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ENVIRONMENTAL RESEARCH

Distribution of microbial communities in metal-contaminated nearshore sediment from Eastern Guangdong, China

2019-10-08

Nearshore environments are a critical transitional zone that connects the marine and terrestrial/freshwater ecosystems. The release of anthropogenic chemicals into nearshore ecosystems pose a human and environmental health risk. In the present study, the authors investigated the microbial diversity, abundance and function in metal-contaminated sediments collected from the Rongjiang, Hanjiang and Lianjiang River estuaries and adjacent coastal areas using high throughput sequencing. The concentration of nutrients (NO₃-N, NO₂-N, NH₄-N, PO₄-P) and metal (Cu, Zn, Cd, Pb, As, Hg) contaminants were higher at the mouth of the rivers compared to the coastal lines, and this was confirmed using cluster analysis. Estimates obtained using geoaccumulation index showed that about 38.9% of the sites were contaminated with Pb and the pollution load index showed that sediment from the mouth of Hanjiang River Estuary was moderately polluted with metals. In the nearshore sediment samples collected, Proteobacteria, Bacteroidetes, Planctomycetes, Chloroflexi, Acidobacteria were the dominant phylum with relative abundances of 46.6%, 8.05%, 6.47%, 5.26%, and 4.59%, respectively. There was no significant correlation between environmental variables and microbial abundance and diversity except for total organic carbon (TOC) (diversity; $r = 0.569$, $p < 0.05$) and Cr (diversity; $r = 0.581$, $p < 0.05$). At phyla level, Nitrospirae had a significant negative correlation with all metals except Cr, while OD1 had a significant positive correlation with all the metals. Overall, changes in nearshore sediment microbial communities by environmental factors were observed, and these may affect biogeochemical cycling.

Authors: Zhuang M, Sanganyado E, Li P, Liu W.

Full Source: Environmental Pollution. 2019 Jul; 250:482-492. doi: 10.1016/j.envpol.2019.04.041. Epub 2019 Apr 12.

In the present study, the authors investigated the microbial diversity, abundance and function in metal-contaminated sediments collected from the Rongjiang, Hanjiang and Lianjiang River estuaries and adjacent coastal areas using high throughput sequencing.

Mode of action (MOA) classifications in the EnviroTox database: Development and implementation of a consensus MOA classification

2019-10-08

Multiple modes of action (MOA) frameworks have been developed in aquatic ecotoxicology, mainly based on fish toxicity. These frameworks provide information on a key determinant of chemical toxicity, but the MOA categories and level of specificity remain unique to each of the classification schemes. This study aimed to develop a consensus MOA assignment within EnviroTox (<https://envirotoxdatabase.org/>), a curated in vivo aquatic toxicity database, based on the following MOA classification schemes: Verhaar (modified) framework, ASTER, TEST, and OASIS. MOA classifications from each scheme were first collapsed into one of 3 categories: non-specifically acting (i.e., narcosis), specifically acting, or non-classifiable. Consensus rules were developed based on the degree of concordance among the 4 individual MOA classifications to attribute a consensus MOA to each chemical. A confidence rank was also assigned to the consensus MOA classification based on the degree of consensus. Overall, 40% of the chemicals were classified as narcotics, 17% as specifically acting, and 43% could not be classified. Sixty percent of chemicals had a medium to high consensus MOA assignment. When compared to empirical acute toxicity data, the general trend of specifically acting chemicals being more toxic is clearly observed for both fish and invertebrates, but not for algae. EnviroTox is the first approach to establishing a high-level consensus across 4 computationally and structurally distinct MOA classification schemes. This consensus MOA classification provides both a transparent understanding of the variation between MOA classification schemes and an added certainty of the MOA assignment. In terms of regulatory relevance, a reliable understanding of MOA can provide information that can be useful for the prioritization (ranking) and risk assessment of chemicals.

Authors: Kienzler A, Connors KA, Bonnell M, Barron MG, Beasley A, Inglis CG, Norberg-King TJ, Martin T, Sanderson H, Vallotton N, Wilson P, Embry MR.

