

Contents

CHEMWATCH

(click on page numbers for links)

ENVIRONMENTAL RESEARCH

- The effect and mechanism of organic pollutants oxidation and chemical energy conversion for neutral wastewater via strengthening reactive oxygen species 3
- Contamination Route of Leaf-Cutting Worker Ants Analysed Through a Fat-Soluble Tracer Dye in Toxic Bait..... 3
- A systematic review of experimental animal studies on microbial bioaerosols: Dose-response data for the derivation of exposure limits..... 4
- Improving small-scale wastewater treatment plant performance by using a filtering tertiary treatment unit 5
- Bioconversion of lignin into bioplastics by *Pandoraea* sp. B-6: molecular mechanism 6

MEDICAL RESEARCH

- Catechol-O-Methyltransferase Val158Met Polymorphism Is Associated with Anxiety, Depression, and Widespread Pressure Pain Sensitivity in Women with Chronic, but Not Episodic, Migraine..... 6
- A metabolome-wide characterisation of the diabetic phenotype in ZDF rats and its reversal by pioglitazone..... 7
- Toxic effects of subacute inhalation exposure to trichloroethylene on serum lipid profile, glucose and biochemical parameters in Sprague-Dawley rats..... 8
- Short-term impact of PM_{2.5} on contemporaneous asthma medication use: Behaviour and the value of pollution reductions..... 9
- Effect of crocetin on quality of sleep: A randomised, double-blind, placebo-controlled, crossover study 10

OCCUPATIONAL RESEARCH

- Blue-yellow dyschromatopsia in toluene-exposed workers 10
- Repeated exposure to high ICT demands at work, and development of suboptimal self-rated health: findings from a 4-year follow-up of the SLOSH study 11
- Urinary hydroxypyrene determination for biomonitoring of firefighters deployed at the Fort McMurray wildfire: an inter-laboratory method comparison..... 12
- Exposure to noise and ototoxic chemicals in the Australian workforce..... 13
- Foods and Beverages Obtained at Worksites in the United States 14

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Contents

CHEMWATCH

PUBLIC HEALTH RESEARCH

Quantum dots and mouse strain influence house dust mite-induced allergic airway disease	15
Perfluorinated alkyl substances in snow as an atmospheric tracer for tracking the interactions between westerly winds and the Indian Monsoon over western China	16
Emerging contaminants of high concern and their enzyme-assisted biodegradation - A review.....	17
Occurrence of legacy and alternative plasticisers in indoor dust from various EU countries and implications for human exposure via dust ingestion and dermal absorption.....	18
Monitoring of environmental persistent organic pollutants in hair samples collected from wild terrestrial mammals of Primorsky Krai, Russia	19

ENVIRONMENTAL RESEARCH

The effect and mechanism of organic pollutants oxidation and chemical energy conversion for neutral wastewater via strengthening reactive oxygen species

2019-03-04

Toxic and refractory organic pollutants are continually discharged into the water environment, which has become the crisis for the human living and sustainable development. However, organic pollutants also contain large amounts of chemical energy. In this study, the authors investigated the effect and mechanism of organic pollutants oxidation and chemical energy conversion for neutral wastewater via strengthening reactive oxygen species (ROS) of HO and O₂⁻ in a photocatalytic fuel cell (PFC) system, since ROS has the power to oxidize or even mineralize the organics and is environment-friendly to treat refractory organic pollutants. In the PFC system, the HO was enhanced by the cyclic radical chain reaction via the addition of Fe²⁺ and tetrapolyphosphate (TPP), while O₂⁻ was enhanced by setting an additional bias voltage at the anode which was favourable to O₂ production. The results show that the HO and O₂⁻ concentration are highly enhanced, showing 8.28 and 8.99 times those of traditional PFC, respectively. Meanwhile, the degradation rate constant is remarkably increased by 6.52 times when methylene blue is used as a model pollutant. Furthermore, the performance of wastewater PFC is so improved that the short-circuit current density (J_{sc}) and maximum power density (J_{vmax}) have been increased by a factor of 9.05 and 12.67 times in the same experiment, respectively.

Authors: Li L, Li J, Bai J, Zeng Q, Xia L, Zhang Y, Chen S, Xu Q, Zhou B.

Full Source: Science of the Total Environment. 2019 Feb 15;651(Pt 1):1226-1235. doi: 10.1016/j.scitotenv.2018.09.302. Epub 2018 Sep 24.

In this study, the authors investigated the effect and mechanism of organic pollutants oxidation and chemical energy conversion for neutral wastewater via strengthening reactive oxygen species (ROS)

Contamination Route of Leaf-Cutting Worker Ants Analysed Through a Fat-Soluble Tracer Dye in Toxic Bait

2019-03-04

The present study seeks to discover contamination routes of leaf-cutting worker ants during chemical control by formicide baits. To do so, toxic baits containing fat-soluble tracer dye were provided to colonies of three subspecies of *Acromyrmex* under laboratory conditions, in order to assess the proportion of dyed workers by size category, as well as dyed internal morphological structures. Results showed that nearly 50% of the workers come into contact with the active ingredient, since the internal structures

of their bodies are dyed by the fat-soluble tracer dye within the first 24 h from contact with the toxic bait. In addition, the three subspecies of leaf-cutting ants present a similarity as to the contamination of their workers, probably due to their specialized behaviour performed during the growth of the fungus garden with the baits. The authors concluded that the workers' pattern of behaviour during fungus garden growth was the main means for dispersion of a fat-soluble substance among approximately half of the nest mates in the experiments, serving as a model for further studies on contamination of worker ants with insecticides.

