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This study aimed to investigate the occurrence and removal efficiency of eighteen PFASs in wastewater treatment plants and drinking water plants with different treatment processes. The results showed that both perfluorobutane sulfonic acid (PFBS) and perfluorooctane sulfonic acid (PFOS) were the predominant compounds in the water phase of WWTPs and DWTPs, while PFOS was dominant in dewatered sludge of WWTPs. The average total PFASs concentrations in the three selected WWTPs were 19.6-232 ng/L in influents, 15.5-234 ng/L in effluents, and 31.5-49.1 ng/g dry weight in sludge. The distribution pattern of PFASs differed between the wastewater and sludge samples, indicating strong partition of PFASs with long carbon chains to sludge. In the WWTPs, most PFASs were not eliminated efficiently in conventional activated sludge treatment, while the membrane bio-reactor (MBR) and Unitank removed approximately 50% of long chain (C ≥ 8) perfluorocarboxylic acids (PFCAs). The daily mass loads of total PFASs in WWTPs were in the range of 1956-24773 mg in influent and 1548-25085 mg in effluent. PFASs were found at higher concentrations in the wastewater from plant A with some industrial wastewater input than from the other two plants (plant B and plant C) with mainly domestic wastewater sources. Meanwhile, the average total PFASs concentrations in the two selected DWTPs were detected at 4.74-14.3 ng/L in the influent and 3.34-13.9 ng/L in the effluent. In DWTPs, only granular activated carbon (GAC) and powder activated carbon (PAC) showed significant removal of PFASs. The PFASs detected in the tap water would not pose immediate health risks in the short term exposure. The authors concluded that the findings from this study showed that effective treatment technology should be applied to eliminate this group of chemicals in the urban water cycle based on the precautionary principle.

Authors: Pan CG, Liu YS, Ying GG.
Comparison of different advanced treatment processes in removing endocrine disruption effects from municipal wastewater secondary effluent

2016-11-14
In this study, secondary effluent from the Wulongkou (WLK) municipal wastewater plant (Zhengzhou, China) was tested for its toxicity effects before and after five advanced treatment processes (ATPs, i.e. coagulation sedimentation, nan da magnetic polyacrylic anion exchange resin (NDMP) resin adsorption, activated carbon adsorption, ozonation and electro-adsorption). Results showed that oestrogen disruption effects (EDEs) were particularly significant for the raw secondary effluent among the studied dioxin-like toxicity effect, androgenic/anti-androgenic response effect, EDEs, and genotoxicity effect. In addition, E1, E2, and EE2 were the main endocrine disruption chemicals (EDCs) contributing to EDEs. Except coagulation sedimentation, all the other four ATPs were efficient in removing the steroid estrogens (i.e. E1, E2, and EE2), but were inefficient in the artificial EDC (i.e. DBP, OP and BPA) removal. In the ATPs treated samples, vitellogenin (VTG) in zebrafish were largely removed. However, they were still significant in comparison with the control, probably due to artificial EDCs. Therefore, finding ways to thoroughly remove EDEs and EDCs from the secondary effluent will be a new research direction in the future.


Tracking polychlorinated biphenyls (PCBs) and polybrominated diphenyl ethers (PBDEs) in sediments and soils from the southwest of Buenos Aires Province, Argentina (South eastern part of the GRULAC region)

2016-11-14
In this study, PCBs and PBDEs (7 and 10 congeners, respectively) were analysed in four coastal surface sediments collected from the northern shore of Bahía Blanca estuary and in nine soils from different locations of Bahía Blanca city and the surrounding region (Southwest of Buenos Aires Province, Argentina). Sediment samples showed PCBs(Σ7) concentrations ranged from 0.61 to 17.6ngg(-1) (dry weight=dw) and PBDEs(Σ10) from 0.16 to 2.02ngg(-1) dw, whereas in soil samples ranged from 0.04 to 1.67ngg(-1) dw for PCBs(Σ7) and 0.04 to 10.7ngg(-1) dw for PBDEs(Σ10). The highest concentrations of both chemicals were detected in the urban
An efficient and economical synthetic approach toward 3-cyano-1H-indoles through the reactions of 2-(2-bromophenyl) acetonitriles with aldehydes and aqueous ammonia is presented in the present study. Mechanically, this novel protocol involves a one-pot cascade procedure consisting of an aldol-type condensation, a copper-catalysed amination by using aqueous ammonia as a cheap and safe nitrogen source, and an intramolecular Michael addition followed by a dehydrogenative aromatisation. Interestingly, the indole products thus obtained were found to be ready substrates for the preparation of indole 2'-deoxyribonucleosides through an unprecedented and highly practical glycosylation procedure in which the required C-N bond formation and toluoyl protecting group removal were accomplished efficiently in one pot.