Full Source: Environmental Toxicology & Chemistry. 2019 Jul 3. doi: 10.1002/etc.4531. [Epub ahead of print]

This study examined the possible combined effects of chemicals on amphibian development and stress levels using Southern leopard frog (*Lithobates sphenoccephala*) larvae.

Effect of Individual and Combined Treatments of Pesticide, Fertiliser, and Salt on Growth and Corticosterone Levels of Larval Southern Leopard Frogs (*Lithobates sphenoccephala*)

2019-10-08

Human activities have introduced a variety of chemicals, including pesticides, fertilisers, and salt, into the environment, which may have deleterious effects on the organisms inhabiting these areas. Amphibians are especially susceptible to absorption of chemical pollutants. To determine the possible combined effects of these chemicals on amphibian development and stress levels, Southern leopard frog (*Lithobates sphenoccephala*) larvae were exposed to one of eight individual or combined treatments of atrazine, ammonium nitrate fertiliser, and sodium chloride salt. Stress levels, indicated by release of the stress hormone corticosterone, were measured premetamorphosis at week 8 of development. Water hormone samples were processed to analyse corticosterone levels. Changes in tadpole growth were determined by surface area measurements taken from biweekly photographs. The combined chemical treatment of atrazine, salt, and fertiliser had a significant interactive effect by increasing stress levels before metamorphosis ($p=0.003$). After a month of larval development, tadpoles exposed to ammonium nitrate had larger surface area ($p=0.035$). Tadpoles exposed to atrazine had a lower growth rate throughout larval development ($p=0.025$) and the lowest number of individuals reaching metamorphosis at 33%. However, the frogs in the atrazine treatment that did successfully metamorphose did so in fewer days ($p=0.002$). Because amphibians are exposed to multiple chemicals simultaneously in the environment, assessing the effects of a combination of contaminants is necessary to improve application strategies and ecosystem health.

Authors: Adelizzi R, Portmann J, Van Meter R.

Full Source: Archives in Environmental Contamination & Toxicology. 2019 Jul;77(1):29-39. doi: 10.1007/s00244-019-00629-6. Epub 2019 Apr 24.

Chemical mixtures and fluorescence in situ hybridization analysis of natural microbial community in the Tiber river

2019-10-08

The Water Framework Directive (WFD) regulates freshwater and coastal water quality assessment in Europe. Chemical and ecological water quality status is based on measurements of chemical pollutants in water and biota together with other indicators such as temperature, nutrients, species compositions (phytoplankton, microalgae, benthos and fish)

and hydromorphological conditions. However, in the current strategy a link between the chemical and the ecological status is missing. In the present WFD, no microbiological indicators are foreseen for integrating the different anthropogenic pressures, including mixtures of chemicals, nutrients and temperature changes, to provide a holistic view of the freshwater ecosystem water quality. The main aim of this work was to evaluate if natural microbial populations can be valuable indicators of multiple stressors (e.g. chemical pollutants, temperature, nutrients etc.) to guide preventive and remediation actions by water authorities. A preliminary survey was conducted to identify four sites reflecting a contamination gradient from the source to the mouth of a river suitable to the objectives of the European Marie Curie project, MicroCoKit. The River Tiber (Italy) was selected as a pilot case study to investigate the correlation between bacteria taxa and the chemical status of the river. The main physicochemical parameters, inorganic elements, organic pollutants and natural microbial community composition were assessed at four selected sites corresponding to pristine, agricultural, industrial and urban areas for three consecutive years. The overall chemical results indicated a correspondence between different groups of contaminants and the main contamination sources at the selected sampling points. Phylogenetic analysis of the microbial community analysed by Fluorescence In Situ Hybridization method (FISH) revealed differences among the four sampling sites which could reflect an adaptive bacterial response to the different anthropogenic pressures.

Authors: Saccà ML, Ferrero VEV, Loos R, Di Lenola M, Tavazzi S, Grenni P, Ademollo N, Patrolecco L, Huggett J, Caracciolo AB, Lettieri T.

Full Source: Science of the Total Environment. 2019 Jul 10; 673:7-19. doi: 10.1016/j.scitotenv.2019.04.011. Epub 2019 Apr 3.

