

Bulletin Board

Contents

MAY. 19, 2023

(click on page numbers for links)

CHEMICAL EFFECTS

- Three years of wastewater surveillance for new psychoactive substances from 16 countries.....3
- Critical review on uranium and arsenic content and their chemical mobilization in groundwater: A case study of the Malwa region Punjab, India4
- Perceptions, beliefs, and current practices regarding neonatal skin care and emollient use in eastern Uganda: a qualitative study5

ENVIRONMENTAL RESEARCH

- Association of multiple air pollutants with oxygen saturation during sleep in COPD patients: Effect modification by smoking status and airway inflammatory phenotypes6

PHARMACEUTICAL/TOXICOLOGY

- Effectiveness and safety of anticoagulants among venous thromboembolism cancer patients with and without brain cancer7
- Effectiveness and Safety of Rivaroxaban and Low Molecular Weight Heparin in Cancer-Associated Venous Thromboembolism8
- Overhauling the ecotoxicological impact of synthetic pesticides using plants' natural products: a focus on Zanthoxylum metabolites.....9

OCCUPATIONAL

- Associations between prenatal phthalate exposure and childhood epigenetic age acceleration9
- Ultraviolet radiation exposure in cannabis growing facilities.....10
- Prenatal DEHP exposure predicts neurological disorders via transgenerational epigenetics11

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Bulletin Board

Technical

MAY. 19, 2023

CHEMICAL EFFECTS

Three years of wastewater surveillance for new psychoactive substances from 16 countries

2023-04-06

The proliferation of new psychoactive substances (NPS) over recent years has made their surveillance complex. The analysis of raw municipal influent wastewater can allow a broader insight into community consumption patterns of NPS. This study examines data from an international wastewater surveillance program that collected and analysed influent wastewater samples from up to 47 sites in 16 countries between 2019 and 2022. Influent wastewater samples were collected over the New Year period and analysed using validated liquid chromatography - mass spectrometry methods. Over the three years, a total of 18 NPS were found in at least one site. Synthetic cathinones were the most found class followed by phenethylamines and designer benzodiazepines. Furthermore, two ketamine analogues, one plant based NPS (mitragynine) and methiopropamine were also quantified across the three years. This work demonstrates that NPS are used across different continents and countries with the use of some more evident in particular regions. For example, mitragynine has highest mass loads in sites in the United States, while eutylone and 3-methylmethcathinone increased considerably in New Zealand and in several European countries, respectively. Moreover, 2F-deschloroketamine, an analogue of ketamine, has emerged more recently and could be quantified in several sites, including one in China, where it is considered as one of the drugs of most concern. Finally, some NPS were detected in specific regions during the initial sampling campaigns and spread to additional sites by the third campaign. Hence, wastewater surveillance can provide an insight into temporal and spatial trends of NPS use.

Authors: Richard Bade, Nikolaos Rousis, Sangeet Adhikari, Christine Baduel, Lubertus Bijlsma, Erasmia Bizani, Tim Boogaerts, Daniel A Burgard, Sara Castiglioni, Andrew Chappell, Adrian Covaci, Erin M Driver, Fernando Fabriz Sodre, Despo Fatta-Kassinou, Aikaterini Galani, Cobus Gerber, Emma Gracia-Lor, Elisa Gracia-Marín, Rolf U Halden, Ester Heath, Felix Hernandez, Emma Jaunay, Foon Yin Lai, Heon-Jun Lee, Maria Laimou-Geraniou, Jeong-Eun Oh, Kristin Olafsdottir, Kaitlyn Phung, Marco Pineda Castro, Magda Psychoudaki, Xueting Shao, Noelia Salgueiro-Gonzalez, Rafael Silva Feitosa, Cezar Silvino Gomes, Bikram Subedi, Arndís Sue Ching Löve, Nikolaos

The proliferation of new psychoactive substances (NPS) over recent years has made their surveillance complex.

