

Bulletin Board

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CHEMICAL EFFECTS

Non-target, suspect and target screening of chemicals of emerging concern in landfill leachates and groundwater in Guangzhou, South China

2022-05-03

Landfill sites have been regarded as a significant source of chemicals of emerging concern (CECs) in groundwater. However, our understanding about the compositions of CECs in landfill leachate and adjacent groundwater is still very limited. Here we investigated the CECs in landfill leachates and groundwater of Guangzhou in South China by target, suspect and non-target analysis using high-resolution mass spectrometry (HRMS). A variety of CECs (n = 242), including pharmaceuticals (n = 64), pharmaceutical intermediates (n = 18), personal care products (n = 9), food additives (n = 18), industrial chemicals (n = 82, e.g., flame retardants, plasticizers, antioxidants and catalysts), pesticides (n = 26), transformation products (n = 8) and other organic compounds (n = 17) were (tentatively) identified by non-target and suspect screening. 142 CECs were quantitated with target analysis, and among them 37, 24 and 27 CECs were detected respectively in the raw leachate (272-1780 µg/L), treated leachate (0.25-0.81 µg/L) and groundwater (0.10-53.7 µg/L). The CECs in the raw leachates were efficiently removed with the removal efficiencies greater than 88.7%. Acesulfame, bisphenol F and ketoprofen were the most abundant compounds in both treated leachate and groundwater. The CECs in groundwater was found most likely to be originated from the landfill sites. Our results highlight the importance of non-target screening in identifying CECs, and reveal the contamination risk of groundwater by landfill leachate.

Authors: Yu Han, Li-Xin Hu, Ting Liu, Jing Liu, Yu-Qing Wang, Jia-Hui Zhao, You-Sheng Liu, Jian-Liang Zhao, Guang-Guo Ying

Full Source: The Science of the total environment 2022 May 3;155705. doi: 10.1016/j.scitotenv.2022.155705.

Observed and predicted embryotoxic and teratogenic effects of organic and inorganic environmental pollutants and their mixtures in zebrafish (*Danio rerio*)

2022-04-25

Risk assessment of chemicals is still primarily focusing on single compound evaluation, even if environmental contamination consists of a mixture of pollutants. The concentration addition (CA) and independent

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action (IA) models have been developed to predict mixture toxicity. Both models assume no interaction between the components, resulting in an additive mixture effect. In the present study, the embryo toxicity test (OECD TG no. 236) with zebrafish embryos (*Danio rerio*) was performed to investigate whether the toxicity caused by binary, ternary, and quaternary mixtures of organic (Benzo[a]pyrene, perfluorooctanesulfonate, and 3,3',4,4',5-pentachlorobiphenyl 126) and inorganic (arsenate) pollutants can be predicted by CA and IA. The acute toxicity and sub-lethal alterations such as lack of blood circulation were investigated. The models estimated the mixture toxicity well and most of the mixtures were additive. However, the binary mixture of PFOS and PCB126 caused a synergistic effect, with almost a ten-fold difference between the observed and predicted LC50-value. For most of the mixtures, the CA model was better in predicting the mixture toxicity than the IA model, which was not expected due to the chemicals' different modes of action. In addition, some of the mixtures caused sub-lethal effects not observed in the single compound toxicity tests. The mixture of PFOS and BaP caused a division of the yolk and imbalance was caused by the combination of PFOS and As and the ternary mixture of PFOS, As, and BaP. Interestingly, PFOS was part of all three mixtures causing the mixture specific sub-lethal effects. In conclusion, the present study shows that CA and IA are mostly resulting in good estimations of the risks that mixtures with few components are posing. However, for a more reliable assessment and a better understanding of mixture toxicity, further investigations are required to study the underlying mechanisms.

Authors: Greta Nilén, Osagie S Obamwonyi, Van Liem-Nguyen, Magnus Engwall, Maria Larsson, Steffen H Keiter

Full Source: Aquatic toxicology (Amsterdam, Netherlands) 2022 Apr 25;248:106175. doi: 10.1016/j.aquatox.2022.106175.

