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ABOUT THE CONFERENCE

The Environmental Mutagen Society of India (EMSI) was founded in 1975 to promote scientific education and research in mutagenesis. The Society is affiliated with the International Association of Environmental Mutagenesis and Genomics Societies (IAEMGS) and the Asian Association of Environmental Mutagen Societies (AAEMS). The availability of genomics has led us to study genomic mutations, protein-protein interactions, epigenetic alterations, polymorphisms, micro-RNA, and metabolites. Toxicogenomics involves genomic analysis to know how chemicals (environmental and pharmaceutical) influence the life of humans. It provides a concrete platform to identify the genomic markers associated with specific drugs /environmental agents. It has increased the molecular understanding of toxicity as well as medicine capabilities. This conference will give a good platform to discuss with the experts in the toxicogenomics field and the current drug discovery and development applications for personalized medicine. Personalized medicine aims to improve individual health and utilize the existing resources to improve the health care system. It requires a better understanding of environmental exposure and epigenome, which may lead to more effective preventive measures. Thus, the present conference will provide a new framework to guide the researchers in understanding the impact of environmental health and the research/efforts required to make truly effective personalized medicine.

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INVITED TALKS

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Keynote Lecture

Reduction Of Genomic Damage By Weight Loss

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ABSTRACT

Obesity is a risk factor for several types of cancer. The frequency of micronuclei in peripheral blood lymphocytes is a biomarker for cancer risk. We have found that morbidly obese individuals exhibit an increased micronucleus frequency which can be reduced by weight loss after bariatric surgery. Oxidative stress was also elevated in obesity, but the reduction after weight loss was less clear. Possibly, burdening the body with fat breakdown products during the acute phase of a major weight loss outweighs the reduction of obesity-mediated oxidative stress. In rodents, an equivalent weight loss achieved by caloric restriction yielded similar effects on genomic damage and oxidative stress as bariatric surgery-mediated weight loss. Evidence is slowly accumulating now that bariatric surgery-mediated weight loss can reduce cancer risk. However, it is unclear which amount of weight loss is required or is most beneficial. We have not found a deviation from linearity and, thus, no threshold for increased micronuclei in a study covering a wide body mass index (BMI) range. Since obesity increases cancer risk, there are many obese cancer patients, and it is unclear whether that affects therapy efficiency. There are indications that drug pharmacokinetics and expression of metabolic enzymes are altered due to obesity. This might require adaptation of therapy beyond the surface or weight-related calculations. Altered expression of metabolic enzymes might furthermore increase susceptibility to mutagenic exposures.

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Keynote Lecture

Environmental Hazard And Biological Complexity: Realizing Phenotype In Post-Genomic Era

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ABSTRACT

The modern phase is called Anthropocene with its alarming man-made impact on the ecosystem affecting climate change, biodiversity, extinction of species, weather fluctuation and heavy toll on animal, plant and human health and well-being. This has called for developing measures to counter the harmful effects and rethinking biological models of developmental and physiological changes affecting organisms and traits. With the human genome project (HGP), the hopes were belied, as the noncoding sequences have far exceeded their unknown functions (ENCODE project) than the known coding genes. Hence, the need to re-evaluate the paradigms of molecular biology from 'genes' to gene expression patterns. This again brings into the picture the Nature-environment-culture triad in the manifestation of traits and development of biological structures viz-a-viz the gene reductionist approach. An attempt will be made to present the developmental synthesis of genes and environment in the evolution of traits and their function in the realization of biological complexity in the scenario of evo-devo-eco perspective of extended evolutionary synthesis with some illustrations and observations from our field and laboratory investigations.

(Intellectual scaffold from Prof(s) Stuart Newman, V Nanjundiah and Gerd Muller and inputs from Ms. Rafat Fatma, Dr. Waseem Chauhan, Dr. Mohd Fareed)

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Invited Talk

Mutagenicity And Carcinogenicity Of The Gas Phase And Particulate Phase Of Combustion Emissions

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ABSTRACT

The mutagenic potency of the extractable organic material (EOM) of ambient air particulate material (PM) that is ≤2.5 µm in diameter ($PM_{2.5}$) in the *Salmonella* (Ames) mutagenicity assay (revertants/µg EOM) varies ~1 order of magnitude worldwide, but the amount of PM/m^3 varies ~5 orders of a magnitude worldwide. Consequently, the mutagenic potency of the air (revertants/m^3) also varies ~5 orders of magnitude. No matter what is burned (paper, wood, plastic, oil, natural gas, coal, etc.), the mutagenic potency of the EOM (revertants/µg EOM) varies only 2 orders of magnitude. However, the mutagenicity emission factor (revertants/kg of fuel burned) varies 5 orders of magnitude because how materials are burned (open burning versus highly controlled combustion) largely dictates the mutagenicity emission factor, with open burning producing the highest mutagenicity emission factors. Polycyclic aromatic hydrocarbons (PAHs) account for much of the mutagenicity and carcinogenicity of the EOM of PM from air and combustion emissions. Approximately 55-80% of the mutations induced in *Salmonella* by EOM from the air and various combustion emissions are G to T base substitutions, likely due to the formation of PAH adducts to guanine. Our studies with simulated gas-phase atmospheres show that the mutagenic potencies of the gas phase span only 2 orders of magnitude, and the same ~150 small, oxygenated, highly reactive compounds are produced regardless of which volatile organic compound is used to create the atmosphere. In contrast to PM, the majority of mutations (55-94%) induced by the gas-phase atmospheres are G to A base substitutions. People exposed to cigarette smoke, coal or charcoal emissions, woodsmoke, or diesel exhaust have mutagenic urine, an indicator of systemic exposure to mutagens. Chronic exposure to ambient air, especially air impacted by traffic exhaust, results in elevated levels of genotoxicity biomarkers and increases the risk for cancer relative to people who work primarily indoors.

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Invited Talk

Search For The Optimal Genotoxicity Test

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ABSTRACT

Chemicals are routinely tested with various validated/standardized genotoxicity tests. Most currently used assays are 30-50 years old and not reliable; i.e., in vitro tests have only a specificity and sensitivity between 60 and 70%. The most widely used in vivo procedures (CA and MN tests with bone marrow cells) have a very low sensitivity (50-60%). Therefore, there is a clear need for the development of improved tests. In the past years, several new procedures have been developed, e.g., the PigA gene mutation assay, yH2X experiments, reporter tests based on the measurement of activation of p53, and the Tox Tracker assay (measurement of alterations of gene expression). Furthermore, attempts have been made to develop cells that reflect xenobiotic metabolism in humans. Several human liver-derived cell lines were found that can activate promutagens. It was also claimed that the metabolism of mutagens is reflected in MN experiments with hen eggs which may be an alternative to experiments with rodents. We attempted to find a cell line that possesses active phase I and phase II enzymes that activate/detoxify mutagens. Therefore, we tested 12 human-derived liver lines in comet experiments with 5 representatives of different groups of mutagens. The most sensitive line was Huh6 which had never been used in genotoxicity studies. In subsequent experiments, we studied the cells' metabolic capacity (measurement of drug-metabolizing enzymes). We developed a protocol for MN experiments (in agreement with OECD guideline 487) used in validation experiments with a panel of different chemicals. These experiments showed that the sensitivity/specificity of MN assays with this cell line is substantially higher than that of tests with conventional cell lines currently used and higher than that of most in vivo tests.

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Invited Talk

Telomere Length And Expression Measurements By Quantitative PCR

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ABSTRACT

Telomere instability due to telomere shortening is a recognized risk factor for carcinogenesis and a biomarker for aging due to the cumulative effects of environmental exposure and life experiences, such as stress. Telomere length (TL) is essential for important cellular processes such as proliferative capacity, senescence, and chromosomal integrity. Short telomeres reduce genome stability, which can lead to malignant cell transformation and activation of mechanisms to maintain telomere length. There are several methods to analyze TL. Our studies aimed to evaluate quantitative PCR (qPCR) to determine mean TL and expression as a marker in malignant and healthy tissues/cells. The monoplex and multiplex qPCR assay for telomere repeats (T) and single genomic copies (S) allows quantification of telomere content (TC) as a T/S ratio and results in relative TL [1]. The studies presented include findings from human and canine tumor patients [2, 3] and healthy human individuals with altered working hours [4] or body weight. The combination with other more sophisticated methods, such as telomere restriction fragment (TRF) Analyzes, verifies and determines the absolute mean TL in base pairs. In addition, this qPCR method can be applied to RNA converted to cDNA and leads to the relative quantification of telomere transcripts, referred to as TERRA. TERRA transcripts are part of telomere structure and function, with potential as prognostic tumor markers [2], but have been less studied in non-malignant cells. In summary, TL and TERRA expression can be determined by qPCR as a cost-effective method from samples such as tissue and blood and are suitable for large-scale studies in humans and other species.

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Invited Talk

A Tale Of Body Patterning Gene: From Diagnostics To Therapeutic Target

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ABSTRACT

Deregulation of homeobox genes has been associated with several human malignancies. For instance, Distal-less homeobox-1 (DLX1), which is involved in the development of craniofacial features and GABAergic interneuron, is also highly upregulated in prostate cancer. We showed that ~60% of advanced-stage prostate cancer patients display higher DLX1 levels, which are associated with metastatic disease and poor survival. We established the oncogenic role of DLX1 in prostate cancer and deciphered its transcriptional regulation involving ERG, Androgen Receptor (AR)/AR-V7 and FOXA1. Moreover, we showed that BET inhibitors and/or anti-androgen drugs disrupt ERG/AR-mediated *DLX1* transcription leading to its reduced expression and downstream oncogenic effects. Taken together, we offered a strategy to include BET inhibitors and anti-androgens for the treatment of DLX1-positive prostate cancer patients.

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Invited Talk

Learning For Long-Term Memory: A Behavioral Phenomenon

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ABSTRACT

Learning requires both attention and working memory. Information can only be absorbed through attention. The brain uses working memory to make sense of it. Working memory and attention are related functions, which suggests that their brain underpinnings may be similar. Attention can choose which information is encoded into working memory and further which memories are consolidated into long-term memories (LTM). Rodent neurobehavior is a robust tool to decipher attention and memory interlinking mechanisms. The Behavioral Tagging (BT) model is the most suitable rodent neurobehavior method to understand the process of learning and memory. Since attention can be variously applied and used by focusing it internally or externally, the BT model utilizes the aspects of attention in the form of novelty exposure to facilitate the formation of novel object recognition (NOR) task LTM in rodents. It is hypothesized that attention-mediated novelty exposure induces the synthesis of certain plasticity-related proteins (PRPs), which actively forms a complex with learning tags formed due to weak training (working memory), thus consolidating LTM. Different attention-mediated novelties, such as open-field exploration and environment enrichment, have also been explored to understand the cascade of memory and attention. It has been found that different forms of novelties exhibit a similar extent of LTM formation, but the molecular pathway differs to a great extent. Moreover, a deeper analysis of neurotransmitter systems, protein machinery and enzymatic activities also paved the way to understanding the basicity of memory formation in the brain. Lastly, while attention and memory might be interdependent functions, the neural circuitry components which lead to their unique functionality need to be further discovered utilizing state-of-the-art technologies.

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Invited Talk

Assessing The Impact Of Persistent And Emerging Contaminants On Aquatic Organisms

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ABSTRACT

The aquatic environment is often the ultimate recipient of increasing amounts and range of contaminants in all probable combinations. This presents a major challenge to protecting natural resources' quality and sustainability. The continued developments of integrated and multidisciplinary approaches incorporating analytical, biological (including 'omics'), statistical and computational technologies realize the importance of natural organisms (sentinel or surrogate) to correlate human and ecosystem health in order to improve environmental risk assessment (ERA). In this context, we have attempted to develop and validate a range of sub-lethal biological or biomarker responses in ecologically important species such as bivalve mollusks. The broader aims have been to determine the relative sensitivity of the biomarkers and the species following exposure to a range of well-known and emerging contaminants (e.g., engineered nanoparticles or ENPs) in combinations with other pollutants such as metals or polycyclic aromatic hydrocarbons (PAHs). Linking 'toxicokinetics' with 'toxicodynamics' processes and using appropriate analytical, statistical and computational modeling tools, our studies complement the observed biological responses with bioavailability and tissue-specific body burden of the contaminants. The synthesized information from our studies offers information pertaining to the potential detrimental impact of contaminants on the health of the organisms. The adopted approach could be translated into other organisms and environmental conditions to protect human and ecosystem health. We, however, must evaluate the inherent limitations and challenges of various available tools while aiming to integrate them into regulatory frameworks readily.

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Invited Talk

Impact Of Radiation Dose Rate On Mammary Organ Defects During Puberty

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ABSTRACT

Medical diagnostic imaging has increased exponentially recently, particularly for adolescents. However, there is uncertainty regarding how these accumulative low-dose exposures to radiation might affect the body, particularly the growth and development of radiation-sensitive organs such as the mammary gland. In this study, we have investigated how an acute low dose of radiation compared to a fractionated exposure of the same dose may differentially impact organ development during puberty, an especially sensitive exposure window. We hypothesized that fractionated low-dose x-ray radiation exposures (10 cGy/day x 5 days), roughly mimicking multiple CT dose diagnostic exposures, would impact the mammary gland less than an acute exposure (1 x 50 cGy). Also, humans have a large genetic diversity that may play a role in how people respond to irradiation exposures. Thus two genetically diverse mouse strains differing in radiation sensitivity (BALB/c-sensitive; C57BL/6-resistant) were used to attempt to address how genetics may affect radiation-induced defects in the mammary gland. Surprisingly, our data reveal that fractionated radiation causes greater effects in terms of immune cell population changes, ductal growth defects, and stem cell population changes as compared to controls. In addition, there was a difference in genetics with the radiation-sensitive BALB/c mice revealing a greater susceptibility to these effects. Preliminary evidence suggests a possible underlying reason for radiation effects on stem cell populations, which were altered more extensively in BALB/c mice. Together these findings suggest that fractionated low-dose exposures are potentially more damaging to organ development as compared to a single low acute exposure. Stem cell populations within the gland may be especially susceptible to these exposures.

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Invited Talk

Arsenic Metabolism And DNA Damage: Elimination, Genotoxicity And Genetic Susceptibility In Bolivian Indigenous Women Exposed To Elevated Arsenic Concentrations In Drinking Water

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ABSTRACT

Exposure to arsenic (As) is a major problem in many parts of the world. It is estimated that more than 200 million people are exposed to arsenic, mainly through contamination of groundwater. Chronic arsenic exposure is associated with adverse effects on human health, such as cancer, cardiovascular diseases, and neurological diseases, and the rate of morbidity and mortality in the health of the exposed population is alarming. Arsenic has a strong genotoxic potential and is capable of causing DNA damage, such as aneuploidy, micronucleus formation, chromosomal aberrations, deletion mutations, sister chromatid exchange and DNA-protein crosslinks. We recruited 200 women from 10 villages around Lake Poopó and 72 controls. Arsenic exposure was determined as the sum concentration of arsenic metabolites (inorganic arsenic; monomethylarsonic acid; MMA); and dimethylarsinic acid, DMA) in urine (U-As), measured by HPLC-HG-ICP-MS. The relative fractions of the urinary metabolites assessed the efficiency of arsenic metabolism. The women had a wide variation in U-As (range 12–407 µg/L, median 65 µg/L) and a markedly efficient metabolism of arsenic with low %MMA (median 7.7%, range: 2.2–18%) and high %DMA (80%, range: 54–91%) in urine. In relation to genotoxic damage, results showed that there is DNA damage in a population by the Comet assay, and significant differences between exposed and non-exposed groups were found (p=0.000); It was shown that genetic polymorphisms on GSTs (GSTM1 null women) presented more genotoxic damage detected by the comet assay.

ACKNOWLEDGMENTS: We thank all the women who voluntarily participated in the study and the health personnel of the centers of the three locations. For the funders IRD-HSM, Eric Philip Sørensens foundation, Kunglig Fysiografiska Sällskapet, Karolinska Institutet and the Institute of Genetics - UMSA.

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Invited Talk

Environmental Contaminants And Health Risks

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ABSTRACT

Environmental contaminants are known to cause a variety of health problems. However, it does not mean that all persons exposed to contaminants will exhibit ill health symptoms. It depends upon the duration of exposure, amount exposed, contaminant, individual's health condition, age, high-risk individuals and inherently predisposed. Vellore district is surrounded by various industries, and thus pollutants increases in the surrounding localities. For example, there is an increase in the number of respiratory cases from September to February due to the weather conditions and the pollutants. The present study included Controls = 500, Asthma = 430, Migraineurs = 150, Diabetes = 150 and their blood serum levels were analyzed by atomic absorption spectrometry. The heavy metals analyzed were Cd, Cr, Pb, Co and Ni and the trace elements were Zn, Fe, Cu, Mg and Mn. The contaminants were compared with the health conditions to analyze if any significant correlation exists.

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Invited Talk

Biodegradation Of Tributyl Phosphate, An Organopollutant, By *Sphingobium* sp. RSMS

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ABSTRACT

Tributyl phosphate (TBP), a phosphotriester compound, is used in large volumes as an extractant for uranium and plutonium at nuclear fuel reprocessing facilities. It is also commercially used in defoamers, plasticizers, herbicides and hydraulic fluids. Large volumes of TBP-containing waste are generated due to industrial activities. TBP causes toxicity to marine life in aquatic habitats, and animal studies have shown the occurrence of developmental toxicity upon ingestion of TBP. Exposure of TBP to rats induced tumors in the urinary bladder, reduced body weight and prolonged blood coagulation times. Drawbacks associated with physical and chemical methods of degradation make biodegradation of TBP a potentially attractive solution. Microbes reported in the literature have shown a poor capacity to degrade TBP. In contrast, *Sphingobium* sp. RSMS (RSMS strain) isolated from BARC, Mumbai, has shown good promise for biodegradation, particularly with its ability to utilize TBP as the sole source of carbon and phosphorous. Our earlier work in this bacterium elucidated the biochemical pathway of TBP degradation and showed its complete mineralization. At the laboratory scale, it degraded 30 mM of TBP, which is 10-15 times higher than any known TBP degrader. Processes were developed for the step-wise scale-up of TBP degradation utilizing RSMS strain. Initially, the process was scaled up to 30 liters of volume under optimum, sterile and controlled conditions. Almost complete mineralization (28 mM in 3 days) was demonstrated to that seen at the laboratory scale. Further scale-up to 205 liters was standardized under non-sterile and ambient temperature conditions to economize the process. At 30 mM of TBP, the growth of other microorganisms is inhibited, while the RSMS strain is able to grow and utilize TBP. Under these conditions, a total of 21 mM TBP degradation was achieved over 15 days, which is approximately 70% of the maximum TBP degradation observed at the laboratory scale.

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Invited Talk

Prevention And Amelioration Of Radiation-Induced Damage By Chlorophyllin

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ABSTRACT

Damage caused by an environmental mutagen can be demonstrated in great detail using a variety of sensitive techniques. However, efforts to find appropriate agents for recovery of the biota from the inflicted damage have met with little success. Ionizing radiation is a well-established environmental mutagen and carcinogen. Prophylaxis, mitigation and amelioration of radiation damage are of immense importance for both planned and unplanned exposures to ionizing radiation. Though a large number of chemicals, including some antioxidants and biological response modifiers, have been evaluated for this purpose in the last several decades, very few such agents have been approved for clinical use. In Bhabha Atomic Research Centre, Mumbai, an antioxidant and immunomodulator, chlorophyllin (CHL), was assessed for its radioprotective ability. Treatment with CHL reduced ROS levels induced by radiation. The protection was significantly more evident in bone marrow cells but not in the spleen. Prior administration of CHL resulted in accelerated recovery from hematopoietic injury in mice. During post-irradiation recovery, CHL-treated mice showed an increased number of colony-forming units (CFU} in the bone marrow. CHL offered complete protection against WBI-induced mortality in Balb/c mice. Activation of survival pathways (ERK-mediated) and enhanced DNA repair appeared to be the major mechanisms for radioprotection in bone-marrow cells by CHL. CHL has already been used in humans as a chemo-preventive agent. Its therapeutic potential as a radioprotector in humans is currently being evaluated.

