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CONTACT US

subscribers@chemwatch.net
tel +61 3 9572 4700
fax +61 3 9572 4777

1227 Glen Huntly Rd
Glen Huntly
Victoria 3163 Australia

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CHEMICAL EFFECTS

Toxicity of Hydrogen Sulfide on Rat Brain Neurons

2022-02-17

Hydrogen sulfide (H₂S) is a toxic compound known as a member of the gasotransmitter family. H₂S has the ability to inhibit the cytochrome c oxidase enzyme in the mitochondrial respiratory chain. Mitochondria play an important role in energy production and the brain needs energy for normal function. Mitochondrial dysfunction is associated with neurodegenerative diseases. This study investigated the mechanisms of cytotoxicity induced by H₂S in brain neurons. thioacetamide has been used to produce H₂S in water solutions. The results of the study showed that thioacetamide at concentrations of 116, 232 and 464 µg/ml was able to increase the level of reactive oxygen species (ROS), collapse in mitochondrial membrane potential (MMP), damage to the lysosomal membrane, increase in the level of oxidized glutathione (GSSG) and decrease in the level of reduced glutathione (GSH) in brain neurons. The results of the study suggested that H₂S causes damage to mitochondria and lysosomes in brain neurons that could be associated with neurodegenerative diseases.

Authors: Enayatollah Seydi, Zahra Irandoost, Mahmoud Ghazi Khansari, Parvaneh Naserzadeh, Farahnaz Tanbakosazan, Jalal Pourahmad
Full Source: Drug research 2022 Feb 17. doi: 10.1055/a-1750-8870.

Influence of climate change on persistent organic pollutants and chemicals of emerging concern in the Arctic: state of knowledge and recommendations for future research

2022-02-16

Persistent organic pollutants (POPs) have accumulated in polar environments as a result of long-range transport from urban/industrial and agricultural source regions in the mid-latitudes. Climate change has been recognized as a factor capable of influencing POP levels and trends in the Arctic, but little empirical data have been available previously. A growing number of recent studies have now addressed the consequences of climate change for the fate of Arctic contaminants, as reviewed and assessed by the Arctic Monitoring and Assessment Programme (AMAP). For example, correlations between POP temporal trends in air or biota and climate indices, such as the North Atlantic Oscillation Index, have been found. Besides the climate indices, temperature, precipitation and sea-ice

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were identified as important climate parameters influencing POP levels in the Arctic environment. However, the physical changes are interlinked with complex ecological changes, including new species habitats and predator/prey relationships, resulting in a vast diversity of processes directly or indirectly affecting levels and trends of POPs. The reviews in this themed issue illustrate that the complexity of physical, chemical, and biological processes, and the rapid developments with regard to both climate change and chemical contamination, require greater interdisciplinary scientific exchange and collaboration. While some climate and biological parameters have been linked to POP levels in the Arctic, mechanisms underlying these correlations are usually not understood and need more work. Going forward there is a need for a stronger collaborative approach to understanding these processes due to high uncertainties and the incremental process of increasing knowledge of these chemicals. There is also a need to support and encourage community-based studies and the co-production of knowledge, including the utilization of Indigenous Knowledge, for interpreting trends of POPs in light of climate change.

Authors: Cynthia A de Wit, Katrin Vorkamp, Derek Muir

Full Source: Environmental science. Processes & impacts 2022 Feb 16. doi: 10.1039/d1em00531f.

ENVIRONMENTAL RESEARCH

Investigating a broad range of emerging contaminants in a set of anthropogenically impacted environmental compartments

2022-02-11

Environmental compartments are repositories of probably thousands of emerging contaminants (ECs) released along with treated/untreated wastewater. Despite extensive studies on the detection of ECs in surface water, other environmental compartments such as sediments and groundwater are yet to be thoroughly investigated. To assess the heavy anthropogenic impact on the environment, 24 environmental samples comprising of surface water, sediment and groundwater collected from the Yamuna River basin of India were analyzed via target and suspect screening. The surface water and sediment samples were collected from upstream and downstream of densely populated cities and towns situated along the heavily contaminated river Yamuna. The groundwater samples were collected from shallow drinking water wells of the catchment. Liquid chromatography tandem mass-spectroscopy was used to quantify 10

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widely consumed pharmaceuticals in the samples. The study also analyzed the potential health hazards posed by the quantified contaminants. In order to evaluate further, the surface water and groundwater samples were subjected to high resolution mass spectrometry (HRMS) screening against a library resulting in a list of 450 ECs in the surface water and 309 ECs in the groundwater. Agricultural chemicals and pharmaceuticals found abundantly in the samples and half of whom were reported first time. The risk quotient was calculated to assess the potential hazard of the target analytes.

