International Toxicology Convention on

Emerging Approaches in Risk Analysis and Translational Aspects of Health and Environment (EARTH)

November 27-30, 2024

BOOK OF ABSTRACTS

ORGANIZED BY

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CSIR-INDIAN INSTITUTE OF TOXICOLOGY RESEARCH

LUCKNOW, INDIA

Association of Toxicologists and Risk Assessors (ASTRA)

Science for Safety, Health and Environment

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OP-1

Determining the Neural Stem Cells fate at NLRP3, -SIRT3 and -Dna2 axis during experimental stroke

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This study explores the roles of NLRP3, SIRT3, and Dna2 in modulating oxidative stress and DNA repair in neural stem cells (NSCs) subjected to oxygen-glucose deprivation (OGD), *in vitro* model to mimic stroke study, with a focus on their potential as therapeutic targets to mitigate ischemia-induced cellular damage. NSCs were exposed to OGD to simulate ischemic conditions, and levels of NLRP3, SIRT3, Dna2, and AcSOD2 were assessed. Genetic and pharmacological approaches, including knockdowns of NLRP3 and SIRT3 and treatment with Nicotinamide Riboside (NR), were employed to determine the roles of these proteins in oxidative stress and DNA damage responses. The results indicated that OGD led to increased levels of NLRP3 and AcSOD2 while reducing Dna2 and SIRT3 expression, reflecting elevated oxidative stress and compromised DNA repair capacity in NSCs. Knockdown of NLRP3 restored levels of Dna2 and SIRT3 and reduced AcSOD2, suggesting its involvement in oxidative stress regulation. In contrast, SIRT3 knockdown heightened oxidative stress markers, underscoring its protective role. Overall, these findings identify NLRP3, SIRT3, and Dna2 as critical regulators of oxidative stress and DNA damage response in NSCs under ischemic conditions. Targeting these proteins may offer a promising strategy for reducing neural damage associated with ischemia, warranting further investigation *in vivo*.

OP-2

A comparative gene expression profiling of HSPA and DNAJ families under different stress conditions

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Protein aggregation diseases such as Alzheimer's disease, Parkinson's disease, and Huntington's disease, are characterized by the accumulation of protein aggregates that hamper cellular proteostasis and are major concerns of public health. Various environmental and genetic factors are associated with protein aggregation diseases that promote protein misfolding and aggregation and disrupt proteostasis. The cellular quality control system comprising molecular chaperones and degradation machinery maintained cellular proteostasis. HSPA is the major family of molecular chaperones that promote protein refolding, disaggregation and degradation under stress conditions, to keep cellular proteostasis in check where the multifunctionality of HSPA is regulated by DNAJ proteins. The effect of different stress inducers on the expression and functions of HSPA and DNAJ proteins is yet unknown. Therefore, in the present study, we analyzed the gene expression of HSPAs and DNAJs in SH-SY5Y cells under different stress conditions and validated the gene expression via real-time PCR. Using the STRING algorithm, we checked the potential functions of HSPA and DNAJ that were affected by stress conditions. We observed a stress-dependent differential expression of the HSPAs and DNAJs in SH-SY5Y cells and identified their stress-specific functions. These differentially expressed HSPAs and DNAJs may be checked further for their specificity, and direct targeting of such DNAJ without altering the functioning of HSPA might act as therapeutic targets for protein aggregation diseases.

OP-3

Mortalin as a Therapeutic Target in Esophageal Cancer

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Background: Rising incidence of esophageal cancer (EC) is a major global concern, with around 500,000 new cases and 445,000 mortality reported in 2022. In India, EC is the fourth leading cause of cancer-related mortality, with risk factors such as alcohol and tobacco consumption, along with late-stage diagnosis and limited healthcare access, are major driving force to its rapidly increasing incidence. Therefore, identification of new therapeutic target is imperative for better management of this malignancy. Over the years, studies have shown that overexpression of Mortalin, a heat shock protein, affects the treatment outcome, relapse and survival in patients afflicted with breast, colon, liver and ovarian cancers. Hence, in this study, we investigated the role and therapeutic significance of mortalin in EC.

Methods: We performed *in silico* and *in vitro* studies to examine the involvement of mortalin in EC. Assays such as MTT, colony formation, cell cycle progression, apoptosis, scratch-wound healing and Boyden chamber assays were performed using control, mortalin-inactivated as well as withaferin A (WiA) treated EC cells. Molecular markers of Akt signaling and EC hallmarks were also evaluated in control, mortalin-inactivated and WiA-treated cells by immunoblotting.

Results: Our investigation revealed the significant upregulation of Mortalin in EC cells and tissues, with its overexpression correlated with advanced stages and high-grade of the disease. Mechanistic studies involving the knockdown of mortalin in EC cells showed the modulation of the Akt/mTOR signaling pathway and various molecules such as survivin, p53, p-wee-1, cyclins, caspases, VEGF-A, MMPs and cadherins. Thus, Mortalin emerges as a potential biomarker, warranting for targeted inhibition. Further studies, involving treatment of EC cells with WiA, a steroidal lactone derived from *Withania somnifera*, exhibited significant downregulation of Mortalin and its associated oncogenic cascades in EC.

Conclusion: Mortalin regulates Akt signaling and various molecules associated with EC hallmarks, demonstrating as a potential biomarker, and hence the exploration of its targeted inhibition by WiA offers a prospective approach for the management of EC.

OP-4

Role of UNK like Zinc Finger (UNKL) in metastatic transformation of Oral Squamous Cell Carcinoma

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Oral squamous cell carcinoma (OSCC), is the 3rd most prevalent cancer in India with 5-year survival rate swooping around 60%. Its poor prognosis and high chances for metastasis is a big hurdle in its management. Statistically, reports suggests that more than 30% of OSCC patients with clinically N0 neck exhibit metastasis thus hereby we are trying to find a novel approach to inhibit this transition by targeting a gene UNKL, an RNA binding Zinc finger protein. Some recent studies suggested its potential role in cancer. We performed bioinformatic analysis of TCGA database using GEPIA tool and found overexpression of UNKL in OSCC cases compared to control. We performed a novel *ex-vivo* metastasis assay to study primary as well as metastatic states of given primary and SCC-9 cells & performed RNA sequencing between these two states. The results of above experiments validated through RT-PCR revealed that the expression level of UNKL (23.33fold up, p-value=0.002, SD±0.228 in SCC-9 & 4.98fold up, p-value=0.004, SD±2.95 in primary OSCC cells) and its variants (UNKL-202, UNKL-204, UNKL-205) were upregulated in metastatic state when compared with the primary state. Also, we investigated the same in the primary and metastatic OSCC tissue samples through RT-PCR & found a higher expression of UNKL (2.07fold up, p-value=0.02, SD±0.926) and its variants in the metastatic patients. We have also performed spheroid assay with SCC-9 cells and UNKL (9.72fold up, p-value=0.003, SD±0.761) was found upregulated suggesting its role in maintaining the stemness of cancer cells. Gene expression data generated from this study suggests role of UNKL in OSCC metastasis & prognosis. Genetic ablations or chemical inhibition of UNKL can be novel approach for metastatic prevention and better prognosis.

OP-5

Human iPSC-derived 3D spheroids to assess the chemical-induced neurotoxicity: The proteomic-miRNA biomics approaches

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Induced pluripotent stem cell (iPSC)-derived 3D models serve as a crucial link between 2D *in vitro* culture and *in vivo* animal studies, enhancing understanding of chemical-induced neurotoxicity. Combining high-throughput biomics profiling with 3D spheroids further enhances predictions of vulnerability to environmental toxicants. We generated hiPSC-derived neural progenitor cells (NPCs) and cultured them in 2D and 3D spheroids. Exposure to 5 µM Sodium Arsenite for 24 hours revealed distinct responses. Biomics profiling identified significant changes in protein expression, with 2D cultures showing 104 upregulated and 302 downregulated proteins, compared to 19 upregulated and 39 downregulated proteins in 3D cultures. The affected pathways included mitochondrial energetics, ubiquitin-proteasome, endoplasmic reticulum proteostasis, autophagy, cellular translation, transcription, cell cycle, cytoskeletal integrity, cellular migration, and differentiation. Changes in microRNA expression, specifically miR-143, miR-155, miR-200b, miR-92a-1*, and miR-124-5p, negatively regulated target protein expression. The cellular kinetic analysis detected Sodium Arsenite-mediated bioenergetics changes in 2D cultures but not in 3D spheroids cultures. The study highlights the importance of cell organization in toxicity assessment, with 2D cultures exhibiting higher sensitivity due to increased Sodium Arsenite internalization. These findings demonstrate the potential of 3D culture systems for assessing neurotoxicity in a more *in vivo*-like context, providing valuable insights for toxicity testing and neurodegenerative disease research. The results underscore the significance of considering cell organization and spatial structure in toxicity studies, emphasizing the advantages of 3D culture systems over traditional 2D models.

OP-6

Restoration of chemical-induced neuronal damages using paracrine secretions of cultured human mesenchymal stem cells

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Mesenchymal Stem Cells (MSCs) possess reparative and restorative capabilities through their paracrine secretions, known as the secretome. We, therefore, aimed to characterize the MSC secretome under both unprimed and primed conditions and explored its restorative effects on Monocrotophos (MCP), a known neurotoxic organophosphate pesticide, exposed Neural Progenitor Cells (NPCs). Secretomics analysis revealed that the MSC secretome is enriched with proteins involved in glycolysis, oxygen transport, anti-inflammation, and cell proliferation. Treatment with MSC secretome restored oxidative stress and mitochondrial membrane potential in MCP-exposed NPCs. Bioenergetic profiling showed impaired mitochondrial activity in MCP-exposed NPCs, with decreased oxygen consumption rate, basal respiration, maximal respiration, and non-mitochondrial respiration. However, treatment with MSC secretome restored these mitochondrial parameters. Bioinformatics analysis identified proteins BAK1, BCL2, BIRC6, and CASP8 as key players in apoptotic pathways and COX5B and NDUFA10 in mitochondrial damage in MCP-exposed NPCs. Notably, treatment with primed MSC secretome restored protein levels. This study demonstrates the MSC secretome's potential to restore cellular homeostasis and immunomodulation in acute neurotoxicity. The findings highlight the therapeutic potential of MSC secretome in mitigating neurotoxicity and promoting neural repair. The MSC secretome's restorative effects on MCP-exposed NPCs suggest its potential as a therapeutic tool. By modulating apoptotic pathways and mitochondrial damage, the MSC secretome contributes to cellular homeostasis and immunomodulation in acute neurotoxicity.

OP-7

Polystyrene Microplastics Promote Renal Fibrosis by Accelerating TGF-β Mediated Epithelial-to-Mesenchymal Transition in Mice and NRK-52E Cells

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Microplastics (MPs), recognized as emerging environmental pollutants, can accumulate in the kidneys, making these organs highly vulnerable to MP-related toxicity. In this study, we examined the impact of polystyrene microplastics (PS-MPs, 1 µm) on eight-week-old Balb/c male mice and NRK-52E cells. The mice were treated for 28 days with a human-equivalent concentration. PS-MPs were found to be accumulated in mice kidney tissue as well as in NRK-52E cells. Findings revealed a notable rise in serum creatinine levels and a reduction in the glomerular filtration rate, indicating impaired kidney function. Additionally, upregulation of injury markers (KIM-1, NGAL, β2M), and epithelial-to-mesenchymal transition (EMT) genes (TGFβ, α-SMA, Fibronectin, Collagen IV, Twist, and Vimentin), were observed in mice, indicating kidney fibrosis. PS-MPs exposure led to persistent oxidative stress and promoted renal fibrosis, evidenced by increased expression of mesenchymal markers such as α-SMA, fibronectin, and collagen IV, while epithelial markers like E-cadherin were downregulated in *vitro*. The study highlighted the pivotal role of TGF-β mediated EMT, which drives fibrosis. Overall, this research presents new evidence linking PS-MPs to renal fibrosis, adding to our understanding of how plastic pollution may negatively impact human health.

OP-8

Mechanism of Bisphenol-A Mediated Effect(s) on Mitochondrial Trafficking in the Rat Hippocampus: Implication on Neurogenesis

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For the neuronal function and survival, it is essential proper distribution and transportation of mitochondria to specific location in neuron where ATP supply and calcium buffering are in high demand. BPA, a known xenoestrogen, found in consumable plastics products, causes neurodegeneration in the brain, contributing to cognitive and motor deficits after chronic exposure. Our earlier studies suggested that BPA exposure reduces neurogenesis by abnormal mitochondrial dynamics and biogenesis through impaired mitochondrial fission protein, DRP1 and import protein, GFER respectively. Therefore, any damage in mitochondria and mitochondrial trafficking factors impaired its trafficking. Herein, we have investigated the effects of BPA exposure on trafficking motor protein (Kinesin-1 and Dynein) responsible for bi-directional mitochondrial movement in the NSC derived neuronal culture and in rat brain hippocampus. We found that, BPA exposure reduced mRNA expression and protein levels of Kinesin-1 and Dynein and increases SNPH (mitochondrial static anchor protein) levels in rat hippocampus. BPA exposure both in vitro and in vivo caused significant reduction in colocalization of Kinesin-1 and Dynein with Nestin, NeuN and β-III tubulin indicating impaired mitochondrial trafficking during neuronal proliferation and differentiation. In silico docking studies confirms Kinesin-1 and Dynein as potential targets of BPA. Transmission Electron Microscopy (TEM) results showed decreased mitochondrial number in axon with damaged cellular architecture and impaired synapse by BPA exposure leading to impaired cognitive functions in the hippocampus. Thus, above findings suggested that, BPA exposure caused reduced anterograde and retrograde transporter protein level, which may reduce the number of moving mitochondria towards both the direction as well as increased the number of stationary mitochondria inside the neuron. Therefore, caused disturbed mitochondrial distribution and homeostasis balance in neuron, caused synaptic vesicles/synapse degeneration, impaired NSCs proliferation, leading to cognition deficits in rats.

OP-9

Perinatal arsenic exposure-induced microglial miR-129-5p mediates increased synaptic pruning leads to learning and memory impairment in mice

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Arsenic exposure is known to induce neuroinflammation and cognitive dysfunction, but the role of microglia, the brain's resident macrophage, in these processes is remains an active area of research. Our previous work demonstrated that arsenic down-regulates CD200R1 on microglia via miR-129-5p, leading to neuroinflammation and impaired learning and memory responses in perinatally exposed mice. In this study, we further investigated the role of microglial miR-129-5p in arsenic-induced learning and memory deficit in perinatally arsenic-exposed pups at PND22. Arsenic exposure post-transcriptionally down-regulates Rock1 via up-regulated miR-129-5p to enhanced microglial phagocytosis. This enhanced phagocytosis led to increased uptake of PSD95, a synaptic protein, by microglia, resulting in its reduced expression only in protein level and decreased synaptic spine density in the hippocampus suggesting increased synaptic pruning. Interestingly, inhibition of miR-129-5p in perinatally arsenic-exposed pups significantly restored the level of PSD95 protein, synaptic spine density and reversed learning and memory impairments. Altogether, our findings suggest that perinatal arsenic exposure induces microglial miR-129-5p-mediated synaptic pruning, contributing to learning and memory deficits in mice pups.

OP-10

A study on interdependent estrogen receptors and BMP2/Smad signaling in BPS and BPF induced motor dysfunction in female rats

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Bisphenol S (BPS) and BPF, have xenoestrogenic properties found in polycarbonate plastics and epoxy resins, are considered safer substitutes for prohibited BPA even in India. However, existing literature raises concerns about the safety of these alternatives as they may leach from plastics containers. Research indicates that BPS and BPF may breach the blood-brain barrier (BBB), emphasizing the need for additional safety investigations. Although, the insufficiency of data regarding the toxic effects of BPS and BPF in the brain, especially in the cerebellum responsible for motor coordination functions, underscores the necessity for more thorough investigations. Here, we explored the involvement of estrogen receptors (ERα and ERβ), which contributes to cerebellar functions. Administering BPS and BPF at environmentally relevant doses to postnatal day-60 (PND60) female rats demonstrated a decrease in cerebellar ERα and ERβ levels at PND120. To look at other underlying factors, we assessed Bone morphogenetic protein (BMP2/Smad) pathway, which participates in neuronal functions. We primarily examined that BMP2 levels and its components, BMPR2 and pSMAD which are also decreased at PND120. Additionally, treatment with ERα and ERβ-agonist, PPT and DPN restored the BMP2 level and BMP2 recombinant protein increased the ERα and ERβ levels, suggesting a link between ER and BMP2/Smad signalling pathway. Our findings indicate that BPS and BPF impair neuronal survival and mature neuronal marker as assessed by Nissl staining and NeuN levels. Further we explored the Rota rod and Grip strength test to check motor performance and forelimb muscular strength, decreased in BPS and BPF treated rats. Additionally, treatment with PPT, DPN and BMP2 recombinant protein improved Nissl staining and NeuN levels. Supportively, we detected improved Rota rod and Grip strength test for motor coordination in these rats. Overall, our study provides a novel insight into ER and BMP2/Smad signaling interaction in BPS and BPF-induced motor deficits.

OP-11

Environment Chemical, Fipronil induced cellular and sub-cellular Toxicities in *Spodoptera litura*

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The indiscriminate application of insecticides and pesticides significantly impacts the structure and functioning of ecosystems. This study focused on assessing the toxic effects of Fipronil, a second-generation phenylpyrazole insecticide, using *Spodoptera litura* larvae (Lepidoptera: Noctuidae) as a model organism. Fourth instar larvae were exposed to commercial-grade Fipronil at concentrations ranging from 20 to 80 mg/L for durations between 12 to 72 hours. Various molecular, biochemical, and organismal parameters were analyzed. The result of the study indicated that significant dose- and time-dependent alterations in biochemical markers, including Superoxide Dismutase (SOD), Glutathione-S-Transferase (GST), Catalase (CAT), levels of 8-hydroxy 2'-deoxyguanosine (8-OHdG), and Malondialdehyde (MDA) level as a marker Lipid peroxidation. in the larvae subjected to Fipronil exposure. Additionally, interactions between Fipronil and DNA were observed. The study explored how cellular and sub-cellular damage manifests at the organismal level, revealing delayed larval emergence, reduced fecundity, and fertility, along with increased malformations in pupae and adults. These findings highlight that non-discriminatory use of insecticides like Fipronil could disrupt insect population dynamics and have broader ecological implications, suggesting further investigation.

OP-12

BPA mediated Renal toxicity in Malpighian tubules of *Drosophila melanogaster*

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BPA is a ubiquitous chemical and a known endocrine disruptor molecule worldwide, used to produce plastic products. Exposure to BPA at the any stage of human life can causes molecular changes that could result in several health related complications. *Drosophila melanogaster*, a well-developed alternative animal model, has a renal system that is functionally and structurally similar to the human renal tubule, which comprises Malpighian tubules (MTs) and nephrocytes. MTs that are exposed to BPA are able to readily mimic the kidney toxicity endpoints and hallmarks. In our study, wild type strain of *D. melanogaster* 1st instar larvae are exposed to different concentrations of BPA (0.1 g/ml, 1 g/ml, 2.5 g/ml, and 5.0 g/ml as compared to control) until 3rd instar larvae (96 hours). Exposure to BPA throughout 1st to 3rd instar stage exhibits characteristics that are similar to those of higher organisms after BPA exposure like increased oxidative stress, diminished cellular antioxidant defence mechanisms, and GSH depletion were seen in the MTs of exposed *D. melanogaster* larvae. Transporter protein efflux activity, mitochondrial membrane potential (MMP), ATP level, junctional protein (Dlg) expression, and filamentous actin (F-actin) expression were also alerted after exposure in the MTs. We concluded that exposure to BPA in third-instar larvae causes oxidative stress, a decrease in antioxidant levels, malfunctioning MTs, and alterations in the shape of renal tubules, besides additional consequences.

OP-13

Anti-diabetic potential of *Asparagus racemosusroot extract and* its bioactive molecule Shatavarin –IV

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The pervasiveness of type 2 diabetes (T2D) is now at epidemic levels and is estimated to increase even further in the coming decades. Recently, the therapeutic potential of natural remedies has garnered the attention of many researchers, opening new avenues towards exploring herbal plants, phytomolecules and nutraceuticals as target specific approaches for the management of T2D.*Asparagus racemosus*a plant of Liliaceae family is considered a traditional medicinal plant, for its antidiabetic, antioxidant, hypolipidemic and is notable for its antimicrobial properties. However, little is known about the anti-diabetic potential of bioactive phytomolecules derived from *Asparagus racemosus.* One such phytomolecule present in the root of *Asparagus racemosus*is Shatavarin IV (S-IV), a saponin with reported medicinal potential.We evaluated the efficacy of *Asparagus racemosus*root extract (ARE) and S-IV against xenobiotic-induced type-2 diabetes using *Drosophila melanogaster* as a model organism. Atrazine is used as a diabetogenic herbicide to induce a type 2 diabetes in Drosophila. These flies were exposed to ARE and S-IV for 3 days and then analyzed for glucose levels, oxidative stress parameters, and the expression levels of candidates associated with the insulin signaling pathway. Supplementation with either ARE or S-IV reduced glucose levels in T2D flies to control levels. In both cases, transcriptional/biochemical analyses revealed that the reduction in glucose levels of T2D fliesis achieved through the antioxidant activity of ARE or SIV and modulation of the insulin signaling pathway. These data will be discussed in the context of the potential applicability of S-IV and its cheaper alternative, AR root extract, for treating oxidative stress-induced type-2 diabetes.

