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CHEMICAL EFFECTS

Recent Progress on Toxicity and Detection Methods of Polychlorinated Biphenyls in Environment and Foodstuffs

2022-01-28

Polychlorinated biphenyls (PCBs), a class of synthetic organochlorine chemicals, were broadly employed in industrial and commercial applications in the last century due to their good thermal and chemical stability. However, PCBs have a great influence on both individual organism and the entire ecosystem. It has been proven that PCBs pose potential risks to human health with neurotoxicity, carcinogenicity, reproductive toxicity, immunotoxicity, hepatotoxicity, and cardiovascular toxicity. Moreover, PCBs exhibit the long-range transport effect on the global scale and bio-enrichment effect along the food chains. This review mainly encompasses recent progress on the toxicity and detection techniques of PCBs in environment and foodstuffs. First of all, we highlighted the latest improvements and achievements of the classification, source, distribution, and toxicity of PCBs. Then, comprehensive summaries of the current technologies for sample preparation (e.g., SPE, DSPE, SPME and SBSE) and analytical determination (e.g., GC-ECD, GC-MS, GC-HRMS, HPLC-MS/MS and sensing technologies) were given. In the end, the shortcomings and prospects of the pretreatment methods for PCBs analysis as well as the future opportunities and challenges are tentatively discussed.

Authors: Jin Liu, Guoliang Li, Jianghua Liu, Panxue Wang, Di Wu, Xianlong Zhang, Yongning Wu

Full Source: Critical reviews in analytical chemistry 2022 Jan 28;1-26.

Polychlorinated biphenyls (PCBs), a class of synthetic organochlorine chemicals, were broadly employed in industrial and commercial applications in the last century due to their good thermal and chemical stability.

Persistent, Bioaccumulative, and Toxic Chemicals in Wild Alpine Insects: A Methodological Case Study

2022-01-28

With their high persistence in the environment and their potential for long-range atmospheric transport, persistent, bioaccumulative, and toxic chemicals (PBTs) may be among the numerous anthropogenic threats to insect populations worldwide. The effects of PBTs on insects have been investigated in the laboratory, but topical field studies are scarce. A reason might be the multiple challenges that PBT-related field studies on wild insects face. Here, two species of bumblebees (*Bombus* spp.) and of ants (*Formica* spp.) were studied in two high-elevation locations in the Austrian and German Alps to tackle two of these challenges. First, PBTs

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occur in minuscule concentrations compared with other substances in the environment. Therefore, the practicability of body burden data from pooled individuals was tested. Second, fitness proxies, like fecundity, which typically are endpoints for chemical toxicity, are difficult to quantify in the field. Hence, fluctuating asymmetry (FA) of bumblebee wings and ant heads was tested as an alternative endpoint. To exclude that FA was caused by genetic stressors, inbreeding-levels were estimated using population-genetic markers, and their relations to FA in the same individuals were assessed. We successfully quantified PCBs and Hg as PBTs using the pooled samples and found PBT data from pooled individuals useful, in that significant correlations to FA were identified in bumblebees and ants. This confirmed the potential of FA to indicate PBT effects in wild insects. Inbreeding did not interfere with PBT links to FA in any instance. Our findings contribute to developing a quantitative methodological framework for investigating effects of persistent environmental chemicals on wild insects. This article is protected by copyright. All rights reserved. © 2022 SETAC.

Authors: Veronika Rosa Hierlmeier, Nils Struck, Patrick Krapf, Timotheus Kopf, Anna Malena Hofinger, Viktoria Leitner, Philipp Jakob Ernest Stromberger, Korbinian Peter Freier, Florian Michael Steiner, Birgit Christiane Schlick-Steiner

Full Source: Environmental toxicology and chemistry 2022 Jan 28. doi: 10.1002/etc.5303.

ENVIRONMENTAL RESEARCH

"Passing Down Pollution": (Inter)generational Toxicology and (Epi)genetic Environmental Health

2021-12

Concern about the harmful health effects of industrial pollution is increasingly taking on an intergenerational dimension. In environmental health sciences such as toxicology, this has resulted in emphasizing the influence of toxic chemicals, substances, and situations across generations. Toxic relationalities are now being explored through research on gene-environment interaction, including toxicogenomics and epigenetic research through animal experiments and birth cohort studies. Based on fieldwork conducted among reproductive and developmental toxicologists working in Nanjing, China, this article shows how toxicological research both expresses and produces renewed anxieties about "passing down pollution." These toxicological accounts of intergenerational harm problematically work through overly simplistic

Concern about the harmful health effects of industrial pollution is increasingly taking on an intergenerational dimension.

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renderings of reproduction and biological relatedness. But they also have the potential to catalyze creative understandings of toxic relationalities and responsibilities at a moment when making kin is increasingly seen as key to securing livable futures. [toxicology, environment, epigenetics, kinship, China].