Authors: Pinakshi Biswas, Bhanu Prakash Vellanki, Absar Ahmad Kazmi
Full Source: The Science of the total environment 2022 Feb 11;824:153757.
doi: 10.1016/j.scitotenv.2022.153757.

A novel preclinical model of environment-like combined benzene, toluene, ethylbenzene, and xylenes (BTEX) exposure: Behavioral and neurochemical findings

2022-02-12

Environmental exposure to toxicants is a major health issue and a leading risk factor for premature mortality worldwide, including environmental exposures to volatile organic compounds (VOCs), specifically Benzene, Toluene, Ethylbenzene, and Xylene (BTEX). While exposure to these compounds individually has shown behavioral and neurochemical effects, this investigation examined the impact of exposure to combined BTEX using a preclinical model. Male Swiss Webster mice were exposed to BTEX vapors designed to approximate environmental levels in urban communities. Animals were exposed to one of four treatment conditions: a 0-ppm, air control, two BTEX groups representing levels of environmental-like exposure, and a fourth group modeling occupational-like exposure. These exposures were conducted in 1.5-h sessions, 2 sessions/day, 5 days/week, for 3 weeks. Effects on coordination (i.e., rotarod and inverted screen test), learning and memory (i.e., Y-maze), and locomotor behavior (i.e., movement during exposure) were assessed during and after exposure. Monoamine levels in the medial prefrontal cortex and nucleus accumbens were assessed immediately following exposure. Effects of BTEX exposure were found on the variance of locomotor activity but not in other behavioral or neurochemical assessments. These results indicate

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that the combination of inhaled BTEX at environmentally representative concentrations has demonstrable, albeit subtle, effects on behavior.

Authors: Cameron J Davidson, D W Svenson, John H Hannigan, Shane A Perrine, Scott E Bowen

Full Source: Neurotoxicology and teratology 2022 Feb 12;107076. doi: 10.1016/j.ntt.2022.107076.

OCCUPATIONAL

The Influence of Vitamin E and Omega-3 Fatty Acids on Reproductive Health Indices Among Male Workers Exposed to Electromagnetic Fields

2022-02-16

The present study aims to investigate the effects of using the supplementation of vitamin E and Omega 3 fatty acids on reproductive indices among workers in an automobile parts manufacturing plant. The effect of exposure to electromagnetic fields on certain sex hormones and sperm parameters will also be assessed. The participants were deployed into four groups as per the double-blind block randomization method. Semen parameters and sex hormones of the participants were analyzed before and after 3-month consumption of supplements. The level of workers' exposure to low-frequency magnetic and electrical fields was measured through the recommendation of National Institute for Occupational Safety and Health. Univariate analysis of variance indicated that exposure to electric fields had a statistically significant effect on sperm count, morphology, and motility. The simultaneous consumption of vitamin E + Omega 3 had a statistically significant effect on sperm morphology and motility.

Authors: Hamzeh Mohammadi, Farideh Golbabaei, Somayeh Farhang Dehghan, Hossein Imani, Fahimeh Ramezani Tehrani, Soheila Khodakarim Ardakani

Full Source: American journal of men's health Jan-Feb 2022;16(1):15579883221074821. doi: 10.1177/15579883221074821.

The present study aims to investigate the effects of using the supplementation of vitamin E and Omega 3 fatty acids on reproductive indices among workers in an automobile parts manufacturing plant.

