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ENVIRONMENTAL RESEARCH

Development of triflumizole ionic liquids containing anions of natural origin for improving the utilisation and minimising the adverse impacts on aquatic ecosystems

2019-05-13

Triflumizole, a broad-spectrum systemic fungicide, has been widely used for the management of fungal diseases in plants. However, rapid photolysis and high risk to the aquatic environment limit its application. Ionic liquid (IL) forms of active pharmaceutical ingredients are innovative and promising agents that can optimise the application of the starting chemicals through the selection, or functionalisation of the counterions (cation or anion). In this study, triflumizole was paired with various natural organic acids to develop novel ILs for improving the physicochemical properties and reducing the toxicity to fish. The results showed that the obtained ILs had low surface tension and lipophilicity and could protect triflumizole against degradation under UV irradiation as well as exhibit more excellent biological activity against *Botrytis cinerea* than triflumizole. The IL forms of triflumizole reduced the dosage and frequency of this fungicide, accordingly minimized the negative effect on environment. The IL contained salicylic acid as anion decreased > 4-fold toxicity to adult zebrafish over TFM. The results reported here create new application possibilities for imidazole fungicides and offer some heuristic rules for the design of active pharmaceutical ingredients-ionic liquids.

Authors: Tang G, Zhang W, Tang J, Niu J, Yang J, Tang R, Dong H, Liang Y, Luo L, Cao Y.

Full Source: Science of the Total Environment. 2019 Mar 18; 670:606-612. doi: 10.1016/j.scitotenv.2019.03.249. [Epub ahead of print]

In this study, triflumizole was paired with various natural organic acids to develop novel ILs for improving the physicochemical properties and reducing the toxicity to fish.

Proximity to chemical equilibria among air, water, soil, and sediment as varied with partition coefficients: A case study of polychlorinated dibenzodioxins/furans, polybrominated diphenyl ethers, phthalates, and polycyclic aromatic hydrocarbons

2019-05-13

To capture the pollutant distribution status among environmental media and to understand how the distribution varies with the pollutants' properties, the authors assessed a total of 225 fugacity ratios (FRs) of 45 semi-volatile organic compounds (SVOCs) (polychlorinated dibenzo-

p-dioxins/furans (PCDDs/Fs), polybrominated diphenyl ethers (PBDEs), phthalates, and polycyclic aromatic hydrocarbons (PAHs)) for five medium pairs (air-water, air-soil, water-sediment, soil-water, and soil-sediment) using the nationwide multimedia monitoring data. For many of the pollutants, fugacity was greatest in air (PCDFs and 6 heavy PAHs) and in sediment (PBDEs and 9 light PAHs) while lowest in soil for most of the pollutants. PAHs and phthalates appeared to be farther away from equilibrium than PCDDs/Fs and PBDEs. The ratios of "equilibrium improbable" FRs to all the FRs in each chemical group were 2%, 0%, 33.3%, and 28.9% for PCDDs/Fs, PBDEs, phthalates, and PAHs, respectively. $FR_{water/air}$ of PAHs, $FR_{soil/air}$, and $FR_{sediment/water}$ of the pollutant groups (except for PBDEs) decreased significantly ($p < 0.01$) with the partition coefficients, $1/K_{air/water}$ ($1/K_{aw}$), $K_{octanol/air}$ (K_{oa}), and $K_{octanol/water}$ (K_{ow}), respectively, even in the field conditions. The findings on FRs values provide valuable clues to identifying the media that would act as sink or source for certain chemicals and to using a more appropriate choice in the coherence test of environmental quality objectives, which should be important considerations in the management of chemical contamination in the environment.

Authors: Kim HS, Lee DS.

Full Source: Science of the Total Environment. 2019 Mar 20; 670:760-769.

doi: 10.1016/j.scitotenv.2019.03.286. [Epub ahead of print]

Uptake and biodegradation of emerging contaminant sulfamethoxazole from aqueous phase using *Ipomoea aquatica*

2019-05-13

Plants serve as appropriate markers of worldwide pollution because they are present in almost every corner of the globe and bioaccumulate xenobiotic chemicals from their environment. The potential of a semi-aquatic plant, *Ipomoea aquatica*, to uptake and metabolise sulfamethoxazole (SMX) was investigated in this study. *I. aquatica* exhibited 100% removal of 0.05 mg L⁻¹ SMX from synthetic media within 30 h. The *I. aquatica* achieved 93, 77 and 72% removal of SMX at 0.2, 0.5 and 1 mg L⁻¹, respectively, after 48 h. This indicated that removal efficiency of *I. aquatica* was deteriorating at high concentrations of SMX. The chlorophyll and carotenoid content of *I. aquatica* was insignificantly influenced by SMX irrespective of its high concentration. Similarly, scanning electron microscopy (SEM) showed that exposure to SMX had an insignificant impact on morphology of the plant organelles. The mechanisms of removal by *I. aquatica* were explored by evaluating

