

# Bulletin Board

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## Technical

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### CHEMICAL EFFECTS

#### Effects of organic and inorganic contaminants and their mixtures on metabolic health and gene expression in developmentally exposed zebrafish

2025-04-12

Organic and inorganic chemicals co-occur in household dust, and these chemicals have been determined to have endocrine and metabolic disrupting effects. While there is increasing study of chemical mixtures, the effects of complex mixtures mimicking household dust and other environmental matrices have not been well studied and their potential metabolism disrupting effects are thus poorly understood. Previous research has demonstrated high potency adipogenic effects of residential household dust extracts using in vitro adipogenesis assays. More recent research simplified this to a mixture relevant to household dust and comprised of common co-occurring organic and inorganic contaminants, finding that these complex combinations often exhibited additive or even synergistic effects in cell models. This study aimed to translate our previous in vitro observation to an in vivo model, the developing zebrafish, to evaluate the metabolic effects of early exposure to organic and inorganic chemicals, individually and in mixtures. Zebrafish embryos were exposed from 1 day post fertilization (dpf) to 6 dpf, then metabolic energy expenditure, swimming behavior and gene expression were measured. Globally, we observed that most mixtures did not reflect the effects of individual chemicals; the BFR mixture produced a less potent effect when compared to the individual chemicals, while the PFAS and the inorganic mixtures seemed to have a more potent effect than the individual chemicals. Finally, the environmental mixture, mimicking household dust proportions, was less potent than the inorganic chemical mix alone. Additional work is necessary to better understand the mixture effect of inorganic and organic chemicals combined.

Authors: Roxanne Bérubé, Matthew K LeFauve, Aicha Khalaf, Darya Aminioroomi, Christopher D Kassotis  
Full Source: Environmental toxicology and chemistry 2025 Apr 12: vgaf099.  
doi: 10.1093/etojnl/vgaf099.

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#### Combining multi-surface and biotoxicity models to predict cadmium bioavailability and accumulation in a soil collembolan

2025-04-11

The link between internal metal concentrations in soil animals and external metal concentrations is a critical issue in soil ecotoxicity tests and involves metal transfer from solid-liquid interfaces to target soil animals. Soil cadmium (Cd) pollution is a major concern, the bioavailability of Cd to the model soil collembolan *Folsomia candida* was therefore determined in naturally Cd-contaminated soils by chemical extraction methods and mechanism-based multi-surface models (MSMs). Three combined models were also developed by combining MSMs with a free ion activity model (MSMs-FIAM), a modified biotic ligand model (MSMs-rBLM), and a Gouy-Chapman-Stern model (MSMs-GCSM) to predict Cd bioaccumulation in *F. candida* in a mechanistic way. MSMs gave better prediction results for Cd bioavailability to *F. candida* (determination coefficient,  $R^2 = 0.667$ ) than other chemical extraction methods (0.01 M  $\text{CaCl}_2$ , 0.43 M  $\text{HNO}_3$ , soil solution, DGT, and soil total Cd). MSMs calculated dissolved Cd is an effective indicator of bioavailable Cd to *F. candida* and allowed prediction under a wide range of soil properties. The combined model MSMs-rBLM more successfully predicted Cd bioaccumulation in *F. candida* ( $R^2 = 0.793$ , root-mean-square error (RMSE) = 0.172, mean absolute percentage error (MAPE) = 15.4 %) than other combined models and linked the soil-liquid interfaces to the surface of the target soil animal. MSMs-rBLM model may be a new tool for the prediction of Cd ecological risks and bioaccumulation in soils.

Authors: Simin Li, Jiawen Zhou, Tingting Mu, Tuo Zheng Wu, Zhu Li, Xin Ke, Longhua Wu, Yongming Luo, Yuanqing Bu  
Full Source: Ecotoxicology and environmental safety 2025 Apr 11:296:118163. doi: 10.1016/j.ecoenv.2025.118163.

#### Reproductive and developmental toxicity screen (OECD TG 421) and extended one generation reproductive toxicity study (OECD TG 443) of decahydronaphthalene in Sprague Dawley rats

2025-04-11

Decahydronaphthalene (DHN), an industrial solvent, was evaluated in OECD TG 421 and TG 443 reproductive toxicity studies in Sprague Dawley rats. In the TG 421, oral doses were 0, 100, 300, or 1000 mg DHN/kg/day. In the TG 443, initial doses of 0, 30, 100, or 300 mg/kg/day were



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increased to 0, 60, 200, and 600 mg/kg/day on test day 30. High dose TG 421 females exhibited estrous cycle disruption; mid and high dose dams had fewer implantations and pups/litter. High dose F0 females in the TG 443 showed signs of stress: lower body weight, disrupted estrous cycling, higher adrenal and lower thymus weights, adrenocortical hypertrophy and thymic atrophy; these effects were less severe at the mid dose. High and mid dose TG 443 F0 females also had fewer implantations and pups per litter and lower litter weight. F1 females in the TG 443 had nominally fewer F2 pups and lower litter weight. The reproductive effects of DHN indicate impaired ovarian function. Mid and high dose F0 dams in the TG 443 showed clear signs of stress, to which the ovary is known to be sensitive. Therefore, DHN's effects are considered secondary to maternal stress, and not relevant to humans.