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Invited Talk

Conventional Cytogenetic Assay As A Test System For Environmental And Industrial Chemicals And Lessons Derived From Methyl Isocyanate (MIC) Gas Exposed Population: Then And Thirty Years Later

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ABSTRACT

The atmospheric environment hosts an amalgamated mixture of chemical compounds, gases, radiation and so on, to which the living kingdom is continually exposed through respiration, feeds and feeders. These components are excreted from industrial usage and become more complex through reactions in the atmosphere air. Many of these complex ingredients in the atmospheric air are not known for their toxicologic potential and effects on human health. The toxicity of methyl isocyanate (MIC) gas was unknown till it claimed thousands of lives during its accidental leakage at Bhopal, India. The cytogenetic study showed increased chromosome aberrations (CA) and sister chromatid exchanges (SCEs), and delayed cell replication index (RI) in an immediate multicenter genetic screening on gas victims. A surveillance study after 30 years displayed a reduction in CA compared to the initial status in survivors of different exposure strata. Altogether, cytogenetic damage was significantly predominant in the severely exposed population. Stable and replicable aberrations and chromatid exchanges detected in both studies collectively indicate genetic instability. The variation in the individual cytogenetic spectrum from similar exposure status might indicate inter-individual variation in response to the external factors over 30 years post-disaster. CA detected after 30 years could be the cumulative effect of occupational, environmental and lifestyle factors at a background of one acute MIC exposure in 1984. Had MIC's toxicologic potential been known, fatality and health effects could have been averted. Evaluation of the genotoxic potential of tin (Sn), inorganic and organic, showed a positive correlation with dose and age of exposure on human lymphocytes in vitro. The effect was further aggravated by smoking. Age has also shown a significant effect on CA in the general population. The vicinity of the living environment to industrial premises showed an increase in Hp1 (a Haptoglobin allele) and TfD (a Transferrin allele) in an assay of polymorphic serum genetic markers in the population of Eastern India. The population of industrial habitat was exposed to suspended particulate matter, chemical and gaseous effluents. A similar assay on lipoprotein variants showed a significant difference between industrialized and rural habitats. The studies were carried out either by conventional cytogenetic or serum electrophoresis techniques. The result indicates the power of conventional techniques for screening environmental health. Molecular karyotyping or sequencing techniques could be used as an adjunct to conventional techniques, keeping the economic factor in mind for environmental and industrial health screening. The present report suggests evaluating and establishing industrial ingredients' toxicity before their use. Reduction of pollution at source shall always be an effort to maintain a sustainable environmental context on the one hand and identify antidotes on the other for medical management of accidental exposure.

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Invited Talk

Health Hazards Of Occupational Exposure To Airborne Fungi In Wastewater Treatment Plants

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ABSTRACT

There is much evidence that workers in wastewater treatment plants (WWTPs) are occupationally exposed to high concentrations of biological air pollutants. The present study aimed to determine the common airborne fungi in a WWTP, its health impacts on occupational exposure workers, and the protective role of the GST gene. Airborne fungi were studied macroscopically, and the 18S rRNA gene sequencing method performed complete identification of fungal isolates. Health risks associated with airborne fungi were estimated based on occupational and medical questionnaires for the workers from the selected WWTP. Pulmonary functions were done for the included workers. PCR identification of fungi was done for the workers' sputum and blood samples, and glutathione S-transferases (GST) gene polymorphism was also studied. Aflatoxin-adduct (AFs) and alpha-fetoprotein (AFP) were estimated in the serum of the workers. Results have been presented in detail with explanations. The findings will give alarm about the common health hazards of airborne pathogenic fungi in WWTPs, and the protective role of the GST gene against environmental exposure to airborne aflatoxigenic fungi.

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Invited Talk

The Comet Assay: Towards A High-Throughput Method To Measure Different DNA Lesions

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ABSTRACT

The conventional alkaline comet assay detects DNA strand breaks and alkali-labile sites at the cellular level; however, modifications to the protocol can also detect other lesions. The combination of the assay with the enzymes formamidopyrimidine DNA glycosylase (Fpg), endonuclease III (EndoIII), human 8-oxoguanine DNA glycosylase I (hOGG1) and alkyladenine DNA glycosylase (hAAG) allows the detection of oxidized and alkylated bases. Moreover, the 'reverse' comet assay allows the detection of DNA cross-links. This modification is based on the decrease in DNA migration in the presence of those DNA lesions. The *in vitro* analysis of a set of non-genotoxic and genotoxic chemicals with different mechanisms of action showed that these modifications increase the sensitivity and specificity of the comet assay towards DNA lesions, providing valuable mechanistic information. High throughput versions of the assay have been devised, allowing the integration of these modifications and the analysis of several compounds in the same experiment. The 'CometChip' (a commercial high throughput device) can perform the conventional *in vitro* alkaline assay, following the manufacturer's protocol. However, this protocol has been adapted to allow the inclusion of enzymes and the possibility of analyzing *in vivo* samples.

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Invited Talk

Implication Of Endothelial Progenitor Cells As Biomarkers For Low Dose Ionizing Radiation Occupational Exposure

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ABSTRACT

It is observed that acute exposure to low-dose ionizing radiation (IR) can induce the mobilization of EPCs from the bone marrow into the systemic circulation to repair the induced endothelium damage. Accordingly, their number increases in circulation. Meanwhile, high doses and/or chronic low-dose IR exposure to ionizing radiation could exhaust and/or deplete bone marrow EPC, reducing their number in the circulatory system provided that individuals are healthy and suffer from no chronic disease. Research previously carried out in our laboratory among cardiac catheterization personnel, and industrial radiographers showed that the numbers of EPCs significantly increased with the frequency of micronuclei or chromosomal aberrations compared to controls. Also, measuring the number of EPCs in cyanotic and acyanotic congenital heart disease (CHD) pediatric patients post cardiac catheterization (CC) revealed that the number of circulating EPCs and the frequency of micronuclei were significantly increased among acyanotic CHD patients and significantly decreased among cyanotic CHD. The aim of this review is to discuss the implication and feasibility of using EPCs as biological markers among occupationally exposed individuals. The search revealed that EPCs are sensitive to ionizing radiation. However, their natural decrease in number with aging, chronic diseases and chronic exposure to IR render them unreliable. However, they indicate the individual ability for endothelial repair or increased susceptibility to IR effects. Accordingly, biological dosimeter assays using circulating lymphocytes remain the top for assessing radiation exposure.

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Invited Talk

Air Pollution Impact On Genomic Instability In People Living In Zagreb (Croatia)

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ABSTRACT

Increased road traffic and industrial and energy production contribute to urban air pollution worldwide. Consequently, cities are hotspots for air pollution, representing a global health threat, resulting in millions of premature deaths annually. The HUMNap project aims to provide scientifically based data on how air pollution can affect genomic instability and our health by determining possible associations between air pollutants and biomarkers of exposure and early biological effects. In the first part of the project, we retrospectively evaluated genomic instability using the comet and micronucleus assays on blood cells in a sample (N=130) of the general population living in Zagreb (Croatia) and associated these results with air pollution levels in the period from 2011 to 2015. We did not observe a significant positive association between parameters tested and measured air pollution parameters except for benzo(a)pyrene (B[a]P), which showed a significant negative association. Our results show that the measured air pollution parameters were largely below regulatory limits, except for B[a]P. In the prospective part of the study, we investigated possible effects of air pollution and BTEX (benzene, toluene, ethylbenzene, *o*-, *m*- and *p*-xylene) exposure on genomic instability using the comet and micronucleus assays on blood in addition to buccal cells in a sample (N = 60) of the general population living in Zagreb (Croatia) during colder and warmer periods in 2021-2022. All measured outdoor air pollution parameters agreed with previously reported values and were below the regulatory limit, except for PM_{10} particles and B[a]P bound to PM_{10}, which exceeded regulatory limit levels. Again, we did not observe the noteworthy impact of air pollution on tested parameters. Since air pollution is identified as a major health threat, further research investigating the effect of air pollution on genome integrity and human health is warranted. It will prioritize other cities where exposure to different air pollutants is expected.

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Invited Talk

QSAR Prediction Of Ames Mutagenicity

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ABSTRACT

Robust Quantitative Structure–Activity Relationship (QSAR) systems defining toxicological endpoints are desirable to identify chemicals possibly causing adverse effects without performing actual toxicological studies. As a prediction tool for mutagenic potency, multiple QSAR systems have shown remarkable progress since the new system was introduced in the genetic toxicology area at the beginning of the 21 century. In particular, it has been widely used in industry-government-academia research institutes as a tool to predict Ames test results, and its recognition has remarkably improved. The ICHM7 guideline enacted in 2014 is considered an inflection point where many researchers started to utilize this system, and this system became popular as a research area in genetic toxicology society. Following the establishment of the guideline, pharmaceutical companies became obligated to use the QSAR system to predict mutagenicity of impurities in pharmaceutical products. Based on the results, they were required to submit the control of impurities to the regulatory authorities. Therefore, authorities were also required to use QSAR, and the number of users spreads drastically. In addition, the prediction accuracy has been improving as the number of users increases. This is likely due to a positive cycle where QSAR vendors continued to make efforts to incorporate a wider range of data and users provided data to improve accuracy. For example, over 10,000 compounds were provided in the QSAR challenge program and captured in the database, resulting in improved prediction accuracy. In this presentation, the speakers' personal views will be provided on how the QSAR prediction accuracy has been improved, what factors have hindered the improvement in accuracy, and whether the "QSAR prediction" will be accepted as an alternative to the existing Ames test in the future.

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Invited Talk

Antimutagenic And Anticarcinogenic Potential Of South African Herbal Teas In Short Term *In Vitro* And *In Vivo* Assays – An Overview

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ABSTRACT

The use of dietary compounds as chemopreventive agents has indicated that many phytochemical constituents can potentially prevent and/or modulate the occurrence of certain types of cancer and that there are a variety of mechanisms for producing such protective and preventative effects. An integrated approach using different experimental animal models, *in vitro* assays and others are used as screening tools and ideal in planning intervention trials. The historically beneficial effects of rooibos (*Aspalathus linearis*) and honeybush (*Cyclopia intermedia*), two indigenous herbal teas to South Africa, on health are well known but most of an anecdotal nature. The international and national popularity of these herbal teas has increased dramatically over the past few years, so it is essential to substantiate some of the beneficial effects on health. An overview of the antimutagenic and anticarcinogenic data available on these indigenous herbal teas that form part of the Western and Southern Cape fynbos floristic Kingdom in South Africa. Studies confirm they contain a complex mixture of unique polyphenolic compounds that differs from those in the *Camelia sinensis* teas. Studies have also confirmed that aqueous extracts of both Rooibos and honeybush possess antimutagenic activity against different groups of chemical carcinogens using the *Salmonella* mutagenicity assay. The antimutagenic properties of Southern African herbal teas were examined using the plate incorporation test in the bacterial Ames assay. Mutagenicity of direct-acting mutagens, MMS, cumolhydroperoxide and H_2O_2 to Salmonella typhimurium TA102 and metabolic-activated mutagens, 2-AAF and FB1 to TA 98 and TA 100 were studied. None of the tea extracts displayed any mutagenic activity against any of the tester strains when tested in the absence of the diagnostic mutagens. Further evaluation of the antimutagenic/ anticarcinogenic properties of these two SA herbal teas and their different tea components have also been done. They include the protective effect of enzyme preparations obtained from liver homogenates of rats consuming Rooibos and Honeybush for 5 weeks. Different experimental carcinogenesis models in rats and mice were utilized to determine the possible chemoprotective effects of rooibos and honeybush. These include the rat liver carcinogenesis model, using diethylnitrosamine and fumonisin B1 as cancer initiators and promoters. At the same time, 7,12-dimethylbenz[a]anthracene and 12-O-tetra-decanoylphorbol-13-acetate were topically applied to induce skin carcinogenesis in the two-stage mouse model. Extracts of the herbal teas were orally fed and topically applied to the experimental animals after initiation was completed for the duration of both experiments. Results from these studies and others strongly suggest that the consumption and/or topical application of the two indigenous herbal teas may play an important role in improving the overall health of humans, which could alleviate the burden of cancer.

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Invited Talk

Environmental Toxicogenomics: Approaches To Analyzing Biological Consequences Of Environmental Toxicants

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ABSTRACT

Toxicogenomics is the fusion of three scientific fields – toxicology, molecular biology and bioinformatics. Toxicogenomics, a discipline of toxicology, allows scientists to identify and characterize the genomic signatures of environmental toxicants, use gene and protein expression profiles to study the relationship between exposure and disease outcome and understand gene–environment interactions. There are numerous applications of molecular genomics in environmental toxicology. We have used gene expression profiling on mammalian cells exposed to environmental toxicants such as Arsenic (sodium arsenite), Bisphenol A, and ionizing radiation to identify potential biological response markers or affected signaling pathways. A multiparametric and integrated approach to identifying bioindicators of toxicants, especially ionizing radiation, will be discussed in detail. In addition, we have studied the influence of DNA repair pathways in modulating the effects of toxicants on mammalian cells. Overall, our investigations have implications in the risk estimation for environmental toxicants as well as in identifying adverse outcome pathways following exposures to toxicants. By monitoring thousands of genes in cells and tissues simultaneously, high-throughput technologies such as transcriptomic analysis, epigenomic analysis or next-generation sequencing provide opportunities to characterize the expression patterns of genes/proteins following exposure to environmental toxicants with eventual applications in human health risk assessment as well as disease prediction modeling.

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Invited Talk

Creation Of Chromosomal Translocations By Genome Editing And Its Genotoxicity

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ABSTRACT

We artificially generated translocated fusion genes of cancer-related genes using genome editing in order to create standards for NGS-based cancer panel tests. We targeted the ALK gene on chromosome 2 and the SmoSMO genes on chromosome 7, adjacent in chromosome territory, as fusion partners and used the CRISPR/Cas9 method to cleave each gene to generate a fusion between the cleaved genes. Cas9 and sgRNA expression vectors of each gene were introduced into HEK293T cells using the Trans-it reagent. The target cells were cloned based on the fusion gene-specific PCR, and the translocated chromosomes were confirmed by chromosome painting.1-2% of translocated cells were observed after genome editing. We could finally obtain a clone with the targeted reciprocal translocations. In addition, a clone showing complex translocations was obtained. The type of complex translocation suggested that the Breakage-Fusion-Bridge (BFB) cycle is involved in their generation. The BFB cycle is known to induce chromothripsis similar to micronuclei. We observed about 20% of the aberrations after genome editing by chromosome painting, which suggested a concern of genotoxicity for CRISPR/Cas9 therapy. For a designed synthesis of clinically reported fusion genes, sgRNAs were designed at the breakpoints of the ALK/KIF5B fusion gene, and synthetic sgRNAs of each gene were transfected as a complex with the Css9 protein. Cloning was performed using fusion-specific PCR as an indicator, and cells with a reciprocal translocation between chromosomes 2 and 10, carrying the desired ALK/KIF5B fusion gene, were successfully isolated. These results raised important aspects for considering the on-target toxicity of genome editing.

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Invited Talk

Increased Genome Sensitivity To Adrenaline During Various Phases Of Progression Through Type 2 Diabetes Mellitus

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ABSTRACT

Diabetes mellitus is a group of metabolic disorders that represents one of the major health concerns, especially in developed countries. Among various factors that influence diabetes outcomes, hormones play an important role. It has been shown that the stress hormone adrenaline can act as an endogenous mutagen. Thus, this investigation aimed to examine whether peripheral blood mononuclear cells (PBMCs) from normal persons exhibit lower genome sensitivity (in alkaline Comet assay) to *in vitro* treatment with adrenaline (0.1, 1 and 10 μM) in comparison to PBMCs from obese, prediabetic and diabetic patients. In addition, we monitored levels of some parameters of oxidative stress (TBARS, catalase) and lactate dehydrogenase. The two highest concentrations of adrenaline (1 and 10 μM) induced a significant increase in DNA damage in obese, prediabetic and diabetic groups. In healthy individuals, only the highest concentration of adrenaline caused an increase in DNA damage. The increase of genome sensitivity to adrenaline and cell membrane damage was most evident in diabetic patients. In conclusion, obese, prediabetic and diabetic persons are more sensitive to the genotoxic effects of adrenaline, probably due to a decrease in antioxidative defense mechanisms in various stages of progression through type 2 diabetes mellitus. The obtained results could contribute to a better understanding of the role of endocrine factors in the damage of cellular biomolecules, which could be further used to find novel therapeutic approaches and lifestyle changes to avoid diabetes complications.

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Invited Talk

Current Research Activities In The Japanese Environmental Mutagen And Genome Society (JEMS)

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ABSTRACT

The Japanese Environmental Mutagen and Genome Society, JEMS, focuses its activities on the annual meeting and the maintenance of the Society's journal like many societies. Outside of Japan, JEMS is a member of the Asian Association of Environmental Mutagen Societies, AAEMS, as is EMS-I. JEMS is also a member of the IAEMGS, the parent body of ICEM that held its annual meeting in the summer of 2022 and is also a member of IAEMGS. In this talk, I will introduce one of the activities of JEMS, the joint research by the two study groups, the Bacterial Mutagenicity Study Group (BMS) and Mammalian Mutagenicity Study Group (MMS), and the international journal Genes and Environment (G&E). The BMS was established for the purpose of promoting the reverse mutation test using bacteria, known as the Ames test, and holds regular meetings twice a year for study sessions, sharing information related to test guidelines, accuracy control tests for the Ames test, joint research, and Q&A. BMS also conducts workshops upon request from members. I will give an overview of the recently launched collaboration on the "Whole Genome Sequence Comparison" of TA100 strains owned by several institutions. The MMS is investigating various mutagenicity tests using mammals and animal cells and is working to contribute to the development of research in this field as well as to the safety evaluation for humans. MMS has conducted many collaborative studies and has influenced the development of domestic guidelines and the ICH and OECD guidelines. I will introduce their current collaborative study for the evaluation of the utility of Error Corrected Sequencing (ECS)-based mutagenicity assay. Finally, I will introduce G&E. JEMS used to publish a Japanese-language journal, which was converted to an English one in 2006; In 2015, G&E became an online journal and received an Impact Factor in 2020. Last year it published a special issue on recent research topics from China, and AAEMS President Cao wrote an article introducing CEMS. There are many contributions from India, and Dr. Das of EMS-I is an Editorial board member. One prize, the Best Paper Award, is awarded annually for the best paper.

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Invited Talk

Current Status And Expectation On Error-Corrected-NGS Technology

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ABSTRACT

Error-corrected next-generation sequencing (EC-NGS) technology using double-stranded DNA sequences is effective in detecting chemically induced somatic mutations. Several research groups have independently demonstrated its utility for evaluating chemical mutagenicity. We previously developed a novel EC-NGS technology (Hawk-Seq™), requiring slightly modified library preparation steps and bioinformatics to achieve an error frequency of less than 10^{-7}. The bioinformatic scheme was constructed using original programs that enabled error reduction and clear detection of entire genomic mutations. These analytical programs supported research using a variety of biological models. We applied the Hawk-Seq™ analysis to three existing genotoxicity test models: bacteria (i.e., *Salmonella typhimurium* TA100), mouse (i.e., *gpt* delta mice), and a human cell line (i.e., TK6 cells). In these test models, we obtained mutagen-specific signatures for over 16 mutagens (e.g., C>T for alkylating agents). However, the relatively high error frequency of C>A and C>G (approximately $1/10^7$ bp) could hamper the outcome for some mutagens under Hawk-Seq™ analysis. Oxidized guanines in single-strand (SS) overhangs, generated after DNA shearing, caused these errors. Therefore, we evaluated the effectiveness of SS-specific nucleases in eliminating these errors by developing Jade-Seq™. This new sequence method uses endonuclease S1 and enables a nearly 10-fold reduction in errors compared with Hawk-Seq™. Jade-Seq™ has an improved sensitivity to the mutational signature of the G:C base pair (e.g., C>A for benzo[*a*]pyrene). This method is useful for detecting extremely rare mutations (ca. < $1/10^7$ bp) and elucidating mutational signatures. We will also initiate collaborative work with the Japanese Environmental Mutagen and Genome Society to evaluate inter-laboratory reproducibility under Hawk-Seq™ analysis. Our studies will promote the acceptance of EC-NGS technologies in the field of genotoxic research.