Authors: Forti LC, Camargo RS, Andrade APP, Catalani GC, Sousa KKA, Silva AAC, Caldato N, Ramos VM.

Full Source: Neotropical Entomology. 2018 Nov 29. doi: 10.1007/s13744-018-0652-1. [Epub ahead of print]

A systematic review of experimental animal studies on microbial bioaerosols: Dose-response data for the derivation of exposure limits

2019-03-04

Although exposure to high levels of microbial bioaerosols can be linked to the deterioration of the human respiratory system, precise exposure levels responsible for such effects are still unknown. A previous systematic review concluded that there was not enough information in the studies in humans to derive an exposure-response relationship. Thus, the aim of this systematic review was to derive exposure limits for microbial bioaerosols based on health effects in experimental animal studies. A systematic search was done in MEDLINE (PubMed) for long-term in vivo exposure of the respiratory system via inhalation of a quantified microbial bioaerosol. A total of $n = 301$ studies were retrieved. Abstract screening using predefined inclusion and exclusion criteria was followed by full-text screening and standardised data extraction of study characteristics and measured outcomes. As a result, four suitable studies were identified where mice or guinea pigs were exposed for 4-12 weeks to a previously described mixture of fungal spores or conidia via inhalation. The number of macrophages, neutrophils, eosinophils and lymphocytes following subchronic exposure has been reported by all included papers and suggested a dose- and time-dependent relationship. Significant inflammation was observed following subacute exposure to *Aspergillus fumigatus*. However, the outcomes of the studies could not be directly compared due to the large degree of variation and poor description of the exposure conditions. The authors concluded that more experimental research needs to be done with the specific aim of establishing a No-

Observed-Adverse-Effect Level (NOAEL) and a Lowest-Observed-Adverse-Effect Level (LOAEL) for exposure to microbial bioaerosols in ambient air. Expertise of both exposure and outcome assessment should be brought together to enable standardisation of experimental animal studies with properly generated aerosols aiming to derive health-based exposure limits.

Authors: Zamfir M, Gerstner DG, Walser SM, Bünger J, Eikmann T, Heinze S, Kolk A, Nowak D, Raulf M, Sagunski H, Sedlmaier N, Suchenwirth R, Wiesmüller GA, Wollin KM, Tesseroux I, Herr CEW.

Full Source: International Journal of Hygiene & Environmental Health. 2018 Nov 26. pii: S1438-4639(18)30180-9. doi: 10.1016/j.ijheh.2018.11.004. [Epub ahead of print]

Improving small-scale wastewater treatment plant performance by using a filtering tertiary treatment unit

2019-03-04

The demand for wastewater treatment plants purposed for a single household or groups of households continues to increase as the quality requirements for wastewater treatment become increasingly rigorous. Researchers are constantly searching for new methods to remove phosphorus compounds from wastewater that do not require the use of chemicals. This study describes a newly designed tertiary wastewater treatment unit that increases the effectiveness of the main small-scale (up to 1 m³/d) biological wastewater treatment unit. The tertiary treatment unit is filled with the sorbent material Filtralite P., after the main treatment wastewater flows through the filler without the use of electric power. A compact system consisting of a main (secondary) treatment unit and the newly designed tertiary wastewater treatment unit was tested in accordance with the harmonised European Standard EN 12566-3. During the testing period, no surplus sludge was discharged from the system, no reagents were dosed into it, the system only consumed 119 kW of electric power, and the treated wastewater contained <1 mg/L of phosphorus. The total wastewater treatment efficiency can be explained as follows: COD - 95.2%, BOD₅ - 99.2%, SS - 99.4%, NH₄-N - 99.6%, Nt - 82.2%, and Pt - 91.8%. The system is efficient, the operational cost is relatively low, it does not use chemical reagents, and it is environment friendly.

Author: Mažeikienė A.

Full Source: Journal of Environmental Management. 2018 Nov 26; 232:336-341. doi: 10.1016/j.jenvman.2018.11.076. [Epub ahead of print]

This study describes a newly designed tertiary wastewater treatment unit that increases the effectiveness of the main small-scale (up to 1 m³/d) biological wastewater treatment unit.

Bioconversion of lignin into bioplastics by *Pandoraea* sp. B-6: molecular mechanism

2019-03-04

Lignin is a by-product in the pulp and paper industry and is considered as a promising alternative for the provision of energy and chemicals. Currently, the efficient valorisation of lignin is a challenge owing to its polymeric structure complexity. In the present study, the authors present a platform for bio-converting Kraft lignin (KL), to polyhydroxyalkanoate (PHA) by *Pandoraea* sp. B-6 (hereafter B-6). Depolymerisation of KL by B-6 was first confirmed, and > 40% KL was degraded by B-6 in the initial 4 days. Characterisation of PHA showed that up to 24.7% of PHA accumulated in B-6 grown in 6-g/L KL mineral medium. The composition, structure, and thermal properties of the produced PHA were analysed, revealing that 3-hydroxybutyrate was the only monomer and that PHA was comparable with the commercially available bioplastics. Moreover, the genomic analysis illustrated three core enzymatic systems for lignin depolymerisation including laccases, peroxidases, and Fenton-reaction enzymes; five catabolic pathways for LDAC degradation and a gene cluster consisting of *bktB*, *phaR*, *phaB*, *phaA*, and *phaC* genes involved in PHA biosynthesis. Accordingly, a basic model for the process from lignin depolymerisation to PHA production was constructed. The findings provide a comprehensive perspective for lignin valorisation and bio-material production from waste.

