

Contents

CHEMWATCH

(click on page numbers for links)

ENVIRONMENTAL RESEARCH

Recent advances in different-dimension electrocatalysts for carbon dioxide reduction	3
Diel population and functional synchrony of microbial communities on coral reefs	3
Evaluation of enterotoxin gene expression and enterotoxin production capacity of the probiotic strain <i>Bacillus toyonensis</i> BCT-7112T4	
A review of multimedia transport and fate models for chemicals: Principles, features and applicability.....	5
Production of Oleaginous Organisms or Lipids Using Sewage Water and Industrial Wastewater	5

MEDICAL RESEARCH

Dermal exposure determines the outcome of repeated airway exposure in a long-term chemical-induced asthma-like mouse model	6
Addition of canagliflozin to insulin improves glycaemic control and reduces insulin dose in patients with type 2 diabetes mellitus: A randomised controlled trial.....	7
Role of microglial activation and neuroinflammation in neurotoxicity of acrylamide in vivo and in vitro	7
Effect of Indoxyl Sulfate on the Repair and Intactness of Intestinal Epithelial Cells: Role of Reactive Oxygen Species' Release.....	8
Betel quid containing safrole enhances metabolic activation of tobacco specific 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)...	9

OCCUPATIONAL RESEARCH

Determinants of Exposures to Hazardous Materials among Nail Cosmeticians in the Kampala City, Uganda	10
Maternal Occupational Oil Mist Exposure and Birth Defects, National Birth Defects Prevention Study, 1997-2011	11
Halogenated flame retardants and organophosphate esters in the air of electronic waste recycling facilities: Evidence of high concentrations and multiple exposures	12
Conductometric acetone vapor sensor based on the use of gold-doped three-dimensional hierarchical porous zinc oxide microspheres ...	13
Service evaluation of alcohol-release door plates: an addition to hand hygiene.....	13

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Contents

CHEMWATCH

PUBLIC HEALTH RESEARCH

Systematic review of exposure to albendazole or mebendazole during pregnancy and effects on maternal and child outcomes, with particular reference to exposure in the first trimester	14
Do Interactions Between Environmental Chemicals and the Human Microbiome Need to Be Considered in Risk Assessments?	15
Foetal growth in environmental epidemiology: mechanisms, limitations, and a review of associations with biomarkers of non-persistent chemical exposures during pregnancy	16
Using a high-resolution mass spectrometry-based metabolomics strategy for comprehensively screening and identifying biomarkers of phthalate exposure: Method development and application	17
Could the Supertowel be used as an alternative hand cleaning product for emergencies? An acceptability and feasibility study in a refugee camp in Ethiopia	17

ENVIRONMENTAL RESEARCH

Recent advances in different-dimension electrocatalysts for carbon dioxide reduction

2019-07-15

Greenhouse effect and energy crisis require the recycling use of carbon dioxide (CO₂) in atmosphere. The electrocatalytic reduction of CO₂ transformed to value-added chemicals with sustainable energy derived electric energy provides a feasible way to address these energy and environment problems; however, developing the electrocatalysts with highly active, selective and durability is still a significant challenge for electrocatalytic CO₂ reduction reaction (CO₂RR). The nanostructured electrocatalysts have been extensively researched as promising catalysts to speed up CO₂ conversion. In the present study, the authors summarised the recent advances in different-dimension nanostructured electrocatalysts for CO₂RR, have tried to provide a picture of how different dimension catalysts work, and discussed the challenges and perspectives for achieving high CO₂RR electrocatalysts.

Authors: Zhou H, Liu K, Li H, Cao M, Fu J, Gao X, Hu J, Li W, Pan H, Zhan J, Li Q, Qiu X, Liu M.

Full Source: Journal of Colloid and Interface Science. 2019 Aug 15; 550:17-47. doi: 10.1016/j.jcis.2019.04.077. Epub 2019 Apr 25.

Diel population and functional synchrony of microbial communities on coral reefs

2019-07-15

On coral reefs, microorganisms are essential for recycling nutrients to primary producers through the remineralisation of benthic-derived organic matter. Diel investigations of reef processes are required to holistically understand the functional roles of microbial players in these ecosystems. In this study, the authors report a metagenomic analysis characterising microbial communities in the water column overlying 16 remote forereef sites over a diel cycle. The results show that microbial community composition is more dissimilar between day and night samples collected from the same site than between day or night samples collected across geographically distant reefs. Diel community differentiation is largely driven by the flux of *Psychrobacter* sp., which is two-orders of magnitude more abundant during the day. Night-time communities are enriched with species of *Roseobacter*, *Halomonas*, and *Alteromonas* encoding a greater variety of pathways for carbohydrate

In the present study, the authors summarised the recent advances in different-dimension nanostructured electrocatalysts for CO₂RR

catabolism, further illustrating temporal patterns of energetic provisioning between different marine microbes. Dynamic diel fluctuations of microbial populations could also support the efficient trophic transfer of energy posited in coral reef food webs.