Dissolution and aggregation kinetics of zero valent copper nanoparticles in (simulated) natural surface waters: Simultaneous effects of pH, NOM and ionic strength

2019-10-08

The combined effects of pH, dissolved organic carbon (DOC) and $\text{Ca}^{2+}/\text{Mg}^{2+}$ on the dissolution and aggregation kinetics of zero valent copper engineered nanoparticles (Cu^0 ENPs) were investigated. The dissolution and aggregation of the particles were studied in (a) synthetic aqueous media, similar in chemistry to natural surface waters, and (b) natural surface waters samples, for up to 32 or 24 h. The DOC stabilised the particles and prevented aggregation, and thus increased the available surface area. The higher available surface area in turn accelerated the

The combined effects of pH, dissolved organic carbon (DOC) and $\text{Ca}^{2+}/\text{Mg}^{2+}$ on the dissolution and aggregation kinetics of zero valent copper engineered nanoparticles (Cu^0 ENPs) were investigated.

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dissolution of the particles. The presence of $\text{Ca}^{2+}/\text{Mg}^{2+}$, however, changed the aggregation and the dissolution of the DOC-stabilized particles. The influence of $\text{Ca}^{2+}/\text{Mg}^{2+}$ on DOC-stabilized particles was different at different pH's. In the absence of DOC, 10 mM of $\text{Ca}^{2+}/\text{Mg}^{2+}$ induced charge reversal on the particles and caused particle stability against aggregation. This subsequently increased particles dissolution. The results obtained with regard to dissolution and aggregation of the particles in natural surface waters were compared with those determined for the synthetic waters. This comparison showed that the behaviour of the particles in the natural surface waters was mostly similar to the behaviour determined for media at pH 9. Overall, the current study provides some novel insights into the simultaneous effects of physicochemical parameters of water on particle stability against aggregation and dissolution, and provides data about how the processes of aggregation and dissolution of CuO ENPs interact and jointly determine the overall particle fate.

Full Source: Arenas-Lago D, Abdolahpur Monikh F, Vijver MG, Peijnenburg WJGM.

Full Source: Chemosphere. 2019 Jul; 226:841-850. doi: 10.1016/j.chemosphere.2019.03.190. Epub 2019 Apr 1.

MEDICAL RESEARCH

Effect of environmental and pharmaceutical exposures on foetal testis development and function: a systematic review of human experimental data

2019-10-08

Overall, the incidence of male reproductive disorders has increased in recent decades. Testicular development during foetal life is crucial for subsequent male reproductive function. Non-genomic factors such as environmental chemicals, pharmaceuticals and lifestyle have been proposed to impact on human foetal testicular development resulting in subsequent effects on male reproductive health. Whilst experimental studies using animal models have provided support for this hypothesis, more recently a number of experimental studies using human tissues and cells have begun to translate these findings to determine direct human relevance. The objective of this systematic review was to provide a comprehensive description of the evidence for effects of prenatal exposure(s) on human foetal testis development and function. The authors present the effects of environmental, pharmaceutical and lifestyle factors

The objective of this systematic review was to provide a comprehensive description of the evidence for effects of prenatal exposure(s) on human foetal testis development and function.

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in experimental systems involving exposure of human foetal testis tissues and cells. Comparison is made with existing epidemiological data primarily derived from a recent meta-analysis. For identification of experimental studies, PubMed and EMBASE were searched for articles published in English between 01/01/1966 and 13/07/2018 using search terms including 'endocrine disruptor', 'human', 'fetal', 'testis', 'germ cells', 'testosterone' and related search terms. Abstracts were screened for selection of full-text articles for further interrogation. Epidemiological studies involving exposure to the same agents were extracted from a recent systematic review and meta-analysis. Additional studies were identified through screening of bibliographies of full-texts of articles identified through the initial searches. A total of 25 experimental studies and 44 epidemiological studies were included. Consistent effects of analgesic and phthalate exposure on human foetal germ cell development are demonstrated in experimental models, correlating with evidence from epidemiological studies and animal models. Furthermore, analgesic-induced reduction in foetal testosterone production, which predisposes to the development of male reproductive disorders, has been reported in studies involving human tissues, which also supports data from animal and epidemiological studies. However, whilst reduced testosterone production has been demonstrated in animal studies following exposure(s) to a variety of environmental chemicals including phthalates and bisphenol A, these effects are not reproduced in experimental approaches using human foetal testis tissues. Direct experimental evidence for effects of prenatal exposure(s) on human foetal testis development and function exists. However, for many exposures the data is limited. The increasing use of human-relevant models systems in which to determine the effects of environmental exposure(s) (including mixed exposures) on development and function of human tissues should form an important part of the process for assessment of such exposures by regulatory bodies to take account of animal-human differences in susceptibility.

