

ABOUT THE CONFERENCE

A Two-day National Conference will be organised, jointly by **Indian Science Congress Association, Kolkata Chapter** and **Surendranath College** (formerly Ripon College, established in 1884), Kolkata, West Bengal, on 20th & 21st January, 2020 at Surendranath Banerjea Auditorium. The event will continue its tradition of delivering premier content to the scientific community with the theme **"Science and Technology: Rural Development"**. The conference will look at the current developing trends in the field of science and technology and will map out necessary direction along with special focus on rural development. This will bring encouragement and opportunity, especially for the young minds, to engage in discussion and cross-border learning. The conference wishes to pioneer a way to a must-attend event for academicians, scholars, researchers and students in the field of science and technology.

IMPORTANT DATES

Last date of online registration:
16th January, 2020

Last date of abstract submission:
6th January, 2020

Conference dates:
20th & 21st January, 2020

ABOUT KOLKATA

Kolkata, the City of Joy, carries the legacy of Sir Ronald Ross, Sir C. V. Raman, Sir J. C. Bose, Dr. S. N. Bose, Acharya Sir P. C. Ray, Dr. Meghnad Saha, Dr. P. C. Mahalanobis and many other notable scientists who have contributed significantly to the present knowledge of Science and Technology. Kolkata remains as the epicenter of excellent students and research scholars not only in India but also for the entire world. The rich cultural heritage of Kolkata has many avenues to charm you. Notable places of interest around the city : Victoria Memorial Hall, Indian Museum, AJC Bose Indian Botanical Garden, Sunderban Biosphere Reserve etc.

Weather in January: Pleasant with Min and Max temp: 13° C and 25° C respectively. No precipitation.

To

From

The Chairperson,
Organising Committee

SURENDRANATH COLLEGE
(ESTABLISHED IN 1884)

24/2 M.G. Road
Kolkata - 700 009

www.surendranathcollege.org

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Conference Webpage

www.sncseminarworkshop.wixsite.com/isca2020

Two-day National Conference
on

**SCIENCE AND TECHNOLOGY:
RURAL DEVELOPMENT**

20th & 21st January, 2020

Jointly Organised by



Indian Science
Congress Association
Kolkata Chapter



Surendranath College,
Kolkata
(formerly Ripon College)



Venue

Surendranath Banerjea Auditorium
Surendranath College
24/2 M.G. Road, Kolkata - 700 009

CALL FOR ABSTRACT FOR PAPER/POSTER

If you wish to be a presenter in this conference, you need to register (online) for the conference and submit your abstract for the paper/poster at the email ID - abstract.isca.snc@gmail.com on or before 6th January, 2020. Before submitting the abstract, please follow the guidelines (for abstract and poster making) given in webpage - www.sncseminarworkshop.wixsite.com/isca2020

The topic of your paper/poster should match the main theme of the conference i.e. **Science and Technology: Rural Development**. For that, you can choose from the following subtopics :

Animal, Veterinary and Fishery Sciences

- Advances in medical zoology
- Application of technology in sustainable rural development
- Anthrozoology

Chemical Sciences

- Directing biosynthesis: Chemical biology and bio-inorganics
- Nano chemistry: A tool to manipulate matter at molecular level
- Green chemistry: A tool for reducing waste and improving sustainability

Earth System and Environmental Sciences

- Industrialization and rural development
- Development of agriculture by technological application
- Impacts of geologic materials and processes on animal and rural health
- Climate changes and sustainable Development
- Estuarine, coastal ecosystem and livelihood
- Challenges of natural disaster management - role of technology including GIS mapping

Mathematical, Statistical and Computational Sciences

- Scope & use of statistical data in rural development
- Modelling in ocean, atmosphere, climate, ecology and evolution
- Numerical simulation of dynamical systems
- Network security and cryptography
- Strategic development of IOT based farming system
- Computer based modelling for entrepreneurship in rural areas
- Development of free multilingual translating software system for educational purpose

Physiology and Allied Sciences

- Food and nutrition in rural health and diseases
- Stress and health
- Communicable and non-communicable diseases: Prevention and control
- Sports and yoga in rural health development

Modern Biology

- Application of immunology in restoration of rural health
- Study of genetic polymorphism of specific population with respect to a particular disease
- Development of kit for on spot disease detection
- Effective bioremediation of organic waste

Physical Sciences and Engineering and Technology

- Condensed matter physics and material sciences
- Recent advances in modern physics
- Innovative technologies for development of rural areas
- Recent trends in engineering and technology and their applications in rural development

Plant Sciences (Classical and Applied)

- Plant biodiversity, ecology and conservation
- Pharmacology and medicinal plants: Application in society
- Ethnobotany: Practical uses through traditional knowledge
- Plant biotechnology, plant tissue culture and micropropagation

Social and Behavioural Sciences

- Innovation as a tool to eradicate poverty
- Climate change and productive capacity: Role of technology for sustainable development
- Technology in rural health (physical/mental) and rural development
- Technology, women's empowerment & rural development
- New gender binary in modern rural India: Role of technology and its effect
- Anthropology and population genetics
- Rural urban migration and technology
- Mode of transportation - indigenous technology

REGISTRATION

Registration Fees:

Designation	Online Registration (with Paper/Poster)	Online Registration (without Paper/Poster)	Spot Registration
Faculty	Rs. 1000/-	Rs. 500/-	Rs. 1000/-
Guest Lecturer Post-doc Research Scholar	Rs. 600/-	Rs. 400/-	Rs. 600/-
PG/UG Student	Rs. 300/-	Rs. 250/-	Rs. 400/-

Accommodation will be provided on request with additional payment. For details, follow the conference webpage.

Registration Link:

<https://forms.gle/7WHzjrEPGz1JUz9s5>

OUR TEAM

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SCIENCE AND TECHNOLOGY: RURAL DEVELOPMENT

20 & 21st January

Jointly Organised by

Indian Science Congress Association, Kolkata Chapter

&

Surendranath College, Kolkata (formerly Ripon College)

DATE	TIME				
20.01.2020	09:00-09:30 AM	REGISTRATION			
	10:00-11:00 AM	INAUGURAL SESSION Venue: Surendranath Banerjea Auditorium, Surendranath College, Kolkata - 700009			
	11:00-11:30 AM	KEY NOTE ADDRESS by Dr. B.K. Das, Director, ICAR, CIFRI			
	11:30-11:45 AM	TEA BREAK			
	11:45-01:45 PM	PLENARY SESSION Prof. Jai Prakash Keshri, Professor & Ex-Head, Department of Botany, University of Burdwan Dr. Timir Baran Ghoshal, Director, Geological Survey of India Dr. Swarup Bhattacharya, CURATOR, Maulana Azad Museum, Maulana Abul Kalam Azad Institute of Asian Studies Dr. Malay Kumar Saha, NICED, Scientist F –in charge-National HIV Reference laboratory			
	01:30-02:15 PM	LUNCH			
	TIME & SESSION	AUDITORIUM	BIOLOGY GALLERY	CHEMISTRY GALLERY	COMMON ROOM (Science Building, Ground Floor)
	02:15 -04:15 PM TECHNICAL SESSION - I	Plant Science <ul style="list-style-type: none">Symposium LectureInvited LectureOral Presentation	Earth system and Environmental Sciences <ul style="list-style-type: none">Symposium LectureInvited LectureOral Presentation	Chemical Sciences <ul style="list-style-type: none">Symposium LectureInvited LectureOral Presentation	Judgment of Poster Session - I <ul style="list-style-type: none">PhysiologyModern BiologyPhysical Science
	04:15-04:30 PM		TEA/COFFEE		
	04:30-06:30 PM TECHNICAL SESSION - II		Modern Biology <ul style="list-style-type: none">Symposium LectureInvited LectureOral Presentation	Physical Science <ul style="list-style-type: none">Symposium LectureInvited LectureOral Presentation	Judgment of Poster Session - II <ul style="list-style-type: none">Plant ScienceChemical Science
		HIGH TEA			

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DATE	TIME				
21.01.2020	09:30-10:00 AM	REGISTRATION			
	10:00-11:30 AM	PLENARY SESSION Dr. Jyotirmoy Samajder, Psychiatrist, MD. DPM. MBBS Dr. D.P. Duari, Director, Birla Planetarium			
	11:30-11:45 AM	TEA BREAK			
	TIME & SESSION	AUDITORIUM	BIOLOGY GALLERY	CHEMISTRY GALLERY	COMMON ROOM (Science Building, Ground Floor)
	11:45-01:45 PM TECHNICAL SESSION - III	Physiology And Allied Sciences <ul style="list-style-type: none"> Symposium Lecture Invited Lecture Oral Presentation 	Animal Sciences <ul style="list-style-type: none"> Symposium Lecture Invited Lecture Oral Presentation 	Social and Behavioral Science A (Sociology, Psychology) <ul style="list-style-type: none"> Symposium Lecture Invited Lecture Oral Presentation 	Judgment of Poster Session - III <ul style="list-style-type: none"> Mathematical, Statistical and Computational Sciences Social and Behavioral Sciences
	01:45-02:30 PM	LUNCH			
	02:30-04:30 PM TECHNICAL SESSION - IV	Physiology And Allied Sciences Continues.....	Social and Behavioral Science B (Economics) <ul style="list-style-type: none"> Symposium Lecture Invited Lecture Oral Presentation 	Mathematics, Statistics, Computer Science <ul style="list-style-type: none"> Symposium Lecture Invited Lecture Oral Presentation 	Judgment of Poster Session IV <ul style="list-style-type: none"> Animal Sciences
	TEA/COFFEE				
	04:30 PM	Valedictory, Prize distribution for Oral & Poster Presentation, and Vote of Thanks			

A Brief Report on the Two Day National Conference on Science and Technology: Rural Development

A two day National Conference on Science and Technology: Rural Development was jointly organised by Indian Science Congress Kolkata Chapter and Surendranath College on 20th and 21st January 2020. The conference focussed at the current developing trends in the field of science and technology with special reference to rural development. The event continued its tradition of delivering premier content to the scientific community. It was a major focal point for scientists, researchers and academicians interested in various aspects of science discoveries and technologies. New developments and technologies are altering the way people live, connect, communicate, transact and work, which would pave the way for economic development. Science Communicators' role is to facilitate public engagement with scientific issues. Science communication plays an integral part in one's scientific career. Being able to effectively disseminate research findings within the community and to consider collective opinions in prioritizing research needs is an important attribute of scientific maturity. Thus, dissemination of scientific information and inculcation of scientific attitude among masses at large is required.

With this aim, this national conference was held to bring together experts in the field of science communication to meet, deliberate and exchange their views.

The Inaugural session was held at Surendranath Banerjee Auditorium, Surendranath College, Kolkata on 20th January, 2020 and was attended by a large number of dignitaries, delegates, distinguished scientists, research scholars, teachers and students. It started with the opening song and welcoming of the dignitaries on the stage. The inauguration was marked by watering the plant. The dignitaries were felicitated with *uttaria* and a potted plant as a memento. The Proceeding book containing more than 200 scientific abstracts was released by the dignitaries.

The welcome address was given by our respected Principal Dr. Indranil Kar, Surendranath College and Prof. Tushar Kanti Ghosh, Convenor on behalf of ISCA Kolkata Chapter. The inaugural address was given by Dr. (Mrs.) Vijay Laxmi Saxena, General President ISCA,

Kolkata followed by the Inaugural speech delivered by Dr. Manoj Chakraborty, Ex General President ISCA, Kolkata and Dr. S. Ramkrishna, General Secretary (Membership affairs) ISCA. Vote of thanks was delivered by Dr. Dipanshu Gangopadhyay, President Governing Body, Surendranath College. Other dignitaries present on the dais were Dr. Nibedita Chakraborty, Dr. Sheo Satya Prakash, Dr. Ashok Kumar Saxena, Past General President ISCA, Kolkata and Dr. Amit Krishna De, Executive Secretary, ISCA Kolkata. The Keynote address was delivered by the Director of ICAR-Central Inland Fisheries Research Institute, Barrackpore, Dr B. K. Das. The scientific session was categorized under nine subtopics covering almost all disciplines of science and technology. It was prepared in accordance with the conference scope to discuss the challenges, opportunities and problems of applications in various fields.

On the first day there were four Plenary lectures delivered by Prof. Jai Prakash Keshri, Professor & Ex-Head, Department of Botany, University of Burdwan, Dr. Timir Baran Ghoshal, Director, Geological Survey of India, Dr. Swarup Bhattacharya, Curator, Maulana Azad Museum, Maulana Abul Kalam Azad Institute of Asian Studies and Dr. Malay Kumar Saha, NICED, Scientist F-in charge-National HIV Reference laboratory. All the lectures were very enriching, discussing innovative ideas and topics in order to promote scientific information interchange between the students, scholars and others.

The Plenary lectures were followed by Technical Session 1 (Plant Sciences, Earth System and Environmental Sciences, Chemical Sciences) and Technical Session 2 (Modern Biology and Physical Sciences and Engineering and Technology). There were Symposium lectures, Invited Lectures and oral presentations for each subtopic. Along with these posters presentation was there for teachers, scholars and students.

An exhibition was displayed by Dr. Swarup Bhattacharya, Curator, Maulana Azad Museum, Maulana Abul Kalam Azad Institute of Asian Studies, on Maritime Technologies with light and sound effect. It was visual treat for everyone present there.

The second day started with two plenary lectures delivered by Dr. Jyotirmoy Samajder, Chairman & Senior Consultant Psychiatrist, Mon Psychiatric Nursing Home Trust and Dr. Debiprasad Duari, Director, Research & Academic, M. P. Birla Institute of Fundamental

Research, M. P. Birla Planetarium, Kolkata. The students got the opportunity to listen, interact with these scientists and learn from them.

It was followed by Technical Session 3 (Animal, Veterinary and Fishery Sciences, Physiology and Allied Sciences, Social and Behavioural Sciences: Sociology, Psychology) and Technical Session 4 (Social and Behavioural Sciences: Economics and Mathematical, Statistical and Computational Sciences). Similarly there were Symposium lectures, Invited Lectures and oral presentation for each subtopic along with poster presentation.

The Valedictory session commenced by inviting all the dignitaries who were present at that time on the podium. They distributed certificates to all the participants. Best oral and poster awards were presented with a memento and certificate for different sessions. The Valedictory Speech was given by the Organizing Secretary Dr. Barnali Ray Basu and Dr. Aditya Sarbajna. The conference was concluded by watering the plant and singing the National Anthem. The event was widely covered by all prominent media houses.

This two day National conference served as a platform for researchers, academicians, students and industries to share their findings in various fields of sciences which were hopefully very effective for rural development.

It has been fruitful with over four hundreds of attendees, paper presenters, students and participants from different disciplines of science. Through a wide range of lectures this conference has provided a forum for new ways to deal with some of the challenges in modern day science and technology.

Inaugural Programme: Gracious Presence of

- Dr. Partha Chatterjee, Honorable Minister in Charge
- Department of Higher Education, Science & Technology
- Govt. of West Bengal Dipanshu Gangopadhyay (President, Governing Body, Surendranath College)
- Dr. Rajib Banerjee, Honorable Minister in Charge, Department of Forest Govt. of West Bengal
- Chairperson – Dr. Indranil Kar, Principal, Surendranath College
- Debasish Banerjee (Member, Governing Body, Surendranath College)
- Convener, ISCA, Kolkata Chapter-Prof. Tushar Kanti Ghosh, Department of Physiology, University Of Calcutta
- Prof. Sonali Chakravarti Banerjee, Vice Chancellor, University of Calcutta
- Prof. Asis Kumar Chattopadhyay, Pro Vice Chancellor for Academic Affairs, University of Calcutta
- Prof. Debasis Das, Registrar, University of Calcutta
- Prof. Asutosh Ghosh, Vice Chancellor, Rani Rashmoni Green University
- Prof. Dipak Kumar Kar, Vice Chancellor, Sidhu Kanhu Birsa University
- Dr. (Mrs.) Vijay Laxmi Saxena (General President, Elect ISCA)
- Dr. Ashok Kumar Saxena (Past President ISCA)
- Dr. Manoj Kumar Chakrabarti (Immediate Past Gen. President ISCA)
- Dr. S. Ramakrishna (General Secretary Membership affair ISCA)
- Dr. Anoop Kumar Jain (General Secretary Scientific activities ISCA)
- Dr. Sheo Satya Prakash (Treasurer ISCA)
- Dr. Ananga M. Chandra
- Dr. Nibedita Chakroborty
- Dr. Malay Kumar Saha, NICED, Scientist F –in charge-National HIV Reference laboratory

Key note Address:

Dr. Basanta Kumar Das,
Director, ICAR-Central Inland Fisheries Research
Institute, Barrackpore, Kolkata, 700120

**Fish for health and social wellbeing**

Indian fisheries and aquaculture is growing rapidly and has registered a growth 11.9 percent in 2017-18. Similarly the exports from fish and fishery product as a largest group in agricultural export and in value terms Rs. 47,620 crores in 2018-19. It is a fast growing sector in India and provides ample sources of nutrition and food security to a larger population of the country besides providing income and employment to more than 14.5 million people. Diversified species and nutritive value including macronutrients (vit. D, B2, Ca, P, Fe, Zn, Iodine, Mg, K), omega-3 fatty acids as well as proteins could lower many health complications including heart diseases, blood pressure, anemic conditions and brain health. Small indigenous fish served as a part of hidden harvest and rich in most of the macronutrients and minerals could be served as diets of 70 percent of rural people who are not privileged for the health care facilities in India and suffers from malnutrition. Around 20 percent of the harvest from natural waterbodies do not contribute to the national production figure and went for the poor man's diet. Investment and profit in the fisheries affordable by the rural poor people and could be encouraged for livelihood option as well as social security. Small-scale fisheries is a driving force to increase the harvest as well as consumption including providing green fish which in turn the blue economy would be greatly more beneficial for more conclusive growth. As it is a second largest fish producer in the world with a total production of 13.7 million metric tonnes in 2018-19 with a total gross value added and accounts for 5.23% share of agricultural GDP, it is high time to harness more for societal development. Inland open water resources have huge potential to conserve and propagate the diversified aqua-fauna by suitable conservation and restoration as well as address climate-resilient fish in the long-term.

Plenary Lecture

Prof. Jai Prakash Keshri, Professor
& Ex-Head, Department of
Botany, University of Burdwan



Dr. Timir Baran Ghoshal,
Director, Geological Survey of
India



Dr. Swarup Bhattacharya,
CURATOR, Maulana Azad
Museum, Maulana Abul Kalam
Azad Institute of Asian Studies



Dr. Malay Kumar Saha, NICED,
Scientist F –in charge-National
HIV Reference laboratory



Technical Session-I

i) PLANT SCIENCE **Symposium Lecture**

Prof. Kashinath Bhattacharya,
Professor, Department of Botany
Visva-Bharati (a Central university)
P.O.- Santiniketan – 731235
West Bengal, India. E.mail:
kashinathb23@rediffmail.com



MIGRATION OF PLANTS FROM AQUATIC TO LAND HABITAT

Life was first originated on our planet at the bottom of ocean to escape lethal effect of uv radiations. At a later stage, life migrated from bottom to floating (planktonic) form and ultimately was transmigrated to land habit. The current hypothesis based on morphological and molecular analyses suggests that there was early divergence of two discrete clades - the Chlorophyta, and the Streptophyta comprises the charophytes and their descendants, the land plants – from an common ancestral green flagellate. The several descendants evolved through primary, secondary and/or tertiary endosymbiosis, are characterised by a number of distinct features, many of which are essential for land habits. The eukaryotic evolution took place through horizontal gene transfer across distinct lineages which is regarded as an important force in the evolution of eukaryotes and their genomes. The origin of land plants from a charophyte ancestor was a most important event in the history of life that influenced the creation of entire terrestrial ecosystem and had extensive outcome on atmospheric environment. *Coleochaete* is an excellent model for the green algal ancestor of land plants and may be a modern representative of the green algal group that gave rise to the land plants. Further biochemical characteristics such as presence of sporopollenin, phragmoplast cell division, tendency to retain the zygote in the oogonium until after germination indicate origin of land plants from *Coleochaete*. The land plants acquired their eco-physiological adaptations through enhanced osmoregulation and osmoprotection, desiccation and freezing tolerance, heat resistance, enhancement of spore viability, protection of spores and their dispersal mechanism which helped them for their successful colonization on land habit. Several morphological, biochemical and molecular innovations have been identified in land plants that have allowed successful adaptation to life on land. The further origin and diversification of land plants have been associated with gene family expansion resulting from large-scale gene duplication or whole-genome duplication. Some of the striking examples of expansions of gene families are MADS box genes (pattern formation), glutaredoxin genes (oxidative stress response), several genes act as signalling molecules, etc.

KEY WORDS: *Plants, migration, aquatic habitat, terrestrial forms, eco-physiology, molecular regulation*

Invited Lecture

Chaired by:

Prof. Kashinath Bhattacharya
Professor, Department of Botany
Visva-Bharati (a Central university)

Prof. Jai Prakash Keshri, Professor &
Ex-Head, Department of Botany,
University of Burdwan

Dr. Debabrata Maity, Assistant Professor,
Department of Botany, University of Calcutta.



Role of taxonomy to uncover biodiversity

Abstract

The present day world is full of paradoxes. One such paradox is that: humans realized that there is only one Biosphere in the universe on one hand, and on the other hand, the same humans made the present era much before its completion to jump into new era – era of mass extinctions of species and ecosystems with numerous yet unknown species facing extinction. In this context the primary role of taxonomists is to explore and recognize the plant diversity of the globe.

The great challenges to the taxonomists of 21st century are (i) identification of all life forms of the mother earth, ii) prevention of species and ecosystem extinctions, (iii) conservation of natural resources and (iv) sustainable development. Taxonomy is critical for addressing these issues. Until now, in India, about 19000 species of flowering plants are recorded and much more are probably waiting to be discovered in near future, particularly in the Himalayan region, NE states, Eastern and Western Ghats. The taxonomic study will thus be helpful in study of plants, to ascertain the identity of the plants and finally to recognize the plant wealth of the globe.

Dr. Supatra Sen, Associate Professor,
Department of Botany, Asutosh College



Towards Zero Hunger: Abiotic Stress and Crop Productivity

Abstract

In the wake of changing climate, temperature (low and high), water (drought and flood) and salinity stress have become the most important limiting factors to crop productivity, supply and ultimately food security. Abiotic stress causes substantial decline in crop yields through negative impacts on plant growth, physiology and reproduction. Other noticeable effects of these stresses are damaged photosynthetic machinery, oxidative damage and membrane instability. Plant ability to withstand these stresses greatly varies from species to species. They possess powerful sensors or signal transduction mechanisms that connect biophysical stimuli and biochemical events which guide them toward optimal growth, development and survival.

Favourable periods are characterised by high photosynthetic efficiency, elevated level of biochemical constituents *viz.* carbohydrate, nitrogen, protein, amino acid and phenol contents. Increased ATP content and ATPase activity along with high respiratory rates and activities of respiratory enzymes during these times signify a peak metabolic phase. Manifold increase of proline along with enhanced activities of chlorophyllase, polyphenol oxidase, acid phosphatase and alkaline phosphatase indicate the stressful periods. These periods are marked by abundant production of free radicals (measured as MDA and total peroxide contents), accompanied by poor scavenging and reduced detoxification of these active oxygen species by the antioxidants (carotenoids, ascorbic acid) and scavenging enzymes (SOD, catalase, peroxidase, ascorbate peroxidase, glutathione reductase). In the optimum periods, prominent stomatal openings (revealed by Scanning Electron Microscopy) ensure efficient gaseous exchange, while Atomic Absorption Spectrophotometry indicate a high mineral content. All these aspects significantly promote the yield and yield quality.

The parameters under study serve as useful bioassay indices of environmental stress, while the plants acting as a measure of the prevailing environmental conditions serve as efficient bio-indicator species. Thus, plant response to environment indicates the enormous impact of environmental stress on agricultural productivity.

Genetic improvements in combination with proper conventional practices are considered important in managing abiotic stresses. Emphasis is also on breeding for stress tolerance and stress resistance. Despite major advances in genetic approaches such as QTL mapping and transgenic approaches there is still a long way to zero hunger, the ultimate and basic need of humankind on this planet.

Dr. Samudra Prasad Banik,
Department of Microbiology,
Maulana Azad College



Trehalose mediated stabilization of cellobiase aggregates – A cross-linking independent approach to improve cellulolytic enzyme efficiency

Abstract

Lignocellulosic biomass has been the most promising raw material for production of bioethanol in recent times. The conversion of lignocellulose into glucose, the precursor for ethanol synthesis, involves stripping the recalcitrant lignin followed by a three step sequential enzymatic conversion of cellulose to glucose. The final step involving hydrolysis of cellobiose to glucose mediated by β -glucosidase is the rate limiting step of cellulose hydrolysis and presents the current technological bottleneck in achieving efficient saccharification of agrowaste and other biomass. β -glucosidase, otherwise referred to as cellobiase (E.C. 3.2.1.21) is secreted into the extracellular medium with high titre and specific activity by filamentous fungi, popularly known as mushrooms. The enzymes once secreted undergo spontaneous concentration driven reversible self association to develop into huge aggregates with enhanced thermostability and catalytic efficiency. However, once purified from other enzymes of the crude culture medium, fungal β -glucosidase dissociates into smaller constituent subunits and loses its activity significantly. Conventional method of stabilizing these enzyme aggregates involves crosslinking by glutaraldehyde or entrapment into calcium alginate beads. We present here a novel method of stabilizing purified cellobiase aggregates by trehalose, a non-reducing sugar osmolyte. Trehalose is known to prevent proteins against desiccation and thermal denaturation by replacing water molecules from the solvent accessible surface of the protein and itself embedding the protein in a sugar matrix. We show that reversible self-association of extra-cellular β -glucosidase obtained from *Penicillium chrysogenum* precedes docking of trehalose onto the enzymes surface – as a result, big cellobiase aggregates resistant to dilution and temperature induced dissociation, are formed and stabilized. We have also validated our hypothesis using *in vitro* glycated Bovine Serum Albumin, an abundant serum carrier protein which resembles fungal β -glucosidase in being globular and intrinsically aggregation prone. This is the first report of a cross-linking independent alternative to stabilize industrially useful fungal enzymes.

Key words: Bioethanol from lignocellulosic biomass, Industrially important cellulolytic enzymes, Fungal β -glucosidase aggregates, small molecule osmolyte trehalose, Cross-linking independent approach.

Dr. Partha Karak, Assistant Professor,
Department of Botany, City College



Airborne spore allergens, air pollutants and socioeconomic status as risk factors for childhood allergic diseases in West Bengal, India

Abstract

Introduction:

The synergistic effect of persistent exposure to aeroallergens in a particular set of climatic condition along with other parameters like socio-economic status, age group, air pollutants, etc., are major risk factors for childhood allergy. Hence, an attempt has been made to find out such relationship among the childhood allergic diseases in West Bengal, India.

Methods:

A total of 1536 paediatric subjects diagnosed as allergic patients at different sub-divisional hospitals at Durgapur and Bolpur, West Bengal were thoroughly studied in presence of clinician with the help of ISAAC questionnaires. A Burkard 7- day volumetric and an Andersen two-stage sampler were concurrently used for monitoring and assessment of airborne fungal spores. Skin prick tests were performed with 11 dominant fungal species as per EAACI guideline. Multiple logistic regression analysis was performed to estimate the association between air pollutants, allergen exposure and the risk of allergic diseases with adjustments for potential confounders.

Results

Children with age group of 1 - 5 years showed higher prevalence in atopic dermatitis (15.79%), idiopathic urticaria (3.51%), cold and heat urticaria (3.75%), dermatographism (3.65%), chronic urticaria (14.4%), allergic contact dermatitis (3.51%), food allergy (3.51%), insect bite allergy (3.51%) etc. The synergistic effects of pollution, fungal spore load and meteorological factors showed an increase in asthma severity 2.441(1.60-3.70), allergic conjunctivitis 0.277(.145-.529), rhinosinitis 3.453(1.44-8.28) and chronic urticaria 0.267(.129-.55). A clinically significant association of fungal spores with allergic symptoms were observed such as *Penicillium oxalicum* with asthma, *Aspergillus flavus* with allergic urticaria, and *Aspergillus tenuis* with rhinitis.

Conclusion

Children below 10 years age were severely affected with at least one or more allergic symptoms. In general, girl child showed more sensitivity than boys. The lower economy class people are more vulnerable to atopic dermatitis perhaps due to their ignorance about sanity and poor nourishment.

MICROPROPAGATION OF *Curcuma caesia* Roxb.Arghya Ghosh¹, Bhaskar Paul²¹Assistant Professor, U. G. & P. G. Dept of Botany, Darjeeling Govt College, Darjeeling²P. G. Student of U. G. & P. G. Dept of Botany, Darjeeling Govt College, Darjeeling

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Abstract: The plant *Curcuma caesia* Roxb. is one of the most potent ethnomedicinal plant that works best against cancer. The production and yield of active principles from this plant itself varies from clone to clones, so formulation of some growth medium that can generate genetically true to type clone is essential. An efficient plant propagation system through rhizomal explants was established in *Curcuma caesia* Roxb., a medicinally important herbaceous annual herb belonging to the family Zingiberaceae. Rhizomal explants from two months old seedlings were cultured on Murashige and Skoog's (MS) medium supplemented with different concentrations of N⁶-benzyladenine (BA) (0.5 - 5.0 mg/l), Naphthalenic acetic acid (NAA) (0.5 -5.0 mg/l) and Indole 3 butyric acid (IBA) (0.5 - 5.0 mg/l). During the first culture on 1.5 mg/l of 6-benzylamino purine (BAP) and 1 mg/l of Naphthalenic acetic acid (NAA) maximum 15.40±0.40a shoots with an average shoot-length of 8.46±0.06a were produced. The elongated shoots produced a maximum of 12.00±0.00a roots on half-strength MS liquid medium supplemented with 1 mg/l of Indole 3 butyric acid (IBA). The plantlets were acclimatized by transferring them first to peat moss: compost (1:1) mixture followed by sand: soil (2:1) mixture, recording 85% survival.

Keywords: Rhizomal explants, Murashige and Skoog's (MS) medium, N⁶-benzyladenine (BA), Naphthalenic acetic acid (NAA) and Indole 3 butyric acid (IBA).

EXPLOITATION OF MEDICINAL PLANTS

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Abstract: India has more than three thousand years of medicinal heritage based on medicinal plants which are largely used as folk medicine or preparation of recent pharmaceuticals. The study of medicinal plants has assumed great importance in India and abroad. These medicinal plants are endangered due to anthropogenic activities like urbanization and various environmental changes. The booming of traditional medicine has resulted in an increased demand on medicinal plant products. Excessive commercial demand from a rapidly expanding pharmaceutical industry, for which no collection regulations exist, affects medicinal plants of various taxa. Asansol and Raniganj coalfield region in West Bengal is an important mineral resource area with a rich vegetation of medicinal plants. But the important medicinal plants which are used in traditional medicine are disappearing due to the impact of environmental changes, prolonged mining, industrial and urban developments. These resources are depleting at an alarming rate and they will soon be extinct and endangered. It is very important that medicinal plants should be conserved as exploitation of medicinal plants can affect the balance of our ecosystem. The knowledge in this field would enable introduction of timely cultivation in necessary cases and maintain the required balance between proper sustainable use and overexploitation of these limited natural resources. Medicinal plants are suitable raw materials for production of new synthetic drugs to treat different health problems. The pharmacologists can use this important natural resource sustainably for the preparation of herbal and modern drugs to cure diseases which can be a boon for mankind.

Keywords: medicinal plants, Asansol, Raniganj, exploitation, sustainable.

ETHNOPHARMACOLOGY OF ANTICANCER DRUGS IN RURAL BENGAL-AN IN SILICO STUDY

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Abstract: Cancer is a disorder caused by unregulated cell growth in all over the world. Uncontrolled cell growth forms tumor in human body. Cancers can be treated by surgery, chemotherapy, radiation therapy and immunotherapy depending on various aspects of cancerous cells. Nutraceuticals for cancer are mostly phytochemicals derived from dietary or medicinal plants. The active constituents of these nutraceuticals have chemo preventive activities as well as chemotherapeutics activities. Phytotherapy is the most common source of medication in traditional medicines used in rural part of West Bengal. Considering the immense potential of phytochemicals used in traditional medicines, the paper provides a detail account of phytochemicals used as anticancer drugs in rural West Bengal, along with their mode of action. Identification of molecular targets for the active constituents present in phytochemicals and gene network construction with oncogenes can be executed with the help of computational techniques. Different sources of scientific literature are accessed to enlist the phytochemicals present in rural medicines to treat cancer. Among them, several flavonoids are identified due to their anticancer activity. From the constructed gene regulatory network, DNA topoisomerase II alpha is selected as target gene for cancer treatment. Molecular docking study with different flavonoids as target gene inhibitor is done. Different types of cancers can be prevented and treated by phytochemicals and their molecular mechanism of action can be explained and visualized by using computational study.

Keywords: Anticancer phytochemicals, flavonoids, target gene, molecular docking

DIVERSITY OF ALPINE SEDGES AND CLIMATE CHANGE

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Abstract: Owing to the adaptability to protect their germplasm from all adversities prevailing in nature, the sedges are found in a wide range of habitats from sea level to the alpine regions. Alpine sedges are predominating at the altitudes of 3000 – 5000m. They remain fully covered by snow throughout the winter and sprout out from their perennating rhizome or seed during the monsoon after the melting of snow. The perturbed ambience of the species compel it to protect its germplasm by specializing both vegetative and sexual reproduction. The floral parts are designed for anemophily since no other biotic agents are trusted for pollination. The seeds are well protected within nuts, the rigidity of which is evident from its hardness as surface sculpture. Most of the various depositions ornamenting the nuts seem to be highly conservative and polymorphic and hence of taxonomic value. The species of this alpine sedge distributed in Northern Hemisphere, especially in the higher altitudes of Himalayas and few in Europe and America (Jana & Srivastava, 2014). It is evinced by the recent field exploration that most species are now shifting their habitat from sub-alpine to alpine zone of Himalaya due to possible effect of climate change and global warming. Recent studies by Yang & al. (2012) reveals the increase malondialdehyde and non-structural carbohydrate compound in *Kobresia pygmaea* at warming conditional effect. Such compounds are help to osmotic adjustment for prevent the leakage of electrolyte and survive the plants at warming condition. Such quick physiological responses suggest the sedges are adapted themselves with the distorted climatic condition.

INFLUENCE OF SELENATE ON GROWTH AND ANTIOXIDANT DEFENSE SYSTEM IN RICE (*Oryza sativa* L.) SEEDLINGS

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Abstract: The effect of Selenium (Se) supplementation in the form of selenate at five levels of 0 (control), 2, 10, 20, 50 μ M in plants supplied with and without 10mM sulphur (S) in the form of sulphate was investigated in rice (*Oryza sativa* L.) seedlings. Selenium acted as an antioxidant at lower concentration of treatment compared to the higher concentrations where it played the role of a prooxidant as evident from our observations where 2 μ M selenate treatment enhanced growth and development in test seedlings in contrast to its higher concentrations (≥ 10 μ M). Concomitant effect of selenate were observed in the antioxidant status in the test seedlings. Joint application of 10mM sulphate was found to regulate as well as ameliorate the toxic effect of selenate alone on the test seedlings of rice.