Authors: Kelly LW, Nelson CE, Haas AF, Naliboff DS, Calhoun S, Carlson CA, Edwards RA, Fox MD, Hatay M, Johnson MD, Kelly ELA, Lim YW, Macherla S, Quinlan ZA, Silva GGZ, Vermeij MJA, Zgliczynski B, Sandin SA, Smith JE, Rohwer F.

Full Source: *Natures Communication*. 2019 Apr 12;10(1):1691. doi: 10.1038/s41467-019-09419-z.

Evaluation of enterotoxin gene expression and enterotoxin production capacity of the probiotic strain *Bacillus toyonensis* BCT-7112T

2019-07-15

The aim of the present study was to evaluate the safety of the probiotic strain *Bacillus toyonensis* BCT-7112T (active ingredient of Toyocerin) in relation to the enterotoxins haemolysin BL (Hbl) and the non-haemolytic enterotoxin (Nhe) by performing a quantitative reverse transcription (RT) real-time polymerase chain reaction (PCR) and a Western blot assay. The expression levels of the enterotoxin genes *hblA*, *hblD*, *nheA*, *nheB* and *nheC*, determined by means of RT real-time PCR in *B. toyonensis*, were lower than those in *B. cereus* reference strains. No expression of *hblC* was detected. The Western blot assays of native and 25-fold concentrated supernatants from *B. toyonensis*, using monoclonal antibodies directed against the Hbl component L1 and the Nhe component NheB, showed weak bands. The NheC component was not detected in the native supernatant, but weakly in the 25-fold concentrated supernatant. According to the results of the present study, the enterotoxin expression and protein levels of *B. toyonensis* BCT-7112T were absent or clearly lower compared to the *B. cereus* reference strains. Thus, their ability to form functional enterotoxins can also be considered to be lower or unlikely compared to the *B. cereus* reference strains. This experimental approach can be implemented when studying the health and safety as well as harmlessness of probiotic microorganisms.

Authors: Abdulmawjood A, Herrmann J, Riede S, Jimenez G, Becker A, Breves G.

Full Source: *PLoS One*. 2019 Apr 25;14(4):e0214536. doi: 10.1371/journal.pone.0214536. eCollection 2019.

The aim of the present study was to evaluate the safety of the probiotic strain *Bacillus toyonensis* BCT-7112T (active ingredient of Toyocerin) in relation to the enterotoxins haemolysin BL (Hbl) and the non-haemolytic enterotoxin (Nhe) by performing a quantitative reverse transcription (RT) real-time polymerase chain reaction (PCR) and a Western blot assay.

A review of multimedia transport and fate models for chemicals: Principles, features and applicability

2019-07-15

The frequent use of chemicals has caused ecosystems and humans to be threatened due to their discharge into the environment. Multimedia environmental fate models could provide a comprehensive picture of transport behaviour and fate for organic chemicals in multiple environmental media. They have been designed and widely used for chemical risk assessment, chemical ranking and management support, and determination of chemical bioaccumulation. This study reviewed the principles, features and applicability of recent commonly used multimedia fate models from peer-reviewed literature. Fugacity-based and concentration-based models are now widely adopted for use in chemical fate evaluation, while they are more appropriate for volatile and semi-volatile chemicals. Or the fugacity-based models can use equivalence equilibrium criterion to cations, anions and involatile chemicals. The MAMI and SESAME models based on activity approach are applicable to neutral and ionisable molecules. However, interactions of ionic species with other water solutes are not taken into account in these models. Additionally, they could not directionally simulate how chemicals transported from one grid to another. Future attention should be focused on the reliability of transfer behaviour and fate of ionizable chemicals, as integrating the advantages of these two kinds of models into a reconstructed one may be a better choice. In a word, environmental multimedia models have been beneficial tools for chemical control and management, risk and effect estimation, and decision supporting.

Authors: Su C, Zhang H, Cridge C, Liang R.

Full Source: Science of the Total Environment. 2019 Jun 10; 668:881-892.

doi: 10.1016/j.scitotenv.2019.02.456. Epub 2019 Mar 7.

Multimedia environmental fate models could provide a comprehensive picture of transport behaviour and fate for organic chemicals in multiple environmental media.

Production of Oleaginous Organisms or Lipids Using Sewage Water and Industrial Wastewater

2019-07-15

Worldwide, wastewater produced from sewage and industry poses a serious risk to the surrounding environment. As a way to address this problem, an integrated approach for cultivation of oleaginous microorganisms on wastewater leading to effective removal of hazardous components and sustainable production of biodiesel is proposed. Oleaginous yeasts have the unique ability to utilize wastewater as feedstock and accumulate large amounts of triacylglycerols within their

Technical

CHEMWATCH

cellular compartments at stationary phase (144 h). The lipids stored in an oleaginous microbe can be visualized by fluorescence microscopy and converted into biodiesel through transesterification after extraction. The authors describe the batch cultivation of oleaginous yeast on sewage and industrial wastewater at 25 C.

