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CHEMICAL EFFECTS

Fluorescence characteristics of dissolved organic matter (DOM) in bottled drinking water of different countries: A potential risk to public health

2025-04

Bottled drinking water of numerous brands from different countries, including Bangladesh, Malaysia, Australia, India, Singapore, Norway, Japan, Vietnam, and Taiwan, were studied using three-dimensional fluorescence (excitation-emission matrix, EEM) spectroscopy and multivariate parallel factor analysis (PARAFAC) model. Fluorescent-dissolved organic matter (DOM) components such as microbial processed tyrosine-, fulvic acid (M)-, and tryptophan-like had maximum intensity/concentration at 70.8%, 16.7%, and 12.5% bottled drinking water samples, respectively. The total intensity of all fluorescing DOM components was minimum and maximum in one of the brands from Australia and Vietnam, respectively. Unlike in Japan, the concentrations of DOM components in bottled drinking water were comparable to or higher than groundwater, freshwater, and marine water in Bangladesh, Malaysia, India, and Taiwan. The concentration of Escherichia coli was quantified from its significant correlation equation with the microbial-processed tryptophan-like component. Apart from 60% and 20% of bottled water samples from Malaysia and Bangladesh, the remaining samples of studied countries were medium to very high-risk because of E. coli signatures. The adverse health impacts from previously identified over-acceptable-limit mineral concentrations in bottled drinking water are discussed. DOM components at such concentrations in bottled drinking water also strengthened doubts about the efficiency of conventional water treatment techniques and biofilm control. Economic indicators of the studied countries affirmed that willingness and proper management knowledge are necessary to ensure safe bottled drinking water besides budget and labor wages. PRACTITIONER POINTS: Higher protein-like components intensity than humic-like affirmed microbial abundance Risks for E. coli availability was medium to very high in maximum samples Adverse health impacts for overlimit Pb, Al, and PO_4^{3-} minerals in Bangladeshi brands Inefficiency of drinking water treatment techniques in DOM and biofilm control Importance of labor wage, willingness, and knowledge for drinking water treatment.

Authors: Nahin Mostofa Niloy, Mashura Shammi, Shafi M Tareq

Full Source: Water environment research: a research publication of the Water Environment Federation 2025 Apr;97(4):e70064. doi: 10.1002/wer.70064.

Identification of endocrine disrupting chemicals targeting NTD-related hub genes during pregnancy via in silico analysis

2025-04-03

Neural tube defects (NTDs) represent severe congenital malformations of the central nervous system with multifactorial etiology, involving intricate gene-environment interactions that remain incompletely characterized. Endocrine disrupting chemicals (EDCs) are exogenous substances with hormone-disrupting properties that are ubiquitous in our surroundings. These chemicals pose a significant threat to human health, contributing to a range of diseases. Pregnant women are particularly vulnerable to the effects of EDCs, as these substances can traverse the placental barrier and impact the development of both the placenta and fetus. This study utilized placental and fetal transcriptome data to identify hub genes associated with NTDs during pregnancy. By leveraging the Comparative Toxicogenomics Database (CTD), we predicted the EDCs targeting these hub genes and performed molecular docking to assess their interactions. Our findings revealed four hub genes (CTSC, FCER1G, ITGB2, and LYVE1) in NTDs, with 72 EDCs identified as their targets. Molecular docking demonstrated that atrazine, bisphenol A (BPA) and diuron exhibited stable affinity with the proteins encoded by hub genes. These findings provide new insights into the environmental endocrine disruptors that affect the development of NTDs during pregnancy.

Authors: Junjie Guo, Hao Yu, Yujun Guo, Jinming Liu, Yuzhu Chen, Zhaozhu Li

Full Source: Reproductive toxicology (Elmsford, N.Y.) 2025 Apr 3:134:108904. doi: 10.1016/j.reprotox.2025.108904.