OP-14

Oxytocin Exposure Through Milk: Implications for Early Puberty and Ovarian Development in Juvenile Rats

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The extensive use of oxytocin (OT) in veterinary practices, especially in India, to enhance milk production in cows and buffaloes raises concerns about possible unintended exposure to exogenous OT in infants and young children who consume this milk. Due to the relative immaturity of their digestive systems and blood-brain barriers, infants may exhibit increased susceptibility to the neuroendocrine effects of OT, potentially impacting pubertal onset timing. Research indicates that OT affects the brain and peripheral systems through complex pathways, such as RAGE, CD38, CD157, and nicotinamide riboside, which may enhance OT's permeability to critical developmental regions.

Our study demonstrates that detectable levels of OT were present in various milk samples, and oral doses within the range of dietary exposure significantly reduced the age of vaginal opening (VO) and advanced the onset of first estrus, thereby affecting the timing of pubertal initiation. Elevated PGE-2 levels in the median basal hypothalamus (MBH) of OT-treated animals indicate a PGE-2 mediated mechanism through which OT accelerates pubertal onset. Analysis of markers related to oocyte maturation, cell survival, matrix deposition, and cumulus expansion from our ovulation induction experiment revealed that OT exposure led to early follicular recruitment via p-AKT activation and hastened a shift from cell proliferation to differentiation through early p-ERK activation.

These findings suggest that early OT exposure stimulates premature activation of the hypothalamic-pituitary-gonadal (HPG) axis, hastening puberty onset via a PGE-2 pathway and promoting follicular development through AKT and ERK signalling pathways. This research underscores the potential risks of exogenous OT exposure, particularly during critical developmental periods.

OP-15

Fabrication of hybrid graphene oxide/magnetic MOF nanocomposites for cationic dye remediation under visible light.

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For the neutralization of porous organic pollutants (POPs), the generation of an effective catalyst that can be handled safely and applied in personal protective equipment is required. Herein, an innovative magnetic core-shell iron oxide-based MOF was synthesised and successfully used as a nanocatalyst for the degradation of cationic dyes. MIL-101(Fe) built into GO nanosheets not only regulates 2D nanochannels but also provides magnetic separations with catalytic photo-Fenton activity. The nanocatalyst was thoroughly characterized using various physic-chemical techniques XRD, FTIR, TGA, Raman-AFM, BET, SEM, and XPS. Response Surface Methodology (RSM) based Design of Experiment (DoE) using Box-Behnken design (BBD) was used to determine the optimum adsorbent dose (A: 0.05-0.5 g/L), the dye concentration (B: 2.5-15 mg/L) and the pH range (C: 3-11.) at room temperature. Simultaneous interaction between AB, AC, and BC provided (95.9%), (99.1%) and (88.5%) MB, VB and RhO removal efficiency, respectively. Moreover, the effective adsorption of cationic dye obtained at pH 9 and also the zeta potential curve of nanocomposite shows lowest value at pH 9, which reveals the strong interaction of cationic dye toward OH^- ions present in the aqueous medium. The adsorption mechanism included hydrogen bonds, electrostatic interactions, stacking interactions between molecules, and dipole-dipole interaction. GO/Fe_3O_4@SiO_2-NH_2/MIL-101 (Fe) nanocatalyst was stable enough and could be easily recovered under a magnetic field. The total organic content (TOC) results of cationic dyes after degradation are 3.39, 4.70 and 9.17 mg/L for MB, VB and RhO respectively. The toxicity profile was assessed using an OECD-approved in vivo model organism, zebrafish (Danio rerio) where the embryos were treated with different concentrations of nanocomposite (5-100 mg/L) for 72 h post-fertilization (hpf). Incubation of the nanocomposite in low concentrations during the embryonic stages did not result in any adverse developmental toxicity, as measured by mortality rates, hatching rates. This study provides synergistic adsorption and photo-Fenton catalytic properties for the removal of cationic dye and also examined the developmental toxicity of nanocomposite in zebrafish. The results show an innovative insight into the developed magnetic nanocomposite which serves as a synergistic catalyst for the removal of harmful dyes from wastewater.

OP-16

Isolation and characterization of antibiotic resistance bacteria in surface water

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The antibiotic resistance has become widespread in the aquatic domains increasing the threat to all forms of life. The aim of this work was to study the occurrence of emerging MDR and ESBL producing strains its associated factors integrons, in surface water. The samples were collected from areas subjected to anthropogenic intervention such as discharge of domestic wastes, industrial wastes, hospital, and municipal wastes. Among 160 bacterial morphotypes, 121 (75.62%) exhibited MDR trait with maximum resistance toward lincosamide (CD=71.3%), beta-lactams (P=70.6%; AMX=66.3%), cephalosporin (CZ=60.6%; CXM=34.4%), sulphonamide (COT=50.6%; TR=43.8%) followed by macrolide (E=29.4%) and tetracycline (TET=18.8%). A total of 103 isolates were found ESBL positive with the presence of ESBL genes in 97.08% isolates. *blaTEM* (93.0%) was the most prevalent ESBL gene detected alone as well as in combination with *bla* genes in surface water. *IntI1* gene was detected in 73(60.3%) of isolates, whereas *intI*2 was found in 11(9.09%) isolates. 3.6% isolates carried both integron genes (*intI1* and *intI2*). The presence of such resistant factors in the environment generates an urgent need to setup stringent strategies for control and management of the resistance rate in the ecosystem before the world run out.

OP-17

Facile synthesis of magnetic clay-based adsorbent for cationic dye spiked wastewater treatment: statistical optimisation, kinetics, and adsorption mechanism

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The unchecked effluent discharge from industries leads to the release of hazardous and toxic organic pollutants into aquatic system. Textile industry is one of the major contributors of water pollution where even their low concentration impacts the quality of water. These necessities the researchers to develop eco-friendly and sustainable methods for wastewater treatment. The current research focus on the valorisation of bentonite clay as capping agent for iron nanoparticles and to further comprehend its application in dye simulated wastewater. The physico-chemical properties of the synthesized nanocomposite were characterized through FE-SEM, FTIR, and XRD analysis. The removal efficiency and reaction kinetics were evaluated by optimizing the experimental factors (pH, adsorbent dose, reaction time) through response surface methodology. The adsorption potential of clay-iron nanocomposite has reached 98% under optimum reaction condition (pH = 3.5, CNP dose = 0.75 g/L, initial dye concentration 50 ppm). The layered structure of bentonite clay enhanced the adsorption capacity while oxidative property of iron nanoparticle stimulates the break-down of parent dye molecule. Further, adsorption mechanism was evaluated through various adsorption isotherm and kinetic models. The degradation mechanism advanced through chemisorption which reflect the dual nature of the developed nanocomposite, leading to the improved and sustainable approach in the field of wastewater treatment.

OP-18

Synthesis, characterization, and application of Lemon Peel-Chitosan hydrogel for mitigation of PFAS & cationic dyes from water with adsorption and kinetic modeling

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The purity of water is often demonstrated by its color, which affects its visual appearance and suggests potential dye contamination. Color is not the sole parameter of water pollution; numerous other contaminants affect water quality. Per- and polyfluoroalkyl substances (PFAS), commonly called "forever chemicals," are significant toxicants in aquatic environments. They are especially alarming due to their environmental persistence and toxicological impacts. Prolonged PFAS release into aquatic systems has resulted in its bioaccumulation in flora, fauna, and people. PFAS has remarkable durability, rendering its remediation a considerable global environmental concern. This work discovered a practical approach for synthesizing a Lemon Peel-Chitosan hydrogel utilizing Response Surface Methodology in conjunction with Central Composite Design (RSM-CCD). This bio-based adsorbent was determined to be environmentally friendly and economically viable. The hydrogel exhibited superior efficacy in dye elimination, achieving maximum capacities of 24.984, 24.788, 24.862, 23.483, 24.409, and 24.726 mg g−1 for Safranin O, Methylene blue, Basic fuchsin, Toluidine blue, Brilliant green, and Crystal violet, respectively, in a 10 mg L−1 aqueous solution. Furthermore, the hydrogel demonstrated considerable efficacy in eliminating PFAS, with a clearance rate of 93.4% for PFOA and 91.2% for PFOS. The adsorption kinetics conformed to the Pseudo second-order kinetic model, while the Freundlich and Langmuir isotherm models effectively characterized the adsorption behavior of both the dyes and PFAS. Thermodynamic metrics, such as ΔG, ΔH, and ΔS, validated the process's viability, indicating that electrostatic interactions were pivotal in the adsorption mechanism. The hydrogel maintained over 80% removal efficacy after six regeneration cycles, underscoring its remarkable recyclability. The findings demonstrate that the Lemon Peel-Chitosan hydrogel is a highly sustainable and efficient method for eliminating colours and PFAS from wastewater, especially in textile manufacturing sectors where these contaminants are common.

OP-19

Untargeted metabolomics uncovers potential health risks of chronic exposure to Polycyclic Aromatic Hydrocarbons (PAH) at an environmentally relevant concentration

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The prevalence of Polycyclic Aromatic Hydrocarbons (PAHs) in our environment poses significant challenges and health risks to humans due to their well-established carcinogenic, endocrine-disrupting, mutagenic, and teratogenic effects. Existing risk analyses are mainly focused on carcinogenic risk and toxicology studies at higher concentrations. This comprehensive study has evaluated the human health risk (HHRA) associated with the detected concentration of PAH in the aquatic fauna from the RAMSAR site on the southwest coast of India. Moreover, an untargeted metabolomics approach was employed to elucidate the potential health risks associated with chronic exposure (60 days) of rodents to PAH at environmentally relevant concentrations (ERC), followed by analysis using UHPLC-Q-Orbitrap MS.

Around 75% of the samples from Vembanad Estuary (VE), Ramsar site of India were found to be contaminated with PAH (5.25 - 1015.28 ng/g). the HHRA for noncarcinogenic risk indicates a lower risk (Hazard Index, HI < 1), whereas the Cancer Risk (CR) indicates a moderate risk of exposure and thereby needs attention. Furthermore, the metabolomic profiling on the liver tissues of animals revealed significant alteration of 76 metabolites including amino acids, glycerophosphate, bile acids, sterol lipids, fatty acyls, pyrimidines, and pyridines suggesting that chronic exposure to ERC of PAH could affect energy metabolism, fatty acid synthesis, DNA synthesis, amino acid metabolism, and catecholamine metabolism.

Even though low-moderate risk was calculated with HHRA, significant alterations have occurred in the metabolic level of PAH-treated animals. This observation highlights the efficacy of the untargeted metabolomics approach in delineating the metabolic disruptions induced by PAH exposures, a critical aspect for initiating effective risk assessment strategies. These findings also emphasize the heightened need to consider the actual exposure dynamics in risk assessment strategies and the need for in-depth analysis to reveal the true exposure scenario.

OP-20

Investigating the Occurrence of Per- and Polyfluoroalkyl Substances (PFAS) in Dairy Products: A Public Health Risk Lurking in Refrigerators.

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The pervasive presence of per- and polyfluoroalkyl substances (PFAS) in contemporary food materials has emerged as a significant concern. These compounds, renowned for their water and grease-resistant properties, find extensive application in food contact materials. This study delved into the occurrence of various PFAS in locally sourced Indian milk and yogurt samples. A modified QuEChERS method, optimized for key parameters such as salt composition, dSPE cleanup, and sample volume, facilitated the extraction of PFAS. Subsequent detection and quantification were achieved through LC/HRMS analysis. Method validation, assessed through the recovery of 24 PFAS at a fixed spiked concentration, yielded cumulative recoveries ranging from 40% to 150%. The analysis of real milk and yogurt samples unveiled the presence of diverse PFAS classes, including perfluorocarboxylic acids (PFCAs), perfluoroalkane sulfonates and sulfonamides (PFSAs), fluorotelomer alcohols, and sodium/potassium PFAS salts. A comprehensive detection of 23 out of 24 targeted PFAS in both milk and yogurt samples highlighted their widespread use in food packaging materials. The concentration of individual PFAS varied significantly, with milk samples exhibiting a range of 15.01 to 84.56 µg/L and yogurt samples ranging from 4.00 to 40.03 µg/L. Notably, N-methyl perfluoro-1-octanesulfonamidoacetic acid and perfluorodecanoic acid were identified as the predominant PFAS in milk and yogurt, respectively.

OP-21

Endocrine/metabolism disrupting chemicals influence mitotic genome-bookmarking properties of nuclear receptors: implications on cellular function and human health.

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Emerging roles of nuclear receptors in mitotic genome-bookmarking under the influence of diverse ligands are being currently highlighted to gain insights into the causative factors inflicting several disease states. Mitotic genome bookmarking is a crucial epigenetic mechanism by which specific transcription factors are stably inherited through cell division. This process relies on the retention of certain chromatin marks and transcription factors during mitosis, ensuring that gene expression patterns are faithfully re-established in daughter cells. This is corroborated by multiple converging mechanisms that include epigenetic markings and lately, the phenomenon of *'mitotic genome-bookmarking'* by specific transcription factors. Upon mitotic exit, this act ensures the accurate reactivation of transcriptome, proteome, cellular traits, and phenotypes in the progeny cells. However, exposure to endocrine/metabolism disrupting chemicals (EDCs) has been shown to interfere with the genome bookmarking process, leading to the erosion of mitotic bookmarks and the subsequent disruption of normal cellular functions. EDCs, such as pesticides, plasticizers and flame retardants, that induce nuclear import of androgen receptor, abrogate receptor binding to mitotic chromosomes. Conversely, agonistic EDCs induce receptor-chromatin interaction in a ligand/receptor specific manner. This dysregulation can have profound effects on cellular processes, including cell differentiation, proliferation, and may contribute to diseases such as cancer, developmental disorders, and metabolic dysfunctions. Recent findings on how EDCs influence mitotic bookmarking may reveal the potential long-term implications of environmental exposures on both human and ecological health.

PP-1

In vitro evaluation of squalene-mediated anti-metastatic potential in BPA-induced aggressive breast cancer cells

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Altered lipid metabolism, including cholesterol metabolism and de novo lipogenesis (DNL), is a hallmark of highly aggressive breast cancer cells. Endocrine-disrupting chemicals (EDCs), including bisphenol A (BPA), are known to affect human health by altering endocrine and metabolic pathways. The impact of BPA on breast cancer etiology has been widely studied. However, the BPA-induced metabolic changes in cancer cells, particularly those associated with lipid metabolism, are poorly studied. Previously, we observed that prolonged exposure to low doses of BPA is associated with the induction of epithelial-mesenchymal transition (EMT) via induction of DNL through GPER1 activation in both hormone-sensitive (MCF-7) and triple-negative (MDA MB-231) breast cancer cells. Here, we demonstrate that squalene (a precursor in cholesterol synthesis) treatment at a non-toxic concentration inhibits the migration in BPA-exposed MCF-7 and MDA MB-231 cells. Squalene treatment further reduced the levels of mesenchymal markers (N-cadherin, α-SMA) in both cells, thereby leading to EMT marker reversal. In addition, enhanced lipid droplet formation and the level of SREBP2 and ABCA1 proteins (mainly associated with regulating cellular cholesterol level) were noted post-squalene treatment in BPA-exposed breast cancer cells. Our findings suggest that manipulating cholesterol metabolism via squalene supplementation may prevent EDCs-induced metastatic aggression in breast cancer cells.

PP-2

Microbiome Meltdown: Adverse Effects on Semen Quality and Male Reproductive Toxicity in Drosophila

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Infertility is a major health issue worldwide, affecting approximately 17.5% of the adult population. This is partly due to the declining semen quality of males as a result of exposure to xenobiotics. Chemical-mediated endocrine disruption has been the prime focus, but yet the underlying cause remains unknown for more than 50% of male infertility cases. Of late, gut microbiome has emerged as the crucial determinant of health and a few studies have implicated gut microbiome in male fertility. However, the impact of gut microbiome on the semen quality of males and the significance of the same to male reproductive toxicity is unknown. Therefore, in the present study, the influence of gut microbiome on semen quality parameters and male reproductive toxicity has been assessed using Drosophila as a model. The gut microbiome of *D. melanogaster* has a relatively simple composition dominated by Lactobacillus and followed by Acetobacter sp. We generated axenic flies (devoid of the microbiome) through antibiotic or sterile approaches and assessed the male fertility as well as semen quality parameters. Interestingly, such axenic males had reduced fertility, potentially as a consequence of altered semen quality: (1) multiple genes encoding seminal proteins were significantly down-regulated and (2) elevated oxidative stress as evidenced by significantly increased levels of reactive oxygen species in axenic flies. In addition, we observed that developmental exposure to Di-butyl phthalate, a reproductive toxicant known to alter Drosophila semen quality, down-regulated the expression of a peptidoglycan receptor and caused gut dysbiosis. Together, these findings reflect gut microbiome-xenobiotic interplay in male reproductive toxicity.

PP-3

Immune and metabolic dysregulation lead to chemical-mediated diabetogenesis in Drosophila

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Type 2 diabetes is a metabolic disorder affecting millions of people worldwide. Xenobiotic exposure has recently been implicated in the etiology of diabetes. Earlier studies in our lab have established that developmental and/or adult exposure to environmental chemicals may lead to the early onset of type 2 diabetes, and this, when combined with a carbohydrate-rich diet, hastens the disease progression.Building on this, the current study aims to understand the molecular mechanisms of chemical-induced type 2 diabetes using an omics approach with Drosophila as a model organism. Transcriptomic studies on flies exposed to atrazine or dibutyl phthalate have shown that the Toll and Imd pathways are significantly affected in the exposed population. The analysis of the metabolome in these flies identified significant biomarkers for type 2 diabetes (T2D), similar to those found in human T2D patients. By integrating these omics data with subsequent validation studies, we have discovered novel candidates associated with immune responses/inflammation and linked these to glucose homeostasis in flies. These findings implicate inflammation in chemical-mediated diabetogenesis and also reflect the potential of Drosophila as a model for deciphering the link between xenobiotics and type 2 diabetes.

PP-4

Identification of target proteins of Zearalenone using Drug Affinity Responsive Target Stability approach

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Zearalenone, a secondary metabolite of *Fusarium* sp. of fungi, contaminates staple food naturally, posing a serious threat to human health. Several research findings delineated its toxic potential and suggested it interacts with estrogen receptors, having structural similarity with endogenous estrogen. In addition, some studies found that it has proteotoxic effects as well. However, the protein targets of Zearalenone are still unknown. Therefore, in this study we aimed to identify the protein targets using drug affinity responsive target stability assay (DARTS). We are using DARTS approach because Zearalenone is a small natural molecule which can directly bind to protein targets and stabilize the same and alter their functionality. In this study, we treated Ishikawa endometrial carcinoma cells with Zearalenone in nanomolar concentration, prepared whole cell lysate, treated with pronase and run SDS-PAGE. Stabilized protein bands were visualized through silver staining and subjected to in-gel digestion followed by analysis of proteome profile through high-resolution LC-MS/MS. As a result, we identified 95 proteins that were stabilized in response to Zearalenone exposure and we selected 13 targets on the basis of percent sequence coverage and abundance ratios. Among these, few selected proteins like 2-phospho-D-glycerate hydro-lyase, L-plastin and 60 kDa chaperonin have been reported to play significant roles in enhancing cancer cell migratory potential. Further, we aim to validate these proteins and study them for therapeutic interventions for Zearalenone induced toxicity/carcinogenicity.

