

# Bulletin Board

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## CHEMICAL EFFECTS

**Aerosol, vapor, or chemicals? College student perceptions of harm from electronic cigarettes and support for a tobacco-free campus policy**

2020-09-15

This study is the first to examine the influence of e-cigarette emission phrasing on perceived harm of secondhand exposure, and whether harm perception was associated with support for a tobacco-free campus policy. Participants: In the fall 2018 and spring 2019 semesters, 52 sections of a college English course (N = 791 students) were cluster randomized to one of three conditions (“vapor,” “aerosol,” or “chemicals”) assessing harm of secondhand exposure to e-cigarette emissions. Methods: Regression models adjusted for demographic characteristics, tobacco use, and other potential confounders. Results: Compared to the “vapor” condition, “chemicals” and “aerosol” conditions were associated with increased odds of perceiving secondhand exposure to e-cigarettes to be harmful/very harmful (AOR = 2.0,  $p < 0.01$ ). Greater perceived harm of secondhand e-cigarette exposure was associated with increased odds of supporting a tobacco-free campus policy (AOR = 2.22,  $p < 0.001$ ). Conclusions: Health campaigns should use accurate terminology to describe e-cigarette emissions, rather than jargon that conveys lower risk.

Authors: Matthew E Rossheim, Xiaoquan Zhao, Eric K Soule, Dennis L Thombs, Sumihiro Suzuki, Asra Ahmad, Tracey E Barnett

Full Source: Journal of American college health : J of ACH 2020 Sep 15;1-7. doi: 10.1080/07448481.2020.1819293.

**Evaluating consumer exposure to disinfecting chemicals against coronavirus disease 2019 (COVID-19) and associated health risks**

2020-09-03

Disinfection of surfaces has been recommended as one of the most effective ways to combat the spread of novel coronavirus (SARS-CoV-2) that causes coronavirus disease 2019 (COVID-19). However, overexposure to disinfecting chemicals may lead to unintended human health risks. Here, using an indoor fate and chemical exposure model, we estimate human exposure to 22 disinfecting chemicals on the lists recommended by various governmental agencies against COVID-19, resulting from contact with disinfected surfaces and handwashing. Three near-field exposure routes, i.e., mouthing-mediated oral ingestion,

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inhalation, and dermal absorption, are considered to calculate the whole-body uptake doses and blood concentrations caused by single use per day for three age groups (3, 14, and 24-year-old). We also assess the health risks by comparing the predicted whole-body uptake doses with in vivo toxicological data and the predicted blood concentrations with in vitro bioactivity data. Our results indicate that both the total exposure and relative contribution of each exposure route vary considerably among the disinfecting chemicals due to their diverse physicochemical properties. 3-year-old children have consistent higher exposure than other age groups, especially in the scenario of contact with disinfected surfaces, due to their more frequent hand contact and mouthing activities. Due to the short duration of handwashing, we do not expect any health risk from the use of disinfecting chemicals in handwashing. In contrast, exposure from contact with disinfected surfaces may result in health risks for certain age groups especially children, even the surfaces are disinfected once a day. Interestingly, risk assessments based on whole-body uptake doses and in vivo toxicological data tend to give higher risk estimates than do those based on blood concentrations and in vitro bioactivity data. Our results reveal the most important exposure routes for disinfecting chemicals used in the indoor environment; they also highlight the need for more accurate data for both chemical properties and toxicity to better understand the risks associated with the increased use of disinfecting chemicals in the pandemic.

Authors: Dingsheng Li, Alessandro Sangion, Li Li

Full Source: Environment international 2020 Sep 3;145:106108. doi: 10.1016/j.envint.2020.106108.