Authors: John M Rogers, Melissa M Heintz, Laurie C Haws

Full Source: Regulatory toxicology and pharmacology: RTP 2025 Apr 11:105829. doi: 10.1016/j.yrtph.2025.105829.

## ENVIRONMENTAL RESEARCH

### Analysis of heavy metal pollution sources caused by sulfide minerals in tunnel waste under photocatalytic oxidation conditions

2025-04-12

The rapid expansion of global transportation infrastructure has significantly increased tunnel construction in mountainous regions, generating substantial amounts of sulfide-rich excavation waste. Current disposal practices relying on open-air storage pose critical environmental risks through land occupation and potential heavy metal pollution, while the intrinsic pollutant release mechanisms from sulfide mineral weathering remain insufficiently investigated. This study elucidates a novel pollution pathway through photocatalytic oxidation-triggered heavy metal liberation in tunnel waste. Conducted comprehensive mineralogical characterization of sulfide-bearing tunnel residues and systematically examined heavy metal migration patterns under controlled photooxidative conditions (variable illumination duration, temperature (25-45 °C), moisture content (20-60%), and aeration status). Parallel experiments monitored pH evolution and heavy metal release kinetics, particularly focusing on Cd, As, Cr, Pb, and Mn. Results revealed the presence of photochemically active Fe- and Ti-bearing phases in sulfide matrices that drive acid generation through solar-induced sulfite

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oxidation. This catalytic process established strongly acidic conditions (pH  $2.0 \pm 0.3$ ) under optimal parameters: 35 °C, 40% moisture content, and 48-h photoexposure with aeration. The resultant acidification promoted mineral dissolution, yielding maximum leachate concentrations of 0.09 mg/L Cd, 1.8 µg/L As, 0.05 mg/L Cr, 0.36 mg/L Pb, and 8.54 mg/L Mn, representing 3-eightfold increases compared to dark controls. This work provides the first mechanistic evidence of photocatalysis-mediated acid mine drainage formation in tunnel waste systems, challenging conventional geochemical weathering paradigms. The findings establish a theoretical framework for predicting heavy metal pollution risks and inform remediation strategies through photochemical parameter control, ultimately supporting sustainable management of tunnel excavation byproducts.

Authors: Xinzhu Yi, Fenghui Wu, Jinrong Zhang, Song Xue, Mingquan Zhou, Xin Li, Hao Chen

Full Source: Environmental science and pollution research international 2025 Apr 12. doi: 10.1007/s11356-025-36396-2.

### Manganese Uptake and Lethality in the Sea Star *Asterias rubens*: Effect of Hypoxia

2025-04-12

Oxygen depletion due to eutrophication in marine waters has been an increasing problem worldwide and during oxygen depletion events, benthic organisms may concurrently be exposed to hypoxia and manganese leaching from reduced sediments. In this investigation the uptake and toxic effects of manganese under normoxia and hypoxia were studied in the sea star *Asterias rubens*. Exposure to 1 mg Mn L<sup>-1</sup> for 4 weeks resulted in increased manganese concentrations in tube feet and pyloric caeca, whereas the concentrations in the aboral body wall showed no statistically significant changes. Manganese concentrations and accumulation did not differ between hypoxia (25% oxygen saturation) and normoxia; mortality was not observed in either of these exposure scenarios. Exposure to 0, 25, 35 and 50 mg Mn L<sup>-1</sup> resulted in a time and concentration dependent increase in mortality over 7 d, aggravated by hypoxic conditions. Hypoxic conditions significantly reduced average survival time at exposure to 50 mg Mn L<sup>-1</sup>.

Authors: Poul Bjerregaard, Søren Nordahl Hansen

Full Source: Bulletin of environmental contamination and toxicology 2025 Apr 12;114(4):65. doi: 10.1007/s00128-025-04037-6.