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Assessing the quality of evidence in studies estimating prevalence of exposure to occupational risk factors: The QoE-SPEO approach applied in the systematic reviews from the WHO/ILO Joint Estimates of the Work-related burden of disease and Injury

2022-02-16

Background: The World Health Organization (WHO) and the International Labour Organization (ILO) have produced the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury (WHO/ILO Joint Estimates). For these, systematic reviews of studies estimating the prevalence of exposure to selected occupational risk factors have been conducted to provide input data for estimations of the number of exposed workers. A critical part of systematic review methodology is to assess the quality of evidence across studies. In this article, we present the approach applied in these WHO/ILO systematic reviews for performing such assessments on studies of prevalence of exposure. It is called the Quality of Evidence in Studies estimating Prevalence of Exposure to Occupational risk factors (QoE-SPEO) approach. We describe QoE-SPEO's development to date, demonstrate its feasibility reporting results from pilot testing and case studies, note its strengths and limitations, and suggest how QoE-SPEO should be tested and developed further.

Methods: Following a comprehensive literature review, and using expert opinion, selected existing quality of evidence assessment approaches used in environmental and occupational health were reviewed and analysed for their relevance to prevalence studies. Relevant steps and components from the existing approaches were adopted or adapted for QoE-SPEO. New steps and components were developed. We elicited feedback from other systematic review methodologists and exposure scientists and reached consensus on the QoE-SPEO approach. Ten individual experts pilot-tested QoE-SPEO. To assess inter-rater agreement, we counted ratings of expected (actual and non-spurious) heterogeneity and quality of evidence and calculated a raw measure of agreement (Pi) between individual raters and rater teams for the downgrade domains. Pi ranged between 0.00 (no two pilot testers selected the same rating) and 1.00 (all pilot testers selected the same rating). Case studies were conducted of experiences of QoE-SPEO's use in two WHO/ILO systematic reviews.

Background: The World Health Organization (WHO) and the International Labour Organization (ILO) have produced the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury (WHO/ILO Joint Estimates).

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Results: We found no existing quality of evidence assessment approach for occupational exposure prevalence studies. We identified three relevant, existing approaches for environmental and occupational health studies of the effect of exposures. Assessments using QoE-SPEO comprise three steps: (1) judge the level of expected heterogeneity (defined as non-spurious variability that can be expected in exposure prevalence, within or between individual persons, because exposure may change over space and/or time), (2) assess downgrade domains, and (3) reach a final rating on the quality of evidence. Assessments are conducted using the same five downgrade domains as the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach: (a) risk of bias, (b) indirectness, (c) inconsistency, (d) imprecision, and (e) publication bias. For downgrade domains (c) and (d), the assessment varies depending on the level of expected heterogeneity. There are no upgrade domains. The QoE-SPEO's ratings are "very low", "low", "moderate", and "high". To arrive at a final decision on the overall quality of evidence, the assessor starts at "high" quality of evidence and for each domain downgrades by one or two levels for serious concerns or very serious concerns, respectively. In pilot tests, there was reasonable agreement in ratings for expected heterogeneity; 70% of raters selected the same rating. Inter-rater agreement ranged considerably between downgrade domains, both for individual rater pairs (range Pi: 0.36-1.00) and rater teams (0.20-1.00). Sparse data prevented rigorous assessment of inter-rater agreement in quality of evidence ratings.

Conclusions: We present QoE-SPEO as an approach for assessing quality of evidence in prevalence studies of exposure to occupational risk factors. It has been developed to its current version (as presented here), has undergone pilot testing, and was applied in the systematic reviews for the WHO/ILO Joint Estimates. While the approach requires further testing and development, it makes steps towards filling an identified gap, and progress made so far can be used to inform future work in this area.

Authors: Frank Pega, Natalie C Momen, Diana Gagliardi, Lisa A Bero, Fabio Bocconi, Nicholas Chartres, Alexis Descatha, Angel M Dzhambov, Lode Godderis, Tom Loney, Daniele Mandrioli, Alberto Modenese, Henk F van der Molen, Rebecca L Morgan, Subas Neupane, Daniela Pachito, Marilia S Paulo, K C Prakash, Paul T J Scheepers, Liliane Teixeira, Thomas Tenkate, Tracey J Woodruff, Susan L Norris

Full Source: Environment international 2022 Feb 16;161:107136. doi: 10.1016/j.envint.2022.107136.

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Utilization of Personal Protective Equipment and Associated Factors among Large-Scale Factory Workers in Debre-Berhan Town, Amhara Region, Ethiopia, 2021

2022-02-08

Background: Personal protective equipment was designed to protect workers from serious workplace injuries or illnesses resulting from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. Use of personal protective equipment has been identified as an important hazard control strategy in work environments where it may not be practical to adopt other strategies.

