CHEMWATCH

Bulletin Board

Contents

MAY. 16, 2025

(click on page numbers for links)

CONTACT US

subscribers@chemwatch.net
tel +61 3 9572 4700
fax +61 3 9572 4777

1227 Glen Huntly Rd
Glen Huntly
Victoria 3163 Australia

CHEMICAL EFFECTS

Region-specific characterization and ecotoxicity assessment of PAH compounds in winter PM2.5 from three capital cities in Northeast Asia

2025-05-07
Industrialization and urbanization in Northeast Asia have heightened PM2.5 pollution, posing significant public health risks. This study examined the spatial and chemical variability of polycyclic aromatic hydrocarbons (PAHs) and their ecotoxicity in winter PM2.5 from three capitals-Ulaanbaatar (UB, Mongolia), Beijing (BJ, China), and Seoul (SE, South Korea)-using two-dimensional gas chromatography time-of-flight mass spectrometry (GC×GC-TOF MS). PM2.5 samples collected between December 15, 2020 and January 14, 2021 revealed UB had the highest concentrations (85.7 ± 36.7 μg m-3) and PAH levels (758.9 ± 224.7 ng m-3), primarily from coal combustion and biomass burning. BJ (30.3 ± 16.9 μg m-3; 41.4 ± 18.4 ng m-3) and SE (26.0 ± 14.4 μg m-3; 6.2 ± 2.4 ng m-3) had lower PAH levels but a higher share of secondary products, including oxygenated (OPAHs) and nitrogen-containing PAHs (NPAHs). Overall, 646 PAH compounds were identified: UB was dominated by methylated alkyl and sulfur-containing PAHs, while BJ and SE had more hydroxylated and carbonylated PAHs. QSAR ecotoxicity analysis indicated the highest toxicity in SE from hydroxylated PAHs and a broader toxic range in UB. These findings support air quality strategies to reduce coal combustion in UB and secondary PAH formation in BJ and SE.
Authors: Min Sung Kim, Seulgidaun Lee, Moonhee Park, Hyemi Jang, Mira Choi, Ji Yi Lee, Mijung Song, Changhyuk Kim, Junyoung Ahn, Zhijun Wu, Amgalan Natsagdorj, Jungju Seo, Tae Kwon Lee, Young Hwan Kim, Kyoung-Soon Jang
Full Source: Journal of hazardous materials 2025 May 7:494:138536. doi: 10.1016/j.jhazmat.2025.138536.

Adsorption kinetics of different mercury species on three kinds of micro-/nano-plastics in micro-polluted aquatic environments and their combined toxicity

2025-05-08
The contamination of micro-plastics (MPs)/nano-plastics (NPs) in environment poses a global concern, necessitating a scientific evaluation of their potential risks to ecosystems and organisms. We herein investigated the adsorption kinetics of different mercury species

CHEMWATCH
Bulletin Board
Technical
MAY. 16, 2025

including inorganic mercury (Hg2+), methylmercury (MeHg) and ethylmercury (EtHg) on three different MPs, such as polyethylene MPs (PE MPs), polypropylene MPs (PP MPs) and polystyrene MPs (PS MPs) in micro-polluted water in detail, and further evaluated the individual and combined cytotoxicity of polystyrene NPs (PS NPs)/polypropylene NPs (PP NPs) and different mercury species. The results indicated that EtHg undergoes demethylation partly to form Hg2+ during the adsorption process on PP MPs, and the adsorption kinetics of Hg2+, MeHg and EtHg on three MPs fitted with pseudo-first-order (PFO) model in initial stage and simultaneously fitted with pseudo-second-order (PSO) model during whole adsorption process. This suggested that adsorption of mercury species on three MPs we driven mainly by physical process in initial stage and by chemical process during whole absorption process. In natural micro-polluted water, the equilibrium adsorption capacities (Qe) of Hg2+ on three MPs (156.3-270.3 ng/g) are much higher than that of MeHg (5.562-78.13 ng/g) and EtHg (7.831-70.42 ng/g). Cytotoxicity experiments revealed that PP NPs and PS NPs themselves have little cytotoxicity, but the presence of them can enhance the cytotoxicity of mercury species, showing NPs size-depended and mercury species-depended synergistic toxic effect. The findings of this study provided valuable insights for scientifically evaluating the potential risk of MPs/NPs to ecosystems and organisms.
Authors: Siqi Wu, Chen Yang, Haochen Xu, Yiwei Zhu, FengFu Fu, Yue Lin
Full Source: The Science of the total environment 2025 May 8:981:179618. doi: 10.1016/j.scitotenv.2025.179618.