ENVIRONMENTAL RESEARCH

Heavy metal pollution through hand loom-dyeing effluents and its effect on the community health

2022-05-03

Kumarkhali upazila in Kushtia district of western Bangladesh has become especially vulnerable to dye-effluent pollution over the last two decades. Twenty dyeing effluent samples were obtained at random from various dyeing units and used to determine the heavy metal concentration. The effluent pH, electrical conductivity and total dissolved solids ranged from 3.69 to 13.68, 627 to 7160 mS cm⁻¹ and 4140 to 19800 mg L⁻¹,

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respectively. In dyeing effluents, the average concentrations of Zn, Cu, Pb, Mn, Fe and Cr ions were 5.50, 82.75, 6.80, 14.27, 66.03 and 65.28 $\mu\text{g mL}^{-1}$, respectively, while the amount of Cd was barely detectable. Total annual discharges of Cu, Zn, Pb, Mn, Fe and Cr were found to be 21.52, 1.43, 1.77, 3.71, 17.12 and 16.98 kg year⁻¹, respectively, which were high enough to pollute the local environment. According to the survey report, only a minority were aware of public safety measures and proper disposal procedures, though many respondents were conscious of the dangers associated with dyes and chemical substances. Most interviewees (58.33%) used synthetic dyes and other dangerous chemicals throughout the dyeing process, despite the fact that 43.33% did not use hand gloves. A remarkable 80% of respondents were improperly disposing of unused dyes and chemicals. Overall, there was a lack of awareness, right attitude and appropriate behavioural patterns about using dyeing chemicals. To prevent the negative effects of dyeing effluents on the community in the research area, environmental conservation rules should be appropriately implemented.

Authors: Shafiqul Islam, Arifur Rahman, Kamrun Nahar, Saljar Rahman Chowdhury, Istiaq Ahmed, K M Mohiuddin
Full Source: Environmental science and pollution research international 2022 May 3. doi: 10.1007/s11356-022-20425-5.

Wildfire, Smoke Exposure, Human Health, and Environmental Justice Need to be Integrated into Forest Restoration and Management

2022-05-07

Purpose of review: Increasing wildfire size and severity across the western United States has created an environmental and social crisis that must be approached from a transdisciplinary perspective. Climate change and more than a century of fire exclusion and wildfire suppression have led to contemporary wildfires with more severe environmental impacts and human smoke exposure. Wildfires increase smoke exposure for broad swaths of the US population, though outdoor workers and socially disadvantaged groups with limited adaptive capacity can be disproportionately exposed. Exposure to wildfire smoke is associated with a range of health impacts in children and adults, including exacerbation of existing respiratory diseases such as asthma and chronic obstructive pulmonary disease, worse birth outcomes, and cardiovascular events. Seasonally dry forests in Washington, Oregon, and California can benefit from ecological restoration as a way to adapt forests to climate change and reduce smoke impacts on affected communities. Recent

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findings: Each wildfire season, large smoke events, and their adverse impacts on human health receive considerable attention from both the public and policymakers. The severity of recent wildfire seasons has state and federal governments outlining budgets and prioritizing policies to combat the worsening crisis. This surging attention provides an opportunity to outline the actions needed now to advance research and practice on conservation, economic, environmental justice, and public health interests, as well as the trade-offs that must be considered. Scientists, planners, foresters and fire managers, fire safety, air quality, and public health practitioners must collaboratively work together. This article is the result of a series of transdisciplinary conversations to find common ground and subsequently provide a holistic view of how forest and fire management intersect with human health through the impacts of smoke and articulate the need for an integrated approach to both planning and practice.