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Invited Talk

Endocrine Disrupting Effects And Reproductive Toxicity Of Food Products: Current Challenges And Future Perspectives

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ABSTRACT

Initial evidence on the endocrine-disrupting effects of food products motivated us to evaluate the reproductive toxicity of plant-derived edible oils and high fructose corn syrup (HFCS 55) in female Wistar rats. There is ambiguous evidence that nutritional resources can induce organ toxicity, but their endocrine-disrupting effects by abnormal changes in female reproductive organs are poorly evidenced. This lecture aims to address the reproductive safety of commercial oils, soy, high fructose diet and some herbals through clinical, biochemical, hormonal, histopathological, and immunohistochemical analysis according to experimental studies in female rats and some clinical evidence. To achieve these goals, clinical factors, serum lipid levels, sex hormones, gonadotropins, and histopathological and immunohistochemical changes were assessed and compared among groups by statistical analysis. I will address in this talk histopathological evaluations, the incidence of severe congestion and multiple follicular cysts, and simple and secondary cysts caused by edible oil, which could be associated with increased risk of Polycystic Ovary Syndrome (PCOS) incidence in women. Remarkable estrogenic properties of plant-derived edible oils with signs of ovarian atrophy, congestion, and cysts may contribute to phthalate or other xenoestrogenic contaminations. Moreover, a battery of differential signs and symptoms in HFCS-fed groups, including squamous metaplasia in the uterine tissue and ovarian congestion, a significant increase in FSH and LH levels, meaningfully decreased serum testosterone and 17β-estradiol levels. Strong androgen receptor expression in the ovaries and uterine of HFCS animals was recorded compared to the other two study groups. These thought-provoking signs and signals of fructose-induced reproductive toxicity in these models emphasize the contribution of food to deteriorated ovarian and endometrial health and increased risk of primary ovarian insufficiency (POI) and PCOS in women.

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Invited Talk

Size Fractionated Particulate Matter: Characterization, Uptake, Genotoxicity And Mutagenicity In V-79 Cells

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ABSTRACT

Particulate matter, often known as PM, has been a major cause for concern for a significant amount of time, both in terms of its effect on the environment and the health of humans. To determine the potentially harmful effects of PM, it is essential to consider the variety and complexity of the various size fractions. The study aimed to present a comprehensive size-composition-morphology characterization and assess the oxidative potential, genotoxicity, and mutagenicity of the atmospheric PM fractions, collected by using MOUDI near a busy roadside in Lucknow, India. Physicochemical characterization of fine ambient particles (0.32-1.8 µm), quasi-ultrafine (0.1-0.32 µm) and ultrafine particles (≤0.1 µm) along with SRM 1649b was done using TEM, SEM, DLS, NTA, CHO analyzer, ICP-MS, and IC in parallel with the estimation of exogenous Reactive Oxygen Species (ROS) by acellular assays, i.e., dithiothreitol (DTT) and the CM-H_2DCFDA assay. The endotoxin concentration in different-size fractions was also estimated. Cellular studies demonstrated significant uptake, cytotoxicity, ultrastructural changes, cellular ROS generation, and changes in the different phases of the cell cycle (Sub G1, G1, S, G2/M) exposed to different size fractions. The Comet assay and the Micronucleus assay were used to estimate genotoxicity. The HGPRT gene forward mutation assay revealed the mutagenic potential in V-97 cells. Conclusively, our results indicate that the genotoxic and mutagenic potential of the fine PM was greater than the other fractions. Interestingly, ultrafine PM has higher bioactivity compared to quasi-ultrafine PM.

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Invited Talk

Deciphering The Role Of Estrogen Related Receptor In Male Reproductive Toxicity Using *Drosophila* As A Model

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ABSTRACT

Male infertility has emerged as a major health problem over the last decade. This has been attributed to certain deficiencies in genetic/endocrine pathways and, more importantly, the disruption of these pathways by man-made chemicals. Albeit the prime focus of researchers on testosterone and estrogen-responsive pathways to unravel the mechanisms of male infertility as well as the chemical-mediated reproductive toxicity, Estrogen Related Receptors (ERRs) that belong to the same subfamily of Nuclear Receptors (such as AR & ER) remain neglected. To remedy this, my laboratory uses *Drosophila melanogaster*, an insect with conserved male reproductive processes, to understand the relevance of ERRs and xenobiotic-ERR interaction to male fertility and reproductive toxicity. Indeed, *Drosophila*-based studies provided the first indication of the involvement of ERR in male fertility as well as reproductive toxicity. Long ago, through a gene silencing approach, my lab had shown that ERR is critical for testicular morphogenesis in *Drosophila*. Recent studies in my lab provided insights into the ERR-mediated molecular mechanisms underlying testicular energy metabolism, sperm motility and the associated consequences on male fertility. In addition, ERR appears to be a critical player in Dibutyl phthalate, a plasticizer, mediated male reproductive toxicity. I will discuss these recent advances and their translational potential for male reproductive health.

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Invited Talk

Coumarin, A Versatile Scaffold For Drug Development: Synthesis Of Coumarin Selenocyanate As A Potential Sensitizer Of Breast Cancer Cell Towards Platinum-Based Chemotherapy Through Modulation Of ROS Level; A Preclinical *In Vivo* Study Highlighting Chemoprotection And Chemo Enhancement

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ABSTRACT

Cancer Chemotherapy is a common treatment modality for cancer patients, but the cancer cells' unwanted cellular toxicity and acquired resistance toward the prescribed treatment regime limits its success. Selective killing of cancer cells over normal cells through selective induction of ROS level of the cancer cells resulting in apoptotic cell death is an excellent approach to circumvent the drug-induced toxicity and acquired resistance. In our drug development program, a novel selenium compound 7-(5-selenocyanetopentyloxy)-4-methyl-2H-chromen-2-one(MUS) utilizing a coumarin scaffold was prepared for this purpose. Oral administration of this compound alone (6 mg/kg b.wt) or in combination with carboplatin (10 mg/kg b.wt. i.p.) against murine breast adenocarcinoma was conducted. Combinatorial application of MUS with carboplatin significantly reduced tumor volume and enhanced host animals' survival. A significant reduction of ROS level induced by carboplatin in the host tissues was noted, along with upregulation of the antioxidant enzymes and glutathione. On the other hand, significant enhancement of carboplatin-induced ROS level in the tumor cells resulted in DNA damage, alteration of mitochondrial membrane potential and apoptotic tumor cell death. The involvement of ROS in MUS-mediated tumor cell killing was further proved by treatment with NAC, which significantly reduced ROS formation in tumor cells resulting reduction of the apoptotic index. A significant reduction of carboplatin-mediated nephrotoxicity was observed by treatment with MUS through induction of Nrf2 signaling, which strengthened the antioxidative defense system of the host animals. MUS also reduced Carboplatin-induced myelotoxicity by MUS, which was evident from the comet assay, chromosomal aberration and micronuclei formation studies. The present study clearly shows that MUS can augment the therapeutic index of carboplatin.

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Invited Talk

Biomonitoring Of Women Bidi Rulers Exposed To Tobacco Dust

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ABSTRACT

In India > 5M individuals are engaged in tobacco-based bid rolling industry. These individuals work in small factories/house-hold based enterprises in an environment laden with tobacco dust. These workers inhale, swallow & expose their skin, mucus surface to significant amount of particulate tobacco. The constituents of it get absorbed into the body & get bioactivated. According to data collected by WHO, 675B bidis are produced and consumed each year in India. Nicotine is rapidly absorbed through the skin when harvesting tobacco, leading to a condition called “green tobacco sickness” (GST). According to case study on female bidi workers handling tobacco has reportedly led to allergic growth of boils in the mouth other symptoms were severe throat burning, stomach pains, giddiness, breathlessness, cramps, joint pains, swelling, palpitations etc. The present study was undertaken in women bidi rollers with the following protocols such as hematological, estimation of urinary cotinine, urinary thioethers and assessment of mutagenic potential in normal & exposed subjects through cytological techniques such as micronucleus assay & analysis of sister chromatid exchanges & CA's in human lymphocytes and Comet assay. The tobacco exposed group comprising of 182 workers out of 600 employees in the industries having duration of services range (16-66 years). The workers were further divided into groups based on the duration of exposure, life style, diet, socioeconomic status and habits such as smoking of bidi or cigarette. For comparison, same matched subjects were selected to serve as control subjects. The results of the present study showed a significant increase in the % of Cotinine & Thioethers were more in women bidi rollers, when compared with control values. The subjects were processed for the cytogenetic biomarkers and the results showed significant increase in the percentage when compared with the controls. The results of this work are expected to throw light on mechanism of cell damage, help in evolving sound criteria for permissible levels of exposure to toxic tobacco dust environment & methods of reducing damage from pollution.

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Invited Talk

Investigations Of Biological Responses To Chronic Low Dose Ionizing Radiation On Human Population Residing In High Background Radiation Areas Of Kerala Coast, India

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ABSTRACT

The effect of physical mutagens such as ionizing radiation (IR) in humans is highly relevant for radiation protection science and public health. Although high doses of IR may cause adverse effects on the living system, the data is inconsistent at low doses of IR. Hence, investigations on the biological and health effects of low dose and low dose rate IR below 100 mSv are essential. The human population living in high-level natural radiation areas (HLNRA) provides an important source of information as the background radiation level may vary ~10-100 times higher compared to normal-level natural radiation areas (NLNRA). The HLNRA of Kerala coast in southwest India is unique because of its vast population size and variation in radiation dose levels, which ranges from <1.0 mGy to 45 mGy/year. A comprehensive program is carried out in this area to determine the effect, response and mechanism of low-dose and low-dose-rate IR on the human population, who have been living for generations. So far, the data do not reveal any adverse health effects in terms of the incidence of birth defects among newborns and the prevalence of non-cancer diseases in the adult population. Cytogenetic investigation and DNA damage endpoints, including DNA double-strand breaks and telomere length attrition, do not show any deleterious effects of LDR on this population. However, efficient DNA repair and various DNA repair pathways are active in the HLNRA population. High throughput analysis revealed abundant DNA damage response, DNA repair, epigenetic and immune response genes, and various survival pathways to be active in HLNRA. Studies using multiple DNA damage endpoints indicated radio-adaptive responses of HLNRA individuals. Integration of biological and epidemiological studies provides new insights into underlying biological mechanisms in response to LDR in this population.

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Invited Talk

Assessment Of Erythromycin Induced Genotoxicity In *Allium cepa* L.

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ABSTRACT

Erythromycin ($C_{37}H_{67}NO_{13}$), Azithromycin ($C_{38}H_{72}N_2O_{12}$) and Roxithromycin ($C_{41}H_{76}N_2O_{15}$) belong to a group of broad-spectrum macrolide antibiotic drugs with essentially bacteriostatic action against gram-positive and gram-negative bacteria as well as other organisms including some species of Mycoplasma, Rickettsia and Spirochaetes and are efficient to inhibit the synthesis of peptides of the sensitive bacteria. The root tips of *Allium cepa* L were treated with different concentrations of antibiotics and sterile water for control for four hours at room temperature. The treated and control root tips were fixed in freshly prepared 1:3 aceto-butanol and squashed in 2% aceto-carmine solution. The results revealed that the increasing concentrations of all three antibiotics gradually reduced the mitotic index from 18.36 ± 0.52 (control) to 03.98 ± 0.16 (5.0%). However, the increasing concentrations of antibiotic solutions gradually induced a variety of chromosomal aberrations such as stickiness, fragment, disturbed metaphase/anaphase, bridge, laggard and micronuclei observed at different stages of mitotic cell division in each treatment. Roxithromycin showed maximum effectiveness. The ANOVA test confirmed the significance of variation due to the action of antibiotic concentrations. The anti-proliferative tendency of mitotic cells due to antibiotic solutions affirms the finding of Xuezheng *et al*. (2012) that may be applicable to the induction of apoptosis. However, an extensive molecular analysis can best understand the mechanism of genotoxicity.

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Invited Talk

Emerging Role Of Microbiome In Oral Squamous Cell Carcinoma: A Metatranscriptomics Study

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ABSTRACT

Oral cancer, predominantly oral squamous cell carcinoma (OSCC), continues to be a major global health burden, with poor prognosis and a 5-year survival rate of < 50 %. It accounts for 377,713 new cases and 177,757 deaths globally each year. In India, around 1,35,929 new cases and 75,290 deaths are reported annually, which is approximately one-third of the total burden of oral cancer globally. The use of smoked and smokeless forms of tobacco, alcohol consumption, and betelnut chewing are the major risk factors. However, 15-20% of all OSCC cases are not associated with known risk factors. In recent years, emerging pieces of evidence have suggested the important role of the microbiome in the development and progression of OSCC. Most studies on the association between microbiome and OSCC have focused on compositional analysis based on 16S RNA sequencing. They have been largely limited to the bacterial component of the microbiome. Here, we used laser microdissection coupled with metatranscriptome sequencing to characterize the multi-kingdom 'Functional' microbiome and host transcriptomes and predict their interaction in OSCC. Analysis was performed on 20 OSCC tumors as well as adjacent normal tissue pairs along with tongue scrapings from 20 matched healthy controls (HC). Analysis of the host transcriptome identified enrichment of known cancer hallmark genes along with several novel splice variants and lnc RNAs. The microbial analysis identified a low abundance yet transcriptionally active, the unique multi-kingdom microbiome in OSCC tissues predominated by bacteria and bacteriophages. Integration of microbial and host data revealed that OSCC-associated taxa were associated with the upregulation of proliferation-related pathways such as E2F targets, MYC targets and G2M checkpoints. The study provides new insight into potential mechanisms by which the microbiome can contribute to oral carcinogenesis.

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Talk

Drosophila melanogaster As A Research Model

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ABSTRACT

Drosophila melanogaster is an excellent model for studying genetics and developmental biology. It has also gained importance for toxicology studies and elucidates the mechanisms of various toxic substances. Nowadays, there is a worldwide effort to reduce the use of higher animals in toxicological research and testing. *Drosophila melanogaster* is a well-established alternative *in vivo* model and is successfully used to screen various environmental agents. The European Centre also recommends the Validation of Alternative Methods (EVCAM) for its use in environmental toxicity monitoring studies. *In vivo* animal studies on rats and other mammals required high operational costs and ethical objections. Therefore, *Drosophila* is an ideal model for studying environmental agents' mutagenic/toxic effects. This model is also widely used for the study of various pathological processes associated with human diseases.

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ORAL PRESENTATIONS

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OP1

Association Between DNA Methylation (5-Methylcytosine) And Pb-Exposure With B Vitamin Deficiencies And Lifestyle Factors Among Pb-Exposed Workers

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ABSTRACT

This study aimed to find an association between DNA methylation (5-methylcytosine) and Pb exposure, as well as B vitamin deficiencies and lifestyle factors in Pb-exposed workers. Among 200 male Pb-exposed workers, B vitamin status (B6, B9, and B12), lifestyle factors, and DNA methylation (% 5-methylcytosine) were determined. Blood lead levels (BLLs) were analyzed using an inductively coupled plasma optical emission spectrometer (ICP-OES). The samples' B vitamin status and % 5-mC were quantified using ELISA methods. Lifestyle factors were collected from the workers using a pre-structured questionnaire. SPSS version 23 software was used for data analysis. The univariate model results showed that the BLLs categories of 10-30, 30–50 and > 50 µg/dL, vitamin B6 and vitamin B9 (folate) deficiency significantly reduced the DNA methylation. In stepwise multiple linear regression analysis, variables such as BLLs (β= -0.302; P = 0.001) and vitamin B9 (β = -0.189; P = 0.001) were negatively and significantly associated with DNA methylation. The constructed model is significant (F=3.030 P=0.001) and influenced by 16.3%. The study findings suggest that Pb exposure, duration of exposure, and lifestyle factors may reduce DNA methylation via epigenetic dysregulation.

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OP2

Therapeutic Potential Of Chrysin Loaded Nanoliposome In Rat Brain Ischemia

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ABSTRACT

Cerebral ischemia results from restricted blood flow in the blood vessels. Chrysin, a flavone, has been reported to reduce infarction following cerebral ischemia. The present study aims to provide an analysis of the effects of chrysin-loaded nanoliposome on ischemic rat brains induced by endothelin-1. The brain's neurological deficit score and infarct area were determined, and histopathological changes were studied post-drug treatment. Antioxidant and anti-inflammatory activities were assessed by measuring superoxide dismutase activity, catalase activity, level of reduced glutathione, brain malondialdehyde, and amount of calcium in the tissue. The expression level of inflammatory molecules was analyzed by western blotting and immunohistochemistry. The infarct area, neurological score and NF-kB expression level were significantly reduced due to the antioxidant efficacy of the formulation. The neuroprotective activity analysis indicated the chrysin-loaded nanoliposome's significant therapeutic potential in alleviating cerebral ischemia.

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OP3

Influence Of PM2.5 On Pro-Oncogenic Signaling Of The Asymptomatic Populations Of West Bengal

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ABSTRACT

The increasing risk of lung cancer is an impending threat posed by particulate matter with an aerodynamic diameter of ≤2.5 µm (PM2.5) exposure. The present study investigated the molecular signaling influenced by PM2.5 in asymptomatic populations' pulmonary and systemic environments (without any chronic disease and addiction). Participants were screened and selected within 2 km radii of PM2.5 monitoring zones in two areas - high PM2.5 [Jadavpur, Kolkata, monthly mean PM2.5-124; 67.5±8.9 µg/m^3; N=75] and low PM2.5 [Boria, Diamond Harbour, South 24 PGNS monthly mean PM2.5-76.06±7.41 µg/m^3, N, 38] during Oct 2021 to Feb 2022. The high PM2.5 exposure caused depletion of hemoglobin and lung function, exacerbated pro-oncogenic drivers like Epidermal growth factor receptor (EGFR)/ Phosphoinositide 3-kinases (PI3K)/AKT/ mammalian target of rapamycin (mTOR)/ Janus kinase 2 (JAK2)/ Signal transducer and activator of transcription 3 (STAT3) and Nuclear factor kappa- B (NFκB), suppressed apoptosis [Bcl-2 Associated X-protein (Bax)/ B-cell lymphoma 2 (BCl-2)], increased cell proliferation (cyclin-D1), Reactive Oxygen Species (ROS) and pro-angiogenic markers [Hypoxia Inducible Factor 1 alpha (HIF)-1α and Vascular Endothelial Growth Factor (VEGF)] than low PM2.5-exposure as evident from the protein and transcript profile of the leucocytes and airway cells. These alterations are at the sub-clinical level, but after a long period of latency, these may manifest as the carcinogenic transformation of lung epithelium. In summary, people residing in high PM2.5 areas are more vulnerable to developing several pulmonary diseases, including lung carcinogenesis, in the near future.

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OP4

Advantageous Role Of Propofol Over Isoflurane On T-Cell Mediated Immune Response In Perioperative Breast Cancer Patients

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ABSTRACT

Onco-anaesthesiology is confronted with the hurdle of immune toxicity in cancer patients. Therefore, the present study investigated the impact of propofol-based intravenous anesthesia and isoflurane-based inhalational anesthesia on T-cell-mediated immune response in perioperative breast cancer patients. Peripheral blood samples were obtained from breast cancer patients anesthetized with isoflurane/propofol as pre (1 day before surgery), intra (during surgery, 1h after incision), and post (48h after surgery). Molecular docking of isoflurane/propofol against CD4 and CD8 was done using the AutoDock vina tool. In comparison to propofol, Isoflurane inhibited helper T cells during the intraoperative period, cytotoxic T cells during the postoperative period, and aggravated the CD4+/CD8+ ratio during the postoperative period irrespective of cancer stage. Molecular docking validated the strong hydrophobic interactions and better binding energy of propofol with CD4+ and CD8+ T cells than isoflurane. Propofol better conserved the inflammatory cytokines IL-8, IL-10, IL-12, and IL-15 than isoflurane. No significant differential effect of isoflurane/propofol was observed on TCR, CD28, and CTLA-4. Propofol proved advantageous over isoflurane in maintaining the pool of helper T cells in the peripheral circulation. The strong bonding of propofol with CD4 and CD8 than isoflurane might have created a protective cover and prevented them from undergoing suppression.