Authors: Kilcoyne KR, Mitchell RT.

Full Source: Human Reproduction Update. 2019 Jul 1;25(4):397-421. doi: 10.1093/humupd/dmz004.

This study aimed to assess the impact of multi-route co-exposures to chemicals on interindividual variability in toxicokinetics.

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An assessment of the impact of multi-route co-exposures on human variability in toxicokinetics: A case study with binary and quaternary mixtures of volatile drinking water contaminants

2019-10-08

This study aimed to assess the impact of multi-route co-exposures to chemicals on interindividual variability in toxicokinetics. Probabilistic physiologically based pharmacokinetic multi-route interaction models were developed for adults and four younger subpopulations. Drinking water-mediated multi-route exposures were simulated for benzene alone or in co-exposure with toluene, ethylbenzene and m-xylene, for trichloroethylene or vinyl chloride (VC), alone and in mixture. These simulations were performed for "low" and "high" exposure scenarios, involving respectively the US EPA's short-term drinking water health advisories, and 10 times these advisory values. Distributions of relevant internal dose metrics for benzene, trichloroethylene and VC were obtained using Monte Carlo simulations. Intergroup variability indexes (VI) were computed for the "low" (VIL) and "high" (VIH) exposure scenarios, as the ratio between the 95th percentile in each subpopulation over the median in adults. Thus, for benzene, parent compound's area under the curve-based VIL for single exposures vs. co-exposures correspondingly varied between 1.7 (teenagers) and 2.8 (infants) vs. 1.9 and 3.1 respectively. VIH varied between 2.5 and 3.5 vs. 2.9 and 4.1. Inversely, VIL and VIH for the amount of benzene metabolized via CYP2E1 pathway decreased in co-exposure compared to single exposure. For VC and trichloroethylene, similar results were obtained for the "high" exposure, but "low" co-exposures did not impact the toxicokinetics of individual substances. In conclusion, multi-route co-exposures can have an impact on the toxicokinetics of individual substances, but to an extent, that does not seem to challenge the default values attributed to the factors deemed at reflecting interindividual or child/adult differences in toxicokinetics.

Authors: Tohon H, Valcke M, Haddad S.

Full Source: Journal of Applied Toxicology. 2019 Jul;39(7):974-991. doi: 10.1002/jat.3787. Epub 2019 Mar 5.

The objective of the present study involved computational approaches to apprehend the mechanism of molecular interaction of CPF and its four degradation products with human SHBG using molecular docking simulation.

Molecular interactions of chlorpyrifos and its environmental degradation products with human sex hormone-binding globulin: an in-silico study.

2019-10-08

In recent years, there has been a widespread interest and awareness about health issues posed by endocrine-disrupting chemicals present in the environment. These chemicals, often present in food and many consumer products, can interfere with hormone biosynthesis and metabolism and may result in deviation from normal homeostatic control. Chlorpyrifos (CPF), a major endocrine-disrupting chemical is used worldwide as an agricultural insecticide against a broad spectrum of insect pests in rice cultivation and to control termites. The insecticide mostly undergoes environmental degradation to chlorpyrifos-oxon (CPYO), des-ethyl chlorpyrifos (DEC), 3,5,6-trichloro-2-methoxypyridine (TMP) and 3,5,6-trichloro-2-pyridinol (TCP). Results from several epidemiological studies suggest that exposure to CPF can result in reproductive disorders, including infertility in male and female. Sex hormone-binding globulin (SHBG) is a circulatory protein that binds sex steroids and is a potential target for endocrine disruptors in the human body. The objective of the present study involved computational approaches to apprehend the mechanism of molecular interaction of CPF and its four degradation products (CPYO, DEC, TMP, TCP) with human SHBG using molecular docking simulation. All five compounds (CPF, CPYO, DEC, TMP, TCP) showed high binding affinity with SHBG; however, the binding affinity values were higher (more negative) for CPF, CPYO, DEC and TMP than for TCP indicating that CPF, CPYO, DEC and TMP formed a tight interaction with SHBG. From the results obtained with the docking analysis, it can be opined that CPF, CPYO, DEC and TMP could possibly act as potential endocrine disruptors for androgen signalling.

