CHEMWATCH

Bulletin Board

Contents

FEB. 10, 2023

(click on page numbers for links)

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CHEMICAL EFFECTS

Silver contamination and its toxicity and risk management in terrestrial and aquatic ecosystems

2023-02-02

Silver (Ag), a naturally occurring, rare and precious metal, is found in major minerals such as cerargyrite (AgCl), pyrargyrite (Ag3SbS3), proustite (Ag3AsS3), and stephanite (Ag5SbS4). From these minerals, Ag is released into soil and water through the weathering of rocks and mining activities. Silver also enters the environment by manufacturing and using Ag compounds in electroplating and photography, catalysts, medical devices, and batteries. With >400 t of Ag NPs produced yearly, Ag NPs have become a rapidly growing source of anthropogenic Ag input in the environment. In soils and natural waters, most Ag is sorbed to soil particles and sediments and precipitated as oxides, carbonates, sulphides, chlorides and hydroxides. Silver and its compounds are toxic, and humans and other animals are exposed to Ag through inhalation of air and the consumption of Ag-contaminated food and drinking water. Remediation of Ag-contaminated soil and water sources can be achieved through immobilization and mobilization processes. Immobilization of Ag in soil and groundwater reduces the bioavailability and mobility of Ag, while mobilization of Ag in the soil can facilitate its removal. This review provides an overview of the current understanding of the sources, geochemistry, health hazards, remediation practices and regulatory mandates of Ag contamination in complex environmental settings, including soil and aquatic ecosystems. Knowledge gaps and future research priorities in the sustainable management of Ag contamination in these settings are also discussed.

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Authors: Lokesh P Padhye, Tahereh Jasemizad, Shiv Bolan, Olga V Tsyusko, Jason M Unrine, Basanta Kumar Biswal, Rajasekhar Balasubramanian, Yingyu Zhang, Tao Zhang, Jian Zhao, Yang Li, Jörg Rinklebe, Hailong Wang, Kadambot H M Siddique, Nanthi Bolan

Full Source: The Science of the total environment 2023 Feb 2;161926. doi: 10.1016/j.scitotenv.2023.161926.

CHEMWATCH
Bulletin Board
Technical
FEB. 10, 2023

Individual blood concentrations of persistent organic pollutants and chemical elements, and COVID-19: A prospective cohort study in Barcelona

2023-02-03

Background: There is wide, largely unexplained heterogeneity in immunological and clinical responses to SARS-CoV-2 infection. Numerous environmental chemicals, such as persistent organic pollutants (POPs) and chemical elements (including some metals, essential trace elements, rare earth elements, and minority elements), are immunomodulatory and cause a range of adverse clinical events. There are no prospective studies on the effects of such substances on the incidence of SARS-CoV-2 infection and COVID-19.

Objective: To investigate the influence of blood concentrations of POPs and elements measured several years before the pandemic on the development of SARS-CoV-2 infection and COVID-19 in individuals from the general population.

Methods: We conducted a prospective cohort study in 154 individuals from the general population of Barcelona. POPs and elements were measured in blood samples collected in 2016-2017. SARS-CoV-2 infection was detected by rRT-PCR in nasopharyngeal swabs and/or by antibody serology using eighteen isotype-antigen combinations measured in blood samples collected in 2020-2021. We analyzed the associations between concentrations of the contaminants and SARS-CoV-2 infection and development of COVID-19, taking into account personal habits and living conditions during the pandemic.

Results: Several historically prevalent POPs, as well as arsenic, cadmium, mercury, and zinc, were not associated with COVID-19, nor with SARS-CoV-2 infection. However, DDE (adjusted OR = 5.0 [95% CI: 1.2-21]), lead (3.9 [1.0-15]), thallium (3.4 [1.0-11]), and ruthenium (5.0 [1.8-14]) were associated with COVID-19, as were tantalum, benzo(b)fluoranthene, DDD, and manganese. Thallium (3.8 [1.6-8.9]), and ruthenium (2.9 [1.3-6.7]) were associated with SARS-CoV-2 infection, and so were lead, gold, and (protectively) iron and selenium. We identified mixtures of up to five substances from several chemical groups, with all substances independently associated to the outcomes.