The potential of a semi-aquatic plant, *Ipomoea aquatica*, to uptake and metabolise sulfamethoxazole (SMX) was investigated in this study.

contributions of bioadsorption, bioaccumulation and biodegradation. There was negligible adsorption of SMX to plant roots. Accumulation of SMX within plant roots and stems was not observed; however, *I. aquatica* accumulated 17% of SMX in leaves. Thus, the major mechanism of elimination of SMX was biodegradation, which accounted for 82% removal of SMX. Gas chromatography-mass spectrometry (GC-MS) confirmed that *I. aquatica* biodegraded SMX into simpler compounds, and generated 4-aminophenol as its final product. A laboratory scale phytoreactor was used to investigate the application of *I. aquatica* in a simulated system, where it achieved 49% removal of SMX (0.2 mg L⁻¹) in 10 d.

Authors: Kurade MB, Xiong JQ, Govindwar SP, Roh HS, Saratale GD, Jeon BH, Lim H.

Full Source: Chemosphere. 2019 Mar 14; 225:696-704. doi: 10.1016/j.chemosphere.2019.03.086. [Epub ahead of print]

Volatiles from Different Instars of Honeybee Worker Larvae and Their Food

2019-05-13

(E)- β -Ocimene was the only volatile chemical found to be emitted by whole, live worker larvae of *Apis mellifera* L. when sampling in the vapor phase. In addition to (E)- β -ocimene, there is evidence for the existence of other volatiles, but the changes in their composition and contents remain unknown during larval development, as are their differences from larvae to larval food. In the present study, the authors investigated volatile components of worker larvae and larval food using solid phase dynamic extraction (SPDE) coupled with gas chromatography-mass spectrometry (GC-MS). Nine compounds were identified with certainty and six tentatively, including terpenoids, aldehydes, hydrocarbons, an ester and a ketone. The contents of volatiles in the second-instar worker larvae differ greatly from those in larvae of other stages. This is mainly attributable to terpenoids, which resulted in the second-instar worker larvae having significantly higher amounts of overall volatiles. Larval food contained significantly higher amounts of aldehydes and hydrocarbons than the corresponding larvae from the fourth to fifth-instar. The authors discovered volatiles in worker larvae and their food that were never reported before; also, the content changes of these volatiles during larval development was determined.

Authors: Zhang H, Hou C, Dai P, Liu Y, Wu Y, Pang Y, Diao Q.

Full Source: Insects. 2019 Apr 25;10(4). pii: E118. doi: 10.3390/insects10040118.

In the present study, the authors investigated volatile components of worker larvae and larval food using solid phase dynamic extraction (SPDE) coupled with gas chromatography-mass spectrometry

Antibiotics in corals of the South China Sea: Occurrence, distribution, bioaccumulation, and considerable role of coral mucus

2019-05-13

Manmade antibiotics are emerging organic pollutants widely detected in the marine environment. In this study, 14 out of 19 target antibiotics were detected in corals collected from coastal and offshore regions in the South China Sea. The average total antibiotic concentrations (Σ 19ABs) in the two regions were similar: 28 ng/g for coastal corals and 31 ng/g for offshore corals, based on dry tissue weight (dw). Fluoroquinolones (FQs) were predominant antibiotics in the coastal corals (mean Σ FQs: 18 ng/g dw), while sulfonamides (SAs) predominated in the offshore corals (mean Σ SAs: 23 ng/g dw). However, corals living in coastal regions tend to excrete more mucus than corals in offshore habitat. The authors found 53% by average of Σ 19ABs in the mucus of the coastal corals; while in offshore corals, most antibiotics (88% by average) were accumulated in the tissues. In addition, the tissue-mucus mass distribution differs among individual antibiotics. Sulfonamides were mainly accumulated in tissues while fluoroquinolones were present mainly in mucus. The results of this study suggest that mucus played an important role in the bioaccumulation of antibiotics by corals. It may resist the bioaccumulation of antibiotics by coral tissue, especially for the coastal corals. Additionally, corals were compared with other marine biotas in the study area and found to be more bioaccumulative towards antibiotics.

Authors: Zhang R, Yu K, Li A, Wang Y, Huang X.

Full Source: Environmental Pollution. 2019 Apr 13; 250:503-510. doi:

10.1016/j.envpol.2019.04.036. [Epub ahead of print]

In this study, 14 out of 19 target antibiotics were detected in corals collected from coastal and offshore regions in the South China Sea.

