

Bulletin Board

Contents

JUN. 19, 2020

[click on page numbers for links]

CHEMICAL EFFECTS

- The stability and efficacy of tricaine methanesulfonate (MS222) solution after long-term storage 3
- Analysis of pesticides mixtures discharged to the Lagoon of the Great Barrier Reef, Australia..... 4
- Sulfur-aided composting facilitates ammonia release mitigation, endocrine disrupting chemicals degradation and biosolids stabilisation.... 4

ENVIRONMENTAL RESEARCH

- A scoping review of non-occupational exposures to environmental pollutants and adult depression, anxiety, and suicide 5
- In utero exposure to organochlorine pesticide residues and their potential impact on birth outcomes and fetal gender 6

PHARMACEUTICAL/TOXICOLOGY

- Hyperactivity disorder in children related to traffic-based air pollution during pregnancy..... 7
- Dendritic epidermal T cells in allergic contact dermatitis 8

OCCUPATIONAL

- Occupational exposure and the risk of airway obstruction and mortality 8
- Respiratory symptoms and diminished lung functions associated with occupational dust exposure among iron ore mine workers in Iran..... 9
- Occupational exposure to metals and solvents: allergy and airway diseases 10

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

JUN. 19, 2020

CHEMICAL EFFECTS

The stability and efficacy of tricaine methanesulfonate (MS222) solution after long-term storage

2020-06-12

Tricaine methanesulfonate (MS222) is widely used for the anesthesia and euthanasia of laboratory zebrafish. Fresh solutions have been recommended for each use; however, researchers often mix and store concentrated stock solutions for convenience and to reduce occupational exposure and environmental waste. While this is common practice, published guidelines are often inconsistent. Thus, the objective of this study was to evaluate the stability and anesthetic efficacy of MS222 after long-term storage and to develop specific storage parameters. Stock solutions (100 mg/mL MS222) were mixed and stored in amber jars at 4 °C and -20 °C for 2- and 6-mo. Stability of the solutions was analyzed using liquid chromatography-ion trap mass spectrometry and compared with fresh MS222. Fifty adult (30 male, 20 female) wildtype AB zebrafish (*Danio rerio*) were randomly anesthetized with 150 mg/L of one of the following MS222 solutions to evaluate anesthetic efficacy: 1) freshly prepared (0m); 2) 2 mo at 4 °C (2m4); 3) 2 mo at -20 °C (2m-20); 4) 6 mo at 4 °C (6m4); 5) 6 mo at -20 °C (6m-20). Time to cessation of swimming, loss of equilibrium, lack of response to von Frey (VF) stimulation, return of equilibrium, and resumption of swimming were compared between groups. Two fish from each group were euthanized at 24-h and 2-wk after anesthesia, and histopathology was performed. All solutions were determined to be stable under all storage conditions. No clinically significant differences were observed between the fresh and stored stock groups during anesthetic testing. No evidence of anesthetic-related histologic changes were noted in the gills, skin, kidneys, muscle, and central nervous system. Hepatic megalocytosis and a reduction in hepatic vacuolation were seen to varying degrees across all groups, but did not follow a treatment-related trend. Therefore, 100 mg/mL solutions of MS222 can be stored in amber jars at 4 °C or -20 °C for 6 mo and still used to effectively anesthetize zebrafish.

Authors: Erin M Katz, David K Chu, Kerriann M Casey, Katechan Jampachaisri, Stephen A Felt, Cholawat Pacharinsak

Full Source: Journal of the American Association for Laboratory Animal Science: JAALAS. 2020 Jun 12. doi: 10.30802/JAALAS-JAALAS-19-000067. Online ahead of print.

All solutions were determined to be stable under all storage conditions.