Authors: Li B, Zhang B, Zhang X, Fan X.

In the present study, the authors used bio-motility assays, that simulate the neuron chemistry in axonopathy, to screen chemicals, that retain the microtubule dynamics in healthy neuronal activity. Tau protein inhibits microtubule activity and leads to oligomerisation. Iron(iii) untangles, whereas mono-sodium-glutamate destabilises the microtubule oligomer.

Authors: Bhattacharyya S, Kim K, Nakazawa H, Umetsu M, Teizer W.

Uncertainties of testing methods: What do we (want to) know about carcinogenicity?

An approach for a systematic description of the uncertainties and complexity of the standard animal testing and assessment approach for carcinogenicity is explored by using a draft OECD Guidance document that was originally developed for reporting defined in vitro approaches to testing and assessment (OECD, 2016). The format is suitable for this re-purposing and it appears that the potential multitude of approaches for integrating and interpreting data from standard animal testing may ultimately be conceptually similar to the challenge of integrating relevant in vitro and in silico data. However, this structured approach shall allow 1) fostering interest in developing improved defined in silico and in vitro approaches; 2) the definition of what type of effects should be predicted by the new approach; 3) selection of the most suitable reference data and assessments; 4) definition of the weight that the standard animal reference data should have, compared to human reference data and mechanistic information in the context of assessing the fitness of the new in vitro and in silico approach; 5) definition of a benchmark for the minimum performance of the new approach, based on a conceptual recognition that correlation of alternative assessment results with reference animal results is limited by uncertainties and complexity of the latter. A longer term perspective is indicated for evolving the definition of adversity for classification and regulatory purposes. This work will be further discussed.
The aim of this study was to investigate the effects of formaldehyde on both normal human keratinocytes (HaCaT cells) and on a highly invasive malignant melanoma cell line (SK-MeL-28) in order to contribute to the definition of safety cut-off to be applied to the production processes. Formaldehyde concentrations below the commonly accepted limits (10-50μM) were obtained by diluting formaldehyde in simulated sweat (UNI EN ISO 105-E04). The effects on cell proliferation were evaluated by cell counting, while ERK pathway activation was evaluated by western blot. Low concentrations of formaldehyde (10μM) in both acidic and alkaline simulated sweat were able to increase malignant melanoma cell proliferation, while not affecting normal keratinocytes. Melanoma proliferation increase was greater in acidic (pH=5.5) than in alkaline (pH=8) conditions. Moreover, formaldehyde stimulation was able to induce ERK pathway activation. The authors concluded that the data obtained suggest the need for an even increasing attention to the potentially harmful effects of textile manufacturing by-products.

Authors: Rizzi M, Cravello B, Tonello S, Renò F.
The aim of this study was to investigate the influence of pH 6.5 and 4.5 on the in vitro permeation of rhodium through intact Caucasian skin using Franz diffusion cells.

