

Bulletin Board

Contents

MAY. 05, 2023

(click on page numbers for links)

CHEMICAL EFFECTS

Arsenic exposure incurs hyperglycemia mediated by oxidative damage in urban adult population: A prospective cohort study with three repeated measures	3
Micro/nanoscale bone char alleviates cadmium toxicity and boosts rice growth via positively altering the rhizosphere and endophytic microbial community	4
Evaluating non-targeted analysis methods for chemical characterization of organic contaminants in different matrices to estimate children's exposure.....	4

ENVIRONMENTAL RESEARCH

Impacts of anthropogenic discharge on distribution, mass budget, and long-term risk of total mercury in coastal region: A case study of the Jiaozhou Bay, China	6
Air pollution and stroke; effect modification by sociodemographic and environmental factors. A cohort study from Denmark.....	7
Potentially toxic elements in the environment - a review of sources, sinks, pathways and mitigation measures	8
Occurrence and ecological risk assessment of organophosphate esters in surface water from rivers and lakes in urban Hanoi, Vietnam.....	8

PHARMACEUTICAL/TOXICOLOGY

Fate of five bisphenol derivatives in <i>Chlamydomonas mexicana</i> : Toxicity, removal, biotransformation and microalgal metabolism.....	9
---	---

OCCUPATIONAL

Occupational exposure to pesticides as a potential risk factor for epilepsy.....	10
Occupational health and safety, metal exposures and multi-exposures health risk in Canadian electronic waste recycling facilities.....	11

CONTACT US

subscribers@chemwatch.net

tel +61 3 9572 4700

fax +61 3 9572 4777

1227 Glen Huntly Rd

Glen Huntly

Victoria 3163 Australia

Bulletin Board

Technical

MAY. 05, 2023

CHEMICAL EFFECTS

Arsenic exposure incurs hyperglycemia mediated by oxidative damage in urban adult population: A prospective cohort study with three repeated measures

2023-04-28

The associations and potential mechanisms of low to moderate arsenic exposure with fasting plasma glucose (FPG) and type 2 diabetes mellitus (T2DM) are still unclear. To assess the effects of short-term and long-term arsenic exposure on hyperglycemia and the mediating effect of oxidative damage on such association, three repeated-measures studies with 9938 observations were conducted in the Wuhan-Zhuhai cohort. The levels of urinary total arsenic, FPG, urinary 8-iso-prostaglandin F2alpha (8-iso-PGF2α), urinary 8-hydroxy-2'-deoxyguanosine (8-OHdG), and plasma protein carbonyls (PCO) were measured. Generalized linear mixed models were used to evaluate the exposure-response relationships of urinary total arsenic with FPG and the prevalent risks of impaired fasting glucose (IFG), T2DM, and abnormal glucose regulation (AGR). Cox regression models were applied to assess the associations of arsenic exposure with incident risks of IFG, T2DM, and AGR. Mediation analyses were performed to assess the mediating effects of 8-iso-PGF2α, 8-OHdG, and PCO. In cross-sectional analyses, each one-unit increase in natural log-transformed urinary total arsenic was associated with a 0.082 (95% CI: 0.047 to 0.118) mmol/L increase in FPG, as well as a 10.3% (95% CI: 1.4%-20.0%), 4.4% (95% CI: 5.3%-15.2%), and 8.7% (95% CI: 1.2%-16.6%) increase in prevalent risks of IFG, T2DM, and AGR, respectively. In longitudinal analyses, arsenic exposure was further associated with the annual increased rate of FPG with a β (95% CI) of 0.021 (95% CI: 0.010 to 0.033). The incident risks of IFG, T2DM, and AGR were increased without statistical significance when arsenic levels increased. Mediation analyses showed that 8-iso-PGF2α and PCO mediated 30.04% and 10.02% of the urinary total arsenic-associated FPG elevation, respectively. Our study indicated that arsenic exposure was associated with elevated level and progression rate of FPG among general Chinese adults, where lipid peroxidation and oxidative protein damage might be the potential mechanisms.