Estimation of Dermal Exposure to Volatile Organic Compounds (VOCs) from Feminine Hygiene Products: Integrating Measurement Data and Physiologically Based Toxicokinetic (PBTK) Model

2025-05-09
Background: Increasing studies have informed noteworthy health risks associated with dermal exposure to volatile organic compounds (VOCs) from feminine hygiene products (FHPs).
Objectives: This study is to address the gap in understanding the absorption, distribution, metabolism, and excretion dynamics of dermal exposure to VOCs from FHPs, and to identify chemicals and products that could cause significant body burden.
Methods: We used measured contents of eight widely present VOCs across five categories of FHPs to estimate dermal exposure, and applied a physiologically based toxicokinetic (PBTK) modeling approach to

elucidate VOC toxicokinetics in human body tissues. Inhalation exposure estimates were derived from 20 air samples collected via passive sampling and analyzed using thermal desorption system coupled with gas chromatography-mass spectrometer. Predicted urinary VOC concentrations based on dermal and inhalation exposure were validated against 99 measurements from 25 females.
Results: Via skin absorption, the estimated levels of most target VOCs in nearly all tissues, except adipose and the rest of the body, rapidly peaked within an hour of product use. Specifically, p-cymene was estimated to reach approximately 2.23 ng/mL in adipose tissue before decreasing over several hours due to efficient excretion pathways, including liver metabolism and exhalation. The model estimated that while the majority of absorbed VOCs (78.9%) were eliminated via liver metabolism, exhalation, and urine excretion, VOCs with logKow higher than 3.5, such as p-cymene, hexane, and n-nonane, exhibited a potential cumulative trend in adipose tissue. This resulted in the estimated VOC concentrations in adipose tissue being 1 to 4 orders of magnitude higher than those estimated in other tissues. Notably, in certain cases, n-nonane posed a potential non-cancer risk (up to 0.07), and benzene presented a notable cancer risk (up to 1.82 × 10-7), primarily attributed to wash and moisturizer, respectively.
Discussion: These findings reveal potential significant body burden and health risks associated with dermal exposure to VOCs from FHPs, warranting further research and regulatory measures. Comprehensive assessment of internal exposure by integrating with toxicokinetic modeling to elucidate chemical distribution in various tissues is recommended, rather than solely measuring solely one type of biomarkers, to illustrate exposure variances and ensure accurate risk assessment.. https://doi.org/10.1289/EHP15418.
Authors: Nan Lin, Zengwei Li, Ning Ding, Sung Kyun Park, Stuart Batterman, Wei Du, Jiayin Dai, Ying Zhu
Full Source: Environmental health perspectives 2025 May 9. doi: 10.1289/EHP15418.