High lipid accumulation with efficient removal of toxic chemicals can be achieved by utilising this integrated method.

Authors: Deeba F, Pruthi V, Negi YS.

Full Source: *Methods in Molecular Biology*. 2019; 1995:405-418. doi: 10.1007/978-1-4939-9484-7_24.

MEDICAL RESEARCH

Dermal exposure determines the outcome of repeated airway exposure in a long-term chemical-induced asthma-like mouse model

2019-07-15

Exposure to diisocyanates is an important cause of occupational asthma (OA) in the industrialised world. Since OA occurs after long-term exposure to diisocyanates, the authors developed a chronic mouse model of chemical-induced asthma where toluene diisocyanate (TDI) was administered at two different exposure sites. Evaluating the effect of long-term respiratory isocyanate exposure - with or without prior dermal exposure- on sensitisation, inflammatory responses and airway hyperreactivity (AHR). On days 1 and 8, BALB/c mice were dermally treated (20 µl/ear) with 0.5% 2,4-toluene diisocyanate TDI or the vehicle acetone olive oil (AOO) (3:2). Starting from day 15, mice received intranasal instillations with 0.1% TDI of vehicle five times in a week, for five successive weeks. One day after the last instillation airway hyperreactivity (AHR) to methacholine was assessed, followed by an evaluation of pulmonary inflammation and structural lung changes. Immune-related parameters were assessed in the lungs (BAL and tissue), blood, cervical- and auricular lymph nodes. Mice repeatedly intranasally exposed to TDI showed systemic sensitisation and a mixed Th1/Th2 type immune response, without the presence of AHR. However, when mice are first dermally sensitised with TDI, followed by repeated intranasal TDI challenges, this

The authors developed a chronic mouse model of chemical-induced asthma where toluene diisocyanate (TDI) was administered at two different exposure sites.

results in a pronounced Th2 response and AHR. Dermal exposure to TDI determines airway hyperreactivity after repeated airway exposure to TDI.

Authors: Pollaris L, Van Den Broucke S, Decaestecker T, Cremer J, Seys S, Devos FC, Provoost S, Maes T, Verbeken E, Vande Velde G, Nemery B, Hoet PHM, Vanoirbeek JAJ.

Full Source: Toxicology. 2019 Jun 1; 421:84-92. doi: 10.1016/j.tox.2019.05.001. Epub 2019 May 6.

Addition of canagliflozin to insulin improves glycaemic control and reduces insulin dose in patients with type 2 diabetes mellitus: A randomised controlled trial

2019-07-15

The aim of this study was to evaluate the efficacy of canagliflozin in reducing the required insulin dose and the risk of hypoglycaemia in type 2 diabetes (T2D). This study was conducted in patients with T2D treated with insulin. They were randomly assigned to the control (n = 17) and canagliflozin (n = 17, plus 100 mg/day canagliflozin) groups. In both groups, a defined insulin dose adjustment protocol was applied to achieve the same level of glycaemic control. The change from baseline in daily insulin dose was significantly smaller in the canagliflozin group (3.9 units/day) than in the control group (13.4 units/day; P = 0.040). Low blood glucose index and predicted % of blood glucose (BG) <70 mg/dL, which are hypoglycaemia-related variables, worsened significantly in the control group but both remained unchanged in the canagliflozin group. The standard deviation for night-time BG levels improved significantly only in the canagliflozin group. Supplementation of insulin therapy with 100 mg canagliflozin in patients with T2D reduced the required insulin dose and hypoglycaemic risk and flattened night-time glycaemic fluctuations while maintaining the same level of glycaemic control.

Authors: Torimoto K, Okada Y, Goshima Y, Tokutsu A, Sato Y, Tanaka Y.

Full Source: Diabetes, Obesity and Metabolism. 2019 May 10. doi: 10.1111/dom.13770. [Epub ahead of print]

The aim of this study was to evaluate the efficacy of canagliflozin in reducing the required insulin dose and the risk of hypoglycaemia in type 2 diabetes (T2D).