Conclusions: Our results provide the first prospective and population-based evidence of an association between individual concentrations of some contaminants and COVID-19 and SARS-CoV-2 infection. POPs and elements may contribute to explain the heterogeneity in the development of SARS-CoV-2 infection and COVID-19 in the general population. If the

Background: There is wide, largely unexplained heterogeneity in immunological and clinical responses to SARS-CoV-2 infection.

associations are confirmed as causal, means are available to mitigate the corresponding risks.
Authors: Miquel Porta, José Pumarega, Magda Gasull, Ruth Aguilar, Luis A Henríquez-Hernández, Xavier Basagaña, Manuel Zumbado, Judith Villar, Cristina Rius, Sneha Mehta, Marta Vidal, Alfons Jimenez, Laura Campi, Joan Lop, Octavio L Pérez Luzardo, Carlota Dobaño, Gemma Moncunill
Full Source: Environmental research 2023 Feb 3;115419. doi: 10.1016/j.envres.2023.115419.

ENVIRONMENTAL RESEARCH

Urban particulate air pollution linked to dyslipidemia by modification innate immune cells

2023-02-03
Air particulate matter (PM) is an essential risk factor for lipid metabolism disorders. However, the underlying mechanism remains unclear. In this cross-sectional study, 216 healthcare workers were recruited to estimate the associations among the daily exposure dose (DED) of air PM, innate immune cells, and plasma lipid levels. All participants were divided into two groups according to the air particulate combined DED (DED-PMC). The peripheral white blood cell counts, lymphocyte counts, and monocyte counts and percentages were higher in the higher-exposure group (HEG) than in the lower-exposure group (LEG), whereas the percentage of natural-killer cells was lower in the HEG than in the LEG. The plasma concentrations of the total cholesterol, triglycerides, LDL-C, and apolipoprotein B were higher in the HEG than in the LEG, whereas the HDL-C and apolipoprotein A1 were lower in the HEG than in the LEG. A dose-effect analysis indicated that when the DED of the air PM increased, there were increased peripheral monocyte counts and percentages, a decreased NK cell percentage, elevated plasma concentrations of total cholesterol, triglycerides, LDL-C, and apolipoprotein B, and reduced plasma levels of HDL-C and apolipoprotein A1. In addition, the modification of the innate immune cells was accompanied by alterations in the plasma lipid levels in a dose-dependent manner. Mediation effect analysis suggested innate immune cells were the potential mediators for the associations among air PM exposure on abnormal lipid metabolism. These results indicated that chronic exposure to air PM may disturb lipid

Air particulate matter (PM) is an essential risk factor for lipid metabolism disorders.

CHEMWATCH
Bulletin Board
Technical
FEB. 10, 2023

metabolism by altering the distribution of innate immune cells in the peripheral blood, ultimately advancing cardiovascular disease risk.
Authors: Shaocheng Zhang, Juan Hu, Guangjun Xiao, Shu Chen, Huanhuan Wang
Full Source: Chemosphere 2023 Feb 3;138040. doi: 10.1016/j.chemosphere.2023.138040.

Characterization of Polycyclic Aromatic Hydrocarbons (PAHs) associated with fine aerosols in ambient atmosphere of high-altitude urban environment in Sikkim Himalaya