ENVIRONMENTAL RESEARCH

Lead as an environmental toxicant in models of synucleinopathies

2025-05-09
Lead, a toxic heavy metal, is prevalent in various industrial applications, contributing to environmental contamination and significant health

CHEMWATCH
Bulletin Board
Technical
MAY. 16, 2025

concerns. Lead affects various body systems, especially the brain, causing long-lasting cognitive and behavioral changes. While most studies have focused on continuous lead exposure, intermittent exposure, such as that caused by migration or relocations, has received less attention. Importantly, lead exposure intensifies the severity of Parkinson's disease (PD) and dementia with Lewy bodies, diseases involving the accumulation of alpha-synuclein (aSyn) in the brain and in the gut. Although the precise mechanisms underlying these observations remain unclear, oxidative stress and mitochondrial dysfunction likely play a role. Here, we investigated how two different profiles of lead exposure - continuous and intermittent - affect models of synucleinopathies. We found that lead exposure enhances the formation of aSyn inclusions, resulting in an increase in both their number and size in cell models. In addition, we found that animals injected with aSyn pre-formed fibrils display serine 129-phosphorylated aSyn inclusions and a reduction in astrocytes in the substantia nigra. These animals also display neuronal damage and alterations in locomotor activity, exploration behavior, anxiety, memory impairments and hypertension. Our results suggest a mechanistic link between environmental lead exposure and the onset and progression of diseases associated with aSyn pathology. Understanding the molecular and cellular interactions between lead and aSyn is crucial for shaping public health policies and may provide novel insight into strategies for mitigating the impact of environmental toxins on neurodegenerative processes involved in Parkinson's disease and related synucleinopathies.
Authors: Liana Shvachiy, Ângela Amaro-Leal, Filipa Machado, Isabel Rocha, Vera Geraldes, Tiago F Outeiro
Full Source: Chemosphere 2025 May 9:380:144477. doi: 10.1016/j.chemosphere.2025.144477.

Environmental modulators of vascular physiology and inflammation

2025-05-11
Environmental factors play a crucial role in modulating vascular inflammation, contributing significantly to the development of atherosclerosis and cardiovascular disease. This review synthesizes current evidence on how various environmental exposures influence vascular function and inflammation, with a focus on pollutants such as particulate matter and chemical toxins like bisphenols and per- and polyfluoroalkyl substances. These environmental stressors can trigger oxidative stress, chronic inflammation and vascular dysfunction, potentially accelerating the progression of atherosclerosis. We also explore the protective effects

of natural compounds and exposure to green spaces in dampening inflammation and reducing cardiovascular risk. By examining the complex interplay between traditional risk factors and environmental exposures, this work highlights the need for comprehensive public health strategies that address both individual lifestyle factors and broader environmental determinants of cardiovascular health. We underscore the importance of further research to elucidate the precise cellular and molecular mechanisms by which environmental factors influence vascular function, with the aim of developing targeted interventions to mitigate their harmful effects and promote cardiovascular well-being.
Authors: Anusha N Seneviratne, Anne Majumdar, Kalpana Surendranath, Mark R Miller
Full Source: Experimental physiology 2025 May 11. doi: 10.1113/EP092309.

Environmental fate and ecotoxicological behavior of complex contamination of antibiotics and metal ions in aquatic systems

2025-05
Antibiotics and metal ions are frequently detected in aquatic environments, where they can form complex pollutants through mechanisms such as complexation, adsorption, co-precipitation, and biological interactions. These interactions significantly affect the physicochemical properties, transport dynamics, and ecotoxicity of the pollutants. Because of their persistence, potential for bioaccumulation, and complex interactions, these pollutants pose substantial challenges to water treatment systems and may present risks to human health and ecological balance. This review synthesizes research on the sources (1999-2024), status, and formation mechanisms of these complex pollutants. Initially, it outlines how complex pollutants originate from sources including pharmaceutical residues, agricultural runoff, and industrial discharges, which often coexist and interact to form these pollutants. The review then delves into the interaction mechanisms between antibiotics and metal ions, highlighting the factors that influence these interactions. Complexes (coordination polymers) formed by antibiotics and metal ions consist of infinite structures where metal ions and organic ligands act as the fundamental building blocks, connected through coordination bonds and other weak chemical interactions. Additionally, the review provides a comprehensive overview of various removal techniques, discussing their effectiveness and the technical challenges associated with treating these complex pollutants. The effects of antibiotics and metal ions on the migration and transformation mechanisms of the pollutants are also

