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CHEMICAL EFFECTS

Effect-directed analysis of hazardous organic chemicals released from ship hull hydroblasting effluents and their emission to marine environments

2025-07-06
Hydroblasting of ship hulls is a significant source of chemical emissions into marine environments, releasing a complex mixture of paint-derived constituents including biocides, pigments, polymeric binders, plasticizers, light stabilizers, and compounds from adhesives and sealants. Although the International Convention on Antifouling Systems highlights the importance of waste management, many countries, including South Korea, have not yet implemented specific regulations addressing hydroblasting effluents. Most existing studies have focused on target biocides, leaving other toxic chemical classes underexplored. This study applied effect-directed analysis to assess hydroblasting effluents using ultra-performance liquid chromatography coupled with high-resolution mass spectrometry. Toxicity screening revealed that the whole effluent exhibited significant toxic effects in zebrafish embryos. Fractionation analysis showed that, of 10 collected fractions, fractions 2 and 3 displayed slight toxicity, while fractions 4-9 showed high toxicity. Non-targeted analysis (NTA) identified 68 compounds in positive electrospray ionization mode and 25 in negative mode in the whole effluent. NTA of individual fractions revealed respective compounds contributing to the observed toxicity. Known toxicants were detected specifically in the toxic fractions. Seven toxicants were confidently identified at Level 1 using authentic standards. Quantitative analysis estimated that the release of these toxicants ranged from 0.16 to 121.83 g per hull cleaning of the one studied ship. When extrapolated globally, annual emissions were estimated to exceed 16 tons. These findings highlight the substantial environmental risks associated with hydroblasting and emphasize the need for regulatory oversight and targeted mitigation strategies to reduce its ecological impact on marine ecosystems.
Authors: Raees Ahmad, Ahsan Javed, Taekhyun Kim, Won Joon Shim, Moonkoo Kim, Kim Sunghwan
Full Source: Journal of hazardous materials 2025 Jul 6:496:139155. doi: 10.1016/j.jhazmat.2025.139155.

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Soil to Synapse: Molecular Insights into the Neurotoxicity of Common Gardening Chemicals in Alzheimer's and Parkinson's Disease

2025-07-04
The common gardening herbicides and fertilizers are crucial for weed control and plant growth, yet they may have potentially harmful impacts on neurological health. This review explored the possible effects of these chemicals on neurodegenerative disorders, especially Alzheimer's disease (AD) and Parkinson's disease (PD). The mode of action of several frequently used gardening chemicals (paraquat, glyphosate, 2,4-dichlorophenoxyacetic acid: 2,4-D, and ammonium chloride) in AD and PD has been highlighted. The mechanisms involved are glutamate excitotoxicity, dopaminergic pathway disruption, oxidative stress, mitochondrial dysfunction, neuroinflammation, synaptic dysfunction, and gut-brain-axis dysregulation, crucial in the pathophysiology of AD and PD. Although the links between these substances and neurodegenerative conditions remained to be seen, growing evidence indicated their detrimental effects on brain health. This highlights the need for further research to understand their long-term consequences and develop effective interventions to mitigate the adverse effects of commonly used chemicals on human health and the environment.
Authors: Niti Sharma, Seong Soo A An
Full Source: International journal of molecular sciences 2025 Jul 4;26(13):6468. doi: 10.3390/ijms26136468.

Optimization of the Organic Matter Content and Temperature in a Bioreactor to Enhance Carbon Monoxide Production During the Initial Phase of Food Waste Composting

2025-06-30
Carbon monoxide (CO) is a key reactant in industries like chemicals, pharmaceuticals, and metallurgy, with a projected global market of $8.2 billion by 2032. A novel method of CO production is biowaste composting, but the impact of organic matter content (OMC) on CO yield remains unexplored. Since OMC affects composting costs, optimizing it is crucial for economic feasibility. This study aimed to identify the optimal OMC in bioreactors for CO production during food waste composting. A laboratory process was conducted in bioreactors with forced aeration. Food waste (FW) was mixed with gravelite (G) at ratios of 1:0, 1:1, and 1:2 (FW:G), corresponding to 95%, 40%, and 20% dry OMC. Bioreactors

were incubated at 45 °C, 60 °C, and 70 °C with ~5% oxygen. The highest CO levels were at 70 °C for FW:G 1:2, with an average of 655 ppm and a maximum of 2000 ppm. Daily CO emissions were highest at 70 °C, reaching up to 1.25 mg. Therefore, the study demonstrated that even a low organic matter content allows for CO production during composting under thermophilic conditions (~70 °C) with limited oxygen. Industrial modeling estimated daily CO yield from 39.25 to 670.61 g, with a 7-day market value between USD 28.89 and USD 175.86. Further studies are needed for large-scale feasibility.
Authors: Karolina Sobieraj
Full Source: Molecules (Basel, Switzerland) 2025 Jun 30;30(13):2807. doi: 10.3390/molecules30132807.