**Lethal and sublethal toxicity of perfluorooctanoic acid (PFOA) in chronic tests with *Hyalella azteca* (amphipod) and early-life stage tests with *Pimephales promelas* (fathead minnow)**

2020-09-10

Perfluoroalkyl substances (PFAS), including perfluorooctanoic acid (PFOA), are industrial chemicals that are of concern due to their environmental presence, persistence, bioaccumulative potential, toxicity, and capacity for long-range transport. Despite a large body of research on environmental exposure, insufficient chronic aquatic toxicity data exist to develop water quality targets for clean-up of federal contaminated sites in Canada. Thus, our objective was to assess the aqueous toxicity of PFOA in chronic tests with *Hyalella azteca* (amphipod) and early-life stage tests with *Pimephales promelas* (fathead minnow). Toxicity data were analyzed based on

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measured PFOA concentrations. Amphipod exposures were 42 d (0.84-97 mg/L) and examined survival, growth, and reproduction. Fathead minnow exposures were 21 d (0.010-76 mg/L), which encompassed hatching (5 d) and larval stages until 16 d post-hatch; endpoints included hatching success, deformities at hatch, and larval survival and growth. Amphipod survival was significantly reduced at 97 mg/L (42-d LC50 = 51 mg/L), but growth and reproduction were more sensitive endpoints (42-d EC50 for both endpoints = 2.3 mg/L). Fathead minnows were less sensitive than amphipods, exhibiting no significant effects in all endpoints with the exception of uninflated swim bladder, which was significantly higher at 76 mg/L (15%) than controls (0%). Maximum concentrations of PFOA are generally in the ng/L range in global surface waters, but can reach the µg/L range in close proximity to major source inputs; therefore, environmental concentrations are well below those that caused toxicity in the current study. Our data will provide valuable information with which to assess the risk of PFOA at contaminated sites, and to set a target for site remediation.

Authors: Adrienne J Bartlett, Amila O De Silva, Daniel M Schissler, Amanda M Hedges, Lisa R Brown, Kallie Shires, Jason Miller, Cheryl Sullivan, Christine Spencer, Joanne L Parrott

Full Source: Ecotoxicology and environmental safety 2020 Sep 10;207:111250. doi: 10.1016/j.ecoenv.2020.111250.

## ENVIRONMENTAL RESEARCH

## Short-term effects of air pollution on cause-specific mental disorders in three subtropical Chinese cities

2020-09-15

Background: The effects of ambient air pollution on specific mental disorders are rarely studied, and the reported results are inconsistent.

Objective: To assess the short-term effect of ambient air pollution on the morbidity of mental disorders in three subtropical Chinese cities.

Methods: Daily concentrations of air pollution were averaged from 19 fixed monitoring stations across each city, and data on patients were collected from three psychiatric specialty hospitals. A time-series study combined with a generalized additive Poisson model was conducted to investigate the association between air pollution and mental disorders. The exposure-response relationships were explored and stratified analyses by age and sex were conducted.

Results: A total of 1,133,220 outpatient visits were recorded in three subtropical cities (Huizhou, Shenzhen, and Zhaoqing). The number of daily

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outpatient visits for mental disorders increased with higher air pollutant (PM2.5, PM10, SO2 and NO2) concentrations, and the effect of NO2 appeared to be consistently significant across the three cities, with excess risk (ER) of 4.45% (95% CI: 2.90%, 6.04%) in Huizhou, 7.94% (95% CI: 6.28%, 9.62%) in Shenzhen, and 2.19% (95% CI: 0.51%, 3.89%) in Zhaoqing, respectively, at lag03. We also observed significant effect of PM2.5 at lag0 (ER=1.20%, 95% CI: 0.28%, 2.13%), PM10 at lag0 (ER=0.99%, 95% CI: 0.36%, 1.62%), and SO2 at lag0 (ER=10.74%, 95% CI: 3.20%, 18.84%) in Shenzhen. For specific mental disorders, significant associations were found in all the air pollutants except between SO2 and affective disorder and between PM2.5 and schizophrenia. In addition, we found that air pollution exhibited stronger effects for males and adults (≥18 years).

Conclusion: Acute exposure to air pollution, especially NO2, might be an important trigger of mental disorders.

