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CONTACT US

subscribers@chemwatch.net
tel +61 3 9572 4700
fax +61 3 9572 4777

1227 Glen Huntly Rd
Glen Huntly
Victoria 3163 Australia

CHEMICAL EFFECTS

tPhotoaged polystyrene microplastics result in neurotoxicity associated with neurotransmission and neurodevelopment in zebrafish larvae (Danio rerio)

2024-02-22

Microplastics (MPs) are emerging pollutants widely distributed in the environment, inducing toxic effects in various organisms. However, the neurotoxicity and underlying mechanisms of simulated sunlight-aged MPs have rarely been investigated. In this study, zebrafish (Danio rerio) were exposed to environmentally relevant concentrations (0, 0.1, 1, 10, and 100 μg/L) of virgin polystyrene (V-PS) and aged polystyrene (A-PS) for 120 h to evaluate the neurotoxicity. The results demonstrated that simulated sunlight irradiation altered the physicochemical properties (morphology, functional groups, and chemical composition) of V-PS. Exposure to A-PS causes greater toxicity on locomotor ability in larval zebrafish than V-PS. Motor neuron development was disrupted by transgenic (hb9-GFP) zebrafish larvae exposed to A-PS, with significant alterations in neurotransmitter levels (ACh, DA, 5-HT, and GABA) and enzyme activity (AChE, ChAT, and ChE). Further investigation found that exposure to A-PS had a significant impact on the expression of neurotransmission and neurodevelopment-related genes in zebrafish. These findings suggest that A-PS induces neurotoxicity by its effects on neurotransmission and neurodevelopment. This study highlights the neurotoxic effects and mechanisms of simulated sunlight irradiation of MPs, providing new insights for assessing the ecological risks of photoaged MPs in the environment.

Authors: Xintong Li, Tong Zheng, Jiayi Zhang, Haibo Chen, Chongdan Xiang, Yanan Sun, Yao Dang, Ping Ding, Guocheng Hu, Yunjiang Yu

Full Source: Environmental research 2024 Feb 22:118524. doi: 10.1016/j.envres.2024.118524.

Microplastics (MPs) are emerging pollutants widely distributed in the environment, inducing toxic effects in various organisms.

Integrative chemical, physiological, and metabolomics analyses reveal nanospecific phytotoxicity of metal nanoparticles

2024-02-23

The increasing application of metal nanoparticles (NPs) via agrochemicals and sewage sludge results in non-negligible phytotoxicological risks. Herein, the potential phytotoxicity of ZnO and CuO NPs on wheat was determined using integrative chemical, physiological, and metabolomics analyses, in comparison to Zn2+ and Cu2+. It was found that ZnO or

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CuO NPs had a stronger inhibitory effect on wheat growth than Zn2+ or Cu2+. After exposure to ZnO or CuO NPs, wheat seedlings accumulated significantly higher levels of Zn or Cu than the corresponding Zn2+ or Cu2+ treatments, indicating the active uptake of NPs via wheat root. TEM analysis further confirmed the intake of NPs. Moreover, ZnO or CuO NPs exposure altered micronutrients (Fe, Mn, Cu, and Zn) accumulation in the tissues and decreased the activities of antioxidant enzymes. The metabolomics analysis identified 312, 357, 145, and 188 significantly changed metabolites (SCMs) in wheat root exposed to ZnO NPs, CuO NPs, Zn2+, and Cu2+, respectively. Most SCMs were nano-specific to ZnO (80%) and CuO NPs (58%), suggesting greater metabolic reprogramming by NPs than metal ions. Overall, nanospecific toxicity dominated the phytotoxicity of ZnO and CuO NPs, and our results provide a molecular perspective on the phytotoxicity of metal oxide NPs.

Authors: Ping Wu, Zeyu Wang, Kwasi Adusei-Fosu, Yujun Wang, Hailong Wang, Xiaofang Li

Full Source: Journal of environmental management 2024 Feb 23:354:120338. doi: 10.1016/j.jenvman.2024.120338.

