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Contents

MAY. 28, 2021

(click on page numbers for links)

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CHEMICAL EFFECTS

Review of the toxic effects of ionic liquids

2021-04-30

Interest in ionic liquids (ILs), called green or designer solvents, has been increasing because of their excellent properties such as thermal stability and low vapor pressure; thus, they can replace harmful organic chemicals and help several industrial fields e.g., energy-storage materials production and biomaterial pretreatment. However, the claim that ILs are green solvents should be carefully considered from an environmental perspective. ILs, given their minimal vapor pressure, may not directly cause atmospheric pollution. However, they have the potential to cause adverse effects if leaked into the environment, for instance if they are spilled due to human mistakes or technical errors. To estimate the risks of ILs, numerous ILs have had their toxicity assessed toward several micro- and macro-organisms over the past few decades. Since the toxic effects of ILs depend on the method of estimating toxicity, it is necessary to briefly summarize and comprehensively discuss the biological effects of ILs according to their structure and toxicity testing levels. This can help simplify our understanding of the toxicity of ILs. Therefore, in this review, we discuss the key findings of toxicological information of ILs, collect some toxicity data of ILs to different species, and explain the influence of IL structure on their toxic properties. In the discussion, we estimated two different sensitivity values of toxicity testing levels depending on the experiment condition, which are theoretical magnitudes of the inherent sensitivity of toxicity testing levels in various conditions and their changes in biological response according to the change in IL structure. Finally, some perspectives, future research directions, and limitations to toxicological research of ILs, presented so far, are discussed.

Authors: Chul-Woong Cho, Thi Phuong Thuy Pham, Yufeng Zhao, Stefan Stolte, Yeoung-Sang Yun

Full Source: The Science of the total environment 2021 Apr 30;786:147309. doi: 10.1016/j.scitotenv.2021.147309.

Interest in ionic liquids (ILs), called green or designer solvents, has been increasing because of their excellent properties such as thermal stability and low vapor pressure; thus, they can replace harmful organic chemicals and help several industrial fields e.g., energy-storage materials production and biomaterial pretreatment.

CHEMWATCH
Bulletin Board
Technical
MAY. 28, 2021

ENVIRONMENTAL RESEARCH

Irritant-Induced Chronic Cough Triggers: A Scoping Review and Clinical Checklist

2021-05-14

Purpose The primary aim of this review was to identify environmental irritants known to trigger chronic cough through the life span and develop a comprehensive clinically useful irritant checklist. Method A scoping review was conducted using the Preferred Reporting Items for Systematic Review and Meta-Analysis Extension for Scoping Reviews, checklist, and explanation. English-language, full-text resources were identified through Medline, PsycINFO, SPORTDiscus, Web of Science, and ProQuest Dissertations and Theses Global. Results A total of 1,072 sources were retrieved; of these, 109 were duplicates. Titles of abstracts of 963 articles were screened, with 295 selected for full-text review. Using the exclusion and inclusion criteria listed, 236 articles were considered eligible and 214 different triggers were identified. Triggers were identified from North America, Europe, Africa, Asia, and Australia. Occupational exposures were also delineated. Conclusions A clinically useful checklist of both frequently encountered triggers and idiosyncratic or rare triggers was developed. The clinical checklist provides a unique contribution to streamline and standardize clinical assessment of irritant-induced chronic cough. The international scope of this review extends the usefulness of the clinical checklist to clinicians on most continents.

Authors: Mary J Sandage, Elizabeth S Ostwalt, Lauren H Allison, Grace M Cutchin, Mariah E Morton, Shelby C Odom

Full Source: American journal of speech-language pathology 2021 May 14;1-31. doi: 10.1044/2021_AJSLP-20-00362.

Purpose The primary aim of this review was to identify environmental irritants known to trigger chronic cough through the life span and develop a comprehensive clinically useful irritant checklist.

Potential Environmental Health Risk Analysis of Neonicotinoids and a Synergist

2021-05-13

The extensive use of neonicotinoid pesticides has led to their widespread presence in the environment, resulting in considerable safety risks to the ecosystem and human health. In this study, we investigated the biotransformation behavior of a cocktail of multiple neonicotinoids and piperonyl butoxide (PBO) synergist in vivo and their potential environmental health risk. It was found that neonicotinoids with a cyano group, such as acetamiprid and thiacloprid, tended to accumulate in liver and spleen tissues, while others with nitro groups (imidacloprid,

thiamethoxam, clothianidin, dinotefuran, and nitenpyram) were mostly excreted in urine. In the presence of the synergist PBO, the metabolism of neonicotinoids in vivo changed, mainly through the nitro reduction pathway, while a low abundance of related metabolites was observed in the conventional hydroxylation and demethylation metabolic pathways, due to inhibition of CYP450 enzymes by the synergist. Furthermore, DNA methylation damage in vivo was exacerbated by the induction of hydroxylamine metabolites formed in the intermediate process of neonicotinoid metabolism with the synergistic effect of PBO, which resulted in a higher level of the O6-methyldeoxyguanosine (O6-medG) biomarker in the liver. Therefore, during the comprehensive evaluation of pesticide environmental risks, attention should be paid not only to the co-exposure mode under real environmental conditions but also to the potential risks of intermediate metabolism and related intermediate metabolites. This study provides a referential strategy and theoretical support for the health risk assessment of co-exposure of chemicals.