Technical

carcinogenicity studies obtained from the EFSA and ToxRef databases. Hundred eleven of the 148 chemicals that did not induce putative preneoplastic lesions in the sub-chronic study also did not induce tumours in the carcinogenicity study (True Negatives). Cellular hypertrophy appeared to be an unreliable predictor of carcinogenicity. The negative predictivity, the measure of the compounds evaluated that did not show any putative preneoplastic lesion in de sub-chronic studies and were negative in the carcinogenicity studies, was 75%, whereas the sensitivity, a measure of the sub-chronic study to predict a positive carcinogenicity outcome was only 5%. The specificity, the accuracy of the sub-chronic study to correctly identify non-carcinogens was 90%. When the chemicals which induced tumours generally considered not relevant for humans (33 out of 37 False Negatives) are classified as True Negatives, the negative predictivity amounts to 97%. Overall, the results of this retrospective study support the concept that chemicals showing no histopathological risk factors for neoplasia in a sub-chronic study in rats may be considered non-carcinogenic and do not require further testing in acarcinogenicity study.

Authors: Woutersen RA, Soffers AE, Kroese ED, Krul CA, van der Laan JW, van Benthem J, Luijten M.


OCCUPATIONAL RESEARCH

The influence of pH on the in vitro permeation of rhodium through human skin

2016-11-14

Workers in precious metals refineries are at risk of exposure to salt compounds of the platinum group metals through inhalation, as well as through the skin. Rhodium salt permeation through the skin has previously been proven using rhodium trichloride (RhCl3) dissolved in synthetic sweat at a pH of 6.5. However, the skin surface pH of refinery workers may be lower than 6.5. The aim of this study was to investigate the influence of pH 6.5 and 4.5 on the in vitro permeation of rhodium through intact Caucasian skin using Franz diffusion cells. A concentration of 0.3 mg mL(-1) rhodium was used and analyses were performed using inductively coupled plasma mass spectrometry and inductively coupled plasma optical emission spectrometry. Results indicated a cumulative increase in permeation over 24 h. Rhodium permeation after 12 h was significantly greater at pH 4.5 (1.56 ± 0.24 ng cm(-2)) than at 6.5 (0.85 ± 0.13 ng cm(-2); p = 0.02). At both pH levels, there was a highly
significant difference (p < 0.01) between the mass of rhodium remaining in the skin (1428.68 ± 224.67 ng cm(-2) at pH 4.5 and 1029.90 ± 115.96 ng cm(-2) at pH 6.5) and the mass that diffused through (0.88 ± 0.17 ng cm(-2) at pH 4.5 and 0.62 ± 0.10 ng cm(-2) at pH 6.5). From these findings, it is evident that an acidic working environment or low skin surface pH may enhance permeation of rhodium salts, contributing to sensitization and adverse health effects.

Authors: Jansen Van Rensburg S, Franken A, Du Plessis J, Du Plessis JL.
Full Source: Toxicology & Industrial Health. 2016 Nov 3. pii: 0748233716675218. [Epub ahead of print]

Bentonite toxicology and epidemiology - a review
2016-11-14
Bentonite, a clay with numerous industrial and consumer applications, is mined and processed in many countries of the world. Its many beneficial uses also create the potential for widespread occupational and consumer exposure. The available studies on toxicity and epidemiology indicate that the principal exposure pathway of concern is inhalation of respirable dust by occupationally exposed cohorts. Bentonite itself is probably not more toxic than any other particulate not otherwise regulated and is not classified as a carcinogen by any regulatory or advisory body, but some bentonite may contain variable amounts of respirable crystalline silica, a recognised human carcinogen. Therefore, prudent management and adherence to occupational exposure limits is appropriate. This review summarises the literature available on production, applications, exposure, toxicity, and epidemiology of bentonite and identifies data gaps and limitations.

Authors: Maxim LD, Niebo R, McConnell EE.

A study of the potential release of bioaerosols from containers as a result of reduced frequency residual waste collections
2016-11-14
Microorganisms have the potential to grow within waste containers if waste is stored for longer periods as a result of an extended residual waste collection cycle. Release of microorganisms as bioaerosols during waste collection and processing may be an occupational risk to workers within the industry. There may be many constituents of the bioaerosol that may be of concern, however, there are currently only workplace exposure limits
This study presents the results from a National Institute for Occupational Safety and Health industrial hygiene survey from a coal slag processing facility in Illinois and also a second facility.