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Prioritizing endocrine-disrupting chemicals targeting systemic lupus erythematosus genes via Mendelian randomization and colocalization analyses

2025-04-03

Background: Systemic lupus erythematosus (SLE) is a multifactorial autoimmune disease, with both genetic and environmental influences contributing to its development. Among environmental factors, endocrine-disrupting chemicals (EDCs), present in plastics, pesticides, and personal care products, have been implicated in immune disruption. This study investigated the interactions between EDCs and SLE-associated genes to elucidate their role in SLE susceptibility.

Methods: We employed Mendelian randomization (MR) and colocalization analyses to explore genetic predispositions and environmental interactions in SLE. Cis-expression quantitative trait loci (cis-eQTL) data were obtained from the eQTLGen Consortium, and genome-wide association study (GWAS) data for SLE were acquired from the IEU Open GWAS database. MR analysis was performed to establish causal links between gene expression and SLE, and colocalization analysis was used to validate these associations.

Results: Our analysis identified 18 genes causally associated with SLE. Among them, five genes (CDCA7, HOXA1, LRRC37A4P, HOXA5, and DND1P1) showed strong evidence of colocalization with SLE. Further, 28 EDCs, including bisphenol A, bisphenol S, and endosulfan, were found to interact with these key genes, potentially influencing immune function and exacerbating the genetic susceptibility to SLE.

Conclusions: This study highlights the complex interactions between EDCs and genetic predisposition in SLE. The findings provide valuable insights into how environmental exposures, particularly EDCs, may contribute to the development and progression of autoimmune diseases like SLE. These results suggest potential targets for future therapeutic interventions and underscore the need for further research on gene-environment interactions in SLE.

Authors: Yanggang Hong, Wanyi Shu, Xiaoyang Jiang, Yi Wang, Rujie Chen, Qianru Yang, Deqi Wang, Chenyou Shao, Sheng Gao, Chunyan Hua

Full Source: Ecotoxicology and environmental safety 2025 Apr 3:295:118126. doi: 10.1016/j.ecoenv.2025.118126.

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ENVIRONMENTAL RESEARCH

Microplastic pollution: Critical analysis of global hotspots and their impact on health and ecosystems

2025-04-04

This paper examines microplastic hotspots and their drastic effects on human health and the environment pointing out microplastic pollution as one of the biggest global issues. Besides, it analyses the key sources including industrial effluent discharge, littered plastic wastes, and deterioration of synthetic products together with pathways and routes of exposure. The review also focuses on microplastic contamination in food systems such as meat, plant-based products, dairy, and seafood, detailing their entry into the food chain via soil, water, and air. On the other hand, this work also focuses on human health issues including cellular absorption, and bioaccumulation, which results in tissue oxidative stress, inflammation, hormonal imbalance and adverse long-term effects, including carcinogenicity and organ toxicity. The ultimate effects of microplastic pollution on the condition of the soil, water, and fauna and flora of the ecosystem, highlighting on the need for the prevention measures, were also addressed. This paper seeks to critically ascertain the problems posed by microplastics, including their slow biodegradation limit, the absence of proper regulations, and lack of a universally accepted standard. It also highlights that microplastic pollution requires interdisciplinary analyses, future studies, and high standards-compliant policies and regulations. This work raises the alarm for a collective international effort to protect the public health, food, and the earth.

Authors: Veeramuthu Ashokkumar, V P Chandramughi, Kaustubha Mohanty, Sathyanarayana N Gummadi

Full Source: Journal of environmental management 2025 Apr 4:381:124995. doi: 10.1016/j.jenvman.2025.124995.