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OP5

Molecular Response Of Telomeres To Ionising Radiation In Human Lymphocytes

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ABSTRACT

DNA-protein structures protect human chromosome ends called telomeres which are sensitive to genotoxic agents such as ionizing radiation (IR). Telomeres are bound by six telomere-specific proteins, together known as shelterin complex. Telomere plays an active role in DNA damage response, aging and carcinogenesis. Therefore, an attempt was made to analyze telomere length attrition, expression of telomere proteins and radio-adaptive response (RAR) in human lymphocytes exposed to acute and chronic radiation. The effect of chronic radiation exposure was carried out on the blood lymphocytes of individuals residing in high-level natural radiation areas (HLNRA) of Kerala. Results showed no adverse effect of low-dose chronic radiation on telomere attrition. IR-induced alteration in the expression of shelterin complex and its associated DNA damage response and repair genes (*TRF1, TRF2, RAD17, CDK2, NEIL1*) was observed. RAR study showed upregulation of *TRF1* after low acute and *TRF2, POT1* after chronic priming dose. Selected single nucleotide polymorphisms of DNA repair genes was also evaluated in HLNRA individuals. *NEIL1,* a base excision repair pathway gene involved in telomere DNA repair, showed differential genotype distribution an increase in basal transcript expression and RAR in HLNRA individuals. Our data suggest an *in vivo* adaptation in telomere maintenance in response to chronic low-dose radiation and differential response of shelterin genes to acute and chronic IR.

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OP6

Lycopene Targets The Proinflammatory Cytokines As Well As Oxidative Stress In Human Cervical Cancer HeLa Cells

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ABSTRACT

Tumor necrosis factor α (TNF-α) is a potent proinflammatory cytokine and has been implicated in the regulation of HPV infection in several *in vivo* and *in vitro* studies. The mRNA expression for cytokines TNF-α, IL-1α, IL-6, IL-10 and IFN-γ were detected in cervical tumors. Reports suggested that TNF- α is found to proliferate metastasis and angiogenesis, suggesting a novel and crucial role in the progression of cancer of the cervix. Furthermore, oxidative stress and redox signaling pathways have been found to implicate the genesis of cancer. Augmented cellular ROS generation due to numerous reasons *in vivo* leads to the activation and up-regulation of the pro-inflammatory cytokine TNF-α gene, i.e., mRNA and protein levels, leading to accelerated carcinogenesis. Thus, if the generation of ROS *in vivo* is regulated by natural antioxidants, carcinogenesis may be regulated or managed. Therefore, natural antioxidants may prove beneficial, and Lycopene can be used as an adjunct in better managing cervical cancer. The mentioned study showed an augmented expression of proinflammatory cytokines (TNF-α, IL-1β and IL-6) in HeLa cells. Furthermore, expressions of these proinflammatory cytokines in HeLa cells were shown to be suppressed by lycopene treatment. The effect of lycopene on the GPx activities and MDA levels in HeLa cells was also studied. The enhanced GPx activity in 24 hours of HeLa cell culture was observed by lycopene at a 30 µg/ml dose. Also, the Malondialdehyde (MDA) levels in our study were found to be significantly lowered by lycopene. So, it can be concluded that the natural antioxidant Lycopene may act as a safe, potentially beneficial and economical therapeutic adjunct in better managing human cervical cancer.

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OP7

Nickel, A Lesser Known Culprit Of Male Infertility

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ABSTRACT

Aligarh region is well known for its lock industry. This lock industry utilizes nickel for electroplating. The industry employs male adolescent labor in bulk, constituting 24% of the workforce. There have been informal reports of infertility in both men and women living in the vicinity of the lock industry. Since the industrial effluents are directly released in the neighboring water bodies, we analyzed field water samples, and the result showed considerable nickel contamination. We further validated our results by exposing male rats to relevant nickel levels in drinking water. This experimental exposure resulted in oxidative stress in rat samples, which was established by increased lipid peroxidation, protein carbonylation and changes in the antioxidant enzyme defense system of the spermatocyte. Biochemical studies showed that nickel damaged the sperm by upsetting the redox scavenging machinery in rats, besides inducing morphological defects in the sperm. A significant decrease in serum testosterone levels on nickel exposure could be due to impairment of the hypothalamic-pituitary-gonadal axis, which further establishes that nickel exposure may lead to infertility in men. Histopathology of testicular samples showed a noticeable amount of architectural alteration on nickel exposure. To the best of our knowledge, this is the first report directly linking industrial nickel exposure to male infertility.

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OP8

Evaluation Of The Toxic Impact Of Nickel Oxide Nanoparticles On Biochemical And Histopathological Parameters Of Gills Of *Heteropneustes fossilis*

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ABSTRACT

The present study aimed to evaluate the toxic impact of nickel oxide nanoparticles on the gills of *Heteropneustes fossilis*. For this purpose, fishes were treated with four concentrations of NiO NPs for 14 days and various biochemical, histopathological, and localization of proteins (metallothionein and CYP1A) were examined. Results revealed increased accumulation of nickel in exposed fishes. Lipid peroxidation and activity of different antioxidant enzymes such as catalase, glutathione s transferase and glutathione reductase increased (except superoxide dismutase) in gills after exposure. Variation in the activity of Na^+/K^+ ATPase was also observed. Furthermore, a histological investigation showed structural damage in the gills of exposed fishes. The level of metallothionein, its expression, the activity of ethoxyresorufin-o-deethylase and the expression of CYP1A also increased in the target tissues of treated fishes. Our results suggest that NiO NPs cause deteriorating effects on the gills of fish. Therefore effluents containing these nanoparticles should be treated before their release into water bodies.

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OP9

Combined Effects Of Salinity And Cadmium On The Antioxidant Defense System Of *Clarias batrachus*

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ABSTRACT

Cadmium (Cd) is a toxic heavy metal, considered a potential toxicant in the aquatic environment. With increasing salinity, the adverse effects of Cd are mitigated. When dissolved in water, Cd can immediately cause physiological disturbances by inducing oxidative stress in fish. The present study aimed to evaluate the combined effects of Cd (5 mg/l) and salinity (30% sea water) on *Clarias batrachus*. After acclimation, fishes were divided into three groups. The first group was exposed to tap water (TW) + Cd, the second group to 30% seawater (SW) + Cd, while the third group remained in TW and served as control. Fish from each group were sampled at 24 hr and 3 and 6 days of the transfer, and the effect of Cd was analyzed by measuring the antioxidant enzyme activities. Catalase (CAT), Superoxide Dismutase (SOD) and Glutathione (GSH) in gills, liver and muscle tissues. Results demonstrated that oxidative stress induced by Cd exposure showed a decreasing trend in the first group (TW + Cd). In the second group (30% SW + Cd), there was an increase in the antioxidant enzyme activities, suggesting that salinity played a protective role against Cd exposure. Furthermore, the salinity could boost the antioxidant defense system. Hence, the role of salinity should be considered when assessing the effect of heavy metals on fish physiology.

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OP10

A Comparison Of Pedigree And Genomic Approach For Homozygosity Determination Among Inbred Humans

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ABSTRACT

The key parameter to comprehend the amount of inbreeding in an individual is the coefficient of inbreeding (F), which can be systematically computed either from pedigree records (F_{PED}) or molecular and genetic information based on runs of homozygosity (ROH) and homozygous loci (F_{ROH} and F_{HOM}, respectively). The present study aimed to investigate and compare the theoretical and realized proportion of homozygosity or autozygosity among the genome of individuals belonging to four subtypes of first-cousin mating in humans. For this purpose, the path coefficient method and Illumina Global Screening Array-24 v1.0 BeadChip, followed by the cyto-ROH analysis, were used to characterize the homozygosity among the participants. The software PLINK v.1.9 detected a maximum ROH and genomic coverage in matrilateral parallel type and a minimum in outbred individuals. The comparison of F_{PED}, F_{ROH} and F_{HOM} showed some difference in theoretical and realized proportion of homozygosity, as expected for sex-chromosomal loci but not for autosome for each type of consanguinity. This is the first study to compare and estimate the proportion of homozygosity among the offspring of first-cousin unions in North Indians. However, a greater number of individuals from each type of marriage is required for the statistical power of reaching the inference of no difference between theoretical and realized homozygosity among different degrees of inbreeding prevalent in humans worldwide.

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OP11

Field Evaluation Of Quantitative And Bio-Physiological Traits Of Cowpea Varieties Treated With Individual And Combined Doses Of Gamma Rays And Sodium Azide

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ABSTRACT

Continuous demand for cowpea is prevalent to meet the food and nutrition demands of the rapidly growing human population, which is expected to increase to 9.6 billion by 2050. Cowpea is a warm-season grain legume often categorized as an orphan crop with immense scope for yield improvement. Compared to other primary pulse crops, the average annual yield of cowpea is less due to the low-yielding potential of existing cultivars. To improve yield, two widely consumed cowpea varieties, Gomati VU-89 and Pusa-578, were treated with different doses of gamma rays and sodium azide. According to the experimental results, lower and higher doses of gamma rays and sodium azide induced a proportional increase and decrease increase in the mean values of traits. Data on ten quantitative and three bio-physiological traits were subjected to one-way analysis of variance and post hoc Duncan's multiple range test. Correlation analysis revealed a highly significant and positive association of yield with pods per plant, seeds per pod and seed weight. Path analysis revealed the maximum direct impact of seeds per pod upon plant yield. This indicated that increasing these attributes could invariably increase the total plant yield. Cluster analysis grouped mutagen-treated and untreated populations into clusters with cluster sizes ranging from 1 to 4. Principal component (PC) analysis of quantitative traits depicted first two PCs with Eigen-value higher than 1 cumulatively contributed 40.46 and 33.47% of the total variation for varieties Gomati VU-89 and Pusa-578, respectively.

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OP12

Assessment Of Oxidative Stress Biomarkers In The Freshwater Catfish, *Wallago attu* Infected With *Isoparorchis hypselobagri* (Digenea: Trematoda)

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ABSTRACT

Parasitic infection in fish is one of the major factors that impede the successful development of the fish industry. *Isoparorchis hypselobagri* is a digenetic trematode parasitizing the swim bladder of the Indian catfish *Wallago attu*. This infection makes the fish unsuitable for human consumption by causing black patches in the muscles and viscera, resulting in significant economic loss. The present study aimed to assess the level of oxidative stress biomarkers of fish infected with *I. hypselobagri*. During the study, we analyzed the activities of the antioxidant enzymes glutathione-S-transferase (GST), superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), and glutathione reductase (GR), as well as the by-products of lipid and protein oxidation, lipid peroxidation (LPO), and protein carbonylation (PC), in noninfected and infected fish blood. A significantly higher level of GST, SOD, CAT, LPO, and PC activity and a lower level of GPx and GR activity was recorded in infected as compared to non-infected serum. It can be concluded that infection of *I. hypselobagri* induces oxidative stress, which results in the generation of reactive oxygen species in the host *Wallago attu* with modulation of the levels of essential antioxidant enzymes and oxidative stress parameters. The present investigation provides a basis for future studies of oxidative stress parameters as potential biomarkers for monitoring the impact of parasitism in fish.

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OP13

Analysis Of Developmental Stage Specific Polypeptides Of *Gastrothylax crumenifer* Infecting Rumen Of Indian Water Buffalo *Bubalus bubalis*

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ABSTRACT

Proteins are an integral component of every biological activity playing a significant role in physiology, and are distributed ubiquitously. During cellular differentiation, the nucleocytoplasmic interactions lead to qualitative and quantitative biochemical changes that ultimately lead to morphogenesis. The proteins are of obvious interest as the development of new structures, and physiological activities are linked with these molecules. The present study involves the detection and analysis of stage-specific polypeptides during the development of an amphistome parasite, *Gastrothylax crumenifer,* which infects the rumen of Indian water buffalo, *Bubalus bubalis*. Coomassie brilliant blue R-250 (CBBR-250) and silver-stained proteins were analyzed, revealing that each developmental stage's proteins separated into a heterogeneous mixture of polypeptides of varying molecular weights. The protein profile has shown quantitative and qualitative differences from one stage to another, besides some fundamental similarities during the development. A total of 22, 25, 30, 34 and 40 protein bands were resolved in 0-day eggs, 4-day eggs, and eggs containing mature miracidium, cercariae and adult stages, respectively. Further, the resolved polypeptides were grouped into three categories, namely (1) Conserved polypeptides: polypeptides that were present in all the developmental stages; (2) Specific polypeptides: polypeptides that were present only in a particular l stage and (3) Variable polypeptides: polypeptides which were present inconsistently during development. It can be surmised that a set of genes controls these three categories and each stage of the life cycle has a corresponding set of the gene. Some of these genes are stage-specific, and others may be active at more than one life cycle stage. These gene sets are switched on and off at an appropriate life cycle point. To localize and characterize these proteins, extensive studies are required to explore their stage-specific expressions and their intrinsic involvement in amphistome biology.

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OP14

Induction Of The Oxidative Stress And DNA damage In Wistar Rats After Oral Exposure To Zinc Oxide Nanoparticles

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ABSTRACT

Nanotechnology is now making headway in different spheres of human lives. This leads to a diverse array of products with applications in diagnosis, drug delivery, the food industry, paints, electronics, sports, environmental cleanup, cosmetics, sunscreens, etc. Among the varieties of engineered nanoparticles being used today, zinc oxide nanoparticles (ZnO-NPs) are one of the most widely used consumer products. They are extensively used in cosmetics and sunscreens because of their efficient UV absorption properties without scattering visible light. Research into the health and environmental concern of metal oxide NPs has increased since the first investigation report was published, which stated that there is a continuous increase in cases of metal oxide NPs generating toxicities in the living system. The majority of these studies have been conducted using *in vitro* systems. However, only a few *in vivo* studies are available, and most focus on respiratory tract exposure. Therefore, the present study has investigated the genotoxicity of ZnO-NPs by comet assay *in vivo* and by biochemical parameters like Superoxide dismutase (SOD), Catalase (CAT) and Reduced glutathione (GSH). Our results conclusively demonstrate that a statistically significant increase was observed in the DNA damage and increased levels of SOD, CAT, total protein and GSH induced by ZnO-NPs at the highest dose when compared to the untreated control ($p<0.001$). ZnO-NPs significantly increased chromosomal aberration. These results suggest the need for a complete risk assessment of any newly engineered nanoparticle before and after its arrival into the consumer market.

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OP15

Evaluation Of The Genotoxicity Induced By ZnO Nanoparticles And Modulation By Thymoquinone

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ABSTRACT

Zinc oxide nanoparticles (ZnO-NPs) are finding increasing application in a wide range of consumer products. The wide-scale use of ZnO-NPs in the world consumer market has inevitably increased the concentration of nanoparticles in the human body, making humans more prone to exposure to ZnO-NPs and resulting in adverse health effects. Mitigating such harmful effects has drawn researchers' attention, especially by using natural products. Moreover, none of the studies have explored the ameliorative effect of thymoquinone (TQ) against toxicity induced by ZnO-NPs. Therefore, the present study aimed to highlight the potential toxic effects associated with ZnO-NPs and the potential prophylactic and protective role of TQ. For this, Wistar rats were exposed to ZnO-NPs via the oral route and TQ by the intraperitoneal route. The chromosomal aberration test, micronucleus test and comet assay analyzed the toxic effects of co-treatment of ZnO-NPs intoxicated rats with TQ. The results showed TQ-mediated protection against ZnO-NPs-induced toxicity. The study suggests that prophylactic TQ supplementation may be beneficial against the toxic effects of ZnO-NPs.

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OP16

Effect Of Cefotaxime In Transgenic *Drosophila melanogaster (hsp70-lacZ)Bg^{9}* As A Marker Of Cellular Damage

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ABSTRACT

Cefotaxime (CTX), a third-generation broad-spectrum cephalosporin, is commonly used as perioperative anti-microbial prophylactic in orthotropic liver transplantation (OLT). It has been reported for adverse effects in humans, showing an increase in serum aspartate aminotransferase level and the occurrence of pseudomembranous colitis. The present study was carried out to evaluate the toxic potential of cefotaxime in the third instar larvae of transgenic *Drosophila melanogaster* (*hsp70-lacZ)Bg 9* . Cefotaxime at a final concentration of 10, 20, 40, 60 and 80 µg/ml was mixed in the diet. The larvae were exposed to the selected doses for 6, 12, 24, and 48 h. The larvae exposed to 40, 60 and 80 µg/ml for 12, 24 and 48 h showed a dose and duration-dependent significant increase in the activity of β-galactosidase, tissue damage, GST, caspase 3 and 9 activity, PC content, apoptosis and the DNA tail length (comet assay) and lipid peroxidation but a decrease in the total protein content and GSH content as compared to unexposed larvae. The result suggests that the cefotaxime is toxic at 40, 60 and 80 µg/ml doses for the third instar larvae of transgenic *D. melanogaster (hsp70-lacZ)Bg 9.*

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OP17

Ropinirole: A Better Drug For The Treatment Of Parkinson's Disease

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ABSTRACT

Parkinson's Disease (PD) is a progressive neurodegenerative disease resulting from the loss of dopaminergic neurons. The motor symptoms, i.e., bradykinesia, rigidity, tremor, and postural instability, are the main diagnostic feature of PD. Several clinical trials have been done for the cure of PD. Ropinirole is a unique non-ergoline D2 or D3 dopamine receptor agonist that helps in the treatment of PD. Many clinical trials were done to study the potency of the drug as a monotherapy for early PD symptoms and as an adjunctive to L-Dopa for treating later stages of PD. The present review highlights the studies carried out for ropinirole and the drug's prospects.

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OP18

Protective Effect Of Rutin Against The Transgenic *Drosophila* Model Of Alzheimer's Disease

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ABSTRACT

A transgenic fly line expressing wild-type human Aβ42 was exposed to rutin mixed in the diet at a final concentration of 100, 150, 200 and 250 µM. The climbing assay, activity pattern, life span, aversive phototaxis suppression assay (APS) along with the estimation of protein carbonyl content (PCC), glutathione-S-transferase (GSTs) activity, glutathione (GSH) content, lipid peroxidation (LPO), acetylcholinesterase activity (AChE), superoxide dismutase (SOD) activity, catalase (CAT) activity, caspase 3 and 9 activities in the brain of treated as well as untreated AD flies (Positive control) were studied. A dose-dependent increase in the life span, delay in the loss of climbing ability, and activity were observed in AD flies exposed to rutin compared to unexposed AD flies. A dose-dependent reduction in LPO, PCC, GST, AChE, SOD, CAT, caspase-9 and caspase-3 activity and an increase in the GSH content was also observed. Histopathological examination of fly brains using thioflavin-S and silver staining has revealed a significant dose-dependent reduction in the expression of Aβ-42 peptides in AD fly groups exposed to 10, 20, 30 and 40 µM of rutin. No gross morphological changes were observed in the brain sections of AD and control flies stained with toluidine blue. Rutin has probably shown its protective effect against AD flies by suppressing acetylcholinesterase activity, preventing aggregation, or enhancing the disaggregation of amyloid plaques in the brain.

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OP19

Effect Of Geraniol Against The Toxicity Induced By Paracetamol

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ABSTRACT

Geraniol is an important terpene alcohol in several aromatic plants' essential oils. It is commercially used as a fragrance compound in cosmetics and household products. Geraniol has a number of biological properties. In the present study, geraniol at the final concentration of 0.0005, 0.0025, 0.0050 and 0.0075 M was mixed in the diet along with the 0.0075 M of paracetamol and the third instar larvae of transgenic *Drosophila melanogaster (hsp 70-lac Z)Bg*^{9} were allowed to feed on it for 24 hrs. The larvae exposed to geraniol showed a dose-dependent decrease in the activity of β-galactosidase, tissue damage, oxidative stress markers and apoptosis. The results suggest that geraniol is potent in reducing the toxicity induced by paracetamol in the third instar larvae of transgenic *Drosophila.*

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OP20

Effect Of Apigenin Against Bis-(2-Ethylhexyl) Phthalate Induced Toxicity In *Drosophila melanogaster*

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ABSTRACT

Bis-(2-ethylhexyl) phthalate is a common member of the phthalates used as plasticizers to make plastic flexible. The present study aimed to study the effect of apigenin (which is a flavonoid and has strong antioxidant and anti-inflammatory activity) on the third instar larvae of transgenic *Drosophila melanogaster (hsp70-lacZ) Bg*^{9} mixed with the Bis-(2-ethylhexyl) phthalate. The third instar larvae were allowed to feed on the diet having various doses of apigenin with Bis-(2-ethylhexyl) phthalate for 24hrs. After the exposure of 24hrs, the larvae were subjected to ONPG assay, X-gal staining, trypan blue exclusion test, oxidative stress markers, and comet assay. A dose-dependent decrease in the activity of hsp 70 expression, tissue damage, trypan blue exclusion test, oxidative stress markers, and DNA damage was also observed. The results suggested that apigenin is potent in reducing the toxicity of Bis-(2-ethylhexyl) phthalate in the third instar larvae of transgenic *Drosophila melanogaster* (hsp70 lacZ) Bg^{9}.