Elemental properties of coal slag and measured airborne exposures at two coal slag processing facilities

2016-11-14

In 1974, the National Institute for Occupational Safety and Health recommended a ban on the use of silica sand abrasives containing >1% silica due to the risk of silicosis. This gave rise to substitutes including coal slag. An Occupational Safety and Health Administration investigation in 2010 uncovered a case cluster of suspected pneumoconiosis in four former workers at a coal slag processing facility in Illinois, possibly attributable to occupational exposure to coal slag dust. This study presents the results from a National Institute for Occupational Safety and Health industrial hygiene survey at the same coal slag processing facility and a second facility. The industrial hygiene survey consisted of the collection of elemental properties of coal slag and measured airborne exposures at two coal slag processing facilities.
The aim of the present study was to compare a group of workers with stable lead levels with a group of workers with fluctuating lead levels in terms of selected haematological, biochemical, and immunological parameters.

The analysis of blood lead levels changeability over the 5-year observation in workers occupationally exposed to lead

2016-11-14

The aim of the present study was to compare a group of workers with stable lead levels with a group of workers with fluctuating lead levels in terms of selected haematological, biochemical, and immunological parameters. The examined group included male workers occupationally exposed to lead. Blood lead (PbB) levels were measured every 3 months during the 5-year observation. Based on standard deviation of mean PbB levels, the examined population was divided into two groups: low level of fluctuation (L-SD) and high level of fluctuation (H-SD) groups. The mean and maximal PbB levels were significantly higher in the H-SD group than in the L-SD group by 9 and 22%, respectively. At the same time, the maximal level of zinc protoporphyrin (ZPP) and standard deviation of mean ZPP level were higher in the H-SD group by 29 and 55%, respectively. The maximal level of haemoglobin and white blood cell (WBC) count as well as
This research describes the different types of exposure to pesticides and heavy metals in a rural population (Loma del Gallo), considering both environmental and occupational exposure.

Heavy metals and pesticide exposure from agricultural activities and former agrochemical factory in a Salvadoran rural community

2016-11-14

Pesticide handling in farming activities involves substantial hazards for the rural population and for the environment. In Latin America, it is estimated that the population at risk of being affected by heavy metals is over 4 million. This research describes the different types of exposure to pesticides and heavy metals in a rural population (Loma del Gallo), considering both environmental and occupational exposure. This study consists of an inspection in a former pesticide factory (QUIMAGRO), analysis of heavy metals in samples from surface and ground water in the community close to the factory, and a survey to the local population about their perceptions of pesticide exposures. Containers with 34.6 tons of chemicals improperly stored were identified in the former factory and removed by the government. Arsenic and cadmium were found in groundwater, and the highest values were 0.012 and 0.004 mg/l, respectively. These contaminants were also detected in most surface water samples, with maximum values of 0.026 and 0.0001 mg/l, respectively. Results of the survey show that of the 44 participants 42 % were farmers. Farmers used 19 different pesticide products containing 11 active ingredients. The most used active ingredients were paraquat (65 %), methamidophos (35 %), and atrazina (29 %). Eighty-two percent of the farmers did not use personal protective equipment. In addition to the pesticides used in the agriculture of the area, pesticide containers were removed from the QUIMAGRO area, but the pollution was still present at time of sampling and it is evident by the odour of the site. Surface water...
This study was undertaken to determine levels of halogenated flame retardants (HFRs) on skin surface to provide preliminary exposure estimates from dermal absorption.

