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CHEMICAL EFFECTS

Skin conditions associated with dermal exposure to oil spill chemicals among Deepwater Horizon disaster response and cleanup workers

2025-03-21
Background: Previous studies have associated oil spill response and cleanup (OSRC) work with skin symptoms, but evidence is lacking on the specific exposure agents that contributed to these skin effects.
Objectives: We investigated OSRC-related exposures, including dermal exposure to specific chemical agents, in relation to acute and longer-term skin conditions among the 2010 Deepwater Horizon (DWH) OSRC workers.
Methods: At GuLF Study enrollment, workers reported duration of work, jobs performed, and skin contact with crude oil/tar, dispersants, and decontamination chemicals. Cumulative dermal exposure to polycyclic aromatic hydrocarbons (PAHs) from oil/tar was estimated based on the "GuLF DREAM model". We used Poisson regression with robust standard errors to evaluate associations of exposures with prevalent skin conditions during spill cleanup and at enrollment (1-3 years later) and incident eczema diagnoses after the start of OSRC work. We examined modification of associations between exposures and prevalent conditions by use of rubber/synthetic gloves.
Results: Duration of OSRC work was positively associated with skin conditions and eczema diagnoses (p-trend<0.01). Workers in operations, response, and decontamination jobs had higher skin condition prevalence (during cleanup: PR range=3.13-4.51; at enrollment: PR range=2.20-2.94) and eczema risk (RR range=1.44-1.89) compared to support workers. After adjusting for co-exposures, we saw associations of skin conditions during cleanup with dermal exposure to oil/tar (PR=3.41, 95 %CI: 3.14, 3.69), decontamination chemicals (PR=1.55, 95 %CI: 1.46, 1.64), dispersants (PR=1.44, 95 %CI: 1.33, 1.57), and PAHs (p-trend<0.01). These associations remained apparent at enrollment. Eczema diagnosis was associated with exposure to oil/tar (RR=1.56, 95 %CI: 1.20, 2.04) and PAHs (Tertile 3 vs. 1: PR=1.33, 95 %CI: 0.86, 2.07). Effect estimates were on average 21 % lower among workers who used rubber/synthetic gloves.
Conclusions: Duration of work, working in non-support jobs, and dermal exposure to oil/tar, dispersants, decontamination chemicals, and PAHs

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were associated with acute and longer-term skin effects among the DWH OSRC workers.
Authors: Dazhe Chen, Kaitlyn G Lawrence, Patricia A Stewart, Melanie Gorman Ng, Mark R Stenzel, John W Cherrie, Kate E Christenbury, W Braxton Jackson Ii, Lawrence S Engel, Dale P Sandler
Full Source: Ecotoxicology and environmental safety 2025 Mar 21:294:118076. doi: 10.1016/j.ecoenv.2025.118076.

MITIGATING BISPHENOL-INDUCED NEUROTOXICITY: EXPLORING THE THERAPEUTIC POTENTIAL OF DIOSMIN IN ZEBRAFISH LARVAE

2025-03-21
Neurological disorders are commonly accompanied by inflammation of the brain, which can be triggered by oxidative stress and cell damage caused by hazardous environmental substances. The ubiquitous harmful chemical bisphenol A (BPA) has been linked to several neuropsychiatric disorders and is thought to contribute to oxidative damage. This study explored the mechanisms underlying the effects of BPA on neurological health. Diosmin (DM) is a natural flavonoid (C28H32O15) found in various plants, including citrus fruits and it possess various pharmacological activities. This study investigated the neuroprotective effects of DM on BPA-induced neuroinflammation in zebrafish larvae, suggesting its potential therapeutic uses. Developmental toxicity, including mortality, hatching rate, and heart rate, was evaluated to determine DM toxicity. Oxidative stress biomarkers such as reactive oxygen species (ROS), superoxide anions (O-2), lipid peroxidation (LPO), and nitric oxide (NO) were quantified using colorimetric assays in the head region of the larvae. Antioxidant enzyme activities were measured to assess the impact of DM on antioxidant defences. Neuroinflammation was evaluated by analysing pro-inflammatory markers using RT-qPCR, and motor neuron function was assessed using acetylcholinesterase (AChE) activity and behavioural assays. The findings indicate that exposure to DM prevents neurotoxicity induced by BPA by increasing antioxidant defence enzymes and reducing the levels of ROS, O2-, LPO, and NO in the head region of zebrafish larvae. Furthermore, DM enhanced motor neuron function by increasing AChE activity and decreasing neuroinflammation by reducing the levels of pro-inflammatory markers influenced by BPA. This study suggests that DM offers neuroprotection against BPA-induced oxidative damage and

neuroinflammation, thereby paving the way for the development of new treatment options for neurological disorders.
Authors: Uvarajan Deenathayalan, Ravikumar Manish, Durairaj Brindha
Full Source: Food and chemical toxicology: an international journal published for the British Industrial Biological Research Association 2025 Mar 21:115402. doi: 10.1016/j.fct.2025.115402.