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OP21

Detection Of Clastogenicity And Aneugenicity In Exfoliated Mucosal Cells Of Gutkha And Pan Masala Chewer's By Pan-Centromeric FISH Analysis

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ABSTRACT

Genetic damage can be detected by fluorescent in situ hybridization (FISH) using human centromeric probes. In the present study, FISH was performed on buccal epithelial cells of gutkha and pan masala chewers alone with and without additional tobacco smoking and/or alcohol consumption. The study comprised 1500 male individuals. The present study found the highest frequency of micronuclei without a centromeric region (MN−) among gutkha users who also smoked and drank ($p < 0.05$). A significant increase in cells having micronuclei with a centromeric region (MN+) was observed among pan masala users who also smoked ($p < 0.05$). The study reveals that the clastogenic effects of pan masala/gutkha increase with smoking and alcohol consumption, but aneugenic effects were also observed among the pan masala chewers who smoked.

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OP22

Dietary Selenium Requirement Of *Heteropneustes fossilis* Based On Growth, Biochemical Parameters And Antioxidant Response

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ABSTRACT

Nine isonitrogenous (400 g/kg crude protein) and isoenergetic (17.89 kJ/g gross energy) purified diets with graded levels of supplemented selenium in the form of sodium selenite at the rate of 0, 0.1, 0.2, 0.3, 0.4, 0.8, 1.6, 2.4 and 3.2 mg/kg contributing 0.11, 0.22, 0.30, 0.44, 0.55, 0.93, 1.68, 2.47 and 3.59 mg/kg, respectively were fed to triplicate groups of *Heteropneustes fossilis* to estimate the optimum selenium requirement. Growth performance and conversion efficiencies were found best at 0.55 mg/kg dietary selenium level, followed by no change up to 1.68 mg/kg and then declined significantly in fish-fed diets containing 2.47 and 3.59 mg/kg selenium. Whole body protein and fat content also showed a similar pattern, while moisture and ash remained unaffected. Antioxidant enzymatic activities increased with the increasing dietary selenium levels up to 0.55 mg/kg, followed by no change up to 1.68 mg/kg. Then a reduction was noted in fish fed 2.47 and 3.59 mg/kg selenium diet. However, selenium concentration in the whole body and muscle increased with increasing dietary selenium levels up to 0.93 mg/kg. Then it stabilized, while hepatic selenium concentration increased progressively in all the groups. Broken-line regression analysis of the growth and biochemical data against dietary selenium levels reflected the optimum requirement in the 0.55- 0.61 mg/kg diet range.

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OP23

Effect Of Myricetin On The Cognitive Impairments In Transgenic *Drosophila* Expressing Human Alpha Synuclein In The Neurons

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ABSTRACT

Myricetin is a polyphenolic compound having anti-oxidant activity. It is commonly found in tomatoes, oranges, nuts and berries. Parkinson's Disease (PD) is a progressive neurodegenerative disorder in which specifically the dopaminergic neurons are destroyed. Despite the availability of numerous drugs to ease the life of PD patients, there is no permanent cure. Nowadays, there has been considerable attention towards the use of herbal products due to fewer side effects and the rise of PD patients worldwide. The exposure to myricetin showed a dose-dependent significant improvement in cognitive impairments. The results of molecular docking showed a positive interaction between myricetin and alpha-synuclein**.** Myricetin can reduce oxidative stress and inhibit the formation of alpha-synuclein aggregates, which could prevent the damage of the dopaminergic neurons resulting in the improvement of cognitive impairments.

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OP24

Effect Of Minocycline And Doxycycline On The Rotenone Induced Neurotoxicity In *Drosophila* Model Of Parkinson's Disease

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ABSTRACT

Parkinson's disease (PD) is the second most common age-associated progressive neurodegenerative disorder in which the degeneration of dopaminergic neurons occurs in the midbrain. Despite much research, there is still no cure for the disease. To date, currently available drugs only provide temporary relief by improving or delaying PD symptoms. Therefore, there is a need to find therapeutic agents that can directly work on neurodegeneration by providing the neuroprotective effect to deal with the pathogenesis of PD. The aim of the study is to investigate the neuroprotective effects of minocycline and doxycycline against rotenone-induced neurotoxicity in *Drosophila* as a model of PD. The study has not been performed on minocycline and doxycycline, taking *Drosophila* as a PD model. The study might be helpful in elucidating the mechanism of rotenone-induced PD symptoms. The study will include various oxidative stress markers (lipid peroxidation, protein carbonyl content, glutathione activity, glutathione-s-transferase activity, dopamine content, caspase-3 (drice), caspase-9 (dronc), monoamine oxidase activity, catalase activity, superoxide dismutase activity), antioxidative assays, courtship assay, odor choice index, climbing ability, survival assay, NADH dehydrogenase (complex-1) activity, Immunohistochemistry, Western blotting, Flow cytometry analysis for mitochondrial ROS generation and mitochondrial membrane potential and molecular docking. The study will provide insight into the mechanisms of minocycline and doxycycline for neuroprotection against the toxicity induced by rotenone in *Drosophila*.

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OP25

Studies On Heavy-Metal-Induced Genotoxicity And Associated Antioxidant Defense System In Lentil Genotype (*Lens culinaris* Medik.)

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ABSTRACT

To create novel plant types by introducing genetic variability, induced mutagenesis is regarded as a coherent approach in crop improvement programs. Plant breeders are expected to reassociate the desired gene from the accessible gene pool of the related plant species through hybridization techniques in order to create new cultivars with desired traits and increased yield since desirable genotypes are insufficient. Heavy metals are indispensable components of the ecosystem. The inactivation of enzyme systems and toxicity are the key characteristics of heavy metals. The goal of the current study was to assess the effects of heavy metal, lead nitrate [Pb (NO)], at different concentrations (20, 40, 60, 80 and 100 ppm) on lentil growth performance, physio-biochemical characteristics and DNA damage. Higher concentrations of lead exhibit a decline in growth and morphological characteristics. The highest concentration experienced the greatest devaluation. Different lead concentrations also had an impact on physiological and biochemical features, which decreased as concentration increased. As mutagenic stress increased, lipid peroxidation activity and antioxidant enzymes increased. At higher concentrations of mutagen, it was discovered that the concentration of CAT and SOD increased gradually. There was also a gradual enhancement in the percentage of DNA damage along with variation in morphological traits. The DNA damage was recorded as precocious movement, stray bivalent, laggard, stickiness, disorientation of chromosomes, multi-bridge, disturbed polarity and micronuclei. It was concluded that heavy metal lead could cause DNA damage at higher concentrations, and these chromosomal alterations cause morpho-physiological and biochemical changes in lentils.

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OP26

Nano-formulation Intensifies Anti-Oxidant, Anti-Diabetic And Anti-Inflammatory Effects Of Chrysin In Diabetic Rat Model

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ABSTRACT

Chrysin is a well-known flavonoid possessing variety of therapeutic benefits. In this study, we have evaluated and compared the effects of chrysin and its nanoparticle (NP) in diabetic rat model. Diabetes was induced by alloxan monohydrate injection and the fasting blood glucose (FBG) level was monitored regularly till they become diabetic. The diabetic rats were then treated with chrysin and its NP (50 mg/kg b.w.) for four weeks. After the completion of treatment protocol, OGTT was performed in overnight fasted rats and were later sacrificed with proper euthanasia. Various biochemical assays were performed on blood and tissue samples. A significant decrease in FBG and HbA 1c level and an increase in fasting insulin level was observed in treated rats when compared to diabetic rats. The levels of enzymatic and non-enzymatic antioxidants showed reduction in oxidative stress in case of treated rats. This was further confirmed by a significant decline in the extent of protein oxidation and lipid peroxidation. There was a reduction in organ damage also, as observed by liver and kidney markers as well as histopathological studies. Moreover, the treatment significantly ameliorated the level of inflammatory markers. Chrysin showed anti-oxidant, anti-diabetic and anti-inflammatory effects in diabetic rat model; however, the nano form was found to be significantly more effective than the soluble form.

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OP27

Alterations In Haematological Parameters Of *Channa punctatus* (Bloch) After Cyfluthrin Exposure

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ABSTRACT

Cyfluthrin is a type II synthetic pyrethroid commonly used to kill agricultural and household pests. Indiscriminate use of this pesticide affects a wide range of non-target aquatic organisms including fish. The present study deals with the toxic effects of Cyfluthrin on some haematological parameters of a fresh water fish *Channa punctatus* (Bloch). After acclimatization in laboratory conditions, fish were divided into control and experimental groups. Fish were treated with two sublethal doses (1/10 th and 1/5 th of LC 50) of Cyfluthrin for a period of 30 days. Study revealed that cyfluthrin caused a significant decrease in TEC, Hb conc., Haematocrit and increase in TLC in both the experimental groups. These results indicate that cyfluthrin is highly toxic to fish and should be used with great caution.

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OP28

Food Intake And Utilization By The Larvae Of *Eupterote undata* (Lepidoptera: Eupterotidae)

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ABSTRACT

Eupterote undata, is a potential polyphagous pest which causes significant damage to many crop species of agro forestry importance. It has been recorded defoliating *Bombax malabaricum, Careya arborea, Cedrela toona, Dalbergia volubilis, Erythrina indica, Gamelina arborea, Paulownia fortunei, Populus deltoids, Shorea robusta, Tecoma grandiflora, Tectona grandis, Terminalia* spp. and *Vitex negundo*. During present study, effect of *Tectona grandis* on the growth and development of the larvae of *E. undata* was studied. Various parameters including consumption of leaf, duration of larval period weight of feacal matter excreted by the larvae, average body weight, increase in body weight, consumption index (CI), approximate digestibility (AD), efficiency of conversion of ingested food (ECI) and efficiency of conversion of digested food (ECD) were studied. The larva of *E. undata* has consumed maximum foliage of *T. grandis* during eighth instar larva. CI and Growth rate (GR) were found maximum 13.64 mg/day/mg of body weight and 85.00 mg/day respectively. Approximate digestibility of the larvae of *E. undata* was 82.26% during first instar, whereas ECI and ECD were found 22.35 % and 32.75% respectively during eighth instar.

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OP29

Bio-Diversity And Conservation Of Insects

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ABSTRACT

Biodiversity is one of the important cornerstones of sustainable development and represents the biological wealth of a given nation. Insects comprise the largest group of organisms making up more than 58% of the known global biodiversity. The members of class Insecta are arranged in 29 orders. Insects are important because of their diversity, ecological role and influence on agriculture, human health and natural resources. They inhabit all habitat types and play major roles in the function and stability of terrestrial and aquatic ecosystems. Insects are involved in various vital 'ecosystem services' such as pollination, decomposition, herbivory and biological control as well as contributing directly to human-based economies through silk, lac and honey production (silkworm, lac insects and honey bee). The world is currently facing its greatest ever biodiversity crisis. According to current estimates, 25–50% of living species will become extinct within the next 25-30 years. They are becoming extinct because of habitat loss, over-exploitation, pollution, overpopulation and the threat of global climatic changes. Assuming that there are 10 million species of insects and that 50 % will be extinct in the next 30 years, there will be an average of nearly 19 insect species lost per hour, 456 per day, and 1,65,984 per year. This incredible rate of decline in species diversity dictates that enormous resources be directed to the problem as rapidly as possible so that they can be collected, preserved, and studied before they are driven to extinction. Insects should be collected and preserved in museums and national depositories so as to make these available to other taxonomists. In the present context biodiversity is in great focus. All the signatories of the Convention on Biological Diversity are required to inventory their biological resources. But whatever biodiversity is collected for inventorisation, environmental monitoring, conservation, preservation, commercial use, etc., by environmentalists, ecologists, or other specialists, the first and foremost requirement is the identification and providing scientific names to the species collected which is the job of taxonomists. Only after identification, knowledge gathered on the species by researchers worldwide could be retrieved and used for the benefits of mankind.

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OP30

Few Biochemical Aspects Of *Trioza hirsuta* Crawford (Homoptera: Psyllidae) Induced Leaf Roll Gall Of *Terminalia tomentosa* C & W

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ABSTRACT

Trioza hirsuta Crawford, a gallinaceous insect and a pest of economically important tree *Terminalia tomentosa*. It is one of the most exploited plant which finds wide usage in pharmaceutical, tasar, tanning and timber industry. It is cardio protective tonic, antioxidant, cardiac stimulant, antihypertensive and anti-ischemic. Galls made by *T. hirsuta* are always injurious to the plant growth and metabolism. The psyllid through its feeding action, incite differentiation of a special tissue of nutrition which will be rich in sugar, proteins, amino acids and lipids in addition to a variety of different hydrolysing enzymes. Galls showed significantly higher content of free amino acids proteins, phenol, total soluble sugar, enzymatic activity and lower content of reducing sugars and orthodihydroxy phenol. In young galls, total protein content were very high initially (I nymphal instar stage). It dropped down abruptly (II nymphal instar stage) and reached the peak again (III nymphal instar stage) Hence, it showed higher values at the start of gall growth and declined progressively with ageing. The pH of the healthy leaf with distilled water was observed 7.4 and that of gall tissue 6.0. Few other biochemical aspects were also studied.

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OP31

Integrated Waste Management (IWM): A Holistic Approach To Convert Food Waste Into Raw Materials For Making Other Useful Products

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ABSTRACT

A fast-growing human population is associated with the production of agricultural and horticultural wastes. Every day, tonnes of waste are created from the beginning of food crop cultivation, animal rearing, postharvest processing, value addition, packaging, preservation, distribution, and during and after the consumption of foods. Changes in our lifestyle have increased waste generation, especially during the value addition of raw foodstuffs of plant or animal origin, packing, storage, distribution, and pre-consumption presentation. Every year, around one-third of the food produced worldwide is wasted. The expansion of landfills close to metropolitan cities in terms of number and area also confirms it. Various research has attempted to find a solution to this issue by recycling waste, developing new uses for wastes, or making changes to food processing. However, managing food waste is extremely difficult because even a single activity in our daily lives generates a variety of the waste that cannot be easily handled. Therefore, effective food waste management is critical for choosing a single solution or combining many solution methods at the same time. Food waste management has to be better coordinated at the individual, social, or municipal levels. Municipal offices may integrate individuals or businesses involved in recycling metals, plastics, and glass; the fertilizer and paper industries; and other sectors currently operating independently. Furthermore, each resident or society shall be encouraged to properly dispose of and classify their garbage according to future uses. They may be given a share of the profit while creating revenue from such waste. It is essential to redefine waste as raw materials that have the potential to make money with the involvement of all stakeholders, which may not only eliminate the problems caused by waste creation but is also beneficial to environmental protection.

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OP32

Tribal Diversity In Uttarakhand: An Insight Into The Jaad Bhotiya Tribe Of Uttarkashi District

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ABSTRACT

There are over 53 million tribal people in India belonging to 550 communities of 227 ethnic groups. The Indian Himalayan Region represents nearly 18.5% of the total tribal population in India. More than 175 of the total 573 Scheduled Tribes of India inhabit IHR. Garhwal and Kumaon divisions of the state of Uttarakhand are inhabited by five tribes: Jaunsaries, Tharus, Buxas, Rajis and Bhotiyas. The districts like Pithoragarh, Chamoli, Uttarkashi, Champawat, Udham Singh Nagar, Nainital etc., have more population of these tribal people. According to the 2011 census, the total population of the Scheduled Tribes in Uttarakhand is 3% of the total population of the state. The Tharu tribe has the maximum population, and only a few hundred people represent the Raji tribe. Among these five tribes, the Bhotiya tribe is the trans-human community of Mongoloid origin, inhabiting the high-altitude regions at Indo- Tibetan and Indo- Nepal borders scattered over eight river valleys in Uttarakhand. The Jaad Bhotiya tribe is the ethnic group belonging to Jaad Ganga, a tributary of Bhagirathi which flows through Nelang and Jadung in Uttarkashi district. The Jaad Bhotiya tribe now shows seasonal shifting between two settlements: Beerpur being the winter village and Bagori as the summer settlement. The socio-cultural and occupational background of this ethnic community depicts the Indo- Tibetan origin and is a blend of Hinduism and Buddhism. The Jaad Bhotiya tribe has conserved the knowledge of sheep rearing, agriculture, the wool industry and ethnomedicine practices. The present work is a compilation of the socio-economic, cultural and occupational aspects of the tribe, with an aim to document and conserve the valuable knowledge of the tribe before it diminishes forever.

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OP33

Polymerase Theta: A Novel Molecular Biomarker And Therapeutic Target Forglioma

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ABSTRACT

Low-grade glioma (LGG) is a rare primary brain tumor that develops in young adults, usually between 35 to 44 years of age and is fatal. LGG arises from astrocytes and oligodendrocytes. Depending on the type of glial cell affected, it may be an astrocytoma or an oligodendroglioma. Novel therapeutic targets are needed for effective LGG treatment. One such target may be DNA polymerase theta (POLQ), a DNA polymerase enzyme positively associated with cancer progression and cellular resistance to cytotoxic agents. It is linked to poor prognosis and higher fatality in cancer patients. POLQ is involved in error-prone translesion DNA synthesis (TLS) and double-strand break repair of DNA. The present study used data from the Cancer Genome Atlas (TCGA) to perform gene expression, survival, mutation, and Receiver Operating Characteristic curve (ROC) analysis. We observed overexpression of POLQ in the tumor cells. An inverse relation between the survival rates of LGG patients and the expression level of POLQ was established. We obtained an area under the curve (AUC) value of 0.7 in the ROC curve for POLQ, signifying its role as a diagnostic parameter in LGG. These results were further validated using Chinese Glioma Genome Atlas (CGGA) data. The findings establish POLQ as a possible molecular biomarker and therapeutic target for LGG.

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POSTER PRESENTATIONS

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PP1

Increase In Oxidative Stress, DNA Damage And Trace Element Levels In Asthma Patients

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ABSTRACT

The impact of oxidative stress, genetics, trace elements and environmental factors are involved in the pathogenesis of asthma. Inadequate levels of trace elements can alter the antioxidant property of the human body. The aim of the study was to assess the DNA damage and determine the serum trace elements (Zn, Fe, Cu, and Mg) and heavy metals (Ni, Pb, Cr, Cd and Co) levels in asthma patients and controls. Out of n=300 subjects recruited, asthma patients were n=150, and age-matched controls were n=150 in this study. DPPH assay was used to measure the oxidative stress, and the alkaline comet assay technique was used to analyze the DNA damage in the subjects. In this study, the DNA damage was significantly higher in asthma patients($p>0.05$) compared to controls. The trace elements level in serum was determined by atomic absorption spectrophotometry. The trace elements Zn, Fe and Mg in serum were significantly lower ($p<0.05$) in the asthma patients than in the controls. The heavy metals Ni, Pb, and Cd levels were significantly higher ($p>0.05$) in asthma patients compared to controls. The Comet assay results showed increased DNA damage in asthma patients, which was associated with oxidative stress.

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PP2

Trace Element Level Variations Associated With Human Taste Perception – A Predictive Machine Learning Approach

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ABSTRACT

Trace elements play a significant role in the pathology of various morbidities. Abnormal levels of certain trace elements like zinc have been established to result in taste abnormalities in humans. Taste influences the dietary intake of an individual. Variations in taste could either be the aftermath of certain diseases or indicate the onset of certain morbidities. Recent studies in mice models have demonstrated metal salts' stimulatory and inhibitory effects on taste signaling responses towards various tastants. This study aimed to detect taste perception abnormalities in human samples while orally administered with varying concentrations of Sugar and Monosodium glutamate. Individuals with diabetes (n=210) and age-matched controls (n=187) were recruited for the study. The taste perception analysis was performed using the Labelled magnitude taste scale. About 90.4% of the diabetic individuals showed taste abnormalities (60% hypogeusia, 21% altered taste, 5.2% hyperguesia and 3.3% ageusia), while 44% of the controls were recorded to have abnormal taste perception. Serum trace metals analysis performed using atomic absorption spectroscopy showed statistically significant ($p < 0.05$) deficiency of Zn, Cu, Fe, Mn, Cr and Co and significant elevation of Ni, Cd and Pb in diabetic subjects when compared to controls. Alkaline comet assay performed for selected samples showed a higher degree of DNA damage among diabetic individuals. Predictive models were designed using unsupervised machine learning concepts resulting in 91% accuracy for incidence of taste abnormality due to altered trace element levels. These predictive models could pave the way to early disease diagnosis and subsequent clinical management.