Authors: Savannah M D'Evelyn, Jihoon Jung, Ernesto Alvarado, Jill Baumgartner, Pete Caligiuri, R Keala Hagmann, Sarah B Henderson, Paul F Hessburg, Sean Hopkins, Edward J Kasner, Meg A Krawchuk, Jennifer E Krenz, Jamie M Lydersen, Miriam E Marlier, Yuta J Masuda, Kerry Metlen, Gillian Mittelstaedt, Susan J Prichard, Claire L Schollaert, Edward B Smith, Jens T Stevens, Christopher W Tessum, Carolyn Reeb-Whitaker, Joseph L Wilkins, Nicholas H Wolff, Leah M Wood, Ryan D Haugo, June T Spector
Full Source: Current environmental health reports 2022 May 7. doi: 10.1007/s40572-022-00355-7.

PHARMACEUTICAL/TOXICOLOGY

Poly- and perfluoroalkyl substances (PFAS) exposure through infant feeding in early life

2022-05-02

Background and aims: Per- and polyfluoroalkyl substances (PFAS) are non-degradable, man-made-chemicals with an elimination half-life of multiple years, causing accumulation in the environment and humans with potential harmful effects. However, longitudinal PFAS levels in human milk, daily PFAS intake and the association with infant plasma PFAS levels have never been reported. We investigated longitudinal PFOA and PFOS levels in human milk and the daily PFAS intake through infant feeding in the first 3 months of life, the most important determinants and the correlation with PFAS plasma levels at age 3 months and 2 years. **Methods:** In 372 healthy term-born Dutch infants, we determined PFOA and PFOS levels in human milk given at age 1 and 3

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months, in 6 infant formula brands and in infant plasma at 3 months and 2 years, using liquid-chromatography-electrospray-ionization-tandem-mass-spectrometry(LC-ESI-MS/MS). We studied the associations between daily PFAS intake and predictive characteristics by multiple regression models. Results: PFOA and PFOS levels in human milk decreased between 1 and 3 months after delivery, regardless whether breastfeeding was given exclusively(EBF) or in combination with formula feeding. PFOA and PFOS could not be detected in any formula feeding. Daily PFAS intake(ng/kg) was highest in EBF-infants. Higher amount of human milk, older maternal age, lower parity and first-time breastfeeding were associated with higher daily intake. Daily PFAS intake in early life was strongly correlated with PFAS plasma levels at age 3 months and 2 years($R = 0.642-0.875$, $p < 0.001$). Conclusions: Human milk contains PFOA and PFOS, in contrast to formula feeding. Daily PFOA and PFOS intake in early life is highest in exclusively breastfed infants and it is highly correlated with infant's plasma levels throughout infancy. Our findings show that breastfeeding is an important PFAS exposure pathway in the first months of life, with unknown but potential adverse effects. Knowing the important health benefits of breastfeeding, our findings warrant more research about the health outcomes in later life.

Authors: Inge A L P van Beijsterveldt, Bertrand D van Zelst, Kirsten S de Fluiter, Sjoerd A A van den Berg, Manouk van der Steen, Anita C S Hokken-Koelega

Full Source: Environment international 2022 May 2;164:107274. doi: 10.1016/j.envint.2022.107274.

Halogenated ingredients of household and personal care products as emerging endocrine disruptors

2022-05-04

The everyday use of household and personal care products (HPCPs) generates an enormous amount of chemicals, of which several groups warrant additional attention, including: (i) parabens, which are widely used as preservatives; (ii) bisphenols, which are used in the manufacture of plastics; (iii) UV filters, which are essential components of many cosmetic products; and (iv) alkylphenol ethoxylates, which are used extensively as non-ionic surfactants. These chemicals are released continuously into the environment, thus contaminating soil, water, plants and animals. Wastewater treatment and water disinfection procedures can convert these chemicals into halogenated transformation products, which end up in the environment and pose a potential threat to humans and wildlife. Indeed, while certain parent HPCP ingredients have been confirmed as

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endocrine disruptors, less is known about the endocrine activities of their halogenated derivatives. The aim of this review is first to examine the sources and occurrence of halogenated transformation products in the environment, and second to compare their endocrine-disrupting properties to those of their parent compounds (i.e., parabens, bisphenols, UV filters, alkylphenol ethoxylates). Albeit previous reports have focused individually on selected classes of such substances, none have considered the problem of their halogenated transformation products. This review therefore summarizes the available research on these halogenated compounds, highlights the potential exposure pathways, and underlines the existing knowledge gaps within their toxicological profiles.

