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CHEMICAL EFFECTS

Independent and combined effects of volatile organic compounds on sarcopenia: Insights into environmental pollutants and muscle health

2025-05-16

This study investigates the associations between volatile organic compound (VOC) exposure and sarcopenia, focusing on independent and combined effects and exploring potential biological mechanisms. Utilizing data from the National Health and Nutrition Examination Survey, we applied logistic regression to examine associations between individual VOCs and sarcopenia, while restricted cubic splines (RCS) assessed dose-response relationships. Weighted quantile sum (WQS) and Bayesian kernel machine regression (BKMR) evaluated mixed exposure effects. Mediation analyses explored the roles of potential mediators, alongside bioinformatic analyses to investigate the underlying mechanisms. Multivariable logistic regression identified significant associations between specific VOCs and sarcopenia, particularly for DHBMA (OR=2.71, 95 % CI: 1.62-4.55). RCS confirmed both linear and nonlinear associations of specific VOCs. WQS analysis corroborated a synergistic effect of mixed VOC exposures and increased sarcopenia risk (OR=1.64, 95 % CI: 1.14-2.36), and BKMR analysis further confirmed this positive relationship. Mediation analysis revealed that inflammation, oxidative stress, and renal function partially mediated these associations (mediated proportions: 4.67-11.00 %). Bioinformatic analyses highlighted apoptosis-related targets and pathways as key mechanisms underlying the observed associations. This study provides comprehensive evidence linking VOC exposure to sarcopenia, emphasizing the importance of reducing VOC exposure to prevent sarcopenia and associated health risks.

Authors: Haobiao Liu, Zhuohang Chen, Rongqi Xiang, Yiting Liu
Full Source: Ecotoxicology and environmental safety 2025 May 16:298:118344. doi: 10.1016/j.ecoenv.2025.118344.

Endocrine-disrupting chemicals as prostate carcinogens

2025-05-16

Endocrine-disrupting chemicals (EDCs) are natural or synthetic compounds that are ubiquitous in the environment and in daily-usage products and interfere with the normal function of the endocrine system leading to adverse health effects in humans. Exposure to these chemicals might elevate the risk of metabolic disorders, developmental and

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reproductive defects, and endocrine-related cancers. Prostate cancer is the most common hormone-dependent cancer in men, and the fifth leading cause of cancer-related mortality, partly owing to a lack of knowledge about the mechanisms that lead to aggressive castration-resistant forms. In addition to the dependence of early-stage prostate cancer on androgen actions, the prostate is a target of oestrogenic regulation. This hormone dependence, along with the fact that exogenous influences are major risk factors for prostate cancer, make the prostate a likely target of harmful actions from EDCs. Various sources of EDCs and their different modes of action might explain their role in prostate carcinogenesis.

Authors: Mariana Feijó, Tiago M A Carvalho, Lara R S Fonseca, Cátia V Vaz, Bruno J Pereira, José Eduardo B Cavaco, Cláudio J Maia, Ana P Duarte, Endre Kiss-Toth, Sara Correia, Sílvia Socorro
Full Source: Nature reviews. Urology 2025 May 16. doi: 10.1038/s41585-025-01031-9.

The effect of para-substituted benzaldehyde derivatives with push/pull electron groups on the conformation of bovine serum albumin and its toxicity investigation in Brachionus calyciflorus Pallas (rotifers)

