

# Bulletin Board

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## CHEMICAL EFFECTS

## New insights into the photo-degraded polystyrene microplastic: Effect on the release of volatile organic compounds

2022-02-24

Excessive use of plastics leads to the ubiquity of plastic waste in the environment. Weathering can cause changes in the properties of plastics and lead to the release of various chemicals especially the volatile organic compounds (VOCs). Possible photodegradation pathway of polystyrene (PS) microplastics (MPs) was proposed and verified by the detection of VOCs. Headspace solid phase microextraction (HS-SPME) was employed to investigate the release behavior of VOCs from PS MPs exposed to simulated ultraviolet (UV). Results indicated that although the physicochemical properties of the PS MPs showed no significant change after UV-irradiation, a variety of toxic VOCs, such as benzene, toluene, and phenol were detected from the irradiated MPs. UV irradiation progressively enhanced the release amount of VOCs with total concentration up to 66  $\mu\text{g g}^{-1}$  after 30 d of exposure, about 2.4 times higher than that stored in the darkness (27  $\mu\text{g g}^{-1}$ ). Some compounds (e.g., benzene and toluene) showed an upward trend over irradiation time, while others (e.g., styrene and 2-propenylbenzene) reduced over time. Results also found that the size of MPs could affect the release amounts but without consistent pattern for different VOCs detected in the headspace of the vial. In general, current study provided a new insight on the photo-aging process of MPs. Authors: Xinyan Wu, Xinlv Chen, Ruifen Jiang, Jing You, Gangfeng Ouyang Full Source: Journal of hazardous materials 2022 Feb 24;431:128523. doi: 10.1016/j.jhazmat.2022.128523.

## One planet: one health. A call to support the initiative on a global science-policy body on chemicals and waste

2022

The chemical pollution crisis severely threatens human and environmental health globally. To tackle this challenge the establishment of an overarching international science-policy body has recently been suggested. We strongly support this initiative based on the awareness that humanity has already likely left the safe operating space within planetary boundaries for novel entities including chemical pollution. Immediate action is essential and needs to be informed by sound scientific knowledge and data compiled and critically evaluated by an

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overarching science-policy interface body. Major challenges for such a body are (i) to foster global knowledge production on exposure, impacts and governance going beyond data-rich regions (e.g., Europe and North America), (ii) to cover the entirety of hazardous chemicals, mixtures and wastes, (iii) to follow a one-health perspective considering the risks posed by chemicals and waste on ecosystem and human health, and (iv) to strive for solution-oriented assessments based on systems thinking. Based on multiple evidence on urgent action on a global scale, we call scientists and practitioners to mobilize their scientific networks and to intensify science-policy interaction with national governments to support the negotiations on the establishment of an intergovernmental body based on scientific knowledge explaining the anticipated benefit for human and environmental health.

Authors: Werner Brack, Damia Barcelo Culleres, Alistair B A Boxall, Hélène Budzinski, Sara Castiglioni, Adrian Covaci, Valeria Dulio, Beate I Escher, Peter Fantke, Faith Kandie, Despo Fatta-Kassinos, Félix J Hernández, Klara Hilscherová, Juliane Hollender, Henner Hollert, Annika Jahnke, Barbara Kasprzyk-Hordern, Stuart J Khan, Andreas Kortenkamp, Klaus Kümmerer, Brice Lalonde, Marja H Lamoree, Yves Levi, Pablo Antonio Lara Martín, Cassiana C Montagner, Christian Mougin, Titus Msagati, Jörg Oehlmann, Leo Posthuma, Malcolm Reid, Martin Reinhard, Susan D Richardson, Pawel Rostkowski, Emma Schymanski, Flurina Schneider, Jaroslav Slobodnik, Yasuyuki Shibata, Shane Allen Snyder, Fernando Fabriz Sodr , Ivana Teodorovic, Kevin V Thomas, Gisela A Umbuzeiro, Pham Hung Viet, Karina Gin Yew-Hoong, Xiaowei Zhang, Ettore Zuccato Full Source: Environmental sciences Europe 2022;34(1):21. doi: 10.1186/s12302-022-00602-6.