ENVIRONMENTAL RESEARCH

Injectable microenvironment-responsive hydrogels encapsulating engineered NF-κB-targeting circular RNA for osteoarthritis therapy

2025-07-11
Osteoarthritis (OA) is a prevalent joint disease characterized by cartilage degeneration and an imbalance in subchondral bone homeostasis. Effective topical treatment of OA remains challenging due to the insufficient long-term efficacy, instability, and rapid clearance of therapeutic agents. In this study, we targeted the overactive NF-κB signaling in OA by introducing a P65 super repressor gene (srIκBα) as a circular RNA (circRNA), encapsulated within modified lipid nanoparticles (LNPs), and embedded in a silk fibroin composite hydrogel (SHC) cross-linked with matrix metalloproteinase (MMP)-sensitive substrate peptides. Consequently, we developed an environment-responsive intelligent drug delivery system, namely, circ-srIκBα@LNP-SHC, and the performance of this system was evaluated both in vitro and in vivo. It demonstrated potent targeting effects on chondrocytes and fibroblast-like synoviocytes (FLS) in vitro, with significantly inhibiting NF-κB signaling. In an OA rat model, circ-srIκBα@LNP-SHC exhibited superior anti-OA efficacy and cartilage repair capability, and markedly suppressed the expression of OA-related inflammatory mediators and matrix-degrading enzymes, and reversed the OA-associated gene expression profile. The therapeutic effect was further validated using human OA cartilage cultured ex vivo. In conclusion, our environmentally responsive drug delivery system based on circ-srIκBα shows significant potential for OA treatment, offering improved

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cell specificity, stability, and low immunogenicity, which may provide a novel strategy for OA management.
Authors: Meng Li, Xumiao Jia, Penghui Lai, Yuqian Ma, Fei Li, Lingyan Yang, Siyuan Zhang, Chongfei Yang, Yu Luo, Qinhao Wang
Full Source: Journal of controlled release : official journal of the Controlled Release Society 2025 Jul 11:114039. doi: 10.1016/j.jconrel.2025.114039.

Microplastic surge in the Ariyankuppam river, Puducherry, India: A study on abundance, characterization, and pollution load index

2025-07-07
The increasing rate of microplastic (MP) pollution in the aquatic environment poses an escalating threat to marine ecosystems and several health concerns to humans. Ocean and Sea MP pollution has been a grave concern in recent decades, and rivers are considered one of the main channels that carry MP to the sea. Here, we investigated the MP abundance in the Ariyankuppam River, which flows through the Puducherry region in South India and merges with the Bay of Bengal. The water and sediment samples were collected from ten locations along the river over three months, from January to March 2024, coinciding with the post-monsoon phase in Puducherry, to understand the impact of seasonal variations on MP abundance. The average MP abundance of sediments and water was found to be 136.33 ± 24.75 particles/Kg and 124.83 ± 22.44 particles/L, respectively. A total of 7837 MP particles were detected, with approximately 52.2 % and 47.8 % originating from sediment and water samples. Fibers were major polymer forms, with an abundance of 79.4 % in sediment and 87.9 % in water samples. The classification of MP (0-3000 µm) reveals predominance of smaller particles, mainly within 0-500 µm and 500-1000 µm. High-density polyethylene (HDPE) and Low-Density Polyethylene (LDPE) were the dominant polymer types in sediments and water samples collected from ten sites along the river. Our results found not much of a significant difference in MP abundances across the months in both sediment and water samples. The Pollution Load Index (PLI) assessment indicated a Hazard Level I (<10), a minimal risk level. These data will help the local government and other agencies take necessary measures for mitigation strategies to safeguard these vital water bodies.
Authors: Cheena Joshi, Saoo Wan Emi Phyllei, Sunidhi Bhatt, Subhankar Chatterjee
Full Source: Journal of contaminant hydrology 2025 Jul 7:274:104669. doi: 10.1016/j.jconhyd.2025.104669.