SOME MAJOR THREATS FOR THE PLANT DIVERSITY OF DARJEELING AND SIKKIM HIMALAYAN REGIONS OF INDIA

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Abstract: Plants and vegetation is such a thing that can be useful for man and animal directly or indirectly. The Darjeeling and Sikkim Himalayan regions are repository for a large number of plant species and a part of Singalila range of Eastern Himalaya and a part of Himalayan Hotspot and globally known as one of the mega biodiversity hotspot zones and is known to provide shelter to a large number of endemic, rare and interesting plant species. When considered from agro-floricultural point of view, the region is known throughout the world as botanical paradise. The atmospheric humidity, rainfall, diurnal rhythm conditions existing in this regions are also suitable for the abundance of Plant species and these may be attributed to its ideal natural climatic conditions like high rainfall, high humidity and presence of maximum forest cover comprising of very rich vegetation. The presence of humus rich forest floor and moist microclimatic zones are ideal for growth of several plant species. Due to great variation in altitude, wide range of climatic zones are available, which favour the lavish growth of diversified and affluent vegetation. The study is expected to give a comprehensive understanding on some major threats for the survival population of Plant species diversity of Darjeeling and Sikkim Himalayan regions viz., Grazing by Domestic Animals, Activities of military, Unauthorized visitors, Destruction of forest lands, Establishment of drinking water sources, Reduction of humus layer, Soil erosion, Bamboo vegetation, Impact of tourism and related activities, Illegal collection, Forest and grassland fires, Weedicide and Pesticidal pollution, Introduction of plantation crops, Climate change and its impact on flora etc. Although Darjeeling and Sikkim Himalayan regions are biodiversity hotspots and favourable climate supports the luxuriant growth of plant species in the region occupies a prominent position from the floristic point of view.

Key words: Threats, Plant diversity, Darjeeling and Sikkim Himalayas.

COMPARING THE OXALATE OXIDASE ENZYME ACTIVITY IN MONOCOT PLANTS

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Abstract: Oxalate oxidases in monocot plants act as a scavenger to breakdown oxalic acid into carbon dioxide and hydrogen peroxide, which thereby perform multiple important functions in early defense responses of plant and induces PR protein synthesis and systemic resistance. Oxalic acid, the pathogenesis factor of many fungi activate the innate immune system thereby secreting oxalate oxidase from the plant system. In the present study oxalic acid, the virulence factor of fungi, was applied to monocotyledonous plants and it was observed that it activates the innate host immune system, along with secretion of oxalate oxidase. The enzymatic activities of other host defence related enzymes like catalase, superoxide dismutase, ascorbic acid oxidase, phenolic content, phenylalanine ammonia lyase were compared between the control and oxalic acid treated (2mM) plants. The present study aim to compare the oxalate oxidase enzyme activity and to investigate which among them is more resistant to oxalate.

Keywords- oxalic acid; oxalate oxidase; defense; resistance

CHIR PINE: A PLANT OF ETHNOBOTANICAL AND MEDICINAL IMPORTANCE

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Abstract: Chir Pine or *Pinus roxburghii* Sarg. is an important gymnosperm that grows all along the Himalayan tracts from Kashmir in the West to Arunachal Pradesh in the east. The plant finds extensive use in the ayurvedic system of medicine. It is also used in a number of medicinal and non-medicinal purposes by the local people living in the Himalayan region. The non-medicinal uses largely centers on use of the plant as wood for furniture and construction purposes. Medicinally, the plant is used for the treatment of cough and cold, asthma while the resin is traditionally used for the treatment of cracks and blisters. Thus based on its relevance amongst the people of himalayan region, an attempt have been made to quantify the chemical constituent of the plant in relation to antioxidant properties. The antioxidant potential of the plant have also been estimated by targeting selective reactive oxygen and reactive nitrogen species. The result of the study indicates that the plant is rich in phenolics, flavonoids, tannins and proanthocyanidins. Antioxidant assays revealed potent superoxide dismutase mimetic activity, inhibition of lipid peroxidation capacity, nitric oxide quenching capacity and hydrogen peroxide decomposing capacity most of which are either at par or greater than standard antioxidants catechin and quercetin. HP-TLC finger print profile of the plant revealed the presence of quercetin and kaempferol. The results strongly indicate the antioxidant capacity of the plant and can be used as a potent and cheap source of antioxidant principles for management of diseases related to oxidative stress.

Keywords: *Pinus roxburghii*, antioxidant, catechin, Ayurveda.

HERBAL REMEDIES AGAINST URINARY AILMENTS AS REVEALED FROM ETHNOMEDICINAL STUDIES UNDERTAKEN IN BANKURA DISTRICT, WEST BENGAL

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Abstract: Considering the tremendous importance of indigenous knowledge especially concerning medicinal plants, the present ethnobotanical work was undertaken in Bankura District of West Bengal which has a position of repute in traditional system of medicines. This work documents from the primary sources the herbal folk remedies prepared from as many as 16 species of angiosperms which are used by the people of the tribal communities settled therein, for the treatment of their urinary ailments like haematuria, incontinence of urine with dropsy, renal disorder with lumbago and swelling of feet (oedema), pain in urinary bladder due to urine retention and renal calculi (stone). These herbal medicines are very simple, highly effective and seem to have potential for use in primary health care elsewhere. These documented remedies deserve consideration for isolation of active principles, phytochemical analyses, pharmacological investigations and therapeutic proving for validation and further development of novel patient friendly medicines against renal disorders. Since rapid socioeconomic and cultural changes have been leading to erosion of the knowledge it is imperative that the herbal use of aborigines against different ailments must be documented on war footing.

Keywords: Herbal, tribal, Bankura, urinary ailments, renal disorders.

URBANISATION AND COMMERCIALIZATION: A THREAT TO BIODIVERSITY IN THE COASTAL AREA

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Abstract: West Bengal have a short but strategic coastline in the Purba Medinipur district and is dotted with lots of tourist places the most popular being Digha in the southernmost tip. Due to proximity of Digha with the state capital and other regions of Southern West Bengal as well as northern part of Odhisha, it is rapidly emerging as a centre of tourist attraction and taking a form of tourist hub where people from all parts of the state gather to have a quality time. This has resulted in ever increasing demand of accommodation in an otherwise small area with large number of hotel cropping up in each and every corner of the place. Not many years ago, Digha used to be a place of good ecological diversity with species of mangroves and large strands of *Cassuarina* dominating the landscapes. However with the increase in tourist influx, the vegetation in the coastal region is now razed upon to give way to new hotels and shopping complex. In addition to it, construction of new market places along the new Digha beach along with cementing of a large strand of area for public leisure has resulted in total loss of vegetation. In addition to it, the marine life of Digha is also at threat specially in Old Digha area where the beach has been totally replaced by concrete. These anthropogenic activity is leading to gradual loss of biodiversity. Special measures requires to be taken to preserve the nature and natural resources along with proper management of tourists.

Keywords: V egetation, Digha, Purba Medinipur, Mangroves.

ANTIOXIDANT PROPERTY ALONG WITH QUALITATIVE PHYTOCHEMICAL ANALYSIS OF *Erigeron* sp. FLOWERS

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Abstract: The plant *Erigeron* sp. (Family: Asteraceae) is profusely grown on Darjeeling Hills and it is medicinally used as antirheumatic, diuretic, astringent, vermifuge etc. Various bioactive compounds present in the plant parts and shows medicinal properties. In the present investigation, white and pink coloured flowers of *Erigeron* sp. were collected from Darjeeling Government College campus and adjoining areas of Darjeeling, West Bengal. Flowers are dried followed by preparation of extracts. These extracts were used as bioassay material for qualitative phytochemical screening along with antioxidant activity. In case of qualitative analysis various phytochemical groups like phenols, tannins, flavonoids, alkaloids, saponins, coumarins, terpenoids are found from the flower extracts of the *Erigeron* sp. In case of antioxidant activity (DPPH free radical scavenging activity), white coloured *Erigeron* flowers show higher percentage of DPPH scavenging activity.

DIVERSITY, THREATS AND CONSERVATION OF MOSSES OF DARJEELING DISTRICT

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Abstract: Darjeeling district is the northern most fringe of the state of West Bengal lying in the foothills of the Himalaya, covers an area of about 3,149 sq. km. The district lies between 27°13' to 26°27' North latitude and 88°53' to 87°59' East longitude. Darjeeling district is represented by a great diversity of plants including liverworts and mosses. The moss diversity of Darjeeling district is remarkable. Most of the Eastern Himalayan species of different group of mosses are growing in this region. Apart from this, many of the endemic and RET species are also growing in different forest areas. Previously Gangulee (1969-1980) had reported 422 species 43 infraspecific taxa belonging to 160 genera under 40 families from Darjeeling district, however, present study highlights the presence of 316 species and 6 infraspecific taxa in this district. In spite of the huge diversity mosses of Darjeeling district are in threats due natural as well as anthropogenic activities. The natural threats like landslide and habitat loss coupled various anthropogenic activities like tourism industry, expansion of cultivation land, establishment of tea gardens, establishment of civilisation, etc. play major role in deterioration of moss diversity in this region. To conserve the moss diversity of the region, as mosses play several important roles ecological succession, soil binding, pollution indicator etc., immediate conservation measures should be implemented by the competent authority.

Key words: Moss, Darjeeling district, Eastern Himalaya, threats, conservation

SODIUM SILICATE SUPPLEMENTATION AMELIORATED INHIBITIONS OF GROWTH, PHOTOSYNTHETIC ACTIVITY AS WELL AS METABOLISM BY CADMIUM CHLORIDE AND SODIUM CHLORIDE IN MUNGBEAN (*Vignaradiata* L. Wilczek) SEEDLINGS

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Abstract: The effect of sodium chloride (NaCl) and cadmium chloride ($\text{CdCl}_2 \cdot \text{H}_2\text{O}$), either alone or in combinations with sodium silicate ($\text{Na}_2\text{O}_3\text{Si} \cdot 9\text{H}_2\text{O}$) were studied on growth, photosynthetic activities as well as metabolism in 15 days old mungbean (*Vignaradiata* L. Wilczek) seedlings. With increasing NaCl as well as cadmium toxicity, there was a significant decrease in root and shoot elongation and biomass production in the test seedlings with respect to water control. The levels of total chlorophyll as well as carotenoid contents were also decreased in the test seedlings with respective increasing toxicities. Cadmium as well as NaCl toxicity affected the activities of different antioxidant enzymes in the test seedlings. Activities of superoxide dismutase, ascorbic acid oxidase, glutathionereductase and glutathione peroxidase were increased whereas catalase and catechol peroxidase activities decreased. Again in the growing test seedlings, oxidative stress was observed and levels of malondialdehyde and hydrogen peroxide were enhanced. Joint application of sodium silicate (2mM) with either salt or cadmium treated test seedlings showed significant alterations on all parameters tested under the purview of either cadmium or salt treatment alone leading to better growth and metabolism in mungbean seedlings. Thus silicate in low concentrations helps to ameliorate heavy metal as well as salt contaminated damage on growth and metabolism in mungbean seedlings.

A STUDY OF HERBACEOUS FLORA IN SOME HUMID AND ARID PARTS OF LOWER GANGETIC VALLEY OF THE WEST BENGAL

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Abstract: Plants are generally autotrophs (exceptions are also there) rich with different life forms. Some are Cryptogams and some others are Phanerogams. Those green autotrophic organisms enrich with sub cellular to cellular complexity and articulated the first strip of life form being a primary producer. Food safety, shelter, and Health are the basic and prime need to the all kind of organisms. Here continuous pressure of human urbanization makes the pivotal pressure to the sustainable livelihood. It brings back the Mother Nature as an ultimatum and death knell. Biodiversity is the key words where we dealing the ultimate different number of items that are organized into different level of complex structure including their chemical and molecular basis of heredity with their relative frequency. India that also has 12 biogeographical provinces, 5 biomes and 3 bioregions. So far India has craved her name as one of the mega biodiversity among the 17 mega biodiversity countries. In India there is major ecosystem that includes forests, grassland, wetlands, costal and marine area as well as desert. We were plan to take a survey to 4 districts viz., Hooghly, Murshidabad, Nadia, and North 24-pargnas at pre monsoon session so that actual threat can be observed to the herbaceous plants during the low water availability period. It was found that Murshidabad has a greater Shannon's index than Hooghly, Nadia and North 24 Parganas, indicating greater diversity than the other studied districts.

GENE SILENCING: A REVIEW ON ITS APPLICATIONS AND ADVANTAGES

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Abstract: Gene Silencing involves the partial or complete inactivation of genes either at transcriptional or translational levels. It can result from various causes like DNA methylation or inactivation of homologous genes or para mutation or suppression by antisense genes or even by RNA interference. The most widely used method of gene silencing is of RNA interference which basically deals with the introduction of double stranded RNA into a diverse range of organisms leading to the degradation of the complementary RNA. Gene silencing techniques have been used in several gene knockdown experiments and it continues to serve as a utilitarian tool in solving many questions of cellular biology. Gene silencing also finds use in several medical research where certain receptors involved in the mitogenic pathways have been targeted through RNA interference so as to combat the production of cancer cells.

Keywords: Gene Silencing, antisense, gene, RNA interference, mitogenic

IDENTIFICATION OF IMPORTANT GENES REGULATING SELF-INCOMPATIBILITY IN BAMBOO

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Abstract: Plants can be primarily classified as self or cross pollinated on the basis of pollination biology. In cross pollination, genetic variation is obtained since mating happens between plants of two different genotypes here. In bamboo, reports on the mode of pollination and also the molecular mechanism behind this is unknown. This study focuses on *Bambusa tulda*, which is a profusely growing Indian timber bamboo. Our study focuses on the mode of pollination in bamboo, identify genes and their regulation behind this process. Our data on *in vivo* pollination experiments suggest that *B. tulda* is primarily a self-incompatible plant. The SRNase based self-incompatibility mechanism is well known in different dicotyledonous plants, but there is no report on their possible involvement in the self incompatibility responses in grasses. The SRNase based genetic system consists of two interacting partners, which are (i) SRNase, a member of RNase T2 family primarily expressed in the pistil and (ii) a F box gene, which is a member of ubiquitin mediated degradation complex and specifically expressed in the pollen. Our data suggest that at least four copies of SRNase genes and two copies of F box family genes are present in *B. tulda*. To further understand their possible involvement in regulating self-incompatibility in bamboo, expression analyses at spatial level and post-pollination time points are currently being undertaken.

Keywords: bamboo, flowering, self-incompatibility

AN OVERVIEW OF PLANT BIOTECHNOLOGICAL APPROACH FOR RURAL DEVELOPMENT

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Abstract: Rural residents make up 45% of the world's population but bear a disproportionate burden of poverty, malnutrition, and poor quality of life. Rural development is the process of improving the quality of life and economic well-being of people living in rural areas. The need for rural communities to approach development from a wider perspective has created more focus on a broad range of development goals rather than merely creating incentive for agricultural or resource-based businesses. Plant biotechnology is a set of techniques used to adapt plants for specific needs or opportunities. Micropropagation, a subset of plant tissue culture or plant biotechnology, is the practice of rapidly multiplying stock plant material to produce many progeny plants, using modern plant tissue culture methods. Micropropagation is used to multiply plants such as those that have been genetically modified or bred through conventional plant breeding methods. It is also used to multiply a plant which does not produce seeds, or does not respond well to vegetative reproduction. Although most commonly used for high value horticultural crops, today tissue culture propagation has also been very successful in producing improved subsistence crops widely used in developing countries. Some major breakthroughs made possible by tissue culture are the development of disease-free and disease resistance plants, higher-yielding varieties etc. and assessment of the clonal fidelity and variations of timber, biodiesel producing plants and other plants with interest. Thus, plant biotechnology can be served as a promising tool in rural development.

Keywords: Rural development; Plant biotechnology; Plant tissue culture; Micropropagation; clonal fidelity

CHROMOSOMAL ASSESSMENT OF SEXUAL STABILITY IN DIOECIOUS PLANT *Coccinia grandis*

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Abstract: The family Cucurbitaceae is one of the unique plant families harboring monoecious as well as dioecious plants some of which are agriculturally important. *Coccinia grandis* is the dioecious cucurbit crop having well known X-Y system and morphologically identifiable Y chromosome. So far, there are no reports on the hereditary assessment of sexual segregation in spite of the well known meiotic pairing between X and Y. Our objective is to find the ratio of male and female individuals raised after a round of natural reproduction. We have utilized aceto-orcin based chromosome staining method to determine sex of seedlings raised after fruit and seed setting in the female plants. The detection of Y chromosome acted as a marker to confirm the male sex which is absent in female plants. We found equal segregation of the sexes (1:1 male:female) by chromosome study which is statistically significant. The report suggests stability of dioecy in this plant in spite of the presence of a heteromorphic sex chromosome. Our result lays a foundation to substantiate the understanding of sex chromosome evolution in plants, particularly *C. grandis*.

Keywords: *Coccinia*, Sex chromosome, Segregation

AN ETHNOBOTANICAL SURVEY AMONG THE LOCAL TRIBES OF GOPHGARH, WEST MIDNAPORE: PLANT REMEDIAL STRATEGIES REGARDING ANIMAL BITES, STINGS AND INFESTATIONS.

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Abstract: Gophgarh is a small tribal village which is located at the outskirts of Midnapore town near Vidyasagar University campus. It is the starting point of Jungal Mahal area of West Midnapore District. The region is a rich reserve in flora and fauna of different types. So tribals of the region are well connected with these resources of nature. Since modernization has begun, most of the tribals now a days travel to the city area for their job and earnings. But even after that children, women and elderly persons go to the forest for various food and timber and other collectibles. The general problems which the tribals face while going to the forest zone and their dwellings are generalized animal attacks, infestations and diseases. Ethnobotany is the study of regional plants and their practical uses through traditional knowledge of local culture and people. The junglemahal area of Midnapore can be held out as an aspect of ethnobotanical survey since there are various tribal villages in the region experiencing ethnobotanical history. Our survey dealt with various remedial strategies practiced by the tribal people of Gophgarh related to such above mentioned problems and a general survey regarding the clash between modern technology and these age old blessings.

Keywords: Ethnobotany, Gophgarh, Animal infestations, Jungalmahal tribes.

SCIENCE AND TECHNOLOGY: RURAL DEVELOPMENT PHARMACOLOGY AND MEDICINAL PLANTS: APPLICATION IN SOCIETY

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Abstract: The biggest issue of rural India is poverty, every second year due to unplanned crop cultivation and natural calamities farmers are becoming poorer and poorer. Rather sticking to the good quality crops they are forced for the quantity and hence not getting the value of their crops. Total consumption of herbal raw drug in the country for the year 2014-15 has been estimated 5,12,000 MT which is predicted to be a Trillion dollar industry in 2050 according to WHO. As India contains 15 agro climatic zones, many biodiversity hotspots, almost 14% of barren land and huge 61% rural population (Census 2011) it's a very huge project to systematically educate and develop the rural society about the medicinal plants, market demands, cultivation, post harvesting processes and marketing. The AYUSH, NMPB, e-charak, SHG loans and subsidies will enhance and make the economy one of the largest raw crude drug material exporter in the world.

Keywords: Agro-climatic zones, Post harvesting processes, NMPB, AYUSH, e-charak

Ocimum sanctum: THE MAJOR ASSET AGAINST DIABETES, INFLAMMATION AND FREE RADICALS

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Abstract: To investigate and explore the role of *Ocimum sanctum* extract as antioxidant, anti-inflammatory and antidiabetic agent. Hydroalcoholic extract of *Ocimum sanctum* (HEOS) was prepared and evaluation of antioxidant, anti-inflammatory and antidiabetic activities have been performed by different In-vitro experiments and presence of total biologically active molecules is determined by In-silico experiments. Alkaloids, flavonoids, carbohydrates, acidic compounds and saponins were found to be present in the crude extract of which phenolic and flavonoid compounds were responsible for scavenging 2,2-diphenyl-1-picrylhydrazyl radical (DPPH). HEOS was found to have the ability of inhibit the denaturation of albumin as compared to the standard anti-inflammatory drug like Diclofenac sodium. HEOS was found to inhibit the α -glucosidase activity about in moderate range and inhibition of α -amylase at very low range. Extract ingredients like, Quercetin, Rosmarinic acid, Linalool, Bieugenol and Aesculin also enhanced anti-diabetic effect by binding with insulin receptor. The present study reveals that *Ocimum sanctum* plant extract reduces the adverse effects of diabetes with its antioxidant and anti-inflammatory activity. It also shows less or no side effects with respect to commercially available drugs.

MARINE POLLUTION: A GREAT CONCERN FOR THE SOCIETY

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Abstract: Marine pollution or Ocean pollution can be defined as anything that contaminates the sea. Common marine pollutants include chemicals, small plastic beads in exfoliates and also toxic bio-matters such as sewage. Ocean pollution is becoming ever more of a problem in the present day. It is a result of excess human interference in the natural world. Recent researches suggest that ninety two percent of people are concerned about the negative impact that plastic pollution in the oceans will have on the future generation. Plastic pollution is one of the major causes responsible for marine pollution. We know that plastic is a major environmental pollutant. The accumulation of synthetic, petroleum derived plastics in the environment is a major cause of marine pollution. Millions of birds and marine animals die each year as a result of plastic in marine world. According to recent reports eighty nine percent of people are concerned about plastic pollution spoiling world's beaches. Increasing level of acidification in the oceans also affects the growth of marine life. People are concerned about the potential health implication of consuming sea foods that contains micro plastics. Marine pollution is a serious issue, and it comes in many forms. Nevertheless, there are several ways that we can take positive action right now to solve this problem of marine pollution. Therefore, every single individual on this earth could prevent several tonnes of trash from spoiling the habitats of marine animals.

Keywords: marine, pollution, ocean, plastic, environment

BIOFILM: THE PREFERRED MICROBIAL LIFESTYLE

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Abstract: A Biofilm community is formed when bacteria adhere to surfaces in moist environments by excreting a slimy, glue-like substance known as extracellular polymeric substance or EPS. Biofilms are generally rich mixtures of many species of bacteria, fungi, algae, yeasts, protozoa and other microorganisms. EPS produced by these cells allows them to develop into complex, three dimensional, resilient, attached communities. Biofilm is a strong and dynamic structure that confers a broad range of advantages to its members, such as adhesion/cohesion capabilities, mechanical properties, nutritional sources, metabolite exchange platform, cellular communication, protection and resistance to drugs, environmental stresses, host immune attacks and shear forces. Greater than 98% of all bacteria are found in biofilms and more than 50% of the earth's biomass is biofilm. Biofilm cells can coordinate behaviour via intercellular communication using biochemical signalling molecules. This population recognition system is termed as quorum sensing. Biofilms have been successfully used in water and wastewater treatment. Scientists claim that drinking water and wastewater processed with a biofilm system in a treatment plant are more "biologically stable" than water filtered by other treatment systems. Bioremediation using biofilms has emerged as a technology of choice for cleaning up groundwater and soil at many sites contaminated with hazardous wastes. Biofilm supported leaching process is called "heap leaching." Low grade ore is placed in a "heap" and sprayed with a mildly acidified water solution that encourages the growth of a particular bacterium that oxidizes the ore, releasing water soluble metal ions that are then recovered from solution.

Keywords - Biofilm communities, EPS, Quorum sensing, Water Treatment, Bioremediation, Bioleaching.

MUSHROOM OF BENGAL CAN CHANGE RURAL ECONOMY

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Abstract: The potential role of mushroom as not only supplementary protein, but as biochemical agent for prevention and treatment of human health attracted the interest of botanists for last few years. In this short review we will just try to focus on the edible mushrooms of West Bengal with nutritional value and area of occurrence. As we know the Geo-morphological nature of West Bengal Starting from Darjeeling Himalaya to Delta of Sundarban; the edaphic diversity helps to enormous growth of variety of Macro-fungi. Many of them are edible. These mushrooms can produce metabolites which can be used not only as protein supplement but as therapeutic agents in low cost if we can promote the cultivation of the same depending upon their natural habitat. The cultivation of the mushroom in rural Bengal can also strengthen the rural economy as it can be flourished as low investment small scale industry.

Key Words: Mushroom, nutritional value, diversity, metabolites, therapeutic, small scale industry

STUDY OF SOME COMMON PLANTS FOUND IN GAURDAHA AND ADJOINING AREAS

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Abstract: Plant morphology or phytomorphology can be defined as the study of the physical form and external structure of plants. Phytomorphological studies offers linkages to many fields of plant biology, such as systematics, crop science, physiology, developmental genetics and so on. The study includes both the vegetative and reproductive structures of plants, however, flower and fruits are no doubt the most interesting characters observed in angiospermic plants. In the present study, morphological characters of some common plants found in Gaurdaha and adjoining areas were observed and documented. Gaurdaha is a town under Canning subdivision of the South 24 Parganas, West Bengal. It is approximately 45kms from Kolkata. The common dominant plants of the area were documented along with their prominent morphological characters emphasising on the floral and fruit morphology. The floral characters studied included, type of inflorescence, flower type, corolla forms, calyx and corolla modifications, cohesion and adhesion of androecium, gynoecium, etc. The list of plants documented in the area include *Jatropha gossypifolia* L. (Euphorbiaceae), *Passiflora* (Passifloraceae), *Boerhavia repens* L. (Nyctaginaceae), *Heliotropium indicum* L. Boraginaceae, *Urena lobata* L. (Malvaceae), *Coccinia grandis* (L.) Voigt. (Cucurbitaceae), *Lindernia crustacea* (L.) F.Muell. (Scrophulariaceae), *Calotropis gigantea* (L.) Dryand. (Apocynaceae), *Albizia saman* (Jacq.) Merr. (Mimosaceae), *Senna alata* (L.) Roxb. (Leguminosae) etc.

Key words: Gaurdaha, West Bengal, floral morphology, fruit types, dominant plants

DOCUMENTATION OF SOME IMPORTANT PLANTS OF RABINDRA SAROBAR

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Abstract: Rabindra Sarobar, previously known as Dhakuria lake, is an artificial lake in South Kolkata, West Bengal. Out of the total area of 192 acres, the lake covers 73 acres and the adjoining areas are occupied by different plant species. The present study is based on the documentation of some of the important plant species that are of taxonomic significance, as well as holds medicinal value. The species were observed giving emphasis on their special morphological characteristics. Attempt have been made to capture these salient morphological features of the herbs, shrubs and trees studied, as far as practicable, in the form of photographs. The list of taxa prepared, thereby, have revealed the presence of avenue trees like *Acacia auriculiformis*, *Putranjiva roxburghii*, *Samanea saman*, *Sterculia foetida*; ornamental plants like *Bauhinia purpurea*, *Bougainvillea spectabilis*; common herbs belonging to the families of Asteraceae, Poaceae, etc among others. Other noteworthy trees like *Couroupita guianensis*, *Casuarina equisetifolia*, shrubs like *Abroma augusta* were also documented.

Keywords: Rabindra Sarobar, plants, morphological features.

ROLE OF PACLITAXEL, VINBLASTINE AND VINCRISTINE IN MODERN CANCER THERAPY

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Abstract: In generic era of modern biotechnology still natural products represent over 50% of all drugs in clinical use. The World Health Organization estimates that 85% of traditional medicine involves the use of plant extracts and about 80% of the people in developing countries of the world depend on traditional medicine for their primary health care. Among the 87 anticancer drugs approved over the past ten years, 62% are of natural origin. The major drugs include paclitaxel, Vinblastine and Vincristine extracted from *Taxus brevifolia* and *Catharanthus roseus* respectively. All of them prevent the multiplication of cancer cells by binding to tubulin and blocking the polymerization to form microtubules required for cell division. The evidence from epidemiological and experimental studies that highlight the importance of compounds derived from plants “phytochemicals” are medically more important to reduce the risk of cancer and inhibit the development and spread of tumours in experimental animals. Paclitaxel, Vinblastine and Vincristine drugs have a strong inhibitory effect on monozygotic leukemia, breast cancer, lung cancer, liver cancer, ovarian cancer, head and neck cancer, testicular cancer, solid sarcoma and malignant melanoma in a variety of spontaneous or transplanted lymphocytic leukemia. The structure of Vinblastine and Vincristine is very similar. There are some differences in their pharmacological effects only and there is no cross-resistance. However, anti-tumourous effects still face challenges and have a long way to go. The process of research and development of these drugs will provide more meaningful future revelations.

Keywords: Paclitaxel, Vinblastine, Vincristine, Cancer, *Taxus brevifolia*, *Catharanthus roseus*

AN OVERVIEW OF POLLUTION MONITORING OF RIVER GANGA

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Susmita Das

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Abstract: The degree of the holiness of river Ganga which is the lifeline of Gangetic Plain is questionable for last 50 years. It covers more than 26% of the country's area in its basin in the north and drains 25% of the annual run-off. Fast urbanization, industrialization and steep demand for water have led to serious problems of water quality degradation. Monitoring of quality of water indicate that it is polluted in most of the segments. Many of its tributaries are heavily polluted and the main water quality issues are, organic pollution indicated by BOD and pathogens. The water quality trend is fluctuating depending on the rate of rain fall and water abstraction. The increasing rate of pollution is due to discharge of huge amount of domestic and industrial discharges. The river water pollution due to heavy metals is one of the major concerns in most of the metropolitan cities in the bank of Ganga. These toxic heavy metals entering the environment may lead to bioaccumulation and biomagnifications. Regular monitoring of River Ganga water quality is necessary to have a check on surface water pollution for the sake of healthy living of human. There is an urgent need to augment water availability in the basin by rainwater collection, water conservation and environmental flow determination in various segments of the river affected by water abstraction.

Keywords: Domestic-Industrial waste, pathogenic pollution, over-exploitation, integrated water resources management

THE GREENHOUSE EFFECT

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Abstract: The greenhouse effect is a natural process that warms the Earth's surface. When the Sun's energy reaches the Earth's atmosphere, some of it is reflected back to space and the rest is absorbed and re-radiated by greenhouse gases. The major six greenhouse gases, as recognised by Kyoto Protocol, are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. Of these six gases, three are of primary concern because they are closely associated to human activities. When these greenhouse gases are added to the atmosphere in larger concentrations, then they will absorb more of the infra-red radiation. The Earth's surface and the lower atmosphere will warm further until a balance of incoming and outgoing radiation is reached again (the emission of infra-red radiation increases as the temperature of the emitting body rises). This extra warming is called the enhanced greenhouse effect. Greenhouse gases have far-ranging environmental and health effects. Extreme weather, thawing of glacial masses, ocean warming, sea-level rising, flooding of islands and coastal cities, hurricanes will be more devastating, migration of species, desertification of fertile areas, increased wildfires, impact on agriculture and livestock, are among the many effects of greenhouse gases.

Keywords: Greenhouse gases, effects, climate change.

***Agrobacterium rhizogenes* MEDIATED TRANSFORMATION: A TOOL FOR PLANT IMPROVEMENT**

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Abstract: *Agrobacterium rhizogenes* is a Gram negative soil bacterium. It is well known for the ability to transfer its T-DNA (Transfer DNA) from Ri-plasmid (Root inducing plasmid) to the host genome of higher plants and form adventitious roots known as 'hairy roots'. These hairy roots formed at the infection sites can be excised and cultured *in vitro* known as the 'hairy root culture'. Hairy root cultures show unique characters like, high growth rate, increased branching, ageotropic growth, ability to grow indefinitely on hormone free medium, ability to produce a plethora of important secondary metabolites comparable to parent plant, genetic stability over a long period of time, etc. Hairy root cultures acts as a promising tool for commercial production of important secondary metabolites. Spontaneous and induced plant regeneration from hairy root culture, their unique phenotypic characters known as 'hairy root syndrome', long term stability of Ri-transformed plants, enhanced ability to produce important secondary metabolites, etc. are reported in a wide array of plant species and reviewed time and again. This area of research is popular for over four decades and still continues to be an important tool for improvement of plants and plant products via wild type transformation as well as transformation with Ri-plasmid harbouring foreign genes. In this review, we present the recent trends in *A. rhizogenes* mediated transformation studies for improvement of plants in the last five years including improvement of secondary metabolites in medicinal plants, improvement of ornamental plants and crop plants.

Keywords: *Agrobacterium rhizogenes*, transformation, hairy root, Ri-transformed plants, recent trends.

CYBRIDS: A REVIEW ON THE APPLICATIONS OF CYTOPLASMIC HYBRIDS IN PLANTS

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Abstract: Cybrids are cytoplasmic hybrids obtained by hybridization processes where the nucleus is derived from one parent and the cytoplasm is derived from both the parents. This hybridization technique does not involve nuclear fusion. In this technique two protoplasts are fused and in one of them the nucleus is inactivated which ultimately allows only the cytoplasmic material to be mixed without nuclear fusion. This procedure has overcome certain limitations of conventional hybridization techniques. Cybridization techniques have produced several intergeneric hybrids like *Raphanobrassica*, *Solanopersicon*, *Oryzochloa* etc. Certain cybrids have been also found resistant to several abiotic stress factors, but the most promising applications of cybridization technique is the introduction of cytoplasmic male sterility in certain crops which facilitate the production of hybrid seeds and more vigorous plants.

Keywords: Cybrids, hybridisation, protoplast, cytoplasmic male sterility

BIOTECHNOLOGICAL APPLICATION OF MICROALGAE

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Abstract: Microalgae are important biological resources that have a wide range of biotechnological applications. They produce a wide range of metabolites such as, proteins, carbohydrates, lipids, carotenoids, vitamins, fatty acids, sterols, etc. They are able to enhance the nutritional content of conventional food and feed preparations and hence positively affect humans and animal health including aquaculture animals. In terms of environmental biotechnology, they are useful for bioremediation of agro-industrial wastewater, and as a biological tool for assessment and monitoring of environmental toxicants such as heavy metals, pesticides and pharmaceuticals. In recent years, microalgae have attracted much interest due to their potential use as feedstock for biodiesel production. There has been active research on microalgal biotechnology for the past 30 years, tapping into the potential of our rich microalgal resources for high-value products and applications in wastewater treatment and assessment of environmental toxicants. A culture collection of microalgae has been established, and this serves as an important resource for microalgal biotechnology research. Microalgal biotechnology should continue to be regarded as a priority area of research in this country. As history has shown, research studies on microalgae have been numerous and varied, but they have not always resulted in commercial applications. The aim of this review is to summarize the commercial applications of microalgae.