Authors: Liwei Xu, Xinxin Xu, Lingling Guo, Zhongxing Wang, Xiaoling Wu, Hua Kuang, Chuanlai Xu
Full Source: Environmental science & technology 2021 May 13. doi: 10.1021/acs.est.1c00872.

Environmental impact and human health risks of air pollutants near a large chemical/petrochemical complex: Case study in Tarragona, Spain

2021-05-06

Chemical industries and oil refineries are known emission sources of environmental contaminants, such as metals/metalloids, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs) and polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs), among others. Based on the toxicological potential of these pollutants, harmful health effects can be expected for the population living near these facilities. One of the largest chemical/petrochemical complexes in Europe is located in Tarragona County (Catalonia, Spain). In the last two decades, a number of investigations aimed at assessing the environmental impact of air pollutants potentially emitted by this industrial complex have been carried out. The present paper is a review of the available scientific information on the levels of air pollutants related with the activities of this chemical/petrochemical complex. Although there are currently some data on the environmental burdens of metals/metalloids, PAHs, VOCs and PCDD/Fs, there is an evident lack of specific biological monitoring studies on human health. Taking into account the amount of chemicals released

Chemical industries and oil refineries are known emission sources of environmental contaminants, such as metals/metalloids, polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs) and polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs), among others.

CHEMWATCH
Bulletin Board
Technical
MAY. 28, 2021

to air and their toxicity, it is essential to perform an in-depth analysis of the current health status of the population living in Tarragona County.

Authors: Joaquim Rovira, Martí Nadal, Marta Schuhmacher, José L Domingo
Full Source: The Science of the total environment 2021 May 6;787:147550. doi: 10.1016/j.scitotenv.2021.147550.

OCCUPATIONAL

Long-term air pollution and road traffic noise exposure and COPD: the Danish Nurse Cohort

2021-05-13

Background: While air pollution has been linked to the development of chronic obstructive pulmonary disease (COPD), evidence on the role of environmental noise is just emerging. We examined the associations of long-term exposure to air pollution and road traffic noise with COPD incidence. Methods: We defined COPD incidence for 24 538 female nurses from the Danish Nurse Cohort (age>44 years) as the first hospital contact between baseline (1993 or 1999) and 2015. We estimated residential annual mean concentrations of particulate matter with diameter<2.5 μm (PM2.5) since 1990 and nitrogen dioxide (NO2) since 1970 by the Danish DEHM/UBM/AirGIS modeling system, and road traffic noise (Lden) since 1970 by the Nord2000 model. Time-varying Cox regression models were applied to assess the associations of air pollution and road traffic noise with COPD incidence.
Results: 977 nurses developed COPD during 18.6 years' mean follow-up. We observed associations with COPD for all three exposures with hazard ratios (HRs) and 95% confidence intervals (CIs) of 1.19 (1.01, 1.41) per 6.26 μg·m-3 for PM2.5, 1.13 (1.05, 1.20) per 8.19 μg·m-3 for NO2, and 1.15 (1.06, 1.25) per 10 dB for Lden. Associations with NO2 and Lden attenuated slightly after mutual adjustment, but were robust to adjustment for PM2.5. Associations with PM2.5 were attenuated to null after adjustment for either NO2 or Lden. No potential interaction effect was observed between air pollutants and noise. Conclusions: Long-term exposure to air pollution, especially traffic-related NO2, and road traffic noise were independently associated with COPD.

Authors: Shuo Liu, Youn-Hee Lim, Marie Pedersen, Jeanette T Jørgensen, Heresh Amini, Thomas Cole-Hunter, Amar J Mehta, Rina So, Laust H Mortensen, Rudi G J Westendorp, Steffen Loft, Elvira V Bräuner, Matthias Ketzel, Ole Hertel, Jørgen Brandt, Steen S Jensen, Jesper H Christensen, Torben Sigsgaard, Camilla Geels, Lise M Frohn, Maja Brborić, Jelena

Background: While air pollution has been linked to the development of chronic obstructive pulmonary disease (COPD), evidence on the role of environmental noise is just emerging.