Bulletin Board

Technical

JUN. 19, 2020

Analysis of pesticides mixtures discharged to the Lagoon of the Great Barrier Reef, Australia

2020-01-31

Organisms and ecosystems are generally exposed to mixtures of chemicals rather than to individual chemicals, but there have been relatively few detailed analyses of the mixtures of pesticides that occur in surface waters. This study examined over 2600 water samples, analysed for between 21 and 47 pesticides, from 15 waterways that discharge to the lagoon of the Great Barrier Reef in Queensland, Australia between July 1, 2011 and June 30, 2015. Essentially all the samples (99.8%) contained detectable concentrations (>limit of detection) of pesticides and pesticide mixtures. Approximately, 10% of the samples contained no quantifiable (>limit of reporting) pesticides, 10% contained one quantifiable pesticide and 80% contained quantifiable mixtures of 2-20 pesticides. Approximately 82% of samples that contained quantifiable mixtures had more than two modes of action (MoAs), but only approximately 6% had five or more MoAs. The mode, average and median number of quantifiable pesticides in all the samples were 2, 5.1 and 4, respectively. The most commonly detected compounds both individually and in mixtures were the pesticides atrazine, diuron, imidacloprid, hexazinone, 2,4-D, and the degradation product desethylatrazine. The number of pesticides and modes of action of pesticides in mixtures differed spatially and were affected by land use. Waterways draining catchments where sugar cane was a major land use had mixtures with the most pesticides.

Authors: M St J Warne, R A Smith, R D R Turner

Full Source: Environmental Pollution. 2020 Jan 31;265(Pt A):114088. doi: 10.1016/j.envpol.2020.114088. Online ahead of print.

Sulfur-aided composting facilitates ammonia release mitigation, endocrine disrupting chemicals degradation and biosolids stabilisation

2020-06-06

In order to investigate the potential effect of sulfur (S) aided composting on NH₃ volatilization mitigation, bisphenol A (PBA) and estrogens (estrone, 17β-estradiol, estriol, and 17α-ethinylestradiol) degradation and biosolids stabilization, five treatments of S (i.e., 0, 0.25%, 0.50%, 1.0%, and 2.0%, dry weight basis) were applied to the mixtures of biosolids and wheat straw during the 50 days of composting stabilization process. Results implicated addition of S decreased alkalinity of compost system, mitigated NH₃ volatilization, facilitated degradation of bisphenol A and estrogen

This study examined over 2600 water samples, analysed for between 21 and 47 pesticides, from 15 waterways that discharge to the lagoon of the Great Barrier Reef in Queensland, Australia between July 1, 2011 and June 30, 2015.

Bulletin Board

Technical

JUN. 19, 2020

in biosolids, and improved biosolids stabilization. Compared to control, the S-added treatments reduced nitrogen loss by 29.39%-97.22%, and degraded PBA and estrogens in biosolids by 25.42-72.63% and 21.11-68.14%, respectively, with S additions in range of 0.25-2.0%. In terms of economic efficiency and ecological risk, S addition at $\leq 0.50\%$ is suggested for composting stabilization of biosolids.

Authors: Ronghua Li, Kaili Xu, Amjad Ali, Hongxia Deng, Hanzhen Cai, Quan Qiang, Junting Pan, Chein-Chi Chang, Hongbin Liu, Zengqiang Zhang
Full Source: Bioresource Technology. 2020 Jun 6;312:123653. doi: 10.1016/j.biortech.2020.123653. Online ahead of print.

ENVIRONMENTAL RESEARCH

A scoping review of non-occupational exposures to environmental pollutants and adult depression, anxiety, and suicide

2020-06-12

Purpose of review: Despite a call for better understanding of the role of environmental pollutant influences on mental health and the tremendous public health burden of mental health, this issue receives far less attention than many other effects of pollutants. Here we summarize the body of literature on non-occupational environmental pollutant exposures and adult depression, anxiety, and suicide in PubMed, Embase, Web of Science, and PsychINFO through the end of year 2018.

Recent findings: One hundred twelve articles met our criteria for further review. Of these, we found 88 articles on depression, 33 on anxiety, and 22 on suicide (31 articles covered multiple outcomes). The earliest article was published in 1976, and the most frequent exposure of interest was air pollution ($n = 33$), followed by secondhand smoke ($n = 20$), metals ($n = 18$), noise ($n = 17$), and pesticides ($n = 10$). Other exposures studied less frequently included radiation, magnetic fields, persistent organic pollutants (POPs), volatile organic compounds, solvents, and reactive sulfur compounds. The current literature, although limited, clearly suggests many kinds of environmental exposures may be risk factors for depression, anxiety, and suicide. For several pollutants, important limitations exist with many of the studies. Gaps in the body of research include a need for more longitudinal, life-course studies, studies that can measure cumulative exposures as well as shorter-term exposures, studies that reduce the

Of these, we found 88 articles on depression, 33 on anxiety, and 22 on suicide (31 articles covered multiple outcomes).