Role of microglial activation and neuroinflammation in neurotoxicity of acrylamide in vivo and in vitro

2019-07-15

Acrylamide, a soft electrophile, is widely used in the industry and laboratories, and also contaminates certain foods. Neurotoxicity and neurodegenerative effects of acrylamide have been reported in humans and experimental animals, although the underlying mechanism remains

obscure. Activation of microglia and neuroinflammation has been demonstrated in various neurodegenerative diseases as well as other pathologies of the brain. The present study aimed to investigate the role of microglial activation and neuroinflammation in acrylamide neurotoxicity. Male 10-week-old Wistar rats were exposed to acrylamide by gavage at 0, 0.2, 2, or 20mg/kg BW, once per day for 5 weeks. The results showed that 5-week exposure to acrylamide induced inflammatory responses in the cerebral cortex, evident by upregulated mRNA and protein expression of pro-inflammatory cytokines IL-1 β , IL-6, and IL-18. Acrylamide also induced activation of microglia, indicated by increased expression of microglial markers, CD11b and CD40, and increased CD11b/c-positive microglial area and microglial process length. In vitro studies using BV-2 microglial cells confirmed microglial inflammatory response, as evident by time- (0-36 h; 50 μ M) and dose- (0-500 μ M; 24 h) dependent increase in mRNA expression of IL-1 β and IL-18, as well as the inflammatory marker iNOS. Furthermore, acrylamide-induced upregulation of pro-inflammatory cytokines was mediated through the NLRP3 inflammasome pathway, as evident by increased expression of NLRP3, caspase 1, and ASC in the rat cerebral cortex, and by the inhibitory effects of NLRP3 inflammasome inhibitor on the acrylamide-induced upregulation of NLRP3, caspase 1, IL-1 β , and IL-18 in BV-2 microglia.

Authors: Zong C, Hasegawa R, Urushitani M, Zhang L, Nagashima D, Sakurai T, Ichihara S, Ohsako S, Ichihara G.

Full Source: Archives in Toxicology. 2019 May 9. doi: 10.1007/s00204-019-02471-0. [Epub ahead of print]

The aim of this study was to evaluate the effect of IS (31.2-250 μ M) on oxidative stress in IEC-6 cells and on the intactness of IECs monolayers.

Effect of Indoxyl Sulfate on the Repair and Intactness of Intestinal Epithelial Cells: Role of Reactive Oxygen Species' Release

2019-07-15

Chronic kidney disease (CKD) is characterised by an oxidative stress status, driving some CKD-associated complications, even at the gastrointestinal level. Indoxyl Sulfate (IS) is a protein-bound uremic toxin, poorly eliminated by dialysis. This toxin is able to affect the intestinal system, but its molecular mechanism/s in intestinal epithelial cells (IECs) remain poorly understood. The aim of this study was to evaluate the effect of IS (31.2-250 μ M) on oxidative stress in IEC-6 cells and on the intactness of IECs monolayers. Our results indicated that IS enhanced oxidative cell damage by inducing reactive oxygen species (ROS) release, reducing the antioxidant response and affecting Nuclear factor (erythroid-derived 2)-like 2 (Nrf2) nuclear translocation as well its related antioxidant enzymes.

In the wound healing assay model, IS reduced IEC-6 migration, slightly impaired actin cytoskeleton rearrangement; this effect was associated with connexin 43 alteration. Moreover, we reported the effect of CKD patients' sera in IEC-6 cells. Our results indicated that patient sera induced ROS release in IEC-6 cells directly related to IS sera content and this effect was reduced by AST-120 serum treatment. Results highlighted the effect of IS in inducing oxidative stress in IECs and in impairing the intactness of the IECs cell monolayer, thus significantly contributing to CKD-associated intestinal alterations.

Authors: Adesso S, Ruocco M, Rapa SF, Piazz FD, Raffaele Di Iorio B, Popolo A, Autore G, Nishijima F, Pinto A, Marzocco S.

Full Source: International Journal of Molecular Sciences. 2019 May 8;20(9). pii: E2280. doi: 10.3390/ijms20092280.

Betel quid containing safrole enhances metabolic activation of tobacco specific 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK).

2019-07-15

Cigarette smoking (CS) and betel quid (BQ) chewing are two known risk factors that have synergistic potential for the enhancing the development of oral squamous cell carcinoma (OSCC) in Taiwan. Most mutagens and carcinogens are metabolically activated by cytochrome P450 (CYP450) to exert their mutagenicity or carcinogenicity. Previous studies have shown that metabolic activation of the tobacco-specific nitrosamine, 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK), by CYP2A6 activity determines NNK-induced carcinogenesis. In addition, safrole affects cytochrome P450 activity in rodents. However, the effect of BQ safrole on the metabolism of tobacco-specific NNK and its carcinogenicity remains elusive. This study demonstrates that safrole (1 mg/kg/d) induced CYP2A6 activity, reduced urinary 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol (NNAL) levels, and increased NNK-induced DNA damage, including N7-methylguanine, 8-OH-deoxyguanosine and DNA strand breaks in a Syrian golden hamster model. Furthermore, altered NNK metabolism and increased NNK-induced DNA damage were also observed in healthy subjects with CS and BQ chewing histories compared to healthy subjects with CS histories. In conclusion, BQ containing safrole induced tobacco-specific NNK metabolic activation, resulting in higher NNK-induced

genotoxicity. This study provides valuable insight into the synergistic mechanisms of CS- and BQ-induced OSCC.