Keywords: Microalgae, Nutrition, Metabolites, Phycoremediation, Nanometals, Nanotechnology, Biofuel

AQUASCAPING: A NEW APPROACH TO EX-SITU CONSERVATION VIA BIOREMEDIATION

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Abstract: Depletion of natural resources and habitat destruction has led to changes in ecosystems from the global to the local scale. For this reason, numerous theories and methods from landscape ecology have emerged and applied in sustainable landscape planning and designs like aquascaping. Aquascaping is the skill of arranging aquatic plants, as well as rocks, stones, cavework, driftwood, etc. BIOTOPE an Aquascaping style is an exact replica of a specific natural aquatic landscape, capable approach in creating a sustainable environmental design. Growing an endangered native species in an AQUASCAPE medium can be filtered by PHYTOREMEDIATION (using water hyacinth/ Duckweed). Phytoremediation is the most promising option to combat Eutrophication and pollution problems in rural areas. Duckweed holds immense potential for nutrients recovery and utilisation as fodder or feed for livestock including fish. Waste water Duckweed aquaculture is an eco-friendly integrated package for converting the waste water nutrients into high quality fish protein and augmenting rural economy. In our present study we propose two aquascaping models, first Bioremediation and Filtration of Ganga water with water hyacinth and second to conserve endangered native species by using the filtered Ganga water. Hence we have tried to show BIOTOPE as a mode of ex-situ conservation, providing protection for rare and endangered species.

Key Words: Aquascaping, Phytoremediation, conservation, water quality

NEW PERSPECTIVES OF ECOPHYSIOLOGICAL RESEARCH ON PLANTS EXHIBITING CRASSULACEAN ACID METABOLISM - AN OVERVIEW

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Abstract: In plants exhibiting Crassulacean Acid Metabolism (CAM) photosynthesis mostly occurs together with C3 photosynthesis, and occasionally with C4 photosynthesis. CAM input to total carbon gain can vary from values of <1% to 100% depending on environment, species and their ontogeny. The wide range of CAM phenotypes among the inter-specific and intra-specific level is an excellent example of functional diversity and plasticity. A principle feature of the CAM photosynthetic pathway involves around the nocturnal uptake of CO₂ and its subsequent storage as organic acids for later day-time fixation into photosynthate. CAM is not only unique, water conserving and carbon-concentrating photosynthetic pathway, but also one of the major means by which mainly terrestrial plants achieve superior levels of resource-use efficiency. As a consequence, CAM plants are increasingly recognized as the key drivers of ecosystem function in dry regions. Considering the potential emergence of drier areas in many parts of the world due to climate change, understanding the advancement of studies on CAM biology holds enormous promise for future engineering of this photosynthetic adaptation in crop species.

Keywords: Crassulacean Acid Metabolism (CAM), ecophysiology, photosynthate.

Ginkgo biloba L. (GINKGOACEAE) AND ITS BENEFITS TO THE SOCIETY

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Abstract: *Ginkgo biloba* L. (Ginkgoaceae, Gymnosperm) is one of the oldest species of trees in the world (found in fossils dating back 270 million years). *G. biloba* or maidenhair tree is native to China. As it is the only surviving member of the order Ginkgoales (a primitive order) and referred as "living fossil". The plant has a long history of being used in traditional Chinese medicine. Present day, *Ginkgo* is a well-known medicinal plant and it is gaining its popularity as phytomedicines for CNS disorders in various countries. A wide range of secondary metabolites including terpenoids, flavanoids, saponins have been isolated from the plants. The most unique components are the ginkgolides and bilobalide, which are responsible for various pharmacological activities like improvement of memory, increased blood circulation, inhibitor of platelet-activating factor etc. Moreover, *G. biloba* is widely used in the treatment of early stage Alzheimer's disease. Now various products of *Ginkgo* extracts are available in market to boost immunity and curing for several diseases.

Key words: *Ginkgo biloba*, gymnosperm, living fossil, secondary metabolites, phytomedicines.

EVALUATION AND COMPARISON OF *E. officinalis* AND *A. marmelos* AS ALTERNATIVE THERAPIES FOR BACTERIAL DISEASES IN INDIAN RURAL AREAS

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Abstract: India is blessed with a diverse range of medicinally important plant species which have been employed by traditional systems of medicine especially the ‘ayurveda’ and ‘unani’ for the treatment of different pathological ailments in man. Unique biological activities of specific phytochemicals present in such plants, have been reported in non-plant systems, ranging from microbes to animals including humans. The remote rural areas of India are still largely underdeveloped, as a result of which healthcare facilities are severely lagging. Therefore, there is a need for development of cheaper therapeutic formulations from crude sources, which can be stored and consumed or formulated into ointments which can be applied topically. Two different plants have been used in this study; the fruits of *Emblica officinalis* (amla) and the leaves of *Aegle marmelos* (bael). Here we have performed ethanolic extraction of the samples followed by qualitative estimation. *In vitro* antimicrobial activity of the extracts was determined against Gram-negative (*Escherichia coli*) and Gram-positive (*Staphylococcus aureus*) bacteria. Studies performed include both morphological and anatomical studies on the bacteria in suspension. MIC of each extract was determined by measuring the zone of inhibition (ZOI) through agar well diffusion method. The antioxidant activity of the extracts was also determined through the DPPH assay. The *in vitro* anti-inflammatory activity of each extract was determined by measuring the percentage protection of human red blood cell (HRBC) membrane spectrometrically. Antimicrobial patches were fabricated through synthesis of PVA-gelatin thin composite hydrogel matrices as a cheap commercial therapy for topical bacterial infections.

Keywords: *Emblica officinalis*, *Aegle marmelos*, antimicrobial, antioxidant, anti-inflammatory.

ii) **EARTH SYSTEM AND ENVIRONMENTAL SCIENCES**

Symposium Lecture

Prof. Anirudhho Mukhopadhyay,
Professor, Department of Environmental
Science, CU



Dr. Sandip Mukhopadhyay,
Associate Professor,
Department of Marine Science, CU

Overview on biogeochemical dynamics of some of the estuaries at the land-ocean boundary of NE coast of the Bay of Bengal, India

Abstract

This talk will mainly cover the biogeochemical studies carried for the estuaries of the Ganges and the Sundarbans mangrove ecosystems. The seasonal variability of the physico-chemical parameters, biogeochemistry of the nutrients, material fluxes at the marine boundaries and air-water exchange of the trace gases in these sub-tropical estuarine systems are the major highlights. The prominent contrast between the Hooghly estuary (estuary of Ganges) and the mangrove dominated estuaries of the Sundarbans will be discussed. The trace gas emission from the coastal wetlands and its impact on the regional climate will be covered. Detailed study on the biogeochemical cycling of methane in the mangrove environment will be presented.

Gautam Ghosh
Director (Geology), Selection Grade (Retd.)
Life Member of MGMI
Life Member of Indian Society of Remote
Sensing
Member of the Committee on Ground Water
Resources of Kolkata Municipal Corporation



Dipak Kumar Mukhopadhyay
Senior Geologist (Retired), GSI



Impact on Human Health Due to Exposure to Arsenic Contaminated Drinking Water and Food

Abstract

Arsenic comprises 0.00058% of the total mass of the earth's crust. It exhibits preferential accumulation in certain environment. High concentration of arsenic is usually observed in the following geo-chemical environments:

- Basin fill deposits of alluvial- lacustrine origin specially in semi-arid areas
- Volcanic deposits
- Geothermal systems
- Uranium and gold mining areas

Major processes responsible for concentration of arsenic in groundwater are (a) mineral precipitation/dissolution, (b) adsorption/desorption, (c) chemical transformations, (d) ion exchange and (e) bio- mediated reactions.

Drinking of water with high levels of arsenic, over a long period of time, gives rise to chronic arsenic toxicity. Consumption of food, cultivated using arsenic contaminated groundwater, may comprise another source of chronic arsenic poisoning. Different foods have different arsenic concentrations.

It has been observed, in case of people suffering from arsenic toxicity, that they have significant accumulation of arsenic in their urine, hair and nail samples.

All arsenic compounds are poisonous and exposure to arsenic gives rise to various adverse impacts on human health. Exposure of humans to arsenic may give rise to non-carcinogenic effects such as hyper-pigmentation, keratosis, blackfoot disease, cardiovascular disease and neuropathy. Arsenic toxicity may adversely affect verbal IQ and long term memory and suppress hormone regulation and hormone mediated gene transcription and also cause increase in loss of foetus and premature delivery with decreased birth weights of infants. Arsenic is the only known human carcinogen for which there is adequate evidence of carcinogenic risk by both inhalation and ingestion. Arsenic toxicity may also result in cancer of lungs, urinary bladder and skin.

Invited Lecture

Chaired by:

Dr. Timir Baran Ghoshal, Director,
Geological Survey of India

Prof. Anirudhho Mukhopadhyay,
Professor, Department of Environmental
Science, CU

Dr. Sandip Mukhopadhyay, Associate Professor,
Department of Marine Science, CU

Dr. Chumki Chowdhury, Assistant Professor,
Department of Botany, Jangipur College,
Murshidabad



Biological pump, relating it to diatom bloom in the estuarine environments along the northeast coast of the Bay of Bengal, India

Abstract

Coastal oceans and estuaries play significant role in global carbon cycle. Study reveals the active presence of biological pump in estuaries and associated coastal areas. Spatio-temporal variation of phytoplankton abundance and community organization have strong connection with the ancillary parameters in the tidal fed river estuaries at the land ocean boundary of North-east Coast of India. The monsoon period is significantly different than other times of the year in terms of phytoplankton productivity and other key parameters. Mean dissolved inorganic nitrogen concentration was found greater in the Sundarbans estuaries than the other east coastal polluted estuaries and reverse was the case for dissolved inorganic phosphorus. N/P ratio was different from Redfield ratio and it showed highest value in the Saptamukhi river (Sundarbans) i.e. 27 than in the Mahanadi estuary (east coastal polluted estuary) i.e. 5.6. In both the estuaries Gross Primary Productivity was lower than community respiration and act as a perennial source of CO₂. Phytoplankton population showed lowest level during monsoon period and highest levels during post-monsoon periods when CO₂ efflux significantly decreased to the lowest level and even Saptamukhi estuary acts as a sink for atmospheric CO₂. Phytoplankton community structure in the Saptamukhi estuary was dominated by diatoms with dominance of nanoplankton, contrast to the Mahanadi estuary which showed the occurrence of Cyanophyceae, Chlorophyceae apart from diatom with greater turn-over time indicating faster CO₂ uptake rate by phytoplankton in the Saptamukhi estuary. Stable prey-predator relationship was observed between phytoplankton and zooplankton making availability of organic matter for microbial degradation and hence less CO₂ flux.

Keywords: *Biological Pump, Phytoplankton, N: P Ratio, CO₂ Flux*

Dr. Ismail Mondal, Assistant Professor,
School of Oceanographic Studies,
Jadavpur University



Spatio-temporal modelling of sea level rising and shoreline migration its effect on Sundarban ecosystem, using remote sensing and GIS techniques, West Bengal, India

Abstract

Sundarban is highly sensitive in general where the multivariate geologic/ geomorphic processes like tectonic, fluvial, marine and aeolian act in varying degrees. Apart from that, the reserve forest is also exposed to natural hazards such as cyclones, coastal erosion, flooding and storm surges. All these effects cause destructive actions on the world heritage site Sundarban mangrove forest. The geodynamics of the Sundarban is affected not only due to sea level changes but also due to storm surge and coastal shoreline erosion. We are using the digital shoreline model to estimate the shoreline migration, most of the erosion occurred in Dhablat in the southern eastern part with a rate of 11.695 ± 2.1 m/year. The mean shoreline change rate was also high in (± 23.525 m/year). However, the overall shoreline change rate for the island was 4.94 m/year and uncertainty of total shoreline change rate was ± 4.4 m/year.

The Fourth Assessment Report of the Intergovernmental Panel for Climate Change (IPCC) reported the SLR at its peak during the 19th century at 1.7 mm yr^{-1} which escalated to 3 mm yr^{-1} in the final decade of the 20th century. From 1990 to 2019, thermal expansion of sea water and melting of land ice each contributed about half of the SLR. So, an average the rate was estimated to vary from 1.4 to 2 mm yr^{-1} for the last century. Our predicted estimation however is about 4 mm yr^{-1} up to 2090 according to the future scenarios. Using tidal gauge data, we have to found that there is a higher rate of SLR in the study area in comparison to global trends. On analyzing temporal Landsat images, it was found that the mangroves covered about 1599.9 sq.km in 1990 and 1582.4 sq.km in 2019. So and appreciable amount (8.5 sq.km) mangroves area is lost during the study period. The results clearly point out that SLR combined with anthropogenic development has caused the depletion of the forests.

Keywords: Accelerated SLR, coastal zone, tide gauge data, shoreline erosion; remote sensing and GIS

DRONE: AN EYE ABOVE AGRICULTURAL FIELD

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Abstract: Agriculture accounted for 23% of GDP, and employed 59% of the country's total workforce in 2016 (FAO). Agriculture, with its allied sectors, is the largest source of livelihoods in India. 70 percent of its rural households still depend primarily on agriculture for their livelihood. Yet, agriculture's contribution to GDP has steadily declined from 1951 to 2011 in country. While achieving food sufficiency in production, India still accounts for a quarter of the world's hungry people and home to over 190 million undernourished people. In India the agricultural production is resource intensive, cereal centric and regionally biased. Climate change and increasing stress on water resources affect the productivity, which are merely controllable by human. Crop diseases also affect the agricultural productivity which caused by pests, insects etc. and may be controlled by proper treatment in a scientific way. But the excessive use of pesticides and fertilizers in agricultural field is a great issue in India. To minimize it an increasing technology, Unmanned Aerial Vehicle (UAV) popularly known as DRONE may be used. This study gives an idea about crop monitoring i.e. detection specific affected or diseased area of crops in the field by DRONE with multispectral camera. DRONE outfitted with thermal sensor can also quickly identify which parts of the field are dry. This real-time data analysis helps farmers to take quick decision of adequate use of fertilizers, pesticides and irrigation to improve the farm productivity and reduce the waste of fertilizers, pesticides and ground water.

Keywords: DRONE, Crop Monitoring, NDVI, WDI, Less Waste of Fertilizers.

NUMERICAL SIMULATION OF ONE-DIMENSIONAL SHALLOW WATER EQUATIONS

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Abstract: The word ‘Tsunami’ is well known to us after the devastating Boxing Day event of December 2004. Tsunami waves can be modelled appropriately using Shallow Water Equation (SWE’s). Here we have tried to simulate the propagation of tsunami waves in one dimension numerically, considering the following coupled non-linear SWE’s (neglecting the frictional terms, Coriolis terms and pressure terms):

$$\frac{\partial \eta}{\partial t} + \frac{\partial M}{\partial x} = 0 \text{ and, } \frac{\partial M}{\partial t} + gD \frac{\partial \eta}{\partial x} = 0,$$

where, $\eta(x, t)$ is water surface elevation, $M(x, t)$ is discharge of water in positive x direction, ‘ g ’ is acceleration due to gravity, $h(x)$ is basin depth, $D(=\eta+h)$ is total thickness of water and ‘ t ’ represents time.

Discretization of these equations has been carried out using Crank-Nicolson scheme of Finite Difference Method (FDM). No-slip boundary conditions are used for the modelling. MATLAB code has been generated for obtaining results for some representative bathymetry. An animation of the result gives some idea of real situation.

Keywords: Shallow Water Equation, Finite Difference Method, MATLAB

THE DEEP LEARNING MODEL FOR ESTIMATION OF INDIAN OCEAN PARAMETERS

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Abstract: Prediction of ocean parameters is important for coastal engineering, naval construction, and marine activities in the oceanic area. The numerical model-generated data in combination with an artificial intelligence method can serve as a cost-effective prediction technique. Deep Neural Learning or Deep Neural Network is an artificial intelligence method that finds abstract features of the data and improves pattern recognition and machine learning techniques. The “deep” in “deep learning” indicates the number of layers through which the data is transformed. Deep learning architectures such as deep neural networks, deep belief networks, and recurrent neural networks have been applied to geophysical fields for forecasting time series data. The accuracy of deep learning depends on finding an architecture to fit the task. Learning can be supervised (classification, regression) or unsupervised. An attempt has been made to forecast the time series of ocean wave parameters using a long short-term memory (LSTM) network. To forecast the values of future time steps of a sequence, a sequence-to-sequence regression LSTM network can be trained, where the responses are the training sequences with values shifted by a one-time step. That is, at each time step of the input sequence, the LSTM network learns to forecast the value of the next time step. The third-generation spectral ocean wave model WAVEWATCH III has been integrated for the entire Indian Ocean region to generate the ocean parameters. Deep network architectures have been used effectively to predict future values from past values.

Keywords: Deep learning, ocean modelling, error analysis, regression equation, Indian Ocean

SCIENCE AND TECHNOLOGY FOR ECOLOGICALLY SUSTAINABLE RURAL DEVELOPMENT

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Abstract: Increased population and industrialization have put on extreme pressure on cultivable land in India. Vertical expansion of farm enterprises are the only way for productivity, profitability and employment generation. Mushroom cultivation and vermicomposting both are very low capital investment but high return allied agribusiness for rural youth and small holder farming women of entrepreneurial spirit. Mushroom cultivation is considered as eco- friendly medicinal crop. Moreover edible mushroom have high antioxidant capacity. Spent mushroom substrates are to be converted into compost through vermicomposting. Vermicomposting provides employment opportunities as it protects the environment augmenting crop productivity when it is used as a fertilizer supplement and helping to maintain ecological balance. Thus, vermicompost plays an important role in the circular economy.

FOREST FIRE: ARE WE COMMITTING SUICIDE?

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Abstract: For thousands of years, fires have shaped ecosystems. Many species thrived when their habitats burned at predictable intervals. Not surprisingly, some have developed traits that enable them to take advantage of fire to reproduce successfully or compete with other species (Miller 2000). For instance, fires burned some grassland nearly every year, while some forests and wetlands escaped fire for centuries at a time. In forests, some fires burned only grass and low shrubs under the large trees, others killed nearly every tree, and still others produced a mosaic of fire-killed trees and patches left unburned because of random changes in wind direction or other conditions (Brown and Smith 2000). Fire-dependent ecosystems are those where fire is essential and the species are adapted to respond positively to fire and facilitate fire spread. Many plants and animals in these landscapes depend on fire for survival. If fire is removed, or the fire regime is altered beyond its normal range of variability, the ecosystem alters, and habitats and species are lost. Forest fires pose a threat not only to the forest wealth but also to the entire regime to fauna and flora disturbing the bio-diversity, ecology and environment of a region. The Himalayan forests, particularly, Garhwal Himalayas have been burning regularly during the last few summers, with colossal loss of vegetation cover. In this paper, we will discuss the environmental and geopolitical background of the recent devastations to biodiversity caused by forest fire through the eye openers like Amazonian and Australian forest incidence. Last year Australia was the hottest and driest on record, with the average annual temperature of 2.7°F (1.5°C) above 1960-1990 average, according to Australia's Bureau of Meteorology. Mike Flannigan, a fire scientist at the University of Alberta in Canada, said Australia's fires are "an example of climate change (India Today, January 4th, 2020)". The question that we need to ask is how much worse are we willing to let this get? This is what global warming of just over 1° C looks like. Do we really want to see the impacts of 3° or more are like, because that is the trajectory we are on." asked Australian University climate Scientist, N.Abram.

Keywords: Forest fire, Biodiversity, Climate change, Global warming, Ecosystem.

BAY OF BENGAL WIND SPEED DATA ANALYZED USING VISIBILITY GRAPH

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Abstract: Wind speed prediction using numerical models are not efficient enough due to the irregular patterns in the data. It is a major parameter for analyzing extreme weather events. All those dwelling near the coast are vulnerable to natural disasters like storm surges and cyclones. Thus analysis of wind speed data especially during cyclones are of great importance to coastal and marine habitants. In this work a simple and fast computational method, the visibility algorithm, has been presented, to convert a time series into a graph. The obtained graph has several properties of the series in its structure. Thereby, resulting in the transformation of periodic series into regular graphs, random series into random graphs. Other than the visibility-graph there are alternative methods to extract the state information. The advantage lies with the detailed information of sub-segments at different scales in each segment. Also it can be used to analyze non-stationary time series. Network based time series analysis has made a great achievement in the recent years. In this paper, time series analysis is based on visibility graph theory, in which series segments are mapped to visibility graphs. This procedure converts a time series into a temporal network and consequently a network of networks. A visibility graph algorithm is applied on Bay of Bengal wind speed data to generate an associated graph that has some character of the time series.

Keywords: visibility graph, complex network, Bay of Bengal, cyclones

ADVERSE EFFECTS OF CLIMATE CHANGE ON INDIAN MANGROVES: A SOCIOECONOMIC CRISIS AND A THREAT TO THE RURAL DEVELOPMENT

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Abstract: Mangroves are one among the important coastal habitats which are highly loaded with immense nutrient and always share it with adjoining coastal habitats. Interestingly this system supports number of endemic and endangered species throughout the tropical coast. India has more than 7500 km coastal line within this, it supports 4, 87,100 hectares of mangroves and harbours 3985 species of flora and fauna. During late 80s India lost considerable areas of its mangrove cover due to several anthropogenic pressures [Easterling, D.R. et al]. The ongoing climate change turned out to be a potential threat to the remaining Indian mangroves and other coastal ecosystem. Ironically there is no sound study till date about the impacts of ongoing climate change on Indian mangroves [Sachs, J. & Malaney et al]. The loss of mangroves will spread its impact on the adjoining system in a significant way. So, the mangrove loss will negatively influence the fishery resource of the tropical region and initiate regional and global socioeconomically crisis and a certain threat to the rural settlement and development of the area concerned.

Keywords: Climate Change, Mangroves, Biodiversity loss, Socioeconomic Crisis

iii) **CHEMICAL SCIENCES**

Symposium Lecture

Prof. Bijon Das, Professor,
Department of Chemistry,
Presidency University



Polyelectrolytes in Solutions: Their Size and Charge

Abstract

Polyelectrolytes are charged macromolecules which, when dissolved in polar solvents, e.g., water, dissociate to yield a polyion and a large number of oppositely charged ions commonly referred to as the counterions. Biopolymers - for example proteins, nucleic acids, lipids, and polysaccharides - are all polyelectrolytes. They interact with each other and also with the small ions present in the media during their biological functions. Coulombic interactions play a pivotal role in structural stabilization of biopolymers as well as in the energetics and kinetics of the biological processes. Polyelectrolytes find widespread applications in industrial processes and in many products of our daily life. Now, the interactions of the polyions with the adjacent ionic species present in the system are governed by the actual size and the effective charge of these polyion chains. Therefore, the nature and behavior of polyions in biological and industrial systems can be understood in a better way if a quantitative information on these parameters is available. Our objective is to show how these two crucial polyion parameters can be ascertained with the help of two simple and inexpensive experimental techniques, e.g., conductometry and viscometry based on two important models of polyelectrolyte solutions put forwarded recently by our research group.

Prof. Samir Kumar Pal, Senior Professor,
Department of Chemical, Biological &
Macromolecular Sciences,
S N Bose National Centre for Basic Sciences



Probing Crucial Interfacial Dynamics of Nanohybrids for Emerging Biomedical Functionalities

Abstract

Nanohybrids are composite of two individual counterparts, interacting at the molecular level exhibiting unprecedented properties than the constituents. The modified properties of the hybrid material have often dictated by the interfacial junction between the two moieties. Thus, it is crucial to understand the various critical interactions present at the interfacial position. The commonly used techniques for structural characterization as electron microscopy (SEM, TEM) or x-ray diffraction (XRD) can only be able to visualize the inorganic counterpart whereas the Fourier transformed infra-red spectroscopy (FTIR), Nuclear magnetic resonance (NMR) can distinguish the organic part predominantly. However, there exists necessity to probe the interfacial dynamical properties of the hybrids. There lie the advantages of ultrafast optical spectroscopic methods to envisage the interfacial properties. The junctional charge transfer or energy transfer processes which are the basis of unusual properties in nanohybrids can be rationalized using excited state lifetime measurements. Finally, the nanohybrids depict unprecedented biomedical applications in destruction of infectious diseases, liver diseases and cancer. The talk will be highlighted about various hybrid materials, their interfacial properties using ultrafast spectroscopy followed by enhanced biological activities.

Invited Lecture

Chaired by:

Prof. Samir Kumar Pal, Senior Professor,
Department of Chemical, Biological &
Macromolecular Sciences,
S N Bose National Centre for Basic Sciences

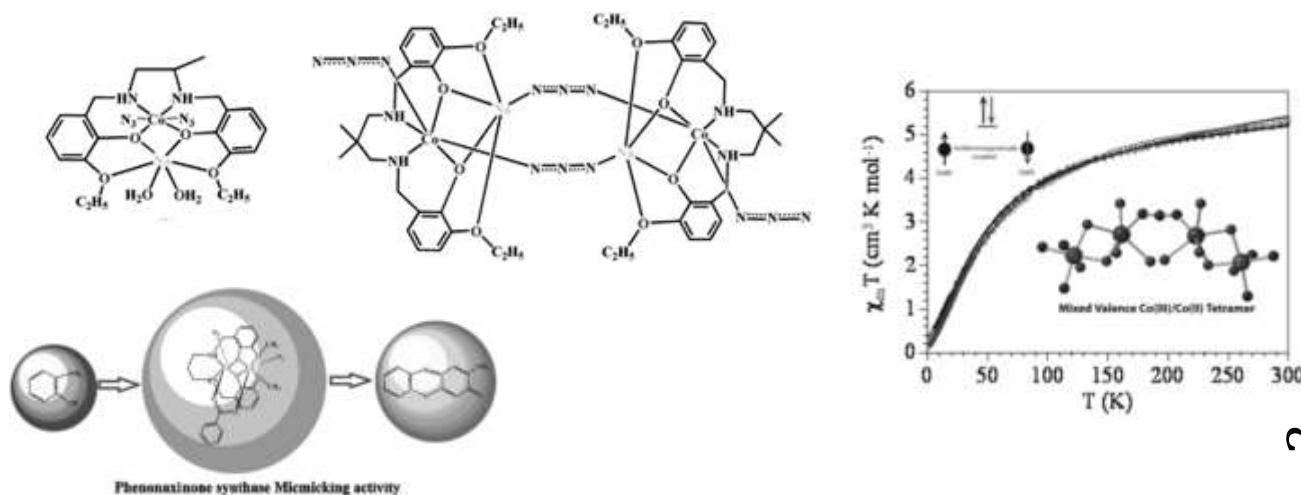
Dr. Shouvik Chattopadhyay,
Associate Professor,
Department of Chemistry,
Jadavpur University



Synthesis and characterization of carboxylate bridged di and polynuclear complexes of cobalt with reduced Schiff bases: Investigation of their ability to mimic phenoxazinone synthase

Abstract

A series of cobalt complexes with reduced Schiff base ligands has been synthesised and characterized by elemental and spectral analysis and also by single crystal X-Ray diffraction analysis. The nuclearity of these complexes were different can be varied by varying the methylene spacer in the diamine moiety. The magnetic properties of two tetranuclear mixed valence cobalt(III/II) complexes having the general formula $[(\mu_{1,3}\text{-N}_3)\{\text{Co}^{\text{II}}(\text{L}^n)(\mu\text{-O}_2\text{CC}_6\text{H}_4\text{NO}_2)\text{Co}^{\text{III}}(\text{N}_3)\}_2]\text{PF}_6$ (where H_2L^1 and H_2L^2 are two reduced Schiff base ligand) show that both are behaving as cobalt(II) dimers connected through a end-to-end azido bridging ligand and show moderate antiferromagnetic Co(II)-Co(II) couplings of -11.0 cm^{-1} and -14.4 cm^{-1} for **1** and **2**, respectively as also corroborated by DFT calculations, $J_{\text{theo}} = -13.07\text{ cm}^{-1}$ for **1** and -12.49 cm^{-1} for **2**. Few dinuclear cobalt(II) complexes were also found to show interesting magnetic properties. The structures of both complexes show cobalt(II) and cobalt(III) centers with a distorted octahedral geometry with cobalt(III) and cobalt(II) centers located at the inner N_2O_2 and outer O_4 cavities of the reduced Schiff base ligands, respectively. The oxidation states of both cobalt centres have been confirmed by bond valence sum (BVS) calculations. One dinuclear mixed valence cobalt(III)/cobalt(II) complex, $[(\text{N}_3)\text{Co}^{\text{III}}\text{L}(\mu\text{-C}_6\text{H}_5\text{COO})\text{Co}^{\text{II}}(\text{N}_3)]\cdot\text{CH}_3\text{OH}$ [where $\text{H}_2\text{L} = (1,3\text{-propanediyl})\text{bis}(\text{iminomethylene})\text{bis}(6\text{-methoxyphenol})$] has been found to act as active functional model for the oxidation of 2-aminophenol to 2-aminophenoxazine-3-one with $k_{\text{cat}} = 153.90\text{ h}^{-1}$.



Dr. Kamalika Sen, Assistant Professor,
University of Calcutta



Green Chemistry for Everyday

Abstract

Green chemistry is a vastly investigated subject these days. The aim of green chemistry is to reduce or eliminate the production of harmful chemicals, minimize energy expenses and maximize the desired product in an eco friendly way. The main emphasis of green chemistry oriented science is to develop alternative processes to replace the use of hazardous substances. Green chemistry has also paved its way to the everyday life of common people. Some recent developments in this direction will be discussed which encompass our everyday life. For instance use of liquid carbon dioxide is being commercialized as a safer solvent along with a surfactant to dry clean clothes instead of the conventional perchloroethylene solvent which is suspected to be carcinogenic. H_2O_2 is now used as a bleaching agent in the presence of some activators which catalyze its fast conversion into hydroxyl radicals that cause bleaching. The conventionally used chemical firefighting foams used worldwide discharge toxic substances into environment contaminating water and depleting the ozone layer. A new foam called pyro cool has now been invented to put out fires effectively without producing toxic substances as in conventional firefighting materials. Green buildings are being innovated which make use of a variety of environmentally friendly techniques by adding photocatalytic materials in order to reduce VOCs from the environment.

Though many exciting green chemical protocols are being developed but there are far greater numbers of challenges ahead. The greatest challenge is to incorporate the green chemistry in everyday life. Several successful efforts have been made but a lot is yet to be done. This can be achieved by training the new generation of chemists. Green chemistry has to be introduced in teaching practices at all levels, so that each individual is made aware to choose the greener path in his or her way of everyday life.

FLUORIMETRIC INVESTIGATION OF 'THERMOSOLVATOCHROMISM' WITHIN PURE AND AQUEOUS IONIC LIQUIDS

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Abstract: Volatile organic compounds (VOCs) used as solvents in the industrial and academic sectors, needed an apt replacement as they spread pollution in our atmosphere and Ionic liquids (ILs) despite some of their vital drawbacks have come up with the suitable answer. To subdue the bottlenecks of ILs there is a necessity of modifying or altering the physicochemical properties of them. The central theme throughout this work is the exploration of the altered solvatochromic probe behavior of different fluorescence probes by the effect of temperature (termed as 'Thermosolvatochromism') which offers a substantial and prolific means of exploring modification/alteration of the physicochemical properties within ionic liquid-based 'green hybrid' solvent systems. As part of our 'Thermosolvatochromism' studies of multicomponent ionic liquid based systems, we have selected neat ionic liquids [bmim][BF₄] & [bmim][PF₆], equimolar aqueous ionic liquids and neat water to investigate the impact of temperature on the fluorescence probes *Pyrene* and *Pyrene-1-carboxaldehyde* response within these solvent systems. On the basis of the responses of these two fluorescence probes, modification/alteration in the dipolarity and/or polarizability of the cybotactic milieu of the neat and solvent mixture have been assessed and found to be in good agreement with our earlier studies using some absorbance probes. The future implementation of this work may be in different fields, viz., in vitro biological reactions within co-solvent modified ionic liquids where temperature may take pivotal role in achieving our desired modes, modulations and variety of products, which may be sustainable, environmentally-benign and beneficial for agricultural sector.

INTERRELATION OF SURFACE ALKANES ON RAJMA (*Phaseolus vulgaris*) L. SEEDS AND *Callosobruchus chinensis* (F.) (COLEOPTERA: BRUCHIDAE)

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Abstract: *Callosobruchus chinensis* (Fabricius) (Coleoptera: Bruchidae) is an important pest of *Phaseolus vulgaris* L. seeds, commonly known as rajma, in India and Europe. Extraction, thin layer chromatography, and gas chromatography analyses of surface waxes of rajma seeds revealed 19 n-alkanes ranging between n-C15 and n-C33. n-Octacosane was the predominant n-alkane, accounting for rajma seeds. n-Hexadecane, n-octadecane were the least abundant alkanes in rajma seeds, representing for 3.46 mg *Callosobruchus chinensis* females elicited attraction to the surface wax alkanes of khesari seeds at 6mg/ml in a glass Y-tube olfactometer bioassay, highest attraction was at concentration of 12 mg/ml. Hence, this concentration of synthetic 12mg/ml might be used for insect pest management programme such as baited traps.

GREEN CHEMISTRY: A TOOL FOR REDUCING WASTE AND IMPROVING SUSTAINABILITY

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Abstract: Green Chemistry is the design, development and execution of chemical products and processes that reduce or eliminate the exploitation and generation of hazardous substances, thus minimizing the pollution and environmental deterioration. It is a combination of chemistry and chemical engineering. Reflection of green chemistry in protection of environment is a major challenge in our daily routine both in domestic as well as in professional sector to make a pollution free environment. The adoption of steps and strategies to control air, water, soil, and industrial waste pollution is nothing but waste management. It includes all activities of collection, transport, treatment, recovery and disposal of waste, including supervising of such operations. Recycling of the waste into the process by green chemistry approach can produce healthy ecosystem to say "Go green, save Green and use Green!" Feedstocks which are formed by yearly renewable resources or from abundant waste uses to make green ecosystem. Similarly, more facile reuse or recycling of chemicals, treatment of chemicals and disposals of chemicals including radioactive waste helps to make the environment eco-friendly. In U.S, the Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA) regulate chemical use and disposal. Green chemistry also prioritises safety, improving energy efficiency and, most importantly, minimising/ eliminating toxic waste from the very beginning. Important examples of green chemistry include: phasing out the use of chlorofluorocarbons (CFCs) in refrigerants, which have played a role in creating the ozone hole; developing more efficient ways of making pharmaceuticals, including the well-known painkiller ibuprofen and chemotherapy drug Taxol; and developing cheaper, more efficient solar cells.