2025-05-13

As intermediates widely used in the synthesis of industrial compounds, excessive ingestion of 4-hydroxybenzaldehyde (4-HBzH) and 4-nitrobenzaldehyde (4-NBzH) may induce potentially irreversible damage in organisms. The potential toxicological of 4-HBzH and 4-NBzH were investigated through a multi-disciplinary approach involving density functional theory (DFT), multispectral techniques and molecular docking, with bovine serum albumin (BSA) employed as the model protein of the study. The interaction mechanism between 4-NBzH/4-HBzH and BSA involved static quenching, and the affinity of 4-NBzH for BSA was stronger than that of 4-HBzH as shown by the Ka value (4-NBzH: 6.30 × 104 M-1 4-HBzH: 5.96 × 104 M-1), which is also confirmed by DFT calculations. The binding of 4-HBzH/4-NBzH to BSA is mainly through hydrogen bonding and hydrophobic interactions, to which van der Waals forces also contribute, as supported by molecular simulations. Furthermore, the toxicity test based on the Brachionus calyciflorus Pallas (Rotifers) showed that the LC50 of 4-NBzH (8.36 mg/L) was significantly lower than that of 4-HBzH (12.13 mg/L). Interestingly, the electron-withdrawing group-substituted benzaldehyde derivatives may be more hazardous than the electron donor-substituted benzaldehyde derivatives. The findings of this study elucidate toxicological information on the action of 4-HBzH/4-NBzH

with BSA and rotifers and offer theoretical foundation for the prevention of the hazards from benzaldehyde derivatives.
Authors: Long Sun, Wenze Li, Xingyu Zhu, Manjie Chen, Xiaofan Yang, Yi Wang, Xiaoping Xu, Meiqing Zhu
Full Source: Journal of hazardous materials 2025 May 13:494:138630. doi: 10.1016/j.jhazmat.2025.138630.

ENVIRONMENTAL RESEARCH

Risks of biodegradable films: The time-lagged release of phthalic acid esters and organophosphates esters under realistic agricultural environments

2025-05-15
Agricultural plastic films, while boosting crop productivity, may pose significant environmental risks due to additive release during crack degradation. Phthalic acid esters (PAEs) and organophosphate esters (OPEs), widely used as plasticizers and flame retardants respectively, represent two additive categories of the greatest environmental concern due to their persistence and endocrine-disrupting properties. This study systematically investigated the dynamic release of PAEs and OPEs from polyethylene (PE) and biodegradable poly (butylene adipate-co-terephthalate)/polylactic acid (PBAT/PLA)-based films under four simulated agricultural conditions: Natural conditions (NC), UV irradiation (UV), high temperature (HT), and flooding (FC). Uncultivated soil exhibited Σ8PAEs and Σ7OPEs approximately of 1317.5 ng/g and 1931.1 ng/g, respectively. During a 360 d incubation period, the contents of PAEs in soil surged during a short-term period, which may link to the desorption of adsorbed contaminant. Biodegradable films released higher PAEs concentrations than PE films, with secondary contamination peaks emerging 180-360 d post-incubation. Scanning electron microscopy (SEM) observations revealed that structural degradation (e.g., cracks/holes) during early degradation (0-180 d) unexpectedly amplified additive leaching in later stages, contrasting with assumptions of reduced contamination risks over time. UV irradiation had a photo-degradation effect on PAEs further accelerated the release of pollutants by 25-40 %, while high temperature and flooding conditions showed limited promoting effects along with NC conditions. These findings highlight

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the need for additive-free formulations and environment-specific mulch management policies to mitigate soil contamination risks.
Authors: Yuhe Yang, Yanna Han, Xuan Zhao, Xiangdong Liu, Wei Zhang, Cheng Peng, Lingjuan Kong, Xiuping Zhan
Full Source: Environmental pollution (Barking, Essex: 1987) 2025 May 15:377:126467. doi: 10.1016/j.envpol.2025.126467.

Pollution Load Index and Ecological Risk Assessment of Sediment Heavy Metals in Lake Edku, Egypt