Authors: Tsou HH, Ko HT, Chen CT, Wang TW, Lee CH, Liu TY, Wang HT.

Full Source: Environmental Pollution. 2019 Apr 30; 251:13-21. doi:

10.1016/j.envpol.2019.04.080. [Epub ahead of print]

OCCUPATIONAL RESEARCH

Determinants of Exposures to Hazardous Materials among Nail Cosmeticians in the Kampala City, Uganda

2019-07-15

Globally, nail salons represent a fast-growing industry and often with low-income cosmeticians. In general, cosmeticians have limited access to safety information about the hazardous materials they handle, which would potentially enable them to minimise workplace exposures. The problem is much pronounced in low- and middle-income countries due to weaknesses in regulation of the industry. In the present study, the authors investigated determinants of exposures to hazardous materials among nail cosmeticians in Kampala District, Uganda. A cross-sectional study design was employed among a random sample of 243 participants. The sociodemographic characteristics, education and training status, knowledge about routes of exposure to hazardous chemicals, and personal protective material use of cosmeticians were assessed through face-to-face interviews. Most cosmeticians were aged 18-34 years, and more males were engaged in this work than females. Also, 82.7% believed inhalation was the major exposure route for the chemicals they handled. Participants who had attained secondary-level education and above were over three times more likely to wear masks (AOR= 3.19, 95% CI 1.58-6.41) and gloves (AOR= 3.48, 95% CI 1.55-7.81) and over two times more likely to use aprons (AOR= 2.50, 95% CI 1.18-5.32). Participants who had ever received safety training on hazardous chemicals were more likely to wear all four personal protective equipment: masks (AOR= 3.21, 95% CI 1.61-6.42), gloves (AOR= 4.23, 95% CI 2.05-8.75), goggles (AOR= 4.14, 95% CI 1.25-13.65), and aprons (AOR= 2.73, 95% CI 1.25-5.96). Participants who had spent more than two years in the nail cosmetics business were more likely to wear masks (AOR= 3.37, 95% CI 1.64-6.95). With the increasing demand for nail cosmetics, and many people in urban areas of low-income countries engaging in this industry, there is need for training and better

In the present study, the authors investigated determinants of exposures to hazardous materials among nail cosmeticians in Kampala District, Uganda.

workplace policies to promote a healthier urban workforce dealing in cosmetics.

Authors: Ssempebwa JC, Ndejjo R, Neebye RM, Atusingwize E, Musinguzi G.

Full Source: Journal of Environmental & Public Health. 2019 Apr 1; 2019:1925863. doi: 10.1155/2019/1925863. eCollection 2019.

Maternal Occupational Oil Mist Exposure and Birth Defects, National Birth Defects Prevention Study, 1997-2011

2019-07-15

Workers in various industries can be exposed to oil mists when oil-based fluids are aerosolised during work processes. Oil mists can be inhaled or deposited on the skin. Little research exists on the reproductive effects of oil mist exposure in pregnant workers. This study aimed to investigate associations between occupational oil mist exposure in early pregnancy and a spectrum of birth defects using data from 22,011 case mothers and 8140 control mothers in the National Birth Defects Prevention Study. In total, 150 mothers were rated as exposed. Manufacturing jobs, particularly apparel manufacturing, comprised the largest groups of exposed mothers. Mothers of infants with septal heart defects (odds ratio (OR): 1.8, 95% confidence interval (CI): 1.0-3.3), and especially perimembranous ventricular septal defects (OR: 2.5, CI: 1.2-5.2), were more likely to be occupationally exposed to oil mists in early pregnancy than control mothers; and their rater-estimated cumulative exposure was more likely to be higher. This was the first U.S. study evaluating associations between oil mist exposure and a broad spectrum of birth defects. Our results are consistent with previous European studies, supporting a potential association between oil-based exposures and congenital heart defects. Further research is needed to evaluate the reproductive effects of occupational oil mist exposure.

Authors: Siegel M, Rocheleau CM, Johnson CY, Waters MA, Lawson CC, Riehle-Colarusso T, Reefhuis J; National Birth Defects Prevention Study.

Full Source: International Journal of Environmental Research & Public Health. 2019 May 4;16(9). pii: E1560. doi: 10.3390/ijerph16091560.