Authors: Liu D, Yan X, Si M, Deng X, Min X, Shi Y, Chai L.

Full Source: Environmental Science & Pollution Research International. 2019 Jan;26(3):2761-2770. doi: 10.1007/s11356-018-3785-1. Epub 2018 Nov 27.

In the present study, the authors present a platform for bio-converting Kraft lignin (KL), to polyhydroxyalkanoate (PHA) by *Pandoraea* sp. B-6 (hereafter B-6).

MEDICAL RESEARCH

Catechol-O-Methyltransferase Val158Met Polymorphism Is Associated with Anxiety, Depression, and Widespread Pressure Pain Sensitivity in Women with Chronic, but Not Episodic, Migraine

2019-03-04

In this study, the authors analysed the association between the rs4680 catechol-O-methyltransferase Val158Met polymorphism and to determine the association of this polymorphism with clinical, psychological, and pain sensitivity variables in women with episodic or chronic migraine. Fifty women with episodic migraine, 50 with chronic migraine, and 50

matched healthy women participated. After amplifying the Val158Met polymorphism by polymerase chain reaction, the authors assessed genotype frequencies and allele distributions. Participants were classified according to the Val158Met polymorphism genotype into Val/Val, Val/Met, or Met/Met. A headache diary was used for collecting migraine pain features. Disability was assessed with the Migraine Disability Assessment Scale, trait/state anxiety levels with the State-Trait Anxiety Inventory, and depression/anxiety with the Hospital Anxiety and Depression Scale. Pressure pain thresholds (PPTs) were bilaterally assessed over the temporalis, the upper trapezius, the second metacarpal, and the tibialis anterior. The distribution of the rs4680 Val158Met genotype was not significantly different between women with and without migraine ($P=0.157$). No differences in migraine features were found to be dependent on the Val158Met genotype. Women with the Met/Met genotype showed higher migraine-related disability than those with the Val/Val or Val/Met genotype in both migraine groups ($P < 0.01$). Women with chronic, but not episodic, migraine with the Met/Met genotype exhibited higher depressive and anxiety levels and lower PPTs than those with the Val/Val or Val/Met genotype. The Val158Met rs4680 polymorphism does not appear to be involved in predisposition to suffer from migraine; however, this genetic factor may be involved in the phenotypic expression of chronic migraine, as anxiety depression, and widespread pressure pain sensitivity were greater in those women with chronic, but not episodic, migraine with the Met/Met genotype.

Authors: Fernández-de-Las-Peñas C, Ambite-Quesada S, Florencio LL, Palacios-Ceña M, Ordás-Bandera C, Arendt-Nielsen L.

Full Source: Pain Medicine. 2018 Nov 27. doi: 10.1093/pm/pny237. [Epub ahead of print]

A metabolome-wide characterisation of the diabetic phenotype in ZDF rats and its reversal by pioglitazone

2019-03-04

Type 2 diabetes (T2D) is a complex metabolic disease associated with alterations in glucose, lipid and protein metabolism. In order to characterise the biochemical phenotype of the Zucker diabetic fatty (ZDF) rat, the most common animal model for the study of T2D, and the impact of the insulin sensitiser pioglitazone, a global, mass spectrometry-based analysis of the metabolome was conducted. Overall, 420 metabolites in serum, 443 in the liver and 603 in the intestine were identified at study end. In comparison to two control groups, obese diabetic ZDF rats showed characteristic metabolic signatures that included hyperglycaemia,

In order to characterise the biochemical phenotype of the Zucker diabetic fatty (ZDF) rat, a global, mass spectrometry-based analysis of the metabolome was conducted.

elevated β -oxidation, dyslipidemia-featured by an increase in saturated and monounsaturated fatty acids and a decrease of medium chain and of polyunsaturated fatty acids in serum-and decreased amino acid levels, consistent with their utilisation in hepatic gluconeogenesis. A 13-week treatment with the PPAR γ agonist pioglitazone reversed most of these signatures: Pioglitazone improved glycaemic control and the fatty acid profile, elevated amino acid levels in the liver, but decreased branched chain amino acids in serum. The hitherto most comprehensive metabolic profiling study identified a biochemical blueprint for the ZDF diabetic model and captured the impact of genetic, nutritional and pharmacological perturbations. The in-depth characterisation on the molecular level deepens the understanding and further validates the ZDF rat as a suitable preclinical model of diabetes in humans.

Authors: Jönsson TJ, Schäfer HL, Herling AW, Brönstrup M.

Full Source: PLoS One. 2018 Nov 27;13(11): e0207210. doi: 10.1371/journal.pone.0207210. eCollection 2018.