Bulletin Board

Technical

JUN. 19, 2020

possibility of reverse causation, and mechanistic studies focused on neurotoxic exposures.

Authors: Aisha S Dickerson, Alexander C Wu, Zeyan Liew, Marc Weisskopf
Full Source: Current Environmental Health Reports. 2020 Jun 12. doi: 10.1007/s40572-020-00280-7. Online ahead of print.

In utero exposure to organochlorine pesticide residues and their potential impact on birth outcomes and fetal gender

2020-06-12

Being the largest agriculture country in the Arab world, Egypt was one of the major consumer of organochlorine pesticides (OCPs) in this area, continued to have a heavy burden of OCPs in the environment. There is growing concern that OCPs could pass from the maternal circulation through the placenta to the fetal circulation and pose several health risks to their fetuses. The current study was intended to identify OCPs residue exposure in healthy pregnant women and to justify the potential impacts of these residues on their fetuses. In this study, the prevalence of 18 OCPs was estimated in 81 maternal and cord blood samples, using Agilent 7890, gas chromatograph equipped with micro-electron capture detector (GC- μ ECD). Our data signposted that the heptachlor epoxide has the highest detection rate among all residues in both maternal (32%) and cord blood serum (27.16%). DDTs were still quantifiable, but with the lowest quantifiable percentage. More than 85% of mothers' serum with detectable residues transfer OCPs residue to their fetuses in a statistically significant manner ($x = 42.9$, p value < 0.001). The present findings showed no significant growth retardation, or preterm delivery induced by in utero exposure to the most abundant residues. There is growing evidence that exposure to OCPs residue has profound impact on sex ratio. Methoxychlor, in this study be deemed as testosterone triggers which yields high boys ratio ($x = 4.37$, $p < 0.05$). In conclusion, Egypt continued to have a heavy burden of OCPs residues, and fetuses and infants are especially the most vulnerable groups to their adverse health effects. Exposure to OCPs may disrupt the maternal hormones, which regulate the offspring gender, but these results need to be validated in larger sample sizes.

Authors: Enas R Abdel Hamid, Nevin E Sharaf, Hanaa Ahmed, Amira Ahmed, Abdel-Tawab H Mossa

Full Source: Environmental Science And Pollution Research International. 2020 Jun 12. doi: 10.1007/s11356-020-09411-x. Online ahead of print.

There is growing concern that OCPs could pass from the maternal circulation through the placenta to the fetal circulation and pose several health risks to their fetuses.

Bulletin Board

Technical

JUN. 19, 2020

PHARMACEUTICAL/TOXICOLOGY

Hyperactivity disorder in children related to traffic-based air pollution during pregnancy

2020-04-25

Background: Attention-deficit hyperactivity disorder (ADHD) is one of the most common neurobehavioral disorders in childhood globally. Between the two components of ADHD, hyperactivity disorder is more prevalent than inattention during early childhood. Although some investigations have implied a relationship between childhood ADHD and gestational exposure to air pollution, the evidence is limited. The aim of this study was to investigate the association between gestational exposure to air pollution exposure and hyperactivity disorder in childhood in a population-based birth cohort.

Methods: The Taiwan Birth Cohort Study started from all deliveries of Taiwan in 2005 by the birth registry, and recruited representative 12% of all mother-infant pairs by two-stage stratified sampling. At age of 8 years in each child, their main caretaker was inquired whether the child had ever received a hyperactivity diagnosis from a physician or other specialist, like special needs educator. Exposure to air pollutants during gestation was estimated through ordinary kriging based on data from air monitoring stations of Environmental Protection Administration, Taiwan. Logistic regression was used to determine adjusted odds ratios (aORs) of hyperactivity disorder in relation to air pollutants.

Results: A total of 16,376 mother-infant pairs were included in the final analysis; 374 (2.3%) of the children had received a diagnosis of hyperactivity before 8 years of age. The occurrence of hyperactivity was significantly related to prenatal nitrogen oxide (NO_x), but not to particulate matter 10 µm or less in diameter or sulfur dioxide. Further analysis to separate effects by nitrogen dioxide (NO₂) and/or nitric oxide (NO) showed that only NO was significantly related to hyperactivity [aOR per interquartile range (3.14 ppb): 1.26, 95% confidence interval: 1.09-1.46].

