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CHEMICAL EFFECTS

Effects of tire particles on earthworm (Eisenia andrei) fitness and bioaccumulation of tire-related chemicals

2025-01-31

Tire and Road Wear Particles (TRWP) are produced during the wear of tire rubber on the road pavement and contain various chemicals originating from the road environment and from the rubber. Toxic effects of TRWP and their associated chemicals on soil organisms remain poorly characterized. In a series of laboratory experiments, this study investigated the bioaccumulation kinetics of several common tire-related chemicals in the earthworm species Eisenia andrei using Cryogenically Milled Tire Tread (CMTT), as a surrogate for environmental TRWP. Effects on survival, growth, reproductive output and behaviour were determined. Average biota-soil accumulation factors ranged from 0.8 to 4.7 indicating low to moderate bioaccumulation of the tire-related chemicals. Toxicokinetics showed both high uptake (0.0 - 13.2 days-1) and elimination rates (0.0 - 6.3 days-1) in E.andrei. Still, the uptake of tire-related chemicals in earthworms' tissues and ingestion of tire particles could lead to trophic transfer to preys feeding on earthworms and requires further investigated. No significant effects on survival and growth were recorded after exposure to 0.05 and 5% CMTT. In the reproduction test, a slight increase of the reproductive output with increasing CMTT concentration and a slight decrease of the weight of the juveniles were observed. Moreover, a strong and significant avoidance behaviour was observed for worms exposed to 5% CMTT. This work highlights that soil highly contaminated with tire particles can negatively impact habitat function due to changes in texture and/or chemical stressors, lead to uptake of tire-related additives by earthworms and that high concentrations can impact organism's fitness.

Authors: Thibault Masset, Florian Breider, Mathieu Renaud, Jonas Müller, Alan Bergmann, Etienne Vermeirssen, William Dudefoi, Kristin Schirmer, Benoit J D Ferrari

Full Source: Environmental pollution (Barking, Essex: 1987) 2025 Jan 31:125780. doi: 10.1016/j.envpol.2025.125780.

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Advancing microplastic detection in zebrafish with micro computed tomography: A novel approach to revealing microplastic distribution in organisms

2025-01-28

The analysis of microplastics with current spectroscopic and pyrolytic methods is reaching its limits, especially with regard to detailed spatial distribution in biological tissues. This limitation hampers a comprehensive understanding of the effects of microplastics on organisms. Therefore, there is a pressing need to expand the analytical approaches to study microplastics in biota. In this context, the aim of this study was to test the applicability of non-destructive 3D imaging using X-ray micro-computed tomography (microCT) for the detection of microplastics in fish. Zebrafish (Danio rerio) were gavaged with polyethylene spherical microplastics (30-110 µm) and the distribution of microplastics in the gut was investigated using microCT. The results showed that the particle size distribution determined by microCT closely matched the data from conventional laser diffraction analysis. In addition, microCT was able to detect microplastics in spiked fish tissue and provide precise localization data by tracing particles of known type and shape. MicroCT offers a novel approach for tracking microplastics in organisms and enables accurate sizing without compromising the integrity of the tissue under investigation. It therefore represents a valuable addition to spectroscopic methods, which are widely used for the detection of microplastics based on their chemical composition but do not provide data on their spatial distribution.

Authors: Viktória Parobková, Lukáš Maleček, Marek Zemek, Gabriela Kalčíková, Michaela Vykypělová, Marcela Buchtová, Ondřej Adamovský, Tomáš Zikmund, Jozef Kaiser

Full Source: Journal of hazardous materials 2025 Jan 28:488:137442. doi: 10.1016/j.jhazmat.2025.137442.

Reduced avoidance behaviour in Daphnia magna due to agrochemical-induced vulnerability

2025-02-01

The continuous discharge of agrochemicals used in intensive agriculture contaminates aquatic systems, harming aquatic biota and their processes. Although mobile organisms can avoid continuous exposure by moving to less-affected habitats, their capacity can be altered by pollutant exposure. Populations with a previous disturbance history, which show a lower ability to respond to subsequent stressors, are defined as vulnerable. Therefore, this study investigated the so far unknown escape

capacity of a vulnerable zooplankton population previously exposed to a contaminated environment. To this end, agrochemically driven vulnerability was induced in populations of Daphnia magna by exposure to sublethal concentrations of glyphosate. Vulnerability was verified using a starvation test in which significant differences were observed between the control populations and populations with a disturbance history. Both the Control and Vulnerable populations were assessed for their avoidance capacity by exposing them to a glyphosate gradient using a Heterogeneous Multiple-Habitat Assay System (HeMHAS). The control populations showed a rapid reaction from the beginning of the assay, with avoidance rates increasing over 24 h, while vulnerable populations were unable to avoid contaminated habitats for up to 24 h. Therefore, we concluded that vulnerable populations have a lower capacity to avoid contaminated habitats. In heterogeneously contaminated habitats, a lower avoidance capacity is responsible for the differential spatial distribution of the affected species, which impacts the ecosystem structure. Additionally, agrochemically induced vulnerability and its effect on avoidance behaviour may affect ecosystem functioning through the altered spatial distribution of zooplankton populations.