2023-02-03
Polycyclic Aromatic Hydrocarbons (PAHs) compounds are ubiquitous in ambient air due to their persistence, carcinogenicity, and mutagenicity. Gangtok being one of the cleanest cities in India located in Eastern Himalayan region, witnesses high developmental activities with enhanced urbanization affecting the ambient air quality. The present study aims to measure PM2.5 and PAHs in the ambient atmosphere of the Sikkim Himalaya to understand the influence of natural and anthropogenic activities on aerosol loading and their chemical characteristics. The PM2.5 samples were collected and analysed for the duration from Jan 2020 to Feb 2021.The seasonal mean concentrations of PM2.5 and PAHs were observed to be high during autumn and low during summer season. Overall, the annual mean concentration of PM2.5 was found higher than the prescribed limit of World Health Organization and National Ambient Air Quality Standards. The concentration of the 16 individual PAHs were found to be highest during autumn season (55.26 ± 37.15 ng/m3). Among the different PAHs, the annual mean concentration of fluorene (3.29 ± 4.07 ng/m3) and naphthalene (1.15 ± 3.76 ng/m3) were found to be the highest and lowest, respectively. The Molecular Diagnostic Ratio (MDR) test reveals higher contribution from heavy traffic activities throughout the winter and autumn seasons. The other possible sources identified over the region are fossil fuel combustion, and biomass burning. The multivariate statistical analysis (Multifactor Principal Component Analysis) also indicates a strong association between PM2.5 /PAHs and meteorological variables across the region in different seasons. The precipitation and wind pattern during the study period suggests that major contribution of the PM2.5 and PAHs were from local sources, with minimal contribution from long-range transport. The findings are important for comprehending the trends of

Polycyclic Aromatic Hydrocarbons (PAHs) compounds are ubiquitous in ambient air due to their persistence, carcinogenicity, and mutagenicity.

PAH accumulation over a high-altitude urban area, and for developing sustainable air quality control methods in the Himalayan region.
Authors: Khushboo Sharma, Pramod Kumar, Jayant Sharma, Satkar Deep Thapa, Aparna Gupta, Rajeev Rajak, Bidyutjyoti Baruah, Amit Prakash, Rakesh Kumar Ranjan
Full Source: The Science of the total environment 2023 Feb 3;161987. doi: 10.1016/j.scitotenv.2023.161987.

PHARMACEUTICAL/TOXICOLOGY

Results of the Austrian Children's Biomonitoring Survey 2020 part A: Per- and polyfluorinated alkylated substances, bisphenols, parabens and other xenobiotics

2023-02-02
In 85 Austrian school children aged 6-10 years, two multi-analyte LC-MS/MS methods were used to study the concentrations of 33 chemical substances in urine, including per- and polyfluorinated alkylated substances (PFAS), bisphenols, parabens, benzophenones, triclosan, polycyclic aromatic hydrocarbon metabolites, and cotinine. Each of the children was exposed to 14-21 substances simultaneously. Correlations were found between compounds of the same and of divergent substance groups supporting the strong need to consider multiple exposures and mixture effects. Eight compounds, including perfluorohexanoic acid (PFHxA), perfluorononanoic acid (PFOA), methyl paraben (n-MeP), ethyl paraben (n-EtP), propyl paraben (n-PrP), benzophenone-1 (BP-1), 2-naphthol, and 3-hydroxyphenanthrene were detected in all urine samples. In the PFAS group the medians of detectable substances ranged between <0.0005 µg/l for perfluorononanoic acid (PFNA) and 0.004 µg/l for PFHxA. For other environmental contaminants investigated, a maximum urinary level of 893 µg/l was identified for n-MeP. The highest median value was 2.5 µg/l for 2-naphthol. Daily intakes were calculated for bisphenol A (BPA), triclosan (TCS), and four parabens. These values did not exceed the tolerable or acceptable daily intakes currently in force. Based on a recently proposed TDI for BPA, daily intakes of all children exceeded this value. A cumulative risk assessment was conducted for four parabens not showing exceedances of acceptable exposures. The results demonstrate simultaneous exposure to several different chemicals, with the majority showing impact on the endocrine system being of particular concern with respect to mixture effects. Further assessments with a stronger focus on mixtures are warranted. The results also highlight

In 85 Austrian school children aged 6-10 years, two multi-analyte LC-MS/MS methods were used to study the concentrations of 33 chemical substances in urine, including per- and polyfluorinated alkylated substances (PFAS), bisphenols, parabens, benzo-phenones, triclosan, polycyclic aromatic hydrocarbon metabo-lites, and cotinine.