Evaluating the environmental impact of leaking WW2 shipwrecks: A closer look at the VRAKA and AmuCad decision support tools

2025-04-05

Of the thousands of shipwrecks originating from WW2, many still contain munitions or chemical warfare agents that still pose a substantial risk to the environment and societal safety. Initially, it was believed that the ammunition would slowly become harmless over time, leading post-war governments to dispose of millions of tonnes of surplus ordnance

by dumping it at sea or loaded onto derelict vessels and scuttled in designated areas. However, this assumption has long been disproven. As the wrecks and their cargo deteriorate, they release toxic substances into marine environments, being taken up by exposed organisms causing contamination of impacted sites. Some of the chemicals contained herein are carcinogenic and highly toxic, thus posing long-term risks to ecosystems and human health. Here, one of the biggest threats lies in the potential of a sudden release of harmful substances due to the collapse of corroding shipwrecks. The collapse rate, influenced by factors such as corrosion, natural forces, and human activities, is poorly understood, especially for deep-sea wrecks. To address these risks, this study evaluates decision-support tools developed for assessing the environmental impact of underwater munitions. It compares the VRAKA and AmuCad tools under varying conditions to prioritize wrecks that pose the greatest environmental threat and determine the urgency of remedial actions. This paper highlights the need for improved risk assessment tools to model wreck deterioration and the associated release of hazardous substances, ultimately contributing to informed decision-making for mitigating the ongoing impacts of wartime shipwrecks.

Authors: John Aasulf Tørnes, Geir Petter Novik

Full Source: Marine pollution bulletin 2025 Apr 5:215:117930. doi: 10.1016/j.marpolbul.2025.117930.

Risks of respiratory and circulatory system diseases induced by exposure to PM2.5 in high humidity and low solar radiation environments: disease types, genes, and functions

2025-04-06

Epidemiological investigation has found that PM2.5 from high humidity and low solar radiation environments (HHLR-PM2.5) induces the highest premature mortality rates from respiratory and circulatory diseases in China. However, the disease types and pathogenic mechanisms of the respiratory and circulatory diseases induced by HHLR-PM2.5 have not been completely revealed. In this study, we explore the risks of commonly existing diseases induced by HHLR-PM2.5 in the respiratory and circulatory systems. For neoplasms, HHLR-PM2.5 significantly induces malignant mesothelioma and arteriovenous hemangioma, the former through the CDKN1A and KIT genes, and the latter through IL6, blood vessel morphogenesis, and transforming growth factor beta binding. Patent ductus arteriosus-persisting type and chronic thromboembolic pulmonary hypertension are the most prominent cardiopulmonary diseases caused by HHLR-PM2.5, with the key molecular target being ACTA2 for the former and CDH5 for the latter. For congenital, hereditary, and neonatal diseases and abnormalities, HHLR-PM2.5 obviously contributes to bronchopulmonary dysplasia and congenital arteriovenous malformation, the former by targeting HMOX1, response to glucocorticoid, and heparin binding, and the latter by targeting IL6, blood vessel morphogenesis, and transforming growth factor beta binding. This study helps to clarify the risks of HHLR-PM2.5 to the respiratory and circulatory systems, supporting and supplementing epidemiology data.

Authors: Xiaomeng Li, Liru Zhang, Zhengliang Zhang, Xuan Li, Jingli Qian, Jiawei Zhou, Hanxiong Che, Yan Han, Xin Qi, Fumo Yang, Yu Huang, Chao Peng, Yang Chen, Yan Xing, Shumin Zhang

Full Source: Environmental geochemistry and health 2025 Apr 6;47(5):155. doi: 10.1007/s10653-025-02465-1.

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PHARMACEUTICAL/TOXICOLOGY

Impact of the Environmental Endocrine Disruptor 4-Octylphenol on Reproductive Function in Pubertal Male Mice