Authors: María Eugenia López-Valcárcel, Ana Del Arco, Cristiano V M Araújo, Gema Parra

Full Source: Ecotoxicology and environmental safety 2025 Feb 1:291:117673. doi: 10.1016/j.ecoenv.2025.117673.

ENVIRONMENTAL RESEARCH

Profile and factors associated with low birth weight in Indonesia: a national data survey

2025-02

Introduction: The third objective of the UN Sustainable Development Goals (SDGs), 'ensure healthy lives and promote well-being for all at all ages', is manifest in Indonesia's commitment to health. One of the SDG3 targets is to reduce under-five mortality and infant mortality. In rural areas of Indonesia, there is a lack of access to medical facilities (healthcare services, anthropometry tools) and health workers, so low birth weight (LBW, <2500 g) in rural areas remains high. This study aimed to determine the profile of and test the factors that cause LBW in Indonesia.
Methods: This study used secondary data from the National Socio-Economic Survey/Survei Sosial Ekonomi Nasional (SUSENAS) 2021 with a national sample of 4 711 455 women (weighted), which is analyzed descriptively and inferentially. The analysis was conducted descriptively

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to determine the profile and distribution of LBW at the national and provincial levels, while inferential analysis was performed using logistic regression to determine the variables that most influence LBW.
Results: The prevalence of LBW in Indonesia was found to be 11.7%. North Maluku was the province with the highest LBW rate (20.1%), and West Java had the highest number of LBW infants in Indonesia, with 104 585 infants. This study found that smoking, rural areas, poor nutrition, age of childbirth, age and birth spacing significantly affected the incidence of LBW in Indonesia. In rural Indonesia, women tend to give birth to LBW babies (adjusted odds ratio: 1.249; 95%CI: 1.241-1.256). The incidence of LBW babies in rural areas was higher than in urban areas (12.9% v 10.8%) in Indonesia.
Conclusion: This study concluded that smoking behavior is the main variable that influences the incidence of LBW in Indonesia. Therefore, there should be assistance to families by prioritizing significant factors for LBW (living in a village/rural area, low education, smoking behavior, not or rarely consuming nutritious food, maternal age at first birth 35 years and birth spacing <33 months). Especially for rural areas, governments need to improve access to healthcare facilities including availability of anthropometry tools, health workers, and healthcare services.

Authors: Mario Ekoriano, Anugerah Widiyanto, Muthmainnah Muthmainnah, Yuli Puspita Devi, Bambang Eko Cahyono, Izatun Nafsi, Teguh Widodo

Full Source: Rural and remote health 2025 Feb;25(1):9170. doi: 10.22605/RRH9170.

Determination of putrefactive amine and ammonia concentrations around decomposed corpses

2025

The surface of a rotting corpse is covered with liquid decomposition products that have flowed out of the body that include putrefactive amines produced via putrefaction and decarboxylation reactions of proteins. Ammonia generated by deamination is also present around the corpse as a liquid or gas. As these putrefactive substances are toxic to humans, we attempted to measure the concentration of putrefactive substances in decomposed corpses in this study. Liquid putrefaction products were collected from the surface of a corpse, and the concentrations of putrefactive amines such as histamine, tyramine, phenethylamine, and tryptamine were analyzed by LC-MS/MS. Ammonia in the liquid and air around the corpse was also measured. Putrefactive amines and ammonia were present on all corpse surfaces.

The highest concentrations and postmortem days in parentheses were as follows: histamine 2.26 mg/g (15 days), tyramine 1.77 mg/g (16 days), phenethylamine 4.90 mg/g (24 days), tryptamine 1.58 mg/g (17 days) and ammonia 25.6 mg/g (24 days postmortem). The highest concentration of ammonia in the air was 1310 ppm at 24 days postmortem. The ammonia level in the air around a corpse is toxic to humans. Inhalation of putrefactive amines and ammonia can cause chemical irritation to the respiratory tract and the skin and damage the mucous membrane of the eye. Oral ingestion can also cause poisoning symptoms such as blood pressure changes and headaches. Adequate protection against putrefactive substances is required when in contact with decaying corpses.

Authors: Hiroaki Sato, Takahiro Umehara, Satoshi Kimura, Toshiko Tanaka, Sang-Eun Kim

Full Source: The Journal of toxicological sciences 2025;50(2):75-81. doi: 10.2131/jts.50.75.