Bulletin Board

Technical

MAY. 19, 2023

Thomaidis, Diana Tran, Alexander van Nuijs, Taja Verovšek, Degao Wang, Jason M White, Viviane Yargeau, Ettore Zuccato, Jochen F Mueller
Full Source: Water research X 2023 Apr 6;19:100179. doi: 10.1016/j.wroa.2023.100179.

Critical review on uranium and arsenic content and their chemical mobilization in groundwater: A case study of the Malwa region Punjab, India

2023-05-03

The presence of pollutants like uranium and arsenic in the groundwater can have a terrible impact on people's health (both radiologically and toxicologically) and their economic conditions. Their infiltration into groundwater can occur through geochemical reactions, natural mineral deposits, mining and ore processing. Governments and scientists are working to address these issues, and significant progress has been achieved, but it's challenging to deal with and mitigate without adequately understanding the different chemical processes and the mobilization mechanism of these hazardous chemicals. Most of the articles and reviews have focused on the particular form of contaminants and specific sources of pollution, such as fertilizers. However, no literature report exists explaining why particular forms appear and the possible basis of their chemical origins. Hence, in this review, we tried to answer the various questions by devising a hypothetical model and chemical schematic flowcharts for the chemical mobilization of arsenic and uranium in groundwater. An effort has been made to explain how chemical seepage and excessive groundwater use resulted in the change in aquifers' chemistry, as evidenced by their physicochemical parameters and heavy metal analysis. Many technological advancements have taken place to mitigate these issues. Still, in low-middle-income countries, especially in the Malwa region of Punjab, also known as Punjab's cancer belt, paying a high amount for installing and maintaining these technologies is an unviable option. In addition to working to improve people's access to sanitary facilities and clean water to drink, the policy-level intervention would focus on increasing community awareness and continued research on developing better and more economical technologies. Our designed model/chemical flowcharts will help policymakers and researchers better understand the problems and alleviate their effects. Moreover, these models can be utilized in other parts of the globe where similar questions exist. This article emphasises the value of understanding the intricate

The presence of pollutants like uranium and arsenic in the groundwater can have a terrible impact on people's health (both radiologically and toxicologically) and their economic conditions.

Bulletin Board

Technical

MAY. 19, 2023

issue of groundwater management through a multidisciplinary and interdepartmental approach.

Authors: Vajinder Kumar, Arnab Maity, Avneesh Kumar, Sandip Saha, Paul Kay, Baljinder Singh, Tirtha Mukherjee

Full Source: The Science of the total environment 2023 May 3;163885. doi: 10.1016/j.scitotenv.2023.163885.

Perceptions, beliefs, and current practices regarding neonatal skin care and emollient use in eastern Uganda: a qualitative study

2023-05-05

The skin is a major route of infection in the neonatal period, especially in low birthweight (LBW) infants. Appropriate and safe neonatal skin care practices are required to reduce this risk. The perceptions and beliefs of mothers and other caregivers towards various neonatal skin care practices in our setting have been documented. Data from Asia suggests that the application of emollient to the skin of LBW infants can promote growth, reduce serious neonatal infections, and potentially reduce mortality. This is the first study to explore the acceptability of emollients and massage as part of neonatal skin care in a low-resource setting in sub-Saharan Africa (SSA) that is representative of the majority of government health facilities in Uganda and many in SSA.

Objective: To explore perceptions, beliefs, and current practices regarding neonatal skin care and emollient use in eastern Uganda.

Methods: We conducted a qualitative study consisting of three focus group discussions (30 participants), eight in-depth interviews with mothers/caregivers of preterm and term neonates and 12 key informant interviews with midwives, doctors and community health workers involved in neonatal care, to explore the perceptions and practices surrounding neonatal skin care and emollient use. Data collected were transcribed and analyzed using thematic content analysis.

Results: Mothers perceived that skin care began in utero. Skincare practices depended on the place of delivery; for deliveries in a health facility the skincare practices were mainly based on the health worker's advice. Vernix caseosa was often washed off due to its perceived undesirability and was attributed to sexual intercourse in the last trimester. Despite their deleterious attributes found in previous studies, petrolatum-based oils, petrolatum-based jellies and talcum baby powders were the most commonly reported items used in neonatal skin care. In our population, there was high acceptability of emollient therapy use; however, neonatal massage was treated with scepticism as mothers feared

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Bulletin Board

Technical

MAY. 19, 2023

damaging the vulnerable neonate. Mothers suggested massage and emollient application be undertaken by health workers, if it becomes an intervention.