Radonić, Maja Turk Sekulic, Klaus Bønnelykke, Claus Backalarz, Mette K Simonsen, Zorana J Andersen
Full Source: The European respiratory journal 2021 May 13;2004594. doi: 10.1183/13993003.04594-2020.

Assessment of the respiratory function of farmers exposed to pesticides in the municipality of Quilombo (state of Santa Catarina, Brazil): relationship between health and occupational protection

2021-04-30
Introduction: Rural workers are exposed to various occupational risks, especially considering the exposure to pesticides. This exposure can lead to respiratory intoxications being the most frequent complaint by these professionals, which could be associated to the lack or improper use of personal protective equipment.
Objectives: To assess the respiratory function of rural workers exposed to pesticides in the municipality of Quilombo, state of Santa Catarina, Brazil.
Methods: This study was quantitative, observational, and descriptive. Our sample consisted of 31 rural workers aged between 25 and 45 years and divided into 2 age groups; we aimed to assess the effect of the period of exposure to pesticides. The participants answered a questionnaire, followed by a respiratory function assessment including measurements of inspiratory and expiratory muscle strength using a manovacuometer, of peak expiratory flow with a peak flow meter, and of tidal volume with a ventilometer.
Results: The groups presented decreases in respiratory muscle strength, peak expiratory flow, and tidal volume.
Conclusions: The damage to expiratory function observed in the evaluated sample presents, as a main factor, the lack of personal protective equipment use; therefore, education and health strategies are needed to instrumentalize these workers and reduce the development of occupational risks.

Introduction: Rural workers are exposed to various occupational risks, especially considering the exposure to pesticides.

Authors: Helber Luiz Bombardelli, Mariana Rossetto, Indiamara de Oliveira Flores Dal Magro Silvani, Vinícius José de Oliveira, Cléber Luis Bombardelli, César Augusto França-Abrahão
Full Source: Revista brasileira de medicina do trabalho : publicacao oficial da Associacao Nacional de Medicina do Trabalho-ANAMT 2021 Apr 30;19(1):27-34. doi: 10.47626/1679-4435-2021-551.

CHEMWATCH
Bulletin Board
Technical
MAY. 28, 2021

Occupational exposure risk during spraying of biocidal paint containing silver nanoparticles

2021-05-14
The study assessed potential to exceed occupational exposure limits while spraying paint with and without a silver nanoparticle biocidal additive. A tradesperson performed the tasks in a sealed chamber with filtered air supply. Integrated air sampling entailed transmission electron microscopy with energy dispersive X-ray analysis, direct-reading of particle number concentrations, and determination of silver mass concentration by NIOSH Method 7300. Silver nanoparticles were primarily embedded in paint spray droplets but also observed as isolated particles. Using an α-level of 0.05, median nanoparticle number concentrations did not differ significantly when spraying conventional vs. biocidal paint, although statistically significant differences were observed at specific particle size ranges <100 nm. The geometric mean concentration of total silver while spraying biocidal paint (n = 6) was 2.1 µg/m3 (95% CI: 1.5-2.8 µg/m3), and no respirable silver was detected (<0.50 µg/m3). The results address a lack of silver nanoparticle exposure data in construction and demonstrate the feasibility of a practical sampling approach. Given similar conditions, the measurements suggest a low probability of exceeding a proposed silver nanoparticle exposure limit of 0.9 µg/m3 as an airborne 8-hr time-weighted average respirable mass concentration. A full workday of exposure to respirable silver at the highest possible level in this study (<0.50 µg/m3) would not exceed the exposure limit, although limitations in comparing short task-based exposures to an 8-hr exposure limit must be noted. There was airflow in the study chamber, whereas exposure levels could increase over time in work environments lacking adequate ventilation. Potential to exceed the exposure limit hinged upon the respirable fraction of the paint mist, which could vary by material and application method. Additional research would improve understanding of silver nanoparticle exposure risks among construction trades, and biological responses to these exposures. Given the potential for exposure variability on construction jobsites, safety and health professionals should be cognizant of methods to assess and control silver nanoparticle exposures.

The study assessed potential to exceed occupational exposure limits while spraying paint with and without a silver nanoparticle biocidal additive.

Authors: Gavin H West, Fatima I Castaneda, Leonard G Burrelli, Daniel Dresser, Michael R Cooper, Sara B Brooks, Bruce E Lippy
Full Source: Journal of occupational and environmental hygiene 2021 May 14;1-15. doi: 10.1080/15459624.2021.1910277.