Authors: Huan Li, Shiyu Zhang, Zhengmin Min Qian, Xin-Hui Xie, Yang Luo, Rong Han, Jiesheng Hou, Chongjian Wang, Stephen Edward McMillin, Shaowei Wu, Fei Tian, Wen-Feng Deng, Hualiang Lin

Full Source: Environmental research 2020 Sep 15;110214. doi: 10.1016/j.envres.2020.110214.

## New directions in understanding the role of environmental contaminants in child development: Four themes

2020-09-13

Environmental contaminants, which include several heavy metals, persistent organic pollutants, and other harmful chemicals, impair several domains of child development. This article describes four themes from recent research on the impact of environmental contaminants on child development. The first theme, disparities in exposure, focuses on how marginalized communities are disproportionately exposed to harmful environmental contaminants. The second theme, complexity of exposures, encapsulates recent emphases on timing of exposures and mixtures of multiple exposures. The third theme, mechanisms that link exposures to outcomes, focuses on processes that elucidate how contaminants impact outcomes. The fourth theme, mitigating risks associated with exposures, sheds light on potential protective factors that could ameliorate many of the harmful effects of contaminant exposures. Developmental scientists are well positioned to contribute to interdisciplinary research that addresses these themes, which could foster additional conceptual and

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empirical innovations and inform policies and practices to mitigate risks and improve children's well-being.

Authors: Christopher J Trentacosta, Daniel J Mulligan

Full Source: New directions for child and adolescent development 2020

Sep 13. doi: 10.1002/cad.20363.

### 20th Pollutant Responses in Marine Organisms (PRIMO 20): Global issues and fundamental mechanisms caused by pollutant stress in marine and freshwater organisms

2020-09-05

The 20th Pollutant Responses in Marine Organisms (PRIMO 20) conference provided a forum for scientists from around the world to communicate novel toxicological research findings specifically focused on aquatic organisms, by combining applied and basic research at the intersection of environmental and mechanistic toxicology. The work highlighted in this special issue of Aquatic Toxicology, a special issue of Marine Environmental Research, and presented through posters and presentations, encompass important and emerging topics in freshwater and marine toxicology. This includes multiple types of emerging contaminants including microplastics and UV filtering chemicals. Other studies aimed to further our understanding of the effects of endocrine disrupting chemicals, pharmaceuticals, and personal care products. Further research presented in this virtual issue examined the interactive effects of chemicals and pathogens, while the final set of manuscripts demonstrates continuing efforts to combine traditional biomonitoring, data from -omic technologies, and modeling for use in risk assessment and management. An additional goal of PRIMO meetings is to address the link between environmental and human health. Several articles in this issue of Aquatic Toxicology describe the appropriateness of using aquatic organisms as models for human health, while the keynote speakers, as described in the editorial below, presented research that highlighted bioaccumulation of contaminants such as PFOS and mercury from fish to marine mammals and coastal human populations such as the Gullah/GeeChee near Charleston, South Carolina, USA.

Authors: William S Baldwin, Lisa J Bain, Richard Di Giulio, Seth Kullman, Charles D Rice, Amy H Ringwood, Peter van den Hurk

Full Source: Aquatic toxicology (Amsterdam, Netherlands) 2020 Sep 5;227:105620. doi: 10.1016/j.aquatox.2020.105620.

The 20th Pollutant Responses in Marine Organisms (PRIMO 20) conference provided a forum for scientists from around the world to communicate novel toxicological research findings specifically focused on aquatic organisms, by combining applied and basic research at the intersection of environmental and mechanistic toxicology.

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## OCCUPATIONAL

### Prevalence of exposure to multiple occupational carcinogens among exposed workers in Australia

2020-09-18

Objectives: Workers can be exposed to a range of different carcinogenic agents in the workplace. However, previous studies have often focused on prevalence of exposure to a single carcinogen, resulting in substantial knowledge gaps regarding the extent of multiple exposures in the workplace. This study aims to investigate the current prevalence of occupational exposure to multiple carcinogens among exposed workers in Australia.