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### PHARMACEUTICAL/TOXICOLOGY

#### Diesel exhaust promoted diethylnitrosamine-induced hepatocarcinogenesis in mice

2025-04-08

Exposure to diesel exhaust (DE) has been linked to an increased risk of various cancers, including liver cancer. However, the underlying mechanisms driving this association remain insufficiently understood. In this study, we employed a diethylnitrosamine (DEN)-induced mouse liver tumor model and conducted a 19-week combined exposure (750 µg/m<sup>3</sup>) using a DE exposure system. Our results demonstrated that long-term DE exposure activates cancer-related genes and enhances the formation of DEN-induced liver tumors. Compared to the DEN group, mice in the DEN + diesel exhaust exposure (DEE) group exhibited lower body weight, higher tumor formation rates and more severe DNA damage. The tumor-promoting effect of DE may be associated with the upregulation of SEMA4D and the activation of the PI3K/AKT signaling pathway. Additionally, liver cells in the DEE group exhibited nuclear atypia, a characteristic feature of cancerous transformation. In vitro studies have revealed that exposure to diesel exhaust particles (DEP) promotes the proliferation of HepG2 cells and HUH7 cells by upregulating SEMA4D and activating the PI3K/AKT signaling pathway. This effect was attenuated by inhibiting either SEMA4D or PI3K. This study was the first to identify that DE exposure promotes the development of DEN-induced liver tumors in mice, with the mechanism potentially involving the SEMA4D/PI3K/AKT pathway. These findings provide novel insights into the hepatotoxic effects of DE and highlight the need for further investigation into its carcinogenic potential.

Authors: Junjie Dou, Hua Xiao, Yixin Chen, Wei Han, Shuxin Zhang, Dong Wu, Sixin Chen, Yuanyuan Ma, Zhengguo Cai, Qi Luan, Lianhua Cui

Full Source: Journal of hazardous materials 2025 Apr 8:492:138219. doi: 10.1016/j.jhazmat.2025.138219.

#### Co-occurrence and risk emission potential of antibiotics, antibiotic resistance genes, and heavy metals in concentrated leachate in China

2025-04-12

Membrane-driven process was widely applied for advanced treatment of leachate to achieve the final limitation, but around 10-million-ton concentrated leachate (CL) generated annually has become a hot potato.

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CL properties and their potential risks were overlooked, and here, we filled in these blanks based on samples from seven provinces from traditional and emerging pollutants perspective. Cd, Pb and Cr were the main contributors for hazardous waste identification with the concentration of 0.07-5.10 mg/L. ΣSulfonamides, Σfluoroquinolones and Σtetracyclines were 408-1,590 ng/L, 2,499-8,306 ng/L and 1,294-1,432 ng/L, respectively. Fluoroquinolones presented critical eco-risks with acute and chronic risk quotients of 85.2-123.1 and 60.3-492.2. Significant correlations between antibiotics, antibiotics resistant genes, and heavy metals were also gained. Annual generation of antibiotics and heavy metal were estimated to be 61.4 kg and 693 tons in 1,955 existing landfills and 214 incineration plants in China. CL seems to be a hazardous waste-like compound based on the toxic substance contents listed in GB 5085.6-2007 and the eco-risks of emerging antibiotics. Regulation permit writers should consider not only water quality, but also the best available technology economically achievable and potential secondary pollutants.

Authors: Wei Liu, Hui Wang, Ziyang Lou, Changzheng Cui, Zhiyi Sun, Qiuji Huang

Full Source: Waste management (New York, N.Y.) 2025 Apr 12:201:114797. doi: 10.1016/j.wasman.2025.114797.

### OCCUPATIONAL

#### Wound Healing in Human Skin Equivalents Reconstructed with Biopolymers Under Fine-Dust Exposure

2025-03-27

Airborne fine-dust pollution poses a significant threat to both respiratory and skin health; however, the skin's wound-healing process in response to such exposure remains underexplored. Therefore, this study examined the effect of fine-dust-model compounds, specifically polycyclic aromatic hydrocarbons (PM10-PAHs) and trace-metal-containing particles (PM10-Trace), on the wound-healing process using human skin equivalents reconstructed with collagen-based biomaterials and human skin cells. Our findings revealed that fine-dust exposure significantly delayed wound closure by 2-3 times compared with unexposed controls, impairing re-epithelialization. Live imaging of wound-healing dynamics revealed that trace-metal-containing particles had a more pronounced inhibitory effect than polycyclic aromatic hydrocarbons. Furthermore, fine-dust exposure elevated protease-activated receptor-1 (PAR1) expression by up to 161%, indicating significant physiological disruption. Additionally, fine-dust exposure triggered inflammation and oxidative stress, leading to



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structural and functional damage in the reconstructed skin. These results provide critical insights into how airborne pollutants disrupt skin repair mechanisms and highlight the need for targeted strategies to mitigate their harmful effects.