PP-5

Metabolomic analysis underlay mechanisms of Ochratoxin A-induced cancer-like phenotypes in normal kidney cells

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Ochratoxin A (OTA) is a major food contaminant, and its primary target organ is the kidney. Moreover, IARC classified OTA as a group 2B carcinogen, which means it is a possible carcinogen to humans. However, the mechanism(s) underlying OTA-induced carcinogenicity remains largely unknown. During the carcinogenesis process and to sustain the neogenic properties, transformed/cancer cells undergo metabolic reprogramming such as higher glycolysis, TCA cycle, amino acid biosynthesis, etc. In this study, we first assessed the effect of OTA on the hallmarks of cancer-like changes such as higher proliferation, survival rate, migration, and invasion. In addition, these phenotypic changes might be due to alterations in the metabolites, thus, NMR-based metabolomic profiling was also performed in OTA-transformed normal rat kidney cells. As a result, chronic exposure to OTA enhanced cell proliferation and migration of normal kidney cells, as evidenced by wound healing assay, soft agar assay, clonogenicity assay, and immunoblotting of epithelial-mesenchymal transition markers, which suggest that normal cells have acquired cancer-like properties. Further, in an NMR-based metabolomics study, we have identified 22 deregulated metabolites, seven of which were significantly up-regulated in the OTA-treated group, including four amino acids (phenylalanine, tyrosine, alanine, and glutamine), acetate, lactate, and formate, indicating that OTA-induced pre-cancerous cells involved in the acquirement of nutrients for high protein turn-over. Furthermore, pathway analysis of metabolomics data showed that alanine, aspartate, glutamate metabolism; phenylalanine, tyrosine, and tryptophan metabolism; arginine and proline metabolism; pyruvate metabolism and citrate cycle was majorly hampered in OTA-induced normal kidney cells. Collectively, our investigations suggest that metabolic alteration might be a reason for the cancer-like properties of OTA-treated kidney cells. However, further investigations are warranted to comprehensively understand the role of metabolite perturbation in increasing cell proliferation of normal kidney cells and their possible implications for human health.

PP-6

Gaseous and particulate emissions from the combustion of wood pellets

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Wood combustion results in gaseous emissions (mainly CO, CO_2, NO, NO_2, and low concentrations of SO_x) which are harmful to humans and partly responsible for climate change. Such combustion also results in emissions of fine and ultrafine particles which are also harmful to humans. The aim of the present study is to analyze the gaseous and particulate emissions occurring during the combustion of wood pellets in a drop tube furnace. This device allows reproducing combustion experiments in domestic pellet furnaces, the pellet falling from the top of the drop tube furnace to the reaction zone in approximately 1 s, thus leading to high heating rates. The temperature of the reaction zone can be adjusted, here between 500 and 900 °C. Gas analyzers and an Electrical Low Pressure Impactor complete the experimental setup to continuously measure the gaseous and particulate emissions. The pellet mass is also continuously measured during the combustion experiment. From these different experimental conditions that leading to minimal emissions are determined, which reduce the risks to humans and the environment. The present study is complementary to that carried out on the combustion of a wood pellet but under low heating rates, [1]. Comparisons of the results obtained under high and low heating rates will be presented.

PP-7

Meta-analysis of global microplastic concentrations and its toxicity assessment in *Daphnia magna*

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Micro- and nano-plastics are emerging contaminants and a newfound curiosity in the scientific community due to their interminable surge since the Anthropocene era. The concentration of MP is still incredibly varied demographically with limited data. The present work was carried out to get cohesive information about MP concentrations from surface waters, sediment, and biota from 3255 data points spanning between 1996 to 2024 and compared to the concentrations employed in 113 laboratory studies from 2012 to 2023 comprising 213 data points. It has been found that globally 1.69E+05 MPs/m^3 in surface water, 6.47E+04 MPs/Kg in the sediments, and 1.49E+01 MPs/Individual in the biota have been reported whereas an average of 1.44E+05 MPs/m^3 in the surface water, 6.23E+02 MPs/Kg in the sediments, and 4.38 MPs/Individual have been reported in the Indian environment. Polyethylene MP was found to be the most abundant plastic category in surface waters, sediments, and biota. An MP-Tox scale was established to classify the concentration range as least toxic (0 to 3.81E+01 MPs/m^3), moderately toxic (1.13E+02 to 1.54E+08 MPs/m^3), and highly toxic (1.00E+11 to 6.80E+19 MPs/m^3) and validated with the *Daphnia magna* model system. Less than 24 hours old daphnids were exposed to different concentrations of PE-MPs from the MP-Tox scale for 21 days, and effects on survival, morphology, and reproduction were evaluated. Chronic exposure to PE-MPs significantly affects daphnia survival and reproduction from 6.70E+08 MPs/m^3 with significant effects on morphology at higher MP concentrations of 100 to 10000 mg/L corresponding to 1.875E+09 to 1.875E+11 MPs/m^3. The findings illustrate the severity of global MP pollution and the potential threat of PE-MPs to daphnia in the aquatic food chain.

PP-8

Molecular Insights into Aflatoxin B1 Induced Carcinogenesis through Genomic, Epigenetic, and Proteomic Approaches

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Aflatoxin B1 (AFB1), is a contaminant produced by *Aspergillus* species. It is one of the prominent mycotoxins present in food that poses significant health risks, including cancer. However, the molecular mechanisms driving its toxicity and carcinogenesis, particularly its impact on gene expression, protein function, and cellular pathways, are not fully understood. This study bridges these gaps by integrating genomics, epigenetics, and proteomics to investigate the molecular effects of AFB1 exposure. Publically available datasets were utilized to perform gene expression analysis, identify differentially expressed genes (DEGs), and conduct network analysis to pinpoint key hub genes. Epigenetic and post-translational modifications at conserved protein motifs were also examined. Molecular docking and molecular dynamics simulations explored the interactions and stability between AFB1 and key proteins. The results show that AFB1 up-regulates proto-oncogenes and down-regulates interleukins, contributing to cancer progression. These findings provide valuable molecular insights into the carcinogenic effects of AFB1, highlighting its potential as a crucial target for further cancer research and the development of therapeutic strategies.

PP-9

Sun, Skin and Nano-shield: Lighting the role of autophagy in photo-protection induced by nano-ferulic acid

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Environmental stresses such as Ultraviolet radiation coming from Sunlight adversely impact the skin. Chronic exposure to UVR accelerates the process of skin aging which can result in compromised skin integrity and reduced protective functions. Ferulic acid (FA), a polyphenol exhibits potent antioxidant activity, protecting cells against oxidative stress-induced damage. However, the low bioavailability and instability of FA under UV-R/sunlight restrict its utilization in photo protective cosmeceuticals and sunscreens. To overcome these limitations, we employed core-shell nanotechnology to encapsulate ferulic acid. Oxidative stress induced by UVA is the major contributor to photoaged skin. *In-silico* and *in-vitro* experiments in photodamaged cell model demonstrates that ferulic acid nanoparticles effectively mitigate oxidative stress induced by repeated UVA exposure. Furthermore, these nanoparticles protect cellular integrity by stabilizing membrane potential, maintaining lysosome integrity, and regulating calcium influx. Notably, the hybrid nano-ferulic acid formulation also induces autophagy, which plays a significant role in protection against UVA-induced damage. Our findings suggest that prominent role of autophagy in photo-protection and supporting the potential application of ferulic acid in nano skin cream formulations for UVR protection and as a therapeutic intervention for age-related skin conditions associated with impaired autophagic flux.

PP-10

Toxicokinetic Insights into Bisphenol AP (BPAP): Human health Implications

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Due to serious health and environmental concerns surrounding Bisphenol A (BPA), a key monomer in polycarbonate plastics, various analogues are now being used as alternatives. However, these alternatives have shown comparable or even greater toxicity. One such alternative is Bisphenol AP (BPAP) which is known to be an endocrine disruptor. Animal studies suggest BPAP may interfere with hormone-sensitive pathways, affecting reproductive and metabolic health. It was detected in wastewater, indoor dust, food items, as well as placental samples (8.7 pg/g) and infant urine (0.036 ng/ml), indicating potential exposure during developmental stages. Despite its structural and functional similarities to BPA, toxicokinetic data on BPAP remain limited, posing challenges for human health risk assessment. This study aims to address this data gap by developing and validating an LC-MS/MS method for BPAP quantification and performing a detailed toxicokinetic analysis in rats. In vitro assays demonstrated that BPAP undergoes phase II metabolism and binds extensively to plasma proteins in both humans (~99%) and rats (~98%). Given that both rats and humans had comparable hepatic extraction ratios (0.86), it is anticipated that both species might have high *in vivo* hepatic clearance of BPAP. *In vivo*, studies in rats revealed BPAP's rapid absorption (Tmax~1.92 h), extensive distribution (volume of distribution of 3.4 L/kg), high clearance (~4.24 L/h/kg), and low oral bioavailability (18.05%) with fecal excretion as the main route of excretion (~70%). Although the systemic exposure of BPAP is lower than the BPA at an equivalent dose, further comprehensive toxicity studies are needed to evaluate its suitability as a replacement for BPA and its potential impact on human health.

PP-11

Toxic effects of 4-octylphenol on hematological parameters, somatic index, total protein content and oxidative stress in *Heteropneustes fossilis* during preparatory phase of the reproductive cycle.

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Alkylphenol polyethoxylates (APEs) represent an important class of non-ionic surfactants widely used in many pesticide formulation, oil paint formulations, detergent formulation and plastic products for industrial and domestic use. 4-octylphenol (4-OP) is a degradation product of APEs. The presence of 4-OP in the environment is mainly due to anthropogenic activities. It has been detected in various environmental matrices, including water, sediments and soil. The 96 hour LC50 value of 4-OP was 0.9 mg/L for the fish *Heteropneustes fossilis*. In the present study, we selected 1/10th (0.09mg/L) of LC50 dose for acute (7days), sub-acute (28days) and sub-chronic (60days) exposure study. After completion of experiment, hematological parameters, somatic index parameters, total protein content and oxidative stress parameters were investigated. In catfish under acute, sub-acute and sub-chronic exposure groups, red blood corpuscles (RBC), hemoglobin (Hb), packed cell volume (PCV), mean corpuscles hemoglobin (MCH) and mean corpuscles hemoglobin concentration (MCHC) values were significantly decreased whereas total white blood corpuscles (WBC), mean corpuscles volume (MCV) and clotting time (CT) value was increased in fish when compared to control. In the present study ovary somatic index (OSI), testis somatic index (TSI), hepatic somatic index (HSI) has been studied. It was observed that all the parameters of OSI, TSI and HSI decreased significantly at acute, sub-acute and sub-chronic levels in both sexes. It is also observed that the total protein content of ovary and liver were decreased significantly. The level of catalase and SOD of both liver and ovary increase significantly in all the treated groups. The present study clearly indicates the toxic effects of the chemical 4-OP on hematological parameters, somatic index, total protein content and oxidative stress parameters of fish *Heteropneustes fossilis.*

PP-12

Impact of a Millet-Supplemented Diet on Metabolic Health in Diabetes and Obesity Model System

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Millets, esteemed for their nutritional benefits and adaptability to diverse climates, are gaining renewed global attention as a sustainable food source. Their resilience and nutrient density make them an affordable option for addressing food security challenges. Recognizing this, the UN General Assembly, alongside the FAO, designated 2023 as the International Year of Millets. Rich in fiber, phenolic compounds, and antioxidants, millets offer potential health benefits, particularly in managing type 2 diabetes and obesity. This study explores the beneficial effects of millets on these conditions using a Streptozotocin and Nicotinamide-induced diabetic mouse model and MSG-induced obesity model, incorporating a 50% millet diet supplementation. Weekly assessments of food intake and body weight were conducted, and metabolic parameters such as fasting blood glucose, glucose tolerance, insulin sensitivity, HDL, LDL, triglycerides (TGL), and total cholesterol were measured. In the diabetes model, a significant reduction in fasting blood glucose was observed four weeks after diet substitution, although changes in glucose tolerance and insulin sensitivity were not statistically significant. The millet-supplemented diet also resulted in a significant increase in HDL (healthy cholesterol) levels. In the obesity model, significant reductions in body weight, TGL, and total cholesterol, along with an increase in HDL, were observed. These findings suggest that millet may serve as a valuable dietary approach to managing metabolic disorders and underscore the need for further research to elucidate the underlying mechanisms and translate these findings into clinical applications.

PP-13

Deciphering the Role of Novel Metastatic Genes in Epithelial to Mesenchymal Transition of Oral Squamous Cell Carcinoma Cell

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Oral squamous cell carcinoma (OSCC) is an aggressive oral malignancy usually seen in cases with deleterious habits such as the consumption of alcohol and tobacco-related products. In an established squamous cell carcinoma, the functionality of malignant cells oscillates between two phases- epithelial and mesenchymal. Epithelial-mesenchymal transition (EMT) is characterized by several cellular states expressing different levels of epithelial and mesenchymal markers. Epithelial cells express E-cadherin and mesenchymal cells express Vimentin, Twist, and CD56. Hybrid-EMT cells co-express epithelial and mesenchymal markers together. The tumor initiation, growth, and metastases are controlled by a small group of tumor cells known as cancer stem cells (CSCs). We have established an *in vitro* metastasis assay to measure the metastatic potential of any primary cells. We have validated this assay using EpCAM, Vimentin, and Twist expression. CD44 (V2-V10) splice variants are differentially expressed between primary and metastatic stages. Using *in vitro* assay, we have shown that CD44V5, CD44V6, and CD44V10 were upregulated in metastatic states in OSCC primary as well as in SSC9 cells.

We screened 58 different CD markers using *in vitro* metastasis assay in primary and SSC9 cells by flow cytometry and several CD markers were upregulated in metastasis. CD25 (IL2Rα) expression in the metastatic state was more than primary state. The functional IL-2 receptor is composed of three components, the α chain, the β chain, and the γ chain. All three subunits are indispensable for the function and affinity of IL-2R. The CD25 upregulation along with the several mesenchymal markers in malignancies of different tissue origins have been associated with poor clinical outcome. CD25 expression is more in vimentin and twist-positive cells. Using IL2Rα inhibitors like cyclosporin A, IL2 inhibitor Chelerythrine chloride, and several inhibitors of IL2 signaling pathways like 3-methyl adenine, U0126, etc inhibited vimentin expression. Understanding the role of CD25 in EMT will help in the therapeutic management of oral cancer patients.

PP-14

Human iPSCs-derived organoid model of Amyotrophic Lateral Sclerosis: A proteomics-based early diagnostic approach

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Amyotrophic lateral sclerosis (ALS) is a devastating neurodegenerative disease with limited treatment options, partly due to the difficulty in accessing diseased human tissue for research. Induced pluripotent stem cells (iPSCs) offer a promising solution, enabling the creation of three-dimensional (3D) disease models that accurately replicate ALS pathology. This study developed a 3D ALS organoid model using human iPSCs with a targeted TDP-43 gene mutation associated with ALS. High-resolution mass spectrometry-based proteomics analyzed molecular differences between wild-type and TDP-43-mutated organoids, providing insights into ALS-related pathways. The iPSCs were obtained commercially, grown, and characterized using standard protocols, then edited using CRISPR/Cas9 technology to introduce the TDP-43 mutation. Two organoid groups were created from normal and TDP-43-mutated iPSCs and subjected to detailed proteomic analysis. Comparative proteomics revealed significant changes in proteins linked to neurodegeneration, proteasome function, autophagy, and hypoxia-inducible factor 1 signaling. The TDP-43 mutation led to proteostatic dysregulation, impairing protein quality control and contributing to cellular stress that promotes ALS pathology. This 3D organoid model effectively replicates key ALS proteomic features, highlighting the potential of TDP-43 mutation-driven protein targets as biomarkers or therapeutic candidates. Our work demonstrates that this iPSC-derived 3D ALS model provides a valuable platform for understanding ALS mechanisms and developing diagnostic and therapeutic strategies for ALS and related neurodegenerative disorders. The study's findings underscore the importance of proteostatic regulation in ALS pathology and suggest potential avenues for therapeutic intervention. By utilizing this 3D ALS model, researchers can explore disease mechanisms, identify novel biomarkers, and develop targeted treatments for this devastating disease.

PP-15

Integrative approaches to correlate the non-coding regulatory RNAs and mRNAs in a cellular model of neurotoxicity

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Research has shown that non-coding RNAs, including microRNAs, long non-coding RNAs, and circular RNAs, play crucial roles in regulating gene expression and neurotoxic pathways triggered by environmental toxins. However, the interactions between these RNA molecules in neurotoxicity remain poorly understood. This study addressed this knowledge gap by conducting a comprehensive analysis of mRNA, lncRNA, and circRNA transcripts in differentiated human neuroblastoma cells- SH-SY5Y exposed to arsenic. Using advanced sequencing technology, we identified significant changes in the expression of 2,487 mRNAs, 1,192 lncRNAs, and 20 circRNAs. Bioinformatics analysis revealed complex regulatory relationships and specific miRNA associations. Functional enrichment analysis showed that these differentially expressed transcripts are involved in key neurotoxicity-related pathways, including oxidative stress response, inflammation, apoptosis, and synaptic signaling. Notably, we found strong links between these regulatory RNA molecules and miRNAs implicated in neurodegenerative processes. Our findings highlight the extensive molecular reprogramming triggered by arsenic exposure and reveal a complex regulatory landscape involving non-coding RNAs. This multi-omics approach provides valuable insights into RNA-driven mechanisms underlying arsenic-induced neurotoxicity. These findings have significant implications for developing precision-based therapeutic strategies targeting RNA regulatory networks to mitigate environmental neurotoxicant-induced neural damage and neurodegenerative risks.

PP-16

Efficacy and Toxicity paradox of Beta-Asarone: A Bioactive Molecule of *Acorus calamus*

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Objective: Evaluation of the efficacy of novel beta-asarone from *Acorus calamus* in isolated rat resistance arteries for potential vasorelaxation response in *ex-vivo* model and its toxicity in rodent model.

Background: *Acorus calamus* has highly active components which possess tranquilizing, antimicrobial, antidiarrheal, antidyslipid, antidiabetic, and anti-inflammatory activities, etc. The present study investigates the vasorelaxation potential of beta-asarone, a key biomarker of *Acorus calamus*. The compound was evaluated for its vasoreactivity in *ex-vivo* system with isolated superior mesenteric atrial rings including elucidation of mode of action. It was also evaluated for the cytotoxicity and *in-vivo* toxicity in rodent models.

Materials and Methods: The experiment followed the Institutional Animal Ethics Committee-approved protocol for *ex-vivo* vasorelaxation studies with isolated rat superior mesenteric artery. Wistar rats (180–250 g; 6–8-week-old) were used for the tension experiment and Swiss albino mice were used for acute oral toxicity studies.

Results and conclusion:

Superior mesenteric arteries were pre-constricted with the U46619 (0.1μM) which produced a sustained and stabilized contraction response. BA-induced concentration-dependent relaxation responses in rat mesenteric artery and was highly sensitive in modulating calcium channel function in vascular smooth muwscle cells suggesting L-type VDCC as major putative target in vasorelaxation response induced by β asarone in isolated rat superior mesenteric artery. In-vitro toxicity of beta-asarone suggested its safety upto 30 μM in MTT assay. However, β asarone enriched extract and essential oil showed cytotoxicity and inhibition of cell proliferation at 30μg/ml when incubated for 12 hours. The results of in-vivo toxicity suggests that β asarone enriched extract and essential oil exhibited potential toxicity and produced complete mortality in all the treated animals when given from the range of 300 mg/kg upto 2000 mg/kg. This data suggests a classic case of efficacy-toxicity paradox in the medicinal plant suggesting further study so as to retain efficacy and enhance safety.

PP-17

Renewable Stem Cells & Their Extracellular Products as Screening Platforms for Toxicological Studies

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The application of stem cells in toxicological screening represents a groundbreaking shift in how chemical safety and efficacy are evaluated. This approach leverages the unique properties of stem cells, including their pluripotency and ability to differentiate into various cell types, to create *in vitro* models that accurately reflect human biological systems. These models offer a significant advantage over traditional animal testing, both in terms of ethical considerations and scientific precision. Renewable stem cells enable the development of high-throughput screening platforms, which can assess the impact of numerous toxicants on various cellular systems simultaneously. By differentiating stem cells into specific tissue types—such as cardiomyocytes, hepatocytes, or neurons—researchers can study the effects of chemicals on distinct organ systems and cellular functions. This not only reduces the need for animal testing but also enhances the relevance of the findings to human health. Additionally, these advanced models allow for the investigation of toxicological mechanisms at a molecular level, facilitating the identification of biomarkers for exposure and adverse effects. The capacity to generate patient—specific or genetically modified stem cells further personalizes toxicological assessments, paving the way for tailored safety evaluations and more precise therapeutic interventions. Extracellular products of stem cell such as micro vesicles, exosomes put them at the center stage. These are increasingly becoming vital in toxicological studies due to their unique properties. They serve as biomarkers for detecting toxic responses, reflecting cellular states through their molecular content. By analyzing these vesicles, researchers can gain mechanistic insights into toxin effects, such as oxidative stress and inflammation. They are also useful in drug development for screening potential toxicities and accelerating safety assessments. Moreover, they help model toxicity *in vitro* and assess individual responses in personalized toxicology. In regenerative medicine, they evaluate the safety of therapeutic materials, enhancing overall research and safety evaluations.