Conclusions: In eastern Uganda, the perceptions and beliefs of mothers/caregivers toward neonatal skincare influenced their practices of which some could potentially be beneficial, and others harmful. Emollient use would be easily accepted if adequate sensitisation is conducted and using the gatekeepers such as health workers.

Authors: authors: Daniel Wenani, Kathy Burgoine, Sarah LA Williams, Milton Musaba, Tewodros Gebremichael, Andrew Clarke, Keona Jh Blanks, Ritah Nantale, Jascenti Nawanga, Sarah Kiguli, Mike English, Peter Waiswa, Gary L Darmstadt, Joseph Kb Matovu, David Mukunya

Full Source: BMC pediatrics 2023 May 5;23(1):223. doi: 10.1186/s12887-023-04040-y.

ENVIRONMENTAL RESEARCH

Association of multiple air pollutants with oxygen saturation during sleep in COPD patients: Effect modification by smoking status and airway inflammatory phenotypes

2023-05-01

Air pollution contributes substantially to the development of chronic obstructive pulmonary disease (COPD). To date, the effect of air pollution on oxygen saturation (SpO₂) during sleep and potential susceptibility factors remain unknown. In this longitudinal panel study, real-time SpO₂ was monitored in 132 COPD patients, with 270 nights (1615 h) of sleep SpO₂ recorded. Exhaled nitric oxide (NO), hydrogen sulfide (H₂S) and carbon monoxide (CO) were measured to assess airway inflammatory characteristics. Exposure levels of air pollutants were estimated by infiltration factor method. Generalized estimating equation was used to investigate the effect of air pollutants on sleep SpO₂. Ozone, even at low levels (<60 µg/m³), was significantly associated with decreased SpO₂ and extended time of oxygen desaturation (SpO₂ < 90%), especially in the warm season. The associations of other pollutants with SpO₂ were weak, but significant adverse effects of PM₁₀ and SO₂ were observed in the cold season. Notably, stronger effects of ozone were observed in current smokers. Consistently, smoking-related airway inflammation, characterized by higher levels of exhaled CO and H₂S but lower NO, significantly augmented the effect of ozone on SpO₂ during sleep. This

Air pollution contributes substantially to the development of chronic obstructive pulmonary disease (COPD).

Bulletin Board

Technical

MAY. 19, 2023

study highlights the importance of ozone control in protecting sleep health in COPD patients.

Authors: Wenlou Zhang, Junyi Wang, Baiqi Chen, Xuezhao Ji, Chen Zhao, Maike Chen, Sha Liao, Simin Jiang, Zihan Pan, Wanzhou Wang, Luyi Li, Yahong Chen, Xinbiao Guo, Furong Deng
Full Source: Journal of hazardous materials 2023 May 1;454:131550. doi: 10.1016/j.jhazmat.2023.131550.

PHARMACEUTICAL/TOXICOLOGY

Effectiveness and safety of anticoagulants among venous thromboembolism cancer patients with and without brain cancer

2023-04-13

Patients with brain cancer are at a high risk of developing venous thromboembolism (VTE) and are underrepresented in clinical trials. This study compared the risk of recurrent VTE (rVTE), major bleeding (MB), and clinically relevant non-major bleeding (CRNMB) among VTE cancer patients initiating apixaban, low molecular weight heparin (LMWH), or warfarin stratified by patients with brain vs other cancer types.

Materials and methods: Active cancer patients initiating apixaban, LMWH, or warfarin within 30 days after VTE diagnosis were identified from 4 US commercial and the Medicare databases. Inverse probability of treatment weights (IPTW) was used to balance patient characteristics. Cox proportional hazards models were used to evaluate the interaction between brain cancer status and treatment on outcomes (rVTE, MB, and CRNMB), with a p-value <0.1 indicating a significant interaction.