Authors: Yongfang Zhang, Min Zhou, Ruyi Liang, Linling Yu, Man Cheng, Xing Wang, Bin Wang, Weihong Chen

Full Source: Environmental research 2023 Apr 28;229:116009. doi: 10.1016/j.envres.2023.116009.

The associations and potential mechanisms of low to moderate arsenic exposure with fasting plasma glucose (FPG) and type 2 diabetes mellitus (T2DM) are still unclear.

Bulletin Board

Technical

MAY. 05, 2023

Micro/nanoscale bone char alleviates cadmium toxicity and boosts rice growth via positively altering the rhizosphere and endophytic microbial community

2023-04-24

This present study investigated pork bone-derived biochar as a promising amendment to reduce Cd accumulation and alleviate Cd-induced oxidative stress in rice. Micro/nanoscale bone char (MNBC) pyrolyzed at 400 °C and 600 °C was synthesized and characterized before use. The application rates for MNBCs were set at 5 and 25 g·kg⁻¹ and the Cd exposure concentration was 15 mg·kg⁻¹. MNBCs increased rice biomass by 15.3-26.0% as compared to the Cd-alone treatment. Both types of MNBCs decreased the bioavailable Cd content by 27.4-54.8%; additionally, the acid-soluble Cd fraction decreased by 10.0-12.3% relative to the Cd alone treatment. MNBC significantly reduced the cell wall Cd content by 50.4-80.2% relative to the Cd-alone treatment. TEM images confirm the toxicity of Cd to rice cells and that MNBCs alleviated Cd-induced damage to the chloroplast ultrastructure. Importantly, the addition of MNBCs decreased the abundance of heavy metal tolerant bacteria, Acidobacteria and Chloroflexi, by 29.6-41.1% in the rhizosphere but had less impact on the endophytic microbial community. Overall, our findings demonstrate the significant potential of MNBC as both a soil amendment for heavy metal-contaminated soil remediation and for crop nutrition in sustainable agriculture.

Authors: Anqi Liang, Chuanxin Ma, Jiang Xiao, Yi Hao, Hao Li, Yaozu Guo, Yini Cao, Weili Jia, Lanfang Han, Guangcai Chen, Qian Tan, Jason C White, Baoshan Xing

Full Source: Journal of hazardous materials 2023 Apr 24;454:131491. doi: 10.1016/j.jhazmat.2023.131491.

This present study investigated pork bone-derived biochar as a promising amendment to reduce Cd accumulation and alleviate Cd-induced oxidative stress in rice.

Evaluating non-targeted analysis methods for chemical characterization of organic contaminants in different matrices to estimate children's exposure

2023-04-29

Background: Children are vulnerable to environmental exposure of contaminants due to their small size, lack of judgement skills, as well as their proximity to dust, soil, and other environmental sources. A better understanding about the types of contaminants that children are exposed to or how their bodies retain or process these compounds is needed. Objective: In this study, we have implemented and optimized a methodology based on non-targeted analysis (NTA) to characterize

Bulletin Board

Technical

MAY. 05, 2023

chemicals in dust, soil, urine, and in the diet (food and drinking water) of infant populations.

Methods: To evaluate potential toxicological concerns associated with chemical exposure, families with children between 6 months and 6 years of age from underrepresented groups were recruited in the greater Miami area. Samples of soil, indoor dust, food, water, and urine were provided by the caregivers, prepared by different techniques (involving online SPE, ASE, USE, QuEChERS), and analyzed by liquid chromatography-high resolution mass spectrometry (LC-HRMS). Data post-processing was performed using the small molecule structure identification software, Compound Discoverer (CD) 3.3, and identified features were plotted using Kendrick mass defect plot and Van Krevelen diagrams to show unique patterns in different samples and regions of anthropogenic compound classifications.