CHEMWATCH
Bulletin Board
Technical
FEB. 10, 2023

the need of policy actions as foreseen in the EU Chemicals Strategy for Sustainability.
Authors: Christina Hartmann, Thomas Jamnik, Stefan Weiss, Martina Göß, Yasmin Fareed, Vito Satrapa, Dominik Braun, Mira Flasch, Benedikt Warth, Maria Uhl
Full Source: International journal of hygiene and environmental health 2023 Feb 2;249:114123. doi: 10.1016/j.ijheh.2023.114123.

Long-term exposure to fine particulate matter and site-specific cancer mortality: A difference-in-differences analysis in Jiangsu province, China

2023-01-31
Background: Accumulating studies have reported that chronic exposure to ambient fine particulate matter (PM2.5) can lead to adverse effects on lung cancer mortality; however, such chronic effects are less clear for mortality from other site-specific cancers.
Objective: To explore the causal effect of long-term PM2.5 exposure on mortality from all-site and a variety of site-specific cancers in Jiangsu province, China during 2015-2020 using a difference-in-differences analysis.
Methods: For each of 53 county-based spatial units in Jiangsu province, we calculated annual death counts for all-site cancer and 23 site-specific cancers. Using a validated high-resolution PM2.5 grid dataset, long-term PM2.5 exposure of a spatial unit within a given year was evaluated as the average of population-weighted annual concentrations during recent 10 years. Conditional Poisson regression models were employed to evaluate exposure-response associations adjusting for spatial and temporal variables, seasonal temperatures, relative humidity, and gross domestic product (GDP).
Results: During the study period, we identified 947,337 adult cancer deaths in Jiangsu province. Each 1 µg/m3 increment in PM2.5 exposure was significantly associated with a 2.7% increase in the risk of all-site cancer mortality. PM2.5-mortality associations were also observed in cancer of lip, oral cavity and pharynx, stomach, colorectum, pancreas, lung, bone and joints, ovary, prostate, and lymphoma (all adjusted $P < 0.05$), with the relative risks ranging from 1.028 (95% confidence interval [CI]: 1.011, 1.046) for stomach cancer to 1.201 (95% CI: 1.120, 1.308) for bone and joints cancers. Exposure-response curves showed that these associations were close to linearity, though most of them had increasing slopes at high exposure levels. Overall, women and subjects in low GDP regions were more vulnerable to PM2.5 exposures.

Background: Accu-mulating studies have reported that chronic exposure to ambient fine particulate matter (PM2.5) can lead to adverse effects on lung cancer mortality; however, such chronic effects are less clear for mortality from other site-specific cancers.

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Conclusions: Long-term exposure to ambient PM2.5 contributes to a higher risk of mortality from multiple site-specific cancers.
Authors: Zhaoyu Fan, Yingxin Li, Jing Wei, Gongbo Chen, Rui Wang, Ruijun Xu, Tingting Liu, Ziquan Lv, Suli Huang, Hong Sun, Yuewei Liu
Full Source: Environmental research 2023 Jan 31;115405. doi: 10.1016/j.envres.2023.115405.

Paternal occupational exposures and infant congenital heart defects in the Japan Environment and Children's Study