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PP3

Antibacterial Efficacy Of Chitosan/PEO (Polyethylene Oxide) Nanosheet Loaded With Rosmarinic Acid As Dressing Material For The Healing Of Burn Wound Of Diabetic Mice

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ABSTRACT

Effective wound healing requires suitable dressing material depending on the wound character, specifically the diabetic one. Electrospun chitosan/polyethylene oxide nanosheet loaded with rosmarinic acid, a natural polyphenol, is one of the effective dressing materials for burn wounds due to the numerous attributes of nanofiber such as biodegradability, biocompatibility, antimicrobial activity, porosity, high surface area to volume ratio, excellent absorption of exudates curbing the conventional burn wound dressing limitations. Nanosheet was characterized by means of FESEM, XPS, FTIR, and XRD. Bacteria infested in the wound were isolated and identified by means of 16S rRNA sequencing. Significant antibacterial efficacy was studied by means of an optical density test against the identified bacteria viz; *Staphylococcus xylossus*, *Mammaliicoccus sciuri*, and *Bacillus cereus*. The histopathological studies of injured skin showed significant healing efficiency of the sheet. So, chitosan/polyethylene oxide nanosheet loaded with rosmarinic acid can act as an effective burn wound dressing material for diabetic individuals over the conventional one.

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PP4

Identification Of Natural Compounds As Inhibitors Of SphK1 Targeting Lung Cancer

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ABSTRACT

Sphingosine kinase 1 (SphK1) is responsible for the conversion of sphingosine to its phosphorylated form, which is known to participate in cell proliferation, migration, anti-apoptosis, angiogenesis, and allergic and immune responses. The upregulation of SphK1 has been associated with tumor angiogenesis, lymph angiogenesis and radiation or chemotherapy resistance and sensitivity. Overexpression of SphK1 results in the enhancement of tumor metastatic potential and neovascularization across a variety of human tissues. The three-dimensional structure of SphK1 is better understood and has served as a target for inhibition by small molecules and natural compounds. Natural product-based inhibitors of SphK1 are purported to be a potential therapeutic agent for various cancers and inflammatory diseases. Nevertheless, the isoform selectivity of such natural compounds remains to be addressed. The lead natural products, including Baicalin, Naringenin, and Noscapine, have been previously reported from our research group, indicating the attractive scope of refinement based on the substitution patterns. Here, we have analyzed the binding affinity of these natural compounds by fluorescence-binding assay, enzyme inhibition assay, molecular docking, MD simulation studies and in-vitro studies. Natural compounds baicalin showed excellent binding affinity to the SphK1 in the 10^5 M^{-1} range and significantly inhibited the activity of SphK1 with IC_{50} values in the micromolar range. Molecular docking studies revealed that these compounds fit well into the sphingosine binding pocket of SphK1 and could be implicated in the therapeutic management of SphK1-associated diseases.

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PP5

Aberrant Liquid-Liquid Phase Separation And Amyloid Aggregation Of Proteins Related To Neurodegenerative Diseases

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ABSTRACT

Recent evidence has shown that the processes of liquid-liquid phase separation (LLPS) or liquid-liquid phase transitions (LLPTs) are a crucial and prevalent phenomenon that underlies the biogenesis of numerous membrane-less organelles (MLOs) and biomolecular condensates withinthe cells. Findings show that processes associated with LLPS play an essential role in physiologyand disease. In this review, we discuss the physical and biomolecular factors that contribute to thedevelopment of LLPS, the associated functions, as well as their consequences for cell physiologyand neurological disorders. Additionally, the finding of misregulated proteins, which have long been linked to aggregates in neuropathology, are also known to induce LLPS/LLPTs, prompting much interest in understanding the connection between aberrant phase separation and disorder conditions. Moreover, the methods used in recent and ongoing studies in this field are also explored, as is the possibility that these findings will encourage new lines of inquiry into the molecular causes of neurodegenerative diseases.

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PP6

Electrochemical-Aptasensor Based On Origami Technique For The Determination Of Dengue Virus Antigen Utilizing Nanomaterials

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ABSTRACT

The development of point-of-care devices based on paper-based origami biosensors is currently of great interest. These devices highlight how the foldability of paper enables the development of sensitive, selective, user-friendly, intelligent, and sustainable analytical devices for the diagnosis of various diseases. Here, for the very first time, we have demonstrated electrochemical aptasensor-based detection of polyvalent antigen of dengue virus using the paper-folded technique called origami and combining it with aptasensor leads to the development of new notation called OBAs, i.e., origami-based aptasensor which offers numerous benefits to the developed platform, such as, it helps to protect the sample from the air-dust particles, to make it confidential, provide closed chamber to the electrodes. In this work, nanocomposites were also synthesized to enhance the proposed sensor's signal. Herein low-cost, simple, and effective OBAs are constructed without using any expensive laser cutter and 3D printer machines which successfully detected the polyvalent antigen of dengue virus in spiked human serum, showing a good range from 0.0001mg/ml to 0.1mg/ml with a LOD of 0.0001mg/ml. This single-folding ori-aptasensor exhibits excellent sensitivity, specificity, and remarkable performance in human serum assay and could be used in point-of-care testing of different viral infections for remote locations and developing nations, as well as applicable during outbreaks.

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PP7

Protein Glycation And Its Interaction With Sugar

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ABSTRACT

Glycation is regarded as a non-enzymatic modification of proteins, nucleic acid and phospholipid by a sugar. Accumulation of irreversible products of glycation in the cells and intracellular matrix results in disruption of the metabolism of cells, tissues and organs. The basic amino acid constituents of the proteins are more susceptible to undergo glycation, leading to further complications, including protein damage, DNA mutation and other cellular complications, including the generation of ROS. Fructose-mediated glycation (fructosylation) of proteins, which leads to the generation of AGEs, can occur as a result of a high-fructose diet and hyperglycemia. Human Lysozyme and Human Insulin are two biologically important proteins that play a significant role in the human body. In this study, we have examined the glycation of human lysozyme and insulin with fructose. Fructosylation of proteins leads to the formation of AGEs(Advanced Glycated End Products), loss of intrinsic fluorescence and change in secondary structure. These results demonstrate that protein fructosylation leads to the generation of AGEs, their aggregation, and a change in the protein's overall structural integrity.

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PP8

The Amyloid State Of Proteins: A Boon Or Bane?

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ABSTRACT

Proteins and their aggregation is a significant field of research due to their association with various conformational maladies, including well-known neurodegenerative diseases like Alzheimer's (AD), Parkinson's (PD), and Huntington's (HD) diseases. Despite being given a negative role for decades, Amyloids are also believed to play a functional role in bacteria to humans. In this review, we discuss both facets of amyloid. We have shed light on AD, one of the most common age-related neurodegenerative diseases caused by the accumulation of Aβ fibrils as extracellular senile plagues. We also discuss PD caused by the aggregation and deposition of α-synuclein in the form of Lewy bodies and neurites. Other amyloid-associated diseases, such as HD and amyotrophic lateral sclerosis (ALS), are also discussed. We have also reviewed functional amyloids that have various biological roles in both prokaryotes and eukaryotes, including biofilm formation and cell attachment in bacteria to hormone storage in humans. We discuss the role of Curli fibrils in biofilm formation, chaplins in cell attachment to peptide hormones, and Pre-Melansomal Protein (PMEL) roles. The disease-related and functional amyloids are compared with regard to their structural integrity, variation in regulation, and speed of forming aggregates and elucidate how amyloids have turned from foe to friend.

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PP9

Birth Prevalence Of Nervous System Disorders In Newborns: Hospital-Based Study From High Background Radiation Areas Of Kerala Coast, India

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ABSTRACT

The high-level natural radiation (HLNR) area of Kerala coast, India, is unique due to its high population density, limited migration and wide range of radiation dose from <1 to 45 mGy/year and due to patchy distribution of monazite sand containing thorium (8-10%), uranium (0.3%) and corresponding decay products. Neurological disorders like Spina bifida, anencephaly, meningocele, meningomyelocele, encephalocele etc., involving the spinal cord and brain are classified as Nervous system disorders (NSD). Consecutive births were monitored in selected hospitals for congenital anomalies (CA), and the birth prevalence of NSD is reported here vis-à-vis HLNR. Of 204,652 newborns, 129 were identified with NSDs (0.63‰). The prevalence at birth of NSDs was 0.63‰ among newborns from both high (76/120376, >1.50 mGy/year) and normal (53/84276, ≤1.50 mGy/year) level radiation areas. Unlike other CAs in general, NSD was less frequent among male newborns (54 of 104441; 0.52‰) compared to female newborns (75 of 100189; 0.75‰), P = 0.046. Consanguineous marriage appears to be a significant risk factor for NSD (2.43‰ vs. 0.60‰), and there was significant variation in the frequency across different ethnic groups. In conclusion, chronic low-dose radiation prevailing on the Kerala coast does not seem to induce NSD.

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PP10

Evaluating The Inhibitory Potential Of Natural Compound Luteolin On Human Lysozyme Fibrillation

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ABSTRACT

Numerous pathophysiological conditions, known as amyloidosis, have been connected to protein misfolding, leading to the aggregation of proteins. Inhibition of cytotoxic aggregates or disaggregation of the preformed fibrils is thus one of the important strategies in the prevention of such diseases. Growing interest and exploration of the identification of small molecules, mainly natural compounds, can prevent or delay amyloid fibril formation. We examined the mechanism of interaction and inhibition of human lysozyme (HL) aggregates with luteolin (LT). Biophysical and computational approaches have been employed to study the effect of LT on HL amyloid aggregation. Transmission Electronic Microscopy, Thioflavin T fluorescence, UV-vis spectroscopy, and RLS demonstrate that LT inhibits HL fibril formation. ANS fluorescence and the hemolytic assay were also employed to examine the LT's effect on HL aggregation's toxicity. Docking and molecular dynamics results showed that LT interacted with HL via hydrophobic and hydrogen interactions, thus reducing fibrillation levels. These findings highlight the benefits of many polyphenols as a novel, safe therapy for preventing amyloid-related diseases.

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PP11

Naringin Attenuates The Diabetic Neuropathy In STZ-Induced Type 2 Diabetic Wistar Rats

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ABSTRACT

The application of traditional medicines for treating diseases, including diabetic neuropathy (DN), has received great attention. This study aimed to investigate the ameliorative potential of naringin, a flavanone, to treat streptozotocin-induced DN in rat models. After the successful induction of diabetes, DN complications were measured by various behavioral tests after 4 weeks post-induction of diabetes with or without treatment with naringin. Serum biochemical assays such as fasting blood glucose, HbA1c%, insulin, lipid profile, and oxidative stress parameters were determined. Proinflammatory cytokines, such as TNF-α and IL-6, and neuron-specific markers, such as BDNF and NGF, were also assessed. In addition, pancreatic and brain tissues were subjected to histopathology to analyze structural alterations. The diabetic rats exhibited increased paw withdrawal frequencies for the acetone drop test and decreased frequencies for the plantar test, hot plate test, and tail flick test. The diabetic rats also showed an altered level of proinflammatory cytokines and oxidative stress parameters, as well as altered levels of proinflammatory cytokines and oxidative stress parameters. Naringin treatment significantly improved these parameters and helped restore the normal architecture of the brain and pancreatic tissues. The findings show that naringin's neuroprotective properties may be linked to its ability to suppress the overactivation of inflammatory molecules and mediators of oxidative stress.

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PP12

Genotoxicity Induced By Heavy Metals From Sewage Sludge Of Industrial Waste In Microarthropods Found In Irrigation Soil

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ABSTRACT

Heavy metals from the sewage sludge tend to accumulate in the soil after prolonged exposure. Their continuous inflow could prove perilous to living organisms. World health organization (WHO) has set their standard permissible limits of heavy metals in agricultural soils to deflect any health hazard. In our study, we determined the level of heavy metals in the soil samples from the local industrial area. We investigated the genotoxic potential of heavy metals on two soil microarthropods, *F. candida* (Willem, 1902) and *P. isotoma* (Tullberg,1871). We evaluated the extent of basal DNA damage inside the insect tissue using comet and micronuclei assay. In addition, we checked the antioxidant enzyme levels in these test subjects to assess the oxidative stress inside the species by observing oxidative species production, lipid, protein, and DNA damage, and antioxidant enzyme levels. We determined the LC_{50} level of the heavy metals in the species. We found that at LC_{50}, heavy metals can induce genotoxic damage, as observed by DNA breaks in comet assay and the presence of micronuclei. We also observed increased LPO and Protein carbonyl while an apparent decrease in antioxidant enzymes. Our study demonstrated that the accumulation of heavy metals inside the insect tissue leads to oxidative stress and macromolecular damage, which might cause severe depletion of the insects' number from the ecosystem. Hence, industries should limit heavy metal dumping in the sewage and near agricultural land.

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PP13

Synthetic Food Additive Dye 'Quinoline Yellow' Triggers Aggregation In Cationic Bovine Serum Albumin: A Multi-Techniques Approach

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ABSTRACT

The formation of aggregates in proteins plays an important role in the pathogenesis of neurodegenerative diseases like Alzheimer's, type II diabetes mellitus, Huntington's disease and Parkinson's. Several factors like small ligands, temperature and pH are capable of stimulating protein aggregation *in vitro*. Quinoline Yellow, a synthetic anionic molecule, is widely used as a coloring agent for various food products. In the current study, we have investigated the effect of quinoline yellow on the aggregation of bovine serum albumin at two different pHs (7.4 and 2.0). Biophysical methods like turbidity measurement, intrinsic fluorescence, Rayleigh light scattering, Congo Red, ANS, and far-UV Circular Dichroism have been employed to characterize quinoline yellow-induced aggregation in bovine serum albumin. Our results showed that a lower concentration of quinoline yellow (0-60 µM) was unable to induce aggregation, while in the concentration range 80-400 µM QY induces aggregation in bovine serum albumin at pH 2.0 due to electrostatic and hydrophobic interactions. However, at pH 7.4, quinoline yellow was unable to induce aggregation in BSA due to strong electrostatic repulsion between quinoline yellow and BSA. Far UV-CD analysis showed that the secondary structure of bovine serum albumin switched from α-helices to cross-β-sheets upon aggregation with quinoline yellow at pH 2. From the results mentioned above, we can see that synthetic food dyes, mainly quinoline yellow, despite being extensively used in the food industry to improve the appearance, color and flavor of food products, are having a possible detrimental effect, particularly in protein misfolding.

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PP14

Cr Metal Toxicity In *Clarias batrachus* Cultured In North Indian Pond

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ABSTRACT

Anthropogenic pollution caused explicitly by heavy metals is an ongoing concern worldwide, and designing methods for monitoring its release and the subsequent impact on fish health is highly important. Intending to probe the impact of Cr on the health of *C. batrachus* collected from a culture pond near the Aligarh region, tissue samples (liver, stomach, foregut, midgut, hindgut and muscle) were analyzed for heavy metal content. The water samples from the culture pond were analyzed for heavy metal content (Cd, Ni, Cu and Cr). Only Cr was detected and within the permissible limits defined by the World Health Organisation/United States Environment Protection Agency. Tissue damages (dilated central vein, tissue breakage and sloughed tissue accumulation) were observed during histopathological examination of the liver, stomach, foregut, midgut and hindgut.

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PP15

Heavy Metal Induced Histopathological Alterations In Liver And Gonads Of *Cyprinus carpio*

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ABSTRACT

Urbanization plays a major role in developing a country by contributing to sustainable growth by increasing productivity. On the other hand, it has been causing serious damage to the ecosystem. Industrialization, mining activities, agricultural activities and improper waste disposal have led to heavy metals accumulation in urban rivers, which has posed a threat to aquatic organisms, especially fish. The study was conducted to analyze water quality and heavy metal accumulation in fish (*Cyprinus carpio*) from two sites of the Ganges (Kanpur and Narora). Gonado-Somatic Index (GSI), Hepatosomatic index (HSI) and Condition factor (K) indicates the poor health status of the fish. Heavy metal accumulation in muscles, liver and gonads, and histopathology were studied. The Histopathological alterations caused by these heavy metals in different organs include multinucleate gonocytes, variation in the number of germ cells, Leydig cell hyperplasia, phagocytic infiltration, pyknotic nuclei, vacuolization, tissue degeneration. The results indicate Kanpur site is more contaminated than Narora.

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PP16

Neurotensin Receptor-1 Antagonist SR48692 Modulation Of High Fat Diet-Induced Adverse Effects On The Testis In Mice

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ABSTRACT

High-fat diet (HFD) consumption leads to a metabolic disturbance that causes reproductive dysfunctions through hormonal/neuropeptide imbalance. Neurotensin (NT), a tridecapeptide of the gastrointestinal tract and brain, increases fat absorption via NT receptors (I & II) which develops systemic oxidative stress (OS) and ultimately affects reproduction. The present study attempted to elucidate the modulation of NTR-1 antagonist SR48692 against HFD-induced adverse effects on the testis. Swiss albino mice (male, 8 weeks) in four groups were maintained for eight weeks. Group-I standard diet (SD), Group II HFD, Group III and IV mice fed with SD and HFD were administered SR48692 (400 µg/kg-BW) for four weeks intraperitoneally. Antioxidant defense enzymes SOD (38.32%), CAT (29.38%) and GR (39.09%) were decreased significantly, and OS parameter MDA (43.08%) was increased significantly in the testis of HFD mice compared to Group-I. Similar results were obtained in Group III (SD+SR48692) and more detrimental in Group IV (HFD+SR48692) mice. Histopathological alterations in the testis, as evidenced by decreased Johnsen's score, elucidated the deleterious effect of HFD-induced OS, which became more detrimental to the administration of SR48692. This result, opposite as anticipated, could be due to complex interaction between central and peripheral NT-NTR signaling pathways, which needs further investigation.

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PP17

Neurotensin Receptor-I Antagonist SR48692 Modulation Of High-Fat Diet-Induced Hepatic Pathogenesis In Mice

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ABSTRACT

Neurotensin (NT), a tridecapeptide of the brain and the gastrointestinal tract, has a complex role in energy homeostasis. High-fat diet (HFD) consumption enhances endogenous NT secretion that promotes fat absorption via NT Receptors I and II. The gut and liver are physiologically connected by the hepatic-portal system and play a key role in lipid metabolism. Excess lipid accumulation in the liver exerts oxidative stress, which can lead to metabolic disturbances. This study attempts to examine the modulation of NTR-I antagonist SR48692 against HFD-induced hepatic pathogenesis. Swiss-albino mice (8 weeks old) were kept in four groups: Group-I standard diet (SD), Group-II (HFD), Group-III (SD+SR48692 400µg/kg-BW), and Group-IV (HFD+SR48692 400µg/kg-BW) for four weeks. Antioxidant defense parameters such as SOD (27.6%), CAT (24.3%), and GR (36.74%) were significantly decreased, pro-oxidant MDA (53.22%) was significantly increased in the liver of Group-II as well as in Groups III and IV. Histopathological alterations were distinct, as evidenced by ballooning degeneration, cytoplasmic shrinkage of hepatocytes, and infiltration of inflammatory cells in HFD-group exacerbated on SR48692 treatment. As opposed to our hypothesis of antagonism and positive regulation, the SR48692 exacerbates HFD-induced hepatic pathogenesis. This could be due to complex interactions of central and peripheral NT-NTR signaling pathways, which need further investigation.

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PP18

Antiglycation And Antioxidant Potential Of Coumaric Acid Isomers: A Comparative *In Vitro* Study

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ABSTRACT

A comparative analysis of coumaric acid isomers (*ortho, meta* and *para*) as antiglycation and antioxidative agents. Human serum albumin was incubated with glucose in the presence and absence of varying concentrations of isomers at 37°C for 28 days. Spectroscopic studies like UV- visible, fluorescence and CD, along with fructosamine analysis, free lysine estimation, free thiol group estimation and free carbonyl group estimation, were done. ROS production was checked with fluorescence microscopy of isolated lymphocytes using DAPI and DCFH-DA. In glycated protein samples, absorbance and fluorescence increased along with the loss of secondary structure, which was recovered in isomers-treated samples. The amount of fructosamine and carbonyl group was found to be elevated. In contrast, the free lysine and thiol groups were found to be diminished in glycated samples but normalized upon treatment. ROS production in lymphocytes treated with the glycated sample was huge as compared to lymphocytes treated with the native sample and got reduced in lymphocytes when exposed to coumaric acid-treated protein samples. DAPI was used to visualize the apoptotic condition in treated lymphocytes. The *para* form was consistently found to be a better antioxidant and antiglycation agent at 200µM.