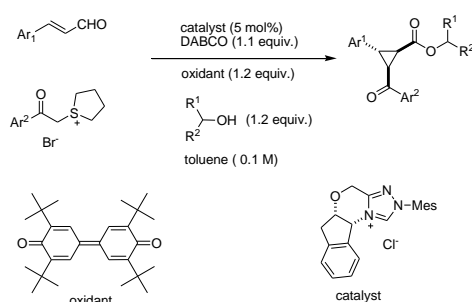
Keywords: Green Chemistry, Recycling Process, Waste Management

STEREOSELECTIVE CASCADE TOWARDS TRISUBSTITUTED CYCLOPROPANE SYNTHESIS BY ORGANOCATALYSIS

Dr. Anup Biswas¹ and Dr. Armido Studer²

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Professor, Organic Chemistry Institute, WWU, Muenster, Germany

Abstract: The occurrence of the cyclopropane moiety in large number of bioactive natural products as well as in therapeutic agents has fostered research on the development of asymmetric synthetic strategies for cyclopropane motifs. Organocatalytic methods specially N-heterocyclic carbene (NHC) catalysis is a very well researched area for the development of cascade methods to prepare various cyclic molecules. In this poster we are presenting the enantioselective synthesis of cyclopropane rings using NHCs as catalysts under mild oxidative conditions. α,β -Unsaturated acyl azolium ions generated by NHC catalysed redox activation of enals are good *Michael* acceptors towards sulfur ylides thereby generating cyclopropyl acyl azolium ions which upon alcoholysis produce the trisubstituted cyclopropyl carboxylic esters. The reaction proceeds through two C-C bond formations and three contiguous stereogenic centres are generated.



FLAVONE FROM KARANJA SEED OIL

Deblina Roy¹, Dr. Nilanshu Das², Dr. Amar Dasgosh³

Department of Microbiology, St. Xavier's College, Kolkata; Department of Microbiology, Surendranath College, Kolkata; Department of Microbiology, Surendranath College, Kolkata

Abstract: *Pongamiapinnata*, Pierre: syn, *Pongamiaglabra*, Vent (family- Leguminosae) known as Karanja, an important medicinal plant. (Late) Prof. Ashima Chatterjee observed that this seed oil has tremendous effects against disease Psoriasis. These led us to carry out detailed investigations on this seed oil. Repeated column chromatography with 5% ethyl acetate in hexane, 10% ethyl acetate in hexane and 20% ethyl acetate in hexane systems followed by recrystallization afforded six compounds. All the compounds except one responded to Mg-HCl test indicating the presence of flavone moiety. Structures of all compounds were established from spectral studies and characterised as - 3-methoxy-(7,8,2'',3'')furano flavones, 3-methoxy- 3',4'- methylene dioxy-. (7,8,2'',3'')furano flavones, 3',5'-dimethoxy- (7,8,2'',3'')furano flavones, 3,7-dimethoxy-3',4'-methylene dioxyflavone, 3',4'-methylenedioxy- (7,8,2'',3'') furano flavones, β -hydroxy-2'-methoxy-(3',4',2'',3'') furanochalcone.

Keywords- Karanja seed, *Pongamiapinnata*, *Pongamiaglabra*, Flavone, Chalcone.

INDUSTRIAL AND AGRICULTURAL WASTEWATER TREATMENT FOR THE REMOVAL OF TOXIC ANIONS USING NATURAL BIOSORBENTS: A GREEN APPROACH

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Abstract: Industrial and agricultural wastewater contains several toxic anionic species like fluoride, arsenate, chromate, phosphate, perchlorates and nitrates [1]. All of these can cause serious health and environmental problems when released into the surrounding without necessary pretreatment. Various processes like precipitation, membrane separation, ion exchange, electrolytic methods and adsorption are employed for water remediation [2]. Amongst them, adsorption process emerges to have several advantages as it is cost effective, simple and can involve benign reagents. Serious attention towards developing methodologies for removing water contamination via green pathway focusing on the principles of reduce, reuse and recycle will benefit mankind. Biosorbents are taken as green adsorbents for pollutant removal due to their environmentally benign and ecofriendly nature- they are also easily available and reusable. Our focus is on removal of anionic toxic species using throw away materials that act also as biosorbents like vegetable peels, fruit peels, fruit seeds, rice husks, coconut choir etc., abundant in rural areas [3]. A study reveals that removal techniques for these anions were mainly by co-precipitation and ion exchange techniques [4]. Removal of the toxic anions using natural biosorbents in adsorption process has not been attempted so far. Also attempt will be made towards chemical modifications of these biosorbents to increase their potentiality. However, efforts should be taken to avoid negative environmental impact during manufacturing process of green adsorbents. Moreover, detection of some anions is easy, rapid and efficient through UV-Vis spectrometry, where lower level of anion sensing is possible.

Technical Session-II

i) MODERN BIOLOGY **Symposium Lecture**

Prof. Debashis Mukhopadhyay, Professor,
Saha Institute of Nuclear Physics



Invited Lecture

Chaired by:?

Prof. Debashis Mukhopadhyay, Professor,
Saha Institute of Nuclear Physics

Dr. Mainak Snegupta, Assistant Professor,
Department of Genetics,
University of Calcutta



To smoke, or not to smoke: that is the question!

Abstract

Lung cancer is found to be the most prevalent malignancy with the highest mortality rates worldwide. It has been reported that about 15-20% of tobacco smokers develop lung cancer while the rest somehow evade the disease, which indicates an operant genetic predisposition to lung cancer. Thus it is imperative to identify the precise genetic markers contributing to this differential susceptibility. Lung carcinogenesis involves aberrant expression of xenobiotic metabolism and DNA repair genes as critical modulators of differential susceptibility among individuals. Such differential expression of genes could be attributed to variants in the cis-regulatory regions regulating the transcription of the respective genes. *In silico* genomics and data mining identified 22 regulatory SNVs (rSNVs) for seven xenobiotic metabolism and 7 DNA repair genes through an *in silico* pipeline developed in our laboratory. Out of the total 22 rSNVs, 3 promoter rSNVs with cis-eQTL p-value <0.01 in lung tissue were genotyped by PCR-RFLP method in 101 cases and 401 controls with smoking history in the eastern Indian region by PCR-RFLP-sequencing method. The case-control study revealed rs3764821 of *ALDH3B1* and rs3748523 of *RAD52* to be associated with overall lung cancer and also with lung cancer modified by pack-years of smoking, tobacco and betel quid chewing. Our study would pave the way to frame a complete personalised genomic map, which in turn would aid in informed decision making towards smoking.

Key words: Lung cancer, smoking, SNV

Dr. Gaurav Gupta, Associate Professor,
NIIT University, Rajasthan



Long Pentraxin 3 (PTX3) Regulates IL-17A Mediated Immunity to Primary *Leishmania major* Infection

Gaurav Gupta^{1,2*}, Ping Jia¹, Rohit Sharma³, Romaniya Zayats¹, Lianyu Shen¹, Zhriiong Mou¹, Thomas T Murooka¹, Abdel Sousi-Gounni¹, Camila I. de Oliveira³ and Jude E. Uzonna¹.

¹University of Manitoba, Canada, ² NIIT University, Rajasthan, India, ³Oswaldo Cruz Fdn. (FIOCRUZ), Brazil, * Presenting Author.

Abstract

Resolution of cutaneous leishmaniasis (CL), caused by the protozoan parasite *Leishmania (L) major*, relies on the nature of the host immune response. The long pentraxin 3 (PTX3), a soluble pattern recognition molecule, is critical for wound healing by regulating tissue repair and also in innate and adaptive responses during infection and inflammation. Here, we have shown that PTX3 regulates immunity to CL. PTX3^{-/-} mice were highly resistant to primary *L. major* infection. Interestingly, the enhanced resistance of PTX3^{-/-} mice to primary *L. major* infection was not associated with enhanced IFN- γ or decreased IL-10 response. Instead, *L. major*-infected PTX3^{-/-} mice displayed strong IL-17 response and *in vivo* neutralization of IL-17A abolished their enhanced resistance. Healed PTX3^{-/-} mice had higher frequency of effector memory cells which were capable of proliferating into host protective IL-17A producing CD4⁺ T cells upon secondary challenge. Naïve CD4⁺ T cells from PTX3^{-/-} mice displayed increased differentiation into Th17 cells and this was associated with increased expression of Th17-specific transcription factors including ROR γ t, AhR and STAT3. Addition of recombinant PTX3 significantly inhibited the expression of Th17-specific transcription factors and the frequency of Th17 cells in Th17 polarizing cultures of PTX3^{-/-} CD4⁺ T cells. Collectively, our results show that PTX3 contributes to pathogenesis of CL by negatively regulating inflammation via enhancing IL-17 response.

Key Words: Host Immunity, cytokines, Leishmania, T cells

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Cross-presentation: an approach against the life threatening diseases

Abstract

Generation of successful immunological responses require the activation of a broad range of T cells by antigen presenting cells which present processed antigens through major histocompatibility complexes. While intracellularly synthesized antigens are presented through MHC class I molecules to activate CD8⁺ cytotoxic T lymphocytes, extracellular antigens are presented through MHC class II molecules to activate CD4⁺ T helper cells. In addition, an interesting pathway exists between these two pathways termed as cross-presentation which permits some form of exogenous antigens to activate CD8⁺ T cells through MHC class-I pathway. This exogenous pathway of antigen presentation is essentially crucial to resist against various microbial, pathogenic and viral infections, as well as tumors.

Protein antigens are poorly immunogenic and are rapidly degraded by proteases resulting in very poor presentation through MHC molecules. Thus they fail to generate required immunity for protection against life threatening diseases. In order to develop proteins as vaccines, unique delivery techniques are required to protect antigens and efficiently deliver them to APCs.

In view of that, we have developed lipid based nano-particles for successful encapsulation of antigens (leishmanial gp63 as model antigen) and their efficient delivery to APCs. We have found that lipid based particles efficiently encapsulated the protein antigens and delivered soluble form of antigens to key cells that initiate required immune responses. We report immunostimulatory capacity of antigen loaded particles and assessed their immunogenicity using mouse model, taking advantage of T cells specific (generated) for the loaded antigen. We show that protein antigen delivered by lipid particles stimulate CD8⁺ T cell responses (cross-presentation) more effectively than protein administered alone. These indicate potential advantage of lipid-based vaccine delivery technology for initiating cross-presentation.

Dr. Subhadeep Ganguly, Assistant Professor,
Department of Physiology,
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Production of L-glutamic acid by *Corynebacterium glutamicum* X680 using agro-based waste materials

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3. Centre of Studies in Surface Science and Technology, School of Chemistry, Sambalpur University, Jyoti Vihar-768 019, Odisha, India

Abstract

Urease catalyzes hydrolysis of urea. The present investigation was undertaken to investigate the urease activity and its optimization during L-glutamic acid fermentation by a biotin auxotroph *Corynebacterium glutamicum* X680 using urea as the principal nitrogen source. The another interesting part of this study was to investigate the efficiency of this microorganism for utilization of indigenous raw materials (such as hydrolysates of cassava starch, rice bran and wheat bran) as cheap carbon sources instead of glucose. Among different raw materials, hydrolysate of cassava starch appeared to be the most suitable. However, the production efficiency is significantly less ($p < 0.01$) with cassava starch compare to glucose. When the medium is supplemented with equivalent amount of (10g%) cassava starch hydrolysate, the L-glutamic acid accumulation was reported only 18.2mg/ml with maximum urease activity (0.18U/mg protein) with pH7 at 30°C.

Key words: Corynebacterium glutamicum X680, urease, L-glutamic acid, hydrolysates of cassava starch

INHIBITION OF RECEPTOR MOBILIZATION AND RECEPTOR SHEDDING DURING DUAL RECEPTOR (TNFR1 AND IL-1R) NEUTRALIZATION DOWNREGULATES CXCR1 EXPRESSION IN STAPHYLOCOCCUS AUREUS INFECTION

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Abstract: The multidrug-resistant, human pathogen, *Staphylococcus aureus* is responsible for wide range of diseases, from skin infections to life-threatening diseases (pneumonia, osteomyelitis, brain abscesses and others). Regulation of highly expressed CXCL8/CXCR1 axis during *S. aureus* infection is essential to protect the host from excessive tissue inflammation leading to sepsis. Currently, *S. aureus* induced invasive diseases is a major public health problem in India, especially in rural areas. Anti-cytokine receptor therapy is current been used as leading treatment of various infectious diseases worldwide. With this approach, we aim to explore the effects of inhibition of intracellular receptor mobilization (using Brefeldin A) and receptor shedding (using TAPI-1) on CXCR1 expression during single or dual receptor (TNFR1 and IL-1R) neutralization in murine peritoneal macrophages during *S.aureus* infection. The peritoneal macrophages were isolated from Swiss albino mice. The ROS generated, cytokine production was measured. Expression of surface receptors, inflammatory mediators (iNOS and COX-2) in macrophages was studied by Western blot. Brefeldin A or TAPI-1 in presence of anti-TNFR1 antibody and IRAP significantly alleviated ROS, cytokine and CXCL8 release along with downregulation of surface receptors (TNFR1, IL-1R, and CXCR1), iNOS and COX-2 that had increased during *S.aureus* infection. Targeting of TNFR1 and IL-1R either through intracellular receptor trafficking blockage or through surface receptor shedding curtails TNFR1/IL-1R interaction and consequently downregulates CXCR1 expression and inflammatory responses during *S.aureus* infection. This experimental study in mice model can be further extrapolated in human and used as baseline for therapeutic approach towards rural health benefits.

Keywords: CXCR1; Interleukin-1 receptor; Peritoneal macrophage; *Staphylococcus aureus*; Tumour necrosis factor receptor 1

ANTIPROLIFERATIVE ACTIVITY OF LEISHMANIAL SPHINGOLIPIDS IN HUMAN SKIN (SK-MEL – 5) AND PANCREATIC (MIAPACA – 2) CANCER CELLS

Mriganka Mandal
Dr. Kanailal Bhattacharyya College, Howrah

Abstract: Purpose of this study is to promote the antiproliferative activity of attenuated Leishmanial sphingolipids in several human malignant cells like Sk –MEL- 5(Human skin melanoma cells) & MiaPaCa (Human pancreatic cancer cells) through caspase mediated pathway. In this respect lipid having apoptosis inducing activities, especially sphingolipids are gaining much attention in biomedical research. Sphingolipids are derived from aliphatic amino alcohol, Sphingosine and are ubiquitous components of eukaryotic cell membrane. Sphingolipids have many unique properties associated with anti cancer activity like, growth of chemotherapy- resistance cells can be effectively inhibited by sphingolipids. All the human malignant cells were treated with Leishmanial sphingolipids in different doses and then antiproliferative activity of Leishmanial sphingolipids were measured by MTT assay. Then DNA fragmentation was studied by ELISA assay. In case of Sk-MEL -5 and MiaPaCa -2 cells DNA fragmentation was also analysed by Gel electrophoresis method. Sphingolipids were fractionated into three parts like LSPL-1, LSPL-2 and LSPL-3 among these three fractions LSPL – 1 was more potent for cell death. These are the hallmarks of cells undergoing apoptosis. Further analysis demonstrated that LSPL - 1 treated Sk – MEL – 5 and MiaPaCa - 2 cells showed significant increase in ROS generation, mitochondrial membrane potential depolarization, release of Cytochrome c, and caspase-3 activation, which are the events closely involved in apoptosis. In conclusion, this study provides evidence that Leishmanial sphingolipids inhibits the growth in human skin melanoma cells (Sk- MEL – 5) and human pancreatic malignant cells (MiaPaCa -2), describes a possible sequence of molecular events underlying its lethal effect, and suggests that it may prove useful for cancer therapy.

Key words: Sphingolipids, apoptosis, pancreatic malignant cells, Melanoma cells

AXL/GAS6 SIGNALING THWART ANTI-TUMOR IMMUNE RESPONSE BY PROMOTING SOCS MEDIATED MACROPHAGE POLARIZATION IN BREAST CANCER MICROENVIRONMENT

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Abstract: To establish the role of AXL/GAS6 signaling in breast cancer angiogenesis, we want to understand the relation between AXL/GAS6 signaling and polarization of macrophage, a hallmark of angiogenesis. Tumor and adjacent normal tissue (ANT) samples were collected from 32 breast cancer patients. Total RNA was extracted and cDNAs were subsequently generated. Analyses of mRNA expression were done by real-time PCR using specific primers against Axl, Gas6, HIF-1 α , SOCS1 and SOCS3. Protein expression was analyzed using Immunohistochemistry. Quantification of total CD206+ myeloid cells or M2 macrophages among all viable CD11b+ myeloid cells was performed using flow cytometry. Statistical analyses were performed. Higher expression of Axl and Gas6 were noted in tumor sample than ANT. High SOCS1 and corresponding low SOCS3 expression were noted in tumor samples, whereas, in ANT samples, low SOCS1 and high SOCS3 expression were noted. SOCS1/SOCS3 ratio was increased in tumor samples than ANT. Percentage of total CD206+ myeloid cells among all viable CD11b+ myeloid cells was increased in tumor samples than ANT. Our study suggests that AXL/GAS6 signaling may promote neoangiogenesis by polarization of macrophages to the proangiogenic M2-type through alteration of SOCS1/SOCS3 ratio in breast tumor microenvironment.

Keywords: neoangiogenesis, AXL/GAS6 signaling, SOCS1/SOCS3 ratio

GENETIC SPECTRUM OF CONGENITAL NEURAL TUBE DEFECTS IN POPULATION OF WEST BENGAL, INDIA

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Abstract: Neural tube defects (NTDs) considered as a major clinical problem imposing a huge socio-economic burden for both affected individuals and their families, globally. In India, the prevalence of Neural tube defects is significantly high (2.41-4.1 babies per 1000 live births) in comparison to worldwide (1 in every 1000 live births). This study aimed to evaluate the association between genetic defects in folate metabolism pathway (FOCM) genes, mainly: Methylenetetrahydrofolate reductase (MTHFR), Dihydrofolate reductase (DHFR) MTR (Methionine Synthase), MTRR (Methionine Synthase Reductase) and Folate hydrolase 1 (FOLH1) with neural tube defects in mothers from eastern India. We enrolled 62 consecutive mothers with NTDs fetuses as cases and their corresponding age matched 73 mothers with healthy babies as controls. Based on the global study, some important single nucleotide polymorphisms (MTHFR: rs1801133 and rs1801131; MTR: rs1805087; MTRR: rs1801394; FOLH1: rs202676, DHFR: rs70991108,) have been amplified by polymerase chain reaction (PCR) and sequenced. Furthermore, Statistical analysis has been undertaken to find out association with NTDs. Genotype and allele frequency analysis of these SNPs revealed that, rs1801133 of MTHFR (p value = 0.028; odds ratio-2.31; 95% CI 1.08–4.93), rs1805087 of MTR gene (p value; 0.032 OR 2.18; 95%CI; 1.06-4.47), rs1801394 of MTRR (p value 0.02; OR 2.34; 95%CI 1.14-4.83) was significantly associated with NTDs risk. In conclusion, rs1801133 rs1805087 rs1801394 was significantly associated with neural tube defects in the eastern part of India and it might be counted as a molecular marker for early diagnosis and to develop better treatment protocol.

Keywords: NTD, SNPs, MTHFR, MTRR.

GENETIC BASIS OF INFERTILITY IN MAN

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Abstract: Infertility is the inability to conceive despite having carefully timed, unprotected sex for one year. WHO has described “infertility” as a health problem of global concern in the sense that 1 in 7 couples experience infertility. Epidemiological studies reveal that genetic and environmental factors are among the factors responsible for infertility. The genetic causes of infertility can be Y chromosome deletion, single gene disorder, and multi-factorial. It may be because of male factor, female factor or a combination of both. Most common cause of male infertility is oligospermia (male fertility issue characterised by a low sperm count) and azoospermia (a complete absence of sperm in the seminal fluid). It has been estimated that approximately 5-15% of men with azoospermia and severe oligospermia may have chromosomal abnormality. Genetic factors can also affect the production of germ cells, ability of the sperms to meet the ovum and further embryonic development. The research in the area of genetic basis of infertility may contribute towards the hope of development of treatments that are based on genetic control of infertility.

PREDICTION, DETECTION, AND TREATMENT OF FEMALE REPRODUCTIVE DISORDERS IN RURAL AREAS- A TECHNOLOGICAL APPROACH

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Abstract: Genetic polymorphism (variation in allele frequency of gene at least 1% of single population) study involving single-nucleotide polymorphism (SNP, substitution of single nucleotide), indel (insertion or deletion of bases in DNA) using PCR-RFLP and gel electrophoresis provides powerful thought to understand and correlate the relationship between diversity of phenotypic expression and predisposition of genetic clusters across the continents in different ethnic population regarding female reproductive disorders. These diseases include endometriosis (outside growth of uterine tissue), pelvic inflammatory disease (PID, infectious disease of women), prolapsed uterus (descending of uterus into or towards vagina) and polycystic ovarian syndrome (PCOS). Advancement of technology plays an essential role in prediction, diagnosis, analysis and treatment of these reproductive diseases. Obesity, unusual fat distribution pattern, weakening of ligament and muscle, bacterial infection, alternation in hormonal profile along with low dietary intake, lack of exercise, psychological distress, and improper lifestyle are some causative factors of these disorders. Bioelectrical impedance analysis (BIA) of various anthropometric indices is a quick and accurate method which can be incorporated for primary health check-up as well as early detection of adolescent female disorders. In rural areas, field study involving these techniques and methods (easy to operate and non-invasive) to analyse alternation in body composition and alleles frequency of marker genes of individuals are helpful to provide information about functional and genetic aspects of biomolecules. It would help to interpret the complexity and crosstalk with the risk factors. This kind of approach would be a promising tool for planning a healthy dietary habit, guiding the proper lifestyle and accordingly designing personalised medicine to increase life span, reproductive fitness and reduce morbidity and mortality.

Keywords: Genetic Polymorphism, PCR-RFLP, Reproductive Disorders, BIA.

REGULATORY T-CELLS IN IMMUNOTHERAPY: A PARADIGM SHIFT FOR TREATMENT OF CANCER

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Abstract: T-reg cells are regulated by a transcription factor FOXP3 are highly immuno-suppressive, important for maintaining tolerance against self-antigens. T-reg cells infiltrate into tumor tissues, impede the development of effective antitumor immunity and enhance tumor progression. Research in the field of cancer immunotherapy has lead to the vivid characterization of Regulatory T-cells (T-reg) and unravel its role in cancer. Targeting T-reg cells is a promising strategy for cancer immunotherapy, without hampering its autoimmune function. One approach is to specifically target the effector T-reg cells and various cell surface receptors like CCR4 expressed on them by implementation of monoclonal antibodies. In addition, blockade of immune checkpoint molecules such as CTLA-4, PD-1 have shown remarkable clinical success in various types of malignancies. Understanding the role of T-reg cells and other associated inhibitors in cancer development, could lead to an efficient cancer immunotherapy without compromising the autoimmune aspect and reducing other adverse effects mediated by T-reg inhibition.

IMMUNOTECHNOLOGY IN DISEASE DIAGNOSIS

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Abstract: Immunotechnology is a technology based on applications of cells and molecules of the immune system. These techniques have played a vital role in diagnosing disease, monitoring the level of the humoral immune response, and identifying molecules of biological or medical interest. The role of the immune system in infections has been extensively exploited in order to develop vaccinal approaches as well as diagnostic and therapeutic tools. The immune response to microorganisms not only participates in the elimination of unwanted organisms from the body, but also assists in diagnosis of infectious diseases. The nonspecific immune response is the first line of defense, assisting the body until the specific immune response can be mobilized to provide protective mechanisms. The specific immune response involves humoral or cell-mediated immunity or both, dependent on the nature of the organism and its site of sequestration. A variety of test systems have been developed to identify the causative organisms of infectious diseases. In the immunotherapeutic field, the idea of engineering the immune system has always been an attractive concept in order to improve and exploit the specificity and functional characteristics of immune cells and molecules, with a primary focus on antibodies. Test systems used in immunoserology have classically included methods of detecting antigen-antibody reactions which range from complement fixation to immunoassay methods. Immunologic tests use one of the following:

- **Antigen** to detect antibodies to a pathogen in the patient's specimen
- **Antibody** to detect an antigen of the pathogen in the patient's specimen

AN APPROACH FOR AWARENESS RELATED TO CERVICAL CANCER THROUGH REVIEW ON ASSOCIATION OF DIET WITH HIGH-RISK HUMAN PAPILLOMAVIRUS INFECTION

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Bijoy Krishna Girls' College Howrah

Abstract: Cervical cancer (CC) is one of the most common types of cancer in females worldwide, second only to breast cancer. Specific foods and nutrients help prevent the progression of persistent high-risk human papillomavirus (hrHPV) infection to cervical cancer. Vaccination and safe sex education have been established as effective prevention strategies against progression of CC. Beside different kinds of basic and applied researches going throughout the world, recently scientists are diverting researches towards the prevention of this deadly disease by understanding the association of food habit with the risk of developing CC.

Population oriented case studies and thereafter statistical analysis had revealed that diets that mainly include fruits, legumes, vegetable soups, potatoes, cooked and raw vegetables decreased the odds of hrHPV infection. Populations that were characterized by high intakes of red and processed meats, dipping sauces and chips and snacks, with low intake of olive oil etc. was associated with a higher risk of hrHPV infection. A study on a cancer free population showed that low fruit consumption and folate deficiency could modulate the Long interspersed nuclear elements 1 (LINE-1) methylation level, an epigenetic marker of cancer risk. Moreover, the consumption of foods which maintain normal DNA methylation levels, such as plant-based foods, could potentially suppress the expression of HPV oncogenes, thereby reducing cell transformation rates and CC risk. In the context of CC prevention, scientific data discourage unhealthy dietary habits in favour of healthy ones, which reduces the risk of hrHPV infection and CIN2+.

Keywords: high-risk human papillomavirus, Cervical cancer, Diet, Methylation

BIOREMEDIATION: A DEVELOPING TECHNOLOGY FOR WASTE MANAGEMENT

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Abstract: Bioremediation is a process used to treat contaminated media, including water, soil and subsurface material by altering environmental conditions to stimulate growth of microorganisms and degrade the target pollutants. In the past few years, there has been a tremendous increase in food waste generation due to rapid urbanization and industrialization. Households are the largest contributors to food waste like vegetable wastes, fruit wastes and bread and baked wastes. In pre-urban and rural regions dumps represent the worst-case scenario in current waste management practices in terms of environmental protection and sustainability. The dumps are a source of complex pollution (air, water, soil and biodiversity) which threatens the public health. Agricultural wastes (eg. straws, stalks, husks, wood and sawdust) are often disposed by burning in open fields with exposure to fire hazard. Household wastes (biowaste, plastics, textiles etc.) are also prone to open burning practices causing environmental pollution (atmosphere, soil, ground waters). The common hazardous substances used in the rural area include insecticides, pesticides, fungicides, herbicides, chemical fertilizers, chemicals used for fumigation, cleaning agents used in animal husbandry and medical wastes. If left unmanaged, these hazardous organic pollutants would pose threat to human, animal and environmental health. Environmental biotechnology, such as bioremediation, phytoremediation, mycoremediation, is a promising field that utilizes natural resources including microbes and plants to eliminate toxic organic contaminants. Bacteria, fungi and archaea are most often used in bioremediation due to their rapid growth rate, variable metabolic needs and ability to be genetically manipulated.

Keywords: environmental pollution, bioremediation, microbial contribution

ii) PHYSICAL SCIENCES AND ENGINEERING AND TECHNOLOGY

Symposium Lecture

Dr. Sayed Minhaz Hossain, Associate Professor,
Department of Physics,
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Optically enhanced hysteretic I-V characteristics of nanocrystalline silicon based p-i-n heterostructure

Abstract

A p-i-n heterostructure containing electrochemically synthesized silicon (Si) nanorod embedded in nonstoichiometric silicon oxide matrix sandwiched as i-layer between p-Si and n-type hydrogenated amorphous Si shows hysteresis both in forward and reverse bias with an additional switching in forward bias. Conductivity in trace path is lesser than the retrace path. Hysteresis in reverse bias has been found to get enhanced up to three order of magnitude under illumination by laser source (as shown in figure 1) of different intensity and wavelength showing the potential of the structure as an effective memory device. Hysteresis area and conductivity becomes maximum for red light and gradually decreases for green and violet light for fixed intensity. It is well known that Si nanocrystal - silicon oxide interface contains a lot of electron and hole trap levels within the band gap. Trapping and detrapping of photogenerated carriers at the trap/defect states are expected to affect the band bending at the junctions. The observed optically enhanced hysteresis has been explained through formation and destruction of the potential barrier at the junctions during trace and retrace paths respectively. The potential has been estimated by solving Poisson's equation and the current-voltage (I - V) relation for trace and retrace paths has been derived where rate of trapping and detrapping becomes different resulting in the observed hysteresis. Theoretically obtained I - V characteristics match well with the experimentally obtained results. The trap density in the i-layer estimated to be $\sim 10^{11}/\text{cm}^2$ is in good agreement for the trap density in similar systems.

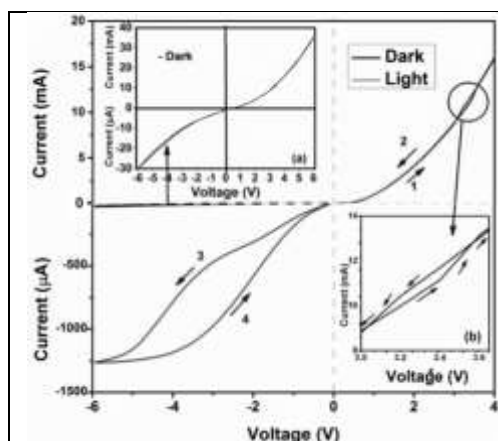


Fig 1: I-V characteristics of the p-i-n device under dark and under illumination by a red laser (632nm, 3.2mW) showing large hysteresis in the reverse bias under illumination; with inset (a) I-V characteristics in dark only showing the maximum current obtained in forward bias in mA order whereas that in the reverse bias in μA and (b) the magnified view of the switching in forward bias

Invited Lecture

Chaired by:

Dr. Sayed Minhaz Hossain, Associate Professor,
Department of Physics,
IEST, Shibpur, Howrah

Dr. Kanik Palodhi, Assistance Professor,
Department of Applied Optics and Photonics,
University of Calcutta



Application of MIoT in rural areas

Abstract

One of the most important areas of applications of science and technology is in the field of remote monitoring of health parameters. This is particularly important for rural population since lower density of health centres aggravates the problem of immediate attention to emergency health problems. IoT or Internet of Things provides the opportunity to access sensor data uploaded in the cloud for continuous monitoring of various parameters. It can also apply real-time analysis to these data for facilitating decision making and setting alarm during crisis.

MIoT or medical IoT is essentially the application of IoT to medical services with particular emphasis on rural development. In many cases, cheaper sensors built-in to wi-fi networks can be used for tracking and monitoring of elderly persons, for updating health parameters of vulnerable patients and even for measurement of dosage of medicine. With the advent of modern ICT i.e. Internet and Communication Technology, MIoT will be able to generate tremendous amount of attention of researchers who can implement it for the betterment of rural living.

Dr. Arijit Ghosh, Assistance Professor,
Department of Physics,
Ananda Mohan College



On-chip particle accelerator and its future perspective

Abstract

Accelerators are huge, expensive tubes sometimes few kilometers long that produce high energies for smashing tiny particles like protons, neutrons etc. or making intense X-ray beam. Fiber optics and silicon crystals could be used to build particle pathways, with high energy laser beams as driving force. Electrons are passed through tiny channels of silicon micro-structures and shined with infrared laser beam having wavelength twice that of the height of the channel. Under special conditions electron gets accelerated by the electric field of the laser light. As electron passes through the channel, gains energy between the oscillating electric fields and losses energy while the electric field reverses oscillation. The net result is a significant increase in energy for those electrons that are perfectly timed with the laser light. The accelerated electron will emit high energy X-ray while travelling through the patterned path. That X-ray is taken out from the channel using wave guide for further use.

Recently Sapra *et al* developed dielectric laser accelerator (DLA) at Stanford University (**Sapra *et al.*, Science 367, 79–83 (2020)**). After comparing the measured electron energy spectra with particle-tracking simulations, they could achieve energy gain upto 0.915 kilo–electron volts over 30 micrometers, corresponding to an acceleration gradient of 30.5 mega–electron volts per meter. On-chip acceleration provides the possibility for a completely integrated mega–electron volt-scale DLA.

With further advancement that chip based accelerator could dramatically shrink particle accelerator size and could be used for nano science research and medical application.

Dr. Kartick Malik, Assistance Professor,
Department of Physics,
Vidyasagar Metropolitan College



Low temperature Structural and Thermoelectric properties of Bi₂Te₃- Sb₂Te₃ mixed crystal

Abstract

Thermoelectric material are those which converts heat into electricity and vice versa. Efficiency of the TE material is measured by the term $= \left(\frac{S^2 \sigma}{k} \right) T$, where S, σ and k are the thermopower, electrical conductivity and thermal conductivity respectively. (Bi_{1-x}Sb_x)₂Te₃ mixed crystal have been synthesized using solid state reaction method. The end members Bi₂Te₃ and Sb₂Te₃ are potential room temperature TE material and also belong to the intriguing class of material, topological insulator. In depth structural characterization of the synthesized samples have been performed using x-ray diffraction (XRD) data by Rietveld refinement method using MAUD software. Temperature dependent XRD is performed using the synchrotron facility at BL-12 beamline, INDUS-2, Raja Ramanna Centre for Advanced Technology, Indore. It is noteworthy to mention that (Bi_{0.32}Sb_{0.68})₂Te₃ shows structural phase transition at low-temperature. Further, lattice parameter, thermal expansion coefficient, Debye temperature etc. have been estimated from thermal variation of x-ray diffraction data. Temperature dependent resistivity [$\rho(T)$], carrier concentration (n) and thermopower [S(T)] measurement have been carried out down to 10K. S(T) data confirms that samples are p-type in nature. Temperature dependent Power factor (PF= S^2/ρ) has been estimated using [$\rho(T)$] and [S(T)]. Highest power factor obtained for x=0.80. Thermal variation of mobility and effective mass is calculated from the (n-T), (ρ -T) and (S-T) data. It is noteworthy to mention that temperature dependent resistivity, carrier concentration, thermopower data are corroborated and also correlated with the structural data.

Dr. Amitava Moitra, Assistance Professor,
Department of Physics,
Raidighi College



Multiscale Materials Modeling to Understand the Role of Defects in Deformation Mechanism

Abstract

Understanding how materials fail, ranging from earthquake to plane-crash, to bone-fracture, has always been of great importance to enable and advance technologies. These are governed by one common underlying theme: the breakdown of the basic constituents of material through defect-generation that leads to the failure of its overall structure and intended functionality. Computational modeling, in particular atomistic simulation, is becoming increasingly important in enriching our understanding at nanoscale materials behavior and in the development of such new technologies. In the present talk, I will be giving a general overview of the atomistic simulation in the context of multiscale modeling. It will be examined in the talk that how the defects are evolved in the system and how they interact with each other that leads towards particular material behavior. Finally it will be shown that with "inverse-multiscale-materials-modeling" approach, properly engineering these defects might lead to a platform of novel alloy design.