PP-18

Neurotoxic Effects of Synthetic Pyrethroids through Mitochondrial Impairment and Autophagy Dysregulation

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Synthetic pyrethroids are widely used insecticides for household, agricultural, and public health purposes in many commercial formulations against insects and parasitic crustaceans. These chemicals have received much attention because of their neurotoxic efficacy and widespread occurrence in the ecosystem. Nonetheless, some recent studies show that synthetic pyrethroids have significant implications for human health, especially when it comes to neurotoxicity. Our research seeks to determine the role of mitochondrial dysfunction and dysregulated autophagy in mediating the neurotoxic effects of synthetic pyrethroids. Long-term exposure to experimental animal/cellular models of pyrethroids impairs mitochondria, leading to changes in mitochondrial membrane potential (MMP), reduced ATP synthesis, decreased NADH production, enhanced reactive oxygen species (ROS) levels, and induced intrinsic apoptosis within neuronal cells. These toxic substances also disrupt different aspects of mitochondrial dynamics, such as fission-fusion machinery, transport, and biogenesis processes. At the same time, pyrethroids alter expression levels for autophagy-associated marker proteins, including LC3 and p62, ultimately causing autophagy to be dysregulated in affected neuronal cells. Thus, the findings highlight an immediate requirement for an in-depth reevaluation of synthetic pyrethroid safety for their possible long-term implications for human health, mainly through cellular mechanisms linked with mitochondrial and autophagic perturbations. The results highlight critical areas for future investigation and potential impact on public health policies.

PP-19

Jigyasa: Connecting Young Minds with the Wonders of Science

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The CSIR Jigyasa program is a pioneering initiative launched during the Platinum Jubilee of the Council of Scientific and Industrial Research (CSIR), inspired by Prime Minister Narendra Modi's vision for a "New India" and the concept of Scientific Social Responsibility (SSR). Jigyasa aims to foster scientific curiosity, innovation, and critical thinking among school students by bridging classroom learning with research-based experiences. It provides a unique platform where students engage directly with the world of science through hands-on experiments, interactive learning sessions, and mentorship from top scientists and researchers. Through the program, students get an opportunity to explore real-world applications of science in state-of-the-art laboratories, encouraging them to develop a deeper understanding of scientific principles and their practical uses. This initiative not only aims to enhance scientific knowledge but also seeks to inspire a generation of young thinkers who are passionate about science and problem-solving. By bringing students closer to research and innovation, Jigyasa is cultivating a culture of scientific inquiry, preparing students to contribute to India's scientific advancements and empowering them to become future innovators.

PP-20

Ecotoxicity, removal efficiency, and molecular response of freshwater microalgae to Bisphenol AP exposure

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Bisphenol AP (BPAP), an analog of bisphenol A (BPA) and endocrine disruptor, is increasingly detected in water, highlighting its emergence as an environmental contaminant similar to BPA, known for its health risks. This study explored the ecotoxicity of BPAP in four freshwater microalgae species (*Chlorella sorokiniana*, *Chlamydomonas mexicana*, *Scenedesmus obliquus*, and *Chlorella vulgaris*), as well as their removal efficiency and biotransformation capabilities. A de novo transcriptomic analysis followed to elucidate the molecular response to BPAP exposure. The toxicity (120 h-EC_{50}) of BPAP for these species ranged from 1.509 mg/L to 6.509 mg/L. *C. mexicana* demonstrated the highest removal efficiency at 86.5% after 12 days, followed by *C. vulgaris* (86.0%), *S. obliquus* (78.9%), and *C. sorokiniana* (56.5%) at 1 mg/L. Eight biotransformed BPAP products were analyzed, and their toxicity was predicted to be lower than that of BPAP, using the Ecological Structure Activity Relationships software. Transcriptomic analysis of *C. mexicana* revealed differential expression of 4611 genes involved in metabolism, cellular activities, and stress responses. Genes encoding methyltransferases, glycosyltransferases, and various oxidoreductases, including electron-transferring flavoprotein dehydrogenase and glutaredoxin, were significantly upregulated in response to BPAP exposure, suggesting that *C. mexicana* can detoxify BPAP through glycosylation and transmethylation. These findings provide novel insights into the ecotoxicity, removal potential, and biotransformation of BPAP in freshwater microalgae, highlighting the molecular mechanisms of BPAP detoxification for effective environmental remediation.

PP-21

Environmental Monitoring Intervention Hub (EMIH): State of the Art Infrastructure and Instrumentation Facility, Served MSEs and Outreach Activities

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The "Environmental Monitoring Intervention Hub" is a state-of-the-art facility designed to address critical environmental challenges through advanced instrumentation and a focus on MSME (Micro, Small, and Medium Enterprises) engagement and community outreach. Equipped with cutting-edge tools such as third-generation sequencing technology, 3D printing, high-capacity pilot plants, BET surface area analyzers, and real-time air and water quality monitoring systems, the Hub supports comprehensive environmental assessments. It enables precise monitoring of pollutants, including particulate matter (PM), volatile organic compounds (VOCs), and gases like SO□, CO□, CO, and ozone. Additionally, specialized analyzers and samplers, including BOD/COD sensors, hydrocarbon and mercury analyzers, and bacteria and fungi samplers, allow for a multi-faceted approach to environmental health.

The Hub's commitment to MSME engagement is a key aspect of its mission, offering these enterprises access to facilities and expertise they might otherwise lack. Through partnerships and targeted training programs, MSMEs can adopt sustainable practices, comply with regulatory standards, and reduce environmental footprints. Outreach activities aim to raise awareness, empower local communities, and foster collaboration across sectors, ensuring that technological advancements translate into real-world environmental improvements. By bridging advanced scientific tools with actionable insights for small enterprises and communities, the Environmental Monitoring Intervention Hub plays a pivotal role in promoting a cleaner, healthier environment. This initiative not only advances environmental science but also fosters economic growth by supporting MSMEs in implementing green practices, ultimately contributing to sustainable development and improved public health outcomes.

PP-22

Advanced Modeling of Ciprofloxacin Biodegradation Kinetics Using Machine Learning

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The excessive use of antibiotics and their synthetic derivatives has significantly impacted ecosystems, contributing to the emergence of extreme multidrug-resistant bacteria (XDR), antibiotic-resistant bacteria (ARB), and resistance genes (ARGs). Traditional physico-chemical methods for wastewater treatment face challenges such as high costs, by-product formation, and limited efficacy, necessitating alternative solutions. Biodegradation presents a sustainable, cost-effective, and energy-efficient approach for removing emerging organic pollutants from environmental matrices. This study focuses on the biodegradation of ciprofloxacin using microbial consortia via metabolic pathways. Optimal biodegradation parameters were determined through machine learning techniques, including Artificial Neural Networks (ANN), and statistical optimization using Response Surface Methodology (RSM) based on the Box-Behnken design (BBD). Under optimized conditions, the microbial consortia achieved 95.5% degradation efficiency, closely matching model predictions of 95.20% (RSM) and 94.53% (ANN). These findings highlight the potential for enhancing biodegradation processes to develop eco-friendly solutions for antibiotic removal from wastewater.

PP-23

Center of Innovation & Translational Research (CITAR): Supporting Biotechnology Ventures through BioNEST@CSIR-IITR

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The Center of Innovation & Translational Research (CITAR) at CSIR-IITR, Lucknow, established in 2017, offers a unique ecosystem for safe product, process, and technology development, supporting bio-entrepreneurship and toxicological testing at regional and national levels. In March 2020, the DBT-BIRAC funded BioNEST center was launched as the first bio-incubator in a CSIR institution and the largest in Uttar Pradesh, fostering connections with national and international scientific communities in toxicology assessment and validation.

This advanced facility, set in the thriving scientific environment of Lucknow, aims to accelerate biotechnology ventures, fostering entrepreneurship, research, and development. With state-of-the-art infrastructure, including specialized laboratories, equipment, and technical support, CITAR-BioNEST empowers researchers and entrepreneurs to explore innovative ideas and bring them to life.

CITAR-BioNEST's strength lies in its comprehensive support system, designed to meet the diverse needs of biotech startups and innovators. Additionally, the center promotes skill development and capacity building in the biotechnology sector through training programs, workshops, and educational initiatives.

In summary, CITAR-BioNEST at CSIR-IITR stands as a dynamic hub of innovation, entrepreneurship, and research excellence in the field of biotechnology. Through its multifaceted initiatives and collaborative approach, the facility catalyzes the transformation of scientific discoveries into real-world solutions, shaping the future of biotechnology and contributing to societal well-being.

PP-24

Common Research and Technology Development Hub (CRTDH): Promoting Sustainable Technologies for Environmental Pollution Abatement and Industry Management

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Common Research and Technology Development Hub (CRTDH) for Environmental Monitoring serves as a collaborative platform between MSMEs and CSIR-IITR, fostering innovation, knowledge exchange, and actionable solutions to address pressing environmental issues. By leveraging cutting-edge technologiessuch as air filters, water analysis kits, antimicrobial coating, bio-adsorbent gels, bio-reactor, etc.,this hub facilitates comprehensive monitoring of air and water quality, effluent treatment, biodiversity, and skill development.

The Environmental Monitoring and Intervention Hub (CSIR-IITR-DSIR-CRTDH) has been established with the objectives of promoting and mentoring R&D startups/MSMEs as well as developing trained human resources in the following verticals:

a) Drinking water disinfection and water quality assessment technologies.
b) Develop technologies for effluent treatment from MSMEs and industries.
c) Build predictive models, including source apportionment for air quality as well as pollution abatement.
d) Develop customized training programs/workshops/seminars for specific clusters to spark and produce trained human resources.

Furthermore, the hub acts as a catalyst for the translation of research findings into real-world applications.Engaging with MSMEs, startups, scientists, engineers, entrepreneurs, and policymakers,the CSIR-IITR-CRTDH provides a one-step solutionand fosters a participatory approach to environmental management, empowering stakeholders to actively contribute to mitigation efforts and adaptation strategies.

PP-25

Bioremediation of polyaromatic hydrocarbon polluted sewage sludge soil employing a bacterial consortium and phytotoxicity evaluation

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A consortium of five distinct bacterial strains was evaluated for their ability to biodegrade multiple PAHs present in sewage sludge under microcosm-based studies, besides determining their contamination. The sludge samples were collected during pre- and post-monsoon seasons from three different waste water treatment plants (WWTPs) from Lucknow (Bharwara), Kanpur (Jajmau) and Prayagraj (Naini) locations. Among the sixteen PAHs prioritized by USEPA and EU, fifteen of them were found except fluorene in both the seasons. Overall, the UHPLC analysis revealed that the lowest concentration was 1.75 ng/g and the highest was 5415.59 ng/g in sludge soil. Further, to our surprise the concentration ranges of PAHs found in both the seasons were comparable as post-monsoon expected yield less concentration owing to some wash-off. Indeno(1,2,3-cd)pyrene was found in high concentrations both in dry and wet samples perhaps owing to its multiple origin of contaminations. A bacterial consortium comprised of *Stenotrophomonas maltophilia* IITR87, *Ochrobactrum anthropi* IITR07, *Microbacterium esteraromaticum* IITR47, *Pseudomonas aeruginosa* IITR48 and *Pseudomonas mendocina* IITR46 were employed for PAHs bioremediation in the sludge following microcosm studies. In 20d, 65-70 % of PAHs were remediated and it was noticed that low molecular weight PAHs such as naphthalene, phenanthrene and pyrene showed enhanced degradation, as revealed by UHPLC analysis. The bioremediated samples showed significant reduction in phytotoxicity using the germination of plants, wheat (*Triticum aestivum*), black chickpea (*Cicer arietinum*) and mustard (*Brassica juncea*) and contaminated soil had inhibitory effects on growth. The results obtained comprehensively suggests a possible remediation option for PAH-contaminated sludge preventing their further contamination into other environmental compartments.

PP-26

Evaluation of cyto-genotoxic effect of iron oxide nanoparticle (IONPs) in V79 cells.

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Iron oxide refers to a group of abundant minerals on the earth.Iron oxide nanoparticles (IONPs) have received much attention for their utility in biomedical applications such as magnetic resonance imaging, drug delivery and hyperthermia.We characterise the hydrodynamic size and zeta potential of Iron oxide nanoparticle (IONPs) by using DLS whereas NTA was used to quantify the size and concentration of nanoparticles by determining the Brownian motion of particles.We have studied the effect of iron oxide nanoparticle onV79 Chinese hamsterlung fibroblast cells.MTT & Trypan blue dye exclusion assay shows an increase in cytotoxicity in dose dependent manner. The MTT assay showed significant % MTT Reduction at highest concentration (100 µg/mL) i.e., 68.88% when compared to control.The live &dead cell assessment was done using trypan blue dye exclusion assay, the live cell percent was found to be 71%at 100 µg/mL.The quantitative internalization of iron oxide nanoparticlewas investigated by flow cytometry which shows significant increase in IONPs uptake in cells with increasing concentration. These nanoparticles also resulted in the significant DNA strand breaks which was evaluated by Alkaline Comet assay.There is significant increase in the percent tail DNA &Olive Tail Moment in V79 cells.This study presents the in vitro estimation of Iron oxide nanoparticle's toxic effect on lung cells and the data can be used for the further studies in the field of biomedical/ therapeutic applications.

PP-27

Investigating mechanism of chronic kidney disease progression and the therapeutic effects of herbal modulators using an aristolochic acid-induced kidney injury model

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Chronic kidney disease (CKD) presents a significant global health challenge, with an estimated 697.5 million cases worldwide and 115.1 million in India. Projections indicate it could become the 5th leading cause of death by 2040. Despite extensive research over the past decade, our understanding of CKD progression remains limited. This study utilizes an Aristolochic Acid (AA)-induced CKD model, both in vitro and in vivo, to investigate the mechanisms underlying CKD progression. We evaluated fibrosis markers in vitro and assessed the mitigating effects of herbal modulators. In vivo, we analysed biochemical parameters such as serum creatinine, blood urea nitrogen (BUN), uric acid, and total protein at three time points: 72 hours, 15 days, and 35 days post-dose administration. We also monitored kidney function by assessing the glomerular filtration rate (GFR). Histopathological analysis was conducted using H&E and PSR staining. At the 15-day mark, we observed significant increases in serum creatinine and BUN, along with a decline in GFR. By day 35, fibrosis markers like tgf-β1and collagen 1 were elevated, there was a loss of the reno-protective marker Klotho, and the acute injury marker kim-1 was upregulated. H&E staining revealed structural damage, including glomerulosclerosis, and PSR staining indicated collagen deposition. This ongoing study aims to further investigate the epigenetic mechanisms of CKD progression and explore potential mitigation strategies using herbal modulators in vivo.

PP-28

Elucidating the functional importance of OCTN in ocular toxicity of systemic drugs

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Many systemic drugs cause carnitine deficiency in tears, leading to ocular toxicity, such as dry eye and ocular pain. Carnitine (a substrate for Novel Organic Cation Transporters, OCTN1/2) is an essential biomolecule that protects the ocular surface by regulating the osmolarity of the tear film. However, the carnitine shuttling pathway across the blood tear barrier (BTB) in the lacrimal gland and conjunctiva is under-explored. We hypothesize that carnitine can gain access in the tear through OCTN1/2 in the lacrimal gland and conjunctiva, and the systemic drugs causing carnitine deficiency could be due to dysregulation of OCTN1/2 in BTB. OCTN1/2 expression in rabbit's lacrimal gland was evaluated by polymerase chain reaction (PCR), Western blotting, and Immunohistochemistry. In vivo tear kinetics of OCTN1/2 substrate (L-carnitine) administered intravenously was performed with or without topical pre-treatment with OCTN1/2 blockers (tetraethylammonium (TEA) and Quinidine). Tear was collected using Schirmer strips at various time points and analyzed using Liquid chromatography-mass spectrometry. Gene and protein expression of OCTN1 and OCTN2 in the lacrimal gland was confirmed by PCR and western blotting, with a relatively higher expression of OCTN2. Immunohistochemistry studies indicated the higher expression of OCTN1/2 in lacrimal gland ductal cells than acinar cells. In vivo tear kinetics indicated a significant decrease in carnitine concentration at 5 and 15 mins in TEA and Quinidine pre-treated groups compared to the control group ($p<0.01$). In the TEA and Quinidine pre-treated group, the $AUC_{[0-2h]}$ was 1.38-fold and 1.24-fold decreased compared to the control group, respectively. The current study reported OCTN1/2 expression in the lacrimal gland and established its functional importance in BTB. The topical blockers can prevent unwanted systemic toxicity and do not alter the drug's systemic pharmacological activity. Further studies are ongoing to understand the role of OCTN in the ocular toxicity of systemic drugs causing carnitine deficiency.

PP-29

Photosensitization potential and phototoxicity of hair dye complex compared to individual ingredients under ambient UV-R

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Permanent hair dyes are the most widely used in the world. They are created by the chemical reaction of a dye precursor and a coupler agent under oxidative conditions. However, these mixtures contain reactive by-products having skin sensitization and irritation potential. Exposure to solar UV-R can enhance their toxicity as they absorb light in the UV/visible spectrum. However, there is a lack of information dealing with the toxicity of these mixtures as most studies investigate the hazard potential of individual ingredients. Therefore, further investigation is needed. This study aims to understand the phototoxicity of hair dye complex (HDC) compared to individual hair dye ingredients under ambient UV-R. Primarily, we created an HDC using p-phenylenediamine, 5-amino-2-methylphenol and hydrogen peroxide. Absorption spectra of HDC show absorbance in both UV/visible regions having peaks at 289nm and 498nm. The result from the cell viability assay on HaCaT cells revealed that HDC has more toxic potential than individual ingredients under ambient UV-R exposure. Furthermore, DCF and DHE assays confirmed greater ROS generation in HDC than individual ingredients. Lipid peroxidation in keratinocytes induced by oxidative stress is observed by the synergistic effect of UV-R and HDC. The above findings revealed that the complex of hair dye is more hazardous than individual ingredients, especially under sunlight exposure. Therefore, hair dye users should avoid direct sunlight exposure during hair dye application to prevent skin inflammatory and allergic diseases.

PP-30

Diclofenac sodium induced phototoxicity assessment in human keratinocytes (HaCaT cell) under UVR exposure

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Diclofenac, a phenyl acetic acid derivative, is an NSAIDs used for the treatment of pain, inflammation and musculoskeletal disorders. However, its cardiovascular, renal and gastrointestinal side effects are already reported. Several clinical studies reported that diclofenac cause photo-onycholysis, toxic epidermal necrolysis (TEN) and Kounis syndrome etc. In this study, we have investigated the photostability, photocytotoxicity and photogenotoxicity potential of diclofenac via *In-chemico, In-vitro and In-silico* method. Our results showed that diclofenac sodium absorbed UV radiation under UV B. Diclofenac degraded in a time dependent manner under UV A (1 hr to 4 hr with 1.6 mW/cm^2), UV B (30 min. to 120 min. with 0.6 mW/cm^2) and sunlight (1 hr to 4 hr) and generates photoproducts. *In-chemico* and *in-vitro experiments* showed that diclofenac generated reactive oxygen species (ROS) under UV B (0.6 mW/cm^2) and UV A (1.6 mW/cm^2). Diclofenac reduces cell viability (60%-65%) under irradiations of UV R by MTT and NRU assays. In addition, Diclofenac induces apoptosis under irradiations of UV A and UV B investigated by AO-EtBr assay. Furthermore, diclofenac also causes DNA damage by comet assay under UV B and UV A compared to dark control in 25 µg/ml and 50 µg/ml, respectively. The Diclofenac cause both single and double stranded DNA damage under UV A and UV B by comet assay, γ-H2X assay, Hoechst assay. Although, diclofenac also has clastogenic activity as it was done by micronucleus and chromosomal aberration assay under UV B and UV A. Thus, our study explored that diclofenac sodium enhanced both phototoxic and photogenotoxic mechanism under UV R. Therefore, it advocates that people should avoid sunlight exposure during the diclofenac medication. This study will help to understand the phototoxicity mechanism of diclofenac under ambient UV R/sunlight exposure.

PP-31

Impact of arsenic exposure on gut microbiota and airway inflammation

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Arsenic is the most prevalent and persistent toxic environmental contaminant, affecting over 200 million people worldwide, with a significant concentration in Asia. There are plethora of reports establishing the toxic effects of arsenic associated with neurotoxicity, teratogen and as mutagens but a very few data available on its direct co-relation with gastrointestinal tract and gut microbiome. Additionally, there has been few significant studies suggesting a notable correlation between arsenic-endemic areas and associated respiratory disorders. The lacunae on the subject focussing the impact of gut microbiota on Gut-Lung axis is scare. Thus, In the current study hypothesis revolves around the tripod between arsenic, gut microbiome, and airway inflammation. Based on our finding, it was evident that presence of arsenic in gut has compromised the gut barrier integrity and significant change has been observed in relative abundance of gut microbiome. Further, the bioaccumulation of arsenic in Lung and liver tissue was confirmed with ICPMS, suggesting its association with host immune responses. Metagenomic analysis revealed that exposure to arsenic in drinking water at a concentration of 3.8 ppm for 30 days resulted in gut microbiota dysbiosis. Through metagenomic analysis, a decrease in *Lactobacillus* and *Clostridiales* was observed, which aligns with previous literature indicating associations with airway inflammation. The airway inflammatory markers such as eosinophils and total leucocyte counts also exhibits a positive correlation with the characteristics of asthma. Our study indicates that arsenic, by altering the gut microbiota and causing changes in the chronic period, may exacerbate airway inflammation.