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PP19

Impact Of Cadmium Nitrate On Physiomorphological Parameters In *Nigella sativa* L.

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ABSTRACT

Nigella belongs to the Ranunculaceae family and is known to be a cultivated medicinal crop sown for its seeds. The present study was designed to investigate the effects of cadmium nitrate $Cd(NO_3)_2$ on cytomorphological and physiological parameters of Nigella sativa L. treated with five different concentrations (10, 20, 30, 40 and 50 ppm) of the metal. The mutagenic treatments induce mutations affecting germination percentage, plant survival, pollen fertility, plant height and yield. It decreased with the increase of cadmium nitrate $Cd(NO_3)_2$ concentrations. Statistical analysis of the traits showed significant variations at different concentrations of the mutagen treatments.

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PP20

Mutagenic Potential Of Lead Nitrate In Inducing Cyto-Morphological Variations In Medicinally Important Crop - *Linum usitatissimum* L.

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ABSTRACT

Linum usitatissimum L. (Linseed/Flaxseed) is one important crop that offers exciting opportunities for quality improvement. Varieties of *L. usitatissimum* have been bred specifically for oil, fiber, or both (dual purpose). The oil yielded by the plant is high in linolenic acid content. Induced mutagenesis techniques have successfully produced and commercialized many new promising varieties in different crops worldwide, including cash crops. Induce mutagenesis to pave the way to crop improvement by inferring variations in germplasm. The present study aimed to determine the effects of lead nitrate [$Pb(NO_3)_2$] on cytomorphological and growth parameters of flaxseeds in M_1 generation. Fresh and healthy seeds of *Linum* were treated with five different concentrations of lead nitrate [Pb(NO3)2)], i.e., 20, 40, 60, 80, and 100 ppm. Biological parameters like seed germination (%), plant survival (%) and pollen fertility (%) were found to be decreased in the treated population than control. Morphological parameters like plant height, number of branches, and different yield parameters showed significant dose-dependent reduction at the seedling and mature stages. In addition, lead affects the pairing of homologous chromosomes, which results in various meiotic aberrations such as stickiness, precocious separation of chromosome, disturbed polarity with laggards, and stickiness multinucleate conditions etc. Higher lead nitrate concentrations were found to be more genotoxic and mutagenic than the lower concentrations as lower doses did not significantly affect the cytomorphological parameters.

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PP21

Frequency And Spectrum Of M_2 Mutants And Genetic Variability In Cyto-Agronomic Characteristics Of Fenugreek Induced By Caffeine And Sodium Azide

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ABSTRACT

Trigonella foenum graecum L. (Fenugreek) is a valuable medicinal plant cultivated for decades for its therapeutic characteristics. Still, no pronounced improvement concerning wild form was accomplished as it is a self-pollinating crop. Induced mutagenesis is encouraged as a remarkable tool on this plant to circumvent the genetic bottleneck of cultivated germplasms. As a result, develop novel allelomorphic combinations for short-term agronomic attributes. Fenugreek cultivar PEB (Pusa Early Bunching), selected for the present experiment, was mutagenized with five doses (0.2%, 0.4%, 0.6%, 0.8%, and 1.0%) of caffeine and sodium azide (SA) to evaluate its impact on qualitative and quantitative traits of M 1 and M 2 generation conducted in a Complete Randomized Block Design (CRBD), replicated five times during 2019-20 and 2020-21 respectively. The frequency of induced phenotypic variations was assessed in M 2 progenies, resulting in identifying and isolating a broad spectrum of mutants with altered phenotypes. Mutagenic effectiveness and efficiency were found to be maximum at lower concentrations of the mutagen treatments, highest in SA, followed by caffeine. Various morphological mutants with modified characters were observed at different concentrations in M 2 generation. The spectrum of mutations was wider in SA than in caffeine, as caffeine produced 51 while SA produced 54 individual mutants under seven major categories. The maximum frequency of morphological mutants was associated with leaf, followed by plant size, plant growth habit, pod, seed size, seed shape, and seed color. Morphological and structural variations in guard cells of stomata and seeds were observed through Scanning Electron Microscopy (SEM). The variations created in the economically important traits may enrich the genetic diversity of this plant species. Moreover, these morphological mutants may serve as a source of elite genes in further breeding programs of fenugreek.

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PP22

Protective Effects Of *Solanum Lycopersicum* On Cyclophosphamide-Induced Genetic Damage In Germ Cell Of Mice

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ABSTRACT

Cyclophosphamide is an anticancer alkylating agent used regularly in chemotherapy regimens. However, the drug-induced single DNA strand breaks at the molecular level in rat embryos and testicular cells. In the present investigation, the antimutagenic effects of *Solanum lycopersicum* fruit extract have been evaluated using sperm morphology assay against Cyclophosphamide-induced aberrant sperms in the germ cells of mice. Single i.p. administration of *Solanum lycopersicum* fruit extract at different test doses, i.e., 250, 500 and 1000 mg per kg, prior to 50 mg per kg Cyclophosphamide was given to all animals. The animals were killed on the 35th day, and slides were prepared and screened for various types of aberrant sperms such as amorphous, banana, hammer-headed etc. The results indicate the inhibition percentage of aberrant sperms by application of *Solanum lycopersicum* in a dose-dependent manner. Therefore, the data indicate that Solanum Lycopersicum fruit extract is a safer dietary component in cancer chemopreventive therapy.

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PP23

Self-Emulsifying Drug Delivery System-Based Formulation Of Andrographolide Exhibiting Improved Solubility, Dissolution And Pharmacological Activity

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ABSTRACT

The study aimed to prepare and characterize an andrographolide (AD) loaded self-emulsifying drug delivery system (SEDDS) to improve its solubility, dissolution, and effectiveness. SEDDS, an emulsion-based formulation, is a blend of oils, surfactants, and co-surfactants in a suitable proportion that rapidly forms an oil in water (o/w) micro or nanoemulsion with moderate gastric motility when exposed to the aqueous media. In the study, to select the optimized formulation, the excipients (Capryol PGMC, Tween 20, PEG 300, and Transcutol HP) with a maximum solubility of AD were chosen from the solubility study. Subsequently, a 2:1 ratio of surfactant to cosurfactant (Smix) was selected for further work using an emulsification study and a ternary phase diagram. After selecting Smix, various formulations (F1-F9) were prepared with different ratios of oil and Smix. Based on transmittance (>90%), particle size (<200nm), PDI (<0.5), thermodynamic stability, and stability when subjected to different dilutions, the final stable formulation F2 of 181.03±2.9 nm size was selected having increased solubility and dissolution. Also, the formulation showed increased effectiveness against carrageenan-induced inflammation in female Wistar rats.

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PP24

Pattern Of Self-Care Practices In Patients Of Chronic Obstructive Pulmonary Disease (COPD)

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ABSTRACT

Self-care means improving quality of life, reducing hospital admissions, and decreasing dyspnoea in individuals with COPD. Self-care is performed in both healthy and ill states. COPD is the third leading cause of death worldwide**.** The most common self-care behaviors include physical exercise, breathing techniques, respiratory muscle training, and dyspnoea management skills. Bronchial hygiene and secretion clearance are also used to reduce breathlessness. The aim of this study is to find the pattern of self-management practices in patients with COPD. A cross-sectional study was conducted in the Rural Health Training Centre field areas in the Department of Community Medicine, Jawaharlal Nehru Medical College, AMU, Aligarh. The study period was one year (December 2020 - December 2021). All patients of the selected non-communicable diseases above 18 years of age who gave their consent for the study were included. *Written informed consent was taken before starting the interview.* The results reported that about 50% of COPD patients take medicines every day. One fourth of patients was found to be doing some form of physically active and walking daily. Very few were exercising more than or equal to two times a week. About three-fourths of the patients with COPD were not smoking, whereas some were chewing tobacco. Most of the patients could not self-adjust their doses of drugs. Only 41% of patients had ever visited a pulmonologist for their complaint. The lack of access to a pulmonologist, smoking cessation programs, and pulmonary rehabilitation programs in rural areas needs to be addressed for early detection of the disease and proper management.

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PP25

Detection Of Cataracts Using Deep Learning Based Artificial Intelligence

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ABSTRACT

A cataract is the leading cause of visual impairment with a rising global clinical burden. The traditional method of cataract detection involves eye examination using a slit lamp biomicroscope and requires trained expertise by ophthalmologists. Improved diagnostic strategies, monitoring and surgical management became a crucial control steps. This study aimed to systematically review the literature on various Artificial Intelligence (AI) techniques and algorithms based on the Deep Learning method in diagnosing and grading Cataracts. A search was undertaken using PubMed, Google Scholar and ResearchGate. Studies have shown that AI has the potential to revolutionize the current procedure of diagnosis of cataracts and achieved significant progress in developing Deep Learning techniques for detection in the early stages. Previous studies have explored the use of Deep Learning based AI from retinal images, color fundus photographs, and Slit lamp photographs to recent discoveries from Near Infrared eye images. However, AI development in cataract detection is still a little under-explored. Despite the progress, limitations such as a lack of robust, more accurate, high quality and cost-effective options remain challenging. Hence, conducting an in-depth inquiry to identify the challenges will be pertinent.

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PP26

Zygogramma bicolorata P. (Coleoptera: Chrysomelidae) Life Parameters And Efficiency In Controlling The Weed *Parthenium hysterophorus*

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ABSTRACT

The Asteraceae family includes *Parthenium hysterophorus* (Linnaeus), often known as "carrot grass" or "gajar ghans" in Hindi, which is a harmful and aggressive annual weed native to tropical America. One of the sustainable control strategies for *Parthenium* weed is the augmentative release of the host-specific, leaf-feeding beetle *Zygogramma bicolorata* Pallister (Coleoptera: Chrysomelidae). Thus, the life parameters and feeding behavior of *Z. bicolorata* were examined in a laboratory setting at a temperature of 27±1 °C and relative humidity of 65±5% at Aligarh Muslim University, Aligarh, India. It was observed in the study that the female beetle laid 448.50± 47.14 eggs, and the grubs hatched after 3 to 5 days. There were four stages of larva that consumed *Parthenium* for 12 to 18 days. The larvae underwent four molts, with the first instar lasting 3.90±0.83 days, the second instar 3.40±0.48 days, the third instar 4.20±0.74 days, and the fourth instar 3.60±0.48 days, respectively. It entered the soil for pupation after reaching the fourth instar. The beetles emerged after 8-10 days and lived for approximately 56-69 days for males and 59-76 days for females. Additionally, we looked at the net house setup for raising *Zygogramma* beetles in their natural condition and researched several aspects that control the beetle population there. *Both adults and grubs could consume parthenium leave*s. *Zygogramma* is an effective biocontrol agent for the *Parthenium* weed. Therefore, there must be a sufficient mass population of beetles. These findings will enable the multiplication of *Z. bicolorata* for the biological control of *Parthenium* weed.

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PP27

Usefulness Of Silkworm *Bombyx mori* As A Model For Studying Pesticide Stress In Non-Target Organisms

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ABSTRACT

Silkworm, *Bombyx mori,* is an economically important insect that produces silk and is the backbone of the silk industry. Besides their economically important role, the silkworm is used as a model organism in many areas of life science research, including toxicological research. The silkworm fat body is comparable to the mammalian liver as it has the same pharmacokinetics and pharmacodynamics as the mammalian liver. Silkworms can thus be used as model organisms to screen and study the negative effects of xenobiotics. Humans and non-target organisms get exposed to harmful xenobiotics like pesticides which might cause negative health impacts them. To study their effects, silkworms can be used. To do so, we did a study and selected a commonly used pesticide Fipronil. The pesticide stress in a sub-lethal dose was given to the fifth instar silkworm larvae. The fat body of the larvae was harvested post-treatment from day 1 post-treatment to day 5 post-treatment. Biochemical analysis was done on the samples to study the effect of single-dose exposure to pesticides on the fat body. The results revealed that pesticide stress caused oxidative stress in the tissue. The natural antioxidants in the fat body of the silkworm are like CAT. SOD, GST, and GPX were reduced by the treatment of the pesticide, resulting in a disbalance in the equilibrium between ROS production and scavenging, shifting it towards more ROS generation. Oxidative stress also caused lipid peroxidation in the tissue. This study shows the usefulness of silkworms as a model for studying the level of toxicity caused by pesticides on non-target organisms.

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PP28

Survey On General Awareness Of Farmers About Insecticide-Related Agricultural Practices In Aligarh District

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ABSTRACT

Agriculture plays a crucial role in India's economy, and therefore crop yield losses due to insect pests can severely impact the economy. Insecticides play a significant role in protecting crops from pest infestation and also enhancing their productivity. However, over the years, the injudicious use of insecticides has led to problems such as insecticide resistance among insect pests, toxicity to non-target organisms, and environmental pollution. To find out the amount of knowledge possessed by farmers regarding the use of insecticides in agriculture, a survey was conducted in which 60 farmers from six different villages in the Aligarh district were interviewed. A questionnaire was prepared to assess their knowledge of pests, chemical use, sources of information about insecticides, insecticide resistance, and beneficial insects. The farmers were also asked about their preference for the mode of information concerning insecticides. The survey observed that the most commonly used insecticides were chlorantraniliprole, cypermethrin, and profenofos. It was also observed that most farmers interviewed were unaware of insecticide resistance and the use of biocontrol agents. The farmers primarily relied on the recommendations of pesticide sellers regarding insecticides. The majority of farmers were not aware of any agricultural-related apps. Most farmers showed interest in acquiring knowledge about alternative insect control methods. Therefore, it would be beneficial if the information is disseminated through awareness camps, mobile apps or any other mass-media applications.

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PP29

Impact Of Mycotoxicosis On Fish Health And Aquaculture

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ABSTRACT

Plant-based materials are commonly used as alternatives in fish feed because of the limited availability of fishmeal. However, these plant-based ingredients are more prone to being contaminated with mycotoxins. These toxins infect about 25% of global crop foods. However, at the same time, the contamination of some mycotoxins can increase up to 60-80%, depending on various factors. Mycotoxins are natural secondary metabolites produced by filamentous fungi, most commonly by *Aspergillus*, *Fusarium,* and *Penicillium* species. Their exposure can cause chronic or acute mycotoxicosis. The symptoms depend on the exposure of the type, amount, and duration of mycotoxin, the exposed individual (age, sex, and health), dietary status, genetics, and interaction with other toxic compounds. Studies suggest that mycotoxin contamination in fish decreases productivity and can cause hemorrhage, anemia, weight loss, liver impairment, reduced reproductive capacity, increased vulnerability to secondary infectious diseases, and high mortality resulting in heavy economic losses. Mycotoxin-contaminated edible fish has severe impacts on human health. Therefore, further studies are needed to control the contamination of fish feed ingredients from different mycotoxins and their effect on fish health and safeguard aquaculture.

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PP30

Taxonomic Studies On Few New Recorded Species Belonging To Subfamily Tetrastichinae (Hymenoptera: Chalcidoidea: Eulophidae) From Uttarakhand And Uttar Pradesh

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ABSTRACT

Members of the family Eulophidae (Hymenoptera: Chalcidoidea) are cosmopolitan in distribution and occur in almost all terrestrial ecosystems. Most eulophid species are entomophagous; a few are phytophagous, including gall inducers. The paper highlights some newly recorded species during field studies from Uttarakhand and Uttar Pradesh using a swape net and Yellow Pan Trap displayed in the study area for 24 hours. During our studies, nine species of the genus *Aprostocetus*, six species of the genus *Quadrastichus,* five species of the genus *Tetrastichus* and three species of the genus *Neotrichoporoides* of the subfamily Tetrastichinae were recorded. The collected specimens were mounted on slides as well as on cards, and identification was done with the help of the available literature.

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PP31

Description Of A New Species Of *Necremnus* Thomson (Chalcidoidea: Eulophidae: Eulophinae) From India

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ABSTRACT

A new species, *Necremnus narendrani* Raza & Zeya, sp.nov., is described. Both females and males of *N. leucarthros* (Nees) have been redescribed from India. Both species are illustrated. Gibiola *et al*. (2015) revised the European species of the genus *Necremnus* which regulate the population of invasive insect pests such as *Tuta absoluta* (Meyrick) (Lepidoptera: Glechiidae) and *Ceutorhynchus obstrictus* (Marsham) /of tomato and canola respectively in Europe and North America. They also provided the key to European species and described/four new species under the genus. Forty species of Genus *Necremnus* Thomson are known worldwide (Noyes, 2017). However, Narendran (2011) reported that the genus contains only one species, *Necremnus leucarthros* (Nees), from India. In the present paper, we describe a new species *Necremnus narendrani* Raza & Zeya, sp.nov., based on a specimen collected from the Indian Union Territory of Jammu & Kashmir and the other species *N. leucarthros* is newly recorded from the Indian State of Uttar Pradesh.

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PP32

Diversity And Distribution Of Some Indian Genera Of Family Mymaridae (Hymenoptera: Chalcidoida) From Ladakh And J&K

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ABSTRACT

The superfamily Chalcidoidea, comprised of 19 families, has significant morphological, ecological, and biological diversity. One of the most widely distributed, speciose, and physiologically diverse families among Chalcids is Mymaridae. Nevertheless, few people are aware of them since the majority of them are so small (0.11 to 1.5 mm). They can be recognized by the presence of "H-shaped" trabeculae on their head, long marginal fringes on their wings, and widely spaced antennal toruli. All around the world, these insects play a significant part in the management of insect pests in agricultural and horticultural crops. In combination with other biological control agents, Mymarids have the potential to replace carcinogenic chemical pesticides in the management of agricultural pests. Mymarids being a member of the superfamily Chalcidoidea are a well-known group of egg-parasitoids commonly used to control many insect pests in the world (Li, 1994; Smith, 1996). From August 2021 to June 2022, a faunistic survey was conducted in various locations throughout the Himalayan and Trans-Himalayan regions of UT J&K and UT Ladakh. Five Mymarid genera (*Anagrus, Gonatocerus, Polynema, Anaphes, Alaptus*) were recorded for the first time from various locations of the described regions. Indices like the Shannon Index, Simpson's Index of Dominance, Margalefs Richness Index and Berger-Parker Diversity Index were used for diversity calculation.

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PP33

Study Of Aflatoxins Induced Histopathology, Immunosuppression And Oxidative Stress By The Implementation Of Different Biomarkers

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ABSTRACT

Aflatoxins are exceptionally toxic secondary metabolites of fungal genera *Aspergillus* that, if consumed excessively, can have several adverse health effects. Aflatoxins can cause histopathological conditions after being metabolized by liver enzymes and generate excessive reactive oxygen species (ROS). They have also proved to be carcinogenic and have reflected immunomodulatory capabilities. These toxins have been reported to be present in all types of Foodstuffs, dominantly in plant products. The possibility of aflatoxin contamination has increased as a result of recent feed formulations in aquaculture using more plant ingredients. About 20 different Aflatoxins have been derived so far, produced by various species of fungi. Various toxicological studies have demonstrated that aflatoxins have the capability to induce oxidative stress-induced cell injuries, DNA and lipid damage which ultimately leads to tumorigenesis. Aflatoxins reduce overall immune responses like suppression of humoral immune response, serum antibacterial capability, and phagocytic properties of macrophages in various aquatic species. Aflatoxins proved to be one of the essential toxins studied because they affect almost every food ingredient on the planet. In order to prevent contamination, we use oxidative stress markers like Glutathione transferase, Catalase and Superoxide dismutase enzymes as their variation from optimum level reflects contamination. Different interleukins and cytokines are being used as markers for the demonstration of the immunosuppressive capabilities of aflatoxins.

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PP34

Role Of *Trichogramma* As Biocontrol Agent

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ABSTRACT

Genus *Trichogramma* Westwood is being utilized in various biological control programs worldwide. *Trichogramma* spp. are egg parasitoids that lay their eggs inside the host eggs. More than 240 species are known, of which 45 are recorded from India. Genus *Trichogramma* Westwood belongs to the superfamily Chalcidoidea and family Trichogrammatidae, which is characterized by having three tarsal segments. *Trichogramma* spp. are characterized by having female antennae with 2-segmented funicles and one segmented club; discal setae arranged in rows; forewings with sigmoid venation and the presence of RS1 vein. Genus *Trichogramma* is renowned for its wide use in the biological controls of important insect pests of agriculture and forestry worldwide. These parasitoids were exploited to control insect pests of various orders, such as Coleoptera, Hemiptera and Lepidoptera.