Skin wipes of palms, back-of-hands, and forearms were collected from 30 participants by using gauze pads soaked in isopropyl alcohol. Eight polybrominated diphenyl ethers (PBDEs), two novel brominated FRs, and two Dechlorane Plus (DPs) isomers were determined. BDE209, Decabromodiphenylethane (DBDPE), and 1,2-Bis (2, 4, 6-tribromophenoxy) ethane (BTBPE) were most frequently detected. BDE209 showed the highest median level (1760 ng m\(^{-2}\)), followed by DBDPE (277 ng m\(^{-2}\)) and anti-DP (64 ng m\(^{-2}\)). The comparison of levels on palms and back-of-hands revealed no statistical differences, but both were significantly higher than the levels on forearms. Detections of HFRs on arms suggested that skin areas covered by clothing were exposed to these chemicals likewise. BDE209 and DPs levels from three repeated samples showed moderate to strong reliability over 3 months, while the levels of other compounds were not statistically reliable. Males had significant higher levels than females for most HFRs, while participants’ age, time from last hand washing to sampling, and other behaviours contributed limitedly to the variations in levels. Daily uptakes of HFRs through dermal absorption were estimated. The estimated median total exposure from palms, back-of-hands, and forearms were 25.9, 1.6, and 7.2 ng d\(^{-1}\) for \(\Sigma\)PBDEs, \(\Sigma\)Dps, and \(\Sigma\)NBFRs, respectively, which were in the same ranges as those from diet and dust ingestion for adults in China.

Loma del Gallo population has been exposed to toxic pesticide from QUIMAGRO and agriculture for many years. The farmers carry out mishandling of pesticides and they not use PPE.


suggested that dermal absorption would be an important exposure route for HFRs.

Screening the Toxicity of Selected Personal Care Products Using Embryo Bioassays: 4-MBC, Propylparaben and Triclocarban
2016-11-14
Recently, several emerging pollutants, including Personal Care Products (PCPs), have been detected in aquatic ecosystems, in the ng/L or µg/L range. Available toxicological data is limited, and, for certain PCPs, evidence indicates a potential risk for the environment. Hence, there is an urgent need to gather ecotoxicological data on PCPs as a proxy to improve risk assessment. In the present study, the authors investigated the toxicity of three different PCPs (4-Methylbenzylidene Camphor (4-MBC), propylparaben and triclocarban) using embryo bioassays with Danio rerio (zebrafish) and Paracentrotus lividus (sea urchin). The No Observed Effect Concentration (NOEC) for triclocarban was 0.256 µg/L for sea urchin and 100 µg/L for zebrafish, whereas NOEC for 4-MBC was 0.32 µg/L for sea urchin and 50 µg/L for zebrafish. Both PCPs impacted embryo development at environmentally relevant concentrations. In comparison with triclocarban and 4-MBC, propylparaben was less toxic for both sea urchin (NOEC = 160 µg/L) and zebrafish (NOEC = 1000 µg/L). Overall, this study further demonstrates the sensitivity of embryo bioassays as a high-throughput approach for testing the toxicity of emerging pollutants.
Authors: Torres T, Cunha I, Martins R, Santos MM.

First trimester phthalate exposure and male newborn genital anomalies
2016-11-14
Anti-androgenic phthalates are environmental chemicals that affect male genital development in rodents leading to genitourinary birth defects. The authors examined whether first trimester phthalate exposure may exert similar effects in humans leading to an increased incidence of newborn male genital anomalies in a multi-centre cohort study. First
The aim of this study was to offer a conceptual scheme for identifying and prioritising chemicals for further assessment and if appropriate further testing, based on their PBT-potential, using a non-testing screening approach.

Authors: Sathyanarayana S, Grady R, Barrett ES, Redmon B, Nguyen RH, Barthold JS, Bush NR, Swan SH.

This study investigates levels of organochlorines in relation to their impact on women’s menstrual cycles and ovulatory status.