Authors: Janelle Lamoreaux

Full Source: Medical anthropology quarterly 2021 Dec;35(4):529-546. doi: 10.1111/maq.12679.

Effects of microplastics on the terrestrial environment: A critical review

2022-01-20

Microplastics are emerging contaminants and there has been growing concern regarding their impacts on aquatic and terrestrial environments. This review provides a comprehensive overview of the current knowledge regarding the sources, occurrences, fates, and risks associated with microplastic contamination in terrestrial environments. This contamination occurs via multiple sources, including primary microplastics (including synthetic materials) and secondary microplastics (derived from the breakdown of larger plastic particles). Microplastic contamination can have both beneficial and detrimental effects on soil properties. Additionally, microplastics have been shown to interact with a wide array of contaminants, including pesticides, persistent organic pollutants, heavy metals, and antibiotics, and may act as a vector for contaminant transfer in terrestrial environments. Microplastics and their associated chemicals can be transferred through food webs and may accumulate across multiple trophic levels, resulting in potential detrimental health effects for humans and other organisms. Although several studies have focused on the occurrence and impacts of microplastic contamination in marine environments, their sources, fate, transport, and effects in terrestrial environments are less studied and not well understood. Therefore, further research focusing on the fate, transport, and impacts of microplastics in relation to soil properties, polymer composition and forms, and land-use types is needed. The development of standardized and harmonized methods for analyzing microplastics in soil-plant ecosystems is essential. Future work should also consider the many interactions of microplastics

Microplastics are emerging contaminants and there has been growing concern regarding their impacts on aquatic and terrestrial environments.

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with soil quality and ecotoxicological impacts on biota in the context of global environmental change.

Authors: Pavani Dulanja Dissanayake, Soobin Kim, Binoy Sarkar, Patryk Oleszczuk, Mee Kyung Sang, Md Niamul Haque, Jea Hyung Ahn, Michael S Bank, Yong Sik Ok

Full Source: Environmental research 2022 Jan 20;112734. doi: 10.1016/j.envres.2022.112734.

Environmental exposures to pesticides, phthalates, phenols and trace elements are associated with neurodevelopment in the CHARGE study

2022-01-24

Objective: To determine if higher exposures measured in early childhood to environmental phenols, phthalates, pesticides, and/or trace elements, are associated with increased odds of having a diagnosis of Autism Spectrum Disorder (ASD), Developmental Delay (DD), or Other Early Concerns (OEC) compared to typically developing children (TD).

Methods: This study included 627 children between the ages of 2-5 who participated in the Childhood Autism Risks from Genetics and Environment (CHARGE) study. Urine samples were collected at the same study visit where diagnostic assessments to confirm diagnosis indicated during the recruitment process were performed. Adjusted multinomial regression models of each chemical with diagnosis as the outcome were conducted. Additionally, two methods were used to analyze mixtures: repeated holdout multinomial weighted quantile sum (WQS) regression for each chemical class; and a total urinary mixture effect was assessed with repeated holdout random subset WQS.

Results: Many urinary chemicals were associated with increased odds of ASD, DD or OEC compared to TD; however, most did not remain significant after false discovery rate adjustment. Repeated holdout WQS indices provided evidence for associations of both a phenol/paraben mixture effect and a trace element mixture effect on DD independently. In analyses adjusted for confounders and other exposures, results suggested an association of a pesticide mixture effect with increased risk for ASD. Results also suggested associations of a total urinary mixture with greater odds of both ASD and DD separately.

Conclusion: Higher concentrations of urinary biomarkers were associated with ASD, DD, and OEC compared to TD, with consistency of the results comparing single chemical analyses and mixture analyses. Given that the biospecimens used for chemical analysis were generally collected many months after diagnoses were made, the direction of any causal association is unknown. Hence findings may reflect

Objective: To determine if higher exposures measured in early childhood to environmental phenols, phthalates, pesticides, and/or trace elements, are associated with increased odds of having a diagnosis of Autism Spectrum Disorder (ASD), Developmental Delay (DD), or Other Early Concerns (OEC) compared to typically developing children (TD).

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higher exposures among children with non-typical development than TD children due to differences in behaviors, metabolism, or toxicokinetics.

Authors: Deborah H Bennett, Stefanie A Busgang, Kurunthachalam Kannan, Patrick J Parsons, Mari Takazawa, Christopher D Palmer, Rebecca J Schmidt, John T Doucette, Julie B Schweitzer, Chris Gennings, Irva Hertz-Picciotto

Full Source: Environment international 2022 Jan 24;161:107075. doi: 10.1016/j.envint.2021.107075.