Conclusions: In conclusion, our study found childhood hyperactivity disorder to be positively associated with prenatal NO exposure. Further confirmation on potential hazardous effects of NO and investigation on potential mechanisms are warranted.

Authors: Ping Shih, Ching-Chun Huang, Shih-Chun Pan, Tung-Ling Chiang, Yue Leon Guo

Full Source: Environmental Research. 2020 Apr 25;188:109588. doi: 10.1016/j.envres.2020.109588. Online ahead of print.

The aim of this study was to investigate the association between gestational exposure to air pollution exposure and hyperactivity disorder in childhood in a population-based birth cohort.

Bulletin Board

Technical

JUN. 19, 2020

Dendritic epidermal T cells in allergic contact dermatitis

2020-05-19

Allergic contact dermatitis (ACD) is a common inflammatory skin disease with a prevalence of approximately 20% in the European population. ACD is caused by contact allergens that are reactive chemicals able to modify non-immunogenic self-proteins to become immunogenic proteins. The most frequent contact allergens are metals, fragrances, and preservatives. ACD clinically manifests as pruritic eczematous lesions, erythema, local papules, and oedema. ACD is a T cell-mediated disease, involving both CD4⁺ and CD8⁺ T cells. In addition, $\gamma\delta$ T cells appear to play an important role in the immune response to contact allergens. However, it is debated whether $\gamma\delta$ T cells act in a pro- or anti-inflammatory manner. A special subset of $\gamma\delta$ T cells, named dendritic epidermal T cells (DETC), is found in the epidermis of mice and it plays an important role in immunosurveillance of the skin. DETC are essential in sensing the contact allergen-induced stressed environment. Thus, allergen-induced activation of DETC is partly mediated by numerous allergen-induced stress proteins expressed on the keratinocytes (KC). Several stress proteins, like mouse UL-16-binding protein-like transcript 1 (Mult-1), histocompatibility 60 (H60) and retinoic acid early inducible-1 (Rae-1) γ family in mice and major histocompatibility complex (MHC) class I-chain-related A (MICA) in humans, are upregulated on allergen-exposed KC. Allergen-induced stress proteins expressed on the KC are consequently recognized by NKG2D receptor on DETC. This review focuses on the role of $\gamma\delta$ T cells in ACD, with DETC in the spotlight, and on the role of stress proteins in contact allergen-induced activation of DETC.

Authors: Veronika Mraz, Carsten Geisler, Charlotte Menné Bonefeld
Full Source: Frontiers in Immunology. 2020 May 19;11:874. doi: 10.3389/fimmu.2020.00874. eCollection 2020.

ACD clinically manifests as pruritic eczematous lesions, erythema, local papules, and oedema.

OCCUPATIONAL

Occupational exposure and the risk of airway obstruction and mortality

2020-06-11

Objectives: To identify occupational groups at high risk of airway obstruction (AO) and mortality and potential interactions with smoking.

Methods: Lung function data from the LuftiBus project were enriched with occupational and follow-up information from the Swiss National Cohort, resulting in a cohort of 10582 adults between 2000 and 2015.

Bulletin Board

Technical

JUN. 19, 2020

We assigned professions to occupational groups and estimated the risk of AO and mortality using adjusted logistic and Cox regression model. Additionally, we assessed multiplicative and additive interactions between occupational exposure and smoking.

Results: Chimney sweeps and male workers from the agriculture, construction and food industries had an increased risk of AO (odds ratios ranging from 1.43 to 2.21). The risk of mortality was increased among male workers from the food industry (hazard ratio 1.57, 95% CI 1.10-2.23). Interactions with smoking were present in most associations, but smoking had no effect on the increased risk of mortality in the food industry.

Conclusions: Some occupational groups have a considerable risk of AO and mortality. The identification of the most affected occupations is of great importance enabling targeted risk reduction strategies.

Authors: Alexandra Strassman, Marco Kaufmann, Holger Dressel, Alexander Turk, Martin Rössli, Kees de Hoogh, Steven S Sadhra, Mathias Bopp, Milo A Puhan, Swiss National Cohort Study Group
Full Source: International journal of public health. 2020 Jun 11. doi: 10.1007/s00038-020-01400-8. Online ahead of print.