Although the potential for endocrine disrupting chemicals (EDCs) to disrupt female fecundity is great, few studies have assessed the threat to human reproduction. This study investigates levels of organochlorines in relation to their impact on women’s menstrual cycles and ovulatory status. To address concerns of the Akwesasne Mohawk community in upstate New York regarding well-established exposure to EDCs, women’s fertility and reproductive health endpoints, we recruited 215 women between the ages of 21 and 38 years to measure menstrual cycle characteristics and levels of local pollutants. Of these, 155 women collected saliva over the course of their menstrual cycle allowing for analysis of oestradiol and progesterone levels and the determination of ovulatory status in relationship to their serum pollutant levels. A subset of participants (15) who did not commence cycling within a month of their enrolment were not included in the analysis, hence reducing the sample size to 140 participants. Additionally, a lipid panel, oestradiol and progesterone were assessed in serum on Day 3 of the menstrual cycle. Median cycle length for women in the sample was 29 days. After aligning the cycles, 110 women were considered ovulatory and 45 (29%) anovulatory. Concentrations of groups of more persistent PCBs congeners, HCB, and
In this study, the authors describe a novel cell assay, based on the translocation of a green fluorescent protein (GFP)-tagged chimeric molecule of glucocorticoid receptor (GR) and the thyroid receptor beta (TRβ) from the cytoplasm to the nucleus in the presence of TR ligands. Unlike the constitutively nuclear TRβ, this GFP-GR-TRβ chimera is cytoplasmic in the absence of hormone while translocating to the nucleus in a time- and concentration-dependent manner upon stimulation with triiodothyronine (T3) and thyroid hormone analogue, TRIAC, while the reverse triiodothyronine (3,3',5'-triiodothyronine, or rT3) was inactive. Moreover, GFP-GR-TRβ chimera does not show any cross-reactivity with the GR-activating hormones, thus providing a clean system for the screening of TR beta-interacting EDCs. Using this assay, the authors demonstrated that Bisphenol A (BPA) and 3,3',5,5'-Tetrabromobisphenol (TBBPA) induced GFP-GR-TRβ translocation at micro molar concentrations. Over 100 concentrated water samples from different geographic locations in the United States were screened and detected a low, but reproducible contamination in 53% of the samples. This system provides a novel high-throughput approach for screening for endocrine disrupting chemicals (EDCs) interacting with TR beta.


Human exposure to endocrine disrupting compounds: Their role in reproductive systems, metabolic syndrome and breast cancer. A review.

2016-11-14
Endocrine disrupting chemicals (EDCs) are released into the environment from different sources. They are mainly used in packaging industries, pesticides and food constituents. Clinical evidence, experimental models, and epidemiological studies suggest that EDCs have major risks for humans by targeting different organs and systems in the body (e.g. reproductive system, breast tissue, adipose tissue, pancreas, etc.). Due to the ubiquity of human exposure to these compounds the aim of this review is to describe the most recent data on the effects induced by phthalates, bisphenol A and parabens in a critical window of exposure: in utero, during pregnancy, infants, and children. The interactions and mechanisms of toxicity of EDCs in relation to human general health problems, especially those broadening the term of endocrine disruption to ‘metabolic disruption’, should be deeply investigated. These include endocrine disturbances, with particular reference to reproductive problems and breast, testicular and ovarian cancers, and metabolic diseases such as obesity or diabetes.

Authors: Giulivo M, Lopez de Alda M, Capri E, Barceló D.

Exposure science in an age of rapidly changing climate: challenges and opportunities

2016-11-14
Climate change is anticipated to alter the production, use, release, and fate of environmental chemicals, likely leading to increased uncertainty in exposure and human health risk predictions. Exposure science provides a key connection between changes in climate and associated health outcomes. The theme of the 2015 Annual Meeting of the International Society of Exposure Science-Exposures in an Evolving Environment-brought this issue to the fore. By directing attention to questions that may affect society in profound ways, exposure scientists have an opportunity to conduct “consequential science”- “doing science that matters”, using our tools for the greater good and to answer key policy questions, and identifying causes leading to implementation of solutions. Understanding the implications of changing exposures on public health may be one of the most consequential areas of study in which exposure scientists could

In this study, the authors use a series of case studies to identify exposure data gaps and research paths that will enable us to capture the information necessary for understanding climate change-related human exposures and consequent health impacts.
currently be engaged. In this study, the authors use a series of case studies to identify exposure data gaps and research paths that will enable us to capture the information necessary for understanding climate change-related human exposures and consequent health impacts. The authors hope that the study will focus attention on under-developed areas of exposure science that will likely have broad implications for public health.

Authors: LaKind JS, Overpeck J, Breysse PN, Backer L, Richardson SD, Sobus J, Sapkota A, Upperman CR, Jiang C, Beard CB, Brunkard JM, Bell JE, Harris R, Chretien JP, Peltier RE, Chew GL, Blount BC.