Authors: Veronika Klančič, Martina Gobec, Žiga Jakopin

Full Source: Chemosphere 2022 May 4;134824. doi: 10.1016/j.chemosphere.2022.134824.

OCCUPATIONAL

Parental Occupational Exposure and Neurodevelopmental Disorders in Offspring: a Systematic Review and Meta-analysis

2022-05-06

Purpose of review: Parental occupational exposures might be associated with neurodevelopmental disorders (NDDs) in offspring. We aimed to conduct a systematic review and meta-analysis to summarize and synthesize the current literature and to estimate the pooled magnitude of the underlying association(s) between parental occupational exposures and subsequent risk of NDDs. Recent findings: In the meta-analysis of 20 included studies, significant associations were found between parental occupational exposure to pesticides or solvents and the risk of attention deficit hyperactivity disorder in offspring. Prenatal occupational exposure to pesticides was significantly associated with motor development or cognition disorders in children. Furthermore, some evidence showed that metals might have a role in the development of autism spectrum disorders. Further studies need to identify the level of parental occupational exposures that can be significantly associated with NDDs. Moreover, utilizing standardized outcome and exposure scales is recommended to incorporate paternal,

Purpose of review: Parental occupational exposures might be associated with neurodevelopmental disorders (NDDs) in offspring.

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maternal, and parental as well as both prenatal and postnatal exposure in future studies.

Authors: Maryam Bemanalizadeh, Mehri Khoshhali, Parvin Goli, Ibrahim Abdollahpour, Roya Kelishadi

Full Source: Current environmental health reports 2022 May 6. doi: 10.1007/s40572-022-00356-6.

Evaluating risk, exposure, and detection capabilities for chemical threats in water

2022-04-30

The unexpected release of chemicals into the environment requires estimation of human health risks, followed by risk management decisions. When environmental concentrations of toxicants are associated with adverse health risks, the limit for analytical measurement needs to be at or below the risk threshold. The aim of this study was to assess chemical contaminants that have the potential to produce acute adverse human health impacts following oral consumption of contaminated drinking water. The U.S. Environmental Protection Agency's (EPA) Candidate Contaminant List, version 4 (CCL4) and EPA's Selected Analytical Methods (SAM) document were screened to identify 24 chemicals that exist as a solid or liquid at room temperature, with acute oral LD50 (lethal dose in 50% of the test population) values < 500 mg/kg-d and water solubility > 500 mg/L at ambient temperature. While these screening criteria were used to identify prioritized needs for targeted research, it does not imply that other chemicals on the CCL4 and SAM lists are not issues in acute and chronic exposures. Of these 24 most toxic and most soluble chemicals, this evaluation identified 6 chemicals (2-chlorovinylarsonous acid, lewisite, N-nitrosopyrrolidine, N-nitrosodiethylamine, 3-hydroxycarbofuran, and triethylamine) lacking either sufficient toxicity value information or analytical sensitivity required to detect at levels protective against adverse effects in adults for acute exposures. This assessment provides an approach for gap identification and highlights research needs related to water contamination incident involving these six priority chemicals.

Authors: Marisa Pfohl, Erin Silvestri, John C Lipscomb, Emily Snyder, Stuart Willison

Full Source: Journal of toxicology and environmental health. Part A 2022 Apr 30;1-26. doi: 10.1080/15287394.2022.2064949.

The unexpected release of chemicals into the environment requires estimation of human health risks, followed by risk management decisions.

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Occupational COPD-The most under-recognized occupational lung disease?

