CHEMWATCH

Bulletin Board

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CHEMICAL EFFECTS

Chemical structure drives developmental toxicity of alkyl-substituted naphthalenes in zebrafish

2025-10-01

Naphthalene and its alkyl-substituted derivatives are among the most abundant polycyclic aromatic hydrocarbons (PAHs) in environmental and human exposure studies, yet their developmental toxicity and mode of action remain poorly understood due to challenges in testing semi-volatile compounds. This study developed a vial based, high throughput method to effectively assess the activity of naphthalenes and a set of 24 alkyl-substituted naphthalenes. Early life stage zebrafish were exposed to a concentration series of each chemical (0-50 µM) in rotating sealed glass vials to minimize volatilization. Benchmark concentration (BMC50) values were calculated for morphological endpoints and lowest effect levels were determined for behavioral effects. The data were assessed for evidence of a narcotic mode of action using body burden measurements for select chemicals and logKow modeling. Targeted transcriptomics at a single concentration and timepoint as well as in silico molecular docking were conducted to generate mode of action hypotheses. The vial method enabled detection of highly variable developmental toxicity not previously observed using standard 96-well plate exposures. LogKow and body burden were poor predictors of toxicity, suggesting a non-narcotic mode of action. Transcriptomic analysis revealed evidence for the disruption of glucocorticoid signaling pathways. Molecular docking identified potential protein targets (e.g., CYP1A2, NT5E, FOLR1) that may mediate observed effects. This study demonstrates the importance of appropriate exposure methods for semi-volatile compounds, reveals structure-dependent toxicity among alkyl-substituted naphthalenes, and provides a foundation for further mechanistic studies and improved risk assessment of alkyl-substituted PAHs.

Authors: Mackenzie L Morshead, Lisa Truong, Steven J Carrell, Richard Scott, Kim A Anderson, Robyn L Tanguay

Full Source: Environment international 2025 Oct 1:204:109837. doi: 10.1016/j.envint.2025.109837.

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Soil organic matter decomposition as a key driver of pharmaceutical retention

2025-10-02

Human activities release Pharmaceutically Active Compounds (PhACs) onto arable land, where they can accumulate and disrupt the ecological balance. The soil's microbial community continuously alters the composition of organic matter, as it serves as their primary nutrient source. The quality and quantity of organic matter may vary even within a single vegetation period. Observing the extent of transformation in the different phases is essential, as organic matter is primarily responsible for the soil's ability to retain micropollutants. An incubated sorption experiment was conducted simulating a vegetation period using Mollisol, to examine this question. Enzyme activity results indicate that the microbial community transforms soil organic matter, reducing its quantity and thus its ability to retain PhACs. At the beginning of the incubation period, among the physico-chemical properties of PhACs, the H-donor/acceptor counts and the size of their van der Waals surface area were the determining factors in the sorption processes. At the end of the incubation period, owing to the reduction in organic matter and the transformation of functional groups, the adsorbed PhACs decreased significantly, while desorption increased because the electrostatic interaction began to dominate the sorption processes. Consequently, the mobility rate of the PhACs with hydrophobic properties may increase in the arable land by the end of the vegetation period. The primary properties of PhACs identified should be considered when assessing soil persistence. It's vital to account for the temporal evolution of soil conditions and avoid relying on a single observation, as this only partially represents the soil's actual state.

Authors: Lili Szabó, Zoltán Szalai, Attila Csaba Kondor, Anna Vancsik, Balázs Vajna, Csaba László Maller, Csilla Király, Zoltán Dévény, Bruna Silva, Colin A Booth, László Bauer

Full Source: Journal of environmental management 2025 Oct 2:394:127492. doi: 10.1016/j.jenvman.2025.127492.

Phytotoxicity Assessment of Electrochemically Anodic Oxidized Coordination Structures Dyeing Wastewater

2025-10-05

Anodic oxidation using boron-doped diamond (BDD) anode offers a promising treatment method for the deep treatment of dyeing wastewater. However, limited attention has been on the phytotoxicity evolution and their cause of degraded wastewater. Here, two

representative coordination-structured dyeing wastewaters were first degraded using a BDD anode, and the resulting degradation intermediates were analyzed. Subsequently, lettuce seed root length, shoot length, and germination rate were evaluated to assess wastewater's phytotoxicity at different degradation periods. Finally, acute toxicity and the relative concentration changes of intermediates were further analyzed to identify the causes of toxicity. Results indicated that the treated wastewater was more toxic than pre-oxidation due to the generation of multiple toxic intermediates, significantly inhibiting seed growth. The synergistic effects of toxic substances and Na2SO4 electrolytes contributed to increased toxicity. This study demonstrated that the decolorization process of dyeing wastewater through anodic oxidation was toxic and provided a basis for evaluating the agricultural reuse potential of oxidized wastewater.
Authors: Haodong Bi, Sen Zhang, Kun Ma, Ying Wang, Lihui An, Qingbo Yang, Jianli Liu
Full Source: Bulletin of environmental contamination and toxicology 2025 Oct 5;115(4):48. doi: 10.1007/s00128-025-04121-x.