An investigation of the effectiveness of vibration-reducing gloves for controlling vibration exposures during grinding handheld workpieces

2021-05-12

Prolonged and intensive vibration exposures during the grinding of handheld workpieces may cause hand-arm vibration syndrome. The objectives of this study are to develop an on-the-hand method for evaluating vibration-reducing (VR) gloves, and to determine whether VR gloves can significantly reduce the vibration exposures. A worker holding and pressing a typical workpiece (golf club head) against a grinding wheel or belt in order to shape the workpiece was simulated, and the input vibration and those on the workpiece and hand-arm system were measured. Ten human subjects participated in the experiment. The results demonstrate that VR gloves significantly reduced the vibrations at the palm, hand dorsum, and wrist. The grinding interface condition and hand feed force did not substantially affect glove effectiveness. The use of gloves slightly increased the workpiece resonant response, but the resonant response did not significantly affect glove effectiveness. This study concluded that the use of VR gloves can help control vibration exposures of workers performing grinding of handheld workpieces.

Authors: Xueyan S Xu, Daniel E Welcome, Thomas W McDowell, Christopher Warren, Samantha Service, Hansheng Lin, Qingsong Chen, Ren G Dong

Full Source: Applied ergonomics 2021 May 12;95:103454. doi: 10.1016/j.apergo.2021.103454.

Prolonged and intensive vibration exposures during the grinding of handheld workpieces may cause hand-arm vibration syndrome.

PHARAMACEUTICAL/TOXICOLOGY

The effects of the exposure to neurotoxic elements on Italian schoolchildren behavior

2021-05-10

Neurodevelopmental disorders are constantly increasing on a global scale. Some elements like heavy metals are known to be neurotoxic. In this cross-sectional study we assessed the neurobehavioral effect of the exposure to trace elements including lead, mercury, cadmium, manganese, arsenic and selenium and their interactions among 299 schoolchildren residing in the heavily polluted Taranto area in Italy. Whole blood, urine and hair were collected for metal analyses, while the Child Behavior Checklist and the Social Responsiveness Scale, administered to the main teacher and the mothers were considered to identify behavioral problems in children.

CHEMWATCH
Bulletin Board
Technical
MAY. 28, 2021

Blood lead mainly influenced social problems, aggressive behavior, externalizing and total problems. Urinary arsenic showed an impact on anxiety and depression, somatic problems, attention problems and rule breaking behavior. A significant interaction between lead and arsenic was observed, with a synergistic effect of the two metals increasing the risk of attention problems, aggressive behavior, externalizing problems and total problems. Overall, we were able to test that higher blood lead, urinary arsenic concentrations and their interaction increase the risk of neurobehavioral problems. This is in line with the U.S. Environmental Protection Agency's priority list of hazardous substances where arsenic and lead are ranked as first and second respectively.

Authors: Stefano Renzetti, Giuseppa Cagna, Stefano Calza, Michele Conversano, Chiara Fedrighi, Giovanni Forte, Augusto Giorgino, Stefano Guazzetti, Costanza Majorani, Manuela Oppini, Marco Peli, Francesco Petrucci, Anna Pino, Donatella Placidi, Oreste Senofonte, Silvia Zoni, Alessandro Alimonti, Roberto G Lucchini

Full Source: Scientific reports 2021 May 10;11(1):9898. doi: 10.1038/s41598-021-88969-z.

Evaluation of the Utility of Vial Packaging to Reduce Occupational Exposure to Antineoplastic Drugs in Preventing Breakages and Scattering

2021-05-14

The dropping of glass vials based on negligence or accidental events that occur during the preparation or mixing of injectable drugs are examples of instances of occupational exposures occurring in a clinical setting. To reduce such risks, several types of glass vial packaging have been developed. We herein compared the resistance of base- and cup-type packaged vials to breakage and scattering of contents during falls with control vials. The falling heights at which test products were dropped were set to 70, 135, and 180 cm. Compared with the control group, appearance changes were inhibited in the cup-type groups. Significant differences were found between the cup-type and control groups at heights of 135 and 180 cm. Next, resistance of packaging to spilling and scattering of solution from the vial was determined. There was no scattering in any types of vials at a height of 70 cm because they were not broken. However, at heights of 135 and 180 cm, the mean scattering distance in the control groups were 50 and 70.6 cm, respectively. At these heights, some vials in the base-type and cup-type group were also cracked, but the solution stayed completely inside the covering packaging, indicating an obvious antiscattering ability. Vials packed in cup- and base-type packaging would

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lower the risk of the exposure of hazardous drugs during vial breakages. Because the base-type packaging did not show significant antibreakage effects, the cup-type packaging is more suited for hazardous drug packaging. However, cup-type packaging requires equipment investments from pharmaceutical manufacturers. Thus, cost-effectiveness and the target drug profile should be evaluated, and the use of cup- and base-type packaging, as well as control, forms should be selected accordingly.

Authors: Takahiro Suzuki, Noriyasu Hirasawa

Full Source: PDA journal of pharmaceutical science and technology 2021 May 14;pdajpst.2020.012286. doi: 10.5731/pdajpst.2020.012286.