3RD CONVENTION : SFE - INDIA

National Seminar

on

"Analytical Techniques for Drug Discovery & Development from Natural Products"

September 24, 2016

Organized by:

School of Natural Product Studies

Jadavpur University, Kolkata, India

www.jaduniv.edu.in

In association with:

Society for Ethnopharmacology, India (SFE-INDIA)

Saktigarh, Jadavpur, Kolkata, India

www.ethnopharmacology.in

Venue: KP Basu Auditorium, Jadavpur University, Kolkata


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Society for
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Jadavpur University
Kolkata, India

3rd Convention : SFE - INDIA

National Seminar

"Analytical techniques for drug discovery & development from natural products"

September 24, 2016

School of Natural Product Studies
Jadavpur University, Kolkata

Secretariat

School of Natural Product Studies

Jadavpur University, Kolkata, India

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Activities of School of Natural product Studies on Traditional Medicine inspired Drug Discovery and Development on Natural Products

SCHOOL OF NATURAL PRODUCT STUDIES

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Website: www.jaduniv.edu.in

3rd Convention: SFE – INDIA, 2016

National Seminar

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web: www.jaduniv.edu.in

In Association with:

Society for Ethnopharmacology (SFE - INDIA)

23/3 Saktigarh, Kolkata

www.ethnopharmacology.in

Venue: K. P. Basu Memorial Hall , Jadavpur University, Kolkata

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3rd National Convention of Society for Ethnopharmacology (SFE - INDIA) is being organized by the School of Natural Product Studies (SNPS), Jadavpur University during September 24, 2016. The theme of the convention is *"Analytical techniques for drug discovery & development from natural products"*. On behalf of the SNPS and the organizing committee, I would like to convey my warm welcome to you all for the convention of SFE -INDIA.

Drug discovery and development from natural products remains a challenging scientific task, which requires expertise and experience. For many years, botanical serves as the source of therapeutically active molecules. However, in addition to their chemical structural diversity and their biodiversity, the development of new technologies has revolutionized the process of discovery of new drugs. New technologies including several analytical techniques offer a unique opportunity to establish natural products as a major source for drug discovery leading to development of new therapeutic agent. The drug development is undergoing a revolution due to recent advancements in combinatorial biosynthesis, microbial genomics and screening processes. Moreover, access to hyphenated techniques like Liquid Chromatography-Mass Spectrometry, Liquid Chromatography-Nuclear Magnetic Resonance have raised the hope of drastically reducing the time and cost involved.

This seminar will focus on some contemporary issues on the analytical techniques used for the drug discovery & development with special reference to

natural resources particularly for their quality evaluation, validation and related aspects.

We cordially invite you to participate in the conference and join the array of professionals, eminent scientists and technologists to make the deliberation a great success.

In order to promote the use of herbal products in different forms more particularly the finished/marketed product in therapy as is being used nowadays, a need-based and novel concept of chemo-profiling is getting momentum. Moreover, access to hyphenated techniques like Liquid Chromatography-Mass Spectrometry, Liquid Chromatography-Nuclear Magnetic Resonance have raised the hope of drastically reducing the time and cost involved. The advancement of analytical techniques with target compound analysis will serve as a rapid and specific approach in the herbal research, thereby allowing the manufacturers to set quality standards and specifications so as to seek marketing approval from regulatory authorities for therapeutic efficacy, safety and shelf life of herbal medicine. For the promotion and development of herbal medicine in different forms more particularly the finished/marketed product in therapy as is being used nowadays, a need-based and novel concept of chemo-profiling is getting momentum. Metabolomics and “target compound analysis” (TCA) is gaining popularity to ensure the chemical constituents/metabolites diversity in the herb medicines. The paradigm shifts towards the drug discovery and development from herbal medicine are the thrust area of research nowadays and has become a major challenge for the natural product scientists for their scientific documentation and validation.

The school of Natural Product Studies, Jadavpur University is working on several area of herbal medicine for developing integrated approaches for development of herbal medicine and natural products particularly from Indian systems of medicine-AYUSH drugs. The research work at the school highlights on evidence based validation of natural products to explore the wide biodiversity of India particularly on scientific validation and documentation on medicinal plants/herbal medicines. Various research activities of school highlights on the development and evaluation of therapeutic efficacy, quality control, safety profile of HMs and especially on herbal medicine based novel drug delivery system. The school has got worldwide recognition for its versatile activities with special reference to

herbal medicine and natural product inspired drug discovery through different integrated approaches:

- Dissemination of knowledge on education and research for promotion of natural products
- Chemo profiling of natural products; development of analytical techniques for quality control, and standardization of herbal medicine
- Phytochemical, pharmacological, microbiological and high throughput screening of natural products
- Drug development from herbal medicine for Alzheimer's diseases as AChE inhibitors
- Scientific validation of ethno pharmacological claims: Promotion and development of complementary healthcare with medicinal plants
- Promotion and development of Phytomedicine with International Coordination through integrated approach
- Evidence based validation and documentation on safety, efficacy and quality of natural products from Indian systems of medicine including Ayurveda, Homeopathy etc.
- Marker and target compound analysis (TCA) of herbal products and development of analytical techniques for their standardization and quality control
- Development and evaluation of herbal formulation from natural sources through industry institute partnership
- Globalization of traditional medicine and localization of traditional knowledge
- Metabolomics approaches for the quality and safety evaluation of natural products
- Establishment of molecular mechanisms and drug interactions
- Development and evaluation of effective herbal dosage form or formulation from herbal medicine through industry-institute collaboration and partnership.

The main focus of this convention and the seminar is to discuss the vital and contemporary issues of quality evaluation of herbal medicines and to highlight the various integrated approaches for promotion and development of herbal medicines in all aspects along with the plant metabolomics, target compound analysis, scientific validation & documentation.

The major highlights of this seminar will be on the following aspects:

- Hyphenated analytical techniques for the identification of bioactive compounds from natural product – a major tool for drug discovery
- Metabolomic study through target compound analysis - an approach towards drug discovery
- Drug discovery & development – Global perspectives.
- Modern molecular biology techniques to elucidate the possible mechanism of action for drug discovery & development
- Pharmacokinetic approaches for lead optimization in Natural product based Drug discovery

I would like to thank you all for your valued participation and interest to make this event successful. I wish you all a very effective scientific interaction during this program and hope to have a meaningful meeting. I convey my sincere thanks to different government and private agencies and other organizations for their kind support in organizing this event. I am very much thankful to the University authority for their support to organize this event. I gratefully acknowledge the service rendered by the organizing committee members of SFE-India and my beloved research scholars and students for their active support in organizing this national convention

Pulok K Mukherjee, PhD, FRSC
Organizing Secretary
3rd Convention: SFE-INDIA &
Director
School of Natural Product Studies
Jadavpur University
Kolkata 700032, India

3rd Convention: SFE – INDIA, 2016

National Seminar

"Analytical Techniques for Drug Discovery & Development form Natural Products"

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Saktigarh, Kolkata

www.ethnopharmacology.in

Venue: K. P. Basu Memorial Hall , Jadavpur University, Kolkata

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REGISTRATION: 09:00 - 10:00 AM

INAUGURATION OF THE PROGRAMME: 10:00 - 11:00 AM

Prof. Suranjan Das, *Vice Chancellor, Jadavpur University, Kolkata*

Prof. A.S. Verma, *Pro Vice Chancellor, Jadavpur University, Kolkata*

Prof. Sugata Hazra, *Dean, Faculty of ISLM, Jadavpur University, Kolkata*

Dr. Shanta Dutta, *Director, National Institute of Cholera & Enteric Diseases, Kolkata*

Prof. Biswajit Mukherjee, *Head, Dept. of Pharm. Tech., Jadavpur University, Kolkata*

Dr. Jayram Hazra, *Director, NRIADD, CCRAS, AYUSH, Govt. of India, Kolkata*

Dr. B. P. Saha, *Society for Ethnopharmacology, India, Kolkata*

Dr. Debanjan Chakraborty, *Director, British Deputy High Commission, Kolkata*

Dr. Pratim Banerji, *President, Society for Ethnopharmacology, India, Kolkata*

Mr. Birendra Kumar Sarkar, *Vice President, Society for Ethnopharmacology, India*

Mr. Indraneel Das, *Vice President, Society for Ethnopharmacology, India*

Prof. Pulok K Mukherjee, *Organizing Secretary & Director, School of Natural Product Studies, Jadavpur University, Kolkata*

Prof. T. Sen, *Jt. Organizing Secretary, 3rd Convention & National Seminar 2016*

11:00 - 11:15 AM **High Tea**

Plenary Lectures: Session I: 11:15 AM - 12:15 PM

Entrepreneurship Development and Dessimination of Knowledge

Chairpersons:

Dr. Prasanta K Sarkar, Director, State Medicinal Plants Board, W. B.
Dr. S. C. Bhattacharya, Professor, Dept. of Chemistry, Jadavpur University, Kolkata

Speaker	Title
Opening Remarks : **Prof. Pulok K Mukherjee** Secretary Society for Ethnopharmacology, India	SFE-India: Globalizing Local Knowledge and Localizing Global Technologies
Mr. Indraneel Das Vice President, SFE, India MD & Chairman Delibac Technologies Pvt. Ltd. Kolkata	The Tulip Mania: 17th Century and beyond
Dr. Ramar Krishnamurthy Coordinator Surat Chapter SFE India & Director C. G. Bhakta Institute of Biotechnology Uka Tarsadia University Surat, Bardoli, Gujarat, India	Healthcare in 21st Century: Perspectives of Ethno-pharmacology & Medicinal Plant Research: SFEC 2017
Dr. Sitesh C Bachar Organizng Secretary ISE-SFEC 2018 Dhaka University Bangladesh	Ethnopharmacology & Drug Development: Innovation Meets Tradition: ISE SFEC 2018
Dr. Debanjan Chakraborty Director, East India British Council Division British Deputy High Commission	Activity of British Council for Promotion of Education and Research

Plenary Lectures: Session II : 12:15 AM - 01:15 PM	
Chromatography in Natural Product Based Drug Discovery ***Chairpersons:*** Dr. A. Bandhopadhay, Retired Scientist, ICAR, Government of India, New Delhi Dr. T. Sen, Professor, Dept. of Pharm. Tech., Jadavpur University, Kolkata	
Speaker	**Title**
Mr. M. Sundar Business Development Manager - Emerging & Growing Market Waters India Pvt Ltd. Bangalore, India	Chromatography beyond doubt
Mr. Subhendu Saha Application Scientist East Region Ancrhom India Pvt. Ltd Mumbai	HPTLC analysis in drug discovery and development
01:15 - 02:00 PM	**Lunch Break (Venue: University Guest House)**
Plenary Lectures: Session III: 02:00 – 03:00 PM	
Hyphenated Chromatographic Techniques: LC-MS and GC-MS ***Chairpersons:*** Prof. Asis Majumdar, Director, School of Water Resource Engineering, JU, Kolkata Prof. T. K. Biswas, J. B. Roy State Ayurvedic Medical College and Hospital, Kolkata	
Speaker	**Title**
Mr. Uttam Karmakar Product Manager – GC & GC-MS Thermo Fisher Scientific India Pvt. Ltd.	GC-MS analysis in drug discovery and development
Dr. Sumit Mukkherjee Product Manager - Life Science Mass Spectrometry, Chromatography, Mass Spectrometry DivisionThermo Fisher Scientific India Pvt. Ltd.	LC-MS analysis in drug discovery and development

Plenary Lectures: Session IV: 03:00 – 04:00 PM

Extraction and Standardization in Natural Product Research

Chairpersons:

Dr. Arun Bandyopadyay, Scientist, Indian Institute of Chemical Biology, Kolkata
Prof. Chiranjib Bhattacharya, Dept. of Chemical Engeneering, JU, Kolkata

Speaker	Title
Mr. Ritesh Oza Product Specialist BUCHI India Private Limited Mumbai	Extraction in natural product based research
Dr. N. Udupa Professor and Research Director (Health Sciences) Manipal University, Manipal	Standardization of herbal products

Tea

Plenary Lectures: Session V: 04:00 – 05:00 PM

Spectroscopy in Natural Product Studies

Chairpersons:

Prof. Ganga Rao Battu, University College of Pharmaceutical Sciences , Andhra University
Prof. Somnath Roy, Professsor, Vidyasagar University, West Bengal

Speaker	Title
Prof. Parasuraman Jaisankar Chief Scientist & Head Chemical Biology Indian Institute of Chemical Biology Kolkata	Modern NMR spectroscopic techniques driving natural products research
Dr. Sougata Sinha Ray Application Scientist GE healthcare Lifescience Kolkata	BIACORE: Surface plasmon resonance (SPR) technique for screening and kinetic characterization of drugs

SFE-India meeting at the Office of the Society for Ethnopharmacology, Jadavpur, Kolkata at 05:00 PM

Scientific Presentation - Session VI: 05:00 - 06:00 PM	
Chairpersons:	
Prof. Sanmoy Karmakar, Coordinator, 3rd Convention & National Seminar 2016	
Dr. Pallab Kanti Haldar, Coordinator, 3rd Convention & National Seminar 2016	
Dr. Achintya Mitra, Scientist, NRIADD, Kolkata	
Dr. Sauvik Halder , Asst. Professor, Dept. of Chemistry, JU, Kolkata	
Mr. Prabir Banerjee, SFE-India, Kolkata	
Mr. Amitavo Das, SFE-India, Kolkata	
Name	**Abstract Title**
SFE/CONV/16/01	Selective inhibition of *Leishmania donovani b*y semi-purified fraction of wild mushroom *Grifola frondosa*
SFE/CONV/16/02	Needle free injection
SFE/CONV/16/03	Emerging role of bioautographic techniques in herbal drug standardization
SFE/CONV/16/04	Ethnoboatanical use of *Cinnamomum verum*
SFE/CONV/16/05	A review on herbal standardization
SFE/CONV/16/06	Isolation of seed meqal bioactives component and its prospective applications
SFE/CONV/16/07	Hepatoprotective activity and nutritional aspect of okra (*Hibiscus esculentus*): an overview
SFE/CONV/16/08	Gelatin nanocarrier, a controlled release delivery for anti-viral therapy: valacyclovir
SFE/CONV/16/09	Ethnobotanical usage and phytochemical screening of satavari (*Asparagus racemosus* willd.)
SFE/CONV/16/10	Differential targeting efficacy of combined doses of eugenol and doxorubicin against breast cancer and healthy cells: impact of surface potential
SFE/CONV/16/11	Effect of 2,4 – DNPH on male reproductive system of rat and it's amelioration by ethanolic extract of *Jussiaea repens* L.