ENVIRONMENTAL RESEARCH

Effect of Environment and Year on the Relationships Between Tofu Texture and Chemical Composition of Soybean in Southern United States

2025-10
Genotype and environmental factors (location and planting year) affect the food quality of soybeans. This study's objective was to explore the impact of genotype, location, and year on seed components and to identify the correlations between seed components and the firmness of tofu. Seventeen soybean genotypes were grown in replicated field trials in Mississippi, Virginia, and Missouri in 2017 and 2018. Tofu was made from soybean by filled and pressed methods. The major storage proteins' subunit composition, protein's secondary structures, phytic acid content, and Ca2+ and Mg2+ contents were determined. Results showed both environmental factors, which varied over years and locations, and genotypes had significant interactions ("year × location × genotype," $p \leq 0.001$) on seed components. Overall 2-year data demonstrated that the A3 polypeptide quantitatively correlated with filled tofu firmness (FF) ($r = 0.82$, $p \leq 0.001$) and with pressed tofu firmness ($r = 0.83$, $p \leq 0.001$). In addition, overall data demonstrated that β-secondary structures (β-sheet + β-turn) positively correlated with the pressed and FF with $r = 0.89$ and 0.88, respectively. Within each trial, the genotype with higher A3 polypeptide generally produced tofu with higher firmness; for instance, in the 2018 Missouri trial, MS-01 and MS-18 soybeans had 3.54% (high) and 1.93% (low) A3 with firmness 141.57 (high) and 97 gf/cm2 (low), respectively. For applications, A3 polypeptide and β-secondary structures may be further developed into factors for selecting soybean genotypes for tofu production by the food industry or for breeders to develop new genotypes for improving tofu firmness. PRACTICAL APPLICATIONS: This study investigates the relationships of chemical composition and tofu making of 17 soybean genotypes grown in three locations over 2 years. The results demonstrated that glycinin polypeptide A3 and β-structures (β-sheet + β-turn) of soybean proteins correlated significantly with tofu firmness. These protein factors can be utilized by both the food industry and plant breeders in their selections of value-added food-grade soybean for tofu quality improvement.
Authors: Sam K C Chang, Ruiqi Chen, Anne M Gillen, Bo Zhang
Full Source: Journal of food science 2025 Oct;90(10):e70588. doi: 10.1111/1750-3841.70588.

Protists as potential microbial tools for environmental microplastic remediation: a mini review

2025-10-03
Microplastics (MPs) are persistent pollutants that pose serious ecological and health hazards across terrestrial and aquatic ecosystems. Compared with physical and chemical degradation methods, the biological degradation of MPs is more pronounced and eco-friendlier. Although bacterial and fungal contributions to MP biodegradation have been extensively studied, the role of protists remains comparatively underexplored. Earlier laboratory studies have demonstrated that various protistan taxa can ingest latex microspheres through phagocytosis and influence their fate in an ecosystem. However, beyond ingestion and transfer, the potential of protists to transform and partially degrade MPs via enzymatic or oxidative processes has only recently attracted attention. Therefore, beyond existing summaries on protist-latex bead interactions, this review proposes a novel conceptual framework that not only positions protists as vectors that transfer MPs within food webs, but also as active agents in degradation processes and facilitators of microbial colonization. By introducing emerging evidence, we highlight protists as overlooked yet promising components of MP fate and outline future research directions

to establish them as part of integrated microbial tools for environmental microplastic remediation.
Authors: Sarika Kumari, Komal A Chandarana, Natarajan Amaresan
Full Source: Environmental science. Processes & impacts 2025 Oct 3. doi: 10.1039/d5em00623f.