CHEMWATCH
Bulletin Board
Technical
MAY. 16, 2025

examined. Moreover, the biotoxicity associated with these composite pollutants is discussed, offering insights that could guide future strategies for effective degradation and control.
PRACTITIONER POINTS: Combined contaminants of antibiotics and metal ions widely detected in water Combined contaminants change the physicochemical properties of a single substance. The transport transformation mechanisms of complex contaminants were summarized. The effect of combined contaminants on the removal of antibiotics and metal ions were evaluated.
Authors: Haoran Ji, Guilin He, Wenxuan Ji, Zeyang Ren, Zeting Chen, Baozhen Liu, Yonglei Wang
Full Source: Water environment research: a research publication of the Water Environment Federation 2025 May;97(5):e70074. doi: 10.1002/wer.70074.

PHARMACEUTICAL/TOXICOLOGY

Perfluoroalkyl and polyfluoroalkyl substances interact with platelet glycoprotein Ibα and exacerbate thrombosis

2025-05-05
Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are highly stable man-made chemicals. They have recently garnered significant attention due to their ubiquitous presence in the environment and deleterious effects on human health including cardiovascular diseases (CVDs). Thrombosis due to platelet activation is a major aspect in CVDs. However, the direct effect and underlying mechanism of PFAS on the platelets remains elusive. Here, we observed that PFAS engagement with the extracellular domain of platelet GPIbα, transduced GPIbα-driven inward signals, resulting in intracellular calcium mobilization, activation of Akt and α bβ3 integrin, culminating in platelet aggregation and procoagulant platelet formation. PFAS pretreatment enhanced GPIb-mediated platelet spreading and thrombus formation under high shear conditions. PFAS-induced platelet activation was markedly decreased in Gpibα-deficient mice. PFAS-primed platelets drove neutrophil extracellular traps formation through GPIbα-dependent pathway. Further, PFAS-exposed mice showed heightened risk of thrombus growth and ischemic stroke. Our findings provide experimental evidence for the causal links between PFAS exposure and thrombotic CVDs. Blockade of GPIbα and the downstream pathways

could be an instrumental strategy against PFAS-induced platelet activation and thrombosis.
Authors: Ming Liu, Weiqing Zhao, Chaoyu Ma, Muhammad Awais, Xue Chen, Yiting Feng, Tianyu Wang, Shaoyun Zhou, Yan Bai, Shuai Jiang, Dachuan Zhang, Guangheng Zhu, Xiaohong Ruby Xu, Miao Xu, Heyu Ni, Chuanbin Shen
Full Source: Journal of hazardous materials 2025 May 5:494:138506. doi: 10.1016/j.jhazmat.2025.138506.

OCCUPATIONAL

Toxicological Response of the BEAS-2B Cell After Acute Exposure at the Air-Liquid Interface to Ethylbenzene and m-Xylene Alone and in Binary Mixtures

2025-05-08
Benzene, toluene, ethylbenzene, and xylenes (o-, m-, and p-xylenes) constitute a family, named BTEX, of volatile organic compounds (VOCs) known for its toxicity. This study aimed to study the acute in vitro toxicity of ethylbenzene and m-xylene on human bronchial epithelial cells exposed at the air-liquid interface (ALI). The cells were exposed to VOCs alone and in a mixture for 1 h, followed by 5, 23, and 47 h of incubation. The kinetics of the cell response was characterized, including cytotoxicity, xenobiotic biotransformation, antioxidant defense system, inflammatory response, and apoptosis. The gene expression results showed major differences between these two compounds, even though their chemical structure is very similar. Ethylbenzene did not appear to be metabolized in BEAS-2B cells, as it inhibited gene expression of xenobiotic metabolizing enzymes (XME) and did not induce antioxidant defense systems or apoptosis. However, a slight inflammatory response was observed after exposure. m-Xylene was metabolized in BEAS-2B cells, inducing several XMEs and upregulating enzymes involved in the antioxidant defense system, as well as markers of inflammation and apoptosis. Co-exposure to the binary mixture resulted in an inhibition phenomenon, resulting in the inhibition of toxic action mechanisms studied. The results provide new information on the toxicity of ethylbenzene and m-xylene and highlight the importance of conducting ALI exposures to mixtures of toxicants.
Authors: Nour Jaber, Claude Emond, Fabrice Cazier, Sylvain Billet
Full Source: Journal of applied toxicology: JAT 2025 May 8. doi: 10.1002/jat.4806.