2023
Background: Few prospective studies have investigated the association between paternal occupational exposures and risk of infant congenital heart defects (CHDs). We investigated the associations between paternal occupational exposures, frequency of use, and concurrent or sequential exposure to a mixture of compounds and the risk of infant CHDs.
Methods: Our study examined 28,866 participants in the Japan Environment and Children's Study. Logistic regression analysis was used to estimate odds ratios (ORs) and 95% confidence intervals (CIs) associated with paternal occupational exposures during the 3 months until pregnancy was noticed after adjustment for potential confounding factors of the infant CHDs. CHD diagnosis was ascertained from medical record.
Results: In total, 175 were diagnosed with infant CHDs. The number of fathers who were exposed to the following substances at least once a month were: 11,533 for photo copying machine/laser printer, 10,326 for permanent marker, 8,226 for soluble paint/inkjet printer, 6,188 for kerosene/petroleum/benzene/gasoline, 4,173 for organic solvents, 3,433 for chlorine bleach/germicide, 2,962 for engine oil, 2,931 for insecticide, 2,460 for medical sterilizing disinfectant, 1,786 for welding fumes, 1,614 for dyestuffs, 1,247 for any products containing lead-like solder, 986 for herbicide, 919 for radiation/radioactive substances/isotopes, 837 for lead-free solder, 341 for microbes, 319 for formalin/formaldehyde, 301 for agricultural chemical not listed above or unidentified, 196 for general anesthetic for surgery at hospital, 171 for anti-cancer drug, 147 for chromium/arsenic/cadmium, 88 for mercury and 833 for other chemical substances. Paternal occupational exposure regularly to photo copying machine or laser printer and soluble paint/inkjet printer were associated with higher risks of infant CHDs: the adjusted ORs (95%CIs) were 1.38 (1.00-1.91) and 1.60 (1.08-2.37), respectively. The higher risks were also observed for occasional exposure to engine oil, any products containing lead-like solder lead-free solder, and microbes; the adjusted ORs (95%CIs)

Background: Few prospective studies have investigated the association between paternal occupational exposures and risk of infant congenital heart defects (CHDs).

CHEMWATCH
Bulletin Board
Technical
FEB. 10, 2023

were 1.68 (1.02-2.77), 2.03 (1.06-3.88), 3.45 (1.85-6.43), and 4.51, (1.63-12.49), respectively.
Conclusions: Periconceptional paternal occupational exposure was associated with a higher risk of infant CHDs. Further studies using biomarkers of the association between paternal occupational exposure and infant CHDs are warranted.
Authors: Mina Hayama-Terada, Yuri Aochi, Satoyo Ikehara, Takashi Kimura, Kazumasa Yamagishi, Takuyo Sato, Hiroyasu Iso
Full Source: Environmental health and preventive medicine 2023;28:12. doi: 10.1265/ehpm.22-00202.

OCCUPATIONAL

Occurrence of emerging bisphenol S analogues in urine from five occupational populations in South China

2023-01-24
Bisphenol S (BPS) and its 11 emerging analogues were investigated in 325 urine samples from five occupational populations in South China. Besides BPS, ten emerging BPS analogues were newly identified and detected in the urine. It should be noted that urinary concentrations of dominant BPS analogues of 2,4′-bis(hydroxyphenyl)sulfone (2,4-BPS), bis(3-allyl-4-hydroxyphenyl)sulfone (TGSA) and diphenylsulfone (DPS) were 1.1-2.3 times higher than that of BPS, with overall detection frequencies at 74-91 %. The median sum concentrations of the target 12 bisphenols (ng/mL) were found highest in urine from cashiers (1.12), followed by water plant staffs (0.994), teachers (0.552), doctors (0.408) and power plant staffs (0.333). The composition profile of the urinary dominant bisphenols was occupational-dependent, with 2,4-BPS accounting for 45-73 % in cashiers and power plant staffs, and with DPS and TGSA for 74-82 % among doctors, teachers and water plant staffs. Significant correlations were found among the most frequently detected bisphenols in cashiers, indicating their common application and emission pathways. The median exposures based on estimated daily intakes (EDIs, ng/kg bw/day) for the 12 bisphenols in cashiers and water plant staffs (31.6-35.6) were 1.8-3.4 times higher than those of teachers, doctors and power plant staffs (10.6-17.5). This is the first study to identify multiple emerging BPS analogues in

Bisphenol S (BPS) and its 11 emerging analogues were investigated in 325 urine samples from five occupational populations in South China.

urine from occupational populations, especially cashiers and water plant staffs.
Authors: Yanan Pan, Liqiao Han, Xiang Chen, Xin Wei, Xiaoyue Zhou, Dingshan Liang, Renli Yin, Xiaoyang Jiao, Huashou Li, Adela Jing Li, Rongliang Qiu
Full Source: Environment international 2023 Jan 24;172:107773. doi: 10.1016/j.envint.2023.107773.

