CHEMWATCH

# Bulletin Board

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## CHEMICAL EFFECTS

### A covalent organic polymer fluorescent probe for highly selective and sensitive UO22+ detection in water and food samples

2025-09-03

A highly sensitive, selective, and simple method for detecting uranyl ions (UO22+) is crucial for human health and environmental safety. Amidoxime-based nanomaterials have been widely employed for UO22+ detection, but their higher affinity for vanadium than UO22+ limits their practical applications. Herein, a novel covalent organic polymer fluorescent probe (TT-COP) for UO22+ detection was innovatively developed by a one-step Schiff-base condensation reaction between 3,3′,5,5′-tetramethylbenzidine (TMB) and 2,4,6-triformylphloroglucinol (Tp). TT-COP not only possesses excellent thermodynamic stability, hydrophilicity, synthetic reproducibility, and fluorescence stability but also achieves outstanding sensing performance, with its interaction with UO22+ reaching equilibrium within 5 min and a detection limit of 35.75 nM. Further investigations reveal that UO22+ coordinates with the imine and hydroxyl groups of TT-COP, thereby inhibiting the intramolecular charge transfer (ICT) process and leading to fluorescence quenching. Moreover, TT-COP exhibits extraordinary selectivity and biocompatibility, enabling reliable UO22+ quantification in complex matrices including environmental waters, food, and biological samples, with recovery rates ranging from 94.54 % to 106.43 %. The detection results closely align with those obtained from high-precision ICP-MS measurements. These findings underscore the promising practical applications of TT-COP in food safety, environmental monitoring, and human health assessment.

Authors: Deshuai Zhen, Qiuhui Deng, Yao Yu, Sihan Chen, Le Li, Qingyun Cai, Yu Liu

Full Source: Biosensors & bioelectronics 2025 Sep 3:290:117950. doi: 10.1016/j.bios.2025.117950.

### Valorizing spent lithium iron phosphate battery in biomass pyrolysis for production of valuable chemicals and mitigating pollutant emissions

2025-09-04

The rapid increase of electronic waste, particularly battery waste, presents significant environmental challenges such as pollutant emissions and resource depletion, emphasizing the need for effective valorization and



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reuse strategies. This study introduces a novel approach for repurposing end-of-life lithium iron phosphate (LFP) batteries as catalysts in the pyrolysis of walnut shells (WS). Characterization analyses revealed that LFP provides both Lewis and Brønsted acid sites, which alter the thermal decomposition pathway of WS. As a catalyst, LFP enhanced dehydration reactions, leading to increased yields of key platform chemicals including H2, furfural, 2-methylfurfural, and levoglucosenone, while simultaneously reducing CO2 emissions. Additionally, WS effectively captured fluorine species released from the volatilization of polyvinylidene fluoride (PVDF) in LFP, thereby suppressing harmful HF formation. The optimal furfural yield was achieved at a 1:2 WS to LFP blending ratio. H2 production increased with temperature up to 800 ˚C, but higher temperature also accelerated the thermal degradation of valuable chemicals, highlighting the importance of proper temperature control to achieve optimal product yields. Life cycle assessment demonstrated that incorporating LFP into WS pyrolysis substantially reduced a broad range of environmental impacts. These findings support the potential of spent LFP batteries as catalysts for sustainable chemical production and resource recycling, contributing to the development of a circular industrial value chain.

Authors: Naeun Kim, Gihoon Kwon, Minki Choi, Gigap Han, Jinsoo Kim, Kyungjung Kwon, Hocheol Song

Full Source: Bioresource technology 2025 Sep 4:133273. doi: 10.1016/j.biortech.2025.133273.