PHARMACEUTICAL/TOXICOLOGY

Co-exposure to polystyrene nanoplastics and glyphosate promotes intestinal apoptosis in mice via intestinal barrier impairment and immunoinflammatory dysregulation

2025-10-03
Environmental contaminants such as polystyrene nanoplastics (PSNPs, 1-1000 nm) and glyphosate pose significant environmental and public health risks. This study aimed to investigate the intestinal toxicity and molecular mechanisms induced by PSNPs and/or glyphosate. Mice were exposed to PSNPs (<100 nm), glyphosate, or a combination of both for 35 days via intragastric administration (PSNPs: 0.5 mg/d; glyphosate: 50 mg/kg-bw/day; PSNPs+glyphosate: 0.5 mg/d +50 mg/kg-bw /day). The control group received same volume of distilled water. Our findings revealed that exposure to PSNPs and/or glyphosate aggravated pathological alterations, including inflammatory cell infiltration, severe mitochondrial cristae fracture, and an approximately 50% reduction in goblet cells in the intestine. Moreover, exposure to PSNPs and/or glyphosate caused a critical 75% inhibition of FOXP3 and dissociation of tight junctions in the intestine (reflected by a 50% decrease in Occludin, and a 20%-50% decrease in ZO-1). These changes were accompanied by significant alterations in beneficial gut microbiota, metabolic profiles, bile acid metabolism disorders, and a pronounced elevation in 3-β-deoxycholic acid, a metabolite tied to bile acid receptor signaling and barrier dysfunction. Although exposure to glyphosate led to the most significant upregulation of the pro-inflammatory factors TNF-α and the pro-apoptosis proteins Cleave-caspase-3, co-exposure did not exacerbate cell apoptosis in animal tissue experiments, which is contrasts with the cell-based findings. MODE-K (mouse intestinal epithelial) cells were treated with PSNPs (0.75 mg/mL) or glyphosate (0.5 mg/mL). In vitro experiments showed that PSNPs aggravated the disrupted Treg/Th17 immune-inflammatory balance, impaired intestinal barrier function (with a 50% reduction in ZO-1 and Occludin), and increased cell apoptosis, caused by glyphosate. This study advances our understanding of the health risks posed by endocrine-disrupting chemical mixtures and provides critical insights into the molecular mechanisms of PSNP-glyphosate-induced intestinal toxicity. These findings lay the groundwork for future research aimed at mitigating the pathophysiological impacts of environmental pollutants.
Authors: Beining Wu, Han Liu, Ruoyu Dong, Haoyu Xu, Jingyi Qi, Huimei Liang, Chen Guo, Huan Zeng, Jinghua Zhao, Houhui Song, Yongchun Yang, Wei Wang
Full Source: Environmental pollution (Barking, Essex: 1987) 2025 Oct 3:127206. doi: 10.1016/j.envpol.2025.127206.

Screening for Common Mental Disorders in Caregivers of Children with Severe Acute Malnutrition in a Nutritional Rehabilitation Center using WHO Self-reporting Questionnaire-20

2025-07-01
Many caregivers of children admitted for inpatient treatment of Severe Acute Malnutrition at the Nutritional Rehabilitation Centre (NRC), experience mental health issues. Identification of these caregivers using WHO Self-reporting questionnaire 20 score to screen for common mental disorders (CMD) was done. This was carried out in an NRC situated in an urban tertiary children's hospital, revealing a total of 29.1% of the caregivers who screened positive for CMD. Maternal mental health is widely neglected, especially in an NRC setting and underlying mental stressors can be significant contributors to the child's malnourished state and should be addressed.
Authors: Radhika Mathur, Nisha Kamble, Saba Pathan, Tejal Lakhan, Ayushi Shah, Minnie Bodhanwala
Full Source: Indian journal of public health 2025 Jul 1;69(3):347-349. doi: 10.4103/ijph.ijph_1008_24.

Long-term exposure to air pollution and metabolites in children and young adults in a Swedish birth cohort

2025-10-03
Background: The biochemical dysregulation underlying the adverse health effects of exposure to air pollution (AP) remains unclear.
Objective: The objective of this study was to explore associations between long-term exposure to AP and the urinary metabolome.
Methods: In the Swedish birth cohort BAMSE (n = 4089), urine samples were collected from a subset of participants attending clinical examination at the 4-year follow-up and from all participants attending

clinical examination at the 24-year follow-up. Among paired samples and children with diagnosis of asthma and/or low lung function, non-targeted screening using liquid chromatography high-resolution mass spectrometry was applied to 4-year samples (n = 612) and 24-year samples (n = 846) and metabolites were annotated based on standard matching to in-house compound libraries (n = 260 metabolites). Time-weighted average exposure to air pollutants (i.e., particulate matter with diameter ≤10µm (PM10), ≤2.5 µm (PM2.5), and nitrogen oxides (NOx)) during the first year of life and the year prior to urine collection was estimated using validated dispersion models. The association between AP exposure and urine metabolites was estimated cross-sectionally using exponential regression.
Results: AP exposure was overall positively associated with metabolite abundance ($p < 0.002$). However, metabolite-specific associations exhibited variability. At the 4-year follow-up, the first-year-of-life and prior-year AP exposures were positively associated with 8 purine/pyrimidine derivative metabolites (e.g., an increase of 2.8 µg/m3 (interquartile range) in PM10 during the first year of life was associated with a 1.21-fold increase in 1,7-dimethylxanthine, $p = 3.87E-05$). We also observed interactions between AP exposures and metabolism-related genetic variants on metabolite levels. At the 24-year follow-up, prior year AP was negatively associated with levels of six long-chain fatty acids.
Impact: Long-term exposure to air pollution alters urinary metabolites in children and young adults, revealing environmental impacts on systemic metabolism even at low levels of air pollution.