SFE/CONV/16/12	Development of genistein loaded nanoemulsion based nano-gel for enhancement of therapeutic efficacy and bioavailability through transdermal delivery
SFE/CONV/16/13	Successful therapy of murine Visceral Leishmaniasis with astrakurkurone, an isolated mushroom constituent, involves up-regulation of TLR9 and protective cell-mediated immunity
SFE/CONV/16/14	LC-MS/MS metabolomics guided network pharmacology analysis of *Lagenaria siceraria*
SFE/CONV/16/15	Astrakurkurone, a novel triterpene isolated from indian mushroom astraeus hygrometricus, induces mitochondrial dysfunction and ROS dependent death in *Leishmania donovani*
SFE/CONV/16/16	Screening and evaluation of *Cedrus deodara* for anti-leishmanial activity
SFE/CONV/16/17	Antiproliferative efficacy of gold nano particles (AuNPs) using indole-3-carbinol against *Ehrlich ascites* carcinoma cell
SFE/CONV/16/18	Hepatoprotective activity of *Andrographis paniculata*: a network pharmacology approach
SFE/CONV/16/19	The antioxidant potential of *Calotropis gigantea* latex in Dalton's ascites lymphoma (DLA) bearing mice
SFE/CONV/16/20	Validation of ferulic acid in four different Indian *Ananas comosus* cultivars through RP-HPLC
SFE/CONV/16/21	Bioactive molecule lycopene obtained from water melon act as potential cytotoxic agent against human colorectal adenocarcinoma cell HT-29

Distribution of Awards for Best Presentations:

Prof. T. Sen, *Jt. Organizing Secretary, 3rd Convention & National Seminar 2016*

Valedictory Remarks:

Prof. Sanmoy Karmakar, *Coordinator, 3rd Convention & National Seminar 2016*

Dr. Pallab Kanti Haldar, *Coordinator, 3rd Convention & National Seminar 2016*

যাদবপুর বিশ্ববিদ্যালয়

Prof. Ashish S. Verma, Ph.D.
Pro-Vice-Chancellor

*JADAVPUR UNIVERSITY
KOLKATA-700 032, INDIA

OFFICE OF THE PRO-VICE-CHANCELLOR : AUROBINDO BHAVAN ANNEXE

Message

I am happy to note that the School of Natural Product Studies, Jadavpur University is organizing the 3rd Convention of the Society for Ethnopharmacology, India (SFE-India) and the National seminar on "Analytical Techniques for Drug Discovery and Development from Natural Products" on September 24, 2016 at Jadavpur University, Kolkata. On my personal behalf and on behalf of Jadavpur University, I would like extend warm welcome to all the participants and experts in the area of researches on medicinal plants. This seminar may prove as a platform for the exchange of thought provoking ideas during this meeting.

The School of Natural Product Studies is working on different aspects for the promotion and development of research on medicinal plants with a particular emphasis towards the quality and safety evaluation of medicinal plants. I do appreciate the initiatives taken by School to work on various aspects towards the dissemination of knowledge by organizing various international and national conferences, workshops and seminars in the field of scientific documentation as well as validation of natural products with respect to its quality, efficacy and safety.

This seminar will focus on several contemporary issues on the analytical techniques used for the drug discovery & development of botanicals' origin. The scientific deliberations during this convention will certainly add values by inculcating the renewed interest for researches on botanicals.

I convey my best wishes for the grand success of this convention.

19/9/16

Ashish S Verma

Established on and from 24th December, 1955 vide Notification No. 10986-Edn/IU-42/55 dated 6th December, 1955 under Jadavpur University Act, 1955 (West Bengal Act XXXIII of 1955) followed by Jadavpur University Act, 1981 (West Bengal Act XXIV of 1981)

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*JADAVPUR UNIVERSITY
KOLKATA - 700 032, INDIA

15.09.2016

Message from Dean FISLM

It gives me immense pleasure to note that the School of Natural Product Studies Jadavpur University, Kolkata is organizing a National seminar on "Analytical techniques for drug discovery and development from natural products" on September 24, 2016 at Jadavpur University, Kolkata. I heartily welcome all the participants of this event.

The School of Natural Product Studies of our university is working on several aspects for development of natural product research in the global perspectives, with major emphasis on application of scientific analytical techniques to assess the quality, efficacy and safety of traditional medicine, which may lead to new drug discoveries in future .

I wish the School of Natural Product Studies, Jadavpur University would continue it's endeavor to add value to traditional medicines and herbs for betterment of health care for the society.

I am sure, with continued national and international support, the school will be able to pursue it's enquiry in to the scientific and technical aspects of natural product research and to evaluate healthcare claims of natural medicines.

This seminar will provide an ideal platform for interaction, debate, fusion and dissemination of ideas among the students, scientists and professionals in different areas on medicinal plant research. The scientific deliberations in the convention will surely add value in inculcating the renewed interest in research on botanicals.

I convey my best wishes for the grand success of this convention.

Prof. Sugata Hazra
Dean
Faculty of Interdisciplinary Studies, Law and Management
Jadavpur University, Kolkata

* Established on and from 24th December, 1955 vide Notification No.10986-Edn/IU-42/55 dated 6th December, 1955 under Jadavpur University Act,1955 (West Bengal Act XXXIII OF 1955) followed by Jadavpur University Act, 1981 (West Bengal Act XXIV of 1981)

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Dr. Biswajit Mukherjee

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Professor in Pharmaceutics
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Former Fellow Scientist, School of Pharmacy.
University of London, London. U.K.
Ex. Biotechnology Overseas Associate
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hod@pharma.jdvu.ac.in

Message

September 14, 2016

I have the pleasure to write that the School of Natural Product Studies, Jadavpur University is going to organize a National Seminar on "Analytical techniques for drug discovery & development from medicinal plants & natural products" in association with the Society for Ethnopharmacology, India (SFE-India) on September 24, 2016 at KP Basu Memorial Hall, Jadavpur University, Kolkata. Analytical techniques are extremely important areas for drug discovery and development and a lot to be done in the field when it is the case of medicinal plants and natural products. I hope that the eminent speakers will highlight the relevant issues in the field and delegates will benefit from the information. I wish every success of the program.

14/09/2016

Professor (Dr.) Biswajit Mukherjee
Head, Department of Pharmaceutical Technology
Jadavpur University
Kolkata-700032

SOCIETY FOR ETHNOPHARMACOLOGY

Affiliated to International Society for Ethnopharmacology

e-mail: sfeindian@gmail.com; Tele-Fax: +91 – 33 2414 6046

Website: www.ethnopharmacology.in

Message

Society for Ethnopharmacology, India is registered under the West Bengal Society Registration act and also affiliated to the International Society for Ethnopharmacology. The society was formed in 2013 and has made its presence throughout the country, which provides networking opportunity for development and promotion of medicinal plants and ethnopharmacology. The Society works on dissemination of knowledge in this area through different local chapters made in different parts of India. The SFE-India as a growing organization, we encourage new members to join us in our efforts of making a healthier tomorrow, capitalizing on the very rich heritage and culture that is so ethnic, so ancient and yet so Indian.

The 3rd convention of SFE-India & National Seminar on “Analytical techniques for drug discovery and development from natural products” organized by the School of Natural Product Studies of Jadavpur University, on September 24, 2016 in association with SFE-India, focusing on some contemporary issues on the analytical techniques used for the drug discovery & development with special reference to natural resources. This seminar will provide an ideal platform for interaction and dissemination of ideas among the students, scientists and industrial professionals. This seminar will also provide an ideal platform for interaction, debate, fusion and dissemination of ideas among the students, scientists and professionals in different areas on medicinal plant research. The scientific deliberations in the convention will surely add value in inculcating the renewed interest in research on botanicals.

In this regard, we, the members of SFE - India, express our appreciation and gratitude to the administration, faculty members and the students of the School of Natural Product Studies and Jadavpur University in their gallant efforts at organizing the 3rd National Convention and making it a grand success.

Pratim Banerji

Dr. Pratim Banerji
President
Society for Ethnopharmacology
Kolkata, India

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23/3 Saktigarh, Kolkata

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Venue: K. P. Basu Memorial Hall , Jadavpur University, Kolkata

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Jadavpur University, Kolkata

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Dean, Faculty of ISLM
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SNPS, JU, Kolkata

Dr. Pallab Kanti Haldar
SNPS, JU, Kolkata

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Joint Organizing Secretary

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School of Natural Product Studies

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The School of Natural Product Studies, Jadavpur University (SNPS-JU) is devoted to empower individuals with skills, spirit and experience required for the promotion and development of natural products, through educational programme, research activities and sharing of experiences on the scientific validation of herbs for betterment of human healthcare. The school is working on exploring the scientific validation of natural products in respect of its quality, efficacy and safety and development of integrated approaches for promotion of natural products. The school has got international recognition for its multifaceted activities with special reference to traditional medicine inspired drug discovery through various approaches:

- Metabolomics approaches for the quality and safety evaluation of Indian Medicinal Plants
- Dissemination of knowledge on education and research for promotion of medicinal plants.
- Evidence based approaches for evaluation of Indian Medicinal Plants; Chemo profiling of natural products; development of analytical techniques for quality control, and standardization of herbal medicine
- Validation and scientific documentation of medicinal plant on the basis of traditional claims for Identification, inventorization and quantification of medicinal plants
- Globalization of traditional medicine and localization of traditional knowledge
- Establishment of molecular mechanisms and drug interactions
- Development and evaluation of value added herbal formulation; Phytochemical, pharmacological, microbiological and high throughput screening of medicinal plants
- Promotion of development of Indian system of Medicine through several National and International seminars, trainings, workshops
- Scientific validation of ethno pharmacological claims: Promotion and development of complementary healthcare with medicinal plants
- Promotion and development of Phytomedicine with International Coordination through integrated approach

The school has been working in the area of evidence based validation of herbal medicine and metabolomic approaches for the quality and safety evaluation of natural products for establishing molecular mechanisms and drug interactions leading to synergy research and development of several approaches for new generation of phyto-pharmaceuticals. In this field of research over 244 research and review articles has been published in various national and international peer reviewed impact journals; over 25 candidates has performed their PhD and are well settled in different national, international institutions and industries. Its wider offerings include the field of:

- Metabolomic study and marker profiling of medicinal plants
- Screening and evaluation of natural products
- Evidence based validation and documentation of herbs used in ancient Indian systems of medicine
- Formulation development of herbal medicinal plants for therapeutic benefits for better health care
- Quality control and standardization of natural products
- Development of herbal drug delivery systems with plant extracts and metabolites of therapeutic importance
- Bioassay guided isolation and Lead finding in natural products
- High throughput screening methodologies for medicinal plants
- Scientific validation of ancient claims with medicinal plants in Ayurveda,Unani etc.
- Phytochemical and phytopharmacological studies for lead finding in natural products from the great ancient treatise of India.
- Herbal therapeutics – pharmacokinetics and utilization of herbal drugs
- Development and evaluation of nutraceutical and dietary supplements
- Harmonization of regulatory requirements to ensure quality, safety and efficacy of the herbal products.

The school has been devoted for the evaluation of the holistic medicine which is useful bio-prospecting tools for the traditional medicine based drug discovery programme so as to make them available from '*Farm to Pharma'*. The SNPS group has been working on different integrated approaches for drug development from natural resources. Several National/International collaborations have been with Indian and abroad Universities and Industries with Jadavpur University based on this concept and memorandum of understanding [MOU] has been signed in this context. Major area of research work on several parameters along with development of high-throughput screening methodologies for drug screening and evaluation, studies on quality control, pharmacovigilence, safety surveillance, risk management, marker profiling and related metabolomic aspects of natural health products. School has established several national and international collaborations among researchers in interdisciplinary, multidisciplinary and trans-disciplinary aspects with several Universities and Industries to share knowledge and experiences in various fields of research related to botanicals. Several very important high cited publications have been made by the research group of the school.