A Mixture Parameterized Biologically Based Dosimetry Model to Predict Body Burdens of PAHs in Developmental Zebrafish Toxicity Assays

2025-03-21
Polycyclic aromatic hydrocarbons (PAHs) are a group of environmental toxicants found ubiquitously as complex mixtures in human impacted environments. Developmental zebrafish exposures have been used widely to study PAH toxicity, but most studies report nominal exposure concentrations. Nominal exposure concentrations can be unreliable dose metrics due to differences in toxicant bioavailability resulting from disparate exposure methodologies and chemical properties. Toxicokinetic modeling can predict toxicant tissue doses to facilitate comparison between exposures of different chemicals, methodologies, and biological models. We parameterize a biologically based dosimetry model for developmental zebrafish toxicity assays for 9 PAHs. The model was optimized with measurements from media, tissue, and plastic plate walls throughout a static developmental exposure to a mixture of ten PAHs of high abundance within the Portland Harbor Superfund Site. Plate binding, volatilization, zebrafish permeability, and tissue-media partitioning coefficients vary widely between PAHs. Model predictions accounted for 83% and 54% of 48 hpf body burdens within a factor of 2 resulting from exposures to mixtures and individual PAHs respectively. Accounting for solubility significantly improves model performance. Competition for active sites in metabolizing enzymes may change biotransformation kinetics between individual PAH and mixture exposures. Area under the curve estimations of concentrations in zebrafish resulted in altered hazard rankings from nominal exposure concentrations. Future work will be oriented to generalizing the model to other PAHs. This PAH dosimetry model improves the interpretability of developmental zebrafish toxicity

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assays by providing time resolved body burdens from nominal exposure concentrations.
Authors: Christian I Rude, Jordan N Smith, Ricky P Scott, Katherine J Schultz, Kim A Anderson, Robyn L Tanguay
Full Source: Toxicological sciences: an official journal of the Society of Toxicology 2025 Mar 21:kfaf039. doi: 10.1093/toxsci/kfaf039.

ENVIRONMENTAL RESEARCH

Atmospheric Microplastic Pollution in Textile Industrial Areas: Source, Composition, and Health Risk Assessment

2025-03-22
Microplastics (MPs) have been increasingly recognized as a pervasive environmental pollutant, with their presence extending to the atmosphere in urban, suburban, and even remote locations. Despite this, the precise sources of atmospheric microplastics remain elusive. Our study focuses on elucidating the contribution of textile industries to atmospheric microplastic pollution by investigating the atmospheric fallout within and around textile industrial areas. Samples of suspended MPs were collected over seven days from indoor and outdoor locations in six textile industries at Dhaka city, Bangladesh. Through examination using fluorescent microscopy and Fourier transform infrared (FTIR) spectroscopy, we identified transparent and black microplastics, predominantly synthetic textile fibres with lengths ranging from 20 to 180 μm. Chemical analysis revealed polymers such as polyester, nylon, regenerated cellulose, and natural fibres among the observed microplastics. Deposition rates inside the textile factory ranged from 109.0 × 103 to 245.3 × 103 MPs/m2/day, while those outside ranged from 19.3 × 103 to 72.7 × 103 MPs/m2/day, indicating a significant contribution of textile operations to atmospheric microplastic contamination. Furthermore, we calculated the exposure of textile workers to microplastics through inhalation and ingestion, with average rates of 8.7 ± 4.3 mg/kg-Bw/year and 97.9 ± 17.5 mg/kg-Bw/year, respectively. These findings emphasize the substantial health risks faced by textile workers due to microplastic exposure. In conclusion, our study provides compelling evidence implicating the textile factory as a noteworthy source of atmospheric microplastic pollution. It is crucial to

address this issue in order to reduce environmental contamination and protect the health of those employed in textile production plants.
Authors: Riajul Haq Tanjil, Md Safiqul Islam, Zubayer Islam, Shatabdi Roy, Samiha Nahian, Abdus Salam
Full Source: Bulletin of environmental contamination and toxicology 2025 Mar 22;114(4):51. doi: 10.1007/s00128-025-04021-0.