MEDICAL RESEARCH

Multi-walled carbon nanotubes induce stronger migration of inflammatory cells in vitro than asbestos or granular particles but a similar pattern of inflammatory mediators

2019-05-13

Biopersistent pro-inflammatory fibres are suspected human carcinogens. Cytotoxicity and transcription of pro- and anti-inflammatory mediators of different fibres were investigated in functional relationship to chemotaxis in vitro as a model for fibre-induced inflammation of the lung. The authors challenged NR8383 rat macrophages with multi-walled carbon nanotubes (MWCNT) and various asbestos fibres. The resulting cell supernatants were

than studied using the Particle-induced Cell Migration Assay (PICMA) and cytotoxicity was determined using the LDH test. Expression of inflammatory mediators was analysed with qPCR and verified by ELISA. Chrysotile A and the rigid, needle-shaped NM-401 caused the strongest cytotoxic effects and the largest number of migrated cells. In contrast, the MWCNT NM-400, NM-402, and NM403 were apparently non-cytotoxic but induced pronounced cell migration showing a very steep dose response. However, the strength of cell migration and cytotoxicity of the asbestos fibres were correlated. The expression profile of inflammatory mediators was comparable, although cytotoxicity of the MWCNT NM-401 and NM-403 differed strongly. Induction of the corresponding proteins was confirmed for CCL2, CCL3, CXCL1, CXCL3, IL1RA (IL1RN), CSF1, GDF15 and TNF α . Chrysotile A and NM-401 induced much stronger chemotaxis than the non-fibrous particles reported in our previous study. Cytotoxic and chemotactic effects correspond to the induction of inflammatory mediators.

Authors: Westphal GA, Rosenkranz N, Brik A, Weber D, Föhrling I, Monsé C, Kaiser N, Hellack B, Mattenklott M, Brüning T, Johnen G, Bünger J.

Full Source: Toxicology In Vitro. 2019 Mar 27; 58:215-223. doi: 10.1016/j.tiv.2019.03.036. [Epub ahead of print]

Therapeutic Targeting of Nuclear Receptors, LXR and RXR, for Alzheimer's Disease

2019-05-13

After 15 years of research into Alzheimer's disease (AD) therapeutics, including billions of US dollars provided by federal agencies, pharmaceutical companies and private foundations, there are still no meaningful therapies that can delay the onset or slow the progression of AD. Understanding of the proteolytic processing of Amyloid Precursor Protein (APP) and the hypothesis that pathogenic mechanisms in familial and sporadic forms of AD are very similar, led to the assumption that pharmacological inhibition of secretases or immunological approaches to clear amyloid depositions in brain would have been the core of drug discovery strategies and successful therapies. However, there are other understudied approaches including: targeting genes, gene networks and metabolic pathways outside the proteolytic processing of APP. The advancement of newly developed sequencing technologies and mass-spectrometry, as well as the availability of animal models expressing human APOE isoforms has been critical in rationalising additional AD-therapeutics. The purpose of this review is to present one of those approaches, based on the role of ligand activated Nuclear Liver X and

The purpose of this review is to present an approach for therapeutic targeting of nuclear receptors for Alzheimer's Disease, based on the role of ligand activated Nuclear Liver X and Retinoid X Receptors in brain.

Retinoid X Receptors in brain. This therapeutic approach was initially proposed utilising in vitro models 15 years ago and has since been examined in numerous studies using AD-like mouse models.

Authors: Fitz NF, Nam KN, Koldamova R, Lefterov I.

Full Source: British Journal of Pharmacology. 2019 Mar 29. doi: 10.1111/bph.14668. [Epub ahead of print]

Prenatal toxicity and maternal-foetal distribution of 1,3,5,8-tetrachloronaphthalene (1,3,5,8-TeCN) in Wistar rats

2019-05-13

1,3,5,8-tetrachloronaphthalene (1,3,5,8-TeCN) is a Persistent Organic Pollutant (POP) that belongs to the group of polychlorinated naphthalenes (PCNs). The aim of the study was to investigate the maternal-foetal distribution and prenatal toxicity of 1,3,5,8-TeCN after its administration to pregnant Wistar rats during organogenesis. Radiolabelled 1,3,5,8-tetrachloronaphthalene-[ring-U-3H] was given by gavage at a dose of 0.3 mg per dam to evaluate its tissue distribution, and that of unlabelled 1,3,5,8-TeCN, at daily doses of 0.3, 1.0 or 3.0 mg kg b.w.⁻¹ to assess prenatal toxicity. After a single administration of 1,3,5,8-TeCN, the highest concentration was detected in maternal adipose tissue. The concentration in the brain, uterus, kidneys, adrenals, ovaries, lungs and liver established in dams were two to nine times higher than in the maternal blood. 1,3,5,8-TeCN penetrated the blood-brain-barrier and the placenta. The results obtained from developmental toxicity indicate that 1,3,5,8-TeCN did not cause maternal toxicity and was not embryotoxic or teratogenic. However, fetotoxic effects were observed after non-toxic doses for dams (1.0 and 3.0 mg.b.w.⁻¹.day⁻¹). 1,3,5,8-TeCN did not induce congenital skeletal defects but increased the number of foetuses with sternum ossification delay. After a dose of 3.0 mg kg b.w.⁻¹.day⁻¹, significantly more foetuses were found with enlargement of the renal pelvis: unilateral in female offspring and bilateral in male offspring. At the doses used, 1,3,5,8-TeCN, unlike hexachloronaphthalene, was not a CYP1A1 inducer.