PHARMACEUTICAL/TOXICOLOGY

Gestational exposure to environmental chemical mixtures and cognitive abilities in children: A pooled analysis of two North American birth cohorts

2025-01-29

Background: Gestational exposures to single toxic chemicals have been associated with cognitive deficits in children, but few studies have explored chemical mixtures.

Objectives: To evaluate the associations between gestational chemical biomarker mixtures and cognitive abilities in children from two prospective cohorts.

Methods: This study includes 617 birthing parent-child pairs from the Health Outcomes and Measures of the Environment (HOME) and Maternal-Infant Research on Environmental Chemicals (MIREC) Studies. We measured 29 chemical biomarkers (metals, persistent organic pollutants, perfluoroalkyl substances, organophosphate esters, phenols, phthalates, organophosphate pesticides, and parabens) in pregnant individuals during early pregnancy and their children's cognitive abilities at ages 3 to 5 years using Wechsler Intelligence Scales. We assessed linear associations using quantile g-computation and non-linear associations using Bayesian Kernel Machine Regression (BKMR) methods, adjusted for covariates.

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Results: Using quantile g-computation, we observed overall null associations between the chemical biomarker mixture and cognitive outcomes among preschool-age children. Although statistical significance was not attained for child sex as an effect modifier, our stratified analysis unveiled a moderate divergence in association trends. We noted a marginal inverse trend between the chemical biomarker mixture and cognitive scores [Full-Scale Intelligence Quotient (FSIQ) & Performance Intelligence Quotient (PIQ)] among males. Using quantile g-computation and BKMR methods, we observed that PBDE47, PFHxS, and di-ethyl organophosphates commonly contributed towards a decline in FSIQ scores in males. Among males, a quartile increase in the chemical biomarker mixture was associated with a 0.64-point decrease (95% CI: -2.59, 1.31) in the FSIQ score and a 1.59-point decrease (95% CI: -3.72, 0.54) in the PIQ score.

Conclusion: In this study, we observed a weak negative trend between the gestational chemical biomarker mixture and cognitive scores (FSIQ/PIQ) among males. Further studies are needed to confirm the findings between the longitudinal chemical biomarkers and child cognitive scores at school ages.

Authors: Jagadeesh Puvvula, Wei-Ting Hwang, Lawrence McCandless, Changchun Xie, Joseph M Braun, Ann M Vuong, Youssef Oulhote, Enrique F Schisterman, Russell T Shinohara, Linda Booij, Maryse F Bouchard, Kristin Linn, Michael M Borghese, Jean R Seguin, Angelika Zidek, Christine Till, William Fraser, Kimberly Yolton, Kim M Cecil, Jillian Ashley-Martin, Tye E Arbuckle, Bruce Lanphear, Aimin Chen

Full Source: Environment international 2025 Jan 29:196:109298. doi: 10.1016/j.envint.2025.109298.

Studying interaction effects on toxicokinetics in zebrafish combining experimental and modelling approaches

2025-01-31

Humans and wildlife are exposed to a complex mixture of anthropogenic chemicals of which only a few have been subjected to regulations. Chemical risk assessment is currently based on evaluating single chemicals, which is costly, time-consuming, and neglect toxicokinetic and toxicodynamic mixture effects. This study focused on interaction effects on the absorption, distribution, metabolism and excretion (ADME) processes of selected chemicals representing potential modulators of these processes. Adult female zebrafish (Danio rerio) were exposed to selected mixture of 11 chemicals and bioconcentration factors (BCFs) on tissue level were determined for 9 of them: bisphenol A (BPA), bisphenol AF

(BPAF), bisphenol Z (BPZ), triclosan, tribromophenol, pentachlorophenol, heptafluorobutyric acid (PFBA), perfluorobutanesulfonic acid (PFBS), and perfluorooctanesulfonic acid (PFOS). Comparison of BCFs of bisphenols obtained from single chemical exposure experiments versus the current study revealed no statistically significant differences ($p > 0.05$), implying no mixture effects on kinetics of bisphenols at investigated concentrations. The same conclusion was reached using two physiologically based kinetic (PBK) models, developed for individual bisphenols and per- and polyfluoroalkyl substances (PFAS), showing good model fit for BPA, BPZ, BPAF, and PFOS. To simulate exposure scenarios where kinetic interaction effects may occur through competitive protein binding in blood, a new PBK model was developed. Simulations where zebrafish were dosed with BPA and BPZ, individually, and combined with varying levels of PFOS, showed that competitive binding to serum proteins alter tissue levels of bisphenols when levels of PFOS exceeded 1 µg/L. This indicates that chemicals acting in concert could perturb ADME but only at higher levels or in complex mixtures.