Results: Of 30,586 patients with active cancer (5 % had brain cancer), apixaban (vs. LMWH and warfarin) was associated with lower risk of rVTE, MB, and CRNMB. Generally, no significant interactions ($P > 0.1$) were found between brain cancer status and anticoagulant treatment across outcomes. The exception was MB for apixaban [vs LMWH (p-value for interaction = 0.091)] with a higher reduction among those with brain cancer (HR = 0.32) than those with (HR = 0.72) other cancer.

Conclusions: Among VTE patients with all types of cancer, apixaban (vs LMWH and warfarin) was associated with a lower risk of rVTE, MB, and CRNMB. In general, anticoagulant treatment effects were not significantly

Patients with brain cancer are at a high risk of developing venous thromboembolism (VTE) and are underrepresented in clinical trials.

Bulletin Board

Technical

MAY. 19, 2023

different between VTE patients with brain cancer and those with other cancer.

Authors: Alexander Cohen, Virginia Noxon, Amol Dhamane, Robert Bruette, Shrushti Shah, Dionne M Hines, Tamuno Alfred, Xuemei Luo
Full Source: Thrombosis research 2023 Apr 13;226:117-126. doi: 10.1016/j.thromres.2023.04.009.

Effectiveness and Safety of Rivaroxaban and Low Molecular Weight Heparin in Cancer-Associated Venous Thromboembolism

2023-02-07

Direct-acting oral anticoagulants (DOACs) are alternatives to low molecular weight heparin (LMWH) in most cancer-associated thrombosis (CAT) patients.

Objectives: This study sought to compare the effectiveness and safety of rivaroxaban and LMWH for venous thromboembolism (VTE) treatment in patients with an active cancer type not associated with a high risk of DOAC bleeding.

Methods: An analysis of electronic health records from January 2012 to December 2020 was performed. Patients were adults, had active cancer, experienced an index CAT event, and were treated with rivaroxaban or LMWH. Patients with cancers with an established high risk of bleeding on DOACs were excluded. Baseline covariates were balanced using propensity score-overlap weighting. HRs with 95% CIs were calculated.

Results: We identified 3,708 CAT patients treated with rivaroxaban (29.5%) or LMWH (70.5%). The median (25th-75th percentiles) time on anticoagulation was 180 (69-365) and 96 (40-336) days for rivaroxaban and LMWH patients. At 3 months, rivaroxaban was associated with a 31% reduced risk of recurrent VTE vs LMWH (4.2% vs 6.1%; HR: 0.69; 95% CI: 0.51-0.92). No difference in bleeding-related hospitalizations or all-cause mortality was observed (HR: 0.79; 95% CI: 0.55-1.13 and HR: 1.07; 95% CI: 0.85-1.35, respectively). Rivaroxaban reduced the recurrent VTE risk (HR: 0.74; 95% CI: 0.57-0.97) but not bleeding-related hospitalizations or all-cause mortality at 6 months. At 12 months, no difference was observed between cohorts for any of the previously mentioned outcomes.

Conclusions: Among active cancer patients experiencing VTE and not at high risk of bleeding on DOACs, rivaroxaban was associated with a reduced risk of recurrent VTE versus LMWHs at 3 and 6 months but not

Direct-acting oral anti-coagulants (DOACs) are alternatives to low molecular weight heparin (LMWH) in most cancer-associated thrombosis (CAT) patients.

Bulletin Board

Technical

MAY. 19, 2023

12 months. (Observational Study in Cancer-Associated Thrombosis for Rivaroxaban-United States Cohort [OSCAR-US]; NCT04979780).

Authors: Craig I Coleman, Kimberly Snow Caroti, Khaled Abdelgawwad, George Psaroudakis, Samuel Fatoba, Marcela Rivera, Bernhard Schaefer, Gunnar Brobert, Alok A Khorana, Cecilia Becattini, Agnes YY Lee, Anders Ekbohm, Marc Carrier, Christopher Brescia, Alexander T Cohen

Full Source: JACC. CardioOncology 2023 Feb 7;5(2):189-200. doi: 10.1016/j.jacc.2022.10.014.