Authors: Kilanowicz A, Sitarek K, Stragierowicz J, Klimczak M, Bruchajzer E.

Full Source: Chemosphere. 2019 Mar 19; 226:75-84. doi: 10.1016/j.chemosphere.2019.03.107. [Epub ahead of print]

The aim of the study was to investigate the maternal-foetal distribution and prenatal toxicity of 1,3,5,8-TeCN after its administration to pregnant Wistar rats during organogenesis.

Adverse Maternal, Foetal, and Postnatal Effects of Hexafluoropropylene Oxide Dimer Acid (GenX) from Oral Gestational Exposure in Sprague-Dawley Rats

2019-05-13

Hexafluoropropylene oxide dimer acid [(HFPO-DA), GenX] is a member of the per- and polyfluoroalkyl substances (PFAS) chemical class, and elevated levels of HFPO-DA have been detected in surface water, air, and treated drinking water in the United States and Europe. The authors aimed to characterise the potential maternal and postnatal toxicities of oral HFPO-DA in rats during sexual differentiation. Given that some PFAS activate peroxisome proliferator-activated receptors (PPARs), the authors sought to assess whether HFPO-DA affects androgen-dependent development or interferes with oestrogen, androgen, or glucocorticoid receptor activity. Steroid receptor activity was assessed with a suite of in vitro transactivation assays, and Sprague-Dawley rats were used to assess maternal, foetal, and postnatal effects of HFPO-DA exposure. Dams were dosed daily via oral gavage during male reproductive development (gestation days 14-18). Foetal testes, maternal and foetal livers, maternal serum clinical chemistry, and reproductive development of F1 animals were evaluated. HFPO-DA exposure resulted in negligible in vitro receptor activity and did not impact testosterone production or expression of genes key to male reproductive development in the foetal testis; however, in vivo exposure during gestation resulted in higher maternal liver weights ([Formula: see text]), lower maternal serum thyroid hormone and lipid profiles ([Formula: see text]), and up-regulated gene expression related to PPAR signalling pathways in maternal and foetal livers ([Formula: see text]). Further, the pilot postnatal study indicated lower female body weight and lower weights of male reproductive tissues in F1 animals. HFPO-DA exposure produced multiple effects that were similar to prior toxicity evaluations on PFAS, such as perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), but seen as the result of higher oral doses. The mean dam serum concentration from the lowest dose group was 4-fold greater than the maximum serum concentration detected in a worker in an HFPO-DA manufacturing facility. The authors concluded that research is needed to examine the mechanisms and downstream

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events linked to the adverse effects of PFAS as are mixture-based studies evaluating multiple PFAS.

Authors: Conley JM, Lambricht CS, Evans N, Strynar MJ, McCord J, McIntyre BS, Travlos GS, Cardon MC, Medlock-Kakaley E, Hartig PC, Wilson VS, Gray LE Jr.

Full Source: Environmental Health Perspectives. 2019 Mar; 127(3):37008. doi: 10.1289/EHP4372.

OCCUPATIONAL RESEARCH

Animal production, insecticide use and self-reported symptoms and diagnoses of COPD, including chronic bronchitis, in the Agricultural Health Study

2019-05-13

Occupational exposure to animal production is associated with chronic bronchitis symptoms; however, few studies consider associations with chronic obstructive pulmonary disease (COPD). In the present study, the authors estimated associations between animal production activities and prevalence of self-reported COPD among farmers in the Agricultural Health Study. During a 2005-2010 interview, farmers self-reported information about: their operations (i.e., size, type, number of animals, insecticide use), respiratory symptoms, and COPD diagnoses (i.e., COPD, chronic bronchitis, emphysema). Operations were classified as small or medium/large based on regulatory definitions. Farmers were classified as having a COPD diagnosis, chronic bronchitis symptoms (cough and phlegm for ≥ 3 months during 2 consecutive years), or both. Polytomous logistic regression was used to estimate odds ratios (OR) and 95% confidence intervals (CI). Of 22,491 participating farmers (median age: 59 years), 922 (4%) reported a COPD diagnosis only, 254 (1%) reported a diagnosis and symptoms, and 962 (4%) reported symptoms only. Compared to raising no commercial animals, raising animals on a medium/large operation was positively associated with chronic bronchitis symptoms with (OR: 1.59; 95% CI: 1.16, 2.18) and without a diagnosis (OR: 1.69; 95% CI: 1.42, 2.01). Ever use of multiple organophosphates, carbaryl, lindane, and permethrin were positively associated with chronic bronchitis symptoms. Animal production work, including insecticide use, was positively associated with chronic bronchitis symptoms; but not consistently with COPD diagnosis alone. Our results support the need for further investigation into the role of animal production-related exposures

In the present study, the authors estimated associations between animal production activities and prevalence of self-reported COPD among farmers in the Agricultural Health Study.

in the aetiology of COPD and better respiratory protection for agricultural workers.