Respiratory symptoms and diminished lung functions associated with occupational dust exposure among iron ore mine workers in Iran

2020-01-23

Background: Dust exposure at quarry mines is inevitable and can result in poor air quality. This research aimed to assess pulmonary symptoms and lung functions of dust-exposed workers at an iron-ore mine in eastern Iran.

Methods: An environmental cross-sectional study sampled 174 dust-exposed mine workers and 93 unexposed administrative employees as the reference group. A standardized questionnaire on respiratory symptoms was completed in accordance with recommendations of the American Thoracic Society(ATS). Calibrated spirometer measured Pulmonary Function Tests (PFTs). Data were analyzed via SPSS-21, integrating independent samples t-test, Chi-square and linear or logistic-regression models.

Results: There was no significant variation between dust-exposed and reference groups in terms of age, weight, height, work experience and the number of smokers ($P>0.05$). Mean levels of exposure to inhalable and respirable mineral-dust were 15.09 ± 2.34 and 3.45 ± 2.57 mg/m³ respectively. Pulmonary capacities of dust-exposed group were considerably decreased as compared to others (Forced Vital

Bulletin Board

Technical

JUN. 19, 2020

Capacity [FVC] 86.55 ± 13.77 vs. 105.05 ± 21.5 ; Forced Expiratory Volume in 1 second [FEV1] 88.06 ± 16.8 vs. 105.81 ± 21.55 ; FEV1/FVC 103.03 ± 18.17 vs. 93.3 ± 12.49 ; and Peak Expiratory Flow [PEF] 89.82 ± 22.58 vs. 98.09 ± 20.60) ($P<0.001$); with a higher prevalence of cough ($P=0.041$), wheezing ($P=0.032$), and dyspnea ($P=0.035$) among formers. Age along with exposure to respirable-dust significantly reduced FVC, FEV1 and FEV1/FVC. Cigarette consumption attenuated FVC and FEV1 on an average of 5 to 9 units.

Conclusion: Controlled occupational dust-exposure is a definitive prerequisite to reduce respiratory problems among quarry workers, with an explicit consideration towards mineral- mine workers. Modifiable accomplices like smoking and non-compliance of PPEs usage should be amicably resolved.

Authors: Abdollah Gholami, Reza Tajik, Khaula Atif, Amin Allah Zarei, Sedigheh Abbaspour, Gholamheidar Teimori-Boghsani, Mohsen Attar
Full Source: The Open Respiratory Medical Journal. 2020 Jan 23;14:1-7. doi: 10.2174/1874306402014010001. eCollection 2020.

Occupational exposure to metals and solvents: allergy and airway diseases

2020-06-06

Purpose of review: Occupational allergic diseases (OAD) such as occupational contact dermatitis (OCD), occupational asthma (OA), and occupational rhinitis (OR) are the most prevalent occupational diseases in industrialized countries. The purpose of this review is to provide an update about the main occupational metal and solvent exposures related to allergy and airway diseases and to discuss newly defined causative agents and industries in this field.

Recent findings: Currently for over 400 causative agents for OA and OCD, several hundreds of agents for OR have been identified. Although many studies have reported an overall decline in OAD related to known agents after implementation of efficient and effective workplace preventive measures, the constant development of new products continuously introduces to the market potential unknown respiratory hazards. Workplace allergens are often high molecular weight (HMW) agents that are > 10 kDa molecular weight and capable of eliciting IgE sensitization. Sensitizing low molecular weight (LMW) agents are often reactive chemicals. Metals and solvents are two large causative agent groups related to OADs that mainly behave as LMW (< 10 kDa) sensitizers and/or irritants. Avoidance of causative exposures through control strategies is the primary prevention approach for OADs. These strategies must be

There was no significant variation between dust-exposed and reference groups in terms of age, weight, height, work experience and the number of smokers ($P>0.05$).

Currently for over 400 causative agents for OA and OCD, several hundreds of agents for OR have been identified.

Bulletin Board

Technical

JUN. 19, 2020

applied and covered for all known and newly defined causative agents. This review aims to summarize current status of known occupational metal and solvent exposures related to allergy and airway diseases and to discuss newly defined causative agents and industries in this field.

Authors: Ozlem Kar Kurt, Nursen Basaran

Full Source: Current allergy and asthma reports. 2020 Jun 6;20(8):38.

doi: 10.1007/s11882-020-00931-7.