Gaseous Air Pollutants and Lung Function in Fibrotic Interstitial Lung Disease (fILD): Evaluation of Different Spatial Analysis Approaches

2025-03-22
Venice is one of the most iconic and massively visited landscape in the World. Leisure and freight boats are extremely needed, yet no one has foreseen their after-life treatment. Those abandoned, turning to the status of 'ghost boats', undergo weathering and progressively fragment into scraps generating microplastics, fiberglass dusts or asbestos. We tackle this problem via a multiple level citizen involving chemistry students, personnel assigned for Public Utility Work by the Venice court, and SMEs within the sustainable business concept of the Triple Bottom Line (Planet, People, Profit). For the very first time an analytical procedure was optimized to scrutinize the leaching of a variegated assortment of chemicals from the abandoned boats into the marine environment via a green analytical approach (AGREE Prep score 0.8, Analytical Eco-scale score 91). We studied its contamination at the molecular level, via HS-SPME-GC-MS, deciphering the volatiles fingerprint of three representative kind of samples (water, soil, and mud) in a remote environment of the Venice Lagoon, contaminated by decaying fiberglass boats. We developed hypotheses on the origin of each identified analyte, taking into account that the most common construction materials are fiberglass reinforced plastic and polyurethane foams and coatings. Among the forty-three positively identified analytes, fifteen identified analytes are related to polymers chemistries. The chromatographic signatures of the volatile organic compounds are dominated, in all cases, by polyurethane related markers, such as isocyanates and polyols. This can be rationalized by the pervasive presence of polyurethane in recreational boats due to its high thermal and electrical resistance, low weight, rigidity or flexibility. Seventeen analytes come from the biotic environment. Fossil fuels volatiles, pharmaceuticals and other common chemicals were also detected. Among them, sarcosine, ethanolamine, methoxy-phenyl oxime, and phytone are specific to the marine biotic environment. Many plant volatiles can also have an anthropic origin as they are widely

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used in personal care products and cleaning agents, According to a Precautionary Principle, this study prompts the removal of these 'ghost boats' for environmental and health reasons, beyond aesthetics and safety motivations. It sheds lights on the origin of the problem from the governance level and it recommends solutions. Finally, it draws insights from an operational sustainable circular economy model preventing the contamination of the biosphere by the plastisphere, showcasing a repurposing of 'ghost boats' with carbon negative emissions certified by an Environmental Product Declaration.
Authors: Teresa Cecchi, Davide Poletto
Full Source: The Science of the total environment 2025 Mar 20:973:179126. doi: 10.1016/j.scitotenv.2025.179126.

PHARMACEUTICAL/TOXICOLOGY

Prenatal bisphenol A exposure causes sperm quality and functional defects via Leydig cell impairment and meiosis arrest in mice offspring

2025-03-21
Bisphenol A (BPA), widely used in plastic production, acts as an environmental endocrine disruptor which is harmful to male reproductive health. However, the specific mechanisms through which prenatal BPA exposure disrupts spermatogenesis in offspring, particularly in terms of Leydig cell dysfunction and meiotic progression, remain poorly understood. To address this gap, we constructed a mouse model with BPA lowest Observed Adverse Effect Level (LOAEL: 50 mg/kg bw/day) exposure from embryonic day (ED) 0.5 to 18.5. Our results demonstrated that prenatal BPA exposure significantly decreased serum testosterone levels, testis weight, sperm count, motility parameters, and acrosomal integrity. Furthermore, it arrested the meiotic transition from zygotene to pachytene spermatocytes, leading to reduced sperm fertility characterized by reduced sperm-egg binding capacity and abnormal early embryonic cleavage in the male offspring. Importantly, prenatal BPA exposure significantly reduced the expression of PCNA (a marker of germ cell proliferation), SYCP3 (a meiosis regulator), and Vimentin (a blood-testis barrier component), collectively indicating impaired spermatogenesis in offspring testes. Additionally, prenatal BPA exposure dramatically reduced Leydig cell numbers and increased apoptosis, marked by BAX/BCL2 up-regulation, which mechanistically explains the observed testosterone reduction. In vitro experiments corroborated these effects: BPA exposure

concentration-dependently inhibited Leydig cell proliferation, induced G0/G1 phase arrest, and downregulated testosterone synthesis molecules (Hsd3b1, Hsd17b3, Star, Cyp11a1, Cyp17a1). Quantitative proteomics identified 234 differentially expressed proteins (97 downregulated, 137 upregulated) in BPA-exposed Leydig cells. Bioinformatics analysis revealed that down-regulated proteins were mainly related to steroid hormone receptor activity, estrogen response element binding, and centrosome duplication processes, while the up-regulated proteins were mainly involved in oxygen binding and ROS metabolic process. Conclusively, prenatal BPA exposure impaired offspring male fertility via multi-faceted mechanisms: sperm quality defects, steroidogenic disruption, and meiotic arrest. This study advances the understanding of BPA transgenerational reproductive toxicity and underscores the need to mitigate prenatal exposure risks.

