distillation, Essential Oils, Superheated steam, Microwave steam distillation, yield vs. energy savings.

Analysis of Ion Exchange Chromatography and Its Application in Biotechnology Industries

Amith R. , Indrayani D. , Khushi A. , Arjun S. , Amanda B. , Shekhar R.P. , Ishita B. , Troyee D

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The study of one of the widely used liquid chromatographic methods to separate a mixture based on ionic charges aimed to learn the procedure of recovery of various biomolecules through IEC. We see the separation of protein from bovine blood plasma, purification of an alkaline cellulase (carboxymethyl cellulase) produced by bacillus subtilis. Furthermore, IEC was also used to separate phycocyanin from spirulina platensis efficiently. Moreover, the purification of two distinct types of chitins obtained by IEC and gel filtration were also analysed. Based on the production of human papillomavirus vaccine from Escherichia coli using ion exchange chromatography

KEY WORDS
Stlon Exchange Chromatography, Protein Purification, Protein Recovery, Protein Separation, Enzyme Purification.