Keywords: *computer modeling and simulations, icme, atomistic simulation; nanoscale, material deformation*

Dr. Saurabh Niyogi, Assistance Professor,
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Gokhale Memorial Girl's College



Electron (g-2) anomaly

Abstract

Experimentally, g_e is one of the most precisely determined quantities in physics. In the Standard Model, g_e is calculable as a function of α (the electromagnetic coupling constant) and other parameters. In the classical approximation $g_e=2$, while the one-loop correction proportional to the first power of α was already known. A recent experiment in Berkeley announced a new ultra-precise measurement of the fine structure constant α using interferometry techniques. The Berkeley measurement allows one to reduce the relative theoretical error on ae down to 0.2 ppb (parts per billion) which matches in magnitude the experimental error and improves by a factor of 3 the previous prediction. The new measurement of g thus disfavors the Standard Model of Particle Physics which gives a tantalizing hint toward new physics.

A CASE STUDY TO EVALUATE NANOPARTICLE COATED CONCRETE'S ABILITY TO INHIBIT FUNGAL GROWTH

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Abstract: The vulnerability of concrete to microbial biodeterioration has been an important issue for concrete buildings' durability over time. Many researches have been conducted to prevent and treat concrete structures from deterioration among which the inclusion of nanotechnology is a recent one. Although the use of nanosilica in concrete industries for admixtures and nanocomposites has been known, the potency of nanosilica coating on concrete has not been widely evaluated yet. This study thus primarily emphasizes on the effectiveness of silicon dioxide nanocoating on concrete that has been subjected to fungal attack. A nanosilica coating was optimized and applied on concrete cube surface that was in turn infected with *Aspergillus tamarii* and monitored for any physical, chemical as well as visual changes for a period of six months. The visual analysis included colour changes, Stereo Microscopy and Scanning Electron Microscopy (SEM) which showed a considerable change in the surface deterioration and fungal colonization of biodeteriorated cubes more than the nanocoated concrete cubes. The physical tests included weight loss which showed positive in all the concrete specimens and compressive strength which increased in nanocoated concrete cubes more than that of the biodeteriorated ones. The chemical analysis included pH change in media, Fourier Transform Infrared Spectroscopy (FTIR) and Energy Dispersive X-Ray Fluorescence Spectroscopy (EDXRF) which showed that leaching of calcium ions from the concrete in biodeteriorated cubes was higher than that of nanocoated cubes. Altogether the effectiveness of silicon oxide nanocoating against biodeterioration of concrete by *Aspergillus tamarii* was concluded to be positive.

Keywords: Nanosilica, Concrete, SEM, FTIR, EDXRF.

POWER LAW MODEL APPROACH AND A LOOK INTO THE PARTICLE PRODUCTION DATA AT 530 GEV/C, 800GEV/C AND AT 7 TEV/C AND COMPARISONS WITH MIXED MODEL

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Abstract: Pions are most abundant variety of the secondaries produced in particles-particles and particle-nucleus collisions at high energies. At large transverse momentum (p_T), there is a copious production of neutral pions, which decay mainly to $\gamma\gamma$, and are often studied simultaneously with π^0 mesons. The ratio of η/π^0 production is therefore sensitive enough to the relative fragmentation of the varieties of partons which can be obtained in the production of these secondaries. Our objective here is to provide an understanding of the nature of data on these two natural secondaries produced in $\pi^-p, \pi^-Be, p-Cu$ and $p-Be$ interactions at large transverse momenta and at high energies. We will deal with both (p_T) and rapidity (y) dependence of both the species of mesons and comparisons between power law model and mixed model.

Keywords: Relativistic heavy ion collisions, proton - beryllium collision, π - beryllium collisions, inclusive production, power laws, mixed model.

SPECTRAL PROPERTIES OF BOUND AND RESONANCE DOUBLY EXCITED $^3F^e$ STATES OF HELIUM

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Abstract: Highly precise non-relativistic energy eigenvalues of doubly excited $2pnf (^3F^e)[n=4-9]$ meta-stable bound states of helium are being calculated by using Ritz variational method. The generalized variational equation has been used [1] for calculation. We have taken multi-exponent Hylleraas basis sets [1] to ensure the inclusion of electron correlation effects. The basis set contains total 1530-terms and the energy eigenvalues are obtained by diagonalization technique [2]. Resonance energies and widths for a wide range of resonance states ($^3F^e$) of helium below $N = 3$ ionization threshold of He^+ have also been evaluated by using stabilization method [3]. Present data have been compared with the available theoretical estimates in the literature. The present resonance parameters *i.e.* the resonance energies and widths are in good agreement with the few available accurate theoretical results [4-6]. For the first time we have found the resonance states ($^3F^e$) of He atom above $N = 3$ ionization threshold of He^+ . With the advancement of experimental techniques [7, 8], it becomes important to make precise theoretical studies on doubly excited states. The present method can be applied for other resonance states of different symmetries with sufficient number of terms in the Hylleraas basis set to yield accurate resonance parameters and to provide useful structural information of Helium like systems.

Keywords: Doubly excited states, variational method; Hylleraas basis; stabilization technique

DETERMINATION OF THE SINGLE PARTICLE DISTRIBUTION FUNCTION IN A WEAKLY CORRELATED WEAKLY INHOMOGENEOUS PLASMA

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Abstract: Plasma can be thought of as a many body system where coulomb interaction holds the key to determine its statistical nature. Lowering the temperature and raising the density of plasma gradually shifts the balance in a continuous manner so that the individual effects in the form of binary collision becomes important and drifts the system to the so called 'correlated plasma systems'. This is the regime where discrete nature of plasma begins to take effect. Consequently detail kinetic theory is needed to explore the system under consideration. In this context, an equation of pair correlation function has been derived from the Bogoliubov-Born-Green-Kirkwood-Yvon (BBGKY) hierarchy for inhomogeneous plasma under certain approximations. A solution of this equation has been obtained under certain conditions.

PREPARATION OF MESOPOROUS MANGANESE AND TITANIUM OXIDES NANOCOMPOSITE AS A NOVEL PHOTOCATALYST DEGRADATION OF ORGANIC DYES

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Abstract: In this study, mesoporous manganese oxide-titanium dioxide ($\text{TiO}_2/\text{Mn}_2\text{O}_3$) nanocomposites have been synthesized following sol-gel method. Different molar ratios of Mn/Ti were evaluated and MT2 (1:5) showed the best photoactivity. From UV spectroscopy, it has been seen that the absorption properties of $\text{TiO}_2/\text{Mn}_2\text{O}_3$ over the whole region of visible light which enable the materials as remarkable photocatalyst for degradation of Malachite green under visible region. This composite possesses increased BET surface areas and large pore sizes. Simply, by adjusting the amount of manganese precursors in the synthesis the pore sizes can be tuned. The Langmuir-Hinshelwood model was delineated to calculate the reaction rate which was found to be highest for MT2 (min^{-1}). This was attributed to the high surface area ($121.81 \text{ m}^2/\text{g}$) as per Brunauer-Emmett-Teller (BET) method which are desirable for efficient photoactivity.

Keywords: Nanocomposite; mesoporous; photoactivity. Bet surface area.

THERMOACOUSTIC ENGINE: A NOVEL AND SIMPLE SOLUTION FOR RURAL POWER GENERATION

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Abstract: A thermoacoustic engine is capable of generation of electrical power by running a small generator. Proper application of the science of thermoacoustics may lead to the small scale development of a portable thermoacoustic engine which can act as a small power source in a rural set-up. Here the development of a simple stationary wave thermoacoustic source is discussed which can be assembled using simple day to day materials that can be procured from the laboratories of any under graduate college. The stack is generally known to be the essential part of any thermoacoustic engine and which may be of various physical and material characteristics. In our thermoacoustic engine a novel stack has been used for the first time. With proper implementation such thermoacoustic engine can utilize solar power and that too in an environment friendly way. The whole process of development of such engine can well be undertaken in a week long project by the undergraduate students majoring in Physics.

Keywords: Thermoacoustics, Heat pump, Heat engine, Brayton cycle

PARA-FERRO PHASE TRANSITION IN DENSE QUARK SYSTEM

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Abstract: The cardinal focus of the present article is to investigate the possibility of the para-ferro phase transition of dense quark system. For these, the calculation of single-particle energies, ground state energy (GSE) densities, and spin susceptibility χ of degenerate quark matter with one gluon exchange interaction in terms of spin-dependent Landau parameters (LPs) have been presented. The expressions for the GSE and χ of cold and dense spin-polarized quark matter have derived with corrections due to correlation. Furthermore, the magnetic properties of spin-polarized quark matter have been discussed by evaluating the magnetization $\langle M \rangle$ and magnetic susceptibility χ_M in terms of LPs. Finally, the possibility of magnetic instability has been revealed by studying the density dependence of $\langle M \rangle$ and χ_M .

FE₃O₄/REDUCED GRAPHENE OXIDE HYBRID: INVESTIGATION OF ELECTROCHEMICAL PROPERTIES FOR SUPERCAPACITOR APPLICATION IN PRESENCE OF EXTERNAL MAGNETIC FIELD

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Abstract: The constant demands of energy storage on large scale instigate researchers to realize supercapacitor devices. In this work, we have fabricated reduced graphene oxide anchored Fe₃O₄ hybrid supercapacitor electrode material by a facile one-pot hydrothermal route. The electrochemical performance of the hybrid supercapacitor was tested in a two-electrode electrochemical device by coin cell method using 1 M Na₂SO₄ as an electrolyte. The external magnetic fields have huge impact on the electrochemical processes which enhance the supercapacitor performance of the magnetic samples. The capacitance value and energy density increased by almost two fold due to small external magnetic field. We have compared the performance of our supercapacitor with previously reported supercapacitor made from iron oxide, which shows that magnetic field assisted electrochemical performance of our fabricated supercapacitor electrode material is comparable to/better than other reported supercapacitor electrode material. We believe this straightforward fabrication of hybrid supercapacitor electrode and the capacitance enhancement in presence of magnetic field could be important for practical electronic and energy storage devices. These findings present a potential revolution of traditional electrochemical capacitors by simply applying an external magnetic field to enhance the capacitance dramatically without material replacement and structural modification.

Key words: Fe₃O₄ /rGO hybrid, cation intercalation/de-intercalation, long cycle life, magnetic field induced capacitance enhancement, high energy density

2-D BISMUTH OXYCHLORIDE NANOPATES/MULTIWALL CARBON NANOTUBE NANOCOMPOSITES FLEXIBLE SUPERCAPACITOR

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Abstract: We have adopted a simple, cost-effective hydrothermal approach for the fabrication of scalable amount of 2-D bismuth oxychloride (BiOCl) nanoplates. A remarkable electrochemical performance has been obtained for BiOCl/MWCNT flexible solid state symmetric supercapacitor (FSSC). Among the various weight ratios between the BiOCl and MWCNT, 60% BiOCl loaded electrodes (FSSC₆₀) delivers a highest specific capacitance of 421F/g at 5mV/s. Furthermore, FSSC₆₀ shows a high energy density of 14.62 Wh/kg at power density 947.5 W/kg compared to previously reported bismuth materials. The FSSC₆₀ shows excellent durability with 94% initial specific capacitance after 2000 cycles. On the other hand the specific capacitance value was almost remained same during different bending angles (0°, 45°, 90°, 135° and 180°) at 10 mV/s.

Keywords: BiOCl nanoplates, Flexible Supercapacitor, High energy density, long cycle life.

Plenary Lecture

Dr. JYOTIRMOY SAMAJDER,
Psychiatrist
MD. DPM. MBBS.



Dr. D.P. Duari, Director,
Birla Planetarium



Technical Session-III

i) ANIMAL VETERINARY AND FISHERY SCIENCES

Symposium Lecture

Prof. Sagartirtha Sarkar, Professor,
Department of Zoology,
University of Calcutta



Invited Lecture

Chaired by:

Prof. Sagartirtha Sarkar, Professor,
Department of Zoology, University of Calcutta

Dr. Suman Bhusan Chakraborty,
Associate Professor, Department of Zoology,
University of Calcutta



In search of suitable alternative to synthetic steroids for monosex tilapia production: an approach towards eco-friendly sustainable tilapia culture

Abstract

All-male tilapia is generally produced by treating fry with the synthetic androgen 17 α -methyltestosterone (MT). But MT has various human health hazards and environmental concerns. Phytochemicals with androgenic, growth promoting and immunostimulating potential can be a safe, environment friendly alternative in this regard. *Basella alba* leaves and *Tribulus terrestris* seeds are reported to have androgenic potential and induce testosterone production, and hence are investigated in this study to evaluate their potential for masculinisation properties in Nile tilapia. Juvenile Nile tilapia (mean weight 0.025 ± 0.009 g, mean length 1.25 ± 0.012 cm) were fed diets containing powdered plant materials, immersed in aqueous extracts of the plants and fed diets containing different solvent extracts of the plant materials at different concentrations. This study revealed that, both the plant materials have efficacy to produce sex reversed male fish. Fish fed diet fortified with plant extracts showed higher male percentage compared to direct feeding of feed mixed with plant powder and immersion using aqueous extract. Fish fed diets fortified with ethanolic extract of *B. alba* leaves at a concentration of 1.0 g / kg and with *T. terrestris* seeds at a concentration of 2.0 g / kg for 30 days showed better results among all types of solvent extracts. Treatment with *Tribulus* ($91.53 \pm 0.38\%$) resulted in higher production of males than those with *Basella* ($83.2 \pm 0.7\%$). The study also revealed that solvent extracts of both plant materials have antioxidant potential and contain steroids, terpenoids, flavonoids which may be responsible for their sex reversal potential. GC / MS analysis revealed that ethanolic extracts of both plant materials contain phenol, 2,4-bis(1,1-dimethylethyl), which is reported to have anti-aromatase activity responsible for the sex reversing potency of the mentioned plant materials. The plants may thus provide an avenue to eco-friendly, sustainable production of monosex tilapia seeds.

Key words: Nile tilapia, Plant extracts, Monosex

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Down Syndrome: Science & Society

Abstract

Down syndrome is most frequent live borne aneuploidy and is caused by presence of extra copy of chromosome 21 in the child. This extra copy usually arises due to nondisjunction of chromosome 21 in oocytes in mother ovary. Several risk factors make the oocytes vulnerable to experience nondisjunction error and that includes maternal age, recombination error, maternal exposure to different habitual risk factors and genetic susceptibility. Mothers of Down syndrome children suffer from advancing aging too All these risk factors interact with each other to generate a complicated risk scenario in ovarian microenvironment.

Down syndrome children suffer from different health problems and complications. Despite of those challenges, they can prove themselves competent in their social and professional life. Proper care, disease management, treatment and personal care by parents can help the Down syndrome children to get back into the main stream of life. Scientific intervention along with social consciousness, awareness would benefit the Down syndrome children and their parents.

Key words: Down syndrome, Nondisjunction, Maternal age, Epidemiological risk factors, Social implications.

DEVELOPMENT AND APPLICATION OF AQUA-SOLUBLE HERBAL DRUG TO CONTROL THE PATHOGENS CAUSING HARM TO FISH INDUSTRY AND POPULARIZATION OF THE DRUG AMONGST THE FISH FARMERS FOR CAPACITY BUILDING OF YOUTHS OF WEAKER COMMUNITY IN WEST BENGAL

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Abstract: Aquaculture is one of the most important approaches at present. The entire water area of India supports the potential fish farming of the state as well as the whole country. Having capturing good market value, Aquaculture industry has been overwhelmed with its share of diseases and problems caused by viruses, parasites and emerging pathogens. Technology is the prime moving force of progress. The majority of state farmers being rural habitant and poor in socio-economic condition, the technologies proposed should be in the low risk and high income category thus needed for technology assessment, refinement and grounding for the state farmers. Herbal extracts have important properties like control of diseases due to their antioxidant and antimicrobial properties. Plant derived compounds have botanical blends of secondary metabolites which act on both behavioral and physiological processes. Thus the chances of developing resistance to such substances are meager. So use of medicinal plants can be a good alternative to control fish diseases. By using this farmers could lower their cost of buying costly chemicals for eradication of the disease with least effort and monetary involvement. So economically the technology of using aqua soluble herbal doses is viable which not only preventing the disease but also improving health of fish with no harm to environment. Thus, bringing a scope of earning through proper marketing of the aqua-soluble drugs is the need of time. So from both socio economic point of view the study is feasible from root level.

Key Words: Aquaculture; diseases; botanical blends; aqua soluble herbal drugs; marketing; socio-economic

ORGANOIDS: INNOVATIVE TOOLS FOR STUDYING HELMINTH INFECTIONS

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Abstract: Organoids are culture systems closely resembling the structure and function of the tissue systems from where they are derived. In other words, they may be considered as miniature organs. They have been used extensively in biomedical research to study viral, bacterial and protozoan parasite infections. The application of organoids in the study of helminth infections is slowly gaining grounds because it helps to overcome one of the greatest hurdles involved in such studies – the availability of suitable animal models. In contrast to the animal models, they are simpler because they lack blood vessels, nerves and are free from interactions with other cells and microbiota in the host gut (or other organs lodging the helminth). They also do away with the problem of interspecies differences to emulate the helminth infections in different human organ systems using animal models. Moreover, they can preserve organ specificity and genome stability, in comparison to traditional cell lines, allowing their use in bio-banking. However, they are still in a nascent stage of research and have some disadvantages that need to be overcome. For example, a helminth needs to pass through several organs systems and moult in order to complete its developmental stages but such passage systems are not available in organoids. Many workers regard them as reductionist models where the complex interactions regulating helminth infections in microenvironments are absent. Nevertheless, they have the potential to open gateways for modern therapeutics and development of vaccines against helminths. Therefore, research in this field needs to be encouraged.

Key words: Organoids, interspecies differences, therapeutics, vaccines

THE POSSIBILITIES OF SUSTAINABLE MANAGEMENT OF AHIRAN LAKE: A CASE STUDY

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Abstract: On March 20th, 1987 United Nations stated “sustainable development is development that meets the need of the present without compromising the ability of the future generation to meet their own need”. The main objectives of the sustainable development are- maintaining a dynamic balance in agricultural strategy; conservation of resource like biodiversity, decrease pollution level; maintaining good health of natural resources like rivers, lakes, forests etc; slow down ecological degradation; develop environmental industry, eco-building up to expand domestic demand, increase employment and alleviate poverty. The wetlands in Murshidabad district, West Bengal, have long been known to support rich diversity. Ahiran Lake of Murshidabad (approximately 400 hectare, 24°26’N to 24°30’S and 87°58’E to 88°02’W) serves as a habitat of large populations of resident and migrant water birds, fish, amphibian, reptiles and mammals. There are 40 species of fishes, 56 species of birds, 6 species of amphibian, 9 species of reptiles and 2 species of mammals are frequently found at Ahiran Lake. A survey on the people of surrounding villages, who are directly or indirectly related with Ahiran Lake reveals that they are very much interested in sustainable development. All of them are aware that the diversity is reducing in Ahiran Lake due to different reasons. 87.8% of them are not poachers, do not kill birds and conserve animals. 97% of them think that proper management of the lake should be done and they want earning from it. They will be happy if ecotourism will develop in this area. In the present study, statistical analysis of the demographic psychology is performed so that proper sustainable management can be designed in future.

Keywords: Ahiran Lake, sustainable development, economy, population

ANTI-LISTERIA ACTIVITY OF FISH LACTIC ACID BACTERIA

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Abstract: *Listeria monocytogenes* is a major microbial risk associated with fresh as well as preserved fish food. In the present study Lactic Acid Bacteria (LAB) isolated from fish intestine were evaluated for their anti-listeria activities. LAB isolates showed effective suppression to *Listeria monocytogenes* (ATCC 657) either with live cells and cell-free supernatant or purely in the form of live cells. Inhibitory zones but no growth circles were observed in agar spot assays. Thus antagonistic activities may be due to synthesis of antimicrobials but not for the competitive exclusion. No acid inhibition was reported. Except few, most of the neutralised culture supernatant when heated to 90°C exhibited strong antagonism against the pathogenic strain. Susceptibility of *Listeria monocytogenes* to LAB antimicrobials seemed to be caused by both thermostable and thermolabile compounds and could be applied in fisheries industry as food safety adjuncts for use as biopreservatives.

Key words: Antimicrobials, Biopreservatives, Thermolabile, Thermostable

POSSIBLE THREATS AND CONSERVATION OF *Varuna litterata* (Fabricius, 1798) AT NORTH 24 PARGANAS IN WEST BENGAL, INDIA

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Abstract: The present study mainly based on small edible herring bow crab *Varuna litterata* (Fabricius, 1798) (commonly known as Chiti kankra) belongs to Class – Crustacea, Order- Decapoda and Family-Grapsidea. These estuarine crabs is euryhaline and mainly found in a sandy substratum. Many species (including chiti kankra) are now under imminent threat due to rapid loss and deterioration of habitat that ultimately affects biodiversity. Extensive surveys conducted over one year (June 2018 to May 2019) mainly on the basis of interview throughout the study area (north 24 parganas). Special emphasis was given to those people who are directly or indirectly depends on the canal water to determine the possible threats of *Varuna litterata* and its distribution revealed that the population has declined significantly day by day. This Qualitative survey also indicates that this crab species was plenty decades ago and pollutants produced by Calcutta Leather Complex (CLC) has a great effect on the population of *Varuna litterata*. Here we discuss about possible threats and conservation of *Varuna litterata* in West Bengal.

Keywords: *Varuna litterata*, Possible threats, Conservation, West Bengal.

PHYSICOCHEMICAL CHARACTERIZATION OF THE BREEDING HABITATS OF *Aedes* sp. DURING MONSOON SEASON IN SOUTH BENGAL, INDIA

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Abstract: Dengue infection is endemic in several areas and the dengue virus is transmitted by *Aedes* mosquitoes. Thus, it becomes important to understand the breeding ecology of dengue vector and characterize the physicochemical parameters of its breeding habitat. The objective of this study was to analyze the physicochemical parameters of the breeding habitat of the dengue vector and to find out the nutrient composition of the habitat in South Bengal. Water samples were collected from various breeding habitats of *Aedes* mosquitoes of different study sites and were analyzed for various physicochemical properties like acidity, alkalinity, electrical conductivity, total dissolved solids, concentration of chloride (Cl^-), nitrite (NO_3^-), nitrate (NO_4^-), sulphate (SO_4^-) in relation to larval prevalence. Certain parameters were found to be dependent on container type, like concentration of different parameters. Significant positive correlations were seen between per dip larval density and total dissolved solids (TDS) and electrical conductivity. Water pH, electrical conductivity, total dissolved solids were seen to play a major role in the ovipositional preferences. Container type did not seem to affect TDS. Thus, container type and various parameters and nutrients play a major role in determining where a gravid female mosquito will lay its eggs. It is expected that alteration of various chemical and physical properties of the breeding habitats can be an effective method of controlling the larval survivability and thus further exploration in this field is needed.

Keywords: *Aedes aegypti*, Breeding habitat, South Bengal, Physicochemical parameters

NEURONAL AND OXIDATIVE DAMAGE IN THE CARP BRAIN ALLEVIATED AFTER ADMINISTRATION OF EXOGENOUS MELATONIN

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Abstract: The neurodegenerative activity of a synthetic detergent sodium dodecyl sulphate (SDS) on brain physiology in *Catla catla* and the efficacy of exogenous melatonin for alleviating such effects were demonstrated. Fish (n=36, 2 replicates) were exposed to SDS (2.5 mg/l) for 0 (control), 14 and 28 days. After 28-days treatment, exogenous melatonin was injected for continuous seven days and sampling was done on each alternate odd days (1, 3, 5 and 7 days). Levels of different enzymatic and non-enzymatic antioxidants, Na⁺-K⁺-ATPase, acetylcholine esterase; monoamine oxidase; nitric oxide were measured in *C. catla* brain tissue. 28-days treatment with SDS caused significant decrease in reduced glutathione, catalase, superoxide dismutase, glutathione S-transferase, while glutathione reductase, malondialdehyde level increased significantly (P<0.05). Administration of melatonin (100 µg/kg body weight) was found to restore the neurological activity and reduce stress in a time-dependent manner as the biochemical and neurological parameters in fish after 7-day exogenous administration showed no significant difference (P>0.05) compared to those in control without SDS treatment, except for GST and GPx which were unable to return to the basal level.

Key words: Melatonin, SDS, stress, neuronal damage, *Catla catla*

SPATIAL DISTRIBUTION OF *Aedes* sp. IN SOUTH BENGAL, INDIA

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Abstract: *Aedes* mosquitoes are vectors of yellow fever, Zika, dengue, chikungunya diseases among others. These mosquitoes bite both humans and animals alike during the day, particularly in the mornings and evenings. This study sought to understand their diversity, distribution and abundance in South Bengal. Larval surveys and human landing collections were used to sample for vectors in 12 districts of South Bengal in 2019. A total of 36,874 *Aedes* mosquitoes, consisting of two (2) different species were collected. *Aedes albopictus* (N=12,015) were found in majority of the collections, while *Aedes aegypti* (N=24,859) was in the least number of collections. *Aedes aegypti* is found only in three districts i.e., Kolkata, Howrah and North 24 Parganas but *Aedes albopictus* is found in ten districts (except Burdwan (East) and Birbhum). The study revealed the overwhelming presence of domestic, peri domestic and canopy breeders of the genus, *Aedes*, in the state. The frequency of *Aedes albopictus* is greater than the other while the *Aedes aegypti* is more abundant than the other species. These include those that transmit some of the most dreaded diseases across the globe. Hence, there is a need for further continuous update of available data on these mosquitoes. This could be the basis for effective vector control and the eventual elimination of *Aedes*-related diseases in Bengal.

Key Words: Distribution, South Bengal, *Aedes aegypti*, *Aedes albopictus*.

THE EFFECT OF HEAVY METALS ON THE GUT EPITHELIUM OF MOSQUITO LARVA

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Abstract: Mosquitoes has adapted to urban environments with the availability of suitable habitats. This has subsequently increased the probability of pathogens transmission in densely populated area. However, their urban habitats are highly contaminated with heavy metals like cadmium, chromium, copper, iron, lead, manganese and zinc. Till date, little is known about their physiological adaptations of metal stress or how the vectors are affected. The present review and pilot study aims to characterize the sub-lethal physiological consequences of metal stress in mosquito larval gut. The studies published so far have indicated that even at low level metal stress has considerable physiological consequences for this important disease vector. Larval stress in the form of heat, competition, insecticide exposure and nutrient limitation causes alterations in adult mosquito phenotype and immunity that increase their susceptibility to arboviruses.

Key words: Mosquito larva, metal stress, gut epithelium.

EXTRACELLULAR ENZYME PRODUCING BACTERIA IN FOUR BRACKISH WATER FISH SPECIES

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Abstract: Occurrence and distribution of enzyme-producing bacteria in the proximal (PI), middle (MI), and distal (DI) segments of the gastrointestinal tracts of 4 brackish water teleosts (*Scatophagus argus*, *Terapon jarbua*, *Mystus gulio*, and *Etroplus suratensis*) have been investigated. Data were presented as log viable counts g⁻¹ intestine (LVC). The heterotrophic bacterial population had the highest occurrence in the DI regions of all fish species studied except *M. gulio*. Proteolytic and amylolytic bacteria had the highest occurrence in the DI of *M. gulio* (LVC = 5.50 and 5.93, respectively), while cellulolytic and lipolytic populations exhibited highest occurrences in the DI regions of *T. jarbua* (LVC = 6.33) and *S. argus* (LVC = 5.78), respectively. Out of the 81 bacterial isolates, the most promising 3 isolates were determined through quantitative enzyme assay and studied through 16S rRNA gene sequence analysis for identification. Both the strains SA2.2 isolated from *S. argus* and TJ2.3 isolated from *T. jarbua* showed high similarity to different strains of *Brevibacillus parabrevis*, while another strain, MG4.2, isolated from *M. gulio*, was similar to *Bacillus licheniformis*. The NCBI GenBank accession numbers of the 16S rRNA gene sequences for isolates SA2.2, TJ2.3, and MG4.2 were KF377322, KF377324, and KF377323, respectively. The present study might offer scope for further research to evaluate prospects for application of the gut-associated extracellular enzyme producing bacteria in brackish water aquaculture.

Keywords: Brackish water fish, exo-enzyme, *Brevibacillus*,

HISTOLOGICAL STUDY OF OVARIAN MATURATION OF *Mystus vittatus*Arnab Basu^{1*}, Sheela Roy¹, Siddhartha Datta² and Indrani Sarkar¹¹ Department of Zoology (P.G. section), Vidyasagar College, Bidhannagar Campus, Block CL, Sector II, Saltlake city, Kolkata-700091² Department of Chemical Engineering, Jadavpur University, Kolkata-700032
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Abstract: The present article deals with the seasonal changes in the ovarian development and the spawning periodicity of *Mystus vittatus*. This indigenous fish species is economically important due to its delicious taste. Based on gross morphological changes in ovary, five maturity stages were observed-immature, mature, early ripening, ripe and spent phase. The fecundity of *Mystus vittatus* has shown highly significant correlation with body length, body weight and ovary weight. Gonado-somatic index (GSI) of *Mystus vittatus* began to increase in March and peaked in July then sharply declined in September- October.

Key words: *Mystus vittatus*, ovarian development, fecundity, gonado-somatic index

**CYTOTOXICITY AND GENOTOXICITY OF GOLD NANOPARTICLES IN FISH:
A CASE STUDY ON *Channa punctatus***

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Abstract: Gold (Au) NPs are also increasingly used in various biomedical applications including imaging, therapeutics and molecular sensing. Fishes are very sensitive to a change in their environment and can play significant role in assessing potential risk associated with contamination in aquatic environment. Aquatic genotoxicity is reflected perfectly in fish as biomagnification of those pollutants and it can be easily assessed in their system. In recent years, cytogenetic studies have established its importance in understanding genotoxic effects of pollutants on aquatic organisms. The present study is dealing with the cytological and molecular effects of Gold (Au) NPs on *Channa punctatus* by karyotyping as well as cytochrome c oxidase gene analysis, based on dose dependent methods. The study also aims to gain more insight into the relationship between the chromosomal differentiation and nanoparticle pollution. The normal number of chromosome in control group of *Channa punctatus* is $2n=32$, consisting of 16 metacentric, 14 submetacentric and 2 acrocentric chromosomes. Different chromosomal aberrations like End to End joining, Chromosome Break and Gap, Pycnosis, Stubbed Arm, Acentric Fragmented chromosome, Attenuated chromosomes are found in *Channa* species collected from the polluted aquatic bodies adjacent to the agricultural field. The difference in banding pattern was found in study of cytochrome c oxidase Gene PCR products which may be due to difference in nucleotide sequences resulting from point mutation or deletion or inversion or translocation.

Key words: Gold nanoparticles, Water Pollution, *Channa punctatus*, Karyological study, cytochrome c oxidase gene profiling.

SEASONAL VARIATION OF ACANTHOCEPHALA INFECTING *CHANNA PUNCTATUS* IN DISTRICT HOOGHLY

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Abstract: The seasonal variation of acanthocephalan parasites infecting *Channa punctatus* was studied during June 2017- May 2019. The host fishes were collected from local fish markets of different regions of Hooghly district, West Bengal. The prevalence, mean intensity and abundance of infection were analyzed and statistically tested. A total of 300 fishes were examined, out of which 141 fishes found to be infected with acanthocephalan parasites. The infection rate was highest during pre monsoon season followed by monsoon and post- monsoon season. Parasitic occurrence was found to be influenced with biotic factors like feeding habit of host fish, availability of intermediate hosts like arthropods and also by abiotic factors like temperature, relative humidity and rainfall.

Keywords: Abiotic factors; Acanthocephala; Biotic factors; *Channa punctatus*; Seasonal variation

IPM IN RURAL AGRICULTURE FOR SUSTAINABILITY

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Abstract: Sustainable Development is a concept which incorporates the social, economic and environmental dimensions of regional and global development. The demands of a growing world population for food and fiber require farmers to produce more crops on existing farmland. India has about 69 percent of population living in its rural areas and villages and the sole source of their livelihood is agriculture and allied activities. Cereal and many ground crop production in agriculture has beset many problems with weeds and pests. *Pesticides* are important tools in pest *management* and include enhanced economic potential in terms of increased production of food and fibre, but their debits have resulted in serious health implications to man and his environment. There is now overwhelming evidence that some of these chemicals do pose a potential risk to humans and other life forms and unwanted side effects to the environment. Integrated Pest Management (IPM) is a component of integrated crop management that harnesses the practices of crop production in a holistic manner. IPM is intended to reduce environmental and health damage from chemical pesticides by using natural parasites and predators to control pest populations. This paper reviews key IPM literature, especially agricultural literature, and discusses techniques that can reduce the pest populations using IPM programs.

Keywords: Integrated pest management (IPM), Environment, Pest, Pesticides.

NUTRITIONAL COMPOSITION OF A SHORT HORNED GRASSHOPPER, *Acrida exaltata* (WALKER) (ORTHOPTERA: ACRIDIDAE) IN SEARCH OF NEW PROTEIN SOURCE

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Abstract: To combat the problem of malnutrition, demand for animal protein is increasing globally day by day and so the conventional animal protein sources are being overexploited. Grasshoppers are a natural renewable good food resource that could overcome this problem. The present study evaluated the nutritional quality in terms of proximate composition of a short-horned grasshopper, *Acrida exaltata* in order to ascertain its suitability as a food and feed source. Results revealed that the studied species contain about 64.28% crude protein, 7.06% crude lipid, 7.85% carbohydrate and nearly 518 kcal/100g of energy. The results suggests for considering the grasshopper as an alternative source of nutrient supplement in both human diet and livestock feed.

Keywords: *Acrida exaltata*, grasshoppers, malnutrition, nutrient supplement, proximate composition.

RISK FACTORS FOR CHROMOSOME 21 NONDISJUNCTION DIFFER IN NONCONSANGUINEOUS AND CONSANGUINEOUS FAMILIES FROM INDIA

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Abstract: Etiology of Trisomy 21 birth includes molecular, genetic and epigenetic risk factors. Anomalous recombination pattern with no exchange or single telomeric exchange has been attributed as risk factor for meiotic I nondisjunction among younger mother in contrast to peri-centromeric chiasma configuration which has been implicated for meiotic II nondisjunction among older women. Owing to substantive number of Down syndrome children born to consanguineous parents from Bengali population of West Bengal, India we were intended to see whether recombination error is equally threat imparting among women who have Trisomy 21 baby following consanguineous marriage. Parental and meiotic origin of supernumerary chromosome 21 was confirmed using STR genotyping of Down syndrome family. Characterization of recombination on nondisjoined chromosome 21 was accomplished using family genotyping data. Sequencing was performed to analyze the polymorphic variants of SYCP3 and MAD2L1 genes from parental genome. Our data reveals absence of any observed recombination error on the nondisjoined chromosome 21 among the women having Trisomy 21 child following consanguineous marriage in contrast to altered recombination profile chromosome 21, as noted previously, among the women having Down syndrome baby from non-consanguineous marriage. Certain polymorphic variants of the genes SYCP3 and MAD2L1 exhibited significant association with the incidence of Down syndrome birth to consanguineous parents. The genetic risk factors for Down syndrome birth may differ among consanguineous and nonconsanguineous families. Homozygosity of certain variants of SYCP3 and MAD2L1 in fertilizing oocyte may cause Down syndrome birth in consanguineous marriages.