## Physiological Roles of Serotonin in Bivalves: Possible Interference by Environmental Chemicals Resulting in Neuroendocrine Disruption

2022-02-25

Contaminants of Emerging Concerns (CECs) are defined as chemicals not commonly monitored in aquatic ecosystems, but with the potential to cause adverse effects on biota. CECs include Endocrine Disrupting Chemicals (EDCs) and Neuro-Endocrine disruptors (NEDs) of vertebrates. However, most invertebrates only rely on neuroendocrine systems to maintain homeostatic processes. Although conserved neuroendocrine components have been characterized in ecologically relevant groups, limited knowledge on invertebrate neuroendocrinology makes it difficult to define EDCs and NEDs in most species. The monoamine serotonin

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(5-hydroxytryptamine, 5-HT) acts both as a neurotransmitter and as a peripheral hormone in mammals. In molluscs, 5-HT is involved in multiple physiological roles and molecular components of the serotonergic system have been identified. This review is focused on the effects of CECs on the serotonergic system of bivalve molluscs. Bivalves are widespread in all aquatic environments, estuarine and coastal areas in particular, where they are exposed to a variety of chemicals. In bivalves, 5-HT is involved in gametogenesis and spawning, oocyte maturation and sperm motility, regulates heart function, gill ciliary beating, mantle/siphon function, the "catch" state of smooth muscle and immune responses. Components of 5-HT transduction (receptors and signaling pathways) are being identified in several bivalve species. Different CECs have been shown to affect bivalve serotonergic system. This particularly applies to antidepressants, among the most commonly detected human pharmaceuticals in the aquatic environment. In particular, selective serotonin reuptake inhibitors (SSRIs) are frequently detected in seawater and in bivalve tissues. Information available on the effects and mechanisms of action of SSRIs on the serotonergic system of adult bivalves is summarized. Data are also reported on the effects of CECs on development of neuroendocrine pathways of early larval stages, in particular on the effects of model EDCs in the marine mussel *Mytilus galloprovincialis*. Overall, available data point at the serotonergic system as a sensitive target for neuroendocrine disruption in bivalves. The results contribute drawing Adverse Outcome Pathways (AOPs) for model EDCs and SSRIs in larvae and adults. However, basic research on neuroendocrine signaling is still needed to evaluate the potential impact of neuroendocrine disruptors in key invertebrate groups of aquatic ecosystems.

Authors: Laura Canesi, Angelica Miglioli, Teresa Balbi, Elena Fabbri  
Full Source: *Frontiers in endocrinology* 2022 Feb 25;13:792589. doi: 10.3389/fendo.2022.792589.

## ENVIRONMENTAL RESEARCH

## Association between ambient air pollution and blood sex hormones levels in men

2022-03-15

Concerns are growing over time on the adverse health effects of air pollution. However, the association between ambient air pollution and blood sex hormones in men is poorly understood. We included 72,917 men aged 20-55 years from February 2014 to December 2019 in Beijing, China in this study. Blood testosterone, follicle stimulating hormone,

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lutinizing hormone, estradiol, and prolactin levels of each participant were measured. We collected exposure data of daily ambient levels of particulate matter  $\leq 10 \mu\text{m}$  (PM10) and  $\leq 2.5 \mu\text{m}$  (PM2.5), nitrogen dioxide, sulfur dioxide (SO<sub>2</sub>), carbon monoxide, and ozone. Generalized linear mixed models were used to analyze the potential association between ambient air pollution exposure and blood sex hormone levels. The results showed that both immediate and short-term cumulative PM2.5, PM10, and SO<sub>2</sub> exposure was related to altered serum sex hormone levels in men, especially testosterone. An increase of 10  $\mu\text{g}/\text{m}^3$  in PM2.5 and PM10 in the current day was related to a 1.6% (95% confidence interval [CI]: 0.9%-2.3%) and 1.1% (95% CI: 0.5%-1.6%) decrease in testosterone, respectively, and a decreasing tendency of accumulated effects persisted within lag 0-30 days. The present study demonstrated that it is important to control ambient air pollution exposure to reduce effects on the reproductive health of men.