### "Fight Fire with Fire": Trace-Water-Induced Controllable Synthesis of Hydrophobic Armors to Stabilize Metal-Organic Cage-Based Crystalline Frameworks

2025-09-05

Metal-organic cage-based crystalline frameworks (MCFs) are distinguished for high porosity and diverse functionality, while their applications are constrained by degradation in wet environments. Inspired by the "fight fire with fire" method in traditional Chinese medicine, trace-water-induced synthesis of armors is proposed to stabilize MCFs. Water at ppm concentration is enriched on the hydrophilic surface of MCFs, and then polymerizes with diisocyanate under the catalysis of MCFs to form hydrophobic shells. The moderate polymerization conditions render this approach extendable to various fragile MCFs. The hydrophobic shells endow the MCF-BPDC@PHDI derived from the polymerization of hexamethylene diisocyanate (HDI) onto MCF-BPDC (BPDC═biphenyl-4,4′-dicarboxylic acid) with improved adsorption capacity and stability in wet environments, making it one of the best materials for iodine

adsorption. Moreover, the armored MCF can adsorb iodine species at ultra-low concentrations and capture anionic iodine selectively from competitive cations for the first time. This study might open up an avenue for controllable fabrication of armors by using "adverse" water, allowing the stabilization of various materials.
Authors: Ze-Jiu Diao, Jin-Peng Liu, Ming Lu, Si-Jia Wang, Guan-Zhou Wu, Hang-Ou Qi, Yahui Cai, Xiao-Qin Liu, Guoliang Liu, Lin-Bing Sun
Full Source: Small (Weinheim an der Bergstrasse, Germany) 2025 Sep 5:e03557. doi: 10.1002/smll.202503557.

## ENVIRONMENTAL RESEARCH

### Decoding the Interactions Between Antibiotics and Microplastics- Chemistry, Environmental Impacts, and Mitigation Approaches- A State-of-the-Art Review

2025-09-05
The coexistence of antibiotics (AB) and microplastics (MP) in the environment has led to the formation of AB-MP complexes, posing several ecological and public health challenges. This review explores the mechanisms driving AB adsorption onto MPs, including diverse interactions (hydrophobic interactions, hydrogen bonding, π-π stacking, and ionic exchange) and their role in maintaining the persistence and mobility of the complexes. These complexes have been reported to serve as reservoirs/vectors for antimicrobial resistance (AMR), disrupt microbial communities, and enhance the bioavailability of ABs, thus posing various threats affecting biodiversity health and ecosystem stability. The investigation explores the possibility of a single-step solution to this problem, which lies in incorporating common remediation methods within one setup to achieve combinatorial efficient removal of both the emerging contaminants simultaneously. Extensive literature mining for authentic information from sources like PubMed, Scopus, WoS, Science Direct, etc., was done using keywords exclusive to the study, and relevant articles were extracted for comparative and critical analysis. The current worldwide status of research in this area has been illustrated via a bibliometric approach. Strategies like constructed wetlands have been critically analysed, and factors affecting the process design that can lead to maximal removal have been thoroughly discussed. This review brings forth a unique compilation of the chemical mechanisms of AB-MP complex



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formation, threats posed by these complexes, and modern technological advancements for tackling AB-MP pollution.
Authors: Indrani Paul, Reshmi Das, Gopinath Halder
Full Source: Environmental research 2025 Sep 5:122774. doi: 10.1016/j.envres.2025.122774.

### Urban surface water flows contribute more PFAS to marine environments than treated wastewater

2025-09-03
Despite the increased number of studies on PFAS globally, our understanding of mass transport pathways remains limited. To address this, we investigated major rivers and creeks feeding into Port Phillip Bay, Melbourne, Australia, for 52 PFAS. We collected 76 grab samples and deployed 28 Polar Organic Chemical Integrative Samplers (POCIS) from 7 locations over 2-months to identify differences PFAS profiles across catchments, the influence of land uses and rainfall. There were 25 PFAS detected in grab samples and 26 in POCIS. Mean ∑52PFAS for grab samples was 76.4 ng/L, with ∑90% made up of ten PFAS. PFOS was the most common but pre-cursers were also present. Our surface water flow model showed a wide range of land uses influenced PFAS profiles across catchments, including those not traditionally associated as point sources, highlighting further investigation is needed. We estimated 57.4 kg/year ∑52PFAS were exported to Port Phillip Bay, with surface water flows exporting over twice the ∑19PFAS compared to wastewater discharges. Our findings show the importance of monitoring a wide range of PFAS in combination with land use and surface water flow models is crucial for mitigating diffuse pollution sources to effectively safeguard both marine ecosystems and community health, worldwide.
Authors: Phoebe Lewis, Erica Odell, Christopher P Johnstone, Timothy Chaston, Daniel MacMahon, Tanya Paige, Simon Sharp, Mark Patrick Taylor, Vincent Pettigrove, Minna Saaristo
Full Source: Environmental research 2025 Sep 3:122751. doi: 10.1016/j.envres.2025.122751.