This study aimed to investigate associations between occupational oil mist exposure in early pregnancy and a spectrum of birth defects

Halogenated flame retardants and organophosphate esters in the air of electronic waste recycling facilities: Evidence of high concentrations and multiple exposures

2019-07-15

In response to a worldwide increase in production of electronic waste, the e-recycling industry is rapidly growing. E-recycling workers are exposed to many potentially toxic contaminants, among which flame retardants (FRs), mainly suspected of being endocrine disruptors, are thought to be the most prevalent. In this study, the authors conducted an exposure assessment of four chemical groups of FRs in Canadian e-recycling facilities, and to identify the main cofactors of exposure. Personal air samples were collected over a workday for 85 workers in six e-recycling facilities, grouped into three facility sizes, and for 15 workers in control commercial waste facilities. Total particulate matter was measured by gravimetry with stationary air samples. FRs were collected on OSHA versatile samplers, which allow particulate and vapor phases collection. Fifteen polybrominated diphenyl ether congeners (PBDEs), nine novel brominated (NBFRs), two chlorinated (ClFRs), and fourteen organophosphate ester (OPEs) flame retardants were analysed by gas chromatography-mass spectrometry. Sociodemographic data, tasks performed and materials processed by participating workers were recorded. Tobit regressions were used to identify cofactors of exposure, and their conclusions were corroborated using semi-parametric reverse Cox regressions. Thirty-nine of the 40 FRs analysed were detected in at least one air sample in e-recycling, and workers in this industry were exposed on average to 26 (range 12 to 39) different substances. The most detected chemical group of FRs in e-recycling was PBDEs with geometric mean sums of all congeners ranging from 120 to 5100 ng/m³, followed by OPEs with 740 to 1000 ng/m³, NBFRs with 7.6 to 100 ng/m³, and finally ClFRs with 3.9 to 32 mg/m³. The most important cofactor of exposure was the size of the e-recycling facility, with the largest one presenting on average 12 times the concentrations found in the control facility. Among tasks as potential cofactors of exposure, manual dismantling and baler operation exposed workers to some of the highest concentrations of PBDEs and ClFRs. There was a reduction of up to 27% in exposure to FRs associated with a 3-year increase in seniority. Finally, particulate matter concentrations in e-recycling facilities were highly correlated with all chemical classes except OPEs, and were higher in the large facility. Among the FRs analysed, PBDE exposure was particularly high in e-recycling. Dust and particulate matter reduction strategies in these workplaces, together with training on proper working practices would certainly be important

first steps to lower occupational exposures and prevent potential health effects.

Authors: Gravel S, Lavoué J, Bakhiyi B, Diamond ML, Jantunen LM, Lavoie J, Roberge B, Verner MA, Zayed J, Labrèche F.

Full Source: Environment International. 2019 Jul; 128:244-253. doi: 10.1016/j.envint.2019.04.027. Epub 2019 May 3.

Conductometric acetone vapor sensor based on the use of gold-doped three-dimensional hierarchical porous zinc oxide microspheres

2019-07-15

A versatile nanoprobe for acetone vapor was designed and fabricated. It is based on the use of gold-doped three-dimensional (3D) hierarchical porous zinc oxide microspheres (Au/ZnO HPMSs). The nanoprobe was synthesised by annealing zinc hydroxide carbonate precursor (obtained by a hydrothermal method) doped with gold nanoparticles. The resulting products possess a 3D open framework structure built of 2D porous nanosheets with a nanoporous wormhole-like shape. The microspheres doped with 0.5 mol% gold display a good selectivity towards acetone. The conductometric nanoprobe, typically operated at a voltage of 5 V, can detect sub-ppm levels of acetone, and the detection limit is as low as 0.2 ppm. The response (at a level of up to 100 ppm of acetone at 325 C) was high (74 ± 1.9), and the response and recovery time are 6 and 3 s, respectively. This superior performance is ascribed (a) to the hierarchical porous ZnO architecture that warrants a large surface area; and (b) to the presence of gold nanoparticles that facilitate the chemisorption and dissociation of gas molecules. Graphical abstract Gold-doped 3D hierarchical porous ZnO microspheres (Au/ZnO HPMSs) architectures assembled by interconnected 2D porous nanosheets structures. The resistive sensor using these Au/ZnO HPMSs demonstrates outstanding acetone vapour sensing behaviours and 0.2 ppm detection limits.

Authors: Xu S, Zhang H, Qi L, Xiao L.

Full Source: Mikrochim Acta. 2019 May 10;186(6):342. doi: 10.1007/s00604-019-3457-y.

Service evaluation of alcohol-release door plates: an addition to hand hygiene

2019-07-15

A service evaluation was designed to examine the effect of installation of alcohol-releasing Surfaceskins doorplates on routine alcohol hand gel

A versatile nanoprobe for acetone vapor was designed and fabricated.

hygiene use by healthcare workers. There was an approximate doubling increase in healthcare worker use of alcohol hand gel dispensers following the installation of Surfaceskins doorplates in two operating theatre suites. No evidence was found that Surfaceskins doorplates replaced routine hand hygiene. It is concluded that these devices represent a useful adjunct to routine hand hygiene practice in healthcare environments, and potentially in other settings (e.g. washrooms, restaurants) where frequent contact with doors could undermine infection prevention practice.