PP-32

Sunset Yellow protects against oxidative damage and exhibits chemo preventive efficacy in a model of chemically-induced skin cancer

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Background: Inflammation is the root cause of skin cancer and other pathophysiological disorders of the skin. Sunset Yellow (SY) demonstrates immunomodulatory properties, as shown by its ability to control immune cell populations, adjust lymphocyte activation, and partially suppress the release of proinflammatory cytokines. The purpose of our work was to further explore the possible anti-inflammatory effects of SY in a two-step skin cancer model produced by DMBA/TPA using in vitro, in silico, and physiochemical test methods.

Result: Pre-treatment with SY significantly increased the viability of HaCaT cells exposed to tertiary-butyl hydrogen peroxide (tBHP) in vitro. This improvement in cell viability was accompanied by reduced ROS levels, restored mitochondrial membrane potential, and less DNA damage. Mechanistic studies confirmed SY's antioxidant properties, with a standard reduction potential (Eo) of 0.211V, as shown by potentiometric titrations and the DPPH antioxidant test. Oxidative stress, driven by exogenous and endogenous factors, contributes to skin cancer, and boosting antioxidant defense is a key strategy to mitigate ROS. In a DMBA/TPA-induced skin carcinogenesis animal model, topical SY application over 21 weeks significantly reduced tumor latency, incidence, yield, and burden in a dose-dependent manner. Additionally, in silico analyses identified potential molecular targets of SY, offering insights into its antioxidant and chemopreventive mechanisms.

Conclusions: In conclusion, this study demonstrates SY's chemoprotective properties against skin cancer as well as its anti-oxidant and anti-genotoxic properties.

PP-33

Quercetin's antioxidant and anti-inflammatory properties counteract arsenic-induced neurotoxicity in human mesenchymal stem cells

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Sodium Arsenite (SA), a highly toxic metal, poses significant health risks due to its widespread environmental presence. Mesenchymal stem cells (MSCs) have shown promise in regenerating damaged tissues. However, SA-induced neurotoxicity remains a concern, with existing treatments focusing solely on symptom relief.This study investigated SA's impact on microRNA (miRNA) expression in human MSCs and explored quercetin's protective effects. MSCs were exposed to 10μM arsenic for 48h, followed by miRNA and mRNA profiling using TaqMan-based open array systems.SA exposure dysregulated 20 miRNAs in MSCs, affecting pathways related to cell proliferation, differentiation, organ development, homeostasis, and regeneration.The mRNA profiling revealed upregulation of 5 genes and downregulation of 53 genes, implicating chaperone-based function, cellular stress, nucleotide and protein binding factors, and neuronal developmental pathways.The affected signaling pathways include FoxO, mTOR, and Ras-signalling, which are crucial for stem cell longevity, proliferation, growth, differentiation, and tissue organization.Bioinformatics analysis using David and Target Scan identified potential targets for dysregulated miRNAs.This study highlights the selected miRNAs as critical mediators of arsenic-induced toxicity in MSCs, offering diagnostic and therapeutic potential for regulating heavy metal toxicity mechanisms. Quercetin's protective effects on SA-exposed MSCs were also demonstrated.The findings underscore the importance of understanding miRNA regulation in MSCs exposed to toxic metals, providing insights for developing targeted therapeutic interventions and diagnostic biomarkers.

PP-34

Evaluation of the Toxicological Effect of Coloured Plastic Feeding Bottles

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Plastics are extensively used in food and pharmaceutical packaging due to their durability, versatility, and cost-effectiveness. However, the safety of plastic materials, particularly those used in infant products like feeding bottles, is a growing concern. Feeding bottles frequently contact food items such as milk and formula, creating potential health risks if harmful substances leach from the plastic. In India, plastic feeding bottles are regulated under IS 14625, which mandates compliance with BIS certification standards. This standard allows the use of colorants and pigments conforming to IS 9833, ensuring their suitability for food contact. IS 14625 also specifies permissible limits for the migration of heavy metals, including Antimony (15 ppm), Arsenic (10 ppm), Chromium (10 ppm), Mercury (10 ppm), Cadmium (20 ppm), Lead (25 ppm), Barium (100 ppm), and Selenium (100 ppm), and also mentioned an overall migration limit test with permissible limit of 60 mg/L tested by using distilled water and n-heptane as simulants, per IS 9845.

The rising popularity of colored feeding bottles in India, both domestically produced and imported, highlights the need for evaluating the toxicological risks associated with repeated use and potential leaching of colorants and pigments. This study tests colored bottles from two manufacturing companies—Chemco Plastic India Pvt. Ltd. and Pigeon India Pvt. Ltd. for five different colored bottles (green, blue, pink, light blue, and light pink) following the guidelines of IS 14625, IS 9845, and IS 9833, which include heavy metal analysis, overall migration testing, and specific migration tests. Findings from this study will provide insight into the toxicological effects and safety of these colored feeding bottles to infants health.

PP-35

Divulging the unexpected: insight investigation of minor and toxic elements in diverse millet

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Millets, a nutritious and resilient crop, have gained prominence due to their ability to thrive in diverse climatic conditions. This study employed microwave digestion coupled with ICP-MS to analyse the elemental composition of various millets sourced from the Indian market. Direct mercury analysis was conducted using a DMA. To validate the analytical methodology, recovery rates were determined at three spiking levels, ranging from 50 to 120%. Furthermore, the analysis revealed the presence of over 20 elements, including essential, non-essential, and heavy metals. Aluminium (Al) was the most abundant non-essential metal in kodo millet (169.5 mg/kg), while buckwheat millet exhibited the highest concentration of lead (Pb) at 3.15 mg/kg. Finger millet contained the most significant amounts of barium (Ba) and mercury (Hg) at 12.345 mg/kg and 35 µg/kg, respectively. Although lithium (Li), cadmium (Cd), and tin (Sn) were detected, their concentrations were below the quantification limit. Moreover, the calculated hazard index (HI) for all millet samples exceeded 1, indicating potential health concerns associated with their consumption. Statistical analyses, including Pearson correlation, hierarchical clustering, and principal component analysis, were performed to evaluate the relationships and influences of essential and non-essential elements on each other. The results highlighted significant correlations, groupings, and the impact of elemental composition on overall millet quality.

PP-36

Arsenic induces protection from demyelination in the corpus callosum of cuprizone-induced demyelinating mouse model

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Myelin is a protective and insulating sheath surrounding neuronal axon that allows electrical impulses to transmit quickly and efficiently from one neuron to another. If it gets damaged, nerve signals can slow down or even stop and subsequently translated in the form of defective motor function in organism. Multiple sclerosis (MS) is a well known demyelating disease with severely damaged motor activity. Although, multiple studies from decades have been conducted to delineate the etiology and pathogenesis of MS using various animal models including cuprizone-induced (copper chelator) mice model, but knowledge regarding this disease is limited. Arsenic is an infamous neurotoxic agent, significant contributor of neuroinflammation and disease. However, our recent study demonstrated that exposure to lower dose of sodium arenite (As) protects corpous callosum (CC) from demyelination in cuprezone-induced Balb/c mice. To investigate the potential mechanism behind this, we checked inflammation status and SOD1 activity in CC region of different experimental groups. Every experimental group exhibited a significant increased inflammation in CC region compare to control, perhaps a significant reversal in decreased SOD1 activity was observed in cuprizone+As group compare to only cuprizone-exposed mice. Additionally, viability, SOD1 activity, and ROS level were evaluated in Oligodendrocytes, know for myelation, following different doses of cuprizone along with or without arsenic. A dose dependent decreased viability, SOD1 activity and increased ROS level were observed in only cuprizone-treated group. Interestingly, arsenic significantly restored viability, SOD1 activity and reversed ROS level in cuprizone+As compare to only cuprizone-treated group. Collectively, our finding suggesting that arsenic mediated improved viability of oligodendrocytes may contribute to protection from demyelination in cuprizone-induced mice model.

PP-37

Investigating the mechanisms of alterations in epigenetic landscape associated with diabetic kidney disease using a streptozotocin-nicotinamide induced diabetic kidney disease model

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Diabetic kidney disease (DKD) is a significant global health and economic issue, characterized by chronic kidney disease (CKD) features such as reduced GFR and increased urinary albumin. Its prevalence is rising with the global surge in diabetes, which has grown by 46% to 783 million cases (IDF 2021). In India, DKD prevalence varies widely, ranging from 0.9% to 62.3%. Despite extensive research over the past decade, the understanding of epigenetic modifications associated with diabetic kidney disease (DKD) remains limited. In this study, a DKD model was established in BALB/c mice through intraperitoneal injection of streptozotocin-nicotinamide (STZ-NA). We monitored the body weight and fasting blood glucose level weekly. We also evaluated the glucose tolerance and insulin tolerance by oral glucose tolerance test (OGTT) and insulin tolerance test (ITT) respectively. Kidney function was assessed by measuring serum creatinine, uric acid, albumin levels, and GFR. At 16th week, the animals were sacrificed and serum inflammatory and diabetic markers were evaluated. Additionally, the relative expression of NGAL, Fibronectin (FN), YY1 were determined by RT-PCR. The fasting blood glucose level was significantly elevated in the treatment groups. Treated groups showed significantly elevated fasting blood glucose, serum creatinine, and uric acid levels, alongside a decline in GFR. Alterations in serum resistin, ghrelin, and leptin were also observed, along with increased inflammatory markers IL1α and TNFα. By week 16th, increased expressions of early kidney injury marker NGAL, fibrosis marker Fibronectin and transcription factor YY1 were observed. In this ongoing study, we will further analyse the histological changes associated with DKD and we will try to decipher the mechanisms associated with alteration of epigenetic landscape during DKD.

PP-38

Photoprotective Efficiency of Sunset Yellow: Antioxidative Properties and Broad-Spectrum UV Absorption Under Sunlight Exposure

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Exposure to phytotoxicants and photosensitizers can lead to the production of reactive oxygen species (ROS), which cause oxidative stress, DNA damage, and various skin pathologies, including aging, allergies, and cancer. Although some photo-protectants can provide protection against ultraviolet radiation (UV-R), but their effectiveness is often compromised by photo-instability. Sunset Yellow (SY), an FDA-approved food dye, has significant UV-R and visible light absorption abilities, yet its potential for photoprotection has not been fully explored. Our findings demonstrates that SY shows significant photostability for up to 8 hours under both UV-R and sunlight. Notably, SY effectively neutralizes various ROS, such as singlet oxygen ($^1O_2$), superoxide radicals ($O_2^{\bullet-}$), and hydroxyl radicals (OH), generated by rose bengal, riboflavin, and levofloxacin, respectively. Furthermore, SY imparted protection against apoptotic and necrotic cell death induced by the phototoxicant chlorpromazine (CPZ) in HaCaT cells. We observed that photoprotective efficacy of SY was associated with reduction in intracellular ROS generation and inhibition of calcium release. Additionally, genotoxicity assessments further confirm SY's protective efficacy against chlorpromazine (CPZ)-induced DNA damage. In summary, these findings highlight the SY's potential as a promising photoprotective agent against the detrimental impactsof phototoxicants, suggesting its possible use in formulation of broad-spectrum sunscreens.

PP-39

Microbial Diversity analysis of landfill sites using Metagenomic approach.

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Landfill sites having plastics form a unique habitat for microbes and form a distinct plastisphere. Organic matter within landfills can create an optimal environment for microbial proliferation, thereby accelerating the degradation process. Factors like moisture content, temperature, and anaerobic conditions are critical in facilitating plastic breakdown. This comprehensive metagenomic study aimed to characterize the taxonomic composition and diversity of microbial communities across four landfill/dump sites samples [designated as A (Lucknow), B (Delhi), C (Delhi) and D (Hardoi)]. Taxonomic profiling revealed remarkable microbial richness across the samples. Specifically, sample A exhibited 3 bacterial, 53 phyla, 151 classes, 375 orders, 618 families, 1240 genera, and 2804 species.Sample B showed slightly lower diversity with 3 divisions, 44 phyla, 128 classes, 287 orders, 456 families, 836 genera, and 1415 species.Samples C and D displayed intermediate levels of taxonomic diversity, with 3 divisions, 55 and 48 phyla, 161 and 131 classes, 407 and 331 orders, 674 and 512 families, 1315 and 878 genera, and 2808 and 1755 species, respectively.

The comprehensive analysis of taxonomic assignments revealed that the phylum Proteobacteria was the dominant taxon across all four samples, followed by Actinobacteria and Bacteroidota etc. The most abundant genera identified were *Streptomyces*, *Galbibacter*, *Alcanivorax*, and OM190 in samples A, B, C, and D, respectively. Furthermore, the dominant species were *Chloroflexi, Galbibacter marinus*, *Gracilimonas amylolytica*, and *Teredinibacter* in the respective samples. These findings provide valuable insights into the complex and diverse microbial communities present in the examined metagenomic samples, and contribute to a better understanding of the ecological roles and potential applications of these microorganisms in various environmental and biotechnological contexts.

PP-40

Quercetin's antioxidant and anti-inflammatory properties counteract monocrotophos-induced neurotoxicity in SH-SY5Y cells

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Monocrotophos (MCP) is a potent neurotoxin that inhibits acetylcholine esterase, disrupting neurotransmission and inducing apoptosis and oxidative stress in neuronal cells. Quercetin, a natural flavonoid, exhibits neuroprotective properties due to its antioxidant and anti-inflammatory nature.Our study investigated dysregulated genes in MCP-exposed SH-SY5Y cells and evaluated quercetin's protective effects. Non-cytotoxic doses of MCP (300μM, 72h) and quercetin (1μM, 24h) were determined using Alamar blue assay.Experiments were conducted under prophylactic conditions, with quercetin administered pre-, co-, or post-MCP exposure. TaqMan-based Open Array and bioinformatics analysis (Expression Suite, David) revealed that MCP exposure dysregulates genes involved in mitophagy, necroptotic cell death, and cellular stress response (CASP8, SQSTM1, NDUFAB1, MMP9, MAP2K9, HSPA2, HSPA5).Quercetin mitigated molecular damage in all treatment conditions, abating the expression of dysregulated genes. Our findings demonstrate MCP's significant impact on gene expression and quercetin's robust neuroprotective effects across various exposure stages. This study highlights quercetin's potential as a therapeutic agent against MCP-induced neurotoxicity and related neurodegenerative diseases.The results underscore the importance of quercetin's antioxidant and anti-inflammatory properties in counteracting neurotoxicity, suggesting its potential application in preventing or treating neurodegenerative disorders.

PP-41

Restoration of chemical-induced neuronal damages using paracrine secretions of cultured human mesenchymal stem cells

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Mesenchymal Stem Cells (MSCs) possess reparative and restorative capabilities through their paracrine secretions, known as the secretome. We, therefore, aimed to characterize the MSC secretome under both unprimed and primed conditions and explored its restorative effects on Monocrotophos (MCP), a known neurotoxic organophosphate pesticide, exposed Neural Progenitor Cells (NPCs). Secretomics analysis revealed that the MSC secretome is enriched with proteins involved in glycolysis, oxygen transport, anti-inflammation, and cell proliferation. Treatment with MSC secretome restored oxidative stress and mitochondrial membrane potential in MCP-exposed NPCs. Bioenergetic profiling showed impaired mitochondrial activity in MCP-exposed NPCs, with decreased oxygen consumption rate, basal respiration, maximal respiration, and non-mitochondrial respiration. However, treatment with MSC secretome restored these mitochondrial parameters. Bioinformatics analysis identified proteins BAK1, BCL2, BIRC6, and CASP8 as key players in apoptotic pathways and COX5B and NDUFA10 in mitochondrial damage in MCP-exposed NPCs. Notably, treatment with primed MSC secretome restored protein levels. This study demonstrates the MSC secretome's potential to restore cellular homeostasis and immunomodulation in acute neurotoxicity. The findings highlight the therapeutic potential of MSC secretome in mitigating neurotoxicity and promoting neural repair. The MSC secretome's restorative effects on MCP-exposed NPCs suggest its potential as a therapeutic tool. By modulating apoptotic pathways and mitochondrial damage, the MSC secretome contributes to cellular homeostasis and immunomodulation in acute neurotoxicity.

PP-42

Effects of Mustard oil consumption on gut-liver axis

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The intestinal tract comprises the human body's most densely colonized microbial ecosystem, known as gut microbiota. The gut microbiota forms a huge taxonomic diversity and performs numerous crucial functions in the physiology. Hence, the human body and its microbiota remain inseparable and is considered as a prognostic marker in determining the health of an individual. One of the significant determinants of gut microbiota composition is the diet. Edible oils are one of the principal sources of nutritionally required fatty acids in our diet. Mustard oil (MO) is the one of the common vegetable oil consumed in Asia, specifically India and China. In contrast to these, several regulations have been set on the consumption of mustard oil in Western countries (primarily Unites States and Europe). Considering the inconsistencies in the consumption of MO in different regions of the world, this study aimed to investigate the effects of different dose of MO on the gut microbiota composition in mice. MO administration changed the Bacteroidetes/Firmicutes ratio (B/F) ratio. Moreover, rise in the population of phylum Proteobacteria was observed which is often linked with intestinal inflammation. In addition to these, there was alteration in the fatty acid profiling of fecal samples. Besides this, there was variation in the fatty acid metabolism gene expression in liver tissue. Altogether, mustard oil consumption causes gut microbiota dysbiosis and affects the fatty acid metabolism in liver.

PP-43

Generation of a cytoplasmic-shifted ERα for screening and validation of (anti) estrogenic modulators and their influence on human health.

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The perpetual use of chemicals with endocrine/metabolism disrupting properties and their bioaccumulation in the environment has led to significant disturbance in the ecosystem.Endocrine-disrupting chemicals (EDCs) are natural or synthetic compounds present in the environment that mimic hormone actions and disturb endocrine homeostasis. These EDCs are well known to interact with steroid/nuclear receptors (NRs), including androgen receptor, estrogen receptor, etc.Estrogen receptor α (ERα) is a ligand-inducible transcriptional regulator influencing several physiological functions, including reproduction and development. Unliganded ERαis localized primarily into the nucleus.It binds to specific DNA response elements and transactivates target genesupon hormone or agonistbinding.Numeroussynthetic EDCs,includingplasticizers, pesticides, flame retardants, etc.,are reported to impart estrogenic/anti-estrogenic responses by acting as ER ligands. Thisreceptor-EDCs interaction leads to the dysregulation and impairment of ERα-dependent transcriptional signaling pathways. Sustained and prolonged metabolic disturbances can contribute to the development and progression of various diseases like cancer, insulin intolerance, early puberty, infertility, and osteoporosis.The regulation of gene expression byNRs is influenced primarily by their subcellular compartmentalization of liganded and unliganded receptors. However, the constitutive presence of nuclear-localized ERαposes challenges to performnuclear translocation assays. Our laboratory has generated a cytoplasmic-shifted mCherry-tagged ERα-chimera by replacing specific residues in the nuclear localization signal (NLS) region of ERα.This cytoplasmic-shifted ERα offers an opportunity to study ligand-receptor interaction, functional dynamics,and their downstream effects by analyzing the ligand-dependent nuclear translocation from the cytosolic compartment in living cells. This cell-based screening tool will facilitate screening estrogenic/anti-estrogenic properties of EDCs, drugs and small molecule modulators by evaluating receptor nuclear translocation before and after ligand challenge.

PP-44

Amine-Functionalized MOF Aerogels for Efficient CO2 Adsorption in Humid Environments

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This study presents a novel approach for direct air capture (DAC) of CO2 using amine-functionalized metal-organic framework (MOF) aerogel beads. By employing carrageenan alginate microbeads as a template, we successfully synthesized MOF aerogels with a highly interconnected network, enhancing CO2 adsorption capacity. An unexpected water-assisted enhancement effect was observed under humid conditions, attributed to the formation of bicarbonate and hydronium carbamate species. The incorporation of amine functional groups further improved CO2 capture performance, providing additional adsorption sites. These findings demonstrate the potential of amine-functionalized MOF aerogel beads as a promising material for efficient and sustainable CO2 capture from ambient air.