Authors: Pai Zheng, Zhangjian Chen, Jiaqi Shi, Yuting Xue, Yi Bai, Yulin Kang, Huiyu Xu, Guang Jia, Tiancheng Wang  
Full Source: *Environmental research* 2022 Mar 15;211:113117. doi: 10.1016/j.envres.2022.113117.

## PHARMACEUTICAL/TOXICOLOGY

## Effect of Time Since Smoking Cessation on Lung Cancer Incidence: An Occupational Cohort With 27 Follow-Up Years

2022-03-01

Background: This special cohort reveals the effect of smoking cessation in occupational miners exposed to radon and arsenic.

Methods: A total of 9,134 tin miners with at least 10 years of underground radon and arsenic exposure were enrolled beginning in 1992 and followed for up to 27 years. Detailed smoking information was collected at baseline, and information on smoking status was consecutively collected from 1992 to 1996. The Cox proportional hazards model was used to explore the relationship between time since smoking cessation and lung cancer. Results: A total of 1,324 lung cancer cases occurred in this cohort over 167,776 person-years of follow-up. Among populations exposed to radon and arsenic, miners after quitting smoking for 10 years or more had almost halved their lung cancer risk [adjusted hazard ratio (HR) = 0.55, 95% CI: 0.38-0.79], compared with current smokers. Among miners after quitting smoking for 5 years or more, lung cancer incidence approximately halved (HR = 0.52, 95% CI: 0.30-0.92) for squamous cell lung carcinoma, while it showed no significant decline

**Background:**  
This special cohort reveals the effect of smoking cessation in occupational miners exposed to radon and arsenic.

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for adenocarcinoma (HR = 0.79, 95% CI: 0.34-1.85). Conclusion: Smoking cessation for 10 years or more halved lung cancer incidence among miners exposed to radon and arsenic, and the benefit was more pronounced among squamous cell lung carcinoma.

Authors: Zheng Su, Xin-Hua Jia, Fang-Hui Zhao, Qing-Hua Zhou, Ya-Guang Fan, You-Lin Qiao

Full Source: *Frontiers in oncology* 2022 Mar 1;12:817045. doi: 10.3389/fonc.2022.817045.

### Status of disease prevalence, drugs and antibiotics usage in pond-based aquaculture at Narsingdi district, Bangladesh: A major public health concern and strategic appraisal for mitigation

2022-03-04

This research aimed to investigate the present status of disease prevalence and usage of aqua drugs for various aquaculture operations in the Narsingdi region of Bangladesh. Data were collected through the market survey, preset questionnaire interview, personal contact, and participatory rural appraisal tools. Amongst the respondents, the maximum percentages were found practicing mixed cultures of carp, tilapia, and pangas. The respondents suggested that epizootic ulcerative syndrome, saprolegniasis, streptococcosis, tail and fin rot and bacillary necrosis are common fish diseases in the area. About 140 drugs of different companies used in aquaculture for different purposes such as disease treatment, growth enhancement, water quality improvement, toxic gas removal, improvement of feed conversion ratio. Zeolite, rotenone, disinfectant, oxygen precursors, ammonia reducers, and probiotics were applied for pond preparation, water, and soil quality maintenance, while 30 different antibiotics were used for the purpose of treatment. Among the available antibiotics, oxytetracycline, ciprofloxacin, enrofloxacin, erythromycin, sulphadiazine, and trimethoprim were found extensively used by the fish farmers. Four enzymes and eighteen growth promoters were identified as being utilized to enhance digestion and boost up the production. This study elicited various issues connected with application and administration of such aqua chemicals, including farmers' ignorance about their usage, proper doses, application methods, withdrawal period, and the human health concerns associated with their irresponsible use. However, the consequences of these chemical products to the

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environment, animal health, and human health required further study for the betterment of mankind.