Key words: Trisomy 21, Nondisjunction, recombination, consanguinity.

GOLD NANOPARTICLES IN TREATMENT OF CANCER

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Abstract: Gold is a multifunctional material that has been utilized in medicinal applications for centuries because it has been recognized for its bacteriostatic, anticorrosive, and antioxidative properties. Modern medicine makes routine, conventional use of gold and has even developed more advanced applications by taking advantage of its ability to be manufactured at the nanoscale and functionalized because of the presence of thiol and amine groups, allowing for the conjugation of various functional groups such as targeted antibodies or drug products. It has been shown that colloidal gold exhibits localized plasmon surface resonance (LPSR), meaning that gold nanoparticles can absorb light at specific wavelengths, resulting in photoacoustic and photothermal properties, making them potentially useful for hyperthermic cancer treatments and medical imaging applications. Modifying gold nanoparticle shape and size can change their LPSR photochemical activities, thereby also altering their photothermal and photoacoustic properties, allowing for the utilization of different wavelengths of light, such as light in the near-infrared spectrum. By manufacturing gold in a nanoscale format, it is possible to passively distribute the material through the body, where it can localize in tumors (which are characterized by leaky blood vessels) and be safely excreted through the urinary system. In this topic, we give a quick review of the structure, applications, recent advancements, and potential future directions for the utilization of gold nanoparticles in cancer therapeutics.

Keywords: bacteriostatic, anticorrosive, antioxidative, Plasmon surface resonance, photothermal, Photoacoustic, nanoscale.

CONSEQUENCES OF METAL TOXICITY ON OXIDATIVE STRESS IN FISH MUSCLE: LINKING OXIDATIVE BIOMARKERS TO MITOCHONDRIAL ENZYMES

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Abstract: Anthropogenic contaminants in water pose physiological threat on fish population. Current study aims to find how species specific accumulation pattern of metals in muscle of *Liza persia*, *Amblylopharyngodon mola* and *Mystus gulio* play role in maintaining antioxidant homeostasis and energy metabolic pathway considering muscle mitochondrial enzymes. Fishes were collected from Malancha, Diamond Harbour and Chandanpiri, West Bengal, India, and concentrations of metals (lead, cadmium, chromium, zinc) were measured in water, sediment and fish muscle. Heavy metal concentration was found significantly higher ($P < 0.05$) in water, sediment and in fish muscles from the site Malancha and Chandanpiri compared to Diamond Harbour. *L. persia* showed highest metal deposition in their muscle followed by *A. mola* and *M. gulio*. MDA, SOD, CAT, GST, GRd and cortisol were increased in case of *L. persia* from Malancha and Chandanpiri. SDH, LDH, Ca^{+2} ATPase and cytochrome C oxidase were found significantly ($p < 0.05$) decreased at Malancha and Chandanpiri than Diamond Harbour in case of three fish species. Heat shock protein 70 (HSP70) was found significantly ($p < 0.05$) high in all fish species in Malancha followed by Chandanpiri and Diamond Harbour. Altered activity of Glucose, glycogen, hexokinase, phosphofructokinase and glycogen phosphorylase indicated that metal toxicity in aquatic system resulted in an alteration of antioxidants by creating damage in oxidative status that ultimately affect the mitochondrial energy system.

Key words: Metal, oxidative stress, fish, mitochondria, heat shock protein

UNRAVELING THE MOLECULAR MYSTERY BEHIND SEX REVERSAL IN NILE TILAPIA: A REVIEW

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Abstract: Sex reversal can be observed in some teleost fishes, where the candidate organism develops the opposite sex irrespective of its genetic configuration for a particular sex. Nile Tilapia (*Oreochromis niloticus*) is a potent model organism in which sex determination is primarily a type of genetically directed sex determination with male heterogamety (XY/XX). In commercial market male tilapia has a higher economic value than the female one due to several aspects like fast growth rate, taste and thus is a preferable choice for culture. Sex reversal in tilapia culture is mostly achieved by oral administration of feed incorporated with methyltestosterone (MT) but, widespread use of large quantities of sex reversal hormone in hatcheries may pose a health risk to workers as well as to the consumers. Though uses of MT is a key card on the table, for production of all male tilapia in monosex culture, the exact molecular background of sex reversal is not yet very clear. Previous reports hypothesized that a possible inhibition of aromatase activity in gonad and brain may play important role toward testis development. Furthermore, in tilapia the expression of 11β -hydroxylase might be the crucial modulator in the development of testis. It is the key enzyme that may be involved in the synthesis of 11β -oxygenated androgens. A recent report demonstrates that the 5' flanking region of CYP19A contains estrogen responsive elements (ERE), suggesting its potential link with sex reversal at molecular level. Current research on DMRT1 (doublesex and mab-3 related transcription factor 1) has established its role as the possible linker between aromatase and 11β -HSD to illuminate the underlying mechanism during the development of testis.

Key words: Nile tilapia; sex reversal; aromatase; 11β -hydroxylase, DMRT1

MODULATION OF TRANSPLANTABLE MURINE SOLID TUMORS BY ACIVICIN

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Abstract: Carcinomas and melanomas are solid tumors characterized by the formation of abnormal clumps of cells. The dependency of these solid tumors on VEGF-mediated angiogenesis to grow beyond a certain size is well-known. The hostile microenvironment of solid tumors is characterized by deficiency of oxygen and nutrients. Tumors not only grow in size by obtaining these essentials from the neovasculature but also find a route to metastasize to different parts. Glutamine, an important nutrient of cells, is avidly consumed by almost all tumor cells, including solid tumors. Malignant cells have a high oxidative glutamine metabolism and there is direct correlation between such oxidation and the degree of malignancy. Acivicin is an analogue of glutamine which is naturally found as a fermentation product of *Streptomyces svacei*. It is known to regulate tumor growth by hindering glutamine uptake by the rapidly multiplying cells. Acivicin or AT-125, is also known to block *de novo* purine and pyrimidine biosynthesis in growing cells by inhibiting a number of different glutamine amidotransferases including GMP synthetase and glutamyl transpeptidase. The current study reports the effect of acivicin on the growth of solid tumors by Ehrlich ascites carcinoma (EAC) cells in Swiss albino mice and B16F10 melanoma cells in C57BL/6 mice. In both the cases, reduction in tumor growth suggests important role of acivicin in regulation of solid tumors and warrants the need for further studies.

Keywords: solid tumor, acivicin, glutamine

DIVERSITY OF *Aedes* MOSQUITOES INDIFFERENT HABITATS OF RURAL AND URBAN ENVIRONMENT OF SOUTH BENGAL

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Abstract: Mosquitoes are wide spread and diversified group of insects. They are prominent blood suckers that annoying, mammals, birds, reptiles, amphibians and fishes. Owing to their biting, blood feeding habits and ability to transmit pathogens causing fatal diseases including filariasis, malaria, yellow fever, Japanese encephalitis and dengue fever etc. Biodiversity of mosquitoes is an important aspect of medical science and is destined to emerge as a new significant and integral aspect of human life. Among the insects, mosquitoes are most important since they are related to health and survival of man. The diversity of mosquito species varies among different geographical regions of the world. Due to rapid urbanization and industrialization, large numbers of people migrate from rural to urban areas. This leads to the development of slums with no proper sanitary works, poor maintenance and water bodies conducive for the breeding of mosquitoes thus increasing the incidence of vector borne diseases in an urban environment. The present study was carried out to study the distribution of *Aedes* mosquitoes in different habitats of rural and urban environment of South Bengal. Mosquito diversity was studied in eleven districts of South Bengal in indoor and outdoor habitats in 2019. Two species belonging to one genus were collected and identified as *Aedes aegypti* and *Aedes albopictus*. The higher number of mosquitoes was collected outdoors as compared to indoor. The percentage of *Aedes* mosquitoes at outdoor was (60.80%) and which is larger than in indoor. Shannon and Evenness were also calculated.

Keywords: Evenness, Habitats, Mosquitoes, Shannon-Weiner diversity index, South Bengal.

FISH BEHAVIOURAL CHANGES IN EXPLOITED ECOSYSTEMS: A LABORATORY STUDY

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Abstract: The enrichment of water by nutrients can be of a natural origin (natural eutrophication) but is often dramatically increased by human activities (cultural or anthropogenic eutrophication), in part because influx of nitrogen (N) and phosphorus (P) continues to increase due to use of agricultural fertilizer and production of urban wastes.

There are three main sources of anthropogenic nutrient input: erosion and leaching from fertilized agricultural areas, sewage from cities and industrial waste water. Further indiscriminate use of shampoos and detergents also cause water pollution. These compounds affect the water quality and in turn the fish and their behaviour. Deviation from normal behaviour is the first sign of some internal physiological stress.

The present study is a comparative assessment of the toxic effects of- urea, ammonia, superphosphates and shampoos plus detergents on hyper-eutrophic freshwaters as observed through the change in behavioural pattern of *Oreochromis niloticus* in such exploited ecosystems. Comparative assessment of the water chemistry was done for the four mentioned toxicants. Observations were done on the food response, opercular activity, and swim patterns. Behaviours of fish in the 4 exploited systems were compared with weight matched controls under laboratory conditions.

Keywords: opercular activity; swim pattern; water quality; anthropogenic eutrophication

A STUDY ON AMELIORATIVE EFFECT OF ZINGERONE ON CHRONIC LEAD EXPOSED SPLEENIC TOXICITY IN SWISS ALBINO MICE (*Mus musculus*)

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Abstract: Lead poisoning is now-a-days a great global problem. Large industrial advancements, modernistic lifestyle, recycling activities, smelting, mining and manufacturing processes increases this toxicity to a great extent. Reports suggest that contamination of lead induces oxidative stress which leads to many haematological, physiological and biochemical alterations. According to many reports, chronic activity of this heavy metal is highly found on the soft and connective tissue of the body. The present study aimed to investigate the effect of lead toxicity on a blood filtering organ -spleen along with the ameliorative effects of Zingerone-an active component of ginger onto it. Sub-lethal concentrations of lead acetate (20mg/kg, 40mg/kg, 60mg/kg) was applied orally on three different sets of mice of 4-5 weeks old for 40 days continuously. A control set was also maintained by applying distilled water. Zingerone (100 mg/kg) was supplementarily given to these sets of mice for another 40 days. Morphological analysis reveals the splenomegaly with minimal decrease of body weight. Some haematological and stress specific parameters shows that a potential stress is generated which is minimized after application of this drug. Histological modifications also suggest the presence of lead mediated oxidative stress which is lowered by application of Zingerone. Thus this herbal drug acts as an antioxidant by reducing the oxidative stress. Further studies for revealing its mechanisms and possible amelioration with other drugs are in progress.

Keywords: Lead, toxicity, Zingerone, Swiss albino mice.

IMPACTS OF GEOLOGIC MATERIAL AND PROCESSES ON ANIMAL AND HUMAN HEALTH

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Abstract: Mother nature has always nurtured human beings, but human race is known for exploiting nature and its resources. Today the direct result of our action is that all the human habitation of our country are dealing with water security (water crisis), quality of service provider and water safety/water quality problem. Importantly, groundwater contamination is caused by geogenic heavy metals like, Arsenic, Fluoride, Nitrate, Iron and many more. Also, due to severe anthropogenic activities the quality of drinking water is totally unfit for human being as well as other natural habitats. India is facing huge challenges in providing adequate access to safe drinking water to its community. As per NITI Aayog report GoI 2019, around 82% of rural habitation do not have safe drinking water for drinking, cooking and other domestic purposes. In West Bengal only 1.31% rural household have safe water tap connection. With increasing demand for water and high cost of treatment, it is of paramount importance that the use of potable quality water is restricted. There is a need to promote purpose based water quality monitoring and surveillance system. Otherwise, we cannot stop diseases like Arsenicosis, Fluorosis or Blue Baby Syndrome and we will lose our natural ecosystem. In public health perspectives, related to availability and access to safe drinking water provides a lens to identify and address the policies and practices related to inadequate supply of drinking water sources. This paper try to analyze the sporadic distribution of geological trace elements and its negative impact on human being and animal health. Further, it tries to prepare a possible Road Map for sustainable water resources and make innovative ideas to protect natural habitat.

Keywords: Rural habitation; Groundwater; Arsenicosis; Fluorosis; Natural habitat

IMPACTS OF UREA ON MONOGASTRIC MAMMALIAN SYSTEM EVIDENCED BY BIOCHEMICAL AND HISTOPATHOLOGICAL CHANGES: A SHORT TERM STUDY

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Abstract: Urea is a naturally occurring end product of amino acid metabolism in mammals. It is also a wide spread fertilizer and considered a non toxic compound. However repeated exposure to urea has reported to cause severe effects. Considering such report a short term experimental study was designed to evaluate the impact of urea on various health aspects. For the study a total of 45 swiss albino mice were taken and divided into 9 groups (Gr I-Normal; Gr II, III, IV and V-Fed 50% of LD50 dose and Gr VI, VII, VIII and IX-Fed 75% of LD50 dose) each consisting of 5 mice. Group I was kept as control and given only normal diet. Remaining groups of animals were given different doses of urea (50% of LD50 and 75% of LD50 respectively) at different hour interval (24, 48, 72 and 96 hours). All the animals were kept in standard experimental condition (temperature 25-30°C, humidity 55%) and given food and water *ad libitum*. Several morphological and physiological changes were noted such as alteration in organ and body weight, variation in the body fur density as well as change in stool colour of the experimental animals. Distinct behavioral changes were also noticed. Liver and kidney function biomarkers in serum were assayed and the results indicated the negative effects of urea. These indications were further strengthened by histological evidences. Histopathological changes of liver, kidney and testis were distinct showing toxic effect of urea.

Keywords: Urea, Biomarkers, Histopathological changes, Liver, Kidney, Testis

CLASSIFIED GUILDS IN AVIFAUNAL COMMUNITY WITHIN INDIAN DECIDUOUS FORESTS: A CASE STUDY OF TADOBA ANDHERI TIGER RESERVE

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Abstract: Tadoba Andheri Tiger Reserve (henceforth, TATR) is one of the 50 Project Tiger areas of India. Even though sporadic documentations of its Avifaunal diversity have been recorded in recent years, but a thorough meticulous and scientific documentation of its Avifaunal community based on food and habitat is lacking. We have documented the feeding preferences of the avian community of TATR in the context of habitat diversity. According to the availability of food, total 95 species of birds were studied in the study area that belonged to 43 families. The studied avian species were divided into 8 basic habitats-*aquatic*, *aquatic-terrestrial*, *terrestrial*, *arboreal*, *arboreal-terrestrial*, *aerial*, *aerial-arboreal* and *aerial-terrestrial*. The species thus obtained based on the 8 different habitat niches were then broken down on the basis of their feeding preferences. The *aquatic* niche included 7 feeding guilds [14.89%] whereas *aquatic-terrestrial* consisted of 5 feeding guilds [10.64%], the *terrestrial* niche included 9 feeding guilds [19.15%], the *arboreal* and the *arboreal-terrestrial* included 9 [19.15%] and 10 [21.28%] feeding guilds respectively while birds of aerial adaptation were divided into 3 categories-*aerial*, *aerial-arboreal* and *aerial-terrestrial* that included 1 [2.12%], 4 [8.51%] and 2 [4.26%] feeding guilds respectively. The bark-prober was included within the *aerial-arboreal* habitat.

EFFECTS OF PHYTOCHEMICALS ON RUMEN FLUKE, *Paramphistomum sp.*Jayita Roy¹ and Sutapa Datta^{2*}¹ M.Sc. Student, ² Assistant Professor, PG Department of Zoology, Parasitology and Immunology Laboratory, Bethune College, Kolkata-700006

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Abstract: The thick, fleshy pear-shaped rumen flukes, *Paramphistomum sp.*, are Platyhelminth responsible for gastrointestinal parasitic disease in domesticated animals mainly ruminants including cattle, goats, sheep, and water buffaloes causing heavy economic loss to the livestock industry. Usually these parasites enter into the sub-mucosa of duodenum and feeding on the epithelial cells of Brunner's gland resulting in malnutrition following considerable economic loss. This study was undertaken to investigate the *in vitro* anthelmintic effect of solvent extracts of leaves of *Aegle marmelos* and *Vitex negundo* L. and observed the morphological changes between treated and untreated parasite collected from local slaughter house in Kolkata, West Bengal. Mature leaves of medicinal plants (*Aegle marmelos* and *Vitex negundo* L.) were washed, shade dried, powered and extracted with ethanol (100%). The treatment was done in 96 well microtitre plates containing PBS cocktail. The flukes were kept in each of the well and exposed to different concentrations of crude ethanolic leaf extracts. A set with only PBS cocktail and 1% DMSO used as solvent for extract was taken as control. These two plant extracts showed their effect in a dose dependent manner in terms of loss of motility of the parasite. MTT assay indicate that the parasite become metabolically inactive under drug induced stress as compare to drug free control.

Keywords : *Paramphistomum* ,Paramphistomosis, *Aegle marmelos* , *Vitex negundo*, MTT assay

ANTHROZOOLOGY- A SUBSET OF ETHNOBIOLOGY

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Abstract: Anthrozoology, also known as human- non human animal studies or HAS is the subset of ethnobiology that deals with interactions between human and animals. It is an interdisciplinary subject that combines many disciplines like anthropology, ethology, medicine, psychology, veterinary medicine and zoology. A major focus of anthrozoologic research is the quantifying of positive effects of human animal relationships on either party of study. It includes scholars from field such as anthropology, biology, history, philosophy. Anthrozoology scholars such as Paulsen Bennett recognize the lack of scholarly attention given to non-human animals in the past, and to the relationship between human and non-human animals, especially in the light of the magnitude of animal representation, syllables, stories, and actual physical presence in human society. Rather than a unified approach, the field currently consists of several methods adapted from the several participating disciplines to compass human non human relationships and occasional efforts to develop Sui generis methods.

PHYSIOLOGICAL RESPONSE OF FISH UNDER VARIABLE ACIDIC CONDITIONS: A MOLECULAR APPROACH THROUGH THE ASSESSMENT OF AN ECO-PHYSIOLOGICAL MARKER IN THE BRAIN

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Abstract: The study demonstrates oxidative damage and associated neurotoxicity following pH stress in two freshwater carp *Labeorohita* and *Cirrhinus cirrhosus*. Carp were exposed to four different pH (5.5, 6, 7.5, and 8) against control (pH 6.8 ± 0.05) for 7 days. After completion of treatment, levels of enzymatic (superoxide dismutase [SOD], catalase [CAT], glutathione reductase [GRd]) and non-enzymatic antioxidants (malondialdehyde [MDA], glutathione [GSH]), brain neurological parameters (Na⁺-K⁺ATPase, acetylcholinesterase [AChE], monoamine oxidase [MAO], and nitric oxide [NO]), xanthine oxidase (XO), heat shock proteins (HSP70 and HSP90), and transcription factor NFκB were measured in carp brain. Variation in the pH caused a significant alteration in the glutathione system (glutathione and glutathione reductase), SOD-CAT system, and stress marker malondialdehyde (MDA). Xanthine oxidase was also induced significantly after pH exposure. Brain neurological parameters (MAO, NO, AChE, and Na⁺-K⁺ATPase) were significantly reduced at each pH-treated carp group though inhibition was highest at lower acidic pH (5.5). *Cirrhinus cirrhosus* was more affected than that of *Labeorohita*. Molecular chaperon HSP70 expression was induced in all pH-treated groups though such induction was more in acid-stressed fish. HSP90 was found to increase only in acid-stressed carp brain. Expression of NFκB was elevated significantly at each treatment group except for pH 7.5. Finally, both acidic and alkaline pH in the aquatic system was found to disturb oxidative balance in carp brain which ultimately affects the neurological activity in carp. However, acidic environment in the aquatic system was more detrimental than the alkaline system regarding oxidative damage and subsequent neurotoxicity in carp brain.

Keywords: Antioxidant; Brain; Heat shock protein; Oxidative stress; pH

A STUDY ON THE GUT MICROBIOTA OF *Anopheles* MOSQUITO TO CONTROL THE MALARIA IN SOME RURAL AREAS OF WEST BENGAL

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Abstract: Malaria affects thirty-six percent of the world population and two thousand twenty million of people are exposed to the risk of malaria in ~90 countries. In India, five states including West Bengal account for sixty percent of cases of malaria according to World malaria report published in 2009. Several studies have shown that the mosquito microbiota can influence (mainly negatively) the parasite's development, and hence the efficacy of malarial infection and transmission. Many vector biologists have shown that the mosquito midgut microbiota stimulates the mosquito's innate immune system, which, in turn, acts against the malaria parasite. Therefore isolation, identification of abundant gut microbiota by the use of gel electrophoresis and gene sequencing is important as the culture and introduction of this identified microbe in to the gut of *Anopheles* may reduce its vectorial capacity. Our study also reveals that *Enterobacter cloacae* is the most abundant gut microbiobial fauna in the *Anopheles* of some rural areas of West Bengal.

Keywords: gut microbiota, malaria, *Anopheles*, gene sequencing, bacterial culture.

APPLICATION OF TECHNOLOGY IN SUSTAINABLE RURAL DEVELOPMENT Where Technology Meets Mankind

Sreejani Sen, B.Sc in Zoology (Semester 4)

Abstract: India, called the land of paradox being one of the largest producers of food along with the largest food market, faces major challenges in creating sufficient occupational sector, lacks in basic infrastructure, institutional financing, poor productivity with high food cost index inflation. India thus must focus on "small rural development" preserving rural cultural assets to promote sustainable livelihood, aiming for a holistic and dynamic approach. Technology is a panache, an aid to generate endogenous and exogenous developmental strategies, promoting local niche products. Starting from the Integrated Child Development Scheme (ICDS) to ICT solutions serve as enablers for connectivity between communities and provide access to E-learning on water management, E-health, focused market for technopreneurs, using "Sensor" technology to make farms connected through "Precision Agriculture", GIS services in the houses connect the rural roads are some of the initiatives. SACS (Sparse Area Communication System) established by ISRO with IIT Madras combines satellite and terrestrial wire systems to connect villages. Similar initiative by IIT Roorkee along with the IT local youth, led to the establishment of VSATs(Very Small Aperture Terminals) used for satellite based data communication for last mile connectivity. NARI (Nimbkar Agricultural Research Institute) produced efficient lanterns called Noorie that produces 1350 lumen of light equivalent to 100W electric bulbs. Dipbahan, an eco friendly tricycle rickshaw, designed by IIT Guwahati, uses jute based composites and produces cost effective, durability comfort using solar photovoltaic fuel cells as a source of energy. CRDT works consistently to promote such sustainable technology to enhance the quality of living in the rural.

USE OF GC-MS TO CONTROL THE *Culex* POPULATION IN SOME RURAL AREAS OF WEST BENGAL

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Abstract: Mosquitoes can transmit more diseases than any other group of arthropods. WHO has declared the mosquitoes as "public enemy number one". Chemical insecticides are commonly considered to be the most effective control strategy against mosquitoes. However, health concern has increased significantly regarding their negative effects, such as potential health hazards, water contamination, environmental pollution, toxicity to non target organisms as well as the development of resistance in mosquitoes. Application of eco friendly alternatives such as biological control of vectors has become the central focus of the control programme in lieu of the chemical insecticides. The present study evaluated the larvicidal potential of a locally available botanical (Lemon Peel i.e. *Citrus limon*) against the 3rd instar *Culex* larvae under controlled laboratory conditions. In order to identify the probable active components GC-MS technique has been utilised. Our future study targets the detail structural studies of the active principal of lemon peels by the use of HPLC and other techniques so that the isolated bio active molecules can be used as a commercially produced mosquito larvicide.

Keywords: Insecticide, *Culex*, Plant extract, GC-MS, HPLC, Lemon peel active principal

i) PHYSIOLOGY AND ALLIED SCIENCES

Symposium Lecture

Chaired by:

Dr. Amit Krishna De
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Prof. Tania Das, Professor,
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Do cancer stem cells have ‘brains’?

Abstract

According to recent ‘Cancer Stem Cell Theory’, cancer development is due to a rare population of cells, termed cancer stem cells (CSCs) that uniquely initiates and sustains the disease. Tumors are organized in a hierarchical manner with CSCs having the ability to self-renew and also to undergo asymmetrical divisions, giving rise to a differentiated progeny that represents most of the tumor populations. Our present study revealed that a small population of breast cancer cells always escaped even the lethal doses of chemotherapeutic drugs. These drug-spared cells exhibited ‘stemness signature’ and displayed self-renewal as well as tumorigenic properties thereby confirming their identity as breast CSCs. These CSCs not only differentiated into non-stem cancer cells (NSCCs) to initiate tumorigenesis and to form the total tumor mass, but also imparted stemness in NSCCs, as and when required. This rare population of cells also played significant role in tumor-induced neo-angiogenesis, metastasis, immune-evasion and transdifferentiated into endothelial-like cells to initiate angiogenesis. Our findings further indicated that depending on the need of the tumor, CSCs even decided the fate of the tumor by choosing their mode of cell division, i.e., symmetric or asymmetric. In fact, in response to any stress that killed NSCCs, CSCs underwent symmetric cell division while discontinuing asymmetric cell division, thereby restricting number of vulnerable NSCCs. CSCs, thus, decide the fate of the tumor so ‘intelligently’ as if they have ‘brains’! Further research indicated that treatment with FDA-approved, affordable drug aspirin prior to chemotherapeutic regimen sensitized CSCs to chemotherapy. Our study not only designates cancer as a ‘stem cell disease’ but also offers a better treatment strategy of breast cancer by a combination of CSC-sensitizing agent and conventional chemotherapy.

Invited Lecture

Chaired by:

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Dr. Asima Das
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Rural or Urban, It's time to 'Bid farewell to Smokeless Tobacco (Gutkha) Chewing: It promotes neuronal cell death **Abstract**

In India, in spite of the prevalence of oral cancer and huge disease burden is high, consumption of paan/masala, gutkha or zardais still popular in rural and urban India and in our state as well. It is as high as 3-53% among men and 3-49% among women. Smokeless Tobacco (SLT) is responsible for wide range of systemic health issues including neurodegeneration, neuronal apoptosis and behavioral abnormality due to presence of many chemical constituents in it. Range of *in vivo* and *in vitro* studies were designed to address the neuro degeneration and associated events to establish the scientific evidence of SLT mediated neurodegeneration.

The effects of graded doses of water soluble lyophilised SLT on mouse model and differentiated PC12 (rat pheochromocytoma) and SH-SY5Y (human neuroblastoma) cell lines were studied. A plethora of cellular and molecular toxicity parameters were evaluated using cell culture, animal behavior study tools, immunochemistry and microscopic techniques.

Dose dependent metabolic and oxidative status perturbations followed by inflammatory developments in SLT treated mice were observed. There were alterations in mood and anxiety behavior of the mice exposed to SLT. Further underpinning revealed certain apoptotic cell death in the hippocampus and cortex. The SLT mediated insults were prominent as apoptotic mechanisms were active in systemic organs. The brain cellular metabolic perturbation was correlated with both cell death and behavioral pattern. To establish the previous claims, 24hr exposure with SLT (6mg/ml) reduced cellular ATP production, mitochondrial health and membrane potential, consistently. Further, SLT decreased oxidative phosphorylation and aerobic glycolysis measured by extracellular flux analyzer. It was observed that there was a time dependent increase of cleaved-Bid levels and down regulation of Bid gives significant protection from death up to 72hr in neurons. "Bid" will be a future therapeutic target as per experimental findings of both intrinsic and extrinsic apoptotic and neurodegenerative pathways. SLT was indeed an agent for the development of neurodegeneration and dementia. This is perhaps the first report with in depth molecular mechanism conferring SLT mediated neuronal cell death using mouse and in vitro cell culture studies with a potential for future targeted therapy.

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High protein diet, a remedy against arsenic-induced female reproductive catastrophe

Abstract

Arsenic toxicity poses a significant threat to a broad spectrum of female reproductive functions due to imprudent oxidative stress generation. This study aimed to explore the role of isocalorichigh protein diet (HPD), containing excess casein and pea, in impeding arsenic mediated ovo-uterine toxicity. Eighteen cyclic female rats were randomly divided into three groups and maintained as control, treated (given As_2O_3 , 3 mg/kg bw/rat/day), and supplemented (given arsenic along with HPD) groups for 28 consecutive days. Arsenic insulted ovary and uterus showed a marked reduction in gross weight along with an enhancement of diestrus phase. Degeneration in granulosa cells accounted by scanning electron microscopy, arrest of folliculogenesis assessed by ovokinetic study and the absence of functional corpus luteum seen by H/E staining were the observed follicular maturational defects caused by arsenic toxicity. Attenuated ovarian activities (unit/mg tissue /h) of $\Delta^5,3\beta$ -hydroxysteroid dehydrogenase (3β -HSD) and 17β -HSD, and serum estradiol level were also noted on arsenic exposure. Less estradiol and Steroidogenic imbalance further supported the ultra structural changes of the uterine luminal epithelia (ULE) like as thinned microvilli density, shrunken endometrial glands which reflected loss of cell polarity and mislaid uterine homeostasis. All these morphological and steroidogenic catastrophe within cellular environment were probably due to abrupt ROS generation and the towering of oxidative stress indices like peroxidase, uterine malondialdehyde, and protein carbonyl level justified our hypothesis. Loss in ovarian cellular integrity as revealed by significant DNA damage was also observed by comet assay. The damages within uterus were blueprinted by western blot analysis of caspase 3 and bax expression to validate the ROS mediated intrinsic apoptotic mechanism. The fatal impacts of arsenic on the female reproductive system was effectively counteracted by HPD supplementation and maintained close to the control levels. This potential role of HPD in protection against these detrimental effects of arsenic may owe to its bio-methylation and inherent antioxidant properties.

Key words: *Arsenic, Formulated high protein diet, Oxidative stress, Ovo-uterine, DNA-damage, Apoptosis*

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Anti-oxidative and Anti-inflammatory Potency of *Amorphophallus campanulatus* against Ethanol Induced Tissue Damage

Abstract

In India, alcohol abuse is an emerging major public-health problem. Chronic alcohol abuse has claimed the life of millions and ranks among the top five factors responsible for disease, disability and morbidity throughout the world. The present study reflects the role of a commonly consumed vegetable, *Amorphophallus campanulatus* (AC), in preventing alcohol induced organ damage.

For this purpose, adult male Wistar rats, weighing 150-200g, were randomly grouped (n=6) as: control (0.5mL saline, i.p.), ethanol treated (2gm/kg bw, i.p.), ethanol co-treated with AC (500 mg / kg, i.p.), and ethanol co-treated with silymarin (50 mg/kg body weight) groups. The treatment was continued for 30 consecutive days. Thereafter, liver and kidney tissues were isolated and homogenized for determining the level of different oxidative stress biomarkers. Level of pro-inflammatory cytokines in serum and histo-morphological alteration of H.E. stained sections were also assessed.

Ethanol administration significantly altered ($p \leq 0.001$) tissue oxidative stress parameters in both liver and kidney. In addition, level of pro-inflammatory cytokines (TNF- α and IL-6) was also significantly elevated ($p \leq 0.001$) in ethanol treated group. However, co-treatment with ethanolic extract of AC significantly restored the above values to near normal level, comparable to both control and silymarin co-treated group. Histo-morphological analysis of H-E stained sections of both liver and kidney also confirmed the results obtained from above mentioned biochemical studies.

It can thus be concluded that the anti-inflammatory and anti-oxidative efficacy of AC can confer hepato-protection and reno-protection against alcohol induced oxidative stress.

Keywords: Alcohol, *Amorphophallus campanulatus*, Anti-inflammatory, Anti-oxidative, Oxidative stress

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Chronic exposure to sunlight (ultra violet radiation) leads to alteration of Limbal Epithelial and Stem/Progenitor Cells in Cornea

Abstract

The flux of Ultra Violet (UV) radiation on earth has increased a lot since the last two decades causing UV induced corneal damage in eye, mainly affecting the Agriculture based population. Limbal Epithelial Stem Cells (LESC) located at limbal Palisade of Vogt alongwith the microenvironmental support maintains the corneal transparency which is the basic need for good vision. Limbal Epithelial stem cell deficiency in eye called Limbal Stem Cell Deficiency Diseases (LSCD) arises due to alteration of LESC and the microenvironment and leads to corneal blindness. The detail understanding of the homeostatic mechanism which maintains these stem cells in their specialized niche is still elusive.

Here, through our experimental endeavor we have tried to put light on various physiological, cellular and molecular aspects of limbal epithelial stem /progenitor cell population in UV related corneal disease like Pterygium and also in UV exposed experimental mice mimicking the same diseased state .

Dr. Amit Bandyopadhyay, Assistant Professor,
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Sports, Exercise and Yoga – a Futuristic Approach for Rural Health Development

Abstract

Beneficial role of sports, exercise and yoga on health and fitness to maintain a healthy wellbeing is globally established. Patients suffering from various ailments (e.g., hypertension, diabetes mellitus, coronary heart diseases, etc.) are being advised by the medical practitioners to follow regular exercise habits as an alternative medicine. Yoga is also acclaimed for its immense role not only to maintain healthy wellbeing but also to treat various diseases. It is used as a complementary treatment modality for physical and mental health in some places of the world although it didn't receive much focus in Indian context. It is another major concern that concept of nutrition, balanced diet, dietary and nutritional supplementation is not known to rural people and this may be because of lack of education and awareness programme. Even some simple physical activities, e.g., brisk walking, jogging, slow running, regular involvement in games and sports as a leisure activity, etc., help to prevent several health problems. Stretching and breathing exercises involved in yoga promote health and wellbeing. Moreover, routine exercise during pregnancy also benefits the mother and the baby. Values of different fitness profile parameters of Bengalee rural populations of different age groups (e.g., aerobic fitness, high intensity effort, motor abilities, muscle strength, muscular endurance, etc.) have been found to be at par with their urban counterparts. Even in some communities, pre-adolescents and young adults were found to have outstanding skill and fitness qualities to be a prospective sportsperson.

Key words: Yoga, exercise, nutrition, health, fitness.

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Smoking augments oxidative damages in erythrocyte: role of vitamin-c as scavenger

Abstract

Cigarettes are a classy way to commit suicide. **Tobacco smoking**, a silent killer – is the practice of burning a substance to inhale the resulting smoke. It has been implicated as a significant risk factor for the establishment and progression of several diseases. Rural areas have higher smoking rates than urban areas, most likely resulting from the demographic and psychosocial factors that are typically associated with rural areas, such as lower income and education levels and higher unemployment. The architecture of erythrocyte is particularly vulnerable to inhaled toxins of cigarette puff creating imbalance in antioxidant defense mechanism as well as morphological alteration, decreased membrane fluidity in tobacco smokers. It causes oxidative damage of erythrocyte membrane as well as its hemoglobin which has been recently reported in our laboratory. But interestingly, the damage of smokers' erythrocyte is to some extent defended by increased up take and consumption of glucose and dehydroascorbate by upregulating its glucose transporter, GLUT1. So, it is concluded that smokers may be advised to intake sufficient Vitamin-C to compensate oxidative burden. Moreover, increased consumption of glucose among smokers may be related to lower prevalence of obesity and diabetes mellitus.