Authors: Rinsky JL, Richardson DB, Kreiss K, Nylander-French L, Beane Freeman LE, London SJ, Henneberger PK, Hoppin JA.

Full Source: Environment International. 2019 Apr 24; 127:764-772. doi: 10.1016/j.envint.2019.02.049. [Epub ahead of print]

Toxicogenomics - What added Value Do These Approaches Provide for Carcinogen Risk Assessment?

2019-05-13

It is still a major challenge to protect humans at workplaces and in the environment. To cope with this task, it is a prerequisite to obtain detailed information on the extent of chemical perturbations of biological pathways, in particular, adaptive vs. adverse effects and the dose-response relationships. This knowledge serves as the basis for the classification of non-carcinogens and carcinogens and for further distinguishing carcinogens in genotoxic (DNA damaging) or non-genotoxic compounds. Basing on quantitative dose-response relationships, points of departures can be derived for chemical risk assessment. In recent years, new methods have shown their capability to support the established rodent models of carcinogenicity testing. In vitro high throughput screening assays assess more comprehensively cell response. In addition, omics technologies were applied to study the mode of action of chemicals whereby the term "toxicogenomics" comprises various technologies such as transcriptomics, epigenomics, or metabolomics. This review aims to summarise the current state of toxicogenomic approaches in risk science and to compare them with established ones. For example, measurement of global transcriptional changes generates meaningful information for toxicological risk assessment such as accurate classification of genotoxic/non-genotoxic carcinogens. Alteration in mRNA expression offers previously unknown insights in the mode of action and enables the definition of key events. Based on these, benchmark doses can be calculated for the transition from an adaptive to an adverse state. In this review, the author assesses the potential and challenges of transcriptomics and addresses the impact of other omics technologies on risk assessment in terms of hazard identification and dose-response assessment.

Author: Schmitz-Spanke S.

Full Source: Environmental Research. 2019 Mar 13; 173:157-164. doi: 10.1016/j.envres.2019.03.025. [Epub ahead of print]

In this review, the author assesses the potential and challenges of transcriptomics and addresses the impact of other omics technologies on risk assessment in terms of hazard identification and dose-response assessment.

Bioaccessibility of nickel and cobalt in powders and massive forms of stainless steel, nickel- or cobalt-based alloys, and nickel and cobalt metals in artificial sweat

2019-05-13

Nickel (Ni) and cobalt (Co) are the most common metal allergens upon skin contact at occupational settings and during consumer handling of metals and alloys. A standardised test (EN, 1811) exists to assess Ni release from articles of metals and alloys in massive forms intended for direct and prolonged skin contact, but no corresponding test exists for other materials such as powders or massive forms of alloys placed on the market or to determine the release of Co, for which only limited data is available. Differences in Ni and Co release from massive forms of a range of common stainless steels and some high-alloyed grades compared to Ni and Co metals were therefore assessed in artificial sweat for 1 week at 30 °C according to EN 1811. A comparable modified test procedure was elaborated and used for powders and some selected massive alloys. All alloys investigated released significantly less amount of Ni (100-5000-fold) and Co (200-400,000-fold) compared with Ni and Co metal, respectively. Almost all alloys showed a lower bioaccessible concentration (0.007-6.8 wt% Ni and 0.00003-0.6 wt% Co) when compared to corresponding bulk alloy contents (0.1-53 wt% Ni, 0.02-65 wt% Co). Observed differences are, among other factors, related to differences in bulk composition and to surface oxide characteristics. For the powders, less Ni and Co were released per surface area, but more per mass, compared to the corresponding massive forms.

Authors: Wang X, Herting G, Wei Z, Odneval Wallinder I, Hedberg Y.

Full Source: Regulatory Toxicology & Pharmacology. 2019 Apr 25; 106:15-26. doi: 10.1016/j.yrtph.2019.04.017. [Epub ahead of print]

In this study, the authors aimed to investigate the associations between occupational exposures and longitudinal lung function decline in the population-based Tasmanian Longitudinal Health Study.