Toxic effects of subacute inhalation exposure to trichloroethylene on serum lipid profile, glucose and biochemical parameters in Sprague-Dawley rats

2019-03-04

The current study evaluated the inhalation toxicity of trichloroethylene (TCE) at 0, 10, 100, 250 and 400 ppm in Sprague-Dawley rats for 10-day period, because the subacute inhalation toxicity of TCE on serum lipid profile, glucose and some biochemical parameters has not been previously reported. TCE vapours were generated using the dynamic generation system based on evaporation method in the exposure chamber. On the basis of the results, mean serum low-density lipoprotein (LDL) and albumin (ALB) decreased significantly in all the groups exposed to TCE compared with the control group ($p < .005$), but there was a significant increase for parameters: fasting blood glucose (FBG) and alkaline phosphatase (ALP) ($p < .005$). Rats exposed to 400 ppm TCE showed a significant decrease in serum cholesterol (CHOL) and protein (Pr) compared with the control group ($p < .005$). A negative relationship was found between triglycerides (TG), very low-density lipoprotein (VLDL), CHOL, LDL, Pr, ALB and urea levels and the subacute exposure to concentrations of TCE ($R^2 = -0.26$, $p < .05$), but there was a direct correlation for parameters FBG, ALP and alanine aminotransferase (ALT) ($R^2 = 0.42$, $p < .05$). In conclusion, studies with Sprague-Dawley rats demonstrated that subacute inhalation exposure to TCE (≥ 100 PPM) is associated with biochemical and lipotoxicity in the form of decreased serum ALB and

LDL and raised ALP and glucose levels. The present study also provides additional evidence relating to decreased serum CHOL and Pr after subacute inhalation exposure to 400 ppm TCE.

Authors: Zamanian Z, Yousefinejad S, Khoshnoud MJ, Golbabaie F, Farhang Dehghan S, Modaresi A, Amanat S, Reza Zare M, Rahmani A.

Full Source: Inhalation Toxicology. 2018 Nov 27:1-7. doi: 10.1080/08958378.2018.1526233. [Epub ahead of print]

Short-term impact of PM_{2.5} on contemporaneous asthma medication use: Behaviour and the value of pollution reductions

2019-03-04

Asthma ranks among the most-costly of chronic diseases, accounting for over \$50 billion annually in direct medical expenditures in the United States. At the same time, evidence has accumulated that fine particulate matter pollution can exacerbate asthma symptoms and generate substantial economic costs. To measure these costs, the authors use a unique nationwide panel dataset tracking asthmatic individuals' use of rescue medication and their exposure to PM_{2.5} (particulate matter with an aerodynamic diameter of <2.5 μm) concentration between 2012 and 2017, to estimate the causal relationship between pollution and inhaler use. The sample consists of individuals using an asthma digital health platform, which relies on a wireless sensor to track the place and time of inhaler use events, as well as regular non-event location and time indicators. These data provide an accurate measurement of inhaler use and allow spatially and temporally resolute assignment of pollution exposure. Using a high-frequency research design and individual fixed effects, the authors find that a 1 μg/m³ (12%) increase in weekly exposure to PM_{2.5} increases weekly inhaler use by 0.82%. It was also shown that there is seasonal, regional, and income-based heterogeneity in this response. Using the response prediction, and an estimate from the literature on the willingness to pay to avoid asthma symptoms, it was shown that a nationwide 1 μg/m³ reduction in particulate matter concentration would generate nearly \$350 million annually in economic benefits.

Authors: Williams AM, Phaneuf DJ, Barrett MA, Su JG.

Full Source: Proceedings of the National Academy of Sciences of the United States of America. 2018 Nov 26. pii: 201805647. doi: 10.1073/pnas.1805647115. [Epub ahead of print]

Technical

CHEMWATCH

Effect of crocetin on quality of sleep: A randomised, double-blind, placebo-controlled, crossover study

2019-03-04

The aim of the present study was to investigate the effect of crocetin on sleep architecture and subjective sleep parameters in healthy adult participants with mild sleep complaints. A randomised, double-blind, placebo-controlled, crossover study with two intervention periods of 14 days each, separated by a 14-day wash-out period. Thirty participants were randomly assigned to one of two sequence groups. Each group was given crocetin at 7.5 mg/day, or placebo. The authors measured objective sleep parameters using single-channel electroencephalography and assessed subjective sleep parameters using the Oguri-Shirakawa-Azumi Sleep Inventory, Middle-age and Aged version (OSA-MA). Differences between crocetin and placebo in an objective sleep parameter (delta power), and OSA-MA scores. Delta power was significantly increased with crocetin compared with placebo. There were no significant differences in the other sleep parameters, including sleep latency, sleep efficiency, total sleep time, and wake after sleep onset. Subjective scores for sleepiness on rising and feeling refreshed were significantly improved with crocetin compared with placebo. The findings of the present study suggest that crocetin supplementation contributes to sleep maintenance, leading to improved subjective sleep quality.

Authors: Umigai N, Takeda R, Mori A.

Full Source: Complementary Therapies in Medicine. 2018 Dec; 41:47-51.

doi: 10.1016/j.ctim.2018.09.003. Epub 2018 Sep 8.

The aim of the present study was to investigate the effect of crocetin on sleep architecture and subjective sleep parameters in healthy adult participants with mild sleep complaints.