Keywords – Tobacco smoking, erythrocyte, morphology, oxidative stress, dehydroascorbate, glucose consumption.

CAPSAICIN PROTECTS SODIUM FLUORIDE-INDUCED OXIDATIVE DAMAGE OF LIVER IN RATS

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Abstract: Capsaicin is the most predominant and naturally occurring alkamide found in *Capsicum* fruits. Since its discovery in the 19th century, the therapeutic roles of capsaicin have been well characterized. The present study investigated the potential hepatoprotective efficacy of capsaicin against fluoride (NaF) induced liver injury and to explore the possible mechanisms whereby this phytochemical mediated its beneficial effects. Twenty four male albino rats (n=6) were divided into four groups for treatment with corn oil, NaF (10.3 mg/kg b.wt), capsaicin (0.5 mg/kg b.wt) and both NaF and capsaicin, respectively, for 5 weeks. Hepatoprotective effect of spice principle was evidenced by the measurement of serum marker enzyme activities such as, SGPT. Oxidative stress was evaluated by measuring malondialdehyde (MDA), reduced glutathione (GSH) contents; and by evaluating of superoxide dismutase (SOD), catalase (CAT) activities. Animals treated with NaF exhibited significant elevation in AST, ALT, total bilirubin and exhibited significant decrease in activities of SOD, CAT, GST and GSH contents. Capsaicin supplementation (both capsaicin and NaF) has preserved the liver histology, liver enzymes and bilirubin close to normal, exhibited significant induction in the activities of CAT, SOD and increased the liver content of GSH and conversely showed significant decrease in liver LPO and NO content compared to NaF challenged rats. The present investigation offers strong evidence regarding the hepatoprotective nature of Capsaicin against the liver oxidative stress in male rats caused by fluoride.

Keywords: Fluoride; Capsaicin; hepatotoxicity; Oxidative stress; antioxidant.

ENVENOMATION - AN INFLAMMATORY DISORDER

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Abstract: Inflammatory changes have been reported in snake bite victims. However whether inflammation is significant enough to override direct toxic effects of venom has not been studied. Direct action of venom has been well established in venom-induced nephrotoxicity. Whether resulting from direct damage from nephrotoxins or indirectly from hemotoxin mediated altered renal hemodynamics, anti-inflammatory drugs are not supposed to prevent either of these mechanisms. Hence to study importance of inflammation we have treated experimental animals with prednisolone, an anti-inflammatory agent, and studied the nephrotoxic damages prevented by this approach done by venom if inflammation is a significant player in venom induced nephrotoxicity. To study the involvement of inflammation in murine model of venom induced nephrotoxicity treated with anti-inflammatory drug prednisolone. Renal, inflammatory, oxidative and carbonyl stress markers and renal histopathological alterations were assessed in murine model of viper venom induced nephrotoxicity. Data were represented as Mean \pm standard error. One way ANOVA followed by Bonferroni post hoc analysis was performed to evaluate any significant variation among the different groups. Renal compromise in venom group was confirmed from oliguria, elevated urinary microprotein, decreased urinary creatinine and creatinine clearance, tubular injury and glomerular damage with mesangial proliferation. The renal changes are associated with significant inflammation and oxidative damages. Administration of Prednisolone was found to significantly prevent the above changes in treatment group. Efficacy of anti-inflammatory drug in prevention of nephrotoxic damage proves involvement of inflammation in viper induced nephrotoxicity. It also indicates the therapeutic importance of anti-inflammatory drugs in snake bite victims.

PULMONARY FUNCTION STUDIES IN FEMALE SINGERS OF KOLKATA, INDIA

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Abstract: Singing performance is based on the efficiency of the respiratory system and therefore it is speculated that respiratory parameters may have significant difference in singers compared to their non-singer counterparts. The present study was aimed to evaluate the pulmonary function tests (PFTs) in female singers of Kolkata, India and to compare the data with their sedentary counterparts from India and abroad. The study was also aimed to propose prediction norms for PFTs in both the groups. 56 female singers and 52 female non-singers (control group) with similar socioeconomic background were randomly sampled from the Rabindrabharati University, Kolkata. Pulmonary function was measured by Expirograph and peak expiratory flow rate (PEFR) was measured by Wright's peak flow meter. PFTs were significantly higher in singers than their control group. Correlation matrix depicted significant relationship of physical parameters (age, body height and body weight) with vital capacity (VC), forced vital capacity (FVC), forced expiratory volume in 1 second (FEV₁) and PEFR in both groups. Regression equations were computed to predict PFTs from physical parameters in both the groups. From the present investigation it can be concluded that female singers of Kolkata have higher lung capacity than their non-singer counterparts probably because of their regular practice and training of singing that requires imperative effort of the respiratory system.

Keywords: FEV₁, FEV₁%, FVC, PEFR, pulmonary function, singers.

EFFECTS OF ACUTE HONEY SUPPLEMENTATION ON ENDURANCE PERFORMANCE IN MALE UNIVERSITY STUDENTS

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Abstract: Ingestion of combination of carbohydrates (CHO) is beneficial for exercise performance. Honey, a natural source of CHO mixtures, possesses anti-oxidant and immune boosting properties which may enhance endurance performance by maintaining blood glucose level and reducing exercise induced oxidative stress. The present study was aimed to investigate the efficacy of acute supplementation of honey on endurance performance in healthy male University students. In this placebo-controlled double-blind study, healthy young males (n=12, age=20–25 years) were supplemented with honey [30g (H₃₀) or honey 60g (H₆₀)] or placebo (PL) before the exercise trial. Endurance time, pre-exercise and working heart rates (HR), rate of perceived exertion (RPE), blood parameters, e.g., glucose, insulin, lactic-acid, free fatty acid, superoxide dismutase, lipid peroxidation, catalase and total thiol were measured by standard methods followed data analysis by two way repeated measure ANOVA. Endurance time showed significant (p<0.05) difference between the PL and honey trials as well as between H₃₀ and H₆₀ trials. Changes in working HR were significantly (p<0.05) different over-time in same experimental-trial compared to respective resting-values. Working HR had no significant difference between H₃₀ and H₆₀ trials (except 90th min and at exhaustion). RPE was significantly (p<0.05) different at the time of exhaustion in comparison to 10th min value of corresponding trial. Lactate, glucose, insulin, free-fatty-acid, lipid peroxidase, total thiol, catalase and superoxide dismutase depicted significant difference not only between H₃₀ and H₆₀ trials but also between PL and honey trials. Acute honey supplementation has significant beneficial effect on endurance performance and biochemical parameters. So it may be used as a natural and economical ergogenic aid to boost exercise-performance.

Keywords: Honey, endurance performance, ergogenic aid, antioxidant.

PHYSICAL FITNESS AND CREATIVITY: A STUDY ON ADOLESCENT GIRLS IN KOLKATA, WEST BENGAL

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Abstract: Students at adolescence age are now-a-days tremendously occupied with scholastic activities at the cost of co-scholastic development to fulfil their personal as well as social expectations and to survive in cut throat competition, surrounding them. Purpose: Knowing the physical health benefits of physical fitness from literature, the present study was aimed to evaluate the association of physical fitness with creativity (a reflection of good mental health). Methodology: The sample size was one hundred and thirty one (131) girl students at XIth standard coming from different socio-economic status and studied in various Kolkata based schools of West Bengal, India. Different parameters of physical fitness and verbal as well as non-verbal creativity were assessed by standard methods. Results: Both verbal and non-verbal creativity had negative correlation with body weight, body mass index (BMI), body surface area (BSA) and skinfold thickness parameters. On the contrary, lean body mass was positively correlated with verbal creativity. The non-verbal creativity had positive correlation with explosive muscular strength, VO_{2max} and Flexibility. Conclusion: The study recommended some means to achieve physical fitness which in turn may lead to better achievement of verbal and non-verbal creative abilities in adolescent individuals.

Keywords: Verbal creativity, non -verbal creativity, VO_{2max}, skin-folds, lean body mass.

MOTOR FITNESS OF MALE KARATE ATHLETES AND JUDO PRACTITIONERS OF KOLKATA, INDIA

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Abstract: Motor fitness and Hb of Karate and Judo athletes have been reported from different countries as well as population. But pertinent data are unavailable in Indian Judo and Karate athletes. The present study was therefore aimed to evaluate the haemoglobin concentration and motor fitness of Judo and Karate athletes of Kolkata, India and also to compare the data with their control group and overseas counterparts. State level male Judo (n=40, age: 22.61±0.91 yrs) and Karate athletes (n=40, age: 22.36±0.97 yrs) were recruited in this study from different sports academies of Kolkata, India. Sedentary (n=40) control subjects (age: 22.73±0.97 yrs) were sampled from same area. Motor fitness parameters and Hb were measured by standard methods. Judo and Karate athletes had significantly (p<0.001) higher values of motor fitness parameters and Hb than the sedentary counterpart. The study depicted that Judo and Karate training improve motor fitness and Hb. It is hypothesized that training duration has close relationship with the betterment in these parameters. Present data would serve as the national standard in eastern Indian male Judo and Karate athletes and this will also help the coaches and athletic trainers to implement more specific training for betterment of performance in these athletic populations.

Keywords: Indian, HGS, VJT, RT.

SPECTROPHOTOMETRIC ANALYSIS OF GREENSYNTHESIZED SILVER NANOPARTICLES AND ITS EFFECT ON GROWTH OF CLINICAL DRUG RESISTANT *Staphylococcus aureus*

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Abstract: *Staphylococcus aureus* is a common human pathogen causing various lethal diseases. Antibiotics are also facing challenges to treat drug resistant Staphylococcal infections, till now vancomycin is the only one to combat it. But the bacteria developed resistance against this antibiotic too. These are called as VRSA. On the other hand, nanoparticles (NPs) in recent times have emerged as potent bactericidal element. Moreover the biologically prepared nanoparticles have lesser side effects than chemically reduced NPs. The aim of the present study is to synthesize green silver nanoparticles and to assess its effect on growth of clinical drug resistant *Staphylococcus aureus*. Biochemical tests and DAD were performed for the identification and to see the sensitivity pattern of *S. aureus*. Silver nanoparticles were prepared biologically with the help of tulsi leaf extract (aqueous) and silver nitrate. UV-Vis spectrophotometric analysis was carried out for analysis of growth of *S. aureus* at different conditions. Among the collected gram-positive strains, 21 were found to be *Staphylococcus aureus*, one of them was XDR (extensively drug resistant) & 15 were MDR (multidrug resistant). Three VRSA isolates were also identified having MIC >16mg/L. The nanoparticles prepared were found to have highest absorbance between 400 – 450 nm wavelengths. A (control) showed gradual increase in absorbance at 600nm wavelength in UV-Vis spectrophotometer. B (Strain + Drug) showed linear absorbance whereas C (Strain + AgNP) also showed approximately same pattern as B which proves the antibacterial activity of the NPs for drug resistant *S. aureus*. As green synthesized nanoparticles are capable of acting as bactericidal agent, it can be taken as primary stage of treatment to treat MDR Staphylococcal infection. Further characterization of different green synthesized nanoparticles and its potency can be a future work.

Keywords: *Staphylococcus*, Nanoparticles, MDR, VRSA

RUTIN- SERUM ALBUMIN INTERACTION IN DIFFERENT MEDIA AND ITS EFFECTIVE DOSE SELECTION IN RADIATION-INDUCED CYTOTOXICITY ON HUMAN BLOOD CELLS

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Abstract: Increases in general circulatory time, half-life and bioavailability increase the efficacy of any drug molecule. Rutin (3, 3', 4', 5, 7- pentahydroxyflavone-3-rhamnoglucoside) is a flavonoid known for its ability to regulate cell metabolism, gene expression, and protect against oxidative stress, although certain biophysical aspects of their functioning are not yet clear. Non protein and small protein molecules with electrophilic properties are transported through the blood to their target site by binding with albumin. The authors therefore hypothesized that modification of rutin-albumin binding by changing the microenvironment in which it is delivered can increase the efficacy of the molecule. Therefore, the interaction of rutin in different solvent systems with albumin has been studied to evaluate the bioavailability and efficacy of the molecule to introduce it as a drug for combating UVB radiation-induced damage in biological systems. We evaluated the effect of rutin-albumin interaction in blood plasma in various modes of delivery (in DMSO, alcohol and PEG). The biological activity and efficacy of different solvents for rutin delivery and its bioavailability were studied using UVB irradiated human peripheral blood mononuclear cells in vitro. Amelioration of UVB radiation-induced oxidative damage and cell death by rutin has been studied by MTT assay and Trypan Blue exclusion assay and LDH-cytotoxicity assay. In these three studied systems the most effective concentration of rutin was also determined.

Keywords: Rutin, Serum albumins, Bioavailability, UVB radiation, Cytotoxicity.

MYELOYDYSPLASTIC SYNDROME RELATED HAEMATOPATHOLOGICAL AND CELLULAR SIGNALLING ABBERATIONS

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Abstract: Hematological disorders like myelodysplastic syndrome (MDS) arise due to clonally dysregulated hematopoiesis forming dysplastic cells which lacks proper maturity and immune functional capacity. Myelodysplastic syndrome is considered globally as heterogenous group of neoplasm which often proclaims leukemic progression. The heterogeneity is reflected not only in clinical manifestations of the disease but also in salient causes of disease development. In spite of multiple therapeutic modalities, shortfall towards treatment of this disorder still persists. The focal point of tussle suggested toward defects, which are not confined to any unifying cellular signalling. The pathobiology of the disease often experiences an intriguing paradox involving '*hyperproliferative bone marrow with pancytopenic peripheral blood*'. Assessment of cell morphology of peripheral blood and bone marrow as well as cytochemistry, histochemistry, karyotyping and flowcytometric analysis were taken into consideration. The focussing zone was MAPK and JAK/STAT signalling in the hematopoietic dysregulation during the course of alkylator (ENU) induced myelodysplasia. The expression of Common leucocyte antigen CD45 (protein phosphatase receptor type C) was less in comparison to the expression of transferrin receptor CD71 which was increased in MDS mouse model. JAK1 showed an upregulated expression followed by STAT5. Therefore, it can be concluded that downregulation of CD45 (PTPRC) may have helped in the upregulation of JAK-STAT signalling and CD71 expression. On the other hand, the phospho-protein status of Receptor Tyrosine Kinases (RTK's) like FLT3, PDGFR, EGFR were markedly increased that activated MAPK signaling proteins which finally executed their tasks by transcription of c-Myc and Rb proteins leading to uncontrolled cellular proliferation. Activated c-Jun revealed stress related apoptosis and the phenotypic expression of receptor CD 150 and CD 90 established a mechanistic correlation with MAPK signalling. Altogether, the role of activated MAPK and JAK/STAT signalling may have led to hyperproliferation and concurrent enhanced apoptosis of abnormal cells which gradually headed towards premalignant transformations during the course of the disease.

Keywords: Bone marrow, MDS, MAPK, JAK1, STAT, CD 45, CD 71, Ras, FLT3, CD 90, CD150

NEED OF DESIGNING THE SITTING ARRANGEMENT OF SCHOOL CHILDREN BASED ON ERGONOMICAL CONSCIOUSNESS

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Abstract: School sitting arrangement is an essential criterion for maintaining standard physiological posture to the growing Children. Anthropometric measurements are essential for the correct design of ergonomically improved workspaces. In most of the school the benches, chairs and desks are structured at random. So the sitting positions and postures put extreme stress and strain on the muscle, ligaments and on the lumbosacral joints(L5/S1) as well as on other vertebral discs. Improper body positioning at school, contribute to the appearance of musculoskeletal problems among students. So the students face posture related syndromes not only in the growing age but also get affected for the rest of the future life. The main purpose of the study is to conduct survey amongst the school students analyse the problems, the students face due to workstation designing to examine the musculoskeletal pain and estimating the adequacy of class room sitting arrangements' in relation to the anthropometric characteristics. This research work was conducted among students in a secondary school to obtain the detailed Data. The sample size of this work was approach 120 students taking 30 students from each of class5, class7, class8 & class10. The work has been undertaken on the basis of Nordic musculoskeletal Questionnaires. The research study intends to propose a guideline for an ergonomically comfortable sitting arrangement of school children in the classroom. With active responses we can observe that discomfort and pain in student was prominent in the neck, shoulder and upper back. Majority of the students stated that their discomfort was first noticed recently. They believe that their pains are related to the school furniture design. Major percentages of students experienced fatigue, and back pain during class work. Some percentage of students doesn't feel comfortable while using existing furniture set up. Based on the responses obtained for musculoskeletal disorders, large percentages of students stated that their existing School furniture does not have proper back-rest and desk respectively. From the student responses obtained it has been concluded that the existing school sitting arrangement has many short-comings. So many improvements in the existing bench, chair and table is present is a must.

Keywords: School children, Anthropometry, Musculoskeletal disorders.

STUDIES ON FLUORIDE INDUCED MALE REPRODUCTIVE DISORDERS- A DOSE DEPENDENT STUDY

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Abstract: Fluoride is a trace element and also considered as an environmental pollutant. Humans are exposed to fluoride through a number of sources like water, food, medicines, pesticides, insecticides and also from dental products (tooth pastes and mouth wash). At normal physiological level it prevents dental carries and reduces tooth decay but at a high concentration it is a threat to human body. In India, fluoride contamination is endemic in many states like Andhra Pradesh, Tamil Nadu, Karnataka, Gujarat, Rajasthan, Punjab, Bihar, Kerala and also in West Bengal due to its huge presence exceeds 20 ppm, where 1.5 ppm is the desirable upper limit as set by WHO. The present study has designed to evaluate the extent of reprotoxicities with three different selected doses. Twenty-four adult male albino rats (120 ± 10 gm) of Wistar strain were randomly divided into four groups. Control rats (Gr. I) were supplied with normal lab diet and the treated rats (Gr. II, III & IV) were orally gavaged with sodium fluoride (10 mg/kg, 15 mg/kg and 20 mg/kg b.wt /day) for thirty consecutive days. Morphological alterations of testes and epididymis were evaluated by H/E staining. There were gradual increment of the disorganized germ cells and distorted germinal epithelium in the seminiferous tubules and denudation of cells within its lumen with the increased doses and all these were minimal with the first dose. Thinning of epithelial layer and decrease in sperm concentration were noticed in the epididymis with the two higher doses. Increased testicular oxidative stress was noted markedly in the rats of Gr. III and IV as assessed by enzymatic (SOD, CAT, GPx, GST) and non-enzymatic (MDA, PC) markers. The sperm parameters (i.e. count, motility, viability and hypo-osmotic swelling) when assessed with isolated spermatozoa from both caput and cauda, depicted that the caudal spermatozoa were affected much. We propose that NaF produces damages of testicular and epididymal tissues, testicular oxidative imbalance and reduction of spermatozoal potentials in adult rats when treated with higher doses.

Keywords: Sodium fluoride, Testes, Sperm, Dose-dependent, Oxidative imbalance.

OCCUPATIONAL STRESS AND POSTAL WORKERS

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Abstract: More than one-third of workers worldwide report high levels of stress (WHO,2009). Musculoskeletal conditions affect people across the life-course irrespective of any age, gender, religion and race etc (Gangopadhyay,2012). In this context there lies a severe need of assessment of the occupational stress status among postal workers as the Indian postal service is the most widely distributed post office system in the world and for more than 150 years, the department of posts has been the backbone of the country's communication and has played a crucial role in the country's social economic development. The main aim of this particular study was to find the intensity of the importance of assessing the occupational health status among the postal workers. After taking the approval certificate from Institutional Human Ethical Committee few randomly selected post offices in West-Bengal are being visited to fulfil the purpose of the pilot study and Modified-Nordic-Musculo-Skeletal-Questionnaire and Body-Parts-Discomfort(BPD) scale being performed upon the workers. Those who have past medical history have been excluded from the statistical evaluation. Among the study subjects, age group between 25-45years (mean age 32years) complaining low-back-pain(65%), headache(60%), knee-pain(65%), wrist-pain(24%) and shoulder-pain(22%). About 71.6% subjects rated their pain above 5 in pain-scale. India-Post can be denoted as the most credible outreach infrastructure in the country. This study result can easily conclude that there is severe need of assessment of the health status of postal workers thus authors are progressing their plan of work towards fulfilling the aim.

Keywords: India Post, occupational health, musculoskeletal disorders.

POSTURAL LOAD OF UTENSIL (ALUMINIUM) MAKERS

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Abstract: There are a lot of utensil making industries spread all over India. Among them, the aluminium utensil is mostly preferred due to its low price and versatility. It is used in both rural as well as urban areas of the country. The aluminium utensil factories are mostly small scale to medium scaled industries. Most of the workers in these factories face different occupational strains during their daily activities. Postural strain is one of the various strains among them. The study was undertaken to assess the postural load and body movement of the aluminium utensil makers which they experience during their daily activities. The study was conducted on 30 workers engaged in 4 different activities. The posture analysis was conducted by utilizing OWAS and REBA tools. The body movement analysis was done by videography. The postural load was considered to be high level of risk. The number of body movements which deviates from the neutral posture generated huge amount of momentary torque. The body movements when considered in terms of the full working period of a worker till his retirement is in numbers of millions. This may result in prevalence of pain and discomfort in the body. The findings of the present study will be helpful to the management of different units dealing with this job as well as to the different management of organized industries where these activities are very common. Proper intervention may also be improvised from the present findings which may relieve the postural stress of the workers to some extent.

Keywords: Postural load, body movement, awkward posture, pain.

SYSTEMIC AND OCULAR MARKERS OF HYPERGLYCEMIA INDUCED BIOCHEMICAL ANOMALIES BEHIND THE INITIATION OF DIABETIC RETINOPATHY

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Abstract:Diabetic retinopathy (DR) is one of the most common microvascular complications leading to blindness among the working-age adults. The prevalence of DR is 18%-23% among the subjects with T2DM in India. Several studies have indicated that hyperglycemia induced oxidative stress is a pathogenic force of DR. However, very few studies have demonstrated the vitreous markers of hyperglycemia induced biochemical derangements related to development of DR. Purpose of the study is to evaluate the surrogate markers of biochemical disarrays in serum and vitreous fluid of diabetic subjects with and without DR. A group of 156 T2DM subjects comprising 96 with mild nonproliferative DR (NPDR) and 65 subjects without any DR (DNR) were recruited in the cross sectional study. Blood sample was collected from each subject. Vitreous fluid from 11 DNR subjects and 17 NPDR subjects was collected during vitrectomy. Erythrocytes' Reactive oxygen species (ROS), serum and vitreous oxidase nicotinamide adenine dinucleotide phosphate (NADPH oxidase), protein carbonyl compound (PCC), lipid peroxide compound 4-Hydroxynonenal (4-HNE) and Hexanoyl lysine (HLY) were measured following standard methods. Present age, gender matched cross sectional study showed significantly higher level of RBC ROS and NADPH oxidase activity, PCC, 4-HNE and HLY in serum and vitreous level of NPDR subjects compared to DNR individual. Further NADPH oxidase activity showed significant positive correlations with ROS, which demonstrated significant positive correlations with PCC, 4-HNE and HLY among study subjects. In diabetic condition NADPH oxidase derived ROS generation damages protein and lipid components, invite apoptosis and dysfunction of retinal endothelial cells and trigger development of DR.

Keywords:Diabetic Retinopathy, oxidative Stress, vitreous, protein carbonylation, lipid peroxidation.

BLACK TEA (*Camellia sinensis*) EXTRACT AMELIORATES LUNG INFLAMMATION AND FIBROSIS

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Abstract: There is no effective therapy exists for Idiopathic pulmonary fibrosis (IPF) till now. Few studies have been done on protective effects of green tea in pulmonary fibrosis but there is no single report on black tea extract (BTE) in pulmonary fibrosis so far. This study aims to investigate the anti-fibrotic effect of BTE against experimental pulmonary fibrosis. Four groups of animals were selected for this study. Group 1: control group mice. Group 2: mice exposed to bleomycin for 21 days, Group 3 and Group 4: bleomycin exposed mice treated with 25 mg BTE/kg b.w./day, p.o and 50 mg BTE/kg b.w./day, p.o. respectively for 21 days. For study, we have performed histopathological examinations (h/e and Masson's trichrome staining, immunohistochemistry) as well as ELISA, real-time PCR etc. Bleomycin exposed mice showed increased collagen deposition and wet/dry weight ratio, which were attenuated upon 50 mg BTE/kg b.w. treatment. The increased level of histopathological parameters in bleomycin-induced mice was significantly decreased after 50 mg BTE/kg b.w. treatment. Furthermore, 50 mg BTE/kg b.w. administration also decreased the expression of α -SMA (a fibrotic marker) in bleomycin-induced mice. This treatment with 50 mg BTE/kg b.w. also down regulated the expression of TGF- β and up regulated IFN- γ expression in experimental pulmonary fibrosis. The results of the present study put-forward BTE as a potential anti-fibrotic agent due to its attenuating effect on potential fibrotic markers.

Keywords: Black Tea Extract (BTE), Lung Inflammation, Lung Fibrosis

STRESS: CONCERN OF THE DAY

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Abstract: Stress is a state of mind which can change the homeostasis of the body. Stress appears in response to the external stimuli (stressors) which might be physical or mental. Sometimes, the factors like social, economical, environmental, personality, family matters etc. might become the causes of stress. Stressed condition of the body is confronted and controlled jointly by central nervous system, autonomous nervous system and endocrine system. Nor-adrenalin neurotransmitter secreted from sympathetic nerve endings stimulates hypothalamus-pituitary-adrenal axis producing cortisol and other stress hormones. These together generate fight and flight response to sustain in the stressed condition. However, the prolonged exposure to the stressors may create chronic effects on the body like damage of brain tissues and neuro-endocrine disorders. These, in turn may result in neuro-muscular dysfunction, weak/impaired immune response and metabolic malfunctions. Thus, the person under stress becomes very much disease-prone. Some of the very common disorders due to stress are diabetes, obesity, Alzheimer's etc. Every moment in the present time, there is chance that man gets succumbed to stress to cope him up to the speed of life to sustain in the competitive surrounding. However, conscious efforts and practice may manage stress and its manifestation.

Key word: Stress, Stressor, Disorder

MOLECULAR REGULATION OF OXIDATIVE STRESS IN TYPE-1 DIABETES BY FENUGREEK

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Abstract: Excessive oxidative stress is implicated in the pathology and complications of diabetes, other than hyperglycaemia. Fenugreek (*Trigonella foenum-graecum*), a medicinal herb is used to treat diabetes in many countries. Current study explores role of hydro-alcoholic fenugreek seed extract (FSE) on serum antioxidant enzymes and expression of antioxidant enzyme genes in normal and type-1 diabetic rats. FSE (containing trigonelline, saponin, 4 hydroxyisoleucine etc.) was fed (0.25 gm of dried hydro-alcoholic extract/day/rat) to normal and alloxan-induced type-1 diabetic rats for four weeks following which expression of antioxidant enzyme genes (catalase, glutathione peroxidase, glutathione S-transferase, superoxide dismutase), serum levels of CAT, GPX, GST, SOD; corticosterone, insulin and glucose were estimated from all rats. FSE significantly ($p < 0.01-0.005$) up regulated expression of all antioxidant enzyme genes and increased serum levels of CAT, GPX, GST, and SOD in diabetic rats than the respective control values. FSE also increased insulin secretion ($p < 0.05$ to 0.001), liver glycogenesis and decreased serum levels of glucose and corticosterone in diabetic rats which before FSE feeding showed hyperglycaemia and hypoinsulinemia. The expression of antioxidant enzyme genes in response to hyperglycaemia in diabetic rats and hypoglycaemia in FSE-fed diabetic rats seems to be multifactorial and complex. But the trend of changes in expression of studied genes and serum levels of CAT, GPX, GST and SOD in FSE-fed diabetic rats indicated that FSE alone can act as an antioxidant system that could protect pancreatic β -cell from oxidative stresses at least partly by decreasing corticosterone and increasing insulin secretion.

Keywords: Fenugreek seed extract, Type-1 diabetes, Antioxidant enzyme gene, Antioxidant enzymes.

UNSATURATED FATTY ACIDS IN TRANSDERMAL DRUG DELIVERY

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Abstract: Skin, the largest organ of the body provides a multifunctional interface between us and our surroundings. It creates a homeostatic barrier to the outward loss of water providing a membrane that is equally skilled at limiting molecular transport both from and into the body. Overcoming this barrier function for the purpose of transdermal drug delivery is a necessarily challenging task. Various skin permeation enhancers are there to promote transdermal drug delivery, unsaturated fatty acids are one of them. The present study aims to highlight – the role of unsaturated fatty acids in transdermal drug delivery. Previous articles were searched from PubMed, Google Scholar, MEDLINE databases with search word- ‘drug delivery’, ‘transdermal drug delivery’, ‘chemical permeation enhancer’, ‘unsaturated fatty acid’, ‘unsaturated fatty acid in transdermal drug delivery’. Articles were downloaded, extensively studied and thoroughly investigated. It was found that several unsaturated fatty acids majorly oleic acid, linoleic acid, linolenic acid in the form of emulsion, emulgel, lipid nanoparticles, fatty acid vesicles used in transdermal delivery of different non-steroidal anti-inflammatory drugs (NSAIDs), steroids, nucleosides, anti-depressants, and peptide hormones. By increasing fluidity in lipid bilayer of stratum corneum they promote drugs to cross the skin. Based on the above analysis, this study concludes that unsaturated fatty acids are very much beneficial for transdermal delivery of several drugs.

Keywords: Unsaturated fatty acids, drug delivery, transdermal.

PHYSIOLOGY AND ALLIED SCIENCES: COMMUNICABLE DISEASE (HIV/AIDS): PREVENTION AND CONTROL

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Abstract: A Communicable Disease is one that is spread from one person to another, through the variety of ways that include contact with blood, and body fluids, breathing in an airborne virus, or by being eaten by an insect. Some examples of the reportable Communicable Diseases include Hepatitis A, B, C, Influenza, TB, Malaria, Gonorrhoea, HIV, Cholera, Plague etc. Reporting of case of Communicable Disease in the planning & evaluation of disease prevention and control programs, in the assurance of appropriate medical therapy and in the detection of common source outbreaks. One of the most important examples of Communicable Disease is AIDS. HIV and AIDS is a spectrum of conditions caused by infection with HIV. HIV is spread primarily by unprotected sex, contaminated blood transfusions, hypodermic needle, and from mother to child during pregnancy, delivery or breast feeding. HIV is a member of the group of viruses known as retroviruses. In 2018 about 37.9 million people were living with HIV and it resulted in 770,000 deaths. Between the time that AIDS was identified (in the early 1980s) and 2018 the disease caused an estimated 32 million death worldwide. HIV/AIDS considered as pandemic. HIV/AIDS had a large impact on society both as an illness and source of discrimination. Many people who have HIV no proper symptoms so the HIV is to be tested. Methods of prevention include safe sex, needle exchange programs, treated those who are infected pre and post exposure, and male circumstances. There is no cure or vaccine however antiretroviral treatment can slow the course of the disease without treatment the average survival time after infection is 11 years.

EFFECTS OF DIFFERENT PROCESSING CONDITIONS ON THE CONSTITUENTS OF TEA

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Abstract: Tea is one of the most popular aromatic beverages. After collection, tea leaves undergo several cycles of modification which affects its sensory qualities as well as its chemical constituents. Several studies have reported the effect of different types of processing conditions such as withering, drying, maceration, fermentation and their effect on the active constituents of tea. The steps in processing the herbs are crucial for better antioxidant and flavonoid content and consequent therapeutic potential. Aim is to review the different processing method and its effect on nutrient contents of tea. Process modification is not only important for constituent differences but also responsible for taste aroma colour and other acceptability factors. From the literature survey, it was found that drying the fresh leaves and processing them into tea leaves increase the antioxidant capacity, total flavonoid contents, tannin contents. After drying, anthocyanin contents get reduced and antioxidant properties become high after vacuum drying method than freeze drying method. Flavonols components and sensory qualities of green tea extract are also affected by heat processing and storage. After processing and 12 days of storage, the exact contents of epigallocatechin gallate, epigallocatechin, epicatechingallate, epicatechin in green tea extract were lost. EGCG and EGC are not only the major factors present but also more unstable to oxidation. It can be concluded that the effect of different drying methods on the nutrient contents, sensory quality parameters namely taste, colour and aroma may be fundamental for future investigation for application of tea not only as recreational beverage but also in nutritional therapy.

Keywords: Tea, Tea processing, Flavonoid, Green tea.

COMMUNICABLE AND NON-COMMUNICABLE DISEASES: PREVENTION AND CONTROL ALZHEIMER'S -A NON-COMMUNICABLE DISEASE

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Abstract: Alzheimer's disease is one of the most devastating brain disorders of elderly humans. It is an undertreated and under-recognized neurodegenerative disease that is becoming a major public health problem. The last decade has witnessed a steadily increasing effort directed at discovering the etiology of the disease and developing pharmacological treatment. It occurs mainly at 65 or older people. Affected parents or ancestors will infect the next generation. APOE-e4 gene and MCI play main role in Alzheimer's disease. Difficulty in recalling recently learned information, trouble in completing tasks that were easy once, problems regarding vision, communication, unsocial behaviours are the common symptoms of Alzheimer's. It is diagnosed by comprehensive medical evaluation that needs family medical history, neurological tests, blood test, brain imaging like MRI, CT scan etc. Various preventive measures can be taken. Mediterranean type of diet, food with vitamin-C and E in daily life are good preventive measures. Main prevention for Alzheimer's is to lead stress free life with stress relaxation; meditation that reduce negative impacts of cholesterol, high BP. Regular physical and mental exercise, social involvement, quality sleep, controlling BP, cholesterol level and weight can prevent Alzheimer's disease. Cholinergic therapy, anti-depressants, mood stabilizer are used for the treatment of behavioural disturbance.

A REVIEW ON MALNUTRITION AND ITS ADVERSE EFFECTS IN RURAL INDIA

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Abstract: Lack of access to nutritious and balanced diets remain a major impediment to the health and well-being of people living in rural areas. Availability and access to nutritious, diverse and balanced diets were identified as key constraints for achieving food and nutritious security as well as for human health and well-being. This has led to the both under and over nutrition, with the former affecting children under 5 years in India, increasing the risk of infant mortality. It is prevalent in every age group with the increase in the risk of maternal mortality and in every group it has an adverse effect through a greater susceptibility to infections, through increased morbidity and mortality, through decreased productivity and through a lesser quality of life. In India there are people with low social status and their diet often lacks quality and quantity. Various diseases affect the rural areas due to lack of nutrition which includes rickets, beriberi, arthritis, polio, etc. On the other hand over nutrition also have severe consequences. In India national obesity rate has increased to a great extent in urban areas which leads to various diseases. Under these circumstances, agriculture could be used to increase availability and access to diverse and nutritious foods for the attainment of a balanced diet. The wider use of vegetable crops and pulses could improve availability and health. The promotion of household and community food gardens and the use of nutrient dense crops can be a remedy to malnutrition in poor rural areas.