2022-05-05

Chronic obstructive pulmonary disease (COPD) is caused by exposure to noxious particles and gases. Smoking is the main risk factor, but other factors are also associated with COPD. Occupational exposure to vapours, gases, dusts and fumes contributes to the development and progression of COPD, accounting for a population attributable fraction of 14%. Workplace pollutants, in particular inorganic dust, can initiate airway damage and inflammation, which are the hallmarks of COPD pathogenesis. Occupational COPD is still underdiagnosed, mainly due to the challenges of assessing the occupational component of the disease in clinical settings, especially if other risk factors are present. There is a need for specific education and training for clinicians, and research with a focus on evaluating the role of occupational exposure in causing COPD. Early diagnosis and identification of occupational causes is very important to prevent further decline in lung function and to reduce the health and socio-economic burden of COPD. Establishing details of the occupational history by general practitioners or respiratory physicians could help to define the occupational burden of COPD for individual patients, providing the first useful interventions (smoking cessation, best therapeutic management, etc.). Once patients are diagnosed with occupational COPD, there is a wide international variation in access to specialist occupational medicine and public health services, along with limitations in workplace and income support. Therefore, a strong collaboration between primary care physicians, respiratory physicians and occupational medicine specialists is desirable to help manage COPD patients' health and social issues.

Authors: Nicola Murgia, Angela Gambelunghe

Full Source: Respirology (Carlton, Vic.) 2022 May 5. doi: 10.1111/resp.14272.

Occupational Benzene Exposure in the Norwegian Offshore Petroleum Industry, 2002-2018

2022-05-06

Purpose: Workers on offshore petroleum installations are at risk of being exposed to benzene which is carcinogenic to humans. The present study aimed to assess the time trend of full-shift benzene exposure from 2002 to 2018 in order to characterize benzene exposure among laboratory technicians, mechanics, process operators, and industrial cleaners, and to examine the possible determinants of benzene

Chronic obstructive pulmonary disease (COPD) is caused by exposure to noxious particles and gases.

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exposure. **Methods:** A total of 924 measurements of benzene exposure from the Norwegian petroleum offshore industry were included. The median sampling duration was 680 min, ranging from 60 to 940 min. The overall geometric mean (GM) and 95% confidence interval, time trends, and determinants of exposure were estimated using multilevel mixed-effects tobit regression analyses. Time trends were estimated for sampling duration below and above 8 h, both overall and for job groups. The variability of exposure between installation and workers was investigated in a subset of data containing worker identification. **Results:** The overall GM of benzene exposure was 0.004 ppm. When adjusting for job group, design of process area, season, wind speed, and sampling duration, industrial cleaners had the highest exposure (GM = 0.012). Laboratory technicians, mechanics, and process operators had a GM exposure of 0.004, 0.003, and 0.004 ppm, respectively. Overall, the measured benzene exposure increased by 7.6% per year from 2002 to 2018. Mechanics had an annual increase of 8.6% and laboratory technicians had an annual decrease of 12.6% when including all measurements. When including only measurements above 8 h, mechanics had an increase of 16.8%. No statistically significant time trend was found for process operators. Open process area, high wind speed, and wintertime were associated with reduced exposure level. **Conclusions:** An overall increase in measured exposure was observed from 2002 to 2018. The increase may reflect changes in measurement strategy from mainly measuring on random days to days with expected exposure. However, the time trend varied between job groups and was different for sampling duration above or below 8 h. Industrial cleaners had the highest exposure of the four job groups while no differences in exposure were observed between laboratory technicians, mechanics, and process operators. The design of the process area, job group, wind speed, and season were all significant determinants of benzene exposure.

Authors: Hilde Ridderseth, Dagrun Slettebø Daltveit, Bjørg Eli Hollund, Jorunn Kirkeleit, Hans Kromhout, Kirsti Krüger, Liv-Torill Austgulen, Magne Bråtveit

Full Source: *Annals of work exposures and health* 2022 May 6;wxac022.
doi: 10.1093/annweh/wxac022.