Authors: Md Abu Kawsar, Md Tariqul Alam, Debasish Pandit, Md Moshir Rahman, Mamun Mia, Anuradha Talukdar, Tofael Ahmed Sumon

Full Source: *Heliyon* 2022 Mar 4;8(3):e09060. doi: 10.1016/j.heliyon.2022.e09060.

## OCCUPATIONAL

### Evaluation of hematological indices among insecticides factory workers

2022-03-03

Insecticides are commonly used pesticides in the world. Chronic exposure to insecticides has adverse effects on various human body organs. In this study, hematological findings were assessed in workers in an insecticide manufacturing plant. Hematological parameters and clinical symptoms were recorded in 99 workers exposed to insecticides and 107 workers not exposed to them in a cross-sectional study. Assessment of the hematological results showed a higher prevalence of thrombocytosis in the exposed group than the non-exposed group ( $P < 0.05$ ). Mean white blood cell (WBC) and platelet counts, anisocytosis of red blood cells (RBCs), and neutrophils to lymphocytes ratio (NLR) were significantly higher in the exposed group compared to the non-exposed group ( $P < 0.05$ ). Prevalence rates of headache, itchy skin, cough, and sleep disorders were higher in the exposed group than in the non-exposed group ( $P < 0.05$ ). Chronic exposure to insecticides can alter hematological parameters in the normal range. Occupational exposure to insecticides may increase WBCs, platelet count, NLR, and red cell distribution width (RDW). It can also cause thrombocytosis. Complete blood count (CBC), as an inexpensive and accessible tool, can help monitor workers' health status exposed to insecticides properly.

Authors: Fatemeh Nejatifar, Mohammad Abdollahi, Mirsaeed Attarchi, Zahra Atrkar Roushan, Alireza Etemadi Deilami, Maryam Joshan, Fateme Rahattalab, Niloofar Faraji, Hamid Mohammadi Kojidi

Full Source: *Heliyon* 2022 Mar 3;8(3):e09040. doi: 10.1016/j.heliyon.2022.e09040.

Insecticides are commonly used pesticides in the world.

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## Tea Consumption is Associated with an Increased Risk of Hyperuricemia in an Occupational Population in Guangdong, China

2022-03-10

**Purpose:** Chronic hyperuricemia leads to long-term deposition of monosodium urate crystals that may damage the joint structure and affect quality of life. Although hyperuricemia prevalence varies, most studies indicate increased cases of hyperuricemia worldwide. The relationship between hyperuricemia and tea consumption is uncertain. This cross-sectional study investigated the effect of tea consumption on the risk of hyperuricemia in the working population in Guangdong, China.

**Patients and methods:** Data on weight, height, blood pressure, laboratory test results, and health questionnaire responses of 7644 adults aged  $\geq 18$  years were obtained from the health examinee dataset of Nanfang Hospital. The characteristics of subjects with and without hyperuricemia were compared using t-tests or non-parametric Mann-Whitney U-tests for continuous variables and chi-square tests for categorical variables. Relationships between hyperuricemia and participant characteristics (sex, age, education level, smoking history, alcohol consumption, hypertension, body mass index, tea consumption, and other dietary factors) were examined using univariate and multivariate logistic regression models to identify independent risk factors for hyperuricemia.

**Results:** Tea consumption was associated with a higher risk of hyperuricemia in the crude model (odds ratio [OR] 1.74, 95% confidence interval [CI] 1.48-2.05, once a month through twice a week vs never,  $P < 0.001$ ; OR 2.44, 95% CI 2.07-2.89,  $\geq 3$  times a week vs never,  $P < 0.001$ ). The adjusted OR for hyperuricemia was 1.30 (95% CI 1.08-1.56,  $P = 0.006$ ) in participants who consumed tea once a month through twice a week and 1.35 (95% CI 1.11-1.64,  $P = 0.003$ ) in those who consumed tea  $\geq 3$  times a week compared with the "never" reference group after adjusting for sociodemographic factors, anthropometric and biochemical indices, and dietary factors. This relationship remained significant in men but not women in subgroup analysis.