Overhauling the ecotoxicological impact of synthetic pesticides using plants' natural products: a focus on *Zanthoxylum* metabolites

2023-05-05

The reduction in agricultural production due to the negative impact of insects and weeds, as well as the health and economic burden associated with vector-borne diseases, has promoted the wide use of chemicals that control these "enemies." However, the use of these synthetic chemicals has been recognized to elicit negative impacts on the environment as well as the health and wellbeing of man. In this study, we presented an overview of recent updates on the environmental and health impacts of synthetic pesticides against agro-pest and disease vectors while exhaustively reviewing the potentials of natural plant products from *Zanthoxylum* species (Rutaceae) as sustainable alternatives. This study is expected to spur further research on exploiting these plants and their chemicals as safe and effective pesticide entities to minimize the impact of their chemical and synthetic counterparts on health and the environment.

Authors: Innocent Uzochukwu Okagu, Emmanuel Sunday Okeke, Wisdom Chinedu Favour Ezeorba, Joseph Chinedum Ndefo, Timothy Prince Chidike Ezeorba

Full Source: Environmental science and pollution research international 2023 May 6. doi: 10.1007/s11356-023-27258-w.

OCCUPATIONAL

Associations between prenatal phthalate exposure and childhood epigenetic age acceleration

2023-05-05

Background: Phthalates, a group of pervasive endocrine-disrupting chemicals found in plastics and personal care products, have been associated with a wide range of developmental and health outcomes.

Bulletin Board

Technical

MAY. 19, 2023

However, their impact on biomarkers of aging has not been characterized. We tested associations between prenatal exposure to 11 phthalate metabolites on epigenetic aging in children at birth, 7, 9, and 14 years of age. We hypothesized that prenatal phthalate exposure will be associated with epigenetic age acceleration measures at birth and in early childhood, with patterns dependent on sex and timing of DNAm measurement. Methods: Among 385 mother-child pairs from the CHAMACOS cohort, we measured DNAm at birth, 7, 9, and 14 years of age, and utilized adjusted linear regression to assess the association between prenatal phthalate exposure and Bohlin's Gestational Age Acceleration (GAA) at birth and Intrinsic Epigenetic Age Acceleration (IEAA) throughout childhood. Additionally, quantile g-computation was utilized to assess the effect of the phthalate mixture on GAA at birth and IEAA throughout childhood. Results: We found a negative association between prenatal di (2-ethylhexyl) phthalate (DEHP) exposure and IEAA among males at age 7 (-0.62 years; 95% CI: -1.06 to -0.18), and a marginal negative association between the whole phthalate mixture and GAA among males at birth (-1.54 days, 95% CI: -2.79 to -0.28), while most other associations were nonsignificant.

Conclusions: Our results suggest that prenatal exposure to certain phthalates is associated with epigenetic aging in children. Additionally, our findings suggest that the influence of prenatal exposures on epigenetic age may only manifest during specific periods of child development, and studies relying on DNAm measurements solely from cord blood or single time points may overlook potential relationships. Authors: Dennis Khodasevich, Nina Holland, Alan Hubbard, Kim Harley, Julianna Dearnorff, Brenda Eskenazi, Andres Cardenas
Full Source: Environmental research 2023 May 5;231(Pt 1):116067. doi: 10.1016/j.envres.2023.116067.

Ultraviolet radiation exposure in cannabis growing facilities

2023-05-05

Cultivation and processing of cannabis is becoming an important industry in the United States and Canada. The industry employs over 400,000 workers in the United States (U.S.) and is growing rapidly. Both natural sunlight and artificial lamp-generated radiation are commonly used to grow cannabis plants. These optical sources can contain both visible and ultraviolet radiation (UVR) wavelengths, and overexposure to UVR is associated with negative health effects. The severity of these adverse health effects is governed by the specific wavelengths and exposed dose of UVR, yet worker exposure to UVR within cannabis growing facilities has

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The reduction in agricultural production due to the negative impact of insects and weeds, as well as the health and economic burden associated with vector-borne diseases, has promoted the wide use of chemicals that control these "enemies." However, the use of these synthetic chemicals has been recognized to elicit negative impacts on the environment as well as the health and wellbeing of man.