Some significant publications of the research groups of the School of Natural Product Studies

- Harwansh RK, Mukherjee Pulok K, Kar A, Bahadur S, Al-Dhabi NA, Duraipandiyan V. Enhancement of photoprotection potential of catechin loaded. nanoemulsion gel against UVA induced oxidative stress. Journal of Photochemistry & Photobiology, B: Biology, 160 2016, 318–329.
- Government policies and initiatives for development of Ayurveda. KatochD., Sharma JS., Banerjee S., Biswas R., Das B., Goswami D., Harwansh RK., Katiyar CK, Mukherjee PK. Journal of Ethnopharmacology. doi.org/10.1016/j.jep.2016.08.018.
- Ahmmed SK, Mukherjee Pulok K, Bahadur S, Harwansh RK, Kar A, Al-Dhabi N, Duraipandiya V. CYP450 mediated inhibition potential of Swertia chirata: An herb from Indian traditional medicine. Journal of Ethnopharmacology, 2016; 78, 34–39.

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- Bhattacharyya S, Majhi S, Saha BP, Mukherjee Pulok K. Chlorogenic acid–phospholipid complex improve protection against UVA induced oxidative stress. *Journal of Photochemistry and Photobiology B: Biology*, 2014, 130, 293–298.
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The school has made several outstanding, including globally acclaimed contributions for development from natural resources including Ayurveda, ethno pharmacology, herbal drug technology and others. The main stay of research is in the domain of natural product research so much so herbal medicine and allied approaches relating to their quality, safety and efficacy for scientifically validated natural product development. The facilities created should be utilized by the industries and others for betterment of health care for the community at large.

Several national/international collaborations have been made through this school with Indian and foreign universities and industries based on this context.

University of Illinois, Chicago, USA, at the Dept. of Pharmacy, University of Illinois at Chicago, USA for joint research and exchange programs between both the institutes in the field of natural product research.

Tokushima University, Japan, Department of Molecular Studies for Incurable Diseases, Institute of Health Biosciences, Tokushima, Japan for scientific evaluation of natural products with special reference to anti allergic drugs.

Belo Horizonte, Brazil, Faculty of Pharmacy – UFMG, Av. Antônio Carlos, 6627 for Trilateral Cooperation in Science & Technology between India, Brazil & South Africa Project entitled “Novel Drug Discovery and Development approaches for the Pharmacological immune enhancers in immune compromised individuals”,

South African Medical Research Council (MRC), Cape Town- for Trilateral Cooperation in Science & Technology between India, Brazil & South Africa Project entitled “Novel Drug Discovery and Development approaches for the Pharmacological immune enhancers in immune compromised individuals”, Sanctioned from Department of Science and Technology, Government of India, New Delhi

King's College London, Franklin-Wilkins Building, 150 Stamford Street, LONDON SE1 9NN, UK Collaboration on natural product research with Center for Natural Medicine Research, Department of Pharmacy, on development of in vitro assay procedures for acetyl cholinesterase inhibitors from natural resources.

CDS Safety, Centralized Diagnostic Services Inc, USA, Collaboration on natural product research with Dr.PradipK.Paul, President. 6 Commerce Drive, Suite 2000 Cranford, NJ 07016 on pharmacovigilance study on botanicals.

Emami Limited,13, BT Road, Kolkata, West Bengal, India, collaborative project on “Development and evaluation of ‘*Varnya*’ formulations from the medicinal plants of Ayurvedic importance”through the Industry Institute Partnership cell of Jadavpur University.

Parker Robison Pvt. Ltd. 1, NimakMahal Street, Kidderpore, Kolkata - 700043, for development of anti-ageing formulation from natural resources through tripartite collaboration between the industry, Jadavpur University and Department of Science and Technology, Govt. of India

The school has been working for the dissemination of knowledge on various issues related to globalization of traditional medicine with international coordination and collaboration.

The school has organized more than 17 potential national and international conferences, workshops, seminars with the involvement of the scientists all over the world as follows:

- **National Seminar [2015],** 2nd Convention of SFE – INDIA, on "Integrated Approaches for Promotion and Development of Herbal Medicine" was organized by School of Natural Product Studies, Jadavpur University, Kolkata, in association with the Society of Ethnopharmacology, Kolkata, India, December 05-06, 2015.
- **1st International Congress of the Society for Ethnopharmacology India (ICSE - 2014),** on "Globalizing traditional medicines: Present and future prospects" was organized at Sri Ramachandra University, Chennai, India, during March 7-9, 2014. The congress has evidenced participation of over 700 delegates from 20 countries with more than 300 scientific presentations.
- **National Seminar [2014],** 1st Convention of SFE-India on "Opportunities in Medicinal Plant Research" November 29-30, 2014, Kolkata was organized by School of Natural Product Studies, Jadavpur University in association with Society for Ethnopharmacology (SFE-INDIA), Kolkata.
- **National Workshop [2013],** on "Botanical identification and evaluation of Indian medicinal plants" November 20-26, 2013, Kolkata, India, organized by School of Natural Product Studies in association with Science Engineering Research Board (SERB), Department of Science and Technology (DST), New Delhi.
- **12th congress of the International Society for Ethnopharmacology** [ISE] held at Kolkata, from February 17-19, 2012, which was the First ISE congress organized in India, on "Traditional Medicines and Globalization–The Future of Ancient Systems of Medicine". The conference has evidenced more than 1000 delegation from 52 different countries.
- **National Conference [2011]** on "Emerging Trends in Natural Product Research" February 12-13, 2011, This conference mainly highlighted the trends in natural

product research with various aspects of scientific validation and evaluation of herbal medicinal products for their promotion and development.

- **National Workshop [2010]** on “Developing Quality Monographs for Pharmacopoeia for Herbs and Herbal Products” January 16-17, 2010, Kolkata, India organized by School of Natural Product Studies in association with Indian Pharmacopoeia Commission (IPC), National Medicinal Plants Board (NMPB), and Association of Pharmaceutical Teachers of India (APTI).
- **International conference [2009]** on “Herbal Medicine –Evaluation of Quality, Efficacy and Safety” held on February 26-28, 2009 at Bangalore, India. Jointly organized by School of Natural Product Studies, Jadavpur University, Rajib Gandhi Health University, Bangalore with Association of Pharmaceutical Teachers of India [APTI], Bangalore. More than 1400 participants from 24 different countries participated in this conference to highlight different aspects of natural product research and development.
- **National seminar [2009]** on “Histamine H1 receptor gene expression in allergy and its suppression by natural medicines” February 23, 2009. Organized by School of Natural Product Studies Jadavpur University, in association with Association of Pharmaceutical Teachers of India [APTI], Bengal Branch.
- **Pre-conference workshop of IPS international conference [2009**] on “Fractionation and Standardization of Natural Products” for the ‘International Conference on Integrative & Personalized Medicine and 42nd Annual Conference of Indian Pharmacological Society’ December 9, 2009.
- **UGC Refresher Course [2008]** on “Thrust Areas on Development of Natural Products” organized by School of Natural Product Studies, Jadavpur University & Academic Staff College, Jadavpur University during November 20-Dcember 10, 2008.
- **National workshop[2008]** on ‘Natural Health Product-Opportunities and Challenges’ March 15, 2008, organized by School of Natural Product Studies, Jadavpur University.
- **National workshop [2008]** on “Instrumental Chromatography and Drug Discovery” December 8, 2008, organized by School of Natural Product Studies Jadavpur University, in Association with Association of Pharmaceutical Teachers of India [APTI], Bengal Branch and Anchrom Enterprises (I) Pvt. Ltd, Mumbai.
- **International Conference [2005]** - on “Promotion and Development of Botanicals with International Coordination: Exploring quality, safety, efficacy and regulations” February 25-26, 2005, Kolkata, India, organized by School of Natural Product Studies, Department of Pharmaceutical Technology, Jadavpur University, Kolkata-700 032, with Drug Information association [DIA], USA and Indian Institute of Chemical Biology, Kolkata.
- **National Workshop [2003]-** on “Contact program for talented school students” May 20-23, 2003 sponsored by Department of Science & Technology (DST), Govt. of India, New Delhi and organized by Jadavpur University, Kolkata.

SOCIETY FOR ETHNOPHARMACOLOGY, INDIA [SFE -INDIA]

"Globalizing local knowledge and localizing global technologies"

23/3 Saktigarh, Jadavpur, Kolkata 700032

(Affiliated to the International Society for Ethnopharmacology, UK)

Website: www.ethnopharmacology.in

Affiliated to

International Society for Ethnopharmacology

The Society for Ethnopharmacology (SFE) is a registered society under the West Bengal Society Registration act and affiliated to the International Society for Ethnopharmacology (ISE), UK. The ISE is an international scientific organization of researchers dedicated to the interdisciplinary study of the pharmacological actions of plants, animals, insects, and other organisms used in medicines of indigenous and modern, past and present, cultures. The society is also committed to the preservation and conservation of such practices for future generation.

After the grand success of the 12th International Congress of International Society for Ethnopharmacology (ISE) organized by the School of Natural Product Studies, Jadavpur University Kolkata in February 2012, the Society for Ethnopharmacology, India (SFE – India) was constituted in August 2013. The Society is extremely grateful to Late Dr. APJ Abdul Kalam, former President of India, for his inspiration and support for its formation.

The Society for Ethnopharmacology, India (SFE - India) was constituted by the eminent academicians, researchers, industrialists and others with the vision of providing an environment for knowledge sharing among industrialists, researchers, students, healthcare-practitioners, decision-makers and others interested in promotion of Ethnopharmacology and medicinal plant. The mission of the society is promotion and development of traditional medicine and medicinal plants through dissemination of knowledge and development of collaboration and cooperation with the major highlights on

"Globalizing local knowledge and localizing global technologies"

The society organizes conferences, seminars, symposiums, workshops etc in different parts of India for discussion and sharing knowledge on different issues for cultivation, production, quality evaluation, safety, clinical studies, biological screening and several other issues of natural product research. The Society helps in forming bridge between the academia and industry for developing cost effective natural remedies. Presently the Society has several local Chapters with dynamic Coordinators for individual chapters and over 600 members across the country. To recognize the outstanding contribution in the area of medicinal plant research and Ethnopharmacology, the Society has instituted several awards which are conferred during the International congress of the society every year as follows:

1) SFE - Lifetime Achievement Award - "Bisheswar Saha Memorial Award"

2) SFE - Outstanding International Ethnopharmacologist Award - “Pranab Banerji Memorial Award”
3) SFE - Outstanding National Ethnopharmacologist Award - “Harihar Mukherjee Memorial Award”
4) SFE - ZANDU Award for Best Research on Plant Drugs
5) SFE - Herbal Industry Leader Award
6) SFE - Outstanding Service Award
7) SFE – Special Recognition Award
8) SFE - Travel Grant Award

Society of Ethnopharmacology (SFE-INDIA) is dedicated for the dissemination of knowledge and information through different educational programmes throughout India and also to serve as a bridge between industry and academia for development of products, process for value addition and promotion of medicinal plants as well as herbal medicines used in ancient system of medicine and folklore and sharing of experience on the scientific evaluation of Ethnopharmacology of HMs for betterment of healthcare of the society. The major activities of the society are:

- To carry out the objectives of International Society for Ethnopharmacology.
- Globalization of traditional medicine and natural products – Globalizing local knowledge and localizing global technology.
- Dissemination of knowledge for promotion and development of Ethnopharmacology and medicinal plants (herbs).
- Organizing conferences, seminars, symposiums, workshops etc. in different parts of India.
- Promotion and development of Ethnopharmacology, HMs, medicinal plants and other natural products in India.
- Promotion of the healthcare of the society.
- Sharing knowledge on various issues on cultivation, production and validation of traditional medicine, quality & safety evaluation, pre-clinical screening & clinical studies and several other issues of natural products.
- Act as a resource at local level for individuals including students interested in Ethnopharmacology.
- Encourage career growth and Knowledge empowerment of its members.
- Publishing journals, newsletters, documents, books, etc. for promotion of knowledge in the field of natural product research.

For dissemination of knowledge the society has taken several initiatives to organize several workshops, seminars, conferences throughout the year in different parts of India:

- The 3rd International Congress of the Society for Ethnopharmacology (SFEC 2016) was organized by National Centre for Natural Resources (NCNR), Pt. Ravishankar Shukla University, Raipur, Chhattisgarh, India, during February 19-21, 2016. Prof. S K Pandey, Vice Chancellor, Pt. Ravishankar Shukla University was the Chairman, Dr.

Atanu K Pati, was the organizing secretary and Dr. Shailendra Saraf, Coordinator, SFE-India, Raipur, Local chapter was the Joint organizing secretary of the 3rd International Congress of SFEC 2016, Raipur (www.sfec2016raipur.com).

- The 2nd International Congress of the Society for Ethnopharmacology (SFEC) was organized by the Department of Pharmaceutical Sciences, R. T. M. Nagpur University, Nagpur, India, during February 20-22, 2015. Dr. Prakash R. Itanakr, Coordinator of Nagpur local chapter was the organizing secretary of the 2nd International Congress 2015 (www.sfec2015.com). The congress was attended by over 1000 delegates from different countries of the world. SFE-India thanks Dr. Prakash Itankar, Coordinator, SFE-India Nagpur local chapter for organizing this event.

- Several invited lectures by disguised speakers was arranged by the SFE-India, Kolkata on emerging topics on Ethnopharmacology and promotion of medicinal plants by the Society office at Kolkata and also in collaboration with School of Natural Product Studies, Jadavpur university, Kolkata.

- The Guwahati local chapter of SFE-India, organized the 1st Regional Seminar: on "Pharmacovigilance of Natural Products- A Preliminary Approach"organized by Department of Pharmacology, ADR Monitoring Centre, Gauhati Medical College, Guwahati, Assam during September 26, 2015. More than 250 delegates from different parts of Indian particularly north east India attended the programme. SFE-India thanks to Dr. Chandana Baruah, Coordinator, SFE-India Guwahati local chapter for organizing this event.