Objective: To determine personal protective equipment utilization and its associated factors based on health belief model among large scale factory workers in Debre-Birhan, Ethiopia.

Methods: An institution-based cross-sectional study was employed in Debre-Birhan Town, North Shoa Ethiopia, from April 1 to May 1, 2021. The data were collected by using an interviewer-administered structured questionnaire. A total of 412 samples were selected by systematic random sampling method. The data were entered to EpiData version 3.1 and analyzed by SPSS. All independent variables were fitted into the binary logistic regression model to evaluate the degree of association and variables with a p value of <0.2 that was fitted for multiple logistic regressions. Finally, variables with a p value of <0.05 was found to be statistically significant.

Result: A total of 412 workers were study participants with 100% response rate. The mean age was 29 (± 7.3) years. Most workers, 367 (89%) knew that PPE can prevent work-related injury and illness. Overall, 172 (41.7%) of the workers were considered to have good personal protective equipment utilization. Perceived susceptibility (AOR = 1.2, 95% CI (1.076-1.38)), perceived severity (AOR = 1.1, 95% CI (1.088-1.163)), perceived self-efficacy (AOR = 1.2, 95% CI (1.082-1.349)), and perceived barrier (AOR = 0.87, 95% CI (0.800-0.956)) were found to be significant predictors of good personal protective equipment utilization.

Conclusion: The study revealed that good personal protective equipment utilization in large-scale factory workers. Perceived susceptibility, perceived severity, perceived barrier, and perceived self-efficacy were found to be predictors of PPE utilization. It is recommended that, during

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delivery of health education special emphasis should be given to severity, susceptibility, barrier, and self-efficacy of occupational disease.

Authors: Muluken Tessema, Wondimu Sema

Full Source: Journal of environmental and public health 2022 Feb 8;2022:8439076. doi: 10.1155/2022/8439076.

PHARMACEUTICAL/TOXICOLOGY

Seafood-Induced Anaphylaxis in Children Presenting to Canadian Emergency Departments: Rates, Clinical Presentation and Management

2022-02-13

Background: There are a lack of data on seafood-induced anaphylaxis in children in Canada.

Objective: We aimed to assess the rate, clinical features, and management of seafood-induced anaphylaxis in children presenting to emergency departments across Canada.

Methods: Children with anaphylaxis were recruited at six emergency departments between 2011 and 2020 as part of the Cross-Canada Anaphylaxis REgistry. A standardized form documenting symptoms, triggers, co-morbidities and management was used to collect data. **Results:** There were 75 fish-induced and 71 shellfish-induced cases of suspected anaphylaxis, most of which were caused by salmon and shrimp, respectively. Mucocutaneous symptoms were most common, while respiratory symptoms were associated with patients with fish-induced reactions who have comorbid asthma [aOR 1.18 (95%CI, 1.02, 1.36)]. Pre-hospital epinephrine was underutilized (<35%), while in-hospital epinephrine was given to <60% patients. Among those with a known fish or shellfish allergy, pre-hospital epinephrine use was associated with known asthma [aOR 1.39 (95%CI, 1.05, 1.84) and aOR 1.25 (95%CI 1.02, 1.54), respectively]. Among children who were assessed by either skin tests or specific IgE, 36 (76.6%) patients with suspected fish-induced anaphylaxis and 19 (51.4%) patients with suspected shellfish-induced anaphylaxis tested positive.

Conclusion: Pre-hospital epinephrine is underused in the management of seafood-induced anaphylaxis. Among children with known seafood

Background: There are a lack of data on seafood-induced anaphylaxis in children in Canada.

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allergy, pre-hospital epinephrine is more likely if there is a known asthma comorbidity.

Authors: Daniel Sehayek, Morgan S Gold, Sofianne Gabrielli, Elissa M Abrams, Adam Bretholz, Edmond S Chan, Derek K Chu, Ann E Clarke, Jennifer Gerds, Ran D Goldman, Jocelyn Gravel, Elana Hochstadter, Rodrick Lim, Christine McCusker, Jocelyn Moisan, Judy Morris, Andrew O'Keefe, Jennifer L P Protudjer, Greg Shand, Elinor Simons, Julia Upton, Xun Zhang, Moshe Ben-Shoshan

Full Source: Annals of allergy, asthma & immunology : official publication of the American College of Allergy, Asthma, & Immunology 2022 Feb 13;S1081-1206(22)00097-7. doi: 10.1016/j.anai.2022.02.003.