Authors: Hazarika J, Ganguly M, Mahanta R.

Full Source: Journal of Applied Toxicology. 2019 Jul;39(7):1002-1011. doi: 10.1002/jat.3789. Epub 2019 Feb 27.

This study assessed the association between EDCs exposure and asthma, respiratory symptoms and obesity in schoolchildren.

Exposure to indoor endocrine-disrupting chemicals and childhood asthma and obesity

2019-10-08

Indoor air contaminants may act as endocrine-disrupting chemicals (EDCs). However, to what extent these contaminants affect health is poorly known. This study assessed the association between EDCs exposure and asthma, respiratory symptoms and obesity in schoolchildren. Data from

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a cross-sectional analysis of 815 participants from 20 schools in Porto, Portugal, were analysed. Symptoms were assessed, asthma was defined on lung function, and airway reversibility and body mass index (BMI) were calculated. The concentrations of 13 volatile organic compounds and 2 aldehydes identified as EDCs were measured in 71 classrooms throughout 1 week. Principal component analysis (PCA) was used to assess the effect of co-exposure. Associations were estimated by regression coefficients using linear and logistic regression models. Increased individual and combined EDCs levels were found in classrooms having more children with asthma and obesity. Higher levels of hexane, styrene, cyclohexanone, butylated hydroxytoluene and 2-butoxyethanol were associated with obesity, and higher levels of cyclohexanone were associated with increased child BMI. Toluene, o-xylene, m/p-xylene and ethylbenzene were significantly associated with nasal obstruction. A positive association was found between PC1 and the risk of obese asthma (OR = 1.43, 95% CI 1.01, 1.98) and between PC2 and overweight (OR = 1.51, 95% CI 1.28, 1.79). PC1 and PC2 were also associated with nasal obstruction, and PC2 was associated with breathing difficulties and lean body mass, although EDCs concentrations were low. These findings further support the role of EDCs in asthma and obesity development. Moreover, even low levels of indoor exposure may influence the risk of asthma, respiratory symptoms and obesity.

Authors: Paciência I, Cavaleiro Rufo J, Silva D, Martins C, Mendes F, Farraia M, Delgado L, de Oliveira Fernandes E, Padrão P, Moreira P, Severo M, Barros H, Moreira A.

Full Source: Allergy. 2019 Jul;74(7):1277-1291. doi: 10.1111/all.13740. Epub 2019 Mar 5.

Angiotensin-converting enzyme inhibitors/angiotensin receptor blockers, β -blockers or both in incident end-stage renal disease patients without cardiovascular disease: a propensity-matched longitudinal cohort study

2019-10-08

End-stage renal disease (ESRD) patients even without known cardiovascular (CV) disease have high mortality rates. Whether neurohormonal blockade treatments improve outcomes in this population remains unknown. The aim of this study was to assess the effect of angiotensin-converting enzyme inhibitors/angiotensin receptor blockers (ACEi/ARBs), β -blockers or both in all-cause mortality rates in incident ESRD patients without known CV disease starting renal replacement therapy (RRT) between 2009 and 2015 in the nationwide

The aim of this study was to assess the effect of angiotensin-converting enzyme inhibitors/angiotensin receptor blockers (ACEi/ARBs), β -blockers or both in all-cause mortality rates in incident ESRD patients without known CV disease starting renal replacement therapy