OCCUPATIONAL RESEARCH

Blue-yellow dyschromatopsia in toluene-exposed workers

2019-03-04

This study evaluated the effects of a chronic occupational exposure to toluene on colour vision. Colour vision was tested in 51 workers exposed to pure toluene and in 51 matched control subjects. Current exposure was determined by biological monitoring. Blood samples were taken at the end of a Friday shift. Colour vision ability was assessed using the Ishihara plates (to screen for congenital dyschromatopsia), the Farnsworth panel D-15 test, the Lanthony panel D-15 desaturated test, the Velhagen plates, and the Standard Pseudoisochromatic Plates Part 2. Median toluene concentration was 1.59 mg/l (quartiles 0.78 and 2.65). The whole group of workers did not perform worse than the controls. The same applies to 20

printers, who regularly assessed hues. Assessed with the most sensitive Lanthony panel D-15 desaturated test, colour vision of 24 permanently exposed assistants was impaired (median colour confusion index of the 1st eyes 1.08 vs. 1.02, $p < 0.02$; 2nd eyes 1.08 vs. 1.0, $p < 0.05$; sign test). The assistants made almost exclusively blue-yellow errors. The other colour vision tests did not reveal any differences between the groups. Changes in the retina are a possible explanation for the observed blue-yellow dyschromatopsia.

Authors: Muttray A, Wolters V, Rose DM.

Full Source: International Archives in Occupational & Environmental Health. 2019 Jan 25. doi: 10.1007/s00420-019-01405-8. [Epub ahead of print]

Repeated exposure to high ICT demands at work, and development of suboptimal self-rated health: findings from a 4-year follow-up of the SLOSH study

2019-03-04

The knowledge about the association between Information and Communication Technology (ICT) demands at work and self-rated health (SRH) is insufficient. The aim of this study was to examine the association between repeated exposure to high ICT demands at work, and risk of suboptimal SRH, and to determine modifications by sex or socioeconomic position (SEP). A prospective design was used, including repeated measurement of ICT demands at work, measured 2 years apart. SRH was measured at baseline and at follow-up after 4 years. The data were derived from the Swedish Longitudinal Occupational Survey of Health (SLOSH), including 4468 gainfully employees (1941 men, 2527 women) with good SRH at baseline. In the total study sample, repeated exposure to high ICT demands at work was associated with suboptimal SRH at follow-up (OR 1.34 [CI 1.06-1.70]), adjusted for age, sex, SEP, health behaviours, BMI, job strain and social support. An interaction between ICT demands and sex was observed ($p = 0.010$). The risk was only present in men (OR 1.53 [CI 1.09-2.16]), and not in women (OR 1.17 [CI 0.85-1.62]). The risk of suboptimal SRH after consistently high ICT demands at work was most elevated in participants with high SEP (OR 1.68 [CI 1.02-2.79]), adjusted for age, sex, health behaviours, BMI and job strain. However, no significant interaction between ICT demands and SEP regarding SRH was observed.

The aim of this study was to examine the association between repeated exposure to high ICT demands at work, and risk of suboptimal SRH, and to determine modifications by sex or socioeconomic position

Repeated exposure to high ICT demands at work was associated with suboptimal SRH at follow-up, and the association was modified by sex.

Authors: Stadin M, Nordin M, Broström A, Magnusson Hanson LL, Westerlund H, Fransson EI.

Full Source: International Archives in Occupational & Environmental Health. 2019 Jan 25. doi: 10.1007/s00420-019-01407-6. [Epub ahead of print]

Urinary hydroxypyrene determination for biomonitoring of firefighters deployed at the Fort McMurray wildfire: an inter-laboratory method comparison

2019-03-04

Urinary 1-hydroxypyrene (OH-Pyr) is widely used for biomonitoring human exposures to polycyclic aromatic hydrocarbons (PAHs) from air pollution and tobacco smoke. However, there have been few rigorous validation studies reported to ensure reliable OH-Pyr determination for occupational health and risk assessment. In the present study, the authors report an inter-laboratory method comparison for urinary OH-Pyr when using gas chromatography-high-resolution mass spectrometry (GC-HRMS) and liquid chromatography-tandem mass spectrometry (LC-MS/MS) on urine specimens collected from firefighters (n = 42) deployed at the 2016 Fort McMurray wildfire. Overall, there was good mutual agreement in urinary OH-Pyr quantification following enzyme deconjugation with an average bias of 39% with no significant deviation from linearity (slope = 1.36; $p > 0.05$), whereas technical precision (< 12%) and average recovery (> 85%) were acceptable when using a stable-isotope internal standard. Faster analysis times (4 min) were achieved by LC-MS/MS without chemical derivatisation, whereas lower detection limits (0.64 ng/L, S/N = 3) was realised with solid-phase extraction prior to GC-HRMS. A median creatinine normalised OH-Pyr concentration of 128 ng/g was measured for firefighters that were below the recommended biological exposure index due to delays between early stages of emergency firefighting and urine sample collection. Similar outcomes were also measured for 3-hydroxyphenanthrene and 9-hydroxyfluorene that were positively correlated with urinary OH-Pyr ($p < 0.05$), implying similar uptake, distribution, and liver biotransformation processes. Optimal specimen collection strategies post-deployment together with standardised protocols for OH-PAH analysis are critical to accurately evaluate smoke

In the present study, the authors report an inter-laboratory method comparison for urinary OH-Pyr when using gas chromatography-high-resolution mass spectrometry (GC-HRMS) and liquid chromatography-tandem mass spectrometry (LC-MS/MS) on urine specimens collected from firefighters deployed at the 2016 Fort McMurray wildfire.

exposure in firefighters, including experimental conditions to ensure quantitative enzyme hydrolysis of urine samples. Graphical abstract.

Authors: Gill B, Mell A, Shanmuganathan M, Jobst K, Zhang X, Kinniburgh D, Cherry N, Britz-McKibbin P.