ENVIRONMENTAL RESEARCH

Potential Effects of Long-Term Exposure to Air Pollution on Dementia: A Longitudinal Analysis in American Indians Aged 55 Years and Older

2024-01-24

(1) Background: American Indians are disproportionately affected by air pollution, an important risk factor for dementia. However, few studies have investigated the effects of air pollution on the risk of dementia among American Indians. (2) Methods: This retrospective cohort study included a total of 26,871 American Indians who were 55+ years old in 2007, with an average follow-up of 3.67 years. County-level average air pollution data were downloaded from land-use regression models. All-cause dementia was identified using ICD-9 diagnostic codes from the Indian Health Service's (IHS) National Data Warehouse and related administrative databases. Cox models were employed to examine the association of air pollution with dementia incidence, adjusting for co-exposures and potential confounders. (3) Results: The average PM2.5 levels in the IHS counties were lower than those in all US counties, while the mean O3 levels in the IHS counties were higher than the US counties. Multivariable Cox regressions revealed a positive association between dementia and

(1) Background: American Indians are disproportionately affected by air pollution, an important risk factor for dementia.

county-level O3 with a hazard ratio of 1.24 (95% CI: 1.02-1.50) per 1 ppb standardized O3. PM2.5 and NO2 were not associated with dementia risk after adjusting for all covariates. (4) Conclusions: O3 is associated with a higher risk of dementia among American Indians.
Authors: Yachen Zhu, Yuxi Shi, Scott M Bartell, Maria M Corrada, Spero M Manson, Joan O'Connell, Luohua Jiang
Full Source: International journal of environmental research and public health 2024 Jan 24;21(2):128. doi: 10.3390/ijerph21020128.

Tetracyclines contamination in European aquatic environments: A comprehensive review of occurrence, fate, and removal techniques

2024-02-22
Tetracyclines are among the most commonly used antibiotics for the treatment of bacterial infections and the improvement of agricultural growth and feed efficiency. All compounds in the group of tetracyclines (tetracycline, chlorotetracycline, doxycycline, and oxytetracycline) are excreted in an unchanged form in urine at a rate of more than 70%. They enter the aquatic environment in altered and unaltered forms which affect aquatic micro- and macroorganisms. This study reviews the occurrence, fate, and removal techniques of tetracycline contamination in Europe. The average level of tetracycline contamination in water ranged from 0 to 20 ng/L. However, data regarding environmental contamination by tetracyclines are still insufficient. Despite the constant presence and impact of tetracyclines in the environment, there are no legal restrictions regarding the discharge of tetracyclines into the aquatic environment. To address these challenges, various removal techniques, including advanced oxidation, adsorption, and UV treatment, are being critically evaluated and compared. The summarized data contributes to a better understanding of the current state of Europe's waters and provides insight into potential strategies for future environmental management and policy development. Further research on the pollution and effects of tetracyclines in aquatic environments is therefore required.
Authors: Joanna Antos, Marianna Piosik, Dobrochna Ginter-Kramarczyk, Joanna Zembrzuska, Izabela Kruszelnicka

Tetracyclines are among the most commonly used antibiotics for the treatment of bacterial infections and the improvement of agricultural growth and feed efficiency.

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PHARMACEUTICAL/TOXICOLOGY

Having Children and Being Married Are Predictors of Burnout and Obesity Among Working Men: Effects of Latent Profile Analysis

2024-01
Emergency call-takers and dispatchers' (ECDs) work makes them vulnerable to occupational burnout and health problems. The aim of this research was to apply a Person-Oriented approach in order to examine the relationships between burnout risk factors (having children), personal resources (being married), and health consequences (overweight and obesity) among men working in these positions. The burnout syndrome was assessed among 228 Polish ECDs using The Link Burnout Questionnaire and the method of latent profile analysis (LPA). All ECDs were characterized by high levels of occupational burnout exhibited in 3 out of its 4 dimensions. The LPA allowed us to differentiate 4 patterns of burnout, taking into account socio-demographic variables, the length of employment as ECD and body weight. The need to balance the demands of professional work with having children and marital roles played an important role in predicting the level of professional burnout. There was a relationship between the dimensions of occupational burnout and age, being married, and having children. Being married was associated with a greater intensity of emotional exhaustion, and the level of exhaustion was higher if the employee had children in their care. Health consequences in the form of overweight and obesity can be associated with levels of emotional exhaustion and professional effectiveness. The application of the Person-Oriented approach presents hidden correlations between burnout predictors and health consequences.
Authors: Maciej Załuski, Marta Makara-Studzińska
Full Source: Inquiry : a journal of medical care organization, provision and financing 2024 Jan-Dec:61:469580241229642. doi: 10.1177/00469580241229642.

Emergency call-takers and dispatchers' (ECDs) work makes them vulnerable to occupational burnout and health problems.