Results: The performance of the NTA workflow was evaluated using quality control standards in terms of accuracy, precision, selectivity, and sensitivity, with an average of 98.2%, 20.3%, 98.4% and 71.1%, respectively. Sample preparation was successfully optimized for soil, dust, water, food, and urine. A total of 30, 78, 103, 20 and 265 annotated features were frequently identified (detection frequency >80%) in the food, dust, soil, water, and urine samples, respectively. Common features detected in each matrix were prioritized and classified, providing insight on children's exposure to organic contaminants of concern and their potential toxicities. **Impact statement:** Current methods to assess the ingestion of chemicals by children have limitations and are generally restricted by specific classes of targeted organic contaminants of interest. This study offers an innovative approach using non-targeted analysis for the comprehensive screening of organic contaminants that children are exposed to through dust, soil, and diet (drinking water and food).

Authors: Danni Cui, Joseph Cox, Emily Mejias, Brian Ng, Piero Gardinali, Daniel M Bagner, Natalia Quinete

Full Source: Journal of exposure science & environmental epidemiology 2023 Apr 29;1-13. doi: 10.1038/s41370-023-00547-9.

Bulletin Board

Technical

MAY. 05, 2023

ENVIRONMENTAL RESEARCH

Impacts of anthropogenic discharge on distribution, mass budget, and long-term risk of total mercury in coastal region: A case study of the Jiaozhou Bay, China

2023-04-26

Mercury (Hg) as a toxic pollutant in marine systems have been paid more attention. The Jiaozhou Bay (JZB) is located at the western coast of the Yellow Sea surrounded by Qingdao city, a developed city in China. >10 rivers and several sewage treatment plants carry lots of Hg input it, increasing the environmental risks JZB facing. However, there is still a lack of knowledge on its cycling in the JZB, limiting sound understanding of Hg fate in coastal regions. To address these needs, four cruises were conducted in different seasons, to investigate distribution, influencing factors, and mass budget of total Hg (THg) in the JZB. Higher THg concentrations were determined in seawater ($22.8 \pm 13.9 \text{ ng L}^{-1}$) and sediment ($148 \pm 107 \text{ ng g}^{-1}$), indicating serious Hg pollution in the JZB. Temperature, salinity in water and enrich factor (EF) in sediment were identified to be possible environmental factors influencing THg distribution in the JZB. Mass budget of THg showed that anthropogenic discharge (river, wastewater input, and atmospheric deposition) was dominant source of THg in the JZB. The results of statistical analyses and mass budget of THg also indicated that anthropogenic discharge plays important roles in long-term risk of THg in the JZB. These results suggested that anthropogenic discharge comprehensively affects distribution, mass budget, and long-term risk of THg in coastal systems. The outcomes highlighted that regular investigations of Hg cycling should be conducted to assess Hg pollution in coastal ecosystems. Our study also shed new light on control of long-term risk posed by Hg in marine systems according to investigations of Hg cycling and link between Hg contamination and other pollutant (e.g., nutrient).

Authors: Lufeng Chen, Chang Liu, Xiaoxiao Han, Yong Liang, Yanbin Li

Full Source: The Science of the total environment 2023 Apr 26;883:163718. doi: 10.1016/j.scitotenv.2023.163718.

Mercury (Hg) as a toxic pollutant in marine systems have been paid more attention.

Bulletin Board

Technical

MAY. 05, 2023

Air pollution and stroke; effect modification by sociodemographic and environmental factors. A cohort study from Denmark

2023-04-28

Objectives: Air pollution increases the risk of stroke, but the literature on identifying susceptible subgroups of populations is scarce and inconsistent. The aim of this study was to investigate if the association between air pollution and risk of stroke differed by sociodemographic factors, financial stress, comorbid conditions, and residential road traffic noise, population density and green space.