Authors: Wilcox MH, Dyche A.

Full Source: Journal of Hospital Infections. 2019 May 7. pii: S0195-6701(19)30194-X. doi: 10.1016/j.jhin.2019.04.023. [Epub ahead of print]

PUBLIC HEALTH RESEARCH

Systematic review of exposure to albendazole or mebendazole during pregnancy and effects on maternal and child outcomes, with particular reference to exposure in the first trimester

2019-07-15

Soil-transmitted helminth infections cause an important burden of morbidity worldwide, primarily from blood loss and malabsorption of nutrients. Where STH endemicity $\geq 20\%$, the World Health Organization (WHO) recommends preventive chemotherapy with single dose anthelmintic drugs: albendazole or mebendazole. Although WHO recommends that women of reproductive age, including pregnant women after the first trimester, be included in large-scale deworming programs, there are concerns related to the use of anthelmintic drugs during pregnancy, especially inadvertent use in the first few weeks when the pregnancy may not yet be confirmed. The authors conducted a systematic review using the MEDLINE database with the aim of appraising all peer-reviewed evidence, published up to July 1, 2018, on the association between exposure to albendazole or mebendazole and outcomes in pregnant women, including those in the first trimester of pregnancy, and their children. From a yield of 205 papers based on titles alone, 58 papers, reporting results from 46 originator studies conducted in pregnant populations, constituted the initial evidence base. Among the nine originator observational studies which had included women in the first trimester of pregnancy within their study population, five compared birth outcomes between women exposed in the first trimester with women who were not exposed, and none reported higher rates of adverse birth

The authors conducted a systematic review using the MEDLINE database on the association between exposure to albendazole or mebendazole and outcomes in pregnant women

outcomes in the exposed group. Due to heterogeneity in terms of study design, sample size, deworming drug, dosage and outcomes measured, data from these studies could not be pooled. Based on this cumulative evidence, it is unlikely that inadvertent exposure to albendazole or mebendazole in the first trimester carries an additional risk of adverse birth outcomes. To optimise relevance for policy making, future research in pregnant populations should aim to provide data disaggregated by trimester and to report on maternal and child adverse events, whenever possible.

Authors: Gyorkos TW, St-Denis K.

Full Source: International Journal of Parasitology. 2019 May 6. pii: S0020-7519(19)30083-9. doi: 10.1016/j.ijpara.2019.02.005. [Epub ahead of print]

Do Interactions Between Environmental Chemicals and the Human Microbiome Need to Be Considered in Risk Assessments?

2019-07-15

One of the most dynamic and fruitful areas of current health-related research concerns the various roles of the human microbiome in disease. Evidence is accumulating that interactions between substances in the environment and the microbiome can affect risks of disease, in both beneficial and adverse ways. Although most of the research has concerned the roles of diet and certain pharmaceutical agents, there is increasing interest in the possible roles of environmental chemicals. Chemical risk assessment has, to date, not included consideration of the influence of the microbiome. The authors suggest that failure to consider the possible roles of the microbiome could lead to significant error in risk assessment results. The purpose of this commentary is to summarise some of the evidence supporting our hypothesis and to urge the risk assessment community to begin considering and influencing how results from microbiome-related research could be incorporated into chemical risk assessments. An additional emphasis in the commentary concerns the distinct possibility that research on chemical-microbiome interactions will also reduce some of the significant uncertainties that accompany current risk assessments. Of particular interest is evidence suggesting that the microbiome has an influence on variability in disease risk across populations and (of particular interest to chemical risk) in animal and human responses to chemical exposure. The possible explanatory power of the microbiome regarding

The authors suggest that failure to consider the possible roles of the microbiome could lead to significant error in risk assessment results.

sources of variability could reduce what might be the most significant source of uncertainty in chemical risk assessment.

Authors: Rodricks J, Huang Y, Mantus E, Shubat P.

Full Source: Risk Analysis. 2019 May 9. doi: 10.1111/risa.13316. [Epub ahead of print]

Foetal growth in environmental epidemiology: mechanisms, limitations, and a review of associations with biomarkers of non-persistent chemical exposures during pregnancy