Authors: Taeun Kim, Junwoo Lim, Jaehyun Jeong, Heewook Ryu

Full Source: *Polymers* 2025 Mar 27;17(7):901. doi: 10.3390/polym17070901.

### Polyfloral nutritional resources promote bumble bee colony development after exposure to a pesticide mixture

2025-04-11

Bumble bees are important pollinators of crops in the field and greenhouses. They are naturally exposed to a combination of interacting stressors, e.g., loss of flowering resources and exposure to plant protection products. Mass-flowering crops are important resources for bees, but they may result in unbalanced nutrition due to different nutritional values. In this study, a semi-field experiment was conducted to evaluate the response of *Bombus terrestris* colonies after the application of a tank mixture containing the insecticide chlorantraniliprole and the fungicide prochloraz, either in monofloral-managed lupin (*Lupinus albus*) as high pollen protein resource or in presence of an additional polyfloral flower mixture. Our results demonstrate an evident effect on worker mortality after application of the tank mixture. Higher worker mortality in polyfloral treatments compared to the untreated control was observed. The number of young brood and pupae in colonies in polyfloral control were significantly higher than in monofloral treatment. However, no long-term effects on the number or weight of new queens were found. Furthermore, flowering resources, but not pesticide exposure, affected colony weight. Exposure to the tank mixture resulted in declining nectar yeasts abundance and an increasing proportion of phylloplane yeasts in forager guts. In conclusion, diverse flowering resources are important for a bumble bee colony's development. Even in a high pollen protein crop, low flower diversity may act as an additional stressor. Thus, we suggest further maintaining and promoting flowering strips or flowering fields in agricultural landscapes, even near high pollen protein crops, to enhance bee health.

Authors: Denise Castle, Abdulrahim T Alkassab, Silvio Erler, Gabriela Bischoff, Falk Gerdes, Andrey Yurkov, Michael Steinert, Ingolf Steffan-Dewenter, Jens Pistorius

Full Source: *Ecotoxicology and environmental safety* 2025 Apr 11;296:118170. doi: 10.1016/j.ecoenv.2025.118170.

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### Prevalence of respiratory symptoms and lung function impairments among woodworkers in Gondar City

2025-04-12

Respiratory symptoms and lung function impairments are concerns in the woodworking industry. In Ethiopia, the woodwork industry has been growing; however, there is limited data on pulmonary function, respiratory symptoms, and risk factors among woodworkers. This study aimed to assess the prevalence of impaired lung function and respiratory symptoms and determine their associated risk factors among woodworkers in Gondar City, Ethiopia. A comparative cross-sectional study was conducted, involving 185 woodworkers and 176 controls. Spirometry was used for Lung function tests. The data were collected using a questionnaire in Kobo Toolbox software. Statistical analyses, including ANOVA, t-test, and logistic regression were done in SPSS version 26. Almost all participants (96.4%) were male. The proportions of obstructive, restrictive, and mixed lung function impairments in woodworkers and control groups were 7.6% vs. 2.8%, 4.86% vs. 3.98%, and 1.08% vs. 0%, respectively. The proportion of chronic respiratory symptoms in woodworkers and control groups was 35.5% vs. 12.7% with the proportion of cough (19.9% Vs 6.6%), phlegm (21.1% Vs 5.8%), wheezing (9.4% Vs 3.9%), shortness of breath (19.9% Vs 6.6%), and breathlessness (13.3% Vs 8.3%). In woodworkers, and pooled models, the absence of a local exhaust ventilation system, working more than eight hours per day, being unable to use filter masks, and being unable to do physical exercise were significantly associated with respiratory symptoms. Forced Expiratory Volume in 1 s/Forced Vital Capacity ratio (FEV1/FVC ratio) ( $P = 0.001$ ) and Mid-Expiratory Flow between 25% and 75% (MEF25%-75%) significantly decreased with work experience ( $P = 0.001$ ). Woodworkers had higher rates of obstructive, restrictive, and mixed lung function impairments and more respiratory symptoms. Prioritizing workplace ventilation and the use of respiratory protective devices is crucial for mitigating these risks.

Authors: Eshetu Abera Worede, Mengesha Genet, Wudneh Simegn, Giziew Abere, Sefinew Tilahun, Mastewal Endalew, Eyayaw Adisu Demeke, Garedew Tadege Engedaw, Hailemariam Feleke, Yifokire Tefera Zele, Jember Azanaw

Full Source: *Scientific reports* 2025 Apr 12;15(1):12565. doi: 10.1038/s41598-025-96151-y.