- The 2nd National Convention of the Society for Ethnopharmacology, India on "Integrated Approaches for Promotion and Development of Herbal Medicine." was organized by School of Natural Product Studies, Jadavpur University, Kolkata during December 5-6, 2015. The seminar was attended by more than 300 delegates from different parts of India with above 150 oral/poster presentations.

- In the 1st International Conference: "Advances in Asian Medicines (ICAAM - 2016); a Special Programme was organized by the Pune Local chapter of SFE-India on "Ethnopharmacology and Validation of Traditional Medicine" during January 4, 2016 at Pune, India. More than 300 delegates participated in this event with above 100 scientific presentations, which make this event grand success. SFE-India is thankful to Dr. Sathiyanarayanan L., SFE-India Coordinator, Pune Local Chapter for organizing this event successfully.

- Chennai local chapter of SFE-India organized a national conference on "Pharmacovigilance of AYUSH Drugs" during January 19, 2016 at Sri Ramachandra University, Porur, Chennai. This event was a very successful event with the participation of more than 500 delegates from all over the country and above 50

scientific presentations were made. SFE-India is thankful to Dr. D. Chamundeeswari, Coordinator, SFE-India Chennai local chapter for organizing this event.

- One day National Seminar on “Ethnopharmacology: Perspectives for Development of Ayurveda” was organised by the National Research Institute of Ayurvedic Drug Development (NRIADD, CCRAS, Ministry of AYUSH, Government of India) in association with the Society for Ethnopharmacology, India (SFE-India) on 19th March 2016. More than 150 delegates participated in this event with above 32 scientific presentations, which make this event grand success. The Society is thankful to Dr. Jayram Hazra, Director, NRIADD, Kolkata & his team for organizing this event.

- The society is publishing the News letter regularly in different aspects for development and promotion of medicinal plants and Ethnopharmacology. We are very excited by the keen interest of our members of SFE from a diverse number of institutes and industries throughout the country to share the knowledge in this regard.

With our limited strength, esteemed efforts and keen interest of our members from several parts of India we have been working for the promotion and development of medicinal plants and ethnopharmacolgy in all aspects. We encourage new members to join us in our efforts of making a healthier tomorrow, capitalizing on the very rich heritage and culture that is so ethnic, so ancient and yet so Indian.

We are happy to welcome you all to the 3rd Convention and the National Seminar on “Analytical techniques for drug discovery & development from natural products” at KP Basu Auditorium, Jadavpur University, Kolkata on September 24, 2016. We thank to the organizing committee especially the members of School of Natural Product Studies, Jadavpur University for organizing the 3rd Convention of SFE-India with involvement of eminent speakers and delegates.

We cordially invite you all, the researchers, regulatory authorities; standard-setting organizations; contract laboratories and research organizations, NGOs, academicians, scientists, students and healthcare practitioners of conventional and traditional health care systems who are interested in the dissemination of knowledge for the promotion and development of medicinal plants and natural products towards a healthier society to join SFE-India and explore the opportunities.

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Dr. Pratim Banerji
President
Society for Ethnopharmacology, India
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Analytical Techniques for Drug Discovery and Development from Natural Sources

R. K. Joshi
Department of Phytochemistry, Regional Medical Research Centre (ICMR), Nehru Nagar, Belagavi, Karnataka 590 010, India

Natural products have been the source of most of the active ingredients of medicines, including the modern medicine and present day research continues to explore a variety of lead structures, which may be used as templates for the development of new drugs. The identification of bioactive natural products from plants and other natural sources such as marine flora and fauna, microbes etc. remains a multifaceted task because of their high chemical diversity and complexity. Chemical and biological investigation for the search of novel bioactive natural products involves the extraction, isolation, purification and structure elucidation, which can be challenging and/or time consuming. The extraction is normally the first step for both marine and terrestrial organisms. The extraction depends on the choice of the extracting solvent, followed by solvent partitioning or trituration that may result in many problems including the formation of artifacts. Further, homogenization and lyophilization with organic solvents can affect the nature and relative amounts of extracted secondary metabolites. In general, classical natural product isolation methodologies are exploited in several laboratories.

With advances in fractionation techniques to isolate and purify natural products (e.g. counter-current chromatography and the techniques to determine structures, screening of mixtures is now more compatible with the expected timescale of high-throughput screening campaigns. The combination of classical spectroscopic techniques such as UV absorption spectroscopy, Infra-red spectroscopy, Mass spectrometry (MS) and Nuclear Magnetic Resonance spectroscopy (NMR) often permits the unambiguous structure determination of pure compounds. In cases where the absolute configuration cannot be determined, synthesis or single-crystal X-ray analysis is utilized. As classical separation techniques are tedious and time

consuming, while the direct hyphenation of an efficient separation technique with powerful spectroscopic techniques can assist in the de-replication process.

The hyphenated systems include HPLC-FTIR, useful for the detection of functional groups in major constituents of mixtures. While HPLC-NMR-MS is an advanced spectrometric hyphenated technique which is used in the dereplication of natural product extracts (typically plant extracts). Apart from its efficiency, the most important advantage of HPLC-NMR-MS is the unequivocal matching of the MS data to the NMR spectrum. The application of HPLC-NMR to the crude extracts (NMR and UV profile from PDA HPLC detection) was found to be a powerful spectroscopic tool which had advanced in the last decade, in particular with the advent of higher field magnets and cryo-probes. In recent years the advances in micro coil HPLC-NMR and capillary NMR (Cap NMR) has allowed for smaller quantities of samples to be analyzed in order of 40–120 µL, this in combination with higher field magnets can greatly increased the sensitivity in profiling and dereplication natural product extracts. The emerging field combines analytical chemistry, biochemistry and informatics that allow the analysis of thousands of small molecules (metabolites) in any biological system. Mass spectrometry hyphenated with gas chromatography, liquid chromatography or capillary electrophoresis and NMR spectroscopy are the leading analytical platforms.

The advancements in analytical instrumentation and sophisticated hyphenation of separation techniques with high sensitive detectors have allowed for greater detection of small molecular compounds measurable in biological systems and undoubtedly are used to advance the discovery of natural product chemistry along with to identify potential novel candidates assisting sustaining health and our fight against diseases and illness.

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ANNUAL AWARDS
SOCIETY FOR ETHNOPHARMACOLOGY, KOLKATA, INDIA

Society for Ethnopharmacology is affiliated to the International Society for Ethnopharmacology,UK. SFE-India is constituted by the academcians, researchers and industrialists for dissemination of knowledge and expertise for promotion and development of medicinal plants & other naturalproducts with the vision of globalizing local knowledge and localizing global technologies.

To recognize the outstanding contribution in the area of medicinal plant research & Ethnopharmacology, the Society has instituted several awards. Nominations are invited for the following awards of the Society for Ethnopharmacology (SFE-INDIA), Kolkata which will be conferred during the Annual International Congress of SFE-India (SFEC).

For Nomination and other details please visit: **www.ethnopharmacology.in**

NAME OF THE AWARDS

SFE - Lifetime Achievement Award - 2017
"Bisheswar Saha Memorial Award"

SFE - Outstanding National Ethnopharmacologist Award - 2017
"Harihar Mukherjee Memorial Award"

SFE - Outstanding International Ethnopharmacologist Award - 2017
"Pranab Banerji Memorial Award"

SFE - Best Poster & Paper Preesntation Award - 2017
"Manujusree Pal Memorial Award"

SFE - Best Research on Plant Drug Award - 2017
"SFE - ZANDU Amard"

SFE Herbal Industry Leader Award - 2017

SFE - Outstanding Service Award - 2017

For further details please contact:

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We gratefully acknowledge the support received from:

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&
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(MENTOR - SFE - INDIA)

Mrs. Sibylle U Saha
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Homage to People's President of India
Dr. APJ Abdul Kalam

Inaugural lecture of Dr. APJ Abdul Kalam at the 12th International congress of the ISE on "Dynamics of Ethnopharmacology" available at **www.ethnopharmacology.in**

We are very much grateful and thankful to him for his great inspiration, which leads to the formation of Society for Ethnopharmacology, India (SFE- India).

1st Regional Seminar Guwahati Local Chapter of SFE- India ; during September, 2015 at Gauhati Medical College Guwahati, Assam, India

1st International Confernece (ICAMM 2016) , A special program of Society for Ethnopharmacology , was organized by SFE-India, Pune Local Chapter during January 4, 2016 at Pune, India

1st National Convention of Society for Ethnopharmacology, India during November, 2014 at Gandhi Bhawan, Jadavpur University,, Kolkata, WB, India



2nd International Congress of Society for Ethnopharmacology , India (SFEC - 2015) during February, 2015 at RTM Nagpur University, Maharashtra, India

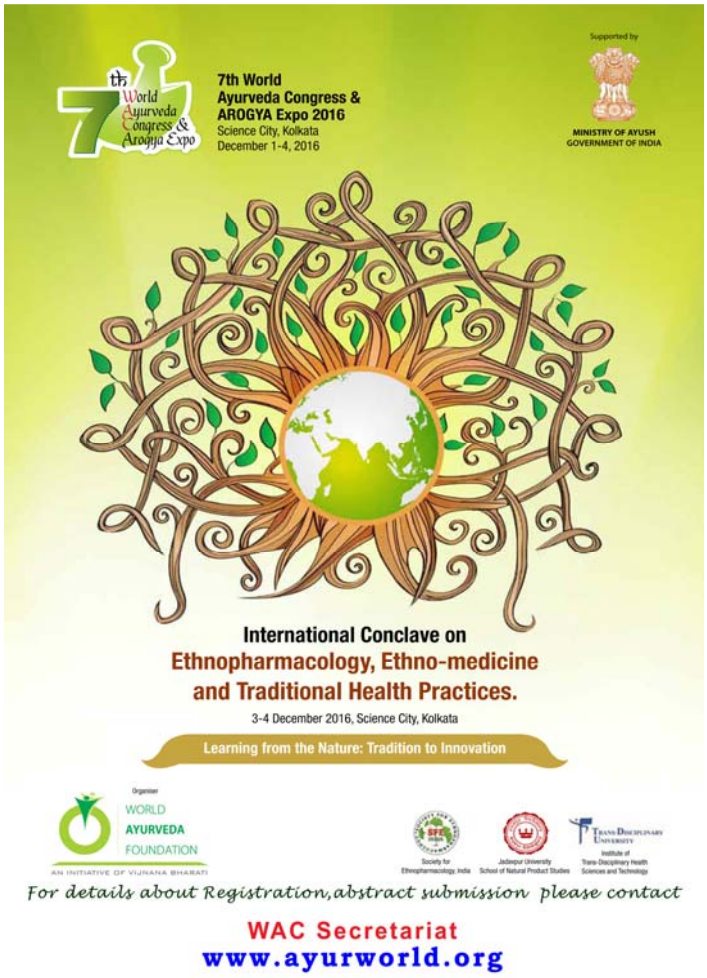


2nd National Convention of Society for Ethnopharmacology, India during December 5-6, 2015 at Triguna Sen Auditorium, Jadavpur University,, Kolkata, WB, India


2nd International Congress of Society for Ethnopharmacology, India (SFEC 2016) during February 19-21, 2016 at Pt. Ravishankar university, Raipur, Chhattisgarh, India



UPCOMING EVENTS



SFEC 2017

4th International Congress of Society for Ethnopharmacology, India

Surat, Gujarat, India

February 23-25, 2017

Healthcare in 21st century: Perspectives of Ethnopharmacology & Medicinal Plant Research

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PLENARY LECTURE SESSION

3nd CONVENTION OF SOCIETY FOR ETHNOPHARMACOLOGY, INDIA (SFE-INDIA)

National Seminar

"Analytical Techniques for Drug Discovery & Development from Natural Products"

SHORT BIOGRAPHY OF SPEAKERS

Mr. Indraneel Das

Mr. Indraneel Das is a Water Treatment Consultant specializing in technologies & services relating to municipal, military, pool and cooling water quality. His technical publications & presentations cover diverse areas covering “Neuropsychopharmacology”, “Multispecialty Hospital Water Quality”, “Arsenic Contamination in Ground Water”, “Water Terrorism”, etc. He has toured the world extensively in course of his academic and professional endeavors. He is currently the Vice Chairman of Indian Water Works Association, Kolkata Center, and holds membership of American Water Works Association, USA. Mr. Indraneel is a Member of the Disinfection & Public Health Committee of Water Environment Federation, USA. He has served as an Executive Committee Member of Eastern Chamber of Commerce, as well as the Secretary of Indian Pharmaceutical Association, Bengal Branch. Mr. Indraneel is a Paul Harris Fellow, actively engaged in Rotary International activities, being the President of RC Cossipore during Rotary Year 2010 – 2011, and the Asst. Governor of RID 3291 during 2013 – 2014. He is a member of International Society for Ethnopharmacology, UK, and the Vice President of Society for Ethnopharmacology, India. He has done his Masters in Pharmacy and MBA from Jadavpur University. Mr. Indraneel has invented a low cost “Arsenic free” domestic filter, which has been certified for successful performance by AIIH&PH, Govt. of India. He can be reached by e-mail at indraneel@declibac.com or skype: indraneeldtpl.

Mr. M. Sundar

Mr. Sundar is the Business Development Manager, Emerging & Growing Market Waters India Pvt. Ltd. Bangalore, India. He has 24 years of experience in analytical instruments on spectroscopy, chromatography, MS, thermal analylsis, rheology and various technologies. He has handled service, sales, marketing, business administration. Currently, he is working as business development manager - LC for expanding the academic and developing the new application markets.