Methods: We assessed long-term exposure to air pollution with ultrafine particles, PM_{2.5}, elemental carbon and NO₂ for a cohort of 1,971,246 Danes aged 50-85 years. During follow-up from 2005 to 2017, we identified 83,211 incident stroke cases. We used Cox proportional hazards model (relative risk) and Aalen additive hazards models (absolute risk) to estimate associations and confidence intervals (CI) between 5-year running means of air pollution at the residence and risk of stroke in population strata.

Results: All four pollutants were associated with higher risk of stroke. The association between air pollution and stroke was strongest among individuals with comorbidities, with shorter education, lower income and being retired. The results also indicated stronger associations among individuals living in less populated areas, and with low noise levels and more green space around the residence. Estimates of absolute risk seemed better suited to detect such interactions than estimates of relative risk. For example for PM_{2.5} the hazard ratio for stroke was 1.28 (95%CI: 1.22-1.34) and 1.26 (95%CI: 1.16-1.37) among those with mandatory and medium/long education respectively. The corresponding rate difference estimates per 100,000 person years were 568 (95%CI: 543-594) and 423(95%CI: 390-456)

Conclusion: The associations between air pollution and risk of stroke was stronger among individuals of lower socioeconomic status or with pre-existing comorbid conditions. Absolute risk estimates were better suited to identify such effect modification.

Authors: Aslak Harbo Poulsen, Mette Sørensen, Ulla Arthur Hvidtfeldt, Matthias Ketzel, Jesper H Christensen, Jørgen Brandt, Lise Marie Frohn, Jibran Khan, Steen Solvang Jensen, Thomas Lund, Ole Raaschou-Nielsen
Full Source: International journal of hygiene and environmental health 2023 Apr 28;251:114165. doi: 10.1016/j.ijheh.2023.114165.

Objectives: Air pollution increases the risk of stroke, but the literature on identifying susceptible subgroups of populations is scarce and inconsistent.

Bulletin Board

Technical

MAY. 05, 2023

Potentially toxic elements in the environment - a review of sources, sinks, pathways and mitigation measures

2023-05-01

Pollution of ecosystems with potentially toxic elements (PTEs) has become a global problem with serious consequences for public health. The PTEs are hazardous to humans owing to their longevity, toxicity, and ability to accumulate in the biotic environment. As most PTEs cannot be degraded microbially or chemically, they can persist in soils for a long time. Besides posing a threat to landsphere, they may be transported to surrounding environmental spheres through movement of water, atmospheric circulation, and biological transmission. This can severely affect the ecological equilibrium. Accumulation of PTEs in soils pose serious health hazards to higher organisms leading to various diseases and disorders and significant relationships exist between the occurrence of PTEs and the toxic effects in humans. In natural soils, PTEs accumulate due to weathering of rocks and ores. Furthermore, locally or regionally significant accumulation of PTEs in soils may occur from industrial goods, pesticides and paints, municipal and industrial waste, fertilizer application, mining activities and atmospheric deposition. In response to the growing need to address PTE contamination, remediation methods have been developed employing mechanical, physico-chemical or biological based technologies. In this review, we discuss sources, sinks, pathways and mitigation measures related to natural and anthropogenic PTEs. We focus on As, Cd, Cr, Hg and Pb which are highly toxic and perform no physiological functions in biota. Further, these are the most widely studied PTEs.

Authors: Rolf Nieder, Dinesh K Benbi

Full Source: Reviews on environmental health 2023 May 1. doi: 10.1515/reveh-2022-0161.

Occurrence and ecological risk assessment of organophosphate esters in surface water from rivers and lakes in urban Hanoi, Vietnam

2023-04-28

In this study, an investigation on the pollution status, distribution, and ecological risk to the aquatic organisms of six organophosphate tri-esters (tri-OPEs) and two organophosphate tri-esters (di-OPEs) in surface water in urban Hanoi, Vietnam were conducted. In 37 surveyed water samples (6 rivers and 17 lakes), all eight targeted OPEs were discovered with a detection frequency (DF) of 41-100% and the concentration varied

Pollution of ecosystems with potentially toxic elements (PTEs) has become a global problem with serious consequences for public health.