## PHARMACEUTICAL/TOXICOLOGY

### Multiple maternal occupational exposures during pregnancy and intrauterine growth: analysis of the French Longitudinal Study of Children - ELFE cohort, using data-driven approaches

2025-09-05

Objective: To use data-driven approaches to investigate maternal multi-occupational exposures during pregnancy and their effects on intrauterine growth.

Methods: Maternal occupational exposure to 47 factors during pregnancy was evaluated with job-exposure matrices in the French ELFE cohort. The outcomes of interest were birthweight (BW), small for gestational age (SGA) and head circumference (HC). Occupational exposures associated with these outcomes were identified by EWAS, LASSO, and random forest. The five exposures with the strongest effects selected with these approaches were included in a final multivariate model with significant interactions.

Results: We included 12,851 women. The most important occupational factors predictive of SGA were endocrine disruptors, high strain, kneeling/squatting, job demands, physical effort. No significant associations were detected when these variables were combined in a final model. For BW, the most important variables were leaning forward/sideways, using a computer screen, ultrafine particles, physical effort, airborne germs, repetitive actions. The use of a computer screen significantly decreased BW and, for women not exposed to airborne germs, leaning forward/sideways significantly increased BW. For HC, repetitive actions, oxygenated solvents, kneeling/squatting, airborne germs, working outdoors were the most important predictive factors. Repetitive actions and working outdoors significantly decreased HC. HC also decreased in women exposed to both airborne germs, and oxygenated solvents. Similar results were found for women who worked during the third trimester.

Conclusion: Our findings highlight potential roles of chemical, biological and postural factors and their interactions in determining intrauterine growth. These results highlight the importance of considering multiple exposures in occupational health studies.

Authors: Marie Tartaglia, Calvin Ge, Anjoeka Pronk, Nathalie Costet, Sabyne Audignon-Durand, Marie-Tülin Houot, Katarina Kjellberg, Maxime Turuban, Nel Roeleveld, Jack Siemiatycki, Camille Carles, Corinne Pilorget, Daniel



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Falkstedt, Sanni Uuksulainen, Michelle C Turner, Alexis Descatha, Marie Noëlle Dufourg, Fleur Delva, Ronan Garlantézec
Full Source: International journal of hygiene and environmental health 2025 Sep 5:270:114666. doi: 10.1016/j.ijheh.2025.114666.

### Toxicity and efficacy of antibody-drug conjugates in advanced solid tumors: a retrospective single-center analysis of clinical trials

2025-09-04

Background: Antibody-drug conjugates (ADCs) combine targeted monoclonal antibodies with cytotoxic payloads and are an emerging modality in systemic cancer therapy. Thirteen ADCs are Food and Drug Administration approved, with many more in development. However, design and use remain challenging, with issues including on/off-target toxicity, resistance from prior exposure to payload classes, and optimal target/payload selection.

Patients and methods: This pooled analysis included patients treated on 19 clinical trials (9 phase I, 10 phase II/III) of 14 novel ADCs at Sarah Cannon Research Institute, London (2012-2025). Patients who received one or more doses of the study drug were analyzed. Descriptive statistics and Cox regression were used to evaluate demographics, tumor characteristics, toxicity and outcomes, overall and in subgroups.

Results: A total of 163 patients [median age 61 years (range 31-82 years); 46.8% male] were included. Most had breast (n = 53, 32.5%) or gynecological cancers (n = 36, 22.1%), with a median of 4 prior treatments (range 1-20). Payloads included alkylating agents (n = 3), microtubule inhibitors (n = 8), and topoisomerase inhibitors (n = 3). Four ADCs targeted an oncogene (HER2); others targeted tumor-associated antigens (TAAs). Treatment-emergent adverse events (TEAEs) occurred in 84% (grade 3-4 in 29%). Rates of any-grade colitis, interstitial lung disease (ILD), neuropathy, ocular toxicity, and hepatotoxicity were 2.4%, 6.0%, 25.1%, 18.0% and 22.8%, respectively. Most toxicities emerged within 6 weeks, except colitis (median 18.2 weeks), ILD (13.1 weeks), neuropathy (11.6 weeks) and thrombocytopenia (23.2 weeks). No significant difference in grade ≥3 AEs was seen across payload classes (P = 0.50), although HER2 targeting was associated with higher rates (P = 0.04). Overall objective response rate was 16%, higher with topoisomerase payloads (43%), HER2 targeting (49% versus 6% for TAAs), in breast cancer (39%), and at recommended phase II dosing (25%).