2025-05-17
Coastal lagoons, like lake Edku in north Egypt, are vital ecosystems that offer a wide variety of ecosystem services, including wildlife habitats. However, many are experiencing severe human impacts due to their proximity to urbanization. The main objectives of this study were to determine the concentrations of major and trace elements in lake Edku sediments, and to assess their ecological risk impacts based on Contamination Degree (Cd), Pollution Load Index (PLI), and Potential Ecological Risk Index (PERI). During March 2022, six sampling stations (S1 through S6) were established across the lake, and a total of 14 elements were analyzed using inductively coupled plasma optical emission spectroscopy (ICP-OES). Our analyses indicate that sediment collected from sampling stations near to sources of wastewater runoff is the most polluted. For example, S1, which is located near to wastewater discharge, had the highest concentration of Cr, Co, Ni, Cu, Zn, Cd, and Pb (90.9, 23.1, 58.7, 55.2, 81.4, 0.5, and 12.8 µg/g, respectively). Evaluating the sediment PERI revealed that sampling stations S1, S2, and S4 had moderate ecological risk (150 < average PERI < 300), indicating there is a negative environmental impact on the living organisms and water quality of lake Edku. Because lake Edku is important for biodiversity conservation, continuous monitoring of metal contamination should be a top priority, as well as improving the efficiency of wastewater treatment facilities to ensure removal of metals before discharging to coastal ecosystems.
Authors: Amr E Keshta, Joel E Gagnon, J C Barrette, Mohamed E Shaheen
Full Source: Bulletin of environmental contamination and toxicology 2025 May 17;114(6):84. doi: 10.1007/s00128-025-04054-5.

PHARMACEUTICAL/TOXICOLOGY

Per- and Polyfluoroalkyl Substances (PFAS) in placental compartments: histopathological and toxicological data integration in an Italian cohort

2025-05-16

Per- and polyfluoroalkyl substances (PFAS) are synthetic environmental contaminants with widespread industrial and consumer applications, characterized by strong chemical stability and environmental persistence. Recent studies have highlighted placental permeability to PFAS, though evidence of direct histopathological impairment remains limited. This study aimed to investigate potential associations between PFAS exposure and histopathological abnormalities in placental samples. A total of 23 at-term pregnant women were recruited from two hospitals in Italy as part of a multicenter study. Placental samples, divided into maternal (decidua) and fetal (villi) compartments, were analyzed for PFAS concentration and histopathological alterations. PFAS were detected in 95.7% of samples. The most frequently detected PFAS were PFOS (88%), followed by PFHxS (83%), PFOA (83%), PFBS (54%) and PFHxA (54%). Preliminary findings suggest variable PFAS concentrations among subjects, with histopathological examination revealing placental alterations of potential clinical relevance. The observed histopathological alterations, particularly in cases of malperfusion and angiogenesis changes, suggest that PFAS may contribute to placental dysfunction, potentially affecting pregnancy outcomes. In particular, it could be hypothesized that PFHxA could exert an adverse influence on placental angiogenesis, due to pre-placental hypoxia stimulating the angiogenesis and resulting in increased ramification and number of branches. While direct causative links remain to be fully elucidated, these results underscore the need for further investigations into PFAS-related placental effects and their implications for fetal development.

Authors: Arianna Giorgetti, Arianna Fornasari, Maria Paola Bonasoni, Alice Ferretti, Anna Seidenari, Maria Sech, Elena Piva, Jennifer P Pascali, Paolo Fais

Full Source: Environmental research 2025 May 16:121846. doi: 10.1016/j.envres.2025.121846.

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A study of radiation workers: Dosimetry, chromosomal aberrations, and cancer risk

2025-05

Cytogenetic analysis of blood lymphocytes can be used as a biomarker of absorbed radiation dose. The frequency of chromosomal aberrations (CA) correlates with subsequent cancer incidence. Healthy medical employees in Hungary - 301 working in an ionizing radiation work area and 732 controls - were studied from 1997 to 2022. Frequencies of chromatid- and chromosome-type aberrations in peripheral blood lymphocytes were significantly higher in the ionizing radiation group. Smoking also affected the frequency of aberrations, which was highest among smokers in the radiation group. Staff working with ionizing radiation were divided into four groups: CT, radiation therapy, diagnostic X-ray, and nuclear medicine. Total aberrations and aberrant cells were significantly higher in the nuclear medicine group than in the CT group. Tumor cases were not more frequent among the ionizing radiation group than among the control group.