PP-45

Development of Pharma Grade Castor Oil Reference Material for Self-Reliant India

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Castor oil is viscous, pale yellow, non-volatile, and non-drying oil derived from the seeds of *Ricinus communis*, of the family Eurphorbiacae, and has significant industrial and medicinal applications due to its unique fatty acid composition, particularly Ricinoleic acid. Developing a pharmaceutical-grade reference material (RM) of castor oil is crucial for ensuring the quality and standardization of pharmaceutical formulations in India, particularly as the country aims for greater self-reliance in its drug manufacturing sector. However, for use in the pharmaceutical industry, it is essential to ensure that the castor oil meets stringent quality standards, making the development of a standardized reference material vital for regulatory purposes and product consistency as per ISO 17034:2016.

This research aims to prepare pharma-grade castor oil, involving the purification process through column chromatography, the purified oil was subjected to detailed analysis of triglyceride composition as per USP using High-Performance Liquid Chromatography (HPLC). The purified oil is subjected to transesterification reaction to prepare fatty acid methyl esters (FAMEs) and analyzed using Gas Chromatography (GC-FID) to assess the purity and composition of FAMEs of the Castor oil complying the requirements of pharma-grade castor oil.

Thus, this research is essential to establish a robust methodology for the preparation and characterization of a pharma-grade castor oil reference material resulting in the establishment of a reliable, high-quality standard of castor oil contributing to India's self-reliance in pharmaceutical manufacturing, facilitating quality control, research, development activities and reducing dependency on imported materials thus improving the consistency and safety of locally produced medicinal products.

PP-46

Forkhead box O transcription factor and Drosophila male fertility: Insights into endocrine disruption in insect pollinators

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Insect pollinators are a crucial and essential part of our ecosystem. In this context, the alarming decline in both the number and diversity of insect pollinators has become a growing concern in recent years. This decline may be attributed to the inadvertent exposure to chemicals and pesticides with the potential to mis-regulate the endocrine system of insects. Despite this, little is known about the candidates associated with endocrine disruption or the underlying mechanisms in insects. Earlier studies from our lab had shown that exposure to chemicals compromises the activity of the ecdysone receptor, which is associated with steroid signaling in insects, leading to loss of seminal proteins and impaired male fertility. Beyond this, nothing is known regarding the impact of chemical exposure on other endocrine signaling pathways or the consequences on insect male fertility. In this context, an attempt has been made to evaluate the role of forkhead box O transcription factors (FOXO), critical players associated with the Insulin signaling pathway and stress response, in insect male fertility, using *Drosophila melanogaster* as a model system. *D. melanogaster* is a well-established model for studying these accessory gland proteins and insect male fertility, due to the wealth of literature, amenable genome as well as the molecular repertoire available. We find that overexpression of FoxO, specifically in the male accessory gland, affects the structure and function of these glands. Consequently, such males fail to produce seminal proteins and are infertile. Interestingly, increased FOXO levels increases the EcR transcript levels, suggesting a potential cross-talk between Insulin signaling and steroid signaling pathways in insect male fertility. Exploring this signaling cross-talk further in response to chemical exposure would help to unravel the mechanisms underlying endocrine disruption in insects.

PP-47

Predicting the developmental toxicity of hexaconazole from in vitro alternative toxicity assays using toxicokinetic modelling for health risk assessment

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In the traditional toxicity testing regime, developmental toxicity requires one of the highest numbers of test animals, raising economical and ethical constraints. Modern 21st-century toxicity testing is gradually shifting to alternative assays, such as rat whole embryo culture test, mouse embryonic stem cell test, zebrafish embryotoxicity test, ToxCast assays, etc., that are high-throughput, cost-effective and require fewer animals than the traditional approach. However, one major drawback of these approaches is the dose-concentration correlation, i.e., *in vitro* to *in vivo* extrapolations (*IVIVE*). For a reliable *IVIVE*, toxicokinetics and modelling approaches, such as the physiologically based toxicokinetic (PBTK) model, are required. This would provide the *in vivo* dose needed to achieve the *in vitro* bioactive concentration in the blood/target organs.

For the first time, we derived the human equivalent oral doses (HEDs) for hexaconazole (HEX, a widely used azole fungicide) from the *in vitro* assay concentrations using PBTK model-facilitated reverse dosimetry approach. For this, *in vitro* (rat and human) and *in vivo* (rat) toxicokinetic data were generated. The *in vitro* data was used to build a full rat and human PBTK model. The predicted toxicokinetic data from the rat PBTK model was found to be comparable with the observed *in vivo* toxicokinetic data, suggesting that this model was successfully verified and could be used to develop the human PBTK model. Further, the human PBTK model was used to translate the *in vitro* concentrations of various alternative developmental toxicity assays into HEDs (0.16-7850 mg/kg/day). These *in vitro*-derived HEDs were comparable with the HED obtained using traditional rat *in vivo* developmental toxicity (0.55 mg/kg/day). As most of the *in vitro* HEDs were within 2-fold of the traditionally derived HED, the PBTK model-facilitated reverse dosimetry approach could be used to directly derive HEDs from *in vitro* assays when sufficient animal data is lacking.

PP-48

Development of CD44 targeted Se/Bio-MOF nanocarrier for anti- cancer synergism: A detailed in vitro and in vivo validation in EAC tumor model.

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The study aims to develop a unique high efficiency CD44 targeting nanocarrier (Se/Bio- MOF-DOX@CMHA) to kill cancer cells. Increasing evidence suggests that Bio-MOFs have high porosity, surface area, and structural diversity and could serve as effective tools for drug delivery nanoplatforms. Recent studies explored the potential role of selenium in inhibiting the TrxR enzyme activity in tumor microenvironment, enhancing the ROS generation that leads to the death of cancer cells. The current study addresses the limitations of the existing conventional chemoprevention modalities by smartly designing a high payload nanocarrier system (Se/Bio-MOF DOX@CMHA) to target the cancer cells. As a molecular target, CD44 receptor binding has been achieved by specifically functionalizing our nanocarriers with hyaluronic acid (HA) that acts a ligand for CD44 receptor. The chemoprevention drug doxorubicin (DOX) was effectively encapsulated within our nanocarriers due to its inherent high porosity and amphiphilic nature. The present proposal showed that the suitably chosen components of the designed nanocarriers has imparted a synergistic therapeutic activity between DOX and Se/Bio-MOF-DOX@CMHA. The effectiveness of nanocarriers against cancer cells was determined through detailed in vitro molecular studies on various cancer cells, the results of which was validated in vivo using Ehrlich ascites carcinoma rat model.

PP-49

Unraveling the impact of millet diet using *Caenorhabditis elegans*

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The metabolic disorder resulting from an imbalance between energy intake and expenditure contributes to chronic diseases such as diabetes, cardiovascular disorders, and hypertension. To mitigate these risks, it is crucial to identify natural compounds or dietary interventions that can effectively regulate energy homeostasis. Although millet is increasingly recognized for its health benefits, there is limited scientific research on the effects of Kodo millet and its impact on overall health. In this regard, a comparative analysis of the impact of Kodo millet was carried out between the obesity model and the wild type of *Caenorhabditis elegans*. In worms on the millet diet, there was no impact on the development or their lifespan compared to the control. However, millet consumption led to increased behavioral activities (foraging, feeding, and locomotion) as well as the reproductive output of worms. Additionally, significant fat accumulation was observed in both models, pointing towards the role of Kodo millet in influencing lipid metabolism. Interestingly, the levels of reactive oxygen species (ROS) decreased significantly in the obesity model compared to their control, indicating the potential antioxidant properties of Kodo millet. This research underscores the need to explore Kodo millet further as a dietary approach for managing energy balance and related metabolic disorders.

PP-50

Isoform-specific differential expression of GABARAP family genes in Glioblastoma

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Autophagy is a vital cellular process that is involved in the degradation and recycling of damaged cellular components in the form of energy. It has been a subject of interest in the context of glioblastoma (GBM), a most aggressive form of primary brain tumor. Concerning the malignant behavior of GBM, more research and novel therapies are immediately required to improve the patient output. Many studies highlight the role of autophagy as an adaptive mechanism by providing GBM cell support. On contrary, others have reported that autophagy can be detrimental for cancer cells by inducing cell death. In this study, we demonstrated the isoform-dependent role of GABARAP family genes in response to autophagy activation and inhibition. We used the CQ drug for autophagy inhibition and investigated the effect of CQ on GABARAP's expression. We observed that CQ treatment predominantly increased the levels of GABARAP. We also analyzed the expression of ATG8 family genes in GBM and LGG patient samples and observed high expression of GABARAP while low expression of MAP1LC3A in most patient samples. Understanding the differential expression of ATG8 genes can help to design better autophagy inhibitors. Our finding demonstrates that elevated expression of GABARAP is providing survival advantage to GBM cells and it can be used as a good prognostic marker for GBM. Further, knockdown of specific GABARAP family gene reduced the TMZ sensitivity and increased the cell proliferation by decreasing p53 expression in glial cell lines. The differential role of GABARAP family can be explored further to attain a better therapeutic advantage.

PP-51

Altered PU.1/CSF1R axis leads to microglia proliferation in mouse hippocampus following perinatal arsenic exposure

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We have previously shown that perinatal arsenic exposure induces microglial activation, proliferation and cognitive dysfunction in mouse pups. The present study sought to decipher the role of PU.1/CSF1R axis in arsenic-induced microglial proliferation. Pregnant dams were orally gavaged RO water and sodium arsenite (0.38mg/kg bd wt) from GD5 till PND22. The mouse pups were sacrificed on PND22 following the treatment regimen and perform western blotting, qRT-PCR and immmunohistochemical (IHC) staining. The microglial number was found to be increased in arsenic-exposed mouse pups as evidenced by IHC staining of Ki67 (proliferation marker) and Iba1 (microglia marker). The expression of CSF1R was up-regulated in arsenic-exposed pups. The expression of CSF1R transcription factor, PU.1 was also increased in treated group. The role of arsenic-induced PU.1 in microglial proliferation was further confirmed by inhibiting PU.1 using siRNA in BV2, a mouse microglia cell line and checking the expression of CSF1R. Reversal of PU.1 following L-methionine supplementation in arsenic-treated BV2 cell suggests a possible demethylation in the CpG island in the upstream regulatory region of the PU.1 promoter. Thus, our study shows that arsenic induces the microglia proliferation via regulation of PU.1/CSF1R axis in mouse hippocampus.

PP-52

Safety/toxicity assessment of transitioning to a kodo millet diet using Drosophila as a model organism.

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Globally, the population is rapidly shifting towards a tech-supported, sedentary lifestyle, which is causing various metabolic disorders. As a result, an alarming rise in the prevalence of various diseases has been observed, with type 2 diabetes being a major contributor. This scenario has inspired the search for implementable daily life strategies to minimize or manage primary and secondary complications of type 2 diabetes. Recently, there has been a growing interest in adopting a millet-based diet. Despite limited scientific evidence, millets are gaining popularity for their low glycemic index and other nutritional benefits compared to conventional diets. Moreover, increased awareness of the importance of fitness has led many people to incorporate millet as a healthy dietary choice. However, the safety and toxicity aspects of transitioning from traditional wheat and rice-based diets to millet diets, as well as the long-term implications of such a dietary shift, are poorly defined. Kodo millets are known for their nutritional benefits, including high-fiber content, vitamins, and minerals. In this study, we aimed to evaluate the short-term and long-term effects of replacing a regular diet with a kodo millet diet using *Drosophila melanogaster* as a model organism. The choice of model is in view of Drosophila's contributions to nutritional and toxicological research. Genetic and metabolic similarities between Drosophila and humans can offer valuable insights into potential health effects in people. Our findings indicated that shifting to kodo millet diets did not significantly impact body weight, body size, locomotion, fertility, and redox state of flies. Interestingly, the shift to a Kodo millet diet appeared to be beneficial in increasing the lifespan of the flies. These findings primarily support the safety of shifting to a millet diet from a regular diet, highlighting the potential benefits without adverse effects.

PP-53

The role of endophytic fungus in lead-tolerance and its effect on rice plant

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Lead (Pb) contamination in soil poses a significant environmental challenge due to its persistent nature. Mycoremediation provides a potential solution for mitigating Pb contamination, as it can enhance Pb immobilization through intracellular or extracellular binding. This study evaluated the Pb-remediation potential of three fungal strains, *Serendipita indica* Si1 (DSM 11827), Si2 (PTB299), and Si3 (West Bengal), which were isolated from different geographic regions. Metabolic profiling with ILPP revealed that Si3 has highest metabolic diversity (80.66%) than Si2 (48.39%) and Si1 (45.16%). Pb tolerance was assessed on AMM plates and in AMM broth with different concentration of $PbNO_3$, Si3 can tolerate upto 517.5 ppm Pb, while Si1 and Si2 can tolerate upto 207 ppm. Phenol cotton blue staining indicated slight increases in spore size at Pb concentrations of 41.4, 51.75, and 103.5 ppm in all three strains. Mycelial growth was highest in Si3, followed by Si2 and Si1. While biomass analysis revealed no significant changes up to 207 ppm Pb in all three strain. Pb bioaccumulation was quantified through ICP-MS, with all strains accumulating up to 40,000 ppm Pb at 207 ppm Pb exposure. SEM-EDAX analysis confirmed Pb accumulation on and within fungal cells, with Si3 accumulating 11.45% Pb by weight. Seedling study demonstrated that Si alleviate effect of Pb. Pb treatment reduced seed germination and seedling growth, but the Si+Pb group, with Si showed recovery, achieving 100% germination at 103.5 ppm. Further, Si also improved root number and shoot and root lengths compared to the Pb-only group. These findings indicate that endophytic fungi like Si play a crucial role in detoxification and immobilization of Pb, supporting plant survival and mitigation of Pb in polluted soil.

PP-54

Nanoplastics as an imperceptible threat to the health-Investigation of polystyrene nanoplastics toxicity using V79 Chinese hamster lung fibroblast cells

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The pervasiveness and growing occurrence of micro-/nanoplastics (MNPLs) in our surroundings necessitate an immediate hazard assessment to ascertain the possible risk. Nanoplastics, such as polystyrene nanoplastics (PS-NPs) is one of the most used plastic types in the food and beverage industry, medical and laboratory devices, are present in the environment and can be continually and directly inhaled, endangering the respiratory system. Considering the paucity of data on MNPL's impact in the literature, our study aims to assess internalization, cytototoxic and genotoxic potential of polystyrene nanoplastics (PS NPs) of different sizes (100nm and 500nm) in *in vitro* test system (Chinese hamster lung fibroblast -V79 cells). We employed polystyrene NPs for this purpose since they are a common model of a synthetic polymer. Physicochemical characterization of PS-NPs was done using TEM, SEM, DLS and NTA. Different endpoints were analyzed as indicators of toxicity, including cytotoxicity, ROS increase and genotoxicity. Cellular studies have demonstrated that PS-NPs were internalized by V79 cells in a concentration dependent manner in case of PS500 but not in PS100, probably due to release process. To further understand the PS-MP internalization process, a number of time points must be taken into account. Similarly, PS500 impacted the cell viability based on the applied concentration. PS NPs also have an effect on genetic material. Therefore, caution should be taken as these nanoplastics could lead to undesired health consequences. Future studies are in progress to understand the mechanism of cellular internalization and their interaction with V79 cells.

PP-55

Absorptive Removal of Organophosphorous Pesticides using Copper-Chitosan Hydrogel from water matrix: Preparation, Characterization, Isotherm and Kinetics

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To overcome health related issues caused due to widespread use of organophosphorous pesticides (OPs), its removal from environmental niche becomes important. In the current work, copper (Cu) based hydrogel using chitosan (Cs) as a polymer is prepared. The efficiency of Cu-Cs hydrogel to remove most commonly used OPs (dichlorvos, quinalphos, chlorpyriphos, profenofos, ethion and phorate) from aqueous medium was studied. The prepared hydrogel was characterized using FTIR, SEM, EDX, TGA, BET and XRD. Batch adsorption experiment with varying temperature, pH, adsorbent dose, contact time and adsorbate concentration was used to achieve efficient adsorption conditions for all the analytes. Additionally, Langmuir isotherm model showed best fitting with adsorption capacity of about 22.22 $mg.g^{-1}$, 3.55 $mg.g^{-1}$, 17.51 $mg.g^{-1}$, 24.21 $mg.g^{-1}$, 22.72 $mg.g^{-1}$ and 23.25 $mg.g^{-1}$ for dichlorvos, quinalphos, profenofos, chlorpyrifos, ethion and phorate, respectively. The good fit of the experimental data to pseudo second order kinetic model confirmed the chemisorption as the preferred mechanism for removal of OPs. Negative Gibbs free energy from thermodynamics study suggested spontaneous reaction. The removal efficiency of hydrogel was also tested in real water samples resulting in the significant removal (≥88%) for the five targeted OPs. Prepared hydrogel may be used for effective remediation of OPs from environmental matrix.

PP-56

Modified sugarcane bagasse biochar: a promising adsorbent for antibiotics and parabens removal from wastewater

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This study examines how modified sugarcane bagasse biochar can remove contaminants of emerging concern i.e., antibiotics and parabens from wastewater. Pyrolysis turned sugarcane bagasse, an abundant agricultural waste, into biochar and improved its adsorption capacity. Biochar was modified by chemical activation and surface functionalisation to increase surface area and introduce functional groups. Batch adsorption studies were performed to assess the removal efficiency of five antibiotics (chlortetracycline, ciprofloxacin, levofloxacin, ofloxacin, oxyteteracycline) and four parabens (methylparaben, ethylparaben, propylparaben and butylparaben) from wastewater. We validated the analytical approach using known contamination standards in the water sample. Methods' LOD, LOQ and Dynamic linearity range (DLR) were assessed using validation features. One-variable at a time optimisation was used to optimise contact time, adsorbent dosage, and initial contaminant concentration. After optimising all parameters, the suggested removal process was used to remediate hospital drainage water samples for the desired analytes. The modified biochar's physicochemical properties were determined using SEM, FTIR, XRD, and TGA. Under optimised settings, modified sugarcane bagasse biochar removed antibiotics and parabens with over 85.23% to 99.73% efficiency. Adsorption kinetics and isotherms were examined to determine processes. The findings indicate that modified sugarcane bagasse biochar is a viable, cost-effective, and sustainable adsorbent for antibiotics and parabens removal from wastewater, with potential applications in water treatment processes.

PP-57

Exploring *in silico* methods for identifying potential vPvBs chemicals and their metabolites in risk assessment

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Very persistent very bioaccumulative toxic chemicals (vPvBs) are those that do not break down easily in the environment and can pose significant risks to human health and ecosystems. Their exposure through air, water and soil and can lead to accumulation in the tissues of living organisms which causes a range of serious health issues, including cancer, reproductive problems, endocrine disruption and immune system damage. Biotransformation of vPvBs leads to the formation of more toxic metabolite or reactive intermediates that can interact with cellular macromolecules, potentially leading to toxic effects such as DNA damage, oxidative stress, or disruption of hormone receptor functions. The characterization of harmful interactions between vPvBs and biological macromolecules, along with the development of robust *in silico* screening methods, like DFT and molecular dynamics is crucial for assessing their toxic potential. In the current computational study, we predicted the blood brain barrier (BBB), target prediction and cross-species toxicity of vPvBs and its metabolites by providing detailed insights into their molecular and electronic properties, reactivity, bioaccumulation potential and interaction with biological systems. Investigation of various toxicity parameters offer insights into how a molecule might react with cellular components like DNA, lipids and hormones. The study inferred that effective monitoring and controlling the use and disposal of vPvBs will help to minimize their detrimental impact on both public health and the environment.

PP-58

A Study on hippocampal GPR30, Matrix metalloprotease and Chemokines in arsenic-treated male rats

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Arsenic is a major contaminant, affecting above 300 million people worldwide. Arsenic deregulates hippocampal neuronal survival and apoptosis, resulting in learning and memory disabilities. Hippocampal neurons produce estradiol (E2) using the biosynthetic enzyme aromatase that converts testosterone to E2. Estrogen receptor isoforms, estrogen receptor ERα, ERβ, and G-protein coupled receptor (GPR30), mediate a genomic and non-genomic estrogenic regulation of brain functions. Previous results from our laboratory showed that chronic arsenic exposure induced learning-memory impairment in adult rats, which was more severe in males than females. Based on this, we proposed exploring the mechanism underlying arsenic-induced hippocampal neurotoxicity in male rats. Pregnant Wistar rats were daily treated with vehicle, (V, R.O. water) or arsenic (0.4 mg/kg and 4.0 mg/Kg) through oral gavage from gestation day 5 (G-05) until the P90. Our results demonstrated a reduction in hippocampal GPR30.To examine the participation of GPR30, we treated rats with G1(GPR30 agonist) into the hippocampus of the arsenic-treated rats.We observed G1 inhibited arsenic-induced learning-memory impairments, assessed using the Y-maze test. There could be other hippocampal neuronal signaling pathways in cross-talk with GPR30 following arsenic exposure, such asmatrix metalloprotease (MMP9), signaling regulating blood-brain barrier integrity. We found an increased level of MMP9 in the hippocampus. We also found altered mRNA levels of chemokine CxCl12/SDF1, which could participate in arsenic-induced neurotoxicity. Hence, we proposed exploring the link between hippocampal sex hormones, their receptors, MMP signaling, chemokine and consequent learning-memory performances following arsenic treatment. Additionally, we assessed the observations in the orchiectomized (ORX) rats to rule out the non-specific effects of circulating gonadal hormones. Overall, our study has a significant impact on toxicology and public health, illuminating roles and mechanisms, particularly in arsenic neurotoxicity.