Conclusions: ADCs show activity across tumor types, with greater efficacy when targeting oncogenes. Toxicities are frequent and often early. Anticipating timing of toxicities is key to effective clinical management.
Authors: R Woodford, H Almarzouq, N Beygozlu, A Cammarota, K Joshi, R Grochot, A Williams, C Swanton, E Fontana
Full Source: ESMO open 2025 Sep 4;10(9):105573. doi: 10.1016/j.esmoop.2025.105573.

## Exposure to high levels of perfluoroalkyl substances through drinking water and risk of cardiovascular morbidity and mortality in a Swedish register-based study

2025-09-05
Introduction: Epidemiological studies focusing on the association of exposure to perfluoroalkyl substances (PFAS) with cardiovascular disease (CVD) morbidity and mortality are limited, with inconsistent findings.
Objectives: This register-based study aimed to investigate the associations between exposure to PFAS and the risk of CVD morbidity and mortality in a Swedish population exposed to PFAS, dominated by perfluorohexane sulfonic acid (PFHxS) and perfluorooctane sulfonic acid (PFOS), through drinking water for decades.
Methods: The study included 46 553 individuals aged ≥30 who lived in Ronneby (1985-2013). Individual exposure status was evaluated based on yearly residential address and categorized into 'ever-high' and 'never-high'. Incident CVD morbidity (acute myocardial infarction [AMI], ischemic [IS] and hemorrhagic stroke [HS]), and CVD mortality were retrieved from national registries. Cox proportional hazards models estimated hazard ratios (HR). Further stratified analyses were performed by calendar year, sex and age (<50, 50-75, >75 years).
Results: Elevated risks were found for AMI (HR 1.10, 95% confidence interval 1.01-1.19), IS (1.10, 1.00-1.22), HS (1.28, 1.03-1.59), and CVD mortality (1.15, 1.08-1.23) among individuals who had lived in the area with PFAS contaminated drinking water. Females showed higher risks for AMI and CVD mortality, while the risk of HS was higher among men. Stronger associations between PFAS and AMI and HS were observed in the age group 50-75 years. For PFAS-related CVD mortality, the point estimates increased with age though no significant interaction was observed.



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Conclusion: Our study suggests an association between high-level PFAS exposure and elevated risk of CVD morbidity and mortality.
Authors: Lucy Zhou, Eva M Anderson, Florencia Harari, Tony Fletcher, Christel Nielsen, Annelise J Blomberg, Kristina Jakobsson, Yiyi Xu, Ying Li
Full Source: Environmental research 2025 Sep 5:122765. doi: 10.1016/j.envres.2025.122765.