Authors: Gyöngyi Farkas, Réka Király, Gábor Székely, Zsuzsa S Kocsis, Gyöngyvér Orsolya Sándor, Csilla Pesznyák, Tibor Major, Zoltán-Takácsi Nagy, Zsolt Jurányi

Full Source: Mutation research. Genetic toxicology and environmental mutagenesis 2025 May-Jun:904:503869. doi: 10.1016/j.mrgentox.2025.503869.

OCCUPATIONAL

Low-dose bisphenol A plus arsenite: Continuous or intermittent exposures in Sprague-Dawley rats; Effects on kidney oxidative stress, DNA damage, ferroptosis, and fibrosis

2025-05

Arsenic and bisphenol A (BPA) are widespread environmental pollutants. We have studied the nephrotoxicity of arsenite (ARS), 10 mg/L in drinking water, plus BPA, 50 µg/kg oral dose, in juvenile Sprague-Dawley rats. Animals were randomized into seven groups and exposed to the chemicals either continuously or intermittently, for 8 weeks. The parameters evaluated were urine biomarkers, histopathological and transmission electron microscopic (TEM) examinations, DNA damage (halo assay), and protein expressions. Continuous exposure to AS and BPA significantly increased urinary creatinine, albumin, and total protein, and

decreased blood urea nitrogen (BUN). Histopathological and TEM data showed brush border detachment, iron accumulation, podocyte injury, increased slit diaphragm space, and collagen deposition in both exposure groups. Significantly greater DNA damage was seen in the combined-exposure group than in the other experimental groups. Combination exposure in the continuous and intermittent groups showed renal fibrosis and ferroptosis and gene expression analysis revealed a significant increase in Bax and decrease in SIRT 1. Combination exposure was more harmful than the individual exposures in causing kidney injury in these animals.

Authors: Girija Prasanna Sahoo, Asutosh Pattnaik, Vinod Kumar, Gopabandhu Jena

Full Source: Mutation research. Genetic toxicology and environmental mutagenesis 2025 May-Jun:904:503871. doi: 10.1016/j.mrgentox.2025.503871.

Long-Term Exposure to Uranium and Arsenic in Community Drinking Water and CKD Risk Among California Women

2025-05-15

Rationale & objective: Metals/metalloids in drinking water, including uranium and arsenic, may damage kidney function and increase chronic kidney disease (CKD) risk. We evaluated exposure to these contaminants in community water supplies (CWS) and CKD risk in the California Teachers Study.

Study design: Prospective cohort study.

Setting & participants: 88,185 women who were California teachers and school administrators enrolled 1995-1996.

Exposures: Time- and residence- weighted annual average uranium and arsenic concentrations from CWS serving participants' residential addresses from 1995 to 2005.

Outcome: 6,185 moderate to end-stage CKD cases from hospitalization records between 2005 and 2018.

Analytical approach: Hazard ratios (HRs) and 95% confidence intervals (95%CIs) calculated using mixed-effects Cox models, adjusted for age as the time scale, body mass index, smoking status, race/ethnicity, neighborhood socioeconomic status, and Census region as a random effect. Analyses were also stratified by risk factors and comorbidities.

Results: Most exposures in this population were below the current regulatory limits (uranium=30µg/L and arsenic=10 µg/L), with median (interquartile range; IQR) concentrations of 3.1 (0.9, 5.6) µg/L for uranium and 1.0 (0.6, 1.8) µg/L for arsenic. Uranium exposure was positively

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associated with CKD risk (continuous log, per IQR; HR=1.11, 95%CI=1.02-1.20). Compared to uranium exposure <2µg/L (World Health Organization 1998 guideline), risk was over 30% greater at 10-<15µg/L (HR=1.33, 95%CI=1.15-1.54) and similar at ≥15µg/L (HR=1.32, 95%CI=1.09-1.58). There was no evidence of a significant association between arsenic and CKD overall (log, per IQR; HR=1.02, 95%CI=0.98-1.07). However, risk from arsenic was greater among younger individuals (≤55 years), and those who developed cardiovascular disease or diabetes.