2025-04-03

4-Octylphenol, a major environmental degradation product of alkylphenols (Aps) used in industry, is an endocrine-disrupting chemical with significant estrogenic activity. It is one of the most toxic Aps, poorly biodegradable in the environment, and can accumulate in organisms through the food chain, thereby affecting the male reproductive system. In this study, the effect of 4-octylphenol on male reproductive health was analyzed. Male pubertal mice were exposed to 4-octylphenol at doses of 0, 1, 10, and 100 mg/kg once daily for 28 days. Our findings indicated that pubertal exposure to 4-octylphenol has significant negative effects on the male reproductive system. Pubertal mice exposed to 4-octylphenol exhibited dose-dependent reproductive toxicity. In the medium- and high-dose groups, a significant reduction in testicular mass, structural damage to the seminiferous tubules, increased oxidative stress and apoptosis within the testicular tissue, and a decline in sperm quality were observed. Additionally, autophagy processes in the testicular tissue, germ cell proliferation, and meiotic processes are inhibited. Serum testosterone and estradiol levels decreased, whereas oxidative stress levels in the testes and spermatozoa increased. In contrast, the low-dose group showed only a reduction in body weight, a decrease in motile sperm count, and mild oxidative stress in the testes without significant pathological changes

in western blot experiments. These results indicate that 4-octylphenol exposure during puberty caused reproductive toxicity in male mice.
Authors: Zhenjun Zhao, Jingyi Chi, Zhang FangFang, Yinglin Song, Wenda Xv, Yan Li, Hui Shi
Full Source: Environmental research 2025 Apr 3:121530. doi: 10.1016/j.envres.2025.121530.

Plasma tRNA-derived small RNAs mediated the association between benzo[a]pyrene exposure with lung cancer risk among Chinese adults from a case-control study

2025-04-04
Exposure to benzo[a]pyrene (BaP) could lead to the development of lung cancer, but the potential mechanisms are complex and remain largely unclear. Plasma tRNA-derived small RNA (tsRNA), a new type epigenetic biomarker of cancer, might link environment exposure with lung cancer. Based on this case-control study of 272 participants recruited from China, we aim to reveal the plasma tsRNA signature of lung cancer and their mediation effects on BaP-induced lung cancer. We sequenced tsRNA profiles and detected the adducts of Benzo[a]pyrene diol epoxide-albumin (BPDE-Alb) in plasma samples. We applied linear regression models to estimate associations between the adducts of BPDE-Alb, normalized tsRNA and the risk of lung cancer. We used mediation analysis to explore the mediation roles of tsRNAs in BaP-associated lung cancer. We identified 104 tsRNAs significantly related to the risk of lung cancer (Bonferroni adjusted $P < 0.05$). Among these 104 tsRNAs, 17 tsRNAs were expressed at different concentrations between before and after lung cancer surgery groups with $|\text{fold change}| > 2$ at Bonferroni adjusted $P < 0.05$. In addition, of these 17 tsRNAs, the adducts of BPDE-Alb were associated with 5'-M-tRNA-Glu-CTC-1-1-L36, i-M-tRNA-Met-CAT-1-1-L24_pos29 and i-M-tRNA-Ala-AGC-2-2-L16_pos16, which could mediate a separate 40.8 %, 39.1 % and 36.8 % of the association between BaP exposure with lung cancer. Our study identified tsRNAs potentially mediating BaP-associated lung cancer development, and revealed tsRNAs as promising biomarkers of lung cancer.
Authors: Yang Xiao, Chenliang Liu, Xin Guan, Ye Fu, Ming Fu, Shiru Hong, Chenming Wang, Yuhan Zhou, Yangkai Li, Meian He, Xiaomin Zhang, Huan Guo
Full Source: Ecotoxicology and environmental safety 2025 Apr 4:295:118129. doi: 10.1016/j.ecoenv.2025.118129.