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PP35

Clinical Utility Of Green Tea In Maintaining Liver Health: Mechanistic Approaches

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ABSTRACT

The liver is a vital organ that plays a significant role in the body. The burden of liver diseases is rising steadily, mainly contributed by hepatitis, fatty liver disease, liver fibrosis, cirrhosis, alcoholic and drug-induced liver pathologies. To lessen the liver burden, phytoconstituents are assumed to be safer in comparison to synthetic medicines. Green tea is the richest source of polyphenols and is listed in dietary supplements due to its antioxidant, antilipidemic, anticancer, cardioprotective, hepatoprotective, and neuroprotective effects. Its main constituent, epigallocatechin gallate, is reportedly involved in molecular crosstalks with gut microbiota and modulates PI3K/Akt/mTOR pathway during fatty liver disease. It is also reported to decrease the levels of fatty acid transporter protein (FATP, CD36), Fas, CCAAT/enhancer-binding proteins- a (C/EBP- a)□ stearoyl-CoA desaturase (SCD-1) and activates AMP-activated protein kinase (AMP). This abstract provides a compilation of green tea constituents used as a dietary supplement with their contradictory properties in maintaining liver health and related disorders.

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PP36

Improving Diagnosis And Management Of Congenital Cataracts Using Next-Generation Sequencing

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ABSTRACT

Congenital cataract (CC) is a leading cause of childhood blindness worldwide. Its reported incidence ranges from 2.5-3.5 per ten thousand children younger than 15 years, with higher rates in underdeveloped countries. Early identification and diagnosis of CC are essential to reach optimal visual functions. Timely diagnosis of an underlying cause facilitates better managing multisystemic complications and streamlines multidisciplinary care. The study aimed to develop an understanding of an effective diagnosis and management of CC by the implementation of Next-generation Sequencing (NGS) techniques. Internet search engines were used for reviewing the published literature using the keywords 'congenital cataract' and 'Next generation sequencing'. Traditional diagnostic approaches based on clinical assessment have been reactive, expensive, and often unsuccessful in identifying an underlying diagnosis and assisting with genetic counseling. The NGS-based diagnostic method has proved to be an excellent tool for determining the precise genetic cause, clarifying inheritance patterns and defining clinical diagnosis of congenital cataracts. It may confirm the presence of isolated cataracts and exclude systemic associations. This approach improves the rate, efficacy and speed of diagnosis in clinical care. Also, it increases prognostic accuracy by establishing a robust genotype-phenotype correlation between disease prognosis and surgical outcomes.

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PP37

Molluscicidal Effects Of Methanolic Extract Of *Trigonella foenum graecum* Seed On *Lymnaea luteola*, An Intermediate Host Of Paramphistomes

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ABSTRACT

Paramphistomosis is a parasitic gastrointestinal disease infecting the rumen, reticule, abomasums and small intestine of livestock in tropical and subtropical regions. The disease is caused by a massive infection in the small intestine with immature paramphistomes and is characterized by acute gastroenteritis with high morbidity and mortality, particularly in young stocks. Adult rumen paramphistomes render low pathogenicity causing catarrhal and hemorrhagic inflammation in the abomasums, duodenum and jejunum with anemia and hypoproteinaemia. Given the magnitude of infection and economic considerations, it is essential to protect our farm animals. *Lymnea luteola*, *Indoplanorbis exustus* and *Bithinia tentaculata* are important snail species harboring paramphistome infections. Methods controlling paramphistomosis may include control of snails, sanitation and community-based chemotherapy. No single method has been shown to control helminth infection and parasitic transmission. To curb paramphistome transmission, molluscicides may be one of the key strategies. This study aimed to screen the molluscicidal effect of methanolic seed extracts of *T. foenum graecum.* The molluscicidal activity was assessed by determining the ability of various concentrations of the seed extracts to kill adult *L. luteola.* In the present study, we searched for a high-efficiency molluscicide with low toxicity against the freshwater snail *Lymnaea luteola.* The snail *L. luteola* was exposed to various concentrations (ranging from 2 mg/mL to 10 mg/mL) of *Trigonella foenum graecum* methanolic seed extracts. Analysis of the mortality data using the probit regression model has shown the molluscicidal activity of the seed extracts under study. Further, in the present study, molluscicidal effects on some enzymes like Alanine aminotransferase (ALT), Aspartate aminotransferase (AST), Acid phosphatase (ACP), Alkaline phosphatase (AKP) in the hepatopancreas and nervous tissues of *L. luteola* were investigated to determine physiological toxicity and inhibitory potential of *T. foenum graecum* methanolic seed extract. The results showed that the methanolic seed extracts had strong molluscicidal effects close to that of the anthelmintic drug, Albendazole (positive control). The enzyme activities under study decreased significantly at higher concentrations (10mg/ml) as compared to the control (all $p < 0.01$), indicating that *T. foenum graecum* seed extract has the potential value to be used as a novel molluscicide.

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PP38

Promising Therapeutic Role Of Fish Collagen Hydrolysate In Osteoporosis

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ABSTRACT

Osteoporosis is a prevalent metabolic disorder associated with reduced bone mineral density and structural integrity, leading to increased fracture risk. Adverse side effects and toxicity limit the use of commercially available anti-osteoporotic drugs. Accumulating scientific evidence support that collagen hydrolysates have osteogenic potential. Fish collagen can be used as an alternative to mammalian collagen because of the lack of zoonotic disease transmission and religious constraints. It can be obtained from fish wastes such as scales, skin, and bones. Several *in vitro* studies reported that fish hydrolyzed collagen positively affects osteoblast proliferation and differentiation while inhibiting osteoclast resorption. Gene expression studies support that fish collagen induces osteogenic specific gene expression viz Runx2 (Runt-related transcription factor2) and OC (Osteocalcin). Furthermore, studies on animal models of bone diseases have indicated that dietary hydrolyzed collagen may enhance bone metabolism, bone strength, and osteogenesis. Moreover, the assessment of bone turnover markers following collagen intake resulted in a significant decrease in bone resorption, as evidenced by low CTX (C-telopeptide of type I collagen) and high bone-specific serum ALP. However, despite the positive findings on the effect of fish collagen hydrolysates on bone health, further research is needed to examine its effect at the clinical level.

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PP39

Zooplankton Diversity In Sagar Taal At Nawada, Budaun District, Uttar Pradesh, India

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ABSTRACT

Zooplankton is microscopic, free-swimming consumers of aquatic ecosystems such as ponds, lakes, rivers, etc. They form a vital source of food for fish and other aquatic animals. These microscopic creatures are sensitive to changes in water quality. Therefore, the use of zooplankton as bioindicators of trophic structure and pollution of any aquatic ecosystem is universally accepted. The present study was conducted on zooplankton diversity in Sagar taal (latitude 28.0512° N and longitude 79.1305° E), located 2.5 kilometers from Budaun Junction in Nawada village for three months from October 2022 to December 2022. Twelve species of zooplankton belonging to four different groups were recorded. On the basis of species contribution, rotifers formed the most abundant and diverse group indicating the eutrophic character of the selected taal. Diversity indices viz., Shannon -Wiener, Simpson index, Pielou's index, Margalef's index and Menhinck's index were also calculated.

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PP40

Taxonomic Studies On Some Indian Genera Of The Family Encyrtidae (Hymenoptera: Chalcidoidea)

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ABSTRACT

Members of the family Encyrtidae are cosmopolitan in distribution and occur in almost all terrestrial ecosystems. Encyrtids are one of the most effective groups used in the biological control of agricultural and horticultural pests worldwide, mainly in the biocontrol of mealy bugs. They are usually parasitoids of a variety of insect pests of the orders Lepidoptera, Coleoptera, Diptera, Neuroptera and other Hymenoptera, and eggs of ticks and spiders (Arachnids), predominantly; they attack the insects of the hemipterous superfamilies, Coccoidea, Aphidoidea and Psylloidea. In India, it is represented by 610 species in 142 genera. Currently, more than 400 encyrtid parasitoids, including those of mealybugs, have been used worldwide as biocontrol agents. It is to note that the success of any biological control program is primarily based on the correct identification of parasitoids and their hosts at the generic and species level before using them for any biocontrol program.

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PP41

Taxonomic Studies On Some Indian Genera Of The Family Aphelinidae (Hymenoptera: Chalcidoidea: Aphelinidae)

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ABSTRACT

Members of the family Aphelinidae are cosmopolitan in distribution and occur in almost all terrestrial ecosystems. The aphelinids are a major source of the bio-control agent of economically important pest species belonging to the Homoptera group of coccoids, Aphids and Aleyrodids. A number of parasitoids of this family have been used as biocontrol agents against various pest species. In India, it is represented by 21 genera and more than 200 species of the family. All species of aphelinus are endoparasitids of aphids, and the genus has a long association with biological control against aphid pests. It is noted that success or failure in any biocontrol program depends primarily on the correct identification of the host and its parasitoids. Correct identifications are possible when a group is thoroughly studied taxonomically so that taxonomic status is known at a species and generic level prior to using them for any bio-control program.

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PP42

Taxonomic Studies On Some Indian Genera Of The Subfamily Entedoninae (Hymenoptera: Chalcidoidea: Eulophidae)

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ABSTRACT

It is evident that the biological control of a pest species depends on correctly identifying the parasitoids and their host insects. Members of the family Eulophidae (Hymenoptera: Chalcidoidea) are cosmopolitan in distribution and occur in almost all terrestrial ecosystems. The family Eulophidae is divided into four subfamilies– Eulophinae, Euderinae, Tetrastichinae and Entedoninae. Of the four recognized subfamilies of Eulophidae, the Entedoninae is certainly the most derived one. Entedoninae is principally solitary or gregarious primary or secondary endoparasites of concealed larvae, or less commonly, eggs or pupae belonging to Lepidoptera, Diptera, Hymenoptera, and Coleoptera. Many of the genera seem to have quite well-defined host ranges. Most Entedon species attack phytophagous beetles; *Chrysocharis* species parasitize lepidopterous, dipterous and hymenopterous leaf miners; *Omphale* species attack cecidomyiid larvae (Diptera). Entedoninae is currently represented by 33 genera with more than 1200 species from the world. Furthermore, the Indian fauna of the subfamily Entedoninae contains 21 genera and 86 species.

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PP43

Cladoceran Density And Diversity In River Ganga At Narora, Uttar Pradesh

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ABSTRACT

The river Ganga is a symbol of faith, hope, sanctity and culture. This mighty river supports agriculture, animal husbandry, fisheries and tourism and, thus, contributes significantly to livelihood, food and nutritional security. Cladocerans are microcrustacean zooplankton that inhabits almost all inland waters of all nature, viz., lotic, lentic, freshwater, saline etc., and play a significant role in the aquatic food web. Most species eat algae, supplemented with detritus and bacteria and serve as food for predacious cladocerans, mycids, insects, small fishes and many other aquatic animals. The present study was conducted on cladoceran density and diversity in the river Ganga at Narora during the summer, monsoon and winter seasons. On the basis of the study, the density was found to be maximum in summers with the dominance of *Daphnia pulex* and minimum during monsoon season. The physicochemical parameters, water temperature (˚C), pH, conductivity (µS/cm), TDS (ppm), DO (mg/l), and free CO_2 (mg/l) were also studied.

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PP44

Aquatic Toxicity And Its Impact On Fish

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ABSTRACT

Aquatic toxicology is the study of the effects of chemicals and other foreign agents on aquatic organisms. Pollutants, which cause adverse effects, infiltrate the aquatic systems from different sources. The source of water pollutants can be natural, runoff, sewage, agricultural, and industrial waste. Water pollutants may be organic, inorganic, radioactive, pathogenic, agricultural, or thermal. Whereas natural activities such as volcanic eruptions or evaporation can sometimes cause water pollution, the major source of pollutants is a consequence of human activities. Toxic effects are a result of acute (short-term) or chronic (long-term) exposure to chemicals or other pollutants. Consuming contaminated fish or fish products can have acute, subacute, or chronic effects on human health. Toxic effects can be lethal or sublethal, which can influence fish behavior, development, growth rate, reproduction, biochemistry, physiology, and metabolism. Extensive use of chemical fertilizers and pesticides can cause aquatic pollution and compromise environmental health and agricultural sustainability globally. Heavy metal contamination in fish and aquatic ecosystems is a major cause of chemical pollution. Environmental pollution can be mitigated by appropriately disposing of various wastes (industrial, agricultural, and medical).

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PP45

Nanotoxicology And Metabolomic Signatures To Predict Nanotoxicity

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ABSTRACT

When we consider nanoscience and nanotechnology, “nanoparticles (NPs)” hold a special place in them. If material is reduced to the nanoscale (10^{-9} of something), it possesses characteristics that the same material does not possess at micro or macro scales. Indeed the recent success of Covid-19 vaccines is likely to boost public trust in nanotechnology and its global impact over the coming years. However, studies have revealed that the same properties that make Nanoparticles unique could also be responsible for their potential toxicity. Owing to their extremely small size, they may interact directly with macromolecules such as DNA. They may lead to a single-stranded or double-stranded break in them, leading to apoptosis. Following exposure to NPs, the intracellular generation of ROS may sharply increase by inducing ROS bursts in cells. Exposure to nanoparticles also brings about changes in serum metabolites profile. Therefore, metabolomics was considered an effective tool for nano-biomarker discovery, which would further contribute to the exploration of biological monitoring indicators for occupational exposure to nanomaterials. Wide human applications with constrained information concerning their impacts on human well-being firmly demand an assessment of the risks associated with deliberate or accidental exposure to these substances.

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PP46

Deciphering The Mechanism Of JAK/STATs Signalling In The Regulation Of Certain Cytokines During Hepatic Fibrosis

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ABSTRACT

Cytokines are soluble extracellular low molecular weight proteins (glycoprotein) and have anti-inflammatory or pro-inflammatory characteristics. They are produced by nucleated cells in response to injurious stimuli to control metabolism, infection, inflammation and tissue regeneration. In the liver, the JAK-STATs pathway is activated by more than 20 cytokines, growth factors and hepatitis viral proteins, which play a crucial role in antiviral defense, acute phase response, hepatic injury, inflammation and hepatitis. Increasing evidence suggests that cytokines may be utilized as potential targets for therapeutic intervention in a variety of disorders. Literature was screened through Pubmed and Google Scholar during 2000-2022. After careful consideration, cytokines IL-6, TGF-β, TNF-α and IFN-γ were arbitrated to be involved in the hepatic pathogenesis. We also used the respective names of the mentioned cytokines followed by the terms “inflammation”, “fibrosis,” and “severe injury”. Based on the available literature, it may be deduced that JAK/STATs signaling appears to be the principal pathway to regulate cytokines. Hence, targeting these cytokines may be a possible therapeutic intervention strategy to control hepatic fibrosis.

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PP47

Toxicities And Sublethal Effects Of Chlorantraniliprole Insecticide On Life Parameters And Predation Capacity Of Mirid Bug *(Cyrtorhinus lividipennis),* An Important Predator Of Brown Plant Hopper *(Nilaparvata lugens)*

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ABSTRACT

The green mirid bug, *Cyrtorhinus lividipennis* Reuter (Hemiptera: Miridae), is an important predator of brown plant hoppers in the rice ecosystem. Chlorantraniliprole is an anthranilic diamide group of insecticides that is useful against the control of different insect pests. In this study, the effects of lethal and sublethal concentrations of Chlorantraniliprole on the life parameters (mortality, fecundity, fertility, longevity) of the *Cyrtorhinus lividipennis* were evaluated under laboratory conditions. The results showed that the LC50 of Chlorantraniliprole to the adults of *Cyrtorhinus lividipennis* at 24 hours was 26.60 mg a.g. L^{-1} and the sublethal concentrations (LC10 and LC30) had significant effects on the life parameters and predation capacity of *Cyrtorhinus lividipennis* as compared to control. Fecundity and fertility were reduced by 12.64% and 16.35%, respectively, in the LC10 dose, whereas 20.25% and 28.58% were in the LC30 dose compared to the control. However, a significant dose-dependent decrease in the longevity and predation capacity of adult males and females was observed. The results revealed that sublethal concentrations of chlorantraniliprole negatively affected the biological parameters, development, and predation capacity of *Cyrtorhinus lividipennis.* Our findings suggested that the use of this insecticide needs to be more attention as a part of integrated pest management strategies.

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PP48

Modulatory Effects Of Turmeric On Cisplatin Induced Toxicity On Germ Cells And Morphology Of Sperms In Swiss Albino Mice

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ABSTRACT

Cisplatin is an anticancer drug used for the treatment of cancers such as Ovarian, Cervical, Testicular etc. carcinomas. The majority of antineoplastic agents cause DNA damage within years of cessation of chemotherapy by generating free radicals and are responsible for secondary malignancies observed in animals and cured patients treated with Cisplatin. Much attention has been focused on reducing Cisplatin's mutagenic effects with the application of plant extracts. In the present study, the antimutagenic effects of Turmeric against Cisplatin-induced genotoxicity in the mouse using Chromosomal Aberrations (CAs) in germ cells and sperm morphology assay. Three different doses (10, 20 and 40 mg/kg) were selected for modulating capacity on the mutagenicity of Cisplatin(10 mg/kg) in germ cells of mice. Turmeric alone did not induce any significant variant in the incidence of CAs and aberrant sperms. Pre-treatment with Turmeric for 7 consecutive days and a simultaneously single dose of Cisplatin reduced the frequency of CAs and aberrant sperms significantly. Thus, the results suggest Turmeric's protective nature for the chemotherapy regimen application.

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PP49

Protective Effect Of Fenugreek (*Trigonella foenum-graecum*) Leaf Extract Against Methyl Methanesulfonate (MMS)-Induced Toxicity In The Third Instar Larvae Of Transgenic *Drosophila melanogaster* (*hsp70-lacZ*) Bg^9

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ABSTRACT

Fenugreek (*Trigonella foenum-graecum*) is one of the oldest known medicinal plants, used as a herb (dried or fresh leaves), spice (seeds), and vegetable (fresh leaves). In recent years, it has been known to have antidiabetic, anticarcinogenic, hypocholesterolemia and antioxidant, antibacterial agent, hypoglycemia, gastric stimulant, and anti-anorexia property. The present study aims to study the effect of fenugreek leaf extract (FLE) (*Trigonella foenum*) against the methyl methanesulfonate (MMS)-induced toxicity in the third instar larvae of transgenic *Drosophila melanogaster* (*hsp70-lacZ*) $Bg^{9.}$ Fenugreek leaf extract was administered to the diet at the concentration of 0.002 g/ml, 0.01 g/ml, 0.02 g/ml, and 0.04 g/ml of third instar larvae previously subjected to MMS at 80µM alone for 24 hrs. After 24 hrs of treatment with fenugreek leaf extract, the larvae were subjected to ONPG, X-gal, trypan blue exclusion test, oxidative stress markers and comet assays. A dose-dependent decrease in the activity of β-galactosidase, tissue damage and oxidative stress markers after exposure to fenugreek leaf extract. Decreased DNA damage was observed in fenugreek leaf extract-treated larvae compared to larvae exposed to MMS alone. The results suggest that fenugreek leaf extract reduces the toxicity caused by MMS in third-instar larvae of transgenic *Drosophila melanogaster* (*hsp70-lacZ*) Bg^9.

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PP50

Ameliorative Action Of Antioxidants Against The Toxicity Induced By Nanoparticles

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ABSTRACT

In recent years the development of nanoparticles has expanded into a broad range of clinical applications. Nanoparticles are used in many products for drug delivery, as biosensors, in biotechnology and agriculture, and as ingredients in cosmetics and food supplements. Besides, NPs may cause serious health effects when exposed to the body through ingestion, inhalation, and skin contact. When NPs come in the vicinity of the cellular system, chances of uptake become high due to their small size. Hence interest has increased among researchers to provide a possible therapeutic agent or natural antioxidant for the amelioration of NPs-induced toxicity. This review highlights the therapeutic effect of antioxidants against NPs induced toxicity through monitoring the alteration of liver enzyme activity, antioxidant defense mechanism, histopathological alterations, and DNA damage. Also, the mechanisms involved in the development of NP induce oxidative stress, and protective mechanisms using different antioxidants have been explored. It may be concluded that antioxidants can be used as protective agents against NPs-induced toxicity.

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