Personal protective equipment (PPE) pollution driven by the COVID-19 pandemic along the shoreline of Lake Tana, Bahir Dar, Ethiopia

2022-01-20

Personal protective equipment (PPE) pollution has become one of the most pending environmental challenges resulting from the pandemic. While various studies investigated PPE pollution in the marine environment, freshwater bodies have been largely overlooked. In the present study, PPE monitoring was carried out in the vicinity of Lake Tana, the largest lake in Ethiopia. PPE density, types, and chemical composition (FTIR spectroscopy) were reported. A total of 221 PPEs were identified with a density ranging from 1.22×10^{-5} PPE m^{-2} (control site S1) to 2.88×10^{-4} PPE m^{-2} with a mean density of $1.54 \times 10^{-4} \pm 2.58 \times 10^{-5}$ PPE m^{-2} . Mismanaged PPE waste was found in all the sampling sites, mostly consisting of surgical face masks (93.7%). Statistical analyzes revealed significantly higher PPE densities in sites where several recreational, touristic, and commercial activities take place, thus, revealing the main sources of PPE pollution. Furthermore, polypropylene and polyester fabrics were identified as the main components of surgical and reusable cloth masks, respectively. Given the hazard that PPEs represent to aquatic biota (e.g., entanglement, ingestion) and their ability to release microplastics (MPs), it is necessary to implement sufficient solid waste management plans and infrastructure where lake activities take place. Additionally, local authorities must promote and ensure sustainable tourism in order to maintain the ecosystems in Lake Tana. Prospective research priorities regarding the colonization and degradation of PPE, as well as the release of toxic chemicals, were identified and discussed.

Authors: Tadele Assefa Aragaw, Gabriel E De-la-Torre, Alebel A Teshager

Full Source: The Science of the total environment 2022 Jan 20;820:153261. doi: 10.1016/j.scitotenv.2022.153261.

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OCCUPATIONAL

Differences between hairdressers and consumers in skin exposure to hair cosmetic products: a review

2022-01-27

Hairdressers are at high risk of developing occupational hand eczema. Opinions on the health and safety concerns of non-food consumer products, such as cosmetics and their ingredients, consider the exposure of a 'common consumer', which may not account for occupational exposure of hairdressers. As result, there is a parlous scenario in which serious safety concerns about occupational exposures are present. The purpose of this review is to compare the frequency of exposure to various types of hair cosmetic products among hairdressers and consumers. Database searches for this review yielded a total of 229 articles. 7 publications were ultimately included. The analysis showed that - dependent on the task - hairdressers were exposed 4 to 78 times more than consumers regarding a wide spectrum of hair cosmetic products used in the daily working life ranging from shampoo, conditioner, oxidative and non-oxidative hair colours, and bleaching agents. The highest frequency was found for colouring hair with oxidative hair colour. Consumer usage frequency does not appear to be appropriate for representing hairdresser exposure. The current standards do not effectively address the occupational risks associated with hairdressers' use of cosmetics. The findings of this study should cause current risk assessment procedures to be reconsidered. This article is protected by copyright. All rights reserved.

Authors: Cara Symanzik, Jeanne D Johansen, Patricia Weinert, Željka Babić, Sarah Hallmann, Martin S Havmose, Sanja Kezic, Marija Macan, Jelena Macan, Julia Strahwald, Rajka Turk, Henk F van der Molen, Swen M John, Wolfgang Uter

Full Source: Contact dermatitis 2022 Jan 27. doi: 10.1111/cod.14055.

Hairdressers are at high risk of developing occupational hand eczema.

Work-related fatigue: A hazard for workers experiencing disproportionate occupational risks

2022-01-27

Background: Long working hours and fatigue are significant occupational safety and health (OSH) hazards for working populations who experience disproportionate risks of injury and illness. These groups include young or new workers, aging workers, contingent and temporary workers, immigrant and nonnative workers, female workers, minority

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workers, workers with low levels of education and lower socioeconomic status, and small business employees. An increasing focus on newer determinants of health in the workplace, such as health equity and work-life conflict, in worker populations at greater risk for injury or illness, provides an opportunity for researchers to address the causes and consequences of work-related fatigue in high-risk populations.

Methods: Articles in the OSH literature that addressed fatigue in higher-risk workers were identified by the authors or recommended by subject matter experts in workplace fatigue as part of a Working Hours, Sleep and Fatigue Forum. Additional articles were identified by searching for a combination of specific at-risk worker group titles (e.g., female workers, temporary workers) with fatigue or working hours.

Results: There remains a paucity of research specifically addressing working hours and fatigue among disproportionately at-risk worker populations. The literature reviewed in this paper suggests that several of these populations are at increased risk of fatigue due to multiple factors, such as irregular shifts, lack of access to fatigue management resources, and socioeconomic barriers.

Conclusions: More research is needed to identify solutions to address fatigue in working populations who may be at greater risk for its consequences by virtue of adverse socioeconomic and related factors. Interventions to address work-related fatigue in specific at-risk worker groups should also consider the multiple and overlapping categories of risk within these populations.