CHEMWATCH
Bulletin Board
Technical
MAY. 16, 2025

Combined exposure to atrazine and phoxim exacerbated the alterations of enzyme activity and abnormal gene expression in earthworms (Eisenia fetida)

2025-05-07
Multiple pesticides often coexist in soil, potentially leading to interactions among their components, these may detrimentally impact soil organisms. This study assessed the potential risks posed by simultaneous exposure to atrazine (ATR) and phoxim (PHO) on enzyme and transcription levels in earthworms (Eisenia fetida). The results revealed that ATR exhibited higher acute toxicity towards E. fetida compared to PHO, and their combined exposure resulted in a synergistic acute effect. Furthermore, low concentration combined exposure significantly stimulated catalase (CAT), malondialdehyde (MDA), and total superoxide dismutase (T-SOD) activities, which lead to more severe oxidative damage. Elevated expression levels of translationally controlled tumor protein (tctp) and calreticulin (crt) genes were observed in most exposed groups compared to the control. The synergistic effects of ATR and PHO on earthworms observed in this study may pose ecological risks to the soil ecosystem; thus, more attention should be paid to the joint effects of different pesticides.
Authors: Jinzhan Li, Jingwen Wang, Fang Shu, Nan Huang, Ru Jia, Yanhua Wang
Full Source: Environmental toxicology and pharmacology 2025 May 7:104713. doi: 10.1016/j.etap.2025.104713.

Characteristics of lead in lung and brain reveals respiration as a direct exposure way

2025-05-08
Lead (Pb) is known as a neurotoxicant, posing a global public health threat. Although Pb exposure is reported to be associated with brain functional impairment, there remain gaps to directly clarify their links and how the environmental lead entry into brain is rarely known. This study explored the entry pathway of atmospheric Pb to brain and lung through comprehensive profiling of Pb characteristics (distribution, nanoparticle characterization and isotope ratio) in the biological and atmospheric samples collected from a typical pollution area. The Pb distribution showed the targeted accumulation of Pb in brain and its descending trend with distances in both tissues and atmosphere indicated the direct transportation of Pb to lung due to point emission of atmospheric Pb. Then the identical characteristics of Pb-containing nanoparticles (PbNPs)

in the lung (two sizes: 35 ± 6 nm and 52 ± 24 nm) and atmospheric (37 ± 6 nm and 53 ± 24 nm inside the smelter) samples, which was identified to be the mixture of PbSO4 and Pb5[PO4]3Cl particles, suggested the origination of exogenous PbNPs in lung from atmosphere through direct respiration. Finally, the highly correlation of Pb isotope ratios in brain and lung, liver and kidney, and the significant difference between the two groups ($p < 0.0001$) indicated Pb in brain and lung was most likely directly inhaled after exposure to particulate pollution in atmosphere, but not from the liver through circulatory system. This is the first time to apply Pb isotopic characteristics in biological organs for investigating the Pb circulations and possible entry route to brain, which would provide direct evidence and a crucial link to understand the brain diseases caused by atmospheric Pb.

Authors: Qinfei Zhou, Yongshun Huang, Lihong Liu, Junhui Zhang, Haozhong Tian, Hua Guo, Qiying Nong, Hongzhe Dong, Zhenhua Wang, Xing Zhang, Yong Liang, Bin He, Ligang Hu, Guibin Jiang

Full Source: Environment international 2025 May 8:199:109519. doi: 10.1016/j.envint.2025.109519.