# OCCUPATIONAL

## Depression outcomes correlated to exposure to per- and poly-fluoroalkyl substances (PFAS)

2025-09-06
Per- and poly-fluoroalkyl substances (PFAS) are fluorinated organic compounds known as forever chemicals that are used in many materials, from cooking appliances to industrial detergents. Given their high chemical stability due to their lipophilic properties and widespread use, PFAS tend to bioaccumulate in the cardiac, hepatic, renal, gastrointestinal, and neural tissues, resulting in a variety of malignant and non-malignant diseases. Depression is a prevalent mental health condition that affects an individual's activities of daily living. Depression is associated with numerous other chronic diseases, as well as the exacerbation of those conditions. With the increasing exposure to PFAS, this study set out to further examine the toxic correlation of nine subtypes of PFAS with depression outcomes in the U.S. adult population. PFAS exposure was analyzed from serum laboratory samples from the National Health and Nutrition Examination Survey (NHANES) datasets from 2015 to 2018 and was analyzed via multiple linear regression and multiple logit regression approaches. Depression ratings were based on individual responses to the Patient Health Questionnaire (PHQ9) and then characterized as none (score of 0-4), mild (score of 5-9), moderate (score of 10-14), moderately severe (score of 15-19), and severe (score of 20-27). All statistical analyses are conducted with R software version 4.4.0. The observed correlation was significant for a subset of PFAS subtypes. The findings suggest a medium concentration exposure to branch perfluorooctanoic acid isomers (BFOA) (odds ratio (OR) 2.010; [95% confidence interval (CI), 1.013, 3.988]), a medium concentration exposure to n-perfluorooctanoic acid (NFOA) (OR 6.073; [95% CI, 1.069, 34.498]), and medium concentration exposure to perfluorononanoic acid (PFNA) (OR 3.992; [95% CI, 1.261, 12.632]) were positively correlated with depression occurrence in adults aged 20 years and older who were not incarcerated. Analyzed covariates that were most common among depressed individuals included being female; widowed,

divorced, separated, or never married; having a BMI of obese; and a current smoker. Given the documented negative health effects and current research gaps, researchers should continue to analyze the effects of PFAS exposure while healthcare and governmental institutions disseminate education, encourage laboratory testing, and fund elimination efforts of PFAS exposure. More investigation is required to support or reject these findings.

Authors: Humairat H Rahman, Weston R Stokey, Stuart H Munson-McGee

Full Source: Environmental science and pollution research international 2025 Sep 6. doi: 10.1007/s11356-025-36917-z.

## Cholinergic Dysfunction in Occupational Manganese Exposure

2025-09-03

Background and objective: Excessive exposure to manganese (Mn) produces a clinical syndrome of parkinsonism and cognitive impairment. However, our understanding of the mechanisms of Mn neurotoxicity remains limited. This study aimed to evaluate the relationships between Mn exposure, cholinergic function, and cognitive impairment in exposed workers.

Methods: We assessed brain cholinergic function using vesicular acetylcholine transporter (VAChT) radiotracer (-)-(1-(8-(2-[(18)F] fluoroethoxy)-3-hydroxy-1,2,3,4-tetrahydronaphthalen-2-yl)-piperidin-4-yl)(4-fluorophenyl)methanone (VAT) with positron emission tomography (PET) in 21 Mn-exposed workers. We estimated occupational Mn exposure from work histories and the MRI pallidal index. A cognitive control battery consisting of the Verbal Fluency (VF), Letter Number Sequencing (LNS), Two-Back Letter Task (2B), Go-No-Go (GnG), and Simon Task assessed cognitive function. We applied generalized linear models to Mn exposure, voxel-based cholinergic PET, and cognitive control measures, estimating coefficients for cholinergic-mediated associations between Mn and cognitive function. We utilized bootstrapping techniques to validate the mediation coefficients.

Results: Both Mn exposure metrics were associated with low cholinergic VAT binding in the caudate and cortical regions including the precuneus, pars triangularis, pars opercularis, middle temporal lobe, and entorhinal cortex. Regional cholinergic function mediated the relationship between Mn exposure and both the composite cognitive control score (mean of the 5 cognitive tests) [β= -0.661, 90% confidence interval (CI) -2.130, -0.032] and the individual VF assessment (β= -0.944, 90% CI -2.157, -0.065).



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Discussion: Higher Mn exposure is associated with lower cholinergic activity in multiple brain regions. Cholinergic function also mediates a portion of the relationship between Mn exposure and cognitive control performance. Caudate and cortical cholinergic activity may be a biomarker of early Mn neurotoxicity and represent an important mechanism of cognitive dysfunction in parkinsonian syndromes.

Authors: T Noah Hutson, Susan Searles Nielsen, Natalie Senini, John O'donnell, Hubert P Flores, Tamara Hershey, Joel S Perlmutter, Anil Kumar Soda, Stephen M Moerlein, Zhude Tu, Michael Kasper, Lianne Sheppard, Brad A Racette, Susan R Criswell

Full Source: Neurotoxicology 2025 Sep 3:103313. doi: 10.1016/j.neuro.2025.103313.