Limitations: Individual tap water use and consumption; limited generalizability to men and non-White and less affluent populations.

Conclusions: Uranium below the current regulatory limit from community water may increase CKD risk.

Authors: Danielle N Medgyesi, Sumit Mohan, Komal Bangia, Emma S Spielfogel, Maya Spaur, Anirban Basu, Jared A Fisher, Jessica M Madrigal, Arce Domingo-Relloso, Rena R Jones, Mary H Ward, James V Lacey Jr, Tiffany R Sanchez, California Teachers Study Investigators

Full Source: American journal of kidney diseases: the official journal of the National Kidney Foundation 2025 May 15:S0272-6386(25)00863-7. doi: 10.1053/j.ajkd.2025.04.008.

Hepatotoxic effects of exposure to different concentrations of Dibutyl phthalate (DBP) in Schizothorax prenanti: Insights from a multi-omics analysis

2025-05-16

Dibutyl phthalate (DBP) is one of the most widely used phthalate esters (PAEs) that raise increasing ecotoxicological concerns due to their harmful effects on living organisms and ecosystems. Recently, while PAEs pollution in the Yangtze River has attracted significant attention, little research has been conducted on the impact of PAEs stress on S. prenanti, an endemic and valuable species in the Yangtze River. In this study, one control group (C-L) and three experimental groups: T1-L (3 µg/L), T2-L (30 µg/L), and T3-L (300 µg/L) were established with reference to the DBP concentration in the environment. For the first time, we investigated the effects of DBP stress on the liver of S. prenanti using histomorphological, physiological, and biochemical indexes, as well as a joint multi-omics analysis. The results revealed that compared to the C-L group, liver structural damage and stress were not significant in the environmental concentration group (T1-L) and the number of differential genes and differential metabolites were lower. However, as DBP stress concentration increased, the liver damage became severe, with significant vacuolation and hemolysis observed in the T2-L and T3-L groups. The TUNEL assay

revealed a significant increase in the number of apoptotic cells along with a notable rise in differential genes and metabolites in the T2-L and T3-L groups. Oxidative stress markers (T-AOC, SOD, CAT, and GSH-PX) were also significantly higher in the T2-L and T3-L groups. RNA-Seq analysis showed that the protein processing in the endoplasmic reticulum pathway was most significantly -enriched differential gene pathway shared by both C-L vs T2-L and C-L vs T3-L, with most of the genes in this pathway showing significant up-regulation. This suggests that the protein processing in the endoplasmic reticulum pathway may play a key role in protecting the liver from injuries caused by high DBP stress. Interestingly, C XI, C XII, C XIII, C XIV and C XV in the chemical carcinogenesis - reactive oxygen species pathway were significantly down-regulated in the T2-L and T3-L groups based on combined transcriptomic and metabolomic analyses, suggesting that DBP causes liver injury by disrupting mitochondria. This comprehensive histomorphometric and multi-omics study demonstrated that the current DBP concentration in the habitat of S. prenanti in the upper reaches of the Yangtze River temporarily causes less liver damage. However, with increasing of DBP concentration, DBP could still cause serious liver damage to S. prenanti. This study provides a new mechanistic understanding of the liver response mechanism of S. prenanti under different concentrations of DBP stress and offers basic data for the ecological protection of the Yangtze River.

Authors: Luo Lei, Wuga Sha, Qing Liu, Shidong Liu, Yinhua Zhou, Rundong Li, Yuting Duan, Suxing Fu, Hejiao Li, Rongrong Liao, Linzhen Li, Rongzhu Zhou, Chaowei Zhou, Haiping Liu

Full Source: Aquatic toxicology (Amsterdam, Netherlands) 2025 May 16:285:107390. doi: 10.1016/j.aquatox.2025.107390.