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Réseau Epidémiologie et Information en Néphrologie registry. Patients with known CV disease and those who started emergency RRT, stopped RRT or died within 6 months were excluded. Propensity score matching models were used. The main outcome was all-cause mortality. A total of 13 741 patients were included in this analysis. The median follow-up time was 24 months. When compared with matched controls without antihypertensive treatment, treatment with ACEi/ARBs, β -blockers and ACEi/ARBs + β -blockers was associated with an event-rate reduction per 100 person-years: ACEi/ARBs 7.6 [95% confidence interval (CI) 7.1-8.2] versus matched controls 9.5 (8.8-10.1) [HR 0.76 (95% CI 0.69-0.84)], β -blocker 7.1 (6.6-7.7) versus matched controls 9.5 (8.5-10.2) [HR 0.72 (0.65-0.80)] and ACEi/ARBs + β -blockers 5.8 (5.4-6.4) versus matched controls 7.8 (7.2-8.4) [HR 0.68 (0.61-0.77)]. The authors concluded that neurohormonal blocking therapies were associated with death rate reduction in incident ESRD without CV disease. Whether these relationships are causal will require randomised controlled trials.

Authors: Ferreira JP, Couchoud C, Gregson J, Tiple A, Glowacki F, London G, Agarwal R, Rossignol P.

Full Source: Nephrology Dialysis Transplantation. 2019 Jul 1;34(7):1216-1222. doi: 10.1093/ndt/gfy378.

OCCUPATIONAL RESEARCH

Hair as a matrix to evaluate cumulative and aggregate exposure to pesticides in winegrowers

2019-10-08

Vineyard is a crop where a large number of pesticides are applied; exposure to pesticides may occur in farmers and the general population living close to the treated area. This study aimed to investigate hair as a matrix for the assessment of cumulative and aggregate exposure to pesticides in potentially exposed individuals. Twenty agricultural workers (AW), 4 agricultural worker relatives (AR), and 5 research staff members (RS) were involved in the study. Hair samples were collected before and after the application season (PRE- and POST-EXP samples) to obtain 18 paired samples. Records with the name and the quantity of applied pesticides were obtained; twenty-seven pesticides were measured in hair by solvent extraction and LC-MS/MS. During the study season, AW applied 14 different pesticides with median amount ranging from 12 to 7200 g. The most popular pesticides were dimethomorph, penconazole, cyazofamid, fenamidone and quinoxifen, applied from 94 to 69% of AW. In AW, in PRE-EXP samples the majority of used pesticides was detectable

This study aimed to investigate hair as a matrix for the assessment of cumulative and aggregate exposure to pesticides in potentially exposed individuals.

(with detection rates from 6 to 88%), with median concentrations of few pg/mg hair; in the POST-EXP samples the frequency of detected values increased (from 25 to 100%), with median concentrations up to two orders of magnitude higher. In AR, most pesticides were quantifiable only in POST-EXP samples and with lower concentration in comparison with AW; in RS, in both PRE- and POST-EXP samples only a few pesticides were quantifiable with very low levels. In AW, a linear correlation ($r = 0.682$ on log-transformed data, $p < 0.01$) was found between the total amounts of applied pesticides during the season and their concentration in hair. The study shows that the majority of assessed pesticides was incorporated into hair of AW and AR. The increased frequency of detection and level at the end of the season and the correlation between pesticide in hair and the amount of applied pesticides, reinforce the use of hair for quantitative biomonitoring of cumulative exposure to pesticides.

Authors: Polledri E, Mercadante R, Nijssen R, Consonni D, Mol H, Fustinoni S.

Full Source: Science of the Total Environment. 2019 Oct 15; 687:808-816. doi: 10.1016/j.scitotenv.2019.06.061. Epub 2019 Jun 5.

Fixed night workers and failed smoking cessation

2019-10-08

The objective of this study was to examine the relationship between employee work schedule and failure in smoking cessation.

Methods: Logistic regression was used to estimate the association between work schedule and failed smoking cessation rate among 4927 male workers who had attempted smoking cessation. The data was obtained from the annual Korean National Health and Nutrition Examination Survey from 2007 to 2015 (excluding data from 2013). An adjusted model, including demographic and occupational variables, was constructed after stratifying the data into two subgroups by age (the 19- to 40-year-old group and the 41- to 60-year-old group).

Results: The percentage of smoking-cessation failure varied according to work schedule and age. The failure rate in the 19- to 40-year-