Full Source: Analytical and Bioanalytical Chemistry. 2019 Jan 25. doi: 10.1007/s00216-018-01569-1. [Epub ahead of print]

Exposure to noise and ototoxic chemicals in the Australian workforce

2019-03-04

In this study, the authors determined the current prevalence of exposure to workplace noise and ototoxic chemicals, including co-exposures. A cross-sectional telephone survey of nearly 5000 Australian workers was conducted using the web-based application, OccIDEAS. Participants were asked about workplace tasks they performed and predefined algorithms automatically assessed worker's likelihood of exposure to 10 known ototoxic chemicals as well as estimated their full shift noise exposure level (LAeq,8h) of their most recent working day. Results were extrapolated to represent the Australian working population using a raked weighting technique. In the Australian workforce, 19.5% of men and 2.8% of women exceeded the recommended full shift noise limit of 85 dBA during their last working day. Men were more likely to be exposed to noise if they were younger, had trade qualifications and did not live in a major city. Men were more likely exposed to workplace ototoxic chemicals (57.3%) than women (25.3%). Over 80% of workers who exceeded the full shift noise limit were also exposed to at least one ototoxic chemical in their workplace. The results demonstrate that exposures to hazardous noise and ototoxic chemicals are widespread in Australian workplaces and co-exposure is common. Occupational exposure occurs predominantly for men and could explain some of the discrepancies in hearing loss prevalence between genders.

Authors: Lewkowski K, Heyworth JS, Li IW, Williams W, McCausland K, Gray C Ytterstad E, Glass DC, Fuente A, Si S, Florath I, Fritschi L.

Full Source: Occupational & Environmental Medicine. 2019 Jan 25. pii: oemed-2018-105471. doi: 10.1136/oemed-2018-105471. [Epub ahead of print]

In this study, the authors determined the current prevalence of exposure to workplace noise and ototoxic chemicals, including co-exposures.

Foods and Beverages Obtained at Worksites in the United States

2019-03-04

Nutrition interventions are a common component of worksite wellness programs and have been recognised as an effective strategy to change employee dietary behaviours. However, little is known about worksite food behaviours or the foods that are obtained at workplaces at the national level. The aims of the present study were to examine the frequency of and the amount of money spent obtaining foods at work among employed US adults, to determine the foods most commonly obtained at work, and to assess the dietary quality of these foods. This is a cross-sectional analysis of data from the US Department of Agriculture Food Acquisition and Purchasing Survey, a nationally representative household survey conducted from April 2012 through January 2013 on food purchases and acquisitions during a 7-day study period. The study included 5,222 employed adult Americans. The study assessed the prevalence of obtaining any foods at work overall and according to sociodemographic subgroups, number of acquisitions and calories obtained, most commonly obtained foods and leading food sources of calories, and 2010 Healthy Eating Index (HEI) scores that represent dietary quality. Prevalence estimates of obtaining ≥ 1 foods at work were compared according to sociodemographic characteristic using χ^2 tests. Nearly a quarter (23.4%) of working adults obtained foods at work during the week, and the foods they obtained averaged 1,292 kcal per person per week. The leading food types obtained included foods typically high in solid fat, added sugars, or sodium, such as pizza, regular soft drinks, cookies or brownies, cakes and pies, and candy. HEI scores suggest that work foods are high in empty calories, sodium, and refined grains and low in whole grains and fruit.

Working adults commonly obtain foods at work, and the foods they obtain have limited dietary quality. Future research should examine the role worksites can play to help ensure access to and promote healthier options.

Authors: Onufrak SJ, Zaganjor H, Pan L, Lee-Kwan SH, Park S, Harris DM.

Full Source: Journal of the Academy of Nutrition and Dietetics. 2019 Jan 16. pii: S2212-2672(18)30369-1. doi: 10.1016/j.jand.2018.11.011. [Epub ahead of print]

In this study, C57BL/6J and A/J mice were exposed to saline, house dust mite (HDM), or a combination of HDM and QDs on day 1 of the sensitisation protocol.

PUBLIC HEALTH RESEARCH

Quantum dots and mouse strain influence house dust mite-induced allergic airway disease

2019-03-04

Quantum dot nanoparticles (QDs) are engineered nanomaterials (ENMs) that have utility in many industries due to unique optical properties not available in small molecules or bulk materials. QD-induced acute lung inflammation and toxicity in rodent models raise concerns about potential human health risks. Recent studies have also shown that some ENMs can exacerbate allergic airway disease (AAD). In this study, C57BL/6J and A/J mice were exposed to saline, house dust mite (HDM), or a combination of HDM and QDs on day 1 of the sensitisation protocol. Mice were then challenged on days 8, 9 and 10 with HDM or saline only. Significant differences in cellular and molecular markers of AAD induced by both HDM and HDM + QD were observed between C57BL/6J and A/J mice. Among A/J mice, HDM + QD co-exposure, but not HDM exposure alone, significantly increased levels of bronchoalveolar lavage fluid (BALF) IL-33 compared to saline controls. BALF total protein levels in both mouse strains were also only significantly increased by HDM + QD co-exposure. In addition, A/J mice had significantly more lung type 2 innate lymphoid cells (ILC2s) cells than C57BL/6J mice. A/J lung ILC2s were inversely correlated with lung glutathione and MHC-IIhigh resident macrophages, and positively correlated with MHC-IIlow resident macrophages. The results from this study suggest that 1) QDs influence HDM-induced AAD by potentiating and/or enhancing select cytokine production; 2) that genetic background modulates the impact of QDs on HDM sensitisation; and 3) that potential ILC2 contributions to HDM induced AAD are also likely to be modulated by genetic background.