Authors: Elena Golosovskaia, Stefan Örn, Pim Leonards, Jacco Koekkoek, Patrik L Andersson

Full Source: The Science of the total environment 2025 Jan 31:965:178663. doi: 10.1016/j.scitotenv.2025.178663

OCCUPATIONAL

Herpes B Virus: Occupational Exposures and Diagnostics

2025-03

Nonhuman primates (NHPs) play a vital role in biomedical research but pose significant zoonotic risks. The global increase in NHP trade and colonies heightens exposure risks for individuals who handle NHPs and NHP-derived biological materials. Diagnostic testing for diseases that NHPs carry, specifically Herpes B virus, faces several hurdles, including the need for specialized laboratory facilities. This review discusses the occupational exposure risks associated with NHP contact and current challenges in diagnostic testing for Herpes B virus in human patients.

Authors: Brandon Linz, Simon Muchohi, R Barton Nielsen

Full Source: Clinics in laboratory medicine 2025 Mar;45(1):63-71. doi: 10.1016/j.cll.2024.10.003

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Labour activity and occupational factors associated with kidney function deterioration among workers of the sugarcane industry in Peru

2025-01-30

Objective: This study compares field workers exposed to occupational conditions with non-field workers to determine the worsening of renal function (eGFR) in workers in the sugar industry.

Methods: The baseline examination occurred from September to December 2021 in Centro Poblado San Jacinto, Peru, involving 372 men aged 18-60. We compared kidney function between 219 field workers (cane cutters, seed cutters, and seeders) exposed to high heat stress and 153 non-field workers (factory and administrative) with low/no heat stress exposure. Exclusions included participants with high blood pressure, diabetes, and chronic kidney disease. We collected data on CKD risk factors, sociodemographic information, work history, and lifestyle. Measurements included height, weight, blood pressure, serum creatinine, urine analysis, and ambient temperature. The outcome was eGFR <90 ml/min/1.73m2 and heat-related symptoms.

Results: Field workers reported lower fluid intake (mean 2.7L) during long shifts with few breaks, while non-field workers had higher rates of alcohol and tobacco use. Field workers had higher serum creatinine (mean 0.84 vs 0.70 mg/dL) and lower eGFR (mean 112 vs 105 ml/min/1.73m2, $p<0.001$), especially among burned cane cutters. Field workers were twice as likely to have reduced kidney function (PR: 1.82, 95% CI: 1.00-3.34), were more frequently dehydrated, and reported more symptoms like muscular weakness, cramps, and exhaustion.

Conclusion: We found significantly lower kidney function among field workers, particularly seed and cane cutters. These findings emphasize the need for targeted interventions to protect the renal health.

Authors: Janina Bazalar-Palacios, Jessica Hanae Zafra-Tanaka, Maria Isabel Palacios, Reyna Romero, Jason Glaser, Catharina Wesseling, Juan Carlos Bazo-Alvarez

Full Source: Environmental research 2025 Jan 30:121012. doi: 10.1016/j.envres.2025.121012.

Co-exposure to F-53B and Nanoplastics induced hepatic glucolipid metabolism disorders by the PI3K-AKT Signaling Pathway

2025-01-29

Recent investigations suggest that the chemical compound F-53B (6:2 chlorinated polyfluorinated ether sulfonate) may pose risks of liver toxicity. Within environmental settings, F-53B attaches to microplastics and nanoplastics, which are capable of being consumed by diverse species. To investigate the synergistic effects on hepatotoxicity, adult male mice were subjected to F-53B at daily doses of 1, 10, and 100 μg/kg, NPs at 100 mg/kg per day, or a combination of both treatments for a duration of 2 months. The results indicated that NPs moderately increased the buildup of F-53B within both the liver and plasma. Co-exposure to F-53B (100 μg/kg/day) and NPs induced hepatocellular edema and elevated plasma ALT levels, which were rarely observed in groups exposed to F-53B or NPs alone. Additionally, we found that co-exposure decreased the concentrations of total cholesterol (TC) and triglycerides (TG) in both plasma and liver tissues, while increasing fasting plasma glucose and insulin levels. Transcriptomic analysis revealed that the PI3K-AKT signaling pathway is potentially involved in mediating hepatic metabolic disorders. Further experiments demonstrated that the combined treatment significantly suppressed the expression of FGF21, an upstream regulator of the PI3K-AKT pathway. This alteration resulted in the suppression of PI3K-regulated gene expression associated with glucose and lipid metabolism. The findings suggest that F-53B impairs hepatic glucolipid metabolism in mice by suppressing of the PI3K-AKT signaling cascade, with NPs amplifying its toxicity.

Authors: Zhihan Zhang, Mengxing Cui, Han Wang, Wenke Yuan, Ziqi Liu, Huan Gao, Xinchao Guan, Xiaoyu Chen, Lijie Xie, Shilin Chen, Yujie He, Qing Wang

Full Source: Environmental pollution (Barking, Essex : 1987) 2025 Jan 29:125771. doi: 10.1016/j.envpol.2025.125771.