Methods: The data for this study come from the Australian Work Exposures Study, a nationwide cross-sectional telephone survey of Australian workers aged between 18 and 65. Information was collected about the respondents' current employment and numerous demographic factors using a web-based application (Occupational Integrated Database Exposure Assessment System) to conduct the interview, with predefined algorithms used to automatically assign exposures to carcinogens based on the respondents' job tasks. Results: The majority (81%) of exposed respondents were assessed as being probably exposed to more than one carcinogen, and 26% reported exposure to five or more carcinogens. We found that after adjusting for occupation, exposure to multiple carcinogens was more likely among male respondents, while older workers (aged between 55 and 65) were less likely to be exposed to multiple carcinogens.

Conclusions: This study provides information on the prevalence of exposure to multiple carcinogens in the general population that has not previously been reported. This information could be useful for the intervention and control of occupational exposures to the prioritised carcinogens identified in this study.

Authors: Jennifer F McKenzie, Sonia El-Zaemey, Renee N Carey

Full Source: Occupational and environmental medicine 2020 Sep 18;oemed-2020-106629. doi: 10.1136/oemed-2020-106629.

Objectives: Workers can be exposed to a range of different carcinogenic agents in the workplace.

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**Respiratory outcomes among refinery workers exposed to inspirable alumina dust: A longitudinal study in Western Australia**

2020-09-17

Background: Information is scarce about the occupational health effects of exposure to alumina dust. This study examines the respiratory effects of inspirable alumina dust exposure in alumina refineries.

Methods: An inception cohort study at three alumina refineries in Western Australia recruited 416 participants (351 males, 65 females) between 1995 and 2000 who were followed up annually until 2008 or until exit from study. At each health interview a respiratory questionnaire and lung function test was undertaken, measuring forced expiratory volume in one second (FEV1) and forced vital capacity (FVC). Participants provided job histories which were combined with air monitoring data to calculate cumulative exposure to inspirable alumina dust (mg/m<sup>3</sup>-years). Generalized estimating equations with Poisson distribution and mixed effects models were used to examine the effects of alumina exposure.

Results: The number of exposed participants was relatively small (n = 82, 19.7%). There was no association between alumina dust exposure and prevalence of cough, wheeze or rhinitis. No associations were found between measures of lung function and tertiles of alumina exposure in the first two follow-ups, or the whole follow-up period, though there was a suggestive dose-response trend across exposed groups for decline in absolute FEV1 (p for trend = .06). For mean annual change in FEV1 and FVC based on the first three follow-ups it was not possible to rule out an effect above a threshold level of exposure. Conclusion: There is no evidence of an association between exposure to alumina and the reporting of respiratory symptoms but some evidence for an effect on lung function.

Authors: Anthony Del Monaco, Stella M Gwini, Sarah Kelly, Nicholas de Klerk, Geza Benke, Martine Dennekamp, Lin Fritschi, Christina Dimitriadis, Arthur William Bill Musk, Michael J Abramson, Malcolm R Sim

Full Source: American journal of industrial medicine 2020 Sep 17. doi: 10.1002/ajim.23182.

**Background: Information is scarce about the occupational health effects of exposure to alumina dust.**

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**PHARMACEUTICAL/TOXICOLOGY****Drug use disorder following early life exposure to tetrachloroethylene (PCE)-contaminated drinking water: a retrospective cohort study**

2020-09-17

Background: Many studies of adults with occupational exposure to solvents such as tetrachloroethylene (PCE) have shown adverse effects on cognition, mood and behavioral problems. Much less is known about neurotoxic effects in early life at lower exposure levels seen in community settings. We recently reported that illicit drug use was more frequent among adults from Cape Cod, Massachusetts who were exposed to PCE-contaminated drinking water during gestation and early childhood than their unexposed counterparts. Using newly collected data from this population-based retrospective cohort study, the current analysis examines whether early life PCE exposure is also associated with drug use disorder over the life course.