Renal tubular dysfunction and cancer mortality in the Japanese general population living in cadmium non-contaminated areas

2022-02-19

The relationship between cadmium exposure, exposure-related renal tubular dysfunction, and mortality have been reported, mainly in the residents of Cd contaminated areas in Japan. The aim of this study was to establish the cause-effect relationship between renal tubular dysfunction and cancer mortality in the general population in non-contaminated areas. A 19-year cohort study was conducted in 1110 men and 1703 women in 1993 or 1994, who lived in three cadmium non-contaminated areas. Mortality risk ratios of urinary β 2-microglobulin (β 2MG) and N-acetyl- β -glucosaminidase (NAG) for all malignant neoplasms and specific cancers were estimated using the Fine and Gray competing risks regression model. Significant HRs for liver and pancreas cancer were observed for NAG (liver: HR corresponding to an increase of 1IU/g cr, 1.10, 95%CI, 1.02-1.19, pancreas: HR, 1.10, 95%CI, 1.02-1.19) in men. In women, a negative HR was observed for NAG (lung cancer: HR 0.80, 95% CI, 0.67-0.96) and for β 2MG (all malignant neoplasms: HR, 0.97, 95% CI, 0.93-1.00). The present study indicated that renal tubular dysfunction was significantly related to mortality in the general population of cadmium non-contaminated areas in Japan.

Authors: Kazuhiro Nogawa, Yuuka Watanabe, Sayaka Sakuma, Masaru Sakurai, Muneko Nishijo, Masao Ishizaki, Yuko Morikawa, Teruhiko Kido, Hideaki Nakagawa, Yasushi Suwazono

Full Source: Journal of applied toxicology : JAT 2022 Feb 19. doi: 10.1002/jat.4304.

The relationship between cadmium exposure, exposure-related renal tubular dysfunction, and mortality have been reported, mainly in the residents of Cd contaminated areas in Japan.

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Associating diethylhexyl phthalate to gestational diabetes mellitus via adverse outcome pathways using a network-based approach

2022-02-16

Gestational diabetes mellitus (GDM) is a common pregnancy complication that is harmful to both the woman and fetus. Several epidemiological studies have found that exposure to diethylhexyl phthalate (DEHP), an endocrine disruptor ubiquitous in the environment, may be associated with GDM. This study aims to investigate the mechanism between DEHP and GDM using the adverse outcome pathway (AOP) framework, which can integrate information from different sources to elucidate the causal pathways between chemicals and adverse outcomes. We applied a network-based workflow to integrate diverse information to generate computational AOPs and accelerate the AOP development. The interactions among DEHP, genes, phenotypes, and GDM were retrieved from several publicly available databases, including the Comparative Toxicogenomics Database (CTD), Computational Toxicology (CompTox) Chemicals Dashboard, DisGeNET, MalaCards, Gene Ontology (GO), and Kyoto Encyclopedia of Genes and Genomes (KEGG). Based on the above interactions, a DEHP-Gene-Phenotype-GDM network consisting of 52 nodes and 227 edges was formed to support AOP construction. The filtered genes and phenotypes were assembled as molecular initiating events (MIEs) and key events (KEs) according to the upstream and downstream relationships, generating a computational AOP (cAOP) network. Based on the Organization for Economic Co-operation and Development handbook of AOPs, a cAOP was assessed and applied to determine the effects of DEHP on GDM. DEHP could increase TNF- α , downregulate the glucose uptake process, and lead to GDM. Overall, this study revealed the utility of computational methods in integrating a variety of datasets, supporting AOP development, and facilitating a better understanding of the underlying mechanism of exposure to chemicals on human health.

Authors: Tao Zhang, Shuo Wang, Ludi Li, An Zhu, Qi Wang

Full Source: The Science of the total environment 2022 Feb 16;153932. doi: 10.1016/j.scitotenv.2022.153932.