Authors: Wendi Zhang, Juan Liu, Yanhua Wang, Jiahui Wang, Peng Zhu, Wenting Wang, Zhan Song, Jun Li, Dan Song, Yanwei Wang, Xin Liu

Full Source: Scientific reports 2025 Mar 21;15(1):9810. doi: 10.1038/s41598-025-93538-9.

Associations of endocrine-disrupting chemicals mixtures with serum lipid and glucose metabolism among overweight/obese and normal-weight children: A panel study

2025-03-20

Background: Endocrine-disrupting chemicals (EDCs) can disturb lipid and glucose metabolism, but few studies have explored the effects of EDC mixtures and underlying inflammation mechanisms in weight-specific children.

Methods: We conducted a panel study with 3 repeated visits among 144 children aged 4-12 years. For each visit, participants provided morning urine samples for 4 consecutive days and fasting blood samples on day 4. A total of 36 EDCs were measured, including 10 per- and polyfluoroalkyl substances (PFAS), 3 phenols, 3 parabens, 10 phthalates, and 10 polycyclic aromatic hydrocarbons. We used quantile g-computation, grouped weighted quantile sum (GWQS) regression, and linear mixed-effect models to evaluate and validate the associations of the mixture and individual effects of EDCs on lipid and fasting blood glucose (FBG). Further, mediation models were applied to explore the potential role of cytokines in the relationships of EDCs and outcomes.

Results: A quantile increase in EDC mixtures was associated with elevated triglyceride (TG) (β = 0.18, 95 % CI: 0.04, 0.33) and FBG (β = 0.02, 95 % CI:

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0.01, 0.04). Also, GWQS regression revealed that PFAS contributed the most to the overall effects for TG and FBG, followed by phenols. These associations were more pronounced in overweight/obese children. Regarding individual pollutants, we observed positive relationships of several PFAS with TG and FBG. Furthermore, chemokine ligand 2 mediated the associations of PFAS with TG among overweight/obese children. Conclusions: The present study suggested that the EDC mixtures were associated with elevated lipid and glucose levels among children, particularly for those with overweight/obesity.

Authors: Yuanyuan Zhang, Biao Zhang, Huihua Yang, Miao Liu, Jie Wang, Lei Zhao, Wenting Guo, Meng Li, Xuefeng Lai, Liangle Yang, Xiao Meng, Cuijuan Wang, Zhihu Zhang, Xiaomin Zhang

Full Source: Ecotoxicology and environmental safety 2025 Mar 20:294:118077. doi: 10.1016/j.ecoenv.2025.118077.

Branched perfluorohexanesulfonic acid (PFHxS) and perfluoroheptanoic acid (PFHpA): 'Safer' per- and polyfluoroalkyl substances (PFASs) alternatives for their effects on gut microbiota and metabolic function in children

2025-03-16

This study examined the effects of branched perfluorohexanesulfonic acid (PFHxS) and perfluoroheptanoic acid (PFHpA), two alternatives to per- and polyfluoroalkyl substances (PFASs), on gut microbiota and metabolic function in Chinese children aged 6-9 years. A total of 336 children were enrolled, providing plasma and fecal samples. Gut microbiota composition was assessed through 16S rRNA gene sequencing, and fecal metabolites and short-chain fatty acids (SCFAs) were analyzed using targeted metabolomics profiling and high-performance liquid chromatography (HPLC), respectively. PFASs in plasma samples were detected using ultra-performance liquid chromatography-tandem mass spectrometry (UPLC-MS/MS). The results revealed that exposure to PFHpA significantly reduced microbial diversity and richness in the gut microbiota. Specific bacterial genera were found to be positively or negatively associated with branched PFHxS and PFHpA exposures (β = -0.008---0.009, P_fdr = <0.001---0.048), with Parabacteroides positively correlated with branched PFHxS and Lachnospiraceae FCS020 group negatively correlated with PFHpA. Metabolomic analysis showed that branched PFHxS and PFHpA exposures were associated with distinct changes in fecal metabolite profiles (β = -0.182---0.177, P_fdr = 0.015---0.172), particularly reducing fatty acids