PHARMACEUTICAL/TOXICOLOGY

Oncologist and General Practitioner Perspectives of Shared Care for Colorectal Cancer Survivors: A Qualitative Study

2025-07

Background: There is a growing body of evidence to support shared survivorship care. The shared care of colorectal cancer survivors (SCORE) randomised controlled trial (RCT) demonstrated that shared care is an appropriate and cost-effective model. Understanding the perspectives of oncologists and general practitioners (GPs) who participated in SCORE will provide crucial insights to support wider implementation of shared care and adoption into clinical practice.
Aims: To explore the experiences of oncologists and GPs who provided shared survivorship care for colorectal cancer survivors within the SCORE RCT, focussing on perceptions of acceptability and appropriateness of shared care, and facilitators and barriers to implementation.
Methods: This qualitative descriptive study utilised semi-structured interviews for data collection. Interviews were recorded and transcribed, and data analysed by hybrid deductive/inductive thematic analysis.
Results: Interviews from 20 HCPs (13 GPs and 7 oncologists) were analysed. Seven themes were developed describing overall acceptance of the shared care model, the importance and challenges regarding bilateral communication between providers, mixed views on the need for GP training, and patients suitable for shared care. The need to support GPs with a direct hospital-based contact person, as well as clear guidance on their role, was emphasised, as was the need for care coordination and logistical support.
Conclusions: Our study offers novel findings regarding shared care from the perspective of participants who have direct experience with delivering the model. While shared care was broadly supported by both GPs and specialists, successful implementation requires agreed-upon bilateral communication, clear guidance for GPs, and coordination support.
Clinical trial registration: The Shared Care for Colorectal Cancer (SCORE) Trial is registered with the Australian New Zealand Clinical Trials Registry, ACTRN12617000004369p. Registered on 3 January 2017; protocol version 4 approved 24 February 2017.

Authors: Karolina Lisy, Matthew Tieu, Claire Gore, Penelope Schofield, Raymond J Chan, Jon Emery, Andrew Martin, Richard De Abreu Lourenco, Michael Jefford

Full Source: Psycho-oncology 2025 Jul;34(7):e70223. doi: 10.1002/pon.70223.

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Reforming Food, Drug, and Nutraceutical Regulations to Improve Public Health and Reduce Healthcare Costs

2025-06-30

Neglecting preventive healthcare policies has contributed to the global surge in chronic diseases, increased hospitalizations, declining quality of care, and escalating costs. Non-communicable diseases (NCDs)-notably cardiovascular conditions, diabetes, and cancer-consume over 80% of healthcare expenditure and account for more than 60% of global deaths, which are projected to exceed 75% by 2030. Poor diets, sedentary lifestyles, regulatory loopholes, and underfunded public health initiatives are driving this crisis. Compounding the issue are flawed policies, congressional lobbying, and conflicts of interest that prioritize costly, hospital-based, symptom-driven care over identifying and treating to eliminate root causes and disease prevention. Regulatory agencies are failing to deliver their intended functions. For instance, the U.S. Food and Drug Administration's (FDA) broad oversight across drugs, devices, food, and supplements has resulted in inefficiencies, reduced transparency, and public safety risks. This broad mandate has allowed the release of unsafe drugs, food additives, and supplements, contributing to the rising childhood diseases, the burden of chronic illness, and over-medicalization. The author proposes separating oversight responsibilities: transferring authority over food, supplements, and OTC products to a new Food and Nutraceutical Agency (FNA), allowing the FDA to be restructured as the Drug and Device Agency (DDA), to refocus on pharmaceuticals and medical devices. While complete reform requires Congressional action, interim policy shifts are urgently needed to improve public health. Broader structural changes-including overhauling the Affordable Care Act, eliminating waste and fraud, redesigning regulatory and insurance systems, and eliminating intermediaries are essential to reducing costs, improving care, and transforming national and global health outcomes. The information provided herein can serve as a White Paper to help reform health agencies and healthcare systems for greater efficiency and lower costs in the USA and globally.

Authors: Sunil J Wimalawansa

Full Source: Foods (Basel, Switzerland) 2025 Jun 30;14(13):2328. doi: 10.3390/foods14132328.

Paternal and maternal exposures to per- and polyfluoroalkyl substances (PFAS) and birth outcomes: a multi-country cohort study

2025-07-12

Background: Maternal prenatal exposures to per- and polyfluoroalkyl substances (PFAS) have been linked to adverse birth outcomes. However, few investigations have considered paternal PFAS exposure. We estimated the parent-specific associations of prenatal PFAS exposures with adverse birth outcomes.

Methods: This study included 498 couples from the INUENDO cohort recruited at antenatal care visits in Greenland, Poland, and Ukraine during 2002-2004. We measured five major types of PFAS in parental serum during pregnancy. We analyzed three birth outcomes ascertained from medical records, including gestational age, birth weight, and birth length. We used weighted least squares linear regression to evaluate parent-specific associations of serum PFAS with the birth outcomes, adjusting for parental co-exposures and covariates. We also used quantile g-computation for mixture modeling of the birth outcomes of paternal and/or maternal exposures to multiple PFAS.