Nosocomial transmission of mpox virus to healthcare workers -an emerging occupational hazard - a case report and review of the literature

2023-02-01
We present an unusual case of mpox(monkeypox) virus transmission to a dermatology resident during examination of affected patients. Viral DNA sequencing led to the identification of the most likely contact. This case, along with a review of all published cases so far, emphasizes the possible hazard of mpox transmission to healthcare personnel, even when wearing personal protective equipment. It also emphasizes the need for maintaining high index of suspicion when examining patients with new dermatological lesions and strict compliance with the revised Centers for Disease Control and Prevention recommendations for specimen collection from such patients.
Authors: Ari Safir, Margarita Safir, Oryan Henig, Meital Nahari, Ora Halutz, Katia Levytskyi, Michal Mizrahi, Michal Yakubovsky, Amos Adler, Ronen Ben-Ami, Eli Sprecher, Michal Dekel
Full Source: American journal of infection control 2023 Feb 1;S0196-6553(23)00046-9. doi: 10.1016/j.ajic.2023.01.006.

We present an unusual case of mpox(monkeypox) virus transmission to a dermatology resident during examination of affected patients.

Polybrominated diphenyl ethers and bromophenols in paired serum, hair, and urine samples of e-waste dismantlers: Insights into hair as an indicator of endogenous exposure

2023-02-02
Polybrominated diphenyl ethers (PBDEs) are important pollutants during dismantling activities of electronic waste (e-waste) in China due to its large production and usage. Bromophenols (BPs), which are a kind of flame retardants and diphenyl ether bond cleavage metabolites of PBDEs, are often neglected in the assessment of human exposure to e-waste. Herein, 22 PBDEs and 19 BPs were determined in paired serum, hair, and urine samples collected from workers and residents of a typical e-waste dismantling site in southern China. Both PBDE and BP congeners were more frequently detected in hair than serum and urine samples. The medians of ΣPBDEs and ΣBPs were 350 and 547 ng/g dw in hair internal (hair-In) of occupational population, respectively, which were significantly higher than non-occupational population. However, a non-significant difference was found in levels of ΣPBDEs and ΣBPs in serum and urine between occupational and non-occupational populations, suggesting that hair analysis could easily differentiate between the exposure intensities of PBDEs and BPs to populations than serum and urine analyses. Moreover, levels of BPs in hair-In were 1-2 orders of magnitude higher than those in hair external (hair-Ex), while a non-significant difference was found in the levels of PBDEs. This result indicated that BPs might have originated from endogenous contribution. Notably, as the predominant congeners, the level of 2,4,6-tribromophenol (2,4,6-TBP) in hair-In was 3-8 times higher than that of BDE-209, while level of 2,4,6-TBP in hair-Ex was 1-3 times lower than that of BDE-209. Furthermore, in vivo experiments performed on Sprague-Dawley rats following a 28-day oral treatment with BDE-209 and 2,4,6-TBP verified that endogenous accumulation of 2,4,6-TBP in hair could be attributed to the metabolism of BDE-209 and exposure to 2,4,6-TBP. In conclusion, compared with PBDEs, biomonitoring phenolic compounds or metabolites with hair could better reflect human endogenous exposure.
Authors: Meiqing Lin, Shengtao Ma, Jian Tang, Yingxin Yu, Guiying Li, Ruifang Fan, Guoxia Zhang, Bixian Mai, Taicheng An
Full Source: The Science of the total environment 2023 Feb 2;161980. doi: 10.1016/j.scitotenv.2023.161980.