Bulletin Board

Technical

MAY. 05, 2023

largely from below the method detection limit (<MDL) to 6138 ng L⁻¹. The total concentrations of six tri-OPEs (6tri-OPEs) were 46-3644 ng L⁻¹ (average 1409 ng L⁻¹) and the total concentrations of two di-OPEs (2di-OPEs) ranged from 2.6 to 6138 ng L⁻¹ (average 351 ng L⁻¹). In general, the 6tri-OPEs in water samples collected in rivers (average 2262 ng L⁻¹) were higher than those in lakes (average 1000 ng L⁻¹). The most dominant chemical was tris(2-chloro-1-methyl ethyl) phosphate (TCPP) with a DF of 100% and took up 75% (on average) of 6tri-OPEs. Principal component analysis showed that most of the tri- and di-OPEs in lakes may come from similar emission sources. While, there were at least four different origins of organophosphate esters (OPEs) in rivers in urban Hanoi. The risk quotient (RQ) was estimated for the detected concentration of tri- and di-OPEs in water samples and the toxicological relevant concentration for three trophic groups of algae, crustaceans, and fish. The RQs and the total of RQs for each group were lower than 1, indicating that the effects of each OPE and their OPEs' combined effects on the aquatic environment in Hanoi were at low to medium levels.

Authors: Dung Anh Truong, Ha Thu Trinh, Giang Truong Le, Thang Quang Phan, Hanh Thi Duong, Thien Thanh Lam Tran, Trung Quang Nguyen, Minh Tue Thi Hoang, Tuyen Van Nguyen

Full Source: Chemosphere 2023 Apr 28;138805. doi: 10.1016/j.chemosphere.2023.138805.

PHARMACEUTICAL/TOXICOLOGY

Fate of five bisphenol derivatives in *Chlamydomonas mexicana*: Toxicity, removal, biotransformation and microalgal metabolism

2023-04-26

Bisphenols (BPs) are recognized as emerging contaminants because of their estrogenic properties and frequent occurrence in environmental matrices. Here, we evaluated the toxic effects of five common BPs on freshwater microalga *Chlamydomonas mexicana* and removal of the BPs by the alga. Bisphenols -AF (BPAF), -B (BPB), and -Z (BPZ) (96 h, EC50 1.78-12.09 mg·L⁻¹) exhibited higher toxicity to *C. mexicana* compared to bisphenol -S (BPS) and -F (BPF) (96 h, EC50 30.53-85.48 mg·L⁻¹). In contrast, the mixture of BPs exhibited acute toxicity (96 h, EC50 8.07 mg·L⁻¹). After 14 days, *C. mexicana* had effectively removed 61%, 99%, 55%, 87%, and 89% of BPS, BPF, BPAF, BPB, and BPZ, respectively, at 1 mg L⁻¹. The biotransformed products of all five BPs were analyzed using

Bulletin Board

Technical

MAY. 05, 2023

UHPLC QTOF, and their toxicity was predicted. All biotransformed products were observed to be less toxic than the parent compounds. The fatty acid composition of *C. mexicana* after exposure to the BP mixture was predominantly palmitic acid (34.14%), followed by oleic acid (18.9%), and γ -linolenic acid (10.79%). The results provide crucial information on the ecotoxicity of these five BPs and their removal by *C. mexicana*; the resulting biomass is a potential feedstock for producing biodiesel.

Authors: Nikita Yadav, Hyun-Jo Ahn, Mayur B Kurade, Yongtae Ahn, Young-Kwon Park, Moonis Ali Khan, El-Sayed Salama, Xiangkai Li, Byong-Hun Jeon
Full Source: Journal of hazardous materials 2023 Apr 26;454:131504. doi: 10.1016/j.jhazmat.2023.131504.