Occupational exposure to solvents and lung function decline: A population-based study

2019-05-13

While cross-sectional studies have shown associations between certain occupational exposures and lower levels of lung function, there was little evidence from population-based studies with repeated lung function measurements. In this study, the authors aimed to investigate the associations between occupational exposures and longitudinal lung function decline in the population-based Tasmanian Longitudinal Health Study. Lung function decline between ages 45 years and 50 years was assessed using data from 767 participants. Using lifetime work history

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calendars completed at age 45 years, exposures were assigned according to the ALOHA plus Job Exposure Matrix. Occupational exposures were defined as ever exposed and cumulative exposure -unit- years. The authors investigated effect modification by sex, smoking and asthma status. Compared with those without exposure, ever exposures to aromatic solvents and metals were associated with a greater decline in FEV1 (aromatic solvents 15.5 mL/year (95% CI -24.8 to 6.3); metals 11.3 mL/year (95% CI -21.9 to - 0.7)) and FVC (aromatic solvents 14.1 mL/year 95% CI -28.8 to - 0.7; metals 17.5 mL/year (95% CI -34.3 to - 0.8)). Cumulative exposure (unit years) to aromatic solvents was also associated with greater decline in FEV1 and FVC. Women had lower cumulative exposure years to aromatic solvents than men (mean (SD) 9.6 (15.5) vs 16.6 (14.6)), but greater lung function decline than men. An association was also found between ever exposures to gases/fumes or mineral dust and greater decline in lung function. Exposures to aromatic solvents and metals were associated with greater lung function decline. The effect of aromatic solvents was strongest in women. Preventive strategies should be implemented to reduce these exposures in the workplace.

Authors: Alif SM, Dharmage S, Benke G, Dennekamp M, Burgess J, Perret JL, Lodge C, Morrison S, Johns DP, Giles G, Gurrin L, Thomas PS, Hopper JL, Wood-Baker R, Thompson B, Feather I, Vermeulen R, Kromhout H, Jarvis D, Garcia Aymerich J, Walters EH, Abramson MJ, Matheson MC.

Full Source: Thorax. 2019 Apr 26. pii: thoraxjnl-2018-212267. doi: 10.1136/thoraxjnl-2018-212267. [Epub ahead of print]

Low-dose computed tomography screening for lung cancer in people with workplace exposure to asbestos

2019-05-13

Smoking is the main risk factor for lung cancer, but environmental and occupational exposure to carcinogens also increase lung cancer risk. During the present study, the authors assessed whether extending low-dose computed tomography (LDCT) screening to persons with occupational exposure to asbestos may be an effective way reducing lung cancer mortality. The authors conducted a nested case-control study within the COSMOS screening program, assessing past asbestos exposure with a questionnaire. LDCT scans of asbestos-exposed participants were reviewed to assess the presence of pulmonary, interstitial and pleural alterations in comparison to matched unexposed controls. An exhaustive review, with meta-analysis, of the literature on LDCT screening in asbestos-exposed persons was also performed. Exposure to asbestos, initially self-reported by 9.8% of COSMOS participants, was confirmed in 216 of

During the present study, the authors assessed whether extending low-dose computed tomography (LDCT) screening to persons with occupational exposure to asbestos may be an effective way reducing lung cancer mortality.

544 assessable cases, corresponding to 2.6% of the screened population. LDCT of asbestos-exposed persons had significantly more pleural plaques, diaphragmatic pleural thickening and pleural calcifications, but similar frequency of parenchymal and interstitial alterations to unexposed persons. From 16 papers, including this study, overall lung cancer detection rates at baseline were 0.81% (95% CI 0.50-1.19) in asbestos-exposed persons, 0.94% (95% CI 0.47-1.53) in asbestos-exposed smokers (12 studies), and 0.11% (95% CI 0.00-0.43) in asbestos-exposed non-smokers (9 studies). Persons occupationally exposed to asbestos should be monitored to gather more information about risks. Although LDCT screening is effective in the early detection lung cancer in asbestos-exposed smokers, our data suggest that screening of asbestos-exposed persons with no additional risk factors for cancer does is not viable due to the low detection rate.

Authors: Maisonneuve P, Rampinelli C, Bertolotti R, Misotti A, Lococo F, Casiraghi M, Spaggiari L, Bellomi M, Novellis P, Solinas M, Dieci E, Alloisio M, Fontana L, Persechino B, Iavicoli S, Veronesi.

Full Source: Lung Cancer. 2019 May; 131:23-30. doi: 10.1016/j.lungcan.2019.03.003. Epub 2019 Mar 6.