Prevalence of dermatitis including allergic contact dermatitis from medical devices used by children and adults with Type 1 diabetes mellitus: A systematic review and questionnaire study

2024-02-23

Use of medical devices (MDs), that is, glucose sensors and insulin pumps, in patients with Type 1 diabetes mellitus (T1D) has proven an enormous advantage for disease control. Adverse skin reactions from these MDs may however hamper compliance. The objective of this study was to systematically review and analyse studies assessing the prevalence and incidence of dermatitis, including allergic contact dermatitis (ACD) related to MDs used in patients with T1D and to compare referral routes and the clinical investigation routines between clinics being part of the European Environmental and Contact Dermatitis Research Group (EECDRG). A systematic search of PubMed, EMBASE, CINAHL and Cochrane databases of full-text studies reporting incidence and prevalence of dermatitis in persons with T1D using MDs was conducted until December 2021. The Newcastle-Ottawa Scale was used to assess study quality. The inventory performed at EECRDG clinics focused on referral routes, patient numbers and the diagnostic process. Among the 3145 screened abstracts, 39 studies fulfilled the inclusion criteria. Sixteen studies included data on children only, 14 studies were on adults and nine studies reported data on both children and adults. Participants were exposed to a broad range of devices. Skin reactions were rarely specified. It was found that both the diagnostic process and referral routes differ in different centres. Further data on the prevalence of skin reactions related to MDs in individuals with T1D is needed and particularly studies where the skin reactions are correctly diagnosed. A correct diagnosis is delayed or hampered by the fact that, at present, the actual substances within the MDs are not declared, are changed without notice and the commercially available test materials are not adequately updated. Within Europe, routines for referral should be made more standardized to improve the diagnostic procedure when investigating patients with possible ACD from MDs.

Authors: L B von Kobyletzki, J Ulriksdotter, T Sukakul, O Aerts, T Agner, T Buhl, M Bruze, C Foti, A Gimenez-Arnau, M Gonçalo, N Hamnerius, J D Johansen, T Rustemeyer, L Stingeni, M Wilkinson, C Svedman

Full Source: Journal of the European Academy of Dermatology and Venereology : JEADV 2024 Feb 23. doi: 10.1111/jdv.19908.

Use of medical devices (MDs), that is, glucose sensors and insulin pumps, in patients with Type 1 diabetes mellitus (T1D) has proven an enormous advantage for disease control.

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Exposure to Per- and Polyfluoroalkyl Substances and Breast Cancer Risk: A Systematic Review and Meta-analysis of Epidemiologic Studies

2024-02-23

We synthesized the epidemiologic evidence on the associations between per- and polyfluoroalkyl substances (PFAS) exposure and breast cancer risk. Our systematic review and meta-analysis included 18 and 11 articles, respectively, covering studies up to February 2023. The summary relative risks (RR) estimated by random-effects meta-analyses did not support an association between PFAS and overall breast cancer risk (e.g., a natural log (ln)-unit increase in serum/plasma concentrations [ng/mL] for perfluorooctanoate [PFOA] RR=0.95, 95% confidence interval [CI]:0.77-1.18; perfluorooctane sulfonate [PFOS] RR=0.98, 95%CI: 0.87-1.11). However, when limiting to studies that assessed exposures prior to a breast cancer diagnosis, we observed a positive association with PFOA (a ln-unit increase, RR=1.16, 95%CI: 0.96-1.40). We also observed some possible heterogeneous associations by tumor estrogen and progesterone receptor status among postmenopausal breast cancer cases. No meaningful changes were observed after excluding the studies with high risk-of-bias (Tier 3). Based on the evaluation tool developed by the National Toxicology Program, given the heterogeneity across studies and the variability in timing of exposure measurements, the epidemiologic evidence needed to determine the association between PFAS exposure and breast cancer remains inadequate. Our findings support the need for future studies with improved study designs to determine this association.

Authors: Che-Jung Chang, Jennifer L Ish, Vicky C Chang, Meklit Daniel, Rena R Jones, Alexandra J White

Full Source: American journal of epidemiology 2024 Feb 23:kwae010. doi: 10.1093/aje/kwae010.

We synthesized the epidemiologic evidence on the associations between per- and poly-fluoroalkyl substances (PFAS) exposure and breast cancer risk.

OCCUPATIONAL

Estimating effects of longitudinal and cumulative exposure to PFAS mixtures on early adolescent body composition

2024-02-23

Few methods have been used to characterize repeatedly measured biomarkers of chemical mixtures. We applied latent profile analysis (LPA) to serum concentrations of four perfluoroalkyl and polyfluoroalkyl substances (PFAS) at four timepoints from gestation to age 12 years. We evaluated the relations between profiles and z-scores of height, body

mass index, fat mass index, and lean body mass index at age 12 years (n = 218). We compared LPA findings with an alternative approach for cumulative PFAS mixtures using g-computation to estimate the effect of simultaneously increasing the area under the curve (AUC) for all PFAS. We identified two profiles: a higher (35% of sample) and lower PFAS profile (relative to each other), based on their average PFAS concentrations at all timepoints. The higher PFAS profile had generally lower z-scores for all outcomes, with somewhat larger effects for males, though all CIs crossed the null. For example, the higher PFAS profile was associated with a -0.50 (95% CI: -1.07, 0.08) lower BMI z-score among males but not females (0.04; 95% CI: -0.45, 0.54). We observed similar patterns with AUCs. We found that higher childhood PFAS profile and higher cumulative PFAS mixtures may be associated with altered growth in early adolescence.