Authors: Scoville DK, Nolin JD, Ogden HL, An D, Afsharinejad Z, Johnson BW, Bammler TK, Gao X, Frevert CW, Altemeier WA, Hallstrand TS, Kavanagh TJ.

Full Source: Toxicology & Applied Pharmacology. 2019 Jan 22. pii: S0041-008X(19)30026-2. doi: 10.1016/j.taap.2019.01.018. [Epub ahead of print]

Perfluorinated alkyl substances in snow as an atmospheric tracer for tracking the interactions between westerly winds and the Indian Monsoon over western China

2019-03-04

Snow is an efficient scavenger for the deposition of contaminants. Atmospheric transport and snow deposition jointly control the distribution of pollutants in remote mountain/polar regions. But can the contaminants contained within snow be used to reflect the interactions of air circulation patterns? The physicochemical properties of perfluoroalkyl substances (PFASs) are unique because of their high-water solubilities. Taking advantage of this, 15 surface-snow and 3 snow-pit samples were collected across a vast area of western China (spanning 20° of latitude and 25° of longitude), to investigate the concentrations, composition profiles (fingerprints), and deposition fluxes of PFASs. Both a high concentration (3974 pg/L) and deposition flux (4.0 µg/m²/yr) for a total of 16 PFASs were found in the snow at Yulong, the most southern sample site, possibly because of its close proximity to source regions of pollutants in South Asia and high rate of snow deposition. Perfluorobutanoic acid was the most commonly found chemical in snow, but in general the PFAS composition in the snow of western China showed large spatial differences, with long-chain (C > 10) PFASs being relatively dominant in the north and west of the region and short-chain (C < 6) PFASs in the south and east. On the basis of the different compositions of PFASs in the snow of western China and the previously reported features of pollutant sources in Europe and India, we found that PFASs in snow can be used as an atmospheric tracer for tracking the interactions between westerly winds and the Indian Monsoon. The belt along 33°N is a key location where both the Indian Monsoon and westerly winds can arrive/interact; however, the contribution of the monsoon was found to be above 70%, while that of the westerly winds can be lower than 30%. The western part of the 33°N belt was found to be more vulnerable to the Indian Monsoon, and could be grouped into the monsoon domain, while the influence of the westerly winds increased from west to east along the belt. This finding is opposite to previous results, which reported that the western part of the 33°N belt was mainly under the influence of the westerly winds, and for the first time quantifies the relative contribution of westerly winds and the Indian Monsoon to the atmospheric transport of chemicals.

Authors: Wang X, Chen M, Gong P, Wang C.

Full Source: Environment International. 2019 Mar; 124:294-301. doi: 10.1016/j.envint.2018.12.057. Epub 2019 Jan 17.

This study overviews the current and state-of-the-art critical aspect related to hazardous pollutants at large and ECs in particular by the immobilised oxido-reductase enzymes.

Emerging contaminants of high concern and their enzyme-assisted biodegradation - A review.

2019-03-04

The widespread occurrence and adverse environmental and health-related impacts of various types of emerging contaminants (ECs) have become an issue of high concern. With ever increasing scientific knowledge, socio-economic awareness, health-related problems and ecological apprehensions, people are more concerned about the widespread ECs, around the globe. Among ECs, biologically active compounds from pharmaceutical, cosmeceutical, biomedical, personal care products (PPCPs), endocrine-disrupting chemicals (EDCs), and flame-retardants are of paramount concern. The presence and persistence of ECs in water bodies are of continued and burning interest, worldwide. Various types of ECs are being discharged knowingly/unknowingly with/without partial treatments into the aquatic environments that pose serious health issues and affects the entire living ecosystem. So far, various approaches have been developed for ECs degradation and removal to diminish their adverse impact. Many previous and/or ongoing studies have focused on contaminants degradation and efficient removal via numerous treatment strategies, i.e. (1) physical, (2) chemical and (3) biological. However, the experimental evidence is lacking to enable specific predictions about ECs mechanistic degradation and removal fate across various in-practice systems. In this context, the deployment oxidoreductases such as peroxidases (lignin peroxidases, manganese-dependent peroxidases, and horseradish peroxidase), aromatic dioxygenases, various oxygenases, laccases, and tyrosinases have received considerable research attention. Immobilisation is highlighted as a promising approach to improve enzyme catalytic performance and stabilisation, as well as, to protect the three-dimensional structure of the enzyme against the undesirable consequences of harsh reaction environment. This study overviews the current and state-of-the-art critical aspect related to hazardous pollutants at large and ECs in particular by the immobilised oxidoreductase enzymes. The first part of the review focuses on the occurrence, physiochemical behaviour, potent sources and significant routes of ECs. Following that, environmentally-related adverse impacts and health-related issues of ECs are discussed in the second part. In the third part, biodegradation and removal strategies with a comparative overview of several conventional vs. non-conventional methods are presented briefly. The fourth part majorly focuses on operational modes of different oxidoreductase enzyme-based biocatalytic processes for the biodegradation and biotransformation of a wide array of harmful environmental contaminants. Finally, the left

In the present study, an analytical method has been developed for the quantification of plasticisers in indoor floor dust based on ultrasonic and vortex extraction, Florisil fractionation and GC-(EI)-MS analysis.

behind research gaps, concluding remarks as well as future trends and recommendations in the use of carrier-immobilised oxidoreductases for environmental perspective are also discussed.