PP-59

Nonsteroidal anti-inflammatory drugs induced modulation of gut microbiota and airway immune responses

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Nonsteroidal anti-inflammatory drugs (NSAIDs) are the most widely prescribed drugs which have analgesic, antipyretic and anti-inflammatory properties. Despite these therapeutic uses, it has been shown to have some adverse effects like ulcer formation and gastrointestinal bleeding. The human gut contains a huge number of microorganisms predominately Firmicutes and Bacteroidetes, which maintains metabolic and immunological functions. The diversity of gut microbiota can be affected by diet, drugs, age and other environmental factors. Animal studies have established the association between dysbiosis of gut microbiota and allergic diseases such as asthma. Cohort studies have revealed that overuse of nonsteroidal anti-inflammatory drugs exacerbates asthma. Looking at the importance of gut microbiota in shaping the different immunological parameters, they can also be one of the important mediators of NSAID-associated asthma exacerbation. Therefore, we investigated the outcome of NSAID(s) induced alternation of gut microbiota and its influence on the severity of allergic airway inflammation. The metagenomic 16S rRNA sequencing of fecal DNA of NSAID-treated mice revealed the changes in Firmicutes/Bacteroidetes (F/B) ratio. Moreover, at the genus level change in the population of *Alistipes* and *Blautia* was observed in NSAID(s) treated mice, which is associated with allergic airway inflammation. The total cell count in the Bronchoalveolar Lavage Fluid (BAL) and other inflammatory parameters were analyzed in ovalbumin-sensitized mice. Our study suggests that NSAID(s) mediated alteration in gut microbiota leads to inflammation and susceptibility to allergic airway inflammation.

PP-60

Toxicity assessment of certain natural products in search of an appropriate adjuvant in the treatment of tuberculosis.

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Tuberculosis is a major global health concern. The anti-tuberculosis drugs can cause severe adverse reactions due to its prolonged treatment duration. There are natural products produced by the various medicinal plants that can help in ameliorating the side effects of the anti-tubercular drugs. These phytochemicals itself should not induce any adverse effects in the individuals. The safety assessment of these plant derived phytochemicals is necessary for them to be classified as an adjuvant. An *in vivo* study was done to assess the toxicity of sesquiterpene, nerolidol. Wistar rats were orally administered at 25, 50, and 100 mg/kg doses for 28 days. Throughout the study period, the animals were closely monitored for any signs of toxicity. At the end of the study, biochemical parameters were examined and histopathological examination was performed on the major organs. With the administration of nerolidol, no mortality was observed. The biochemical parameters did not show a significant change. Histopathological examinations showed no structural alterations in the major organs. Based on these findings, it can be concluded that nerolidol may be checked at lower doses for its potential to acts as an adjuvant during the treatment of tuberculosis. Various other natural products should be explored and tested for its efficacy to be used as an adjunct therapy.

PP-61

Evaluation of Bioactivities and Neuroprotective Potential of Polyphenol-Rich Indian Millets

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Neurodegenerative diseases are characterized by progressive neuronal loss which are closely associated with oxidative stress, emphasizing the therapeutic potential of antioxidants in slowing disease progression. Guided by the principle of "let food be the medicine," this study aimed at identifying bioactive compounds from sustainable food sources with neuroprotective properties to develop functional food-based supplements. Millets have been widely studied for their nutrient density, fiber, protein content and rich polyphenol profile. Due to the properties such as easy cultivation in arid soil and drought-resistance they are sustainable food crops that can address food security. Despite their traditional use as staple food grains for decades, how their unique antioxidant and bioactive compounds contributes to their potential health benefits and the mechanisms behind these benefits in diverse health conditions is an area that remains underexplored. Owing to their potent antioxidant properties, we hypothesized that millet-derived polyphenols may exert neuroprotective effects in neuronal cells by reducing oxidative stress and inflammation. Here, we evaluated the antioxidant and neuroprotective potentials of polyphenol-rich extracts from selected Indian millet varieties (Kodo, Browntop, and Finger millet). A diverse polyphenolic composition was observed from LC-MS profiling with bioactive compounds such as daidzin, trans-ferulic acid and catechins, recognized for their therapeutic relevance. Antioxidant assays (DPPH and ABTS) demonstrated significant free-radical scavenging activity (IC_{50}), which further supported the concept of millet polyphenols. Cytoprotection studies in SH-SY5Y neuronal cells via MTT assays showed a ~20% increase in cell viability at a concentration of 0.5 mg/mL of Kodo millet extract ($p < 0.05$). These findings suggest that millet-derived polyphenols may have a potential role in exerting neuroprotection. However, further studies in cellular and animal models are required to elucidate the molecular pathways to facilitate the development of millet-based functional food supplements for neuroprotection.

PP-62

Prenatal exposure to PM2.5 impairs fetal development and can increase the risk of adult-onset kidney diseases

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Global Burden of Diseases Study estimated around 4.14 million deaths and 118.2 million DALYs were attributed to PM2.5 exposure in 2019. In India, the Central Pollution Control Board declared 131 cities as non-attainment for high ambient PM2.5 levels (CPCB, June 18, 2021). PM2.5 exposure causes respiratory, cardiovascular issues, kidney diseases, increases cancer risk, and contributes to premature deaths, especially among vulnerable groups like the elderly and children. This study investigates how prenatal exposure to PM2.5 may contribute to the development of kidney disease in offspring during adulthood. Prior to conception, the eight week old female BALB/c mice were exposed to PM2.5 collected from Lucknow city, with the exposure continuing throughout pregnancy. After birth, the impact of prenatal PM2.5 exposure on kidney tissue and developmental gene expression was evaluated in the offspring up to 25 weeks of age. We observed lower number of glomerulus in 2day and 10 week old offspring's after prenatal PM2.5 exposure. Additionally we noticed downregulation of cellular memory module factors in 2 day old pups. Histological analysis, indicated that the progressive glomerular damage, tubular dilation, and immune infiltration in 25 weeks old offspring's. PM2.5 exposure affected kidney function in 25-week-old offspring, showing reduced glomerular filtration rate (GFR) and elevated serum creatinine levels, suggesting progressive kidney damage. Overall, this study demonstrated that prenatal PM2.5 exposure causes long-term kidney damage in mice offspring's. Further studies are needed to elucidate the developmental alterations that contribute to the onset of kidney disease in adulthood.

PP-63

Band gap features of graphene oxide and its effect on sensitivity: An interaction study with bovine serum albumin

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In the current time, point of use biosensors are essentially required to be develop for early diagnosis of diseases and their monitoring. Graphene is an allotrope of carbon.Due to its capability to binds with different molecule by covalent and non-covalent interaction, is the "material of future".Graphene oxide (GO) is the derivative of graphene synthesized from graphite. GO bears functional group to be exploited as probe for diagnosis of biomarkers. Highly functionalized GO possess wide band gap with defects and are not applicable for biosensor application where high conductivity is required.In the present work, we have focused on the development of graphene oxide by controlled oxidation and band gap tuning for biosensor development. We are using band gap properties of graphene oxide (GO) to understand the molecular interaction with bovine serum albumin (BSA) protein. Bovine serum albumin (BSA) mimics ~ 70 % with the human serum albumin protein and is most suitable model protein for experimental purposes. GO has been synthesized by optimized and controlled oxidation process with band gap tuning from 2.2 eV to 1.35 eV. Spectroscopy tools have been used for interaction study and further a radiofrequency (RF) based single split resonator (SSR) bio sensor device was fabricated. This device reflects the frequency on the bases of the concentration of the BSA protein. The sequential shifting in the frequency for GO with~1.35 eVband gap was observed with increasing concentration of BSA. The Q-factor, figure of merit was found to be~47 and 57 to 82 respectively.

PP-64

Load of Heavy Metals and Ions in Girwa River flowing through Katarniaghat Wildlife Sanctuary, U.P.

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The Girwa is a part of the Karnali River, originating from Nepal, which later rejoins to the Ghagra River in India. Girwa River is flowing sidewise of the Katarniaghat Wildlife Sanctuary in Uttar Pradesh, India, and catering the water to Katarniaghat Wildlife Sanctuary approximately 18 kilometers. The aim of the study is to assess the load of heavy metal and ion pollution in the Girwa River, that may affect the ecosystem of the wildlife sanctuary.

Water samples were collected from five different locations of both upstream and downstream of the Girwa river near Katarniaghat premises; then the samples were analyzed to determine the concentrations of heavy metals and ions. The results shows that some locations have loaded by concentrations of heavy metals and ions at moderate levels of the river. These findings indicate potential anthropogenic influences on water quality, including agricultural runoff and urban wastewater. The presence of heavy metals and ions in the river poses significant ecological risks to wildlife and also bioaccumulate aquatic organisms, which disrupts the delicate balance of the ecosystem. To mitigate the adverse effects of pollution, it is imperative to implement effective water quality management strategies. Strict laws governing agricultural and urban wastewater treatment, better wastewater treatment, and public awareness initiatives to support sustainable water resource management are a few examples to mitigate the risk associated with the toxic metal and ions.

PP-65

Development and application of an efficient method for simultaneous analysis of multi-class antibiotic residues in environmental wastewater samples using LC-MS/MS

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Antimicrobial resistance (AMR) is a known threat to global health, global food security and a hindrance to sustainable development; caused by unwanted dissemination of antimicrobials in different environmental niches and finally leading to emergence of resistant microbes. Inefficiency of sewage treatment plants (STPs) for removal of antibiotics is another major factor responsible for their persistence in environment. Thus, constant monitoring of these antibiotics for the purpose of detection and quantification becomes crucial in understanding their prevalence and addressing the issue of AMR by devising remediation strategies. In present study, a simple and rugged method is developed for simultaneous detection of twenty-eight antibiotics, belonging to four different class i.e., fluoroquinolones, β-lactams, tetracyclines and nitrofurans. Analyte enrichment was performed by optimizing a simple extraction technique via lyophilization coupled with dispersive-SPE clean-up. Samples were spiked at four concentration levels i.e., 3.12, 6.25, 12.5, and 25 $\mu g L^{-1}$ resulting in the recoveries in the range of 62.69-104.63% except for minocycline (44.62%) with relative standard deviation below < 20%. The matrix effect was high for minocycline, ciprofloxacin, danofloxacin, enoxacin, chlortetracycline and oxacillin (54.11- 97.33%) which was corrected by using matrix matched standard. Instrumental limit of detection (IDL) and instrumental limit of quantification (IQL) of targeted analytes ranged from 0.43 to 3.8 and 1.40 to 12.53 $\mu g L^{-1}$, respectively with R^2 above 0.99, ensuring good sensitivity and selectivity. Successful application of method was performed for detection and quantification of targeted analytes in eleven environmental wastewater samples comprising five major hospitals and six inlets of STPs. Eleven targeted antibiotics were detected in a range of 0.01 to 5.33 $\mu g L^{-1}$.

PP-66

Capsicum annum Extract Mediated Green Synthesis of Fe-Zn Nanocomposite for Remediation of Tetracycline Antibiotics in Aqueous Medium

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Antimicrobial resistance has emerged in a range of microbial communities as a result of the widespread use of antibiotics in aquatic environments. Decontamination of the environmental matrices is essential to addressing the growing concerns about antimicrobial resistance. The present study investigates the use of *Capsicum annum* mediated Fe-Zn nanocomposite (CFZ) for the remediation of five antibiotics belonging to tetracycline class.At various contact times, temperatures, pH values, initial concentrations of the adsorbate, and adsorbent doses, the adsorption capacity of nanoparticles for the simultaneous removal of the tested antibiotics was examined. Green synthesized nanocomposite demonstrated high adsorption capacity of 87-98% for minocycline, oxytetracycline, demeclocycline, chlortetracycline and doxycycline.Additionally, among the tested isotherm model (Temkin, Langmuir, and Freundlich), the Langmuir model fitted well for all antibiotics. Adsorption experiments were conducted at different temperatures to establish thermodynamic properties that suggested a spontaneous exothermic adsorption phenomenon. The structural and chemical composition of the CFZ nanocomposite was determined using Fourier transformed infrared (FTIR) spectroscopy, and the hydrodynamic size of the nanocomposite and it's zeta potential were determined using dynamic light scattering (DLS). The prepared nanocomposite may be used for effective remediation of antibiotics from water matrix.

PP-67

From Ocean to Table: Pesticide residue level in dry fish and associated health risk in India

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Background: India is the largest fish producer in the world. However, pesticide monitoring in the Indian dry fish samples has been overlooked. This might pose a serious threat to dry fish consumers in the Indian population.

Objective: The goal of the present study was to develop a sensitive and simple analytical method for simultaneous detection and quantification of 52 pesticide residues in dry fish samples (n=30) collected from Maharashtra, Goa and Assam. Further, the risk associated with the detected pesticide was also evaluated by deriving their estimated daily intake and target hazard quotient to understand their impact on the Indian population.

Methods: For the detection of the multiclass pesticide residues, a simple and sensitive LC-MS/MS method was developed and validated (SANTE guidelines 2021) in dry fish samples using the LC-MS/MS technique. Pesticides were extracted using the QuEChERS (Quick, Easy, Cheap, Effective, Rugged, and Safe) method. Estimated daily intake and THQ were calculated by using consumption data and the detected concentration of the pesticides in dry fish.

Result: An LC-MS/MS method was successfully developed and validated for the detection of multi-class pesticides in dry fish samples within a linear range of 0.10-50 ng/mL. Studied samples were mainly contaminated with Cypermethrin (17.2-226.77 µg/kg), Chlorpyrifos (10.62-4849.40 µg/kg) and Fenpropathrin (5.3-142.40 µg/kg). Detection frequency data showed that Fenpropathrin was detected in all the samples collected from Goa. The mean estimated daily intake was estimated as 203.38×10^{-3} µg/kg/day and 46.92×10^{-3} µg/kg/day in children and adults, respectively. Further, hazard index (HI) values of 0.0125 (adults) and 0.0028 (children) indicated that the overall exposure to pesticides did not cause harmful concern to the Indian population (according to US EPA, an HI value <1 indicates no harmful effects).

Conclusion–The overall results indicated that almost all the dry fish samples were contaminated with at least one pesticide. The HI value indicated that exposure to the studied pesticides might not cause any serious effects on the Indian population. However, more samples from different regions of India are required to further substantiate these findings.

PP-68

Triclosan exposure during *Drosophila* developmental stages induces multigenerational immune toxicity

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Triclosan (TCS) is widely used as an antibacterial agent, but its residue in the environment poses a significant threat. This study was aimed to assess the immune toxicity of TCS at multigenerational level using *Drosophila melanogaster*. The study explored the effects of multigenerational TCS exposure on immune response over three subsequent generations. Total circulatory hemocyte (immune cells) count, circulatory crystal cell count, phagocytic activity, clotting time and real time expression of genes related to immune response were assessed for TCS-induced immunomodulation in *Drosophila* larvae. A concentration dependent decline in the total hemocytes, crystal cells and phagocytic activity was observed along with an increase in the clotting time (delayed wound healing) in the larvae. Further investigations using real time-PCR revealed the downregulation of immune responsive anti-microbial peptides *Drosomycin* and *Diptericin* and the inflammatory genes *UPD1*,*UPD2* and *UPD3*. The study also emphasizes an elevated production of reactive oxygen species (ROS) in the offspring, along with upregulated expression of pro-apoptotic genes and cellular apoptosis. Our results also indicated an upward trend in the transcript levels of epigenetic regulators, *g9a*, *Dnmt2* upon TCS exposure. The study also indicated an upward trend in the transcript levels of epigenetic regulators, *G9a* and *Dnmt2*, upon TCS exposure. We also found that the antioxidant N-acetylcysteine (NAC) reduced TCS toxicity and improved immunological functions in the progeny of exposed parents. NAC treatment increased circulatory cells, restored function, and reduced the overexpression of antimicrobial and inflammatory genes. Additionally, NAC alleviated ROS production, apoptosis, and epigenetic gene overexpression.

PP-69

Genotoxicity and Cytotoxicity Assessment of 'Forever Chemicals' in Genotoxicity and cytotoxicity assessment of 'forever chemicals' in zebrafish (*Danio rerio*)

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Per- and polyfluoroalkyl substances (PFAS) are a wide array of chemicals with strong carbon-carbon and carbon-fluorine bonds and have extensive industrial applications in manufacturing several consumer products. The solid covalent bonding makes them more persistent in the environment and stays away from all types of degradation, naming them "forever chemicals." Genotoxicity and cytotoxicity of legacy PFAS, Perfluorooctane sulfonate (PFOS), and its alternatives such as Perfluoro-2-methyl-3-oxahexanoic acid ammonium (GenX) and 7H-Perfluoro-3,6-dioxa-4-methyl-octane-1-sulfonic acid (Nafion by-product 2 [NBP2]) was evaluated using Zebrafish (*Danio rerio*) erythrocytes in single and mixture exposure at environmental concentration (10 µg/L) for 48-hour. Erythrocyte micronucleus cytome assay (EMNCA) revealed an increased frequency of micronuclei (MN) in fish erythrocytes with a significant increase in NBP2-treated fish. Based on MN frequency, the order of genotoxicity was NBP2 > PFOS > Mixture > GenX in *D. rerio*. No significant difference in nuclear abnormalities has been noted in fish exposed to PFOS and its alternatives, either in single or combined treatments. However, PFOS and combined exposure positively affected cytokinesis, resulting in an 8.16 and 7.44-fold-change increase of binucleated cells. Besides, statistically significant increased levels of reactive oxygen species (ROS) and malondialdehyde (MDA) content indicate oxidative stress in *D. rerio*. In addition, 'forever chemicals' resulted in cytotoxicity, as evident through significant changes in nucleus width to the erythrocyte length in NBP2 and mixture exposure groups. The findings revealed that PFAS alternative NBP2 is more toxic than PFOS in inducing DNA damage and cytotoxicity. In addition, all three compounds induced ROS and lipid peroxidation after individual and mixture exposure. The present work is the first to assess the genotoxicity and cytotoxicity of 'forever chemicals' in the aquatic vertebrate *D. rerio*.

PP-70

Impact of neuronal and microglial interaction on alpha-synuclein induced proteotoxicity stress in co-culture model

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Alpha-synuclein (α-syn) is a neuronal protein that plays an important role in synaptic function. However, its aggregation into toxic oligomeric and fibrils is common characteristic of Parkinson's Disease and associated diseases. Parkinson's disease (PD) is the second most common neurodegenerative disease, characterized by loss of dopaminergic neurons in the substantia nigra (SN). In previous studies α-syn aggregation has been prominently studied in in vitro neuronal cells. However, in addition to neuronal cells, the brain nervous system comprises additional kinds of cells such as glial cells. Glial cells, the brain's resident immune cells, actively respond to α-syn pathology and play an important role in immune response and neuroprotection, thus together with neuronal cells may represent the true in vitro model system to study protein aggregation and proteotoxicity. Therefore, in the present study, we have evaluated the protein aggregation-induced cytotoxicity in the co-culture model consisting of neuronal (SH-SY5Y) and glial cells (HMC3). The cytotoxicity of preformed α-syn fibrils (PFFs) was evaluated on both neuronal and microglial cells and also the effect of microglia condition media (CM) on α-syn treated-neuronal cells was determined. Further, the resultant effect on cell death by PFFs in the presence of microglia CM was evaluated. A direct co-culture system was optimised using cell labelling and labelled α-syn was used to assay internalization of extracellular α-syn in SH-SY5Y and HMC3 cells was optimized. Results suggest that disease-specific activation of microglia cells can protect neurons against proteotoxicity caused by aggregation. The established co-culture approach may be used to investigate further abnormal protein aggregation and may provide insights into neuron-microglia interactions during proteotoxicity.

PP-71

Mortalin as a Therapeutic Target in Esophageal Cancer

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Background: Rising incidence of esophageal cancer (EC) is a major global concern, with around 500,000 new cases and 445,000 mortality reported in 2022. In India, EC is the fourth leading cause of cancer-related mortality, with risk factors such as alcohol and tobacco consumption, along with late-stage diagnosis and limited healthcare access, are major driving force to its rapidly increasing incidence. Therefore, identification of new therapeutic target is imperative for better management of this malignancy. Over the years, studies have shown that overexpression of Mortalin, a heat shock protein, affects the treatment outcome, relapse and survival in patients afflicted with breast, colon, liver and ovarian cancers. Hence, in this study, we investigated the role and therapeutic significance of mortalin in EC.