2019-07-15

Non-persistent chemicals, such as phthalates, environmental phenols, organophosphate pesticides, and others, are challenging to study because of their ubiquity in the environment, diverse exposure routes, and high temporal variability of biomarkers. Nonetheless, there is interest in understanding how gestational exposure to these chemicals may affect foetal growth, as perturbations to normal foetal growth are related to a plethora of adverse health outcomes in childhood and adulthood. The purpose of this review is to describe the state of the science on this topic. The authors searched PubMed for studies that included both 1) biomarkers of non-persistent chemicals collected during pregnancy and 2) foetal growth outcomes measured at birth (e.g., birth weight) or by ultrasound in utero (e.g., estimated foetal weight). The bulk of the literature we found uses biomarkers measured at a single time point in pregnancy and birth weight as the primary measure of foetal growth. There is a small, but growing, body of research that uses ultrasound measures to assess foetal growth during pregnancy. In addition to summarising the findings of the publications the authors identified, described inconsistencies in methodology, areas for improvement, and gaps in existing knowledge that can be targeted for improvement in future work. This literature is characterised by variability in methodology, likely contributing to the inconsistency of results reported. The authors further discuss maternal, placental, and foetal pathways by which these classes of chemicals may affect foetal growth. To improve understanding of how everyday chemical exposures, affect foetal growth, and ultimately lifelong health outcomes, mechanisms of toxicant action should be considered alongside improved study designs for future hypothesis-driven research.

Authors: Kamai EM, McElrath TF, Ferguson KK.

Full Source: Environmental Health. 2019 May 8;18(1):43. doi: 10.1186/s12940-019-0480-8.

Using a high-resolution mass spectrometry-based metabolomics strategy for comprehensively screening and identifying biomarkers of phthalate exposure: Method development and application

2019-07-15

Di-(2-propylheptyl) phthalate (DHP) is an alternative plasticiser that can replace other phthalates currently being scrutinized, and its use and production volumes are increasing. This study aimed to develop a high-resolution mass spectrometry (HRMS)-based metabolomics strategy to comprehensively screen urinary biomarkers of DHP exposure and filter out potentially useful DHP exposure markers for human exposure assessments. This strategy included three stages: screening of biomarkers, verification of dose-response relationships in laboratory animals, and application in human subjects. The multivariate data analysis method known as orthogonal partial least-squares discriminant analysis (OPLS-DA) was used to screen and find meaningful signals in an MS dataset generated from urine samples collected from DHP-administered rats. Thirty-six MS signals were verified as exposure marker candidates by assessing dose-response relationships in an animal feeding study. A biotransformation product of DHP, mono-(2-propyl-7-dihydroxy-heptyl) phthalate, was suggested as a DHP exposure marker for general human exposure assessments after the human application study and chemical structure identification. Three previously oxidised DHP biotransformation products might be suitable for human exposure assessments in high-level exposure groups but not in the general population due to their low sensitivity.

Authors: Hsu JF, Tien CP, Shih CL, Liao PM, Wong HI, Liao PC.

Full Source: Environment International. 2019 Jul; 128:261-270. doi: 10.1016/j.envint.2019.04.041. Epub 2019 May 4.

This study aimed to develop a high-resolution mass spectrometry (HRMS)-based metabolomics strategy to comprehensively screen urinary biomarkers of DHP exposure and filter out potentially useful DHP exposure markers for human exposure assessments.

Could the Supertowel be used as an alternative hand cleaning product for emergencies? An acceptability and feasibility study in a refugee camp in Ethiopia

2019-07-15

Diarrhoeal diseases are a major contributor to morbidity and mortality in humanitarian crises. Handwashing with soap may reduce diarrhoea by up to 47%, however, the circumstances associated with displacement make it challenging for crisis-affected populations to be able to wash their hands with soap. The Supertowel is an alternative hand-cleaning product, proven to be as efficacious as handwashing with soap. The Supertowel is a micro-

Technical

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fibre towel with an anti-microbial treatment. When dipped in water it is capable of removing and killing pathogens from hands. This study aims to assess whether the Supertowel could be an acceptable and feasible product for crisis-affected populations. The study took place in an Eritrean refugee camp located in Tigray state in Ethiopia. The authors used a mix of qualitative methods to understand use and acceptability, including baseline observations ($n = 13$), behaviour trials involving interviews at three time points ($n = 19$) and focus group discussions ($n = 3$). We thematically analysed data from interviews and discussions. Participants indicated that the Supertowel was convenient, easy to use and saved them water and money. All households participating in the behaviour trials had at least one Supertowel in use at the end of the trials (follow-up visit two). In discussions participants reported that the Supertowel was more desirable than comparable hand cleaning products. In interviews, trial participants explained that the product enabled them to clean their hands at times when they might not normally bother. The research also identified some issues with the smell of the Supertowel and its intuitive use. The Supertowel was found to be an acceptable and useful hand-cleaning product that could complement soap use in crisis contexts. This pilot study also identified areas of future research including the need to compare different distribution models for the Supertowel (distribution in hygiene kits compared to distribution with an accompanying communication package) and to evaluate its use at scale over a longer time period.

Authors: White S, Petz JF, Desta K, Holm Larsen T.

Full Source: PLoS One. 2019 May 6;14(5):e0216237. doi: 10.1371/journal.pone.0216237. eCollection 2019.