and amino acids. Additionally, higher exposure to PFHpA was linked to a reduction in SCFA profiles, such as valeric acid (β = -0.691 - -0.341, P = 0.011---0.030). This study offers new insights into the potential adverse effects of PFASs alternatives, specifically branched PFHxS and PFHpA, on the gut microbiome and metabolic health in children.
Authors: Zhen Hong, Lizi Lin, Haoran Yu, Qinzhi Wei, Yunting Zhang, Wanting He, Xuemei Liao, Jin Jing, Guanghui Dong, Zheqing Zhang
Full Source: Environment international 2025 Mar 16:198:109380. doi: 10.1016/j.envint.2025.109380.

OCCUPATIONAL

Exposure and risk assessment of organophosphorus pesticides in brinjal and tomato of Coimbatore District, Tamil Nadu, India

2025-03-22
The current work gives a snapshot of pesticide residuals, their exposure levels, and the associated potential risks of some organophosphates in Coimbatore district, Tamil Nadu. The study has significant viewpoints on food safety and pesticide management. The pesticide residual analysis was carried out on two commonly used vegetables, tomato and brinjal. The QuEChERS method is used to extract pesticides and GC-MS/SIM analyses were used to quantify pesticide residues. Among the various samples tested, organophosphorus pesticides, such as Phorate Sulfoxide, Chlorpyrifos, and Malathion, were detected in some samples. In the majority of brinjal samples analyzed, no pesticide residues were detected. However, one sample showed the presence of malathion (0.001 mg/kg). The detected level of malathion was within the acceptable safety limits, indicating that the sample is safe for consumption. Nevertheless, in one of the tomato samples tested, the residual level of phorate sulfoxide (0.34 mg/kg) is found to be higher than the MRL with a health risk index of 2.79. Except for phorate sulfoxide, all the other pesticide residuals were within MRL. Phorate residues with a soil half-life of 2 to 173 days are readily water soluble and may leach easily into groundwater, adversely affecting human health. The dietary risk of phorate can also put people at increased health risks of reproductive harm, endocrine system disruption, neurological damage, and an increased risk of certain cancers. The study's outcome suggests the need to review the strict guidelines imposed on using unsafe pesticides. Also, future investigations are necessary to validate the presence of other toxic pesticides in the study area.
Authors: Arun Bala S, Asha Sathish, K Nithya, P Senthil Kumar, Gayathri Rangasamy
Full Source: Environmental monitoring and assessment 2025 Mar 22;197(4):457. doi: 10.1007/s10661-025-13896-9.

Prediction of the exposure profile of bisphenol A in Chinese population by physiologically-based pharmacokinetics modeling

2025-03-21
Bisphenol A (BPA) has emerged as a typical contaminant which can induce various adverse effects on human health and environment. BPA exposure and the corresponding human responses can vary across different regions and populations. China is one of the largest producers and consumers of BPA, but the exposure profile of BPA in Chinese population is poorly understood. Physiologically-based pharmacokinetic (PBPK) models are emerging as useful tools to predict the internal exposure profiles of chemicals. Herein, the present study was aimed to predict the exposure profile of BPA in Chinese population by PBPK modeling using external BPA exposure data. A PBPK model specific for oral BPA exposure in Chinese population was established using interspecies and route-to-route extrapolations using pharmacokinetic data from intravenous BPA exposure studies in monkeys. This model was refined and validated using the data concerning BPA physicochemical properties and pharmacokinetic (absorption, distribution, metabolism, and excretion) data from existing literature. Afterward, this model was applied to simulate the internal exposure profile of BPA in Chinese population by integrating external exposure data from the Fifth China Total Diet Survey with physiological parameters specific to Chinese population. Parameter sensitivity and modeling uncertainty were analyzed. Based on the simulated BPA internal profile, human equivalent dose factors (HEDF) were calculated. Our results provide an important basis for assessment of the potential risk of BPA exposure in Chinese population and an essential reference for determination of the safe margin limits for BPA in China.
Authors: Jun He, Li Zhang, Hong Jin, Daoyuan Yang, Li Jia, Bin Han, Haixia Sui, Jiabin Guo
Full Source: Environmental pollution (Barking, Essex : 1987) 2025 Mar 21:126075. doi: 10.1016/j.envpol.2025.126075.