Authors: Shizhen He, Baninia Habchi, Romanas Chaleckis, Natalia Hernandez-Pacheco, Anna Bergström, Anne-Sophie Merritt, Inger Kull, Kristina Eneroth, Matteo Bottai, Göran Pershagen, Simon Kebede Merid, Sophia Björkander, Zhebin Yu, Erik Melén, Olena Gruzieva, Craig E Wheelock, Susanna Klevebro
Full Source: Journal of exposure science & environmental epidemiology 2025 Oct 3. doi: 10.1038/s41370-025-00810-1.

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OCCUPATIONAL

Airway exposure to microplastics: Potential mechanisms from epithelial barrier damage to the development of allergic rhinitis

2025-10-01
Microplastics, as global pollutants, are widely distributed in the atmosphere and pose a potential threat to human respiratory health. This review summarizes the multiple mechanisms by which airborne microplastic exposure triggers allergic rhinitis (AR). Research indicates that microplastics drive AR progression through several pathways: (1) physical abrasion and chemical toxicity that disrupt the airway epithelial barrier (2) adsorbed pollutants (e.g., PAHs) that induce oxidative stress and inflammation; and (3) induction of a Th2 immune shift and IgE class-switching, leading to immune dysregulation. By integrating evidence from environmental toxicology, immunology, and clinical medicine, this paper elucidates the role of microplastics as an emerging environmental risk factor in AR pathogenesis and proposes multi-dimensional intervention strategies, including barrier repair, pollution control, and immune modulation. We emphasize the urgent need for interdisciplinary research to address the health challenges posed by microplastics and call for collaborative efforts across environmental governance, precision medicine, and public education to mitigate their impact on global public health.

Authors: Xu Zhang, Mengyuan Liu, Zhiqiang Zhang, Xinyu Huang, Daoming Bai, Rui Yang, Maohua Wang, Peng Wang, Chunping Yang
Full Source: Environmental research 2025 Oct 1;286(Pt 3):123007. doi: 10.1016/j.envres.2025.123007.

Sulfur Dioxide- and Fluoride-Associated Declines in Lung Function Over an 11-Year Observation Among Aluminum Smelter Workers

2025-10-03
Background: Work exposure-related declines in lung function among aluminum smelter workers are well documented, yet task-varying exposures are likely to contribute differently to respiratory outcomes. This study aimed to assess the association between potroom exposure and lung function changes over time among aluminum smelter workers.
Methods: A retrospective review of spirometric assessments of 265 potroom workers and their exposure to sulfur dioxide (SO_2) and fluoride

was conducted. Cumulative exposure was described through job exposure matrices by job titles and exposure across the lifetime of employment. Associations between exposure and lung function were determined using mixed-effect models and a 1-year lag exposure.
Results: Exposures were within the prescribed occupational exposure limits. SO2 was highest in the maintenance section (mean: 0.4 ppm [range 0.3-0.5 ppm]), while the process control section (mean: 1.1 mg/m3 [range 0.04-2.6 mg/m3]) had the highest level of fluoride. Among those workers who contributed lung function measures at each of the 10 years (n = 98), there was a decline in the percentpredicted forced expiratory volume in 1 second/forced vital capacity ratio (FEV1/FVC) of 0.21% (95% CI: 0.35-0.07). Within the entire sample, there was an estimated decline of 2.9% (95% CI: -3.9 to -1.9) and 0.15% (95% CI: -0.23 to -0.07) in percentage-predicted FEV1/FVC, associated with cumulative SO2 and cumulative fluoride exposure, respectively. A 1-year lagged decline was also seen for the FEV1/FVC ratio for both pollutants.
Conclusion: fSO2 and fluoride exposure in aluminum smelting is associated with statistically significant lung function declines over the years of exposure.

Authors: Edite Macaringue Raja, Sujatha Hariparsad, Rajen N Naidoo
Full Source: American journal of industrial medicine 2025 Oct 3. doi: 10.1002/ajim.70023.