Bulletin Board

Technical

MAY. 19, 2023

not been studied. In this study, worker exposure to UVR was assessed at five cannabis production facilities in Washington State, including indoor, outdoor, and shade house facilities. Lamp emission testing was performed at each facility and worker UVR exposures were measured for 87 work-shifts. Observations of worker activities and use of personal protective equipment in association with UVR exposure measurements were recorded. For lamp emission measurements, at three feet from the center of the lamp, the average irradiances were 4.09×10^{-4} , 6.95×10^{-8} , 6.76×10^{-9} , 3.96×10^{-9} , 1.98×10^{-9} effective W/cm² for germicidal lamps, metal halide lamps, high pressure sodium lamps, fluorescent lamps, and light emitting diodes, respectively. The average measured UVR exposure was 2.91×10^{-3} effective J/cm² (range: 1.54×10^{-6} , 1.57×10^{-2} effective J/cm²). Thirty percent of the work-shifts monitored exceeded the American Conference for Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV) of 0.003 effective J/cm². Exposures were highest for workers who spent all or part of the work-shift outdoors, and solar radiation was the primary source of worker UVR exposure for most of the work-shifts that exceeded the TLVs. Outdoor workers can reduce UVR exposures by applying sunscreen and wearing appropriate personal protective equipment. Although the artificial lighting used in the cannabis production facilities included in this study did not contribute substantially to the measured UV exposures, in many cases the lamp emissions would generate theoretical exposures at three feet from the center of the lamp that would exceed the TLV. Therefore, employers should choose low UVR emitting lamps for indoor grow operations and should use engineering controls (e.g., door-interlocks to de-energize lamps) to prevent worker exposure to UVR from germicidal lamps.

Authors: Maximilian J Chmielinski, Patricia O Ehrlich, Martin Cohen, Tania M Busch Isaksen, Christopher D Simpson

Full Source: Journal of occupational and environmental hygiene 2023 May 5;1-14. doi: 10.1080/15459624.2023.2207616.

Prenatal DEHP exposure predicts neurological disorders via transgenerational epigenetics

2023-05-06

Recent experimental and observational research has suggested that childhood allergic asthma and other conditions may be the result of prenatal exposure to environmental contaminants, such as di-(2-ethylhexyl) phthalate (DEHP). In a previous epidemiological study, we found that ancestral exposure (F0 generation) to endocrine disruptors or the common plasticizer DEHP promoted allergic airway inflammation via

Bulletin Board

Technical

MAY. 19, 2023

transgenerational transmission in mice from generation F1 to F4. In the current study, we employed a MethylationEPIC Beadchip microarray to examine global DNA methylation in the human placenta as a function of maternal exposure to DEHP during pregnancy. Interestingly, global DNA hypomethylation was observed in placental DNA following exposure to DEHP at high concentrations. Bioinformatic analysis confirmed that DNA methylation affected genes related to neurological disorders, such as autism and dementia. These results suggest that maternal exposure to DEHP may predispose offspring to neurological diseases. Given the small sample size in this study, the potential role of DNA methylation as a biomarker to assess the risk of these diseases deserves further investigation.

Authors: Mita T M T Tran, Fu-Chen Kuo, Jie-Ting Low, Yu-Ming Chuang, Sofia Sultana, Wen-Long Huang, Zhe-Young Lin, Guan-Ling Lin, Chia-Fang Wu, Sih-Syuan Li, Jau-Ling Suen, Chih-Hsing Hung, Ming-Tsang Wu, Michael W Y Chan

Full Source: Scientific reports 2023 May 6;13(1):7399. doi: 10.1038/s41598-023-34661-3.

Recent experimental and observational research has suggested that childhood allergic asthma and other conditions may be the result of prenatal exposure to environmental contaminants, such as di-(2-ethylhexyl) phthalate (DEHP).