Authors: Bilal M, Adeel M, Rasheed T, Zhao Y, Iqbal HMN.

Full Source: Environment International. 2019 Mar; 124:336-353. doi:

10.1016/j.envint.2019.01.011. Epub 2019 Jan 17

Occurrence of legacy and alternative plasticisers in indoor dust from various EU countries and implications for human exposure via dust ingestion and dermal absorption

2019-03-04

Plasticisers are a category of chemicals extensively used in consumer products and, consequently, their presence is ubiquitous in the indoor environment. In the present study, an analytical method has been developed for the quantification of plasticisers (7 legacy phthalate esters (LPEs) and 14 alternative plasticisers (APs)) in indoor floor dust based on ultrasonic and vortex extraction, Florisil fractionation and GC-(EI)-MS analysis. Dust samples (n = 54) were collected from homes, offices, and daycare centres from different EU countries (Belgium, the Netherlands, Ireland and Sweden). Method LOQs ranged from 0.2 to 5 µg/g. Tri-n-hexyl trimellitate (THTM) was not detected in any sample, whereas dimethyl phthalate (DMP), diphenyl phthalate and acetyl triethyl citrate (ATEC) were detected only in 6, 2 and 1 out of 54 samples, respectively. The highest concentrations of plasticisers were measured in Swedish offices, at a mean concentration of total plasticisers of 1800 µg/g, followed by Swedish daycare centres at 1200 and 670 µg/g for winter and spring sampling, respectively. Generally, the contribution of APs was slightly higher than for LPEs for all indoor environments (mean contribution 60% and 40%, respectively based on contributions per indoor environment). For the APs, main contributors were DINP in Belgian homes (28%), Swedish offices (60%), Swedish daycare centres (48%), and Dutch offices (31%) and DEHT in Belgian (28%), Irish (40%) and Dutch homes (37%) of total APs. The predominant LPE was bis-2-ethylhexyl-phthalate (DEHP) with a mean contribution varying from 60% to 85% of total LPEs. Human exposure was evaluated for dust ingestion and dermal absorption using hazard quotients (HQs) of plasticisers (ratio between average daily doses and the reference dose). None of the HQs of plasticisers exceeded 1, meaning that

The aim of this current study was to detect selected POPs in hair samples of wild terrestrial mammals from Primorsky Krai, Russia, so as to assess potential environmental exposure.

the risk for adverse human health effects from these plasticisers via dust ingestion and dermal absorption is unlikely.

Authors: Christia C, Poma G, Harrad S, de Wit CA, Sjostrom Y, Leonards P, Lamoree M, Covaci A.

Full Source: Environmental Research. 2018 Nov 22; 171:204-212. doi: 10.1016/j.envres.2018.11.034. [Epub ahead of print]

Monitoring of environmental persistent organic pollutants in hair samples collected from wild terrestrial mammals of Primorsky Krai, Russia

2019-03-04

Persistent organic pollutants (POPs) constitute a wide range of chemicals. Their release into the environment has raised great concern due to their potentially harmful impact in humans and wildlife species. The aim of this current study was to detect selected POPs in hair samples of wild terrestrial mammals from Primorsky Krai, Russia, so as to assess potential environmental exposure. The tested wild species were leopard cat, musk deer, wolf, amur hedgehog, and raccoon dog. The targeted organochlorines were hexachlorobenzene (HCB) and DDTs (opDDE, ppDDE, and opDDD), polychlorinated biphenyl (PCB) congeners (28, 52, 101, 118, 138, 153, and 180), and polycyclic aromatic hydrocarbons (PAHs) (acenaphylene (ACEN), fluorene (FLU), anthracene (ANTH) phenanthrene (PHEN), and pyrene (PYR)). The detection of POPs was conducted in hair samples by a one-step hair extraction method, by using a headspace solid-phase microextraction technique (HS-SPME) and analysed then by GC-MS. The majority of the wild animal hair samples were found positive in all tested pollutants. More specifically, the percentage of positive hair samples for HCB was 93.3% and for DDTs, PCBs, and PAHs, 20.0 to 100.0%, 6.7 to 100.0%, and 75.0 to 100.0%, respectively. DDT, PCB, and PAH detection ranged from 1.26 to 52.06 pg mg⁻¹, 0.73 to 31.34 pg mg⁻¹, and 2.59 to 35.00 pg mg⁻¹, respectively. The highest mean concentration levels of all tested pollutants were found for musk deer (PCBs 12.41 pg mg⁻¹, DDTs 21.87 pg mg⁻¹, PAHs 22.12 pg mg⁻¹) compared to the other wild species. To the best of the authors knowledge, this is the first study that provides results regarding contamination in different terrestrial mammals by POP exposure. The use of hair as a matrix is proven to be an effective

Technical

CHEMWATCH

tool for non-destructive biological monitoring of POP contamination in terrestrial ecosystems.

Authors: Iatrou EI, Tsygankov V, Seryodkin I, Tzatzarakis MN, Vakonaki E, Barbounis E, Zakharenko AM, Chaika VV, Sergievich AA, Tsatsakis AM, Golokhvast K.

Full Source: Environmental Science & Pollution Research International. 2019 Jan 21. doi: 10.1007/s11356-019-04171-9. [Epub ahead of print]