Authors: Jordan R Kuiper, Shelley H Liu, Bruce P Lanphear, Antonia M Calafat, Kim M Cecil, Yingying Xu, Kimberly Yolton, Heidi J Kalkwarf, Aimin Chen, Joseph M Braun, Jessie P Buckley

Full Source: American journal of epidemiology 2024 Feb 23:kwae014. doi: 10.1093/aje/kwae014.

Multifaceted ORganizational InterventiONs (M-ORION) project for prevention of depression and anxiety among workers: study protocol for a five-arm cluster randomized controlled trial

Background: Depression and anxiety are the most common mental health issues experienced by workers.

2024-02-24

Background: Depression and anxiety are the most common mental health issues experienced by workers. Although organizational intervention has been extensively evaluated as a primary prevention of depression and anxiety, the corresponding scientific evidence remains limited because of the lack of cluster randomized controlled trials (cRCT) and failure to detect organizational-level effects. Therefore, the present study aims to assess the preventive effects of four types of interventions on depression and anxiety among workers in an open, five-arm, parallel-group cRCT.

Methods: Overall, 140 worksites and 18,200 nested employees will be recruited from September 2023. The eligible worksites will be randomly assigned to each of the five arms, and programs will be offered for 6-12 months. The five arms are 1) psychoeducation for workers, 2) psychoeducation for supervisors, 3) work environment improvement, 4) physical activity promotion, and 5) active control. The primary outcomes of interest are depression and anxiety. We will also assess psychosocial factors at work, work engagement, health-related quality of life, well-being, economic outcomes, physiological outcomes of health checkups,

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cortisol levels extracted from fingernails, and indices representing the process and implementation outcomes, including program completion rates. Follow-up surveys will be conducted at 6, 12, and 18 months from baseline, and the primary endpoint is set at the 6-month follow-up. Repeated-measures multi-level mixed modeling will be used to evaluate the effect of each intervention compared with the control.

Ethics and dissemination: The study protocol was approved by the Research Ethics Committee of the Kitasato University Medical Ethics Organization (C22-082). The results and findings of this study will be published in a scientific journal and disseminated to companies that participate in the study.

Trial registration number: UMIN000050949.

Authors: Kazuhiro Watanabe, Hiroyuki Hikichi, Kotaro Imamura, Asuka Sakuraya, Toru Yoshikawa, Shuhei Izawa, Hisashi Eguchi, Akiomi Inoue, Kengo Yoshida, Yasushi Orihashi, Akizumi Tsutsumi

Full Source: BMC public health 2024 Feb 24;24(1):601. doi: 10.1186/s12889-024-18112-w.

Long-term Exposure to Industrial Chemical Contamination Affects the Magnitude of Predator-induced Immunosuppression in a Free-living Passerine

Industrial chemical contamination is known to have immuno-toxic effects on birds.

2024-02-25

Industrial chemical contamination is known to have immuno-toxic effects on birds. It may also interfere with natural stressful conditions to further disrupt the immune responses, but these possible interactive effects are still poorly documented in free-living birds. Using the phytohaemagglutinin skin-swelling test, we assessed how the T-cell mediated immune response varied according to the perceived risk of predation in hybrid sparrows, Passer domesticus × Passer hispaniolensis, originating from two sites differentially impacted by industrial chemical contamination, in southern Tunisia. Results showed that T-cell mediated immune response decreased with increasing perceived risk of predation, but the extent of this predator-associated immunosuppression was weaker in birds from the contaminated site compared to those from the control site. The immune response of birds living in the contaminated site was so weak that it could not be further weakened by a predator-related stress. Overall, these results support the idea that chemical contamination interferes with natural environmental stressors, such as predators, thus

entailing profound disruption of the immune responses, with possible deleterious repercussions on the ability of birds to cope with diseases.
Authors: Abdessalem Hammouda, Tasnim Ayadi, Slaheddine Selmi
Full Source: Bulletin of environmental contamination and toxicology 2024 Feb 25;112(3):42. doi: 10.1007/s00128-024-03857-2.