Mr. Subhendu Saha

Mr. Subhendu Saha is the product manager (South Asia) of Anchrom. He did his M.Sc. Chemistry in 1997 from Vidyasagar University, Midnapur, West Bengal. He was in-charge of Eastern India for Anchrom when he joined more than 13 years ago. Later on, after extensive training at Camag in Switzerland and M/s. Mitsubishi Chemical Medience Corp in Japan, he became the Product Manager (India) and later on for whole South Asia. As an HPTLC expert he has travelled to Nigeria, Bangladesh, S. Arabia, Bhutan, Nepal for lecturers and on-site support to CAMAG HPTLC users. Mr. Subehndu Saha has also been invited to speak

on HPTLC at numerous seminars in India, being a recognized expert in theory and practice of HPTLC as well as Iatroscan TLC/FID chromatography.

Dr. Sumit Mukherjee

Dr. Sumit Mukherjee is the product manager at Thermo Fisher Scientific India Pvt. Ltd., Mumbai, MH, India. He did his B. Pharm and M. Pharm in Pharmaceutical Chemistry from Jadavpur University, Kolkata. Then he pursued his PhD from University of the Pacific, Stockton, CA, USA in Bioanalytical and Physical Chemistry under Pharmaceutical and Chemical Sciences Program and worked as teaching assistant there. He also worked as lecturer in Sachdeva College, Kolkata. In Aridis Pharmaceuticals, San Jose, CA, USA he worked as a Graduate Intern. He also worked for Waters India Pvt. Ltd., Bengaluru as Sr. Application Specialist. In 2014, he joined Thermo Fisher Scientific India Pvt. Ltd., Kolkata, India as Area Sales Manager. He can be reached through his E-Mail: sumit.mukherjee@thermofisher.com.

Mr. Uttam Karmakar

Mr. Karmakar is the product manager of GC & GC-MS at Thermo Fisher Scientific India Pvt. Ltd. He has an extensive work experience of 16 Yrs in GC & GCMS Product line. He has hands on experience on GC, GCMS & triple quadrupole mass spectrometry. He is an expert in method development procedure based on molecule types, spectra interpretation, sample extraction techniques & solvent selection, trouble shooting of chromatography pattern, system validation for accreditation. He has delivered various lectures in various topics like full scan mode in single quadrupole system to discover the unknown molecules; matrix minimization technique by using single ion monitoring (SIM) technique, identification & trace level quantification, further matrix elimination & molecules confirmation by using more powerful technique –triple quadrupole mass spectrometry – selected reaction monitoring (SRM) mode, triple quadrupole mass spectrometer to minimize the sample preparation steps, sample extraction techniques & useful accessories, new advancement in GC & MS technology.

Mr. Ritesh Oza

Mr. Ritesh Oza is Product Specialist at BUCHI India Pvt. Ltd. BUCHI is a leading solution provider in laboratory technology for R & D, quality control and production worldwide. He is responsible for Kjeldahl and Extraction solutions, for classical protein and fat determination and as well as for residue and contaminant analysis in various matrices. He holds an MSc in Bioanalytical Sciences from Mumbai University. He lives and works in India where he drives BUCHI's local sales & marketing efforts for Kjeldahl and Extraction solutions in the Indian market. In today's session, Mr. Ritesh shall discuss about BUCHI's Extraction Solutions for natural product research.

Dr. N. Udupa

Dr. Udupa is Professor and Principal at Manipal College of Pharmaceutical Sciences. He is a renowned educationist and eminent scientist in the field of Pharmaceutical Technology, was born on July 15, 1953 in small village of Kinnigoli, South Kanara in Karnataka District. He has 35 years of Teaching & Professional Experience in UG and PG classes and guiding Ph.D candidates. His area of research is novel and targeted drug delivery systems - developing liposomes, niosomes, microspheres, transdermal drug delivery systems, and drug delivery systems for dental diseases, ocular drug delivery, polyherbal drug formulations, cosmeceuticals, nutraceuticals and nasal drug delivery systems. Dr. Udupa completed his B. Pharm (1974), M. Pharm (1976) and Ph.D (1987) from Banaras Hindu University, Varanasi. He started his carrier in R&D department in Indian drugs & Pharmaceuticals Ltd. Hrishikesh & Gurgaon during the period 1976-81 and in Citadal Fine Pharmaceuticals Ltd. Madras (1981-1984). But to serve the pharmacy profession with academic carrier, he joined Department of Pharmaceutics Institute of Technology, Banaras Hindu University, Varansi as a lecturer (1984-1987). At the age of 34 years, he became the youngest principal in College of Pharmaceutical Sciences, Manipal from 1987 to till date.

Dr. Parasuraman Jaisankar

Dr. Parasuraman Jaisankar was born on 20th May 1966 in Vinayagapuram Village, Tiruvannamalai Dist. Tamil Nadu; and did his M.Sc. (Chemistry) degree from Presidency College, Madras University in 1989; Ph.D. degree from Jadavpur University, Kolkata in 1995. Dr. Jaisankar research career started by joining CSIR-Indian Institute of Chemical Biology (IICB), Kolkata as Scientist 'B' on 19th January 1990 and presently holding permanent position as "Chief Scientist and also heading the Organic and Medicinal Chemistry Department, Kolkata and he is also Professor of Chemical Sciences, AcSIR, New Delhi". Dr. Jaisankar is the Founder Joint Secretary; Chemical Biology Society of India. He is the Chief Editor/Editor of several peer reviewed international scientific journals.Dr. Jaisankar's main area of research includes development of lead molecules with spec ific biological activities such as anti-asthma, anti-cancer, anti-malarial and anti-microbial anti-inflammatory etc. activities by using both chiral and achiral organic and organo metallic catalysts including enzyme catalysts. He has published 90 research articles in reputed international journals and 6 international and national patents. He has guided 18 doctoral and 15 Master degree students for their dissertation to his credit. Presently, he is guiding four Ph.D and three master (M.S. Pharm) students for their thesis/ dissertation work.

Dr. Sougata Sinha Ray

Dr. Ray is the application Scientist, at GE Healthcare Lifescience, Kolkata Area, India. He completed his Bachelor (microbiology) in 2001, Master (biotechnology) in 2003 and Ph.D. (biochemistry) from Calcutta University in year 2008. He did the post doctoral research from Cleveland Clinic foundation under Dr. Dennis Stuehr on structure function of nitric oxide synthase. His areas of research interest are as follows, generation of different point, deletion mutant construct of human nitric oxide synthase, purification of those proteins by chromatographic techniques and their enzyme kinetics, biochemical and biophysical characterization.

ABSTRACT OF SPEAKERS

THE TULIP MANIA: 17th CENTURY AND BEYOND

Indraneel Das

Vice-Chairman, Indian Water Works Association, Kolkata

Since ages, community economy has suffered bubbles or crashes off and on. You could encase your life savings in the next bubble or contribute to the next crash. The history of bubbles & crashes can be traced back to the seventeenth century Tulip mania, a period in the Dutch Golden Age during which contract prices for bulbs of the recently introduced tulip reached extraordinarily high levels and then suddenly collapsed. This paper is an attempt to take you through the ages by highlighting the major economic bubbles and crashes, to help you avoid investing your hard-earned money in financial products with such risk potential. So, it is felt that we take the time to highlight what we can learn from these past tragedies. The lecture unveils the mysteries relating to the real culprits behind most market volatility. This brings us to one of the most debatable topic of the day, an emerging chapter in Entrepreneurship Development startups in India! One forecast states that the startup bubble in India will last till about 2016-17, by the time which the world would have witnessed the death of a few billion dollar startups due to excessive cash-burn. All these lead us to wonder if the startup phenomenon be extrapolated to entrepreneurship development in the field of natural products to develop a sustainable industry immune to the tragedies of bubbles and crashes.

SEPARATIONS BEYOND DOUBT - IN NATURAL PRODUCTS RESEARCH FOR NOVEL DRUG DISCOVERY

M. Sundar

Business Development Manager, Waters India, Bangalore

Natural Products begins with research for either novel drug discovery or a mechanism study. Drug discovery is the process of screening samples from naturally occurring sources - botanicals, microorganisms, and marine life - to uncover new chemical scaffolds with therapeutic benefit. Mechanism study scientists seek to improve understanding of herbal medicine and uncover the link of plants to disease targets and biomarkers. Scientists from both groups face many challenges that require rigorous analytical tools. One of the top needs is to deliver meaningful results more quickly. In the talk by Waters, the topic of Supercritical fluid extraction and Chromatography are covered. For the fact that most of the time the Chromatography work is done using normal phase fluids, Supercritical Fluid will be of immense help to provide an orthogonal insight for most efficient active ingredient extractions and also to do separations. After the extraction, the active ingredients needs to be screened for its purity, then identified without doubt and then quantified. The newer technologies of Ultra Performance Liquid Chromatography, in conjunction with QDa mass detection can be of immense help. The talk covers this subject and also to provide how a Drug can be characterised from its

novel development stage. The total workflow provided herewith may be practised and modified to suit to the natural products a scientist may develop to a drug.

HPTLC ANALYSIS IN DRUG DISCOVERY AND DEVELOPMENT

Subhendu Saha

Product Manager (South Asia) Anchrom, India

In a far reaching development, the US and Europe decided in the last few weeks to use “HPTLC fingerprint” as an identification test for “materials of botanical origin”. US Pharmacopeia has also published a SOP to perform HPTLC which has ended confusion with traditional TLC technique. HPTLC Fingerprint is a visual representation of the chemical composition of complex mixtures such as herbal extracts and formulations. Fingerprint method is simple, low cost, meets GLP requirements and produces irrefutable evidence about identity of botanicals. India has been following the fingerprint concept since long but without a proper SOP and a built-in system suitability test. High Performance Thin Layer Chromatography is the most/ widely used chromatography method for herbal analysis for drug discovery and development. It is simple, visible with low costs which are ideal traits for a “screening” technique. HPTLC generates for more information per “Chromatogram” than other methods. The information can be about UV absorbance, fluorescence, visible colours, images in short and long wave UV as well as visible light. Further information can be gleaned by using some of the 1100 known in-situ derivatization reagents. HPTLC has now been hyphenated to MS, NMR, IR, HPTLC plates are widely used for bio-autography studies and effect directed analysis. All these multilevel detections are possible due to separated spots are stationed on the plate. HPTLC will be very common place soon in the herbal and foods industry because of its “fingerprint” feature which has become mandatory.

LC-MS ANALYSIS IN DRUG DISCOVERY AND DEVELOPMENT

Sumit Mukherjee

Thermo Fisher Scientific India Pvt. Ltd., Product Manager, Life Science Mass Spectrometry

One of the goals of drug discovery & development is to generate accurate & precise data in the qualitative & quantitative analyses of discovery candidates in samples from studies that support their characterization & optimization as potential development candidates. The challenges stem from the need to detect & measure very low levels of analytes in complex matrices, full of potentially interfering endogenous or drug-related substances. Mass spectrometry (MS) is one of the most powerful analytical techniques today from the world of separation science. For the non-volatile/semi-volatile, thermolabile/ thermostable, ionizable molecules a hyphenated technique like LC-MS (liquid chromatography-mass spectrometry) offers unmatched selectivity, speed & sensitivity. Thermo Scientific TM is the MS leader as it developed numerous breakthroughs over the time that has defined mainstream MS. The Orbitrap TM mass analyzer has drawn attention due to its unsurpassed performance in terms of resolving power, mass accuracy, space charge capacity, linear dynamic range, footprint & cost. It is easy-to-use, rugged, essentially maintenance free, & requires calibration infrequently that results in higher productivity. This high-resolution accurate-mass (HR/AM) analyzer

is available standalone, or in hybrid form (with ion trap or transmission quadrupole), or in a fusion of all of them to help scientists dive into the enormous possibilities. Screen, identify, confirm & quantify (quanfirmation) traces of compounds in complex mixtures of natural products with high throughput & confidence using the Orbitrap TM mass spectrometers.

MASS SPECTROMETRY TECHNOLOGY TO DISCOVER DRUGS FROM NATURAL PRODUCTS

Uttam Karmakar

Product Manager, GC & GCMS, Thermo Fisher Scientific India Pvt. Ltd.

The key goal of drug discovery & development from Natural Products is to identify the components, take further confirmation of its presence & quantify the amount. The single Quadruple mass spectrometry technology is a helpful tool for Identification of unknowns and discovers the drugs from natural products or any other matrix but sometimes most challenging part is matrix elimination to get better chromatogram with good quality spectra. The sample preparation &cleanup are sometimes very critical part of the analysis to get better chromatogram. The components which require further confirmation and trace level of quantification by eliminating the complex matrix then Triple quadruple mass spectrometry is a powerful tool which will give confirmation of the molecules from complex matrix and also provide the quantification data of the molecules. Metabolite Profiling by using mass Spectrometry is one of the key goals to identify the Primary & Secondary metabolites and do the characterization and find the reasons of it. Secondary metabolites are organic compounds that are not directly involved in the normal growth, development, or reproduction of an organism but the secondary metabolites give information about drug & its development and the powerful thermo scientific mass spectrometry technology will help to discover the drugs from natural Products and also give more inputs of its development.

EXTRACTION TECHNOLOGIES IN NATURAL PRODUCT BASED RESEARCH

Ritesh Oza

Product Specialist, Kjeldahl & Extraction Solutions, BUCHI India Pvt. Ltd.