Results: No associations were found between maternal and paternal PFAS exposures and gestational age. However, after adjusting for paternal PFOA, a higher level of maternal serum perfluorooctanoate (PFOA) was linked to a tendency towards lower birth weight and shorter birth length. Paternal exposure to several PFAS was also associated with a tendency for shorter birth length, but the estimated effect sizes were small. We found no joint exposure effects in the mixture analyses.

Conclusions: While the evidence was inconclusive, maternal PFOA and paternal PFAS exposures seemed to be associated with lower offspring birth weight and shorter birth length, respectively. Parent-specific effects of PFAS exposures on offspring growth and development warrant further research.

Authors: Pengfei Guo, Jiajun Luo, Jie Zhang, Jens Peter Bonde, Paweł Struciński, Viktor Ohniev, Onyebuchi A Arah, Nicole C Deziel, Joshua L Warren, Gunnar Toft, Zeyan Liew

Full Source: Environmental health : a global access science source 2025 Jul 12;24(1):48. doi: 10.1186/s12940-025-01199-y.

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OCCUPATIONAL

Assessing the effectiveness of an occupational musculoskeletal ınjury prevention program for paramedic students: A quasi-experimental, pretest-posttest study

2025-07-12

Background: Paramedics must apply appropriate body mechanics principles when providing emergency care, actively engaging their bodies to prevent physical injuries and protect patients from falls and harm.

The aim of this study is to investigate the effectiveness of a occupational musculoskeletal injury prevention program provided to paramedic students on their level of knowledge regarding body mechanics principles and their performance in patient transport practices.

Methods: This semi-experimental study employs a pretest-posttest single-group design. The study population consisted of 60 paramedic program students at a university's health services vocational school during the 2022-2023 academic year's fall semester. Students received theoretical and practical training on body mechanics, following the Body Mechanics Training Guide. Data were analyzed using IBM SPSS 24.

Results: The mean age of the students was 20.40 ± 1.65 years, with 58.3 % in their second year, and 76.7 % female. Significant differences were found in Body Mechanics Knowledge Form scores across pre-training, post-training, and follow-up assessments. A statistically significant improvement was also observed in Observational Checklist scores, with 95.0 % of students failing the pre-test but all succeeding in the post-training assessment.

Conclusion: This study concluded that the occupational injury prevention training program improved the knowledge levels and performance in patient transport practices of paramedic students.

Authors: Fatma Tok, Naile Canıtez, Tuğba Aydemir

Full Source: International emergency nursing 2025 Jul 12:82:101658. doi: 10.1016/j.ienj.2025.101658.

Effectiveness of an app-delivered, self-management exercise program in public safety workers with chronic low back pain: a randomized controlled trial

2025-07-11

Background: Public safety workers (PSW), such as police officers and firefighters, face a high prevalence of chronic low back pain (LBP). Effective

and accessible interventions are essential to improve their health and job performance.
Objective: To evaluate the effectiveness of a m-health-based core stability exercise self-management program combined with health education compared to m-health-based health education alone in PSW with chronic LBP.
Methods: Forty-seven PSW with chronic LBP were randomly assigned to receive a smartphone app-based self-managed exercise program (twice a week) plus health education (INT; n = 23) or health education alone (CON; n = 24) for eight weeks. Primary outcomes were pain intensity and disability at 8 weeks. PSW were assessed preintervention and 8 and 16 weeks after the randomization.
Results: Those in the INT group had a greater reduction in pain intensity (MD = -1.54; 95 %CI -2.95, -0.13) and disability (MD = -3.23; 95 %CI -5.51, -0.95) than those in the CON group at 8 weeks. Quality of life, self-efficacy, and anxiety improved for those in the INT group compared to those in the CON group at eight weeks. The treatment effects remained for disability, quality of life, and anxiety in the follow-up period of 16 weeks. No between-group differences were found for depression, stress, sleep quality, or neuromuscular outcomes.
Conclusion: A m-health-based core stability exercise self-management program combined with health education was more effective in reducing pain intensity, disability, and anxiety, as well as improving quality of life and self-efficacy, compared to m-health-based health education alone in PSW with chronic LBP.

Authors: Eduardo Frio Marins, Tiago Thompsen Primo, Breno Berny Vasconcelos, Mauricio Tatsch Ximenes Carvalho, Lorena de Lima Oppelt, Victor Hugo Guesser Pinheiro, Fabrício Gonzales Scaglioni, Dirceu Antonio Maraschin Junior, Valdinar de Araújo Rocha Junior, Eduardo Lucia Caputo, Fabricio Boscolo Del Vecchio, Cristine Lima Alberton
Full Source: Brazilian journal of physical therapy 2025 Jul 11;29(5):101232. doi: 10.1016/j.bjpt.2025.101232.