PUBLIC HEALTH RESEARCH

Role of cadmium and arsenic as endocrine disruptors in the metabolism of carbohydrates: Inserting the association into perspectives

2019-05-13

Endocrine disrupting chemicals (EDCs) have widespread environmental distribution originated from both natural and anthropogenic sources. From the last few decades, their contamination has been raised dramatically owing to continuous discharge in sewage and untreated industrial effluents. They have rapidly gained a considerable attention due to their critical role in the development of multiple endocrine-related disorders notably diabetes mellitus (DM). Cadmium and arsenic, among the most hazardous EDCs, are not only widely spread in our environment, but they are also found to be associated with wide range of health hazards. After entering into the human body, they are preferably accumulated in the liver, kidney and pancreas where they exhibit deleterious effects on carbohydrate metabolism pathways notably glycolysis, gluconeogenesis and gluconeogenesis through the modification and impairment of relevant key enzymes activity. Impairment of hepatic glucose homeostasis plays a

In this study, the authors have briefly highlighted the impact of arsenic and cadmium on the metabolism of carbohydrates and the enzymes that are involved in carbohydrate metabolism and glucose homeostasis.

crucial role in the pathogenesis of DM. Along with compromised function of pancreas and muscles, diminished liver and kidney functions also contribute considerably to increase the blood glucose level. These metals have potential to bring conformational changes in these enzymes and make them inactive. Additionally, these metals also disturb the hormonal balance, such as insulin, glucocorticoids and catecholamines; by damaging pancreas and adrenal gland, respectively. Moreover, these metals also enhance the production of reactive oxygen species and depress the anti-oxidative defence mechanism with subsequent disruption of multiple organs. In this study, the authors have briefly highlighted the impact of arsenic and cadmium on the metabolism of carbohydrates and the enzymes that are involved in carbohydrate metabolism and glucose homeostasis.

Authors: Sabir S, Akash MSH, Fiayyaz F, Saleem U, Mehmood MH, Rehman K.

Full Source: Biomedicine & Pharmacotherapy. 2019 Mar 25; 114:108802. doi: 10.1016/j.biopha.2019.108802.[Epub ahead of print]

Harmonised methodology to assess chronic dietary exposure to residues from compounds used as pesticide and veterinary drug

2019-05-13

Risk assessments for pesticide and veterinary drug residues in food are performed respectively by the Joint FAO/WHO Expert Meeting on Pesticide Residues (JMPR) and the Joint FAO/WHO Expert Committee on Food Additives (JECFA). The models used by the two Committees to assess chronic dietary exposure are based on different data and assumptions which may be confusing, particularly for risk managers, when the same compound is used to treat plants and animals. This study details the results of combined chronic dietary exposure assessments for eight compounds used both as pesticide and veterinary drugs. It compares the results from models in use by JMPR and JECFA with those from national estimates performed by 17 countries. Results show that the JECFA model is better reflecting less than lifetime dietary exposure by considering consumption of children and high consumers. The JMPR model is a suitable model for estimating average chronic (lifetime) exposure to residues present in widely and regularly consumed staple commodities. However, it is suitable neither for estimating children's exposure nor more generally for assessing less than lifetime dietary exposure. In order to select the appropriate exposure model related to the occurrence of adverse effects i.e. effects occurring over less-than-lifetime or effects occurring only over lifetime,

This study details the results of combined chronic dietary exposure assessments for eight compounds used both as pesticide and veterinary drugs.

this paper proposes criteria to match the toxicological profile of the compound and the appropriate exposure scenarios. These approaches will continue to be harmonised to ensure the most scientifically sound basis for the risk assessment for pesticides and veterinary drug residues and consequently for other chemicals in food.

Authors: Arcella D, Boobis A, Cressey P, Erdely H, Fattori V, Leblanc JC, Lipp M, Reuss R, Scheid S, Tritscher A, Van der Velde-Koerts T, Verger P.

Full Source: Critical Reviews in Toxicology. 2019 Mar 28:1-10. doi: 10.1080/10408444.2019.1578729. [Epub ahead of print]

Biological exposure limits caused by co exposure to fluoride and arsenic based on Wnt signalling pathway

2019-05-13

Chronic fluoride-arsenic combined poisoning is a global public health problem. While the cause of the disease is clear, the pathogenesis is unknown. Given that there is no specific treatment, early prevention is particularly important. Biological exposure limits are designed to investigate the maximum allowable concentration of harmful effects from exogenous chemicals. To explore the biological exposure limits for mixed exposures of fluoride and arsenic, the authors compared the contents of fluorine and arsenic in the environmental media of the control and fluoride-arsenic combined exposure areas and analysed the dose-effect and dose-response relationship between fluoride, arsenic and the key proteins of Wnt signalling pathways. The benchmark dose method was used to estimate the biological exposure limit for fluoride-arsenic combined exposure. The results showed that the content of fluoride in coal, clay, indoor air, outdoor air, chili and rice, as well as arsenic content in coal, clay, outdoor air, chili and rice was higher than that of the control. With the increase of fluoride and arsenic exposure levels, the glycogen synthase kinase 3 β (GSK3 β), β -catenin contents and the prevalence of Wnt/ β -catenin signalling pathway antagonistic protein Dickkopf-1 (DKK1), GSK3 β , β -catenin (β -catenin) gradually increased, but the content of DKK1 significantly decreased. Based on the Wnt signalling pathway, the biological exposure limit for fluoride-arsenic combined exposure was urinary fluoride of 0.52 mg \cdot g⁻¹ creatinine and urinary arsenic of 6.59 mg \cdot g⁻¹ creatinine. These results had important guiding significance for early prevention of body damage caused by fluoride-arsenic combined poisoning.