In traditional Indian medicine, natural products have a history of thousands years about its effect in the prevention and treatment of chronic diseases. Getting the goals of high purity single or groups of active substances from traditional herbal medicine ingredients, and subsequently its physical, chemical and biological activity has always been an important subject of study on modernization of traditional herbal medicine. The rapid development of modern analytical instruments enhancing throughput in sample preparation is the key to speed up the whole process steps. With an experience of 30 years in the field of laboratory sample preparation, BUCHI provides efficient, multi-channel system of extraction, purification and concentration, greatly improving the efficiency of sample pre-treatment. In the natural product solutions, BUCHI offers tailored solutions in the areas of natural products to accelerate your product development. Pressurised solvent extraction is a high temperature and high pressure solvent extraction of solid or semi-solid samples. This is an effective method to extract

active ingredients of natural products with less solvent, reduced extraction time and conducive to environmental protection. This system can be used for extraction of polar and non-polar components. It is widely used in the research of medicinal plants and herbs. Typical applications are the quality control of active compounds in natural or pharmaceutical products and the research of valuable compounds in plant materials.

STANDARDIZATION OF HERBAL PRODUCTS

N. Udupa

College of Pharmaceutical Sciences, Manipal

There are plenty of medicinal plants in India and they are rich resources for Medicinal and herbal products with rich therapeutic value for treating pain, inflammation, infection as well as cancer etc. The cost of treatment can be brought down by our medicinal plants provided they are tested and characterization and quality control aspects are set right.

MODERN NMR SPECTROSCOPIC TECHNIQUES DRIVING NATURAL PRODUCTS RESEARCH

Parasuarman Jaisankar

Chief Scientist & Head, Department of Organic and Medicinal Chemistry, CSIR-Indian Institute of Chemical Biology, 4, Raja S. C. Mullick Road, Jadavpur, Kolkata – 700032

Natural products have been a rich source of complex and structurally diverse chemical molecules. There are nearly 64% of the existing drugs molecules are either Natural Products or Natural Product inspired molecules. Characterization of these unknown chemical entities forms the basis of natural product chemistry. Various analytical and spectroscopic techniques like elemental analysis, melting points, NMR, Infrared spectroscopy, Raman spectroscopy, absorption spectroscopy, optical rotatory dispersion, circular dichroism, magnetic circular dichroism are used to elucidate the structure of molecules. Apart from these analytical data, a set of 2D - NMR experiments (HSQC, HMBC, COSY and NOESY) are necessary to elucidate the exact structure including stereochemistry of the unknown molecules. The talk will focus on the effective application of modern 2D-NMR techniques to deduce the structure of the natural products.

BIACORE: SURFACE PLASMON RESONANCE (SPR) TECHNIQUE FOR SCREENING AND KINETIC CHARACTERIZATION OF DRUGS

Sougata Sinha Ray

Application scientist at GE Healthcare Life science, Kolkata Area, India

Label-free interaction analysis is of increasing importance for scientists in the academic, pharmaceutical, biotechnology and diagnostic markets. Setting the performance benchmark, Biacore systems generate unique data on the interactions between proteins and other molecules, including small molecule drug candidates. During research, development and manufacture, these data give insights into protein functionality, elucidate disease mechanisms and play a key role in the critical decisions needed for efficient development and production of therapeutics

SCIENTIFIC PRESENTATION

3nd CONVENTION OF SOCIETY FOR ETHNOPHARMACOLOGY, INDIA (SFE-INDIA)

National Seminar

"Analytical Techniques for Drug Discovery & Development from Natural Products"

SFE/CONV/16/01

SELECTIVE INHIBITION OF *LEISHMANIA DONOVANI* BY SEMI-PURIFIED FRACTION OF WILD MUSHROOM *GRIFOLA FRONDOSA*

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Leishmania is the ninth largest infectious disease and is highly endemic in the Indian subcontinent and East Africa. An estimated 200000 to 400000 new cases of VL occur worldwide each year. Over 90% of new cases occur in 6 countries: India, Nepal, Bangladesh, Brazil, Ethiopia, and Sudan. A very limited approach has been made till date to establish the mushrooms or mushroom derived metabolites as therapeutic agent against *Leishmania* infection. As few as only eight reports, including four from our group, have been documented regarding the anti-leishmanial effect of extracts or active constituents of wild mushrooms till 2015. In continuation with our line of investigations on anti-leishmanial leads, we claimed that a semi-purified fraction (designated as GFa) of wild mushroom *Grifola frondosa* significantly inhibited the survival of three different species of *Leishmania* parasite (*L. donovani, L. tropica & L. major*) *in vitro*. The semi-purified fraction of *Grifola frondosa* (IC_{50}: 20 µg/ml) was found more effective against *Leishmania donovani* promastigotes in comparison to crude extract of *Grifola frondosa* (IC_{50}: 100 µg/ml). GFa interfered in cell cycle progression, lipid biosynthesis, altering the morphology and inducing the apoptosis in promastigotes. More interestingly, the 50% inhibitory concentration of GFa was estimated much lower against the intracellular amastigotes (IC_{50}: 2.5 µg/mL), the pathogenic form of the parasite in mammalian host in comparison to promastigotes (IC_{50}: 20 µg/ml) and induced the pro-inflammatory cytokines in infected macrophages. GFa was also found noticeably non-toxic towards murine splenocytes. Gas-chromatography analysis revealed that 1,2-Benzenedicarboxylic acid, bis(2-methylpropyl) ester, 1,2-Benzenedicarboxylic acid, butyl 2-methylpropyl ester, 1,2-Benzenedicarboxylic acid, dibutyl ester, Phthalic acid, isobutyl 2-Pentyl ester, Pathalic acid ,butyl 2-Pentyl ester, Pathalic acid, butyl 2-ethyl hexyl ester are the primary constituents of active semi-purified fraction of *Grifola frondosa.* The findings of the present study established that the constituents of *G. frondosa* might be an interesting lead for the exploration of anti-leishmanial molecules.

SFE/CONV/16/02

NEEDLE FREE INJECTION

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The aim of this study is to introduce various medicines into patient without piercing the skin with a conventional needle. Needle free injection technology was uses force generated by a compressed gas. When administered through the skin, ultrafine stream of fluid penetrate the skin, delivering the vaccine in a fraction of a second to the skin, subcutaneous tissue, and underlying shallow muscle. This technology is not only beneficial for the pharma industry but developing world too find it highly useful in mass immunization programs, by passing the chances of needle stick injuries and avoiding other complications including those arising due to multiple use of single needle. Needle-free delivery is done conveniently both for solid and liquids. Needle-free injection systems are typically made up of three components including an injection device, disposable needle free syringe and air cartridge. Various needle free injectors are available in the market like Biojector, Vitajet, Iject etc. These formulations are designed for better acceptability and patient convenience. These devices were used extensively to inoculate against infectious diseases and were later applied more generally in large scale vaccination program. Today, they are steadily developing technology that promises to make the administration of medicine more efficiently and less painfully.

SFE/CONV/16/03

EMERGING ROLE OF BIOAUTOGRAPHIC TECHNIQUES IN HERBAL DRUG STANDARDISATION

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Traditional medicine has been defined by the World Health Organization (WHO) as the sum total of knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures, that are used to maintain health, as well as to prevent, diagnose, improve or treat physical and mental illnesses and handed down from one generation to another. Standardisation techniques of these products and evaluation of their safety and effectiveness is the current area of thrust in many countries of the world. For the purpose of this present review study, bibliographical literature databases and abstracting sites such as PubMed, Taylor and Francis and Cochrane Reviews were searched comprehensively ranging from 2009-2016. Bioautography represents one such emerging scientific technique adopted for the specific isolation of active molecules using chromatographic techniques followed by thorough biological evaluation of the selected lead compounds. They afford a quick, convenient way of evaluation of the bioactive lead compounds from plant extracts. The bioautographic techniques follow the broad principle of identification of the lead

compound from the natural product which is followed by subsequent biological evaluation. In addition to the other sophisticated techniques of HPLC, HPTLC, UPLC, GC-MS, LC-MS, FTIR, NMR, Mass spectrometry; metabolomic studies and bioautography techniques have found an emerging role in the crucial herbal drug standardization process. These aforesaid techniques have been used for the detection of medicinal products ranging from anti microbials to antidiabetics and have a potential in ensuring safe, effective and quality natural products from indigenous natural sources and thereby promoting the cause of evidence-based pharmacotherapy.

SFE/CONV/16/04

ETHNOPHARMACOLOGICAL ASPECTS OF *CINNAMOMUM VENUM*

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Cinnamon is a tree, whose bark is used. Generally Cinnamon is used in sweet and savory dishes. This is one of the spices used in Garam Masala. Cinnamon is used in food for giving it a special and delicious scent. Cinnamon helps to increase the body temperature, which helps to maintain our physical weakness. In winter old people face problem due to cold weather and decrease in body temperature. The use of cinnamon helps them to tackle this problem. Lady members of our family naturally face menstrual cycles problem at a certain age. During this period they go through many physical troubles such as pain, fever, vomiting and frequent urination. While doing urine it does not happen. Allopathy doctors suggest that the medicine has to be taken for the whole life. There is no medicine to cure the problems completely from the root. In this situation this cinnamon is very helpful and its results are remarkable. The doctors have failed here. But this cinnamon which is bark of a tree has done a miracle and helped people to lead a healthy life. The medicine prescribed by the doctors has to be taken for the whole life. But this cinnamon has no side effects and the patients don't have to take the medicine for the whole life.

SFE/CONV/16/05

A REVIEW ON HERBAL DRUG STANDARDIZATION

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There is increasing awareness in today's medical practice and general acceptability of the use of herbal drugs. Over 80% of the world population depends on herbal medicines and product for healthy living. This rise in the use of herbal product has also given rise to various forms of misuse and adulteration of the products leading to disappointment of consumers' and manufacturers' and in some cases fatal consequences. This review seeks to inform stakeholders in herbal medicine on the need to establish quality parameters for collection, handling, processing and production of herbal medicine as well as employ such parameters in ensuring the safety of the global herbal market. The processes of good quality assurance and standardization of herbal medicines and products were also discussed.

SFE/CONV/16/06

ISOLATION OF SEED MEAL BIOACTIVES COMPONENT AND ITS PROSPECTIVE APPLICATIONS

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Oil seeds meals are source of various bioactives. The seed residue obtained after extraction of oil is rich source of protein, dietary fibers and micronutrients like polar antioxidants. Efficient isolation of each component from seed meals append new value to the seed meals which conventionally either dumped or used as cattle feed. This study aims to explore some new utilisation pattern for seed bioactives as potential nutraceutical. Sesame (*Sesamum indicum* L.) seed is a conventional oil seed which is commercial utilized for preparation of sesame oil. This study aims to highlight isolation of micronutrients and synthesis of bioactive peptides from sesame meal using membrane based separation process principle with detail evaluation of the effectiveness of the respective products *in vitro*. Micronutrients are evaluated for their antioxidant properties and the bioactive peptide fractions are evaluated for their antioxidant and antimicrobial activity. The solvent extract of sesame meal was also studied for green synthesis of nano silver which having superior bioactivities in drug delivery system. Results have ascertained the effectiveness of the isolated components in the *in vitro* applications. The overall findings have exemplified the diverse application potency of sesame seed bioactives in food and pharmaceutical industries. However, the data presented in present study was done with simulated media and further studies for real application in food and pharmaceutical systems are required before making decisive statement.

SFE/CONV/16/07

HEPATOPROTECTIVE ACTIVITY AND NUTRITIONAL ASPECT OF OKRA (*HIBISCUS ESCULENTUS*): AN OVERVIEW

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Okra (*Hibiscus esculentus*) is an important vegetable crop cultivated in tropical, subtropical and warm temperate regions around the world. Besides its nutritious food value, in Asian and African traditional medicine, okra fruits are served as mucilaginous food as a dietary meal in the treatment of gastric irritations & inflammative diseases. According to Indian Ethno medicine, infusion of the fruit (okra) mucilage has been used to treat dysentery & diarrhoea in acute inflammation and irritation of the stomach. The purpose of this article is to focus on potent hepatoprotective activity of Okra. Ethanolic extract of okra root possesses in-vitro free radical scavenging activity which was well comparable with Silymarin. Okra contains flavanoids that may have anti-oxidant and hepatoprotective activities. The different studies further suggest that phenolic compounds of the roots *H.esculentus* provide a good source of anti-oxidants that could

offer potential protective effects against lipid oxidation and which could be exploited to make a hepatoprotective formulation. It also used to treat bowels and kidneys catarrhal infections, ardour urinae, dysuria, diuretic, plasma replacement and gonorrhea. Okra pods are mucilaginous, low in calories but nutritionally rich and a good source of edible fibre. Okra pod contains important bioactive compounds such as carotene, folic acid, thiamine, riboflavin, niacin, vit.C, oxalic acid and amino acid.