OCCUPATIONAL

Occupational exposure to pesticides as a potential risk factor for epilepsy

2023-04-28

Epilepsy is a chronic neurological disorder in which brain activity becomes abnormal, causing seizures. In a previous study we found that environmental exposure to pesticides was associated with a greater risk of epilepsy. The present study examined possible occupational risk factors that may contribute to the occurrence of epilepsy in farmers and pesticide applicators. A case-referent study was conducted on 19,704 individuals over a 17-year study period (2000-2016). Epilepsy cases (n=5091) were collected from Hospital records and referents (non-epilepsy cases, n=14,613) from the Centre for Prevention of Occupational Risks, both from Almería (South-Eastern Spain). A significant increased risk of having epilepsy was found in farmers working in intensive agriculture (high-yield greenhouse crops) compared to extensive agriculture (open-air crops). The risk was greater for farmers residing in rural areas with high pesticide use (intensive farming crops in plastic greenhouses) and for those not wearing protective gloves. As for sprayers, the greatest risk of epilepsy was observed in those not wearing face mask, and in those living in areas with high pesticide use (greenhouse intensive agriculture). Overall, this study supports previous findings on the association between epilepsy and pesticide exposure in the general population, and extends the risk to

Epilepsy is a chronic neurological disorder in which brain activity becomes abnormal, causing seizures.

Bulletin Board

Technical

MAY. 05, 2023

farmers occupationally exposed to pesticides, mainly those engaged in intensive agriculture.

Authors: Raquel Alarcón, Belén Giménez, Antonio F Hernández, Antonia López-Villén, Tesifón Parrón, Jessica García-González, Mar Requena

Full Source: *Neurotoxicology* 2023 Apr 28;50161-813X(23)00059-1. doi: 10.1016/j.neuro.2023.04.012.

Occupational health and safety, metal exposures and multi-exposures health risk in Canadian electronic waste recycling facilities

2023-04-28

Electronic waste recycling (e-recycling) involves manual operations that expose workers to toxic metals. We aim to describe occupational health and safety practices and workers' exposures to metals in the Canadian formal e-recycling industry, and to estimate the health risk associated with multiple exposures. This cross-sectional study documented practices through observations and questionnaires, and assessed metal exposures using personal air samples and biomarkers. Health risks were estimated relative to recognised occupational exposure guidelines, and using an additive approach for consideration of multiple exposures. Six e-recycling and one commercial recycling facilities were investigated, and the metal exposures of 99 workers (23 women) were measured. In most facilities, dust control was inadequate and personal protective equipment was improperly worn. In e-recycling, lead was detected in all air samples and in most blood samples, up to 48 $\mu\text{g}/\text{m}^3$ and 136 $\mu\text{g}/\text{l}$, respectively. Other quantified metals included beryllium, mercury, arsenic, barium, cadmium, chrome, cobalt, copper, indium, manganese, nickel and yttrium. When handling cathode ray tube screens, workers were 4.9 times and 8.5 times more likely to be exposed to lead and yttrium, respectively, than workers who were not assigned to a specific type of electronics. Overall, exposures were largely associated with facility size and airborne dust concentration. The additive hazard indices for airborne exposures raised concerns for kidney disorders, for peripheral and central nervous systems, and for the male reproductive system. Minimizing airborne dust through collective control methods and adequately using personal protection should reduce metal exposures and associated health risks in this growing industry.

Authors: Sabrina Gravel, Brigitte Roberge, Mickaël Calosso, Sébastien Gagné, Jacques Lavoie, France Labrèche

Full Source: *Waste management (New York, N.Y.)* 2023 Apr 28;165:140-149. doi: 10.1016/j.wasman.2023.04.026.

Electronic waste recycling (e-recycling) involves manual operations that expose workers to toxic metals.