Authors: Zeng QB, Xu YY, Tu CL, Yu X, Yang J, Hong F.

Full Source: Ying Yong Sheng Tai Xue Bao. 2019 Jan 20;30(1):37-42. doi: 10.13287/j.1001-9332.201901.023.

Technical

CHEMWATCH

Mercury levels in blood, urine and hair in a nation-wide sample of Spanish adults

2019-05-13

Mercury (Hg) is among the top 10 environmental chemicals of major public health concern (WHO). The Minamata Convention on Mercury (United Nations Environment Program, 2017), commits signing countries to control anthropogenic mercury emissions and reduce human exposure. Human biomonitoring (HBM) programs, are the most straight-forward approaches to get information on the actual exposure levels in the population and assess over time. In the present study, the authors report the results of a HBM study in a nationwide cross-section of Spanish adults (18-65y) as baseline values obtained before the Minamata Convention entered into force. Subsequent follow-ups will show if the Convention has been successful. The study includes 1880 blood samples, 1704 urine samples and 577 hair samples from all Spanish regions collected and analysed under a strictly quality controlled and quality assured protocol. The EU-DEMOCOPHES project demonstrated that fish and seafood are the major sources of mercury exposure and that the Spanish as well as the Portuguese populations have higher levels than other European countries. The data from the present study confirms this pattern at national level and that inhabitants in coastal regions have higher values than from inland regions. The geometric mean (GM) for blood is 6.35 $\mu\text{g Hg/l}$, in urine is 1.11 $\mu\text{g Hg/l}$ and for hair is 1.91 $\mu\text{g Hg/g}$. In an international comparison these values are not exceptional. Spanish concentrations fall into the group of Eastern Mediterranean populations. Although information on gender, age, occupational sector, geographical area, sampling period and frequency of fish consumption is reported in the tables, the purpose of this study has not been to analyse the determinants of exposure in detail but to provide baseline data for future assessments and for regional authorities.

Authors: Castaño A, Pedraza-Díaz S, Cañas AI, Pérez-Gómez B, Ramos JJ, Bartolomé M, Pärt P, Soto EP, Motas M, Navarro C, Calvo E, Esteban M; Bioambient.es.

Full Source: Science of the Total Environment. 2019 Mar 13; 670:262-270. doi: 10.1016/j.scitotenv.2019.03.174.[Epub ahead of print]

In the present study, the authors report the results of a HBM study in a nationwide cross-section of Spanish adults (18-65y) as baseline values obtained before the Minamata Convention entered into force.

Pathway analysis of a genome-wide gene by air pollution interaction study in asthmatic children

2019-05-13

The authors aimed to investigate the role of genetics in the respiratory response of asthmatic children to air pollution, with a genome-wide level analysis of gene by nitrogen dioxide (NO₂) and carbon monoxide (CO) interaction on lung function and to identify biological pathways involved. A two-step method was used for fast linear mixed model computations for genome-wide association studies, exploring whether variants modify the longitudinal relationship between 4-month average pollution and post-bronchodilator FEV₁ in 522 Caucasian and 88 African-American asthmatic children. Top hits were confirmed with classic linear mixed-effect models. The improved gene set enrichment analysis was used for GWAS (i-GSEA4GWAS) to identify plausible pathways. Two SNPs near the EPHA3 (rs13090972 and rs958144) and one in TXNDC8 (rs7041938) showed significant interactions with NO₂ in Caucasians but the authors did not replicate this locus in African-Americans. SNP-CO interactions did not reach genome-wide significance. The i-GSEA4GWAS showed a pathway linked to the HO-1/CO system to be associated with CO-related FEV₁ changes. For NO₂-related FEV₁ responses, the authors identified pathways involved in cellular adhesion, oxidative stress, inflammation, and metabolic responses. The host lung function response to long-term exposure to pollution is linked to genes involved in cellular adhesion, oxidative stress, inflammatory, and metabolic pathways.

Authors: Ierodiakonou D, Coull BA, Zanobetti A, Postma DS, Boezen HM, Vonk JM, McKone EF, Schildcrout JS, Koppelman GH, Croteau-Chonka DC, Lumley T, Koutrakis P, Schwartz J, Gold DR, Weiss ST.

Full Source: Journal of Exposure Science & Environmental Epidemiology. 2019 Apr 26. doi: 10.1038/s41370-019-0136-3. [Epub ahead of print]

The authors aimed to investigate the role of genetics in the respiratory response of asthmatic children to air pollution, with a genome-wide level analysis of gene by nitrogen dioxide (NO₂) and carbon monoxide (CO) interaction on lung function and to identify biological pathways involved.