SFE/CONV/16/08

GELATIN NANOCARRIER, A CONTROLLED RELEASE DELIVERY FOR ANTI-VIRAL THERAPY: VALACYCLOVIR

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Novel biodegradable and biocompatible gelatin cross-linking based valacyclovir nanoparticles have been successfully prepared by two-step desolvation method using acetone as desolvating and glutaraldehyde as cross-linking agent along with a number of variables. FESEM images elucidate the homogenous, smooth and spherical nanoparticles of size 110 nm diameter with 0.046 PI. The highest entrapment efficacy of valacyclovir in gelatin nanoparticles was 89% and the *in vitro* release of valacyclovir about 91% at 48 h were found. The FTIR study confirmed the absence of drug-excipients interactions. DSC spectra and XRD thermogram confirmed the stability and amorphous configuration of valacyclovir in gelatin matrix respectively. *In vivo* study was carried out with rabbit using a rapid, simple and sensitive HPLC method having reverse phase C18 analytical column with PDA detector. The T_{max} values of optimized formulation and marketed drug (Valcivir) were found 5 h and 2 h respectively in rabbit plasma. The mean AUC_{0-24} of optimized formulation was found 50% higher than that of Valcivir. This study revealed that valacyclovir loaded gelatin nanoparticles is not only simple and cost efficient delivery but also offers a promising controlled release with anti-viral therapy through oral administration.

SFE/CONV/16/09

ETHNOBOTANICAL USAGE AND PHYTOCHEMICAL SCREENING OF SATAVARI (*ASPARAGUS RACEMOSUS* WILLD.).

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Satavari (*Asparagus racemosus*) is an herb of medicinal importance found in Indian subcontinent and traditionally used by ethnic community to treat multiple ailments. It has roughly a hundred tuberous roots (Satamul) with tapering at both ends which are mainly used in indigenous medicine. Satavari was identified as flagship species for conservation out of 57 species identified for conservation of medicinal plants in Mayurjharna forest of Paschim Medinipur district. The traditional usage of Satavari roots

were captured through interaction with the local tribes. The roots were collected from the wild and a preliminary phytochemical analysis was conducted in methanolic, aquous and alchoholic extraction by following standard methodology. The local tribes reported that the most common use of roots were to treat blood dysentery and bloody urine. They also use the leaves to treat night blindness and rhizomes to treat piles. The preliminary phytochemical screening reveals that the roots of Satavari contains glycosides as responded in methanolic extraction, carbohydrate in both methanolic and aqueous extraction, steroids and triterpenoids in all methanolic, aqueous and alcoholic extraction.

SFE/CONV/16/10

DIFFERENTIAL TARGETING EFFICACY OF COMBINED DOSES OF EUGENOL AND DOXORUBICIN AGAINST BREAST CANCER AND HEALTHY CELLS: IMPACT OF SURFACE POTENTIAL

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Cancer continues to be one of the major leading causes of death worldwide. Lack of specificity of conventional and traditional chemotherapeutics produces a deadly change in anticancer therapy. Despite remarkable achievements in the treatment of breast cancer, some obstacles still remain. Now-a-days phytotherapy has been considered as most resourceful tool for fighting against various form of cancer. In the present study, drug combinations using Eugenol and Doxorubicin was formulated and their synergistic efficacy was tested aginst breast cancer cells (MCF-7). The combined doses of Eugenol+DOX (50 µg/ml + 0.50µg/ml) produced high anticancer efficacy along with low toxicity compared with only DOX. The anticancer activity of this drug combination was found through generation of reactive oxygen (ROS) and reactive nitrogen species (NO) which disrupted cellular metabolic homeostasis in MCF-7 cells. Loss of membrane integrity along with severe DNA damage were found to be the most effective phemonemon in breast cancer cell death. The differential surface charge of cancer cells, lymphocytes makes this selectivity in therapeutic efficacy of DOX and Eugenol. The comparatively more difference of zeta potential between MCF-7 and Eugenol+DOX falicilated the entry of both compounds with in MCF-7 cells while restriction of the entry of DOX in normal lymphocyte was noted due to hydrophobic nature of eugenol over the cell surface. The summative effects of differential drug targeting specifically killed the MCF-& cells through induction of apoptosis while producing no toxic effects towards healthy cells. Thus, this study may be futuristic and give rise to resourceful protocol for formulation drug polices in breast cancer therapy.

SFE/CONV/16/11

EFFECT OF 2,4 – DNPH ON MALE REPRODUCTIVE SYSTEM OF RAT AND IT'S AMELIORATION BY ETHANOLIC EXTRACT OF *JUSSIAEA REPENS* L

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In hematological studies, 2,4-DNPH is commonly used to develop artificial anaemia in experimental animals. It is reported to have toxicity including reproductive toxicity but is not so supportive. So we studied the effect of 2,4–DNPH in adult male rats and also it's amelioration by ethanolic extract of *Jussiaea repens* L. (JR) a medicinal plant, known as 'Keshardam' in Bengal. In male rats 2,4–DNPH was infused at a dose of 2mg/100gm b.wt./day i.p. for seven days. Then one group was killed, one group was kept as DNPH withdrawal and other one withdrawal group was gavaged ethanolic extract of JR at a dose of 20mg/100gm b.wt./day for next fourteen days. Simultaneously one group was maintained as JR treated alone. Six animals were taken in each group. The results revealed the significant rise of testicular weight, serum level of ALKP, SGOT ,SGPT, total protein, cholesterol, HDL , LDL and LDL-VLDL ratio in DNPH treated rats, which was partially recovered in withdrawal and extract supplemented groups. But weights of accessory sex glands, serum TG and VLDL showed no change at all. The sperm count was significantly reduced in DNPH treated group than control but was insignificantly higher in other groups than DNPH treated group. Where the sperm abnormalities were significantly higher in DNPH treated group. Sperm abnormalities were acrosomal distortion, head less, bent neck, bent tail, bubbled body etc. which was predominant in most treated groups. The SEM study revealed the moderate necrosis in seminiferousn tubules with reduced spermatozoa, infracted epididymal epithelial lining with detachment of basal lamina in DNPH treated rats. Such abnormalities were partially recovered in withdrawal and extract supplemented rats. So, the ethanolic extract of *Jussiaea repens* at a maintained dose and duration can be applied further in remedy of such type of chemical toxicity.

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DEVELOPMENT OF GENISTEIN LOADED NANOEMULSION BASED NANO-GEL FOR ENHANCEMENT OF THERAPEUTIC EFFICACY AND BIOAVAILABILITY THROUGH TRANSDERMAL DELIVERY

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Genistein (GN) is a potent nutraceutical bioactive compound and famous for several beneficial health effects including antioxidant and photoprotection activities. However, their therapeutic efficacy is limited due to poor solubility and hence low bioavailability. The aim of the present study was to develop a GN loaded nanoemulsion based nano-

gel in order to ensure its enhanced bioavailability and improved photoprotection efficacy against UVA induced oxidative stress through transdermal route. The optimized nanoemulsion (GN-NE2) was composed of oil-labrafac Lipophile WL1349, water and S_{mix} (surfactant-labrasol and co-surfactant-PEG 400) at an appropriate ratio (15:30:55 % w/w) respectively. Genistein loaded nanoemulsions were characterized through Zetasizer, TEM, UV-spectrophotometry, HPTLC, FTIR and stability studies. *Ex vivo* skin permeation, *in vivo* bioavailability and *in vivo* UVA protection efficacy of GN-NE2 based nano-gel (GN-NG2) were studied through the rat skin. The bioavailability of pure GN and nano-gel, GN-NG2 were studied at dose of 20 mg/kg in rats. GN-NG2 exhibited improved pharmacokinetics (C_{max}: 95.06 ± 4.09 $ngmL^{-1}$; $t_{1/2}$el: 3.81 ± 0.25 h) and % relative bioavailability (352.58) in comparison with pure GN. Nano-gel significantly (P < 0.01) released the drug content in a sustained manner to maintain the plasma concentration for longer periods (24 h). GN-NG2 exhibited improved UVA protection efficacy and antioxidant potential due to its enhanced skin permeability as well as bioavailability. Thus, genistein based nano-gel offers an effective strategy for minimizing UVA-mediated oxidative stress in the skin tissues.

SFE/CONV/16/13

SUCCESSFUL THERAPY OF MURINE VISCERAL LEISHMANIASIS WITH ASTRAKURKURONE, AN ISOLATED MUSHROOM CONSTITUENT, INVOLVES UP-REGULATION OF TLR9 AND PROTECTIVE CELL-MEDIATED IMMUNITY

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In continuation with our line of investigations for novel target specific antileishmanial leads, earlier we revealed that astrakurkurone selectively elevated the ROS leading to mitochondrial dysfunction mediated apoptosis in promastigotes. To further strengthen our investigation on astrakurkurone as anti-leishmanial lead, we found that the *in vivo* administration could reduce the parasite load both in spleen and liver of *L. donovani*-infected BALB/c mice with concomitant induction of CD4+IFN-γ+ and CD4+IL-17+ T cell mediated immunity. The molecule also induced the expression of co-stimulatory molecules in bone marrow derived dendritic cells and infected-macrophages *in vitro* with simultaneous release of pro-inflammatory cytokines. Interestingly, astrakurkurone was found to induce the expression of TLR9 in *L. donovani*-infected macrophages. Pre-treatment with bafilomycin A1 (TLR9 antagonist) alone and in addition with astrakurkurone reduced the parasite killing, suggesting the involvement of TLR9 which can be further strengthened by the fact that CpG ODN (TLR9 agonist) enhanced the

anti-amastigote potential of astrakurkurone. A closer view of receptor-ligand interactions of TLR9-astrakurkurone as revealed from docking studies indicated that the best binding energy pose of astrakurkurone is present inside a loop comprising residues 99-111 of mouse TRL9. This region of TLR9 is the leucine rich repeat 2 (LRR2) segment. Astrakurkurone could also induce the proliferation of CD4+ T cells of active VL patients, *in vitro*. We may claim that this is the first convulsive report of its kind to establish mushroom derived astrakurkurone as a leishmanicidal molecule whose administration not only curbs the parasite infection, but also enhances the immune effectiveness of host cells. This work was supported by Indian Council of Medical Research, Government of India (Project Ref: Tribal/56/2010-ECD-II, dated, 04.01.2012). AD is the recipient of DST-WOS B Fellowship, Govt. of India (Ref. SSD/SS/029/2010 dated, 23.08.2011).

SFE/CONV/16/14

LC-MS/MS METABOLOMICS GUIDED NETWORK PHARMACOLOGY ANALYSIS OF *LAGENARIA SICERARIA*

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The drug discovery is shifting towards a systems-level poly-pharmacology approach to combat situations such as lack of efficacy and resistance of single-targeted compounds. Elucidation of the spectrum of potential interactions between these phyto-metabolites with their cellular targets facilitates exploring the therapeutic application of the natural products. This presents work explores a metabolomics guided network pharmacology approach to understand the target, disease and functional profile of the common food plant *Lagenaria siceraria* (LS) of the family Cucurbitaceae. Liquid Chromatography – Mass spectrometry QTOF analysis of the methanolic extract of LS revealed presence of list of phenolic glycosides and phenolic acids with good fragmentation pattern. The ChemBioDraw was used to make 3D chemical structural formulas of the ingredients, which were saved in SDF format. These chemical structural formulas were taken into PharmMapper for pharmacophore based matching analysis across various human targets listed in Therapeutic target Database (TTD). The potential targets were chosen by the rank of matching score for input into Universal Protein Database and Molecule Annotation System to obtain target proteins and related pathways. Protein –protein interaction analysis was done into String 9.0. Finally, Cytoscape 3.0 was used to build networks and analyze some significant nodes with PPI information. The analysis found about various targets interacting with a single compound. This effort might open new possibilities to know mechanism of action of natural products like *Lagenaria siceraria* and also help in the discovery of new leads and targets for various diseases.

SFE/CONV/16/15

ASTRAKURKURONE, A NOVEL TRITERPENE ISOLATED FROM INDIAN MUSHROOM *ASTRAEUS HYGROMETRICUS*, INDUCES MITOCHONDRIAL DYSFUNCTION AND ROS DEPENDENT DEATH IN *LEISHMANIA DONOVANI*

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Leishmaniasis is endemic in more than 80 countries and 350 million people are considered to be at risk. There is an urgent need for searching efficient, target specific antileishmanial molecule from indigenous natural resources to add in the pool of drug discovery against *L. donovani* as the current chemotherapeutics have been proven not to be so prudent due to emergence of resistance and severe toxicity. With the aim to find out the innovative leads against visceral leishmaniasis, in our previous report we have reported that astrakurkurone, a novel triterpene, isolated from indigenous mushroom *Astraeus hygrometricus*, has a significant anti-leishmanial role against *Leishmania donovani* promastigotes. In this study, we attempted to answer three major questions. At first, the nature of astrakurkurone-induced cell death. Second, the key intracellular factors involved in astrakurkurone-induced death and the third, whether this death occurs via any death machinery in *L. donovani* promastigotes. Astrakurkurone could inhibit the proliferation of *L. donovani* (IC50: 37.5 µg/ml) and induced reactive oxygen species (ROS)-dependent and caspase-independent mitochondrial dysfunction leading to apoptotic death in promastigotes. Astrakurkurone could induce the ROS, depolarized the mitochondrial membrane potential (MMP), down-regulated reduced glutathione (GSH) and enhanced the lipid peroxidation in promastigotes as estimated by flow cytometer. It could also enhance the level of Cytochrome c in cytosolic fraction in promastigotes. Interestingly, the alterations of all parameters in promastigotes could be restored by pre-incubation with NAC and GSH, but not with protease and caspase inhibitors. NAC, an aminothiol, is a unique compound that can raise intracellular GSH levels by acting as a synthetic precursor to intracellular cysteine and GSH and thereby protect cells from adverse effects of ROS. The involvement of ROS in astrakurkurone-induced death has been further confirmed by detection of nuclear damage and chromatin condensation in *L. donovani* promastigotes. It is worth mentioning that astrakurkurone could also inhibit the intracellular amastigotes, the pathogenic stage in mammalian host by inducing ROS in macrophages. Fascinatingly, the 50% inhibitory concentration of astrakurkurone against the amastigotes (2.5 mg/ml) has been found much lower than that of promastigotes. In agreement with our findings, we may place

our argument that this in depth investigation is an attempt and is the first of its kind to establish Indian mushrooms as the representatives which can be exploited as the source of new antileishmanial leads.