Methods: Three-hundred and sixty-three subjects with prenatal and early childhood PCE exposure and 255 unexposed subjects were studied. These individuals (median age: 40-41 years) completed self-administered questionnaires on the eleven established diagnostic criteria for drug use disorder and confounding variables. A validated leaching and transport model was used to estimate exposure to PCE-contaminated water. Results: Overall, 23.3% of subjects reported having at least one criterion for drug use disorder over their lifetime. Early life PCE exposure was associated with a modest increase in the lifetime presence of one or more diagnostic criteria for drug use disorder (adjusted RR: 1.4, 95% CI: 1.0-1.8). Compared to unexposed subjects, PCE-exposed subjects were more likely to report having most diagnostic criteria of drug use disorder, including neglecting major roles due to drug use, physical and psychological problems related to drug use, and giving up activities due to drug use. No dose-response relationships were observed with increasing levels of PCE exposure.

Conclusions: These results suggest that exposure to PCE-contaminated drinking water during early life modestly increases the risk of developing diagnostic criteria for drug use disorder later in life. Because this study has several limitations, these findings should be confirmed in follow-up

**Background: Many studies of adults with occupational exposure to solvents such as tetrachloroethylene (PCE) have shown adverse effects on cognition, mood and behavioral problems.**

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investigations of other exposed populations with more diverse racial and socioeconomic characteristics.

Authors: Ann Aschengrau, Alexandra Grippo, Michael R Winter, Margaret G Shea, Roberta F White, Richard Saitz

Full Source: Environmental health : a global access science source 2020 Sep 17;19(1):99. doi: 10.1186/s12940-020-00638-2.

### Human biomonitoring of per- and polyfluoroalkyl substances in German blood plasma samples from 1982 to 2019

2020-09-17

The findings of per- and polyfluoroalkyl substances (PFAS) in humans and the environment all over the world have raised concerns and public awareness for this group of man-made chemicals. In the last three decades, this led to different regulatory restrictions for specific PFAS as well as shifts in the production and usage of these substances. In this study, we analyzed the PFAS levels of 100 human blood plasma samples collected from 2009 to 2019 for the German Environmental Specimen Bank (ESB) to further elucidate the time course of exposure towards this substance group as shown by Schröter-Kermani et al., (2013) with samples from 1982 to 2010. A spectrum of 37 PFAS, including perfluorocarboxylic (PFCA) and -sulfonic acids (PFSA) as well as potential precursors and substitutes like ADONA, GenX or F-53B was analyzed by UHPLC coupled with high-resolution mass spectrometry. Validation was successful for 33 of the substances. The two legacy substances perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) were detected in every sample of the 2009-2019 dataset and showed the highest concentrations with ranges of 0.27-14.0 ng/mL and 1.21-14.1 ng/mL, respectively. A significant portion of total PFOS analytes was present as branched isomers (mean:  $34 \pm 7\%$ ). High detection frequencies of 95% and 82% were also found for perfluorohexane sulfonic acid (PFHxS) and perfluorononanoic acid (PFNA), respectively, but in lower concentrations (PFHxS: <LOQ - 4.62 ng/mL; PFNA: <LOQ - 3.66 ng/mL) than PFOA and PFOS. Besides other PFCA and PFSA only 8:2 fluorotelomer sulfonic acid (8:2 FtS) and N-methyl perfluorooctane sulfonamidoacetic acid were detected in very few samples. In combination with the previous results from 1982 to 2010, declining temporal trends were observed for all PFAS (PFOA, PFNA, PFHxS, and PFOS) frequently detected in the ESB samples. The results of this study indicate a decrease in human exposure to known PFAS in Germany over the last three decades

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and emphasize the importance of long-term human biomonitoring studies for investigating the effects of chemical regulation.

Authors: Bernd Göckener, Till Weber, Heinz Rüdell, Mark Bücking, Marika Kolossa-Gehring

Full Source: Environment international 2020 Sep 17;145:106123. doi: 10.1016/j.envint.2020.106123.