**Conclusion:** Tea consumption is an independent risk factor for hyperuricemia and is more pronounced in men than women.

**Authors:** Ruining Li, Lin Zeng, Chengkai Wu, Pengcheng Ma, Hao Cui, Liya Chen, Qimei Li, Chang Hong, Li Liu, Lushan Xiao, Wenyuan Li  
**Full Source:** International journal of general medicine 2022 Mar 10;15:2747-2757. doi: 10.2147/IJGM.S355253.

**Purpose:** Chronic hyperuricemia leads to long-term deposition of monosodium urate crystals that may damage the joint structure and affect quality of life.

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## Assessment and Mitigation of Exposure of 3-D Printer Emissions

2022-02-18

This study monitored particulates, and volatile organic compounds (VOCs) emitted from 3-D printers using acrylonitrile-butadiene-styrene copolymer (ABS) filaments at a workplace to assess exposure before and after introducing exposure mitigation measures. Air samples were collected in the printing room and adjacent corridor, and real-time measurements of ultrafine and fine particle were also conducted. Extensive physicochemical characterizations of 3-D printer emissions were performed, including real-time (size distribution, number concentration) nanoparticle characterization, size-fractionated mass distribution and concentration, as well as chemical composition for metals by ICP-MS and VOCs by GC-FID, real-time VOC monitors, and proton-transfer-reaction time-of-flight mass spectrometer (PTR-TOF-MS). Air sampling showed low levels of total suspended particulates (TSP, 9-12.5/m<sup>3</sup>), minimal levels (1.93-4 ppm) of total volatile organic chemicals (TVOC), and formaldehyde (2.5-21.7 ppb). Various harmful gases, such as formaldehyde, acrolein, acetone, hexane, styrene, toluene, and trimethylamine, were detected at concentrations in the 1-100 ppb by PTR-TOF-MS when air sample was collected into the Tedlar bag from the front of the 3-D printer. Ultrafine particles having an average particle size (30 nm count median diameter and 71 nm mass median diameter) increased during the 3-D printing operation. They decreased to the background level after the 3-D printing operation, while fine particles continually increased after the termination of 3-D printing to the next day morning. The exposure to 3-D printer emissions was greatly reduced after isolating 3-D printers in the enclosed space. Particle number concentration measured by real-time particle counters (DMAS and OPC) were greatly reduced after isolating 3-D printers to the isolated place.

**Authors:** Boowook Kim, Jae Hoo Shin, Hoi Pin Kim, Mi Seong Jo, Hee Sang Kim, Jong Sung Lee, Hong Ku Lee, Hyuk Cheol Kwon, Sung Gu Han, Noeul Kang, Mary Gulumian, Dhimiter Bello, Il Je Yu  
**Full Source:** Frontiers in toxicology 2022 Feb 18;3:817454. doi: 10.3389/ftox.2021.817454.

## Occupational Hazards of Orthopedic Surgery Exposures: Infection, Smoke, and Noise

2022-03-15

The orthopedic environment exposes surgeons and staff to infection, surgical smoke, and high levels of noise. It is helpful to understand how

This study monitored particulates, and volatile organic compounds (VOCs) emitted from 3-D printers using acrylonitrile-butadiene-styrene copolymer (ABS) filaments at a workplace to assess exposure before and after introducing exposure mitigation measures.

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exposure increases risk for adverse health consequences. Protective equipment, safety protocols, and instrument modification can reduce exposure to hazards. When modifications to practice are made, they must be evaluated to ensure they do not introduce new hazards or impede the use of instruments. Despite evidence of risk, protective measures are seldom employed in orthopedic practice. Wider implementation of protection for clinicians may not occur unless the same hazards are shown to impact patient outcomes.

Authors: David Kugelman, Campbell G Wepler, Cooper F Warren, Claudette M Lajam

Full Source: The Journal of arthroplasty 2022 Mar 15;S0883-5403(22)00315-1. doi: 10.1016/j.arth.2022.03.034.