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OCCUPATIONAL

PFOS Exposure Impairs Porcine Oocyte Maturation and Embryo Development via Mitochondria-Dependent Ferroptosis

2025-04-04
Perfluorooctane sulfonate (PFOS) is a widely utilized chemical known for its exceptional environmental stability over extended periods, its significant potential to bioaccumulate in living organisms, and its considerable risks to both health and the environment. Several studies have suggested that PFOS may pose reproductive risks in mammals; however, the exact mechanisms driving these effects are not well understood. In this study, we explored the possible mechanisms by which PFOS toxicity affects the maturation of mammalian oocytes and the embryonic development employing porcine oocytes as a model system. SMART-seq results suggested that PFOS may affect oocyte maturation through mechanisms involving ferroptosis, autophagy, and alterations in membrane structure. Our results suggest that PFOS exposure adversely affects mitochondrial function and structure, thereby influencing peroxisome biogenesis and contributing to oxidative stress. Most importantly, we found that exposure to PFOS significantly elevated Fe2+ levels, an indicator associated with ferroptosis in oocytes. Furthermore, malondialdehyde (MDA) levels in the PFOS group were significantly higher than those in the control group. Additionally, the mRNA expression levels of PCBP1 and PCBP2, which are related to ferroptosis, as well as the expression level of P53, were significantly reduced in the PFOS group. Overall, exposure to PFOS in vitro results in mitochondrial damage in porcine oocytes, which induces lipid peroxidation and subsequently leads to the occurrence of ferroptosis.
Authors: Xiaoqing Sun, Ran Teng, Ning Xu, Yutong Sun, Enbo Zhang, Xingfu Chen, Qing Guo, Suo Li
Full Source: Environmental pollution (Barking, Essex : 1987) 2025 Apr 4:126185. doi: 10.1016/j.envpol.2025.126185.

The impact of particulate matter exposure on global and domain-specific cognitive function: evidence from the Chinese Square Dancer Study

2025-04-05
Background: There is growing evidence that exposure to particulate matter (PM) is associated with impaired cognitive function. However,

limited studies have specifically examined the relationship between PM exposure and domain-specific cognitive function.
Methods: This study involved 2,668 female participants from the Lifestyle and Healthy Aging of Chinese Square Dancer Study. Global cognitive function was assessed using a composite Z-score derived from four tests: the Auditory Verbal Learning Test (AVLT), Verbal Fluency Test (VFT), Digit Symbol Substitution Test (DSST), and Trail Making Test-B (TMT-B). These tests evaluated specific cognitive subdomains: memory (AVLT), language (VFT), attention (DSST), and executive function (TMT-B). PM concentrations were estimated using a Random Forest (RF) model, which calculated the average concentrations over 1-year and 3-year periods at a high grid resolution of 1 × 1 km. Mixed linear regression was employed to explore the association between PM exposure and cognitive function.
Results: After adjusting for basic socio-demographic factors, a 10 mg/m3 increase in 3-year exposure to PM10 was significantly associated with a decrease in the DSST score by -0.05 (95% confidence interval [CI]: -0.11, 0) and an increase in the TMT-B score by 0.05 (95% CI: 0.01, 0.1). When further adjusting for gaseous pollutants (SO_2, NO_2, and O_3), even stronger associations were observed between 3-year exposure to either PM2.5 or PM10 and performance in both global cognition and specific cognitive subdomains. Specifically, in the DSST subdomain, a 10 μg/m^3 increase in 1-year PM10 exposure was associated with a decrease in the score by -0.10 (95% CI: -0.15, -0.04). Age-stratified analyses further indicated that older participants were consistently more vulnerable to PM exposure. Notably, 3-year exposure to both PM2.5 and PM10 was linked to declines in DSST scores across both middle-aged and older age groups.
Conclusion: Ambient PM exposure was significantly associated with performance in global cognitive function and specific cognitive domains among Chinese females. Female populations over 65 years old were more susceptible to the adverse effects of PM2.5 and PM10. Among the four subdomains, the DSST showed the strongest association with PM exposure, even at earlier ages, suggesting that impaired attention may serve as an early warning sign of cognitive decline.
Clinical trial number: Not applicable.

Authors: Jingyi Zhu, Shuaibo Wang, Peizheng Li, Fengping Li, Benchao Li, Lu Ma, Shuang Rong, Jingling Liao
Full Source: BMC public health 2025 Apr 5;25(1):1289. doi: 10.1186/s12889-025-22126-3.