KeyWords: Malnutrition, Morbidity, Balance Diet, Social Determinants.

NON INVASIVE TECHNIQUES FOR ASSESSMENT OF ANEMIA

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Abstract: Anemia is the pathological condition which affects more than 2 billion people worldwide. Screening for anemia requires several setups like a good phlebotomist, clinical hematological analyzer, biochemical reagents etc. It is costly, time consuming process and painful at the same time. In recent times several non-invasive techniques were developed to overcome these problems and screen anemia in a community setup especially for children and younger population. The aim of the study is to review several non invasive techniques for screening anemia within a large population with greater accuracy. Anemia used to be clinically assessed by the non invasive methods of evaluation of palm, nail or conjunctival pallor. Recent studies have resurrected this old approach as a screening tool armed with detail understanding of accuracy and applicability of this method. It was found that Palm pallor is less accurate than the nailbed pallor as an indicator of anemia. Digital quantification of conjunctival pallor has also been introduced. A smart phone app has been developed to detect anemia by using the colour of finger nailbed and it is highly accurate. Non invasive technique called Maximo Radical-7 pulse co-oximeter has been developed to detect anemia with greater accuracy and it has the ability to continuously monitoring the hemoglobin concentration within the blood during even hemorrhagic condition but it is quite expensive. Comparative analysis of these methods along with nutritional survey, questionnaire method and biochemical tests can help us design a protocol for non invasive anemia screening for community based nutritional assessment. From various studies it can be concluded that there are several non invasive techniques that are promising and very useful for screening anemia with greater accuracy.

Key words: non invasive technique, anemia, palmer pallor, finger nailbed, conjunctival pallor

THYMOQUINONE- A NEPHROPROTECTIVE FLAVONOID OF BLACK CUMIN

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Abstract: Thymoquinone (TQ) is a major bioactive component of *Nigella sativa* widely used Indian condiment. It is considered as an active agent responsible for antioxidant, anti-inflammatory, immuno-modulatory, anticancer and nephroprotective activity. In Tropical countries like India, AKI exceptionally affect the younger population as a result of snakebite, malaria infection & severe malnutrition etc. The known treatment of AKI is either prolong dialysis or RRT which are expensive and their success rate are also low. As thymoquinone has nephroprotective effect and low LD50 value so it can be used as a nutritional therapy of AKI. The aim of our review is to establish the possibilities of using TQ from *N.sativa* as nutritional therapy of AKI. Several bibliographies, narrative and literature reviews were done. Google scholar and pubmed were searched. Nephroprotective activity of TQ was reported in in vitro, in vivo and clinical studies. In human proximal tubular epithelial cells in vitro thymoquinone was prevented tubular injury induced by Angiotensin II via decreasing NF-kB activation. Activity of thymoquinone was studied in different nephrotoxic AKIs as – Drug induced AKIs (Gentamycin, Cisplatin, Methotrexate etc), I/R induced AKI, Heavy metal induced AKIs (Arsenic, lead, cadmium etc). The parameters found to be decreased to Thymoquinone treatment were - the serum levels of Blood Urea Nitrogen, Creatinine, oxidative stress (MDA) & immune response (IL-6, IL-1, TNF α) while the levels of Glutathione, Glutathione peroxidase, catalase, IL-10, and ATP were increased. However no clinical studies have been done to this claim. Studies have shown Thymoquinone can ameliorate the condition caused by renal injury through its antioxidant, anti-inflammatory and immunomodulatory role and can be used as nutritional therapy of AKI.

Keywords: Thymoquinone, AKI, *Nigella sativa*

AN OVERVIEW OF KIDNEY STONE DISEASE AND ITS CAUSE AND PRECAUTIONS

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Abstract: Kidney Stone Disease (KSD) occurs in all parts of the world and incidence of KSD continues to rise in different parts of world including India urging implementation of prevention and therapeutic strategies. The highest incidence of kidney stone is in 30-45 years of age group and 50% of the patients have the reoccurrence of the kidney stones. In India, approximately five to seven million patients suffer from stone disease and at least 1/1000 of Indian population needs hospitalization. The “stone belt” of India occupies part of Maharashtra, Gujarat, Punjab, Haryana, Delhi and Rajasthan due to dry, hot climate. KSD is a multi-factorial urologic disorder resulting from the combined influence of epidemiological, biochemical and genetic risk factors. Kidney stone is a solid concretion or crystal aggregation formed in the kidneys from dietary minerals. Calcium oxalate is the major constituent of most stones and is generally found mixed with calcium phosphate. The stones can form anywhere in the urinary system, in the kidneys (nephrolithiasis), ureter (ureterolithiasis), bladder (cystolithiasis). KSD associated with hematuria and renal failure poses an increasing threat to healthcare. Very few studies have been reported on the causes of the kidney stone in the Indian population. This review is important to characterize the present status of kidney stone affecting the population of India. This will eventuate in accurate early diagnosis & treatment for the Indian population.

Keywords: KSD, Calcium oxalate, Ureterolithiasis, Cystolithiasis, Nephrolithiasis

PREVENTION OF STRESS INDUCED DISORDERS WITH THE HELP OF SPORTS AND YOGA

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Abstract: The socio-economically backward people of rural areas of west Bengal suffers from psychosocial stressors. These affect persons mood, sense of wellbeing, behaviour and health. The persistent of stressors particularly in case of unhealthy individuals along with the geriatrics, it can damage health notably. Regular practice of Yoga and Sports can be considered as an alternative type of health care for mental and physical well being. Regular sports activities (like : swimming , playing football), practicing yogasanas (like: Halasan , vajrasans, Sukhasanas etc.) along with walk and meditation with respiratory exercise can reduce stress and anxiety as well as improve cardiovascular health and life style.

Key words: Meditation, Psychology, rural health care, Sports, Stress, Yoga.

POLYCYSTIC OVARIAN SYNDROME: A BURNING ISSUE IN INDIA

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Abstract: Polycystic ovarian syndrome (PCOS) is a heterogeneous endocrinal disorder common among premenopausal women. Women with PCOS may have infrequent or prolonged menstrual period or excess androgen levels. The ovaries may develop numerous follicles and fail to ovulate regularly. The exact cause of PCOS is unknown. Factors that might play important roles include excess insulin production, obesity, heredity, excess androgen production, poor nutritional status. Signs and symptoms of PCOS include irregular and painful periods, hirsutism, acanthosis nigricans, alopecia, acne on face and back, pear shaped hefty figure etc. Complications of PCOS is associated with infertility, gestational diabetes, miscarriage or premature birth, nonalcoholic fatty liver, high blood sugar, blood pressure and abnormal cholesterol level, type2 diabetes, sleep apnea, abnormal uterine bleeding, depression, anxiety etc. PCOS is diagnosed medically by a pelvic examination, blood test by testing the abnormality in androgen level, glucose tolerance and cholesterol level. Transvaginal ultrasound is the best way to check the appearance of cysts in the ovaries. PCOS treatment focuses on managing individual concerns. Specific changes might involve lifestyle changes and medications. A low calorie diet combined with moderate exercise activities is often recommended as a treatment of PCOS. Even a modest reduction in weight might improve the condition. Medications include combination of birth control pills, progestin therapy, metformin, gonadotrophins etc. Socioeconomic studies from India have observed PCOS as a lifestyle disorder highly prevalent among middle and high income urban population than rural population. It was found that 90.24% of girls knew about PCOS in urban area and only 8.34% of the rural populations were aware. The immediate preventive measures can be taken by awareness programmes in villages through posters and campaigns.

Keywords: Polycystic ovarian syndrome, Hirsutism, Acanthosis nigricans, Infertility, Alopecia.

i) SOCIAL AND BEHAVIOURAL SCIENCES (SOCIOLOGY AND PSYCHOLOGY)-A
Symposium Lecture

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Mental health: present scenario and role of technology

Abstract

World is witnessing an epidemic of mental illness, which now constitutes the most important cause of disability worldwide. Depression and anxiety disorders are rapidly increasing and becoming major cause of productivity loss. Suicide is already second most common cause of death in adolescents and young adults.

Apart from major psychiatric illnesses, substance abuse and childhood mental illnesses are also proving to be important causes of disease burden. With advent of technology, new problems like behavioral addiction are becoming cause of concern. On the other hand role of stress, childhood experiences, personality variables and psychological factors in causation as well as treatment of several physical illnesses are being apparent.

Yet almost eighty percent of people with mental illness in low income countries do not have access to quality mental health care. Further, stigma about mental illness acts as a major impedance in recognizing and help seeking in mental illness. Allocation of resources and availability of mental health services is scant worldwide.

In such a scenario, application of technology in awareness generation as well as service delivery may be helpful. Use of telepsychiatry in service delivery has been found effective in studies from west. However, its use in India is debated despite positive results from some studies.

Technology appears to be best used in spreading awareness about mental illness and reducing stigma. Using audio-visual media can have a significant role. Experience in use of different such platform is discussed.

Dr. Debaprasad Chatterjee,
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Technology, Women Empowerment and Rural Development

Abstract

Technology is cultural. It's a crucial element that differentiates human beings from other non-human forms of life. So also are the gender differences and development in general and rural development in particular. Since the onset of human civilization and more recently, the modern era, science and technology are continuously playing the role of the prime movers of the chariot of human development. As development discourses are culturally specified, it bears a host of inbuilt inequalities that mark human society. Such inequalities, produced culturally, are often institutional such as economic, political, religious etc. and marked by different bases of social stratification. Science and technology are often criticized as masculine and gender-biased, both at their origin and outcomes. Obviously, feminists and scholars and activists are quite concerned with the deleterious effects of science on women (Bauchspies et al. 2006). While development is often equated with growth and predominantly considered to be economic, scholars often insist on much wider connotations that should incorporate cultural and social dimensions that lead to improved quality of life for both the genders rather than achieving purely economic developmental landmarks. Blessings of modern science and technology never diffuse equally. Culturally (i.e. economic and political) powerful set of people often corner the fruits of development in larger proportions. Disparities based on gender, income and wealth, residence (urban or rural), age categories, race, caste and class often interplay and determine the process of technological innovation and distribution of its fruits. Conventionally, the rural people are more disadvantaged than their urban counterparts and women face worse hardships compared to the men. In the context of widespread rural poverty of the global south, India to be specific, rural women thus confront a double-barreled disadvantage. Increasing sociological attention in this area seems to be crucial.

Nevertheless, the very project of technology driven modern developmental paradigm started to face critical appreciation since the middle of the last century. As the salience of more inclusive development and quality of life issues are increasingly underscored, the issues of gender equality, inclusive growth, redistributive justice and development at the grassroots level are increasingly emerging as the major challenges before the humanity. Spread of scientific education and the improved rate of diffusion and adoption of modern technology by the rural women are crucial for more even rural development and overall development of the Indian society in the twenty first century. This calls for further sociological reflections in this domain of scholarship.

Invited Lecture

Chaired by:

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Dr. Chandana Aditya, Assistant Professor,
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Resolving gender binary through digitalization in rural India: Emphasis on women empowerment

Abstract

A powerful gender binary system is a hallmark for any patriarchal society. Since any rural culture binds to traditional practices more, it gets enhanced in any such culture. However, in order to keep pace with changing socio economical and socio political environment, this issue needs to be resolved. Redistribution of power and resources will ultimately lead to women empowerment, a journey which aims to bloom the seed of gender equality.

Technology and digitalization may play a vital role to bring an enormous change in the outlook of both the gender. Both in government and private sector, initiatives have been taken to sensitize members of a rural society to accept the natural differences of gender and neutralize its impact as far as possible. Short films, documentary, advertisement may act as the source of necessary exposure in this regard. Apart from that introducing the use of computer, android phones and an enormous number of software may create the awareness and opportunity to survive in the fast changing world competing with the urban counterparts.

Dr. Sraboni Chatterjee, Assistant Professor,
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Common Mental Disorders and Risk Factors of People Living in Rural Communities

Abstract

Rural communities are principally peasant in nature, with subsistence agriculture as the main form of sustenance combined with various levels of dependence on forests, freshwater or wildlife. Mental health is defined as a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community (WHO, 2002).” Researcher suggests that prevalence of mental illness is similar in both rural and urban areas but the services available are very different. Considering this point, here an attempt is made to draw a rough sketch of the common mental disorders and risk factors of the people living in rural communities. Literature indicates that anxiety, depression and suicidal tendency are some of the most prevalent mental illness among the people of rural subsample. Environmental, situational and risk factors are some of the key catalysts responsible to be at the great risk for developing certain mental illness among people in rural communities. In searching the preventive measures for them three important challenges comes in front of us. Lack of accessibility for insurance of mental health, shortages of mental health professionals and lastly, lack of acceptability to receive mental health services basically creates barriers to care.

Dr. Tinni Dutta, Assistance Professor,
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Ego functioning of Women in Rural areas

Abstract

Chitragada was the symbol of women empowerment. Modern days in rural areas women organize focus group discussion, self help group for enhancement for their quality of lives. They could achieve peak if their ego functioning fully operate. We could give stress on some of the major functioning postulated by Bellak-et al(1973). At the very outset whether reality testing develops within the women is to be judged. Development of judgmental capacity is essential which reflects sense of reality of the world and of the self. Another important factor is the regulation and control of drives, affects and impulses. The women who foster emotional intelligence could find success in lives. Adaptive Regression in The Service of Ego(ARISE) should be developed among women. Creativity-the ability to meet the life's demands is the essence of adaptation. In the ideal condition in rural areas also man should ready to accept women but only through stand by his side through joys and sorrows in day to day life. Here in lies the essence of women empowerment.

A CULTURAL EXPLORATION OF PROENVIRONMENTAL IN CHILDREN FROM KOLKATA

Chaiti Dasgupta and Dr. Mallika Banerjee

Guest Faculty, Department of Psychology, Scottish Church College; Research Scholar,
Department of Psychology, University of Calcutta

Retired Professor and Ex Head, Department of Psychology, University of Calcutta

Abstract: The recent tenets of environmental psychology, delve into the attitudinal components of pro-environmental behavior and models of sustainability. With the overarching forces of globalization and climate change, the construct of environmental attitudes holds special relevance in understanding children's concerns for the environment. The present study aims to develop a culturally suitable tool to assess environmental attitudes in primary school children, within the Indian subcontinent. The authors have revised and validated Children's Attitude towards the Environment Scale (CATES), by Musser and Mulkus (1994). The original 25 item pool, across the 5 dimensions of CATES, has been explored, in terms of the value-driven and common sense view towards environment in the given socio-cultural space. Items, particularly those related recycling, pollution (waste management) and conservation required modification, for its application for the urban school-going population. Following relevance judgment by a multidisciplinary panel of 5 experts, pilot testing was ensued. Validation of the scale has been done on a sample of 120 children, between 8-11 years, across several parts of Kolkata. Cronbach's alpha and relevant statistics have been computed for the standardized application of the scale in the given cultural context. Range and variance of participant's scores reveal an overarching role of contact-based experiences in children's concerns towards the environment. Besides, themes of morality based concerns in standing for environmental issues have also surfaced in the data.

Keywords: environmental attitude, proenvironmental behavior, sustainability, environmental concern in children, contact experience.

USE OF SOCIAL NETWORKING SITES AMONG COLLEGE STUDENTS OF HOWRAH AND HOOGHLY AND ITS RELATION WITH THEIR SUBJECTIVE WELL-BEING

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Abstract: Present study is aimed at finding out the relationship between the use of social networking sites and how this behaviour influences the subjective well-being of the (SNSs) user. Social networking sites provide user with a computer mediated environment where individuals are able to disclose their thoughts, feelings and experiences within their circles of personal ties. Given the rising popularity social networking sites (SNSs), the influence of these platforms on the subjective well-being (SWB) of their users is an emerging topic in information system research. Findings suggest that amount of time spent and degree of self-discloser on social networking sites are related with subjective wellbeing of young college students.

Keywords: Social Networking sites, self-discloser, subjective well-being.

ECO FEMINIST STUDY OF SELECTED NOVELS OF TONI MORRISON

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Abstract: Eco feminism describes movements and philosophies that link feminism with ecology. As the environmental movement along with environmental crisis raised the consciousness of women to the decay of the earth, they began to see a parallel between the devaluation of the earth and devaluation of the women. The concept of eco- feminism uses the age old connection between women and nature as a bridge to strengthen both the feminism and ecological movements which seek to end the oppression of women and nature.

Both nature and women are important themes in Toni Morrison's novels. The **Bluest Eye** has been analysed from cultural feminist perspective through the illustration of rape, menstruation and natural images in the novel. These illustrations emphasize women's femininity and the connection with nature. Social eco- feminists insist that women are close to nature through their long time social roles which are pregnancy, giving birth, raising children and doing house work. **Sula** is her second novel which depicts the fates of two black women- Sula and Nel. The novel demonstrates racialism, sexism and classicism through the oppression of the Sula and Nel in their search for identity, struggling for freedom and equality. Birds, flowers, and fire is very much associated with the character of Sula. Various themes have been explored by the author such as racial discrimination, women friendship, marriage and sex, self growth, evil and goodness etc. Morrison's eco-feminist concern for nature has seldom been studied. Toni Morrison's **Beloved** shows the history of African American women's views of nature and how the institute of slavery fractured African American relationship with the environment and rendered nature as a place of conflict for slaves.

ECOFEMINISM: WOMEN'S PROACTIVE ROLE IN ECO-REGENERATION

Reni Pal

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Abstract: Environmental ethics and feminism are two hotly debatable contemporary issues in the field of moral philosophy. It was in the late nineteenth century that women's movements emerged in the West demanding greater educational opportunities, rights to income and property, right to employment and right to vote. Over the last three decades ecofeminism as a social issue emerged when feminists got interested in environmentalism and it is a platform where environmentalism and feminism become blended with each other. In 1991 the World Bank declared that women took significant role in preserving natural resources like water, soil, forest, energy etc. Both nature and women are exploited, deprived and dominated by men. Moreover, women depend on the natural environments to meet most of their material needs much more than men. Thus a kind of proximity is built between them. The source of power of both women and nature is productivity. Various case studies show that women are as capable as men in acting as proactive agents of social change and sustainable development. Ecofeminism emphasizes that both women and nature must be respected. It does not claim to place women in a dominant position in society; rather it gives stress on a collaborative society. This paper also tries to explore different segments of ecofeminism. In the conclusion it can be said that the ultimate goals of several brands of ecofeminism differ in many various issues. But there is perhaps more unity than diversity in women's common goal of restoring the natural environment as well as quality of life for people and other living and nonliving inhabitants of the planet.

A COMPARATIVE STUDY ON MENOPAUSAL SYMPTOMS AND ITS EFFECT ON MENTAL HEALTH IN URBAN VERSUS RURAL WOMEN

Sujata Saha

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Abstract: Menopause is a natural and significant biological phenomenon in a women's life. The overall health and mental well-being of mid-aged women has become a major public health concern around the world. More than 80% of women experience physical or psychological symptoms in the year approaching menopause, leading to decrease in Mental Health (MHC-SH). Mental health is the state of someone who is "functioning at a satisfactory level of emotional and behavioural adjustment" .With change of significant biological symptoms, women also need the ability to enjoy life and to create a balance between life activities and efforts to achieve psychological resilience.

The present study was undertaken to determine the menopause related symptoms and its impact on mental health in urban and rural post-menopausal women. Random selection from the health care centres had been done. The study was assessed to find out if menopausal symptoms and mental health had any significant differences among these groups of women. The method used to collect data were interview based on the questionnaire. The questionnaires used were of Menopausal rating scale by Caroline Helwick (2014) and hindi adaptation by Renuka Mallick (2019) and Mental Health Continuum –Short Form by Keyes ,2008). The data was collected from different parts of Howrah District and rural areas of Domjur West Bengal, India. However, the findings showed that there is a significant difference among urban and rural women in terms of mental well being and menopausal symptoms.

Keywords: Menopausal symptoms, mental well –being

EFFECT OF SOCIO-ECONOMIC STATUS ON SATISFACTION WITH LIFE AND SELF-ESTEEM IN RURAL POPULATION

Ankush Chakraborty

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Abstract: According to the World Bank (2017), the rural population of India is 66.46 percent. In West Bengal 68.13 percent (62183113 Individuals) of people live in villages or rural area (census 2011). Life satisfaction is the perceived assessment of whether one is content with one's life. The present study was conducted with the aim to measure satisfaction with life, self-esteem and the socio-economic status in a rural setting in order to find out if the socio-economic status of an individual has an effect on the Satisfaction with life and self-esteem of the individuals. The method used to collect data were interview based on the questionnaire. The questionnaires used were Bengali adaptations of Satisfaction with life scale by Diener E. et.al. (1985), and Rosenberg self-esteem scale by Rosenberg, M. (1965). The total number of subjects who took part in this study was 203 (between ages 19 years to 84 years), out of which 94 (Mage=50.3298, SD=18.0158) were male and 108 (Mage=46.8611, SD= 12.4664) were female. The subjects for the study had been selected by the process of random selection. The data was collected from different parts of the area of Bagnan, West Bengal, India. It had been hypothesized that there would be a positive correlation between socio-economic status and satisfaction with life, as well as a positive correlation between socio-economic status and self-esteem. However, the findings show that there is no significant correlation between either of the cases, namely, between socio-economic status and satisfaction with life, and between socio-economic status and self-esteem.

Keywords: self-esteem, satisfaction with life, socio-economic status, rural.

Technical Session-IV

i) MATHEMATICAL, STATISTICAL AND COMPUTATIONAL SCIENCES

Symposium Lecture

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Security of Multimedia Data: Few Important Issues

Abstract

There is no doubt that in today's scenario, due to the massive improvement of technologies, especially technology related to Internet, the possibilities for transmitting multimedia data over the Internet or storing them on computers, mobiles or cloud storage have increased enormously. However, these media do not appear to be 100% secure. That is why, sometimes, it is easy to the intruders to steal or distort digitally stored important multimedia data. But it is very important to protect these important multimedia data from being stolen or distorted by hackers in certain fields, especially in industrial or in defense sectors. Secret sharing may be considered as one of the most important primitives to handle the situation. In case of multimedia images, though there exist plenty of image encryption schemes based on polynomial based secret sharing, up to the best of our knowledge, none of the schemes assume adversarial activities. In these schemes it is assumed that all the participants are honest and follow the protocols. But, in real life, this assumption is far from reality. For example, if some share of an important data is stored in some server, and if by any chance, the server is damaged or hacked, then the portion of the share got distorted. As a result, if this portion of the share is joined for reconstruction of the secret image, then, it will cause a problem. Due to the submission of the faulty shares, original secret image will not be revealed. So, few issues, such as detection of cheating, identification of the cheaters and schemes withstanding such unwanted scenarios need to be addressed. In the current paper, mathematically, we deal with such issues and come up with few solutions.

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Technology-enabled Information Services for uplifting the lives of rural people in India

Abstract

Technologies helping in the uplifting of the lives of the rural people in the developing countries are computational technology, wide spread Web connectivity, progress in the domain of artificial intelligence, advances in biotechnology and emerging issues in GIS, among others. Various new and nascent technologies are also introduced in the technology arena which may prove beneficial if applied after proper experimentation.

The Fourth Industrial Revolution (4IR) and the 'Digital India' concept have its roots back in early 90s and being carried forward till date. Globally as well as locally, this is transforming the lives of the people, even in rural areas, by transforming systems and society. Manifold advantages of this technology-driven era has been countered by the 'Digital Divide', inequality in distribution system, This era also sees threats in the form of anti-globalisation movements - manifested in the rise of US President Donald Trump and Brexit, where national rather than global structure have been stressed.

Many experts stressed that all background agricultural work is done by the women though they have very poor access to land, irrigation, credit, inputs and markets. Some of the remedies may be seen in inclusive agriculture, rural growth and structural transformation from agriculture to high-productivity manufacturing and acceleration of other economic sectors. With this backdrop, there is a need to showcase the examples of people and projects where technology has enhanced the quality of lives of the rural people.

According to National Sample Survey Organization (NSSO) of India, there are about 156 million Indian rural households in India. eNAM, an online platform for national agricultural market providing information to and fro farmers to the buyers. Life insurance program for crops PradhanMantriFasalBimaYojana (PMFBY, 2016) is also a suitable step forward. Mapping of water situation is going on to measure: water demand, rain, water bodies, water levels, irrigation, etc. Improved farming is possible through digitization of all land related info. It may help the small and middle level farmers. Use of Indic language is facilitating retrieval in GOI portals for seeking information by rural people. Through mobile technology and through GUI, is becoming easier to reach the remote corners. The three ways of improving rural life through technology is tried through JAM: Jan Dhan (Rs.1000 per family in bank accounts), mobile phones and Adhaar (an ID consisting of 12-digits).

Invited Lecture

Chaired by:

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Interaction of Ocean waves with floating and submerged bodies

Abstract

The study of surface waves in oceans has attracted many scientists and engineers over a long time. A proper understanding of water waves is crucial to much of physical oceanography and is an exciting area of study. It is seen that mathematical models have been used to correlate predicted and experimental data. Perfect correlation is the ultimate goal of the mathematical models, and still there is a lot of scope for future work. The inherent nonlinearity of ocean waves make their behaviour very complicated. However, a linear model under certain assumptions may adequately represent a particular wave motion. In oceans, waves interact with each other and with the mean flow: they grow due to the action of external forces or through internal instability, and they decay as a result of molecular and turbulent friction and diffusion. The study of water wave scattering-reflection and transmission has a very significant place in various areas of ocean and marine engineering. The subject of surface gravity waves has great variety whether regarded from the point of view of the types of physical problems, which occur, or from the point of view of the mathematical ideas and methods needed to attack them. The physical problems range from discussion of wave motion over slopping beaches to flood waves in rivers, the motion of ships in sea, free oscillations of enclosed bodies of water such as lakes and harbours, and the propagation of frontal discontinuities in the atmosphere, to mention just a few. The mathematical tools employed comprise just about the whole of the tools developed in the classical linear mathematical physics concerned with partial differential equations. A number of classes of water wave propagation problems involving obstacles of various geometrical shapes, surface discontinuities, variable bottom topography, etc. have been considered. The obstacles may be present in water with a *free surface*, or with an *ice-cover* modeled as thin elastic plate, or in a *two-layer fluid* with upper layer having a *free surface* or an *ice-cover*, or in water with *variable bottom topography*. Wave interaction with *very large floating structures (VLFS)* is a front line area of research due to its practical utility in constructing floating offshore oil platforms, floating airports, floating pleasure cities, etc. The floating structure has elastic properties, and if it is modeled as a thin elastic plate, then the boundary condition at the floating structure, when linearised, involves *fifth order* partial derivative of the potential function describing the irrotational motion in water in contrast to the *first order* partial derivative in the free surface condition. Wave propagation problems in the presence of floating elastic plates or floating sheets

of ice are being investigated in recent times by mathematicians as well as ocean engineers due to a surge of scientific and ocean-related industrial activities in polar regions.

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Viscous dissipation and chemical reaction effects on mixed convective MHD oscillatory flow of Casson fluid

Abstract

In this paper the effects of Soret term on magnetohydrodynamic heat and mass transfer of a Casson fluid in the presence of magnetic field and viscous dissipation are analyzed. Perturbation technique has been used to convert the governing nonlinear partial differential equations into an ordinary linear differential equation and then solved analytically. The effects of interesting parameters on velocity, temperature and concentration profiles are analyzed by plotting graphs and compared the result in tabular form. It is observed from the results that the velocity profile increases with increase in the thermal Grashof number and mass Grashof number but the opposite trends are seen with increase in the magnetic field parameter, Prandtl number and Schmidt number. Also, there is a tendency to increase the value of skin friction coefficient and the local Nusselt number with an increase in the Casson fluid parameter.

Keywords: *Casson fluid, Heat and mass transfer, Magnetic field, Perturbation analysis, Soret effect, Viscous dissipation.*

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A study of atmospheric acoustic-gravity waves and its linear analysis for different phase states

Abstract

Nonlinear dynamics of low-frequency finite amplitude acoustic-gravity waves has received renewed interests because of its relevance in atmospheric disturbances. The latter occur due to various meteorological conditions including different pressure and density gradients. Furthermore, the nonlinear acoustic gravity waves can appear in the forms of localized solitary vortices, ordered structures as well as chaos and turbulence.

In this work, we study the linear stability analysis of a system of five coupled nonlinear equations that govern the evolution of low-frequency finite-amplitude acoustic-gravity waves in the atmosphere. Numerical simulation together with the analysis of Lyapunov exponent spectra reveal that the system can involve into periodic, quasi-periodic and chaotic orbits depending on a control parameter associated with the density scale height of acoustic-gravity waves.

i) SOCIAL AND BEHAVIOURAL SCIENCES (ECONOMICS) -B

Symposium Lecture

Dr. Kumarjit Mondal, Associate Professor,
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Dr. Sudip Mukherjee, Assistant Professor,
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EFFECT OF CLIMATE CHANGE ON INDIAN AGRICULTURAL PRODUCTIVITY

Abstract

The process of urbanization, industrialization emits CO₂ and at the same time it is one of the main causes of deforestation. The rise in CO₂ concentration increases the average temperature and hence has effect on climate change. The changing pattern of temperature and rainfall affect the agricultural productivity. Various inorganic fertilizers have been used to increase the agricultural productivity. Uses of inorganic fertilizer emit various greenhouse gases like nitrous oxide, methane which is also responsible for climate change. On the one hand agriculture is the source of food of the living beings, and on the other hand it is also the source of greenhouse gases. We should say high concentration of CO₂ may affect agricultural productivity; however climatic factors related to increased CO₂ concentration may also affect the agricultural productivity. This paper analyzed published data to derive a conclusion on most effective air quality and climatic factors to affect different crop productivity.

PERCEPTION OF RURAL FARMERS REGARDING SUSTAINABLE CROP INSURANCE POLICIES IN INDIA: AN APPRAISAL

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Abstract: Indian farmers have always a serious requirement of sustainable crop insurance as rural farmers in India have to face natural calamities and other risky situations throughout the year. There are several factors influencing Indian farmers to adopt crop insurance. An Exploratory Factor Analysis (EFA) has been conducted in this present study to statistically explore the key factors (principal components) influencing Indian farmers' perception towards adoption of prevailing crop insurance policies in India. Primary data are collected from 585 farmers of five selected states of India with the help of convenient and purposive sampling to conduct this study. The findings of the study reveal that age, size of the family, educational qualification and monthly family income are the major demographic factors influencing the level of satisfaction of the insured farmers. Accessibility, image and infrastructural benefits of crop insurers, marketing communication by the crop insurers, availability of different crop insurance policies with their relative premium rates and subsidized insurance premium are the four principal components extracted from EFA. On the other side, majority of the uninsured farmers is still found unaware about the benefits of available crop insurance schemes in India.

Keywords: Crop insurance, Exploratory Factor Analysis, Principal Components

TECHNICAL EXTRACTION OF GROUNDWATER FOR IRRIGATION. A BLESSINGS OR CURSE? A CASE STUDY IN MURSHIDABAD DISTRICT OF WEST BENGAL

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Abstract: Technological introduction in agriculture had boosted up agricultural productivity since introduction of Green Revolution no doubt but agricultural tools such as shallow water pumps and dip tube wells pumping out groundwater for irrigation had triggered rural health problem due to arsenic contamination in groundwater. Murshidabad district of West Bengal is situated at the central part of the state divided almost equally by river Bhagirathi a tributary of Ganges into two halves naming as 'bagri' to the eastern part of the river and 'rarh' to the western portion of the river. Studies revealed that the eastern blocks of the Ganges are very much affected by arsenic and iron contamination in groundwater above the permissible limit consequence into qualitative deterioration of sweet groundwater in the entire rural part of eastern India. The extraction of groundwater for irrigation had contaminated arsenic in the groundwater of the western blocks of Murshidabad District >50 meters below ground level also; specially during the pre-monsoon period. Health hazard like chronic arsenical dermatosis, skin lesions, irregular digestion and in some cases, deaths are recorded. The agricultural development of Murshidabad district has occurred at the cost of health and water. Statistical representations show that rural development and physical health problems had increased hand in hand in this district from 1990. Rural Developmental policies and schemes had tried to minimize the groundwater deterioration for irrigation but unorganized work had little potential to safe guard the health hazard that occurs in this district.

Keywords: Agricultural tools, 'rarh', 'bagri', arsenic, skin lesions.

URBANIZATION IMPACT ON THE TRADITIONAL WASTEWATER AQUACULTURE SYSTEM AND SOCIO-ECONOMIC CONDITION OF EAST KOLKATA WETLANDS

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Abstract: Recent advances in environmental research has proved wetland as a most promising solution in managing environmental problems using its unique ecological functions and economic services. East Kolkata Wetlands situated in eastern part of Kolkata city (22°25′-22°40′ North and 88°22′-88°55′ East; 125 sqkm) is the world largest resource recycled ecosystem. The sewage water entering the EKW system from Kolkata city is utilized for waste-fed aquaculture and agriculture. Due to rapid industrialisation, urbanisation, dumping of solid waste and siltation this site is under continuous severe threat. The sewage fed ponds are also getting polluted by aquatic developmental activities and large scale commercial aquaculture, heavy metals etc. through effluent of different industries like tannery, electroplating, plastic etc. Also the introduction of externalising technologies, erosion of social capital and loss of traditional ecological knowledge threaten to undermine the resilience of the area. There is an urgent need for a balance to be struck between wetland conservation-sustainable utilization and wetland conversion. The interrelationship and interdependency between ecological services and economic return can lead to a meaningful sustainable development. The studied wetlands showed a gradual decrease and increase in the area of rural and urban settlement respectively from 2011-2016. Sharp increase in NH₄-N, BOD, COD and PO₄-P concentration in the wetlands over the study years in the south-eastern and south-western part of EKW was due to rapid urbanization of the adjoining area with corresponding low dissolved oxygen and NO₃-N concentration indicating a low rate of aerobic nitrification process and tending towards eutrophication. Presence of industries, dense settlements and intensive agricultural practice has resulted in presence of higher concentration of heavy metals in the water of the studied wetlands in the southern part of EKW than the northern part. A high decrease in income from fishery was recorded in the south-western zone whereas income from agriculture decreased (8-30%) all over the EKW. Therefore, the wetlands need an immediate sustainable environmental modelling programme as a tool to bring a check to the wetland degradation process due to their conversion into urban residential areas through an ecological-economic interrelated integrative approach.

Keywords: East Kolkata Wetlands, waste-fed aquaculture, ecology, socio-economy, integration