Methods: We performed *in silico* and *in vitro* studies to examine the involvement of mortalin in EC. Assays such as MTT, colony formation, cell cycle progression, apoptosis, scratch-wound healing and Boyden chamber assays were performed using control, mortalin-inactivated as well as withaferin A (WiA) treated EC cells. Molecular markers of Akt signaling and EC hallmarks were also evaluated in control, mortalin-inactivated and WiA-treated cells by immunoblotting.

Results: Our investigation revealed the significant upregulation of Mortalin in EC cells and tissues, with its overexpression correlated with advanced stages and high-grade of the disease. Mechanistic studies involving the knockdown of mortalin in EC cells showed the modulation of the Akt/mTOR signaling pathway and various molecules such as survivin, p53, p-wee-1, cyclins, caspases, VEGF-A, MMPs and cadherins. Thus, Mortalin emerges as a potential biomarker, warranting for targeted inhibition. Further studies, involving treatment of EC cells with WiA, a steroidal lactone derived from *Withania somnifera*, exhibited significant downregulation of Mortalin and its associated oncogenic cascades in EC.

Conclusion: Mortalin regulates Akt signaling and various molecules associated with EC hallmarks, demonstrating as a potential biomarker, and hence the exploration of its targeted inhibition by WiA offers a prospective approach for the management of EC.

PP-72

Development of metal based certified reference materials for import substitute

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Accurate and precise measurement plays an important role in the development of science and technology. In order to acquire accurate measured value and obtaining appropriate results, calibration of an instrument with reference materials is a basic and integral objective for most of the measurements. The materials which fulfill the required criterion for calibration of various instruments are known as reference materials (RMs). When reference materials are characterized by a metrological valid procedure for one or more specified properties, accompanied by a certificate that provides the value of the specified property, its associated uncertainty, and a statement of metrological traceability, then they are known as certified reference material (CRM).

India is importing huge number of RM & CRM to fulfill the testing needs. It is essential need to develop RM/CRM in India to avoid dependency on foreign supply and enhance export. The current work focuses on development of certified reference material as per ISO17034:2016 for single element solutions in water matrix. Based on the requirement from different regulatory guidelines, total 31 elements have been selected to develop CRM. The elements are Al, Sb, As, Ba, Bi, B, Be, Cd, Ca, Cr, Cu, Co, Ga, In, Fe, Pb, Li, Mg, Mn, Hg, Mo, Ni, K, Se, Ag, Na, Sr, Tl, Sn, V, Zn. The production of reference materials involves a range of chemical techniques, including chemical synthesis, characterization and formulation. The processes have been conducted under stringent quality control measures to ensure that the materials produced are homogenous and reproducible. Once synthesized, these materials undergo rigorous characterization using techniques like AAS, ICP-MS and ICP-OES, as well as classical primary method like complexometric titration for value assignment. Homogeneity and stability testing ensure consistency, and the materials are certified with a certificate of analysis confirming their accuracy. Measurement uncertainty is defined by inclusion of all possible factors for uncertainty contribution. This process ensures CRMs are reliable for calibration, validation, and quality control making CRMs fit for their intended application.

PP-73

Non-caloric Artificial Sweeteners disrupt intestinal epithelial function and increase oxidative stress with effects on glucose uptake

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Consumption of artificial sweetener in food and beverages has become a part of daily lifestyle. It is a general perception that artificial sweeteners (AS) are healthy substitutes for sugars imparting sweet taste without calories or glycemic effects. In present scenario, it is considered to be a health concern with their implications in metabolic diseases as their downstream products may have controversial effects. There are few reports which suggest that chronic consumption of artificial sweetener can contribute to metabolic dysregulation but the available literature regarding the associated mechanisms related to metabolic dysregulation is limited. In this study, we assess different markers as signals for intestinal integrity and cellular damage through gene expression and western blot analysis using Caco-2 monolayer as an *in-vitro* model. Our study reveals that exposure of artificial sweeteners to the epithelial cells influence the expression of tight junction proteins and compromise intestinal barrier function. This ultimately leads to increased intestinal permeability. Other possible consequences include changes in pro-inflammatory cytokines, ROS levels leading to cellular damage to artificial sweetener exposed Caco-2 monolayer. We have found that saccharin shows more cytotoxicity as compared to other artificial sweeteners including aspartame and sucralose. Our study concludes the possible consequences of consumption of artificial sweeteners on intestinal epithelial cells that arise a question that prerequisite to be address in terms of regular intake of the artificial sweeteners.

PP-74

In silico Meta-Analysis of Mycotoxin Metabolism and Toxicity in Millet Species

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Millet is a highly nutritious cereal owing to the presence of a diverse pool of bioactive compounds however, its susceptibility to fungal contamination leads to the production of mycotoxins that can compromise its nutritional quality, pose health risks, and lead to economic loss. This study employed *in silico* methods to analyze the mycotoxin profiles in millet. Using the MetaTox tool, we predicted the Phase-I (oxidation, reduction, and hydrolysis) and Phase-II (conjugation) metabolites of mycotoxins, which enhance water solubility and facilitate excretion. The toxicity of these metabolites was assessed with the PASS (Prediction of Activity Spectra for Substances) tool, which provided insights into the potential harmful effects and safety profiles of each metabolite. Further, gene expression analysis identified differential regulation of genes in response to mycotoxins, highlighting molecular responses. This computational approach provides insights into the metabolism, toxicological effects, and genetic responses to mycotoxins in millet. These findings offer plausible insights for improving food safety and safeguarding the health benefits of millet as a staple crop with value-added products.

PP-75

Zingiber officinale essential oil attenuates psoriasis-like skin inflammation via inhibiting TNF-α-IL-23-IL-17 cytokine axis: *in-silico*, *in-vitro* and *in-vivo* approach

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Aims: Psoriasis is an immune-mediated chronic skin inflammatory disease that is characterized by aberrant keratinocyte proliferation with increased inflammation. Possible anti-inflammatory, and anti-proliferative mechanisms of *Zingiber officinale* essential oil (ZOEO) were investigated through in-silico, *in-vitro* and *in-vivo* models to evaluate anti-psoriatic potential of ZOEO. This study aimed to report ZOEO as a therapeutics agent for psoriasis like skin inflammation and explore the underlying mechanism.

Main methods: In this study, GC/GC-MS analysis of *Zingiber officinale* essential oil was done to identify the major phytoconstituents. For *in-silico* study, molecular docking and simulation studies were performed. For *in-vitro* study, NO estimation, qRT-PCR, ELISA, immunofluorescence was conducted to evaluate anti-inflammatory potential of ZOEO in LPS induced inflammation in Raw 264.7 cells. Cell migration, cell proliferation assay and TNF-α induced proliferation in HaCaT cell were conducted to evaluate anti-proliferative potential of ZOEO in HaCaT cells. For *in-vivo* study, PASI scores, CosCam scores, qRT-PCR, ELISA, histopathological alteration, and immunohistochemical analysis of specific marker (IL-17, ccr6 and NF-κb) were done to evaluate effectiveness of topically applied ZOEO against IMQ-induced psoriasis like skin inflammation in BALB/c mice. Acute dermal toxicity study was done in CF rats and rabbits as per OECD guidelines.

Key findings: GC/GC-MS analysis revealed the presence of zingiberene, β-sesquiphellandrene, β-bisabolen, camphene, and ar-curcumene as major phytomolecules. *In-vitro* studies have shown anti-inflammatory and anti-proliferative potential of ZOEO in Raw264.7 and HaCaT cells, respectively. For *in-vivo* study, ZOEO have shown potential role in attenuating the psoriasis condition in IMQ induced psoriasis like skin inflammation by significantly reducing the PASI and CosCam scores, downregulated the expression of CCR6, IL-17A, IL-23 and NF-κB, downregulated the expression and secretion of pro-inflammatory cytokines through TNF-α/IL-23/IL-17/IL-22 axis. ZOEO was found safe during acute dermal toxicity study in CF rats and rabbits.

Significance: Our present study proves the effectiveness of ZOEO against psoriasis like skin inflammation and provides the scientific evidence for topical use of ZOEO.

PP-76

Title: Fate of inhaled Li-ion battery fire smoke particles in the airway using MPPD modelling: A simulation study

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Over the years universal application-based usage of lithium-ion batteries have expanded which is known for thermal runaway events leading to significant emission of gases and particles posing environmental and human health risks which needs to be studied in a mechanistic way using controlled animal inhalation exposure setup. The present study was aimed to analyse the particle size distribution of emitted particles from lithium-ion batteries using a customized setup and human respiratory dosimetry using MPPD modelling with an input parameter of particle size distribution data. Lithium-ion batteries of 3.7 V and 4.44 W were procured (wt. 34.32g) online. One battery was burnt with spark side wall heating inside an ignition platform (stainless steel) kept inside the 250 L stainless steel chamber. The smoke from this chamber was drawn to 40 L stainless-steel whole-body inhalation exposure chamber for rodents attached through Y connector for 1:1 air and smoke mixing. The PM_{10}, $PM_{2.5}$, $PM_{0.1}$, CO_2, CO, HCHO were recorded at defined time points in a differential pressure based multipurpose sampler box. The smoke extract was collected for 2 hours using 4 bubbling devices connected in series and filled with water and dichloromethane. The particle size distribution analysis was performed using MOUDI Cascade Impactor at 30LPM. Deposition of smoke particles in human airway (male, female, adult and elderly) was predicted using MPPD modelling. A significant increase in PM_{10}, $PM_{2.5}$, $PM_{0.1}$, CO_2, CO, HCHO was observed. Average 24-hour fine particulate matter concentration reached upto 208 $\mu g/m^3$. Significant differential deposition of PM was observed posing risk in elderly and females. These data may be useful in respiratory risk analysis of fire fighters under occupational exposure.

PP-77

Multivariate analysis and health risk assessment of heavy metals through organic branded and non-branded spices intake.

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To determine the presence of heavy metals in organic- branded and non-branded spices using a microwave system, followed by analysis using inductively coupled plasma-mass spectrometry (ICP-MS). Additionally, a multivariate analysis will be conducted to evaluate the health risks associated with these heavy metals. Heavy metal analysis was performed using digestion by a microwave system followed by ICP-MS. The spices included organic branded, and non-branded varieties. The comprehensive evaluation that comprised the validation of the analytical method included linearity, detection limit, precision, accuracy, recovery experiments, and health risk assessment following USEPA guidelines. Comparing spices samples from local street vendors to branded products revealed significantly higher levels of metal residues, including Pb, Cd, Ni, Zn, Se, Ba, Co, Cu, Cr, and Mn in the former. All samples tested positive for these heavy metals except for Indium (In) and Tin (Sn) which were detected in 70.67% and 96% of samples, respectively. A health risk evaluation was conducted on the elements present in spices in accordance with USEPA. Multivariate statistical methods, such as principal component analysis (PCA), Cluster analysis, (CA), and discriminant analysis (DA) were employed to establish associations between heavy metals and their sources.

PP-78

Exploring the Role of Sonic Hedgehog Pathway in Arsenic-Induced Chronic Kidney Disease: Therapeutic Insights from Kaempferol

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Inorganic arsenic (As^{3+}, hereafter As) is one of the most potent groundwater toxicants. Chronic exposure to arsenic through drinking water is associated with several types of disease including kidney fibrosis and Chronic Kidney Disease (CKD), yet the underlying molecular mechanism is not well understood. Accumulating studies have shown that the Sonic Hedgehog (SHH) pathway is activated in various profibrotic diseases, indicating a potential relationship between SHH signalling and organ fibrosis. This study investigates the connection between arsenic, CKD, and SHH pathway, also exploring the therapeutic potential of Kaempferol, a flavonoid known for its protective properties. We employed in vitro experiments using NRK52E cell line (Rat Proximal Tubule Cells) exposed to aqueous solution of Sodium Arsenite (As III) at 0.001 µM, 0.01 µM, and 0.1 µM concentrations. Concurrently, in silico modelling was employed to analyse the interaction between components of SHH pathway and Kaempferol. Our findings suggested that arsenic exposure disrupts SHH signalling, leading to inflammatory and fibrotic changes. Notably, kaempferol treatment mitigated these effects, restoring normal status of SHH pathway function. In silico analyses revealed kaempferol's potential to bind several key proteins in the pathway and possibly modulating their actions. This integrative approach confirms the role of SHH pathway in arsenic-induced CKD and shows therapeutic potential of kaempferol for protecting renal function against arsenic toxicity.

PP-79

Integrative approaches to correlate the non-coding regulatory RNAs and mRNAs in a cellular model of neurotoxicity

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Research has shown that non-coding RNAs, including microRNAs, long non-coding RNAs, and circular RNAs, play crucial roles in regulating gene expression and neurotoxic pathways triggered by environmental toxins. However, the interactions between these RNA molecules in neurotoxicity remain poorly understood. This study addressed this knowledge gap by conducting a comprehensive analysis of mRNA, lncRNA, and circRNA transcripts in differentiated human neuroblastoma cells- SH-SY5Y exposed to arsenic. Using advanced sequencing technology, we identified significant changes in the expression of 2,487 mRNAs, 1,192 lncRNAs, and 20 circRNAs. Bioinformatics analysis revealed complex regulatory relationships and specific miRNA associations. Functional enrichment analysis showed that these differentially expressed transcripts are involved in key neurotoxicity-related pathways, including oxidative stress response, inflammation, apoptosis, and synaptic signaling. Notably, we found strong links between these regulatory RNA molecules and miRNAs implicated in neurodegenerative processes. Our findings highlight the extensive molecular reprogramming triggered by arsenic exposure and reveal a complex regulatory landscape involving non-coding RNAs. This multi-omics approach provides valuable insights into RNA-driven mechanisms underlying arsenic-induced neurotoxicity. These findings have significant implications for developing precision-based therapeutic strategies targeting RNA regulatory networks to mitigate environmental neurotoxicant-induced neural damage and neurodegenerative risks.

PP-80

Understanding Epidermal Growth Factor Receptor Inhibitor Interaction with MembraneTransporter to Prevent Ocular Toxicity

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Cancer patients treated with Epidermal Growth Factor Receptor (EGFR) inhibitors (EGFRI) such as erlotinib suffer from ocular toxicity, such as delayed corneal wound healing and corneal thinning. The membrane transporters in the ocular barriers that facilitate the transport of endogenous molecules can non-specifically recognise systemic EGFR inhibitors and facilitate their entry, leading to drug accumulation in the eye and causing toxicity (delayed wound healing). We hypothesize that blocking the transporters that facilitate the entry of EGFR inhibitors into the eye can reduce toxicity. The current study aims to identify the erlotinib-transporter interactions and the effect of transporter blockers on EGFRI-induced ocular toxicity. Computer simulation studies were used to identify the drug-transporter interactions. Cell viability was performed on Human Corneal Epithelial cells (HCE) to assess the safe concentration of erlotinib and rifampicin (transporter blocker). Cell migration studies were performed using erlotinib in the presence and absence of rifampicin in HCE cells to understand the functional role of the transporters in corneal wound healing. Computer simulation studies revealed that erlotinib was a substrate for hOATP2B1 and hOCT1. In HCE cells, erlotinib and rifampicin (OATP2B1 blocker) were safe at 10 µM and 100 µM concentrations, respectively. EGFRI (10 µM) decreased the HCE cell migration, whereas upon blocking the OATP2B1 transporter using rifampicin, cell migration was increased concentration-dependent (1 to 100 µM). Thus, the current study concludes that OATP2B1 mediates erlotinib uptake, and an OATP2B1 blocker can enhance EGFRI-induced wound healing. However, further in vivo studies need to be performed to validate the role of OATP2B1 and OCT1 in the ocular toxicity of EGFRI.

PP-81

Inhibitory Effect of BPA on Neogenin 1, a regulator of adult hippocampal neurogenesis in rat brain

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Bisphenol A (BPA), a synthetic xenoestrogen endocrine disruptor, used commonly in consumer plastics and is a well-known environmental neurotoxicant. Previous study suggests that BPA decreases neurogenesis in the rat hippocampus via altering the WNT/β Catenin pathway and mitochondrial biogenesis. We studied the effects of BPA on neogenin (NEO1), a multifunctional transmembrane receptor that controls neurogenesis in the adult brain hippocampus. It also promotes new synapse development, dendritic growth, and the maturation of newly formed neurons. NEO1 induces glioma-associated oncogene 1 (Gli1), a critical downstream transcriptional regulator of sonic hedgehog, and expressing Gli1 in neogenin-depleted NSCs restores proliferation. The mRNA expression and protein levels revealed that BPA treatment in vivo/in vitro altered the Repulsive guidance molecule A (RGMA), NEO1, and GLI1. BPA treatment decreases co-localization of RGMA, NEO1, GLI1 with mature neuronal markers (NeuN, β tubulin) as seen by immunofluorescence analysis. Furthermore, a TEM structural examination found that BPA treatment decreased axonal extension, dendritic outgrowth, and synapse density. Overall, our study found that BPA affects neurogenesis by altering the NEO1/GLI 1 pathway.

PP-82

The influence of amine structure on formic acid-amine complex stability through isothermal titration calorimetry

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A secondary reaction is required to get around the unfavorable chemical balance when carbon dioxide is converted to formic acid. By creating reversible complexes with formic acid that consist of hydrogen bonds and ion pairs, aromatic heterocyclic amines can do this. The complex stoichiometry and equilibrium constant of the reaction are still unknown since chemical analysis is not always able to determine the concentration of these complexes in organic solvents. This work offers a novel approach for quantifying both bound and free formic acid using heat flow curves by combining dynamic modeling with isothermal titration calorimetry studies. In a component system where formic acid builds up in a mixture of methanol and the amine 1,2-dimethylimidazole, this method was effectively used.

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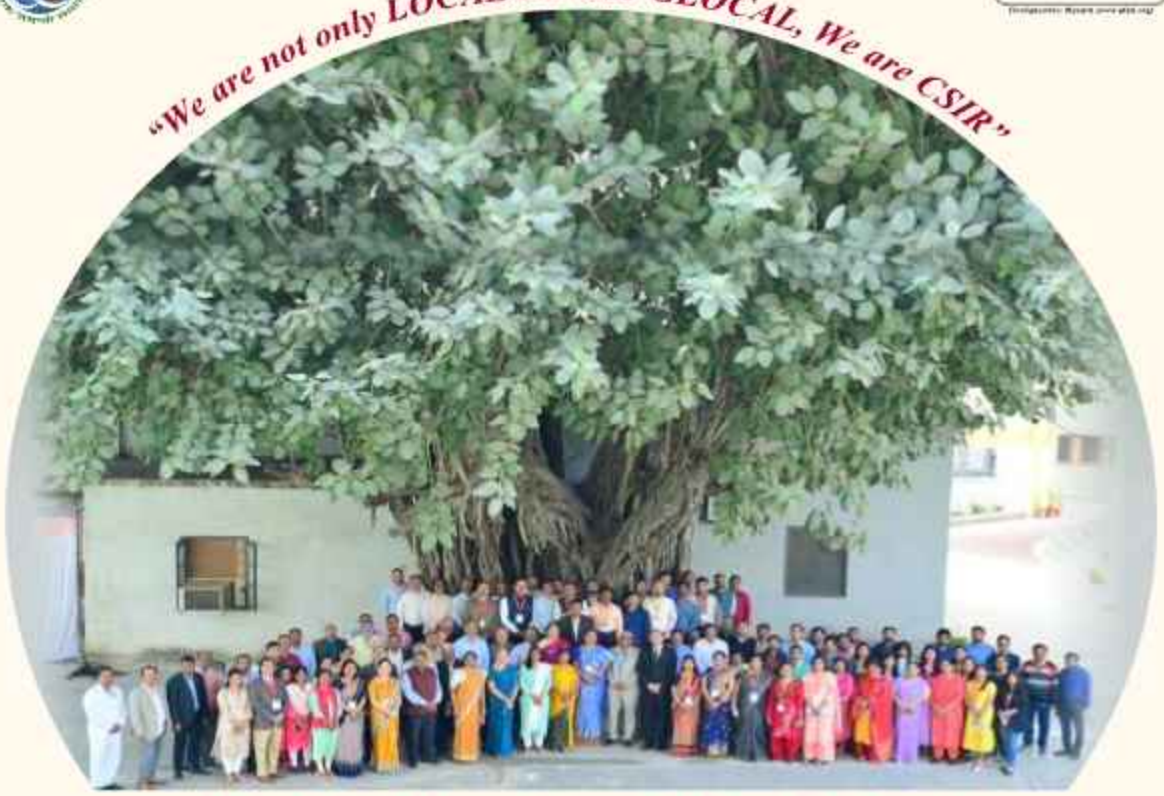

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