SFE/CONV/16/16

SCREENING AND EVALUATION OF *CEDRUS DEODARA* FOR ANTI-LEISHMANIAL ACTIVITY

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The existing anti-leishmanial drugs for cure and mitigation of Kala-azar are very limited. Most of the available drugs are either toxic or less effective to become cause of disease relapse or conversion of post kala-azar dermal leishmaniasis in some cases even after full treatment of the patients. These problems made the mind towards the herbal medicine for leishmaniasis. However a series of herbal extracts has already been claimed for anti-leishmanial activities since two decades and more but herb does not mean always safe. Therefore in the present study extracts of *Cedrus deodara,* an Indian medicinal plant, has been characterized and bio-assay tested with immunomodulation for anti-leishmanial activities. Extracts of *Cedrus deodara* were prepared by soxhlation process using different such as benzene, chloroform, ethyl acetate and methanol. The *Leishmanaia* parasites were maintained in the laboratory for the bioassay. Immunomodulatory activities and assessed by FACS calibur. Active fraction of extract was standardised with linalool as a marker compound through reverse phase high performance liquid chromatography (RP-HPLC) method. Benzene fraction and cedarwood oil showed strong anti-leishmanial activities within a dose regimen ~25-200µg/ml culture with non significant haemolytic activities against the host cells. Linalool was found to be 1.29% in the effective extract of *Cedrus* deodara. Anti-leishmanial activities of *Cedrus deodara* extract indicates a new safe therapeutic for the treatment of *visceral leishmaniasis*.

SFE/CONV/16/17

ANTIPROLIFERATIVE EFFICACY OF GOLD NANO PARTICLES (AUNPS) USING INDOLE-3-CARBINOL AGAINST EHRLICH ASCITES CARCINOMA CELL

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Gold nanoparticles (AuNPs) are important class of nanoparticles for a wide range of therapeutic and biomedical applications. *Indole-3-carbinol is abundant in cruciferous*

vegetables, such as mustard plants, cabbage, and cauliflower. Gold nanoparticles have potential applications in biomedicine, but one of the important concerns is about their safety. Therefore, the present study has been designed to characterize synthesized gold nanoparticles (AuNPI3Cs) using indole-3-carbinol and to investigate its cytotoxic and antiproliferative activities against Ehrlich ascites carcinoma (EAC) cell by the induction of apoptosis. AuNPI3C was characterized by FTIR analysis, SEM and DLS. The cytotoxicity of AuNPI3C was examined by MTT assay. Chromatin condensation using PI staining, nitric oxide (NO) generation and release level were performed to find out the apoptosis mediated death of treated cells. The results showed that AuNPI3C produce a significant antiproliferative effect on EAC cells at IC_{50} of 5µg/ml. The NO release and NO generation level were decreased significantly ($p<0.05$) and induction of chromatin condensation and apoptosis occurred in AuNPI3C-treated EAC cells. Present study suggests that AuNPI3C has potent anticancer efficacy against EAC cell.

SFE/CONV/16/18

HEPATOPROTECTIVE ACTIVITY OF *ANDROGRAPHIS PANICULATA*: A NETWORK PHARMACOLOGY APPROACH

Sayan Biswas, Akansha Sharma, Subhadip Banerjee, Joydeb Chanda, Logesh Rajan, Pritorthi Bhattacharya, Amit Kar, Debayan Goswami, Pulok K Mukherjee

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Andrographis paniculata (Burm.f.) Nees (Family: Acanthaceae) is one of the most popular medicinal plants used in Indian system of medicine for the treatment of variety of diseases such as cancer, diabetes, high blood pressure, flatulence, colic, dysentery, dyspepsia etc. for centuries. It is made of several phytochemicals with diverse pharmacological properties. Network pharmacology is a promising new approach for identification of novel lead compounds from natural sources. About 135 chemical constituents structure was downloaded from UNPD (Universal Natural Product Database) in SDF format and put in BindingDB to find the similarity in structure and inhibition potential of various targets. The structures having similarity score of more than 0.7 was selected for further evaluation. The target proteins involved in various diseases were then searched from Therapeutic Target Database (TTD). This dataset was then compiled in MS Excel and the protein disease network was constructed using freely available software Cytoscape 3.3.0. Significant interactions were then searched by MCODE plug-in module. This led to identification of 32 compounds directly or indirectly related to liver functioning. This included andrographidin C,D,E, ferulic acid, caffeic acid, andrographiside, andrographoside etc. This shows the synergistic mechanism of action of these set of compounds are involved in promoting hepatoprotective activity. This could lead to discovery of potent lead compounds from *Andrographis paniculata* having hepatoprotective activity.

SFE/CONV/16/19

THE ANTIOXIDANT POTENTIAL OF *CALOTROPIS GIGANTEA LATEX* IN DALTON'S ASCITES LYMPHOMA (DLA) BEARING MICE

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Calotropis gigantea of family apocynaceae is traditionally used in ayurveda for its anti-helminthic, anti-pyretic, and anti-malarial activities. It has also been studied widely for its anticancer potential. The aim of the present study was to evaluate the antioxidant role of *Calotropis gigantea* latex in Dalton's ascites lymphoma (DLA) bearing mice. The ethanol and water extracts of *Calotropis gigantea* latex (EECGL and WECGL respectively) were administered at a 100 and 200 mg/kg body wt for 14 days, 24 h after the inoculation of tumor cell line. Hepatic and renal malon-di-aldehyde (MDA), reduced glutathione (GSH) and the activities of glutathione peroxidase (GP_X), glutathione-s-transferase (GST), catalase (CAT), superoxide dismutase (SOD) were measured. Treatment with EECGL and WECGL significantly reduced the elevated levels of MDA and increased the reduced levels of GSH, GPx, GST, CAT and SOD activities in DAL induced mice compared to those of DAL control group animals. The results conclude that the ethanol and water extract of *Calotropis gigantea* latex possess significant antioxidant effects in DLA bearing mice.

SFE/CONV/16/20

VALIDATION OF FERULIC ACID IN FOUR DIFFERENT INDIAN ANANAS COMOSUS CULTIVARS THROUGH RP-HPLC

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A comparative estimation of ferulic acid in four varieties of pineapple cultivars *Ananas comosus* var Smooth Cayenne (ACSC), Ananas comosus var Giant Kew (ACGK), Ananas comosus var Charlotte Rothschild (ACCR) and Ananas comosus var Kallara Local (ACKL) through RP-HPLC method. The HPLC method was carried out in reverse phase C18 column using methanol and water (1% glacial acetic acid) as mobile phase (35:65 v/v), at a flow rate of 1ml/min. The λmax was detected at 254 nm. The calibration curves were linear in the concentration range of 1-80 µg/ml. The calibration curves were linear in the concentration range of 1-100 µg/ml. The comparative study revealed that the ferulic acid content was highest (1.05% w/w) in ACCR, whereas ACSC variety contains the lowest (0.81% w/w). The % RSD of precision and recovery was found to be < 2%, which confirms high repeatability of the method. The outcomes of our study elucidated that the current method can be commercialized at industrial level for ensuring the quality of cultivars of Ananas comosus used as raw material.

SFE/CONV/16/21

BIOACTIVE MOLECULE LYCOPENE OBTAINED FROM WATER MELON ACT AS POTENTIAL CYTOTOXIC AGENT AGAINST HUMAN COLORECTAL ADENOCARCINOMA CELL HT-29

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The main aim and objective of my present research work was the isolation and characterization of carotenoid lycopene from ethanolic extract of Watermelon (EEWM) and evaluation of *in vitro* cytotoxic activity against HT-29 cell line. The isolation and characterization of lycopene from EEWM was carried out by UV, IR, ^{1}H-NMR, ^{13}C-NMR, Mass spectrometry and HPLC. The cytotoxic potentiality of EEWM was performed by SRB assay against human colorectal adenocarcinoma HT29 cell line. The results obtained from the *in-vitro* studies displayed that the ethanolic extracts of fruit of *Citrullus vulgaris* L. (EEWM) possessed a very good cytotoxic activity against human colorectal adenocarcinoma HT-29 cell line. From the present experimental data it had been concluded that EEWM was exhibiting the potential capability to inhibit the growth of cancer cell when compared with standard drug 5-FU and the cell growth inhibition of EEWM was found to be the highest 92.95% at 10 µg (IC_{50} = 2.7 µg/mL). The IC_{50} value of standard drug 5-FU was found to be 1.399 µg/mL with 95.97 % growth inhibition at concentration 75 µg/mL.

SFE/CONV/16/22

ASSESSMENT OF MEMBRANE DAMAGE USING DYNAMIC LIGHT SCATTERING (DLS) TECHNOLOGY AND FLUORESCENCE ANALYSIS

Suman Halder[1], Kirendra Kumar Yadav[1], Ratul Sarkar[1], Amit Maity[1], Sanmoy Karmakar[1], Saubhik Haldar[2], Tuhinadri Sen[1]

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The correlation between cell surface permeability and zeta potential can be applied to study the membrane damaging effect of drugs. Here, both synthetic cationic agents and natural products were used for inducing membrane damage and the alteration in the membrane architecture was apparent from the alteration of Zeta potential and subsequently the same was correlated to the changes in the cell membrane permeability using fluorescence analysis. Thus, from this study, we can suggest that alteration of membrane permeability (as observed with different cytotoxic drugs) may be predicted by utilising the data obtained from dynamic light scattering (DLS) technology, using Zeta potential and polydispersity index (PDI) as a marker of cell damage.

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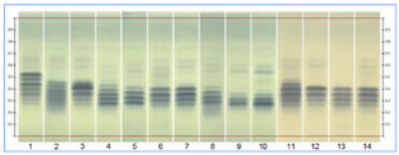

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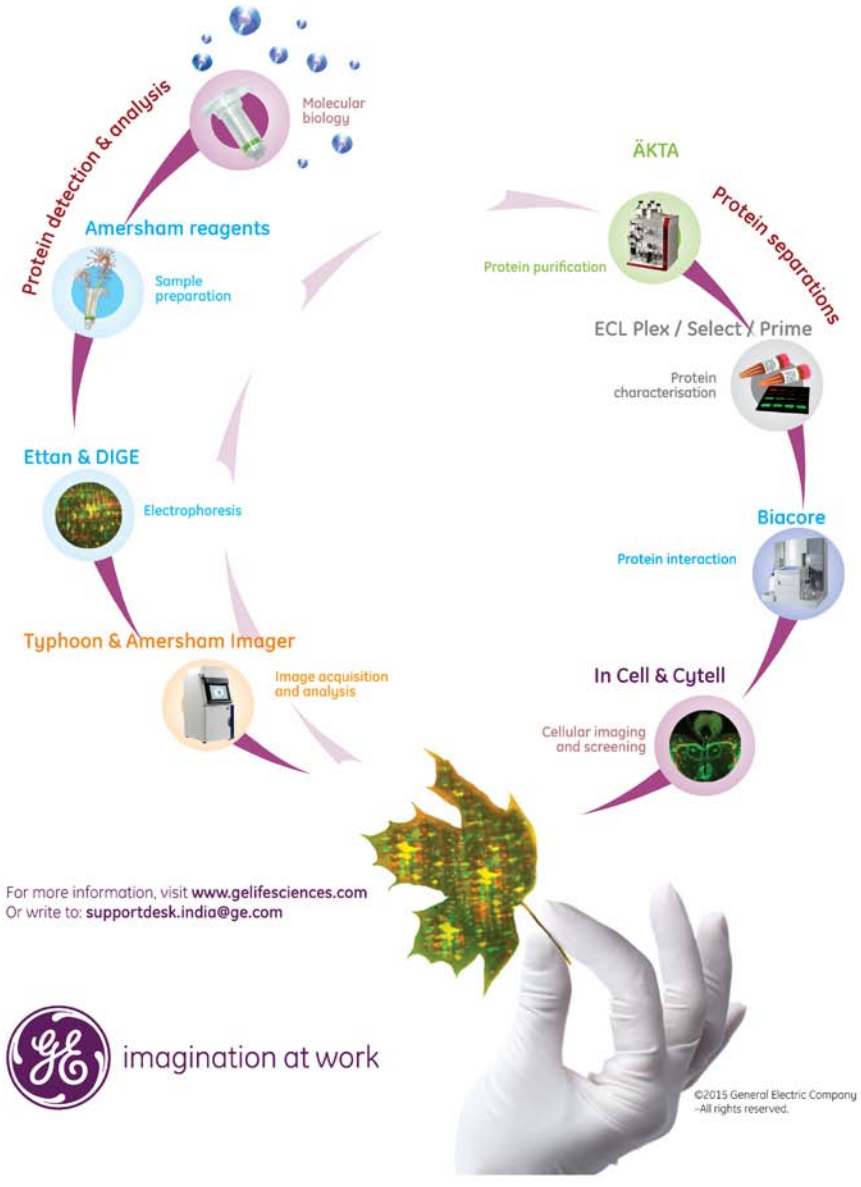

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