Authors: Thomas R Cunningham, Rebecca J Guerin, Jacqueline Ferguson, Jennifer Cavallari

Full Source: American journal of industrial medicine 2022 Jan 27. doi: 10.1002/ajim.23325.

Background and aim:
Occupational exposures are important, preventable causes of COPD.

Lifetime occupational exposures and chronic obstructive pulmonary disease risk in the UK Biobank cohort

2022-01-26

Background and aim: Occupational exposures are important, preventable causes of COPD. We previously found an increased risk of COPD among six occupations by analysing lifetime job histories and lung function data in the population-based UK Biobank cohort. We aimed to build on these findings and elucidate the underlying potential causal agents to focus preventive strategies.

Methods: We applied the ALOHA+job exposure matrix (JEM) based on the International Standard Classification of Occupations V.1988 codes, where exposure to 12 selected agents was rated as 0 (no exposure), 1 (low) or 2 (high). COPD was spirometrically defined as FEV1/FVC less than the lower limit of normal.

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We calculated semiquantitative cumulative exposure estimates for each agent by multiplying the duration of exposure and squared intensity. Prevalence ratio (PR) and 95% CI for COPD were estimated using robust Poisson regression adjusted for centre, sex, age, smoking and coexposure to JEM agents. Only associations confirmed among never-smokers and never-asthmatics were considered reliable. Results: Out of 116 375 participants with complete job histories, 94 514 had acceptable/repeatable spirometry and smoking data and were included in the analysis. Pesticide exposure showed increased risk of COPD for ever exposure (PR=1.13, 95% CI 1.01 to 1.28) and high cumulative exposure (PR=1.32, 95% CI 1.12 to 1.56), with positive exposure-response trends (p trend=0.004), which were confirmed among never-smokers (p trend=0.005) and never-asthmatics (p trend=0.001). Conclusion: In a large population-based study, occupational exposure to pesticides was associated with risk of COPD. Focused preventive strategies for workers exposed to pesticides can prevent the associated COPD burden. Authors: Sara De Matteis, Debbie Jarvis, Lucy Darnton, Dario Consonni, Hans Kromhout, Sally Hutchings, Steven S Sadhra, David Fishwick, Roel Vermeulen, Lesley Rushton, Paul Cullinan Full Source: Thorax 2022 Jan 26;thoraxjnl-2020-216523. doi: 10.1136/thoraxjnl-2020-216523.

PHARMACEUTICAL/TOXICOLOGY

A Children's Health Perspective on Nano- and Microplastics

2022-01

Background: Pregnancy, infancy, and childhood are sensitive windows for environmental exposures. Yet the health effects of exposure to nano- and microplastics (NMPs) remain largely uninvestigated or unknown. Although plastic chemicals are a well-established research topic, the impacts of plastic particles are unexplored, especially with regard to early life exposures. Objectives: This commentary aims to summarize the knowns and unknowns around child- and pregnancy-relevant exposures to NMPs via inhalation, placental transfer, ingestion and breastmilk, and dermal absorption. Methods: A comprehensive literature search to map the state of the science on NMPs found 37 primary research articles on the health relevance of NMPs during early life and revealed major knowledge gaps in the field. We discuss opportunities and challenges for quantifying child-specific exposures (e.g., NMPs in breastmilk or infant formula) and health effects, in light of global inequalities in baby bottle use, consumption of packaged foods, air

Background:
Pregnancy, infancy, and
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pollution, hazardous plastic disposal, and regulatory safeguards. We also summarize research needs for linking child health and NMP exposures and address the unknowns in the context of public health action.

Discussion: Few studies have addressed child-specific sources of exposure, and exposure estimates currently rely on generic assumptions rather than empirical measurements. Furthermore, toxicological research on NMPs has not specifically focused on child health, yet children's immature defense mechanisms make them particularly vulnerable.

Apart from few studies investigating the placental transfer of NMPs, the physicochemical properties (e.g., polymer, size, shape, charge) driving the absorption, biodistribution, and elimination in early life have yet to be benchmarked. Accordingly, the evidence base regarding the potential health impacts of NMPs in early life remains sparse. Based on the evidence to date, we provide recommendations to fill research gaps, stimulate policymakers and industry to address the safety of NMPs, and point to opportunities for families to reduce early life exposures to plastic. <https://doi.org/10.1289/EHP9086>.

Authors: Kam Sripada, Aneta Wierzbicka, Khaled Abass, Joan O Grimalt, Andreas Erbe, Halina B Röllin, Pál Weihe, Gabriela Jiménez Díaz, Randolph Reyes Singh, Torkild Visnes, Arja Rautio, Jon Øyvind Odland, Martin Wagner
Full Source: Environmental health perspectives 2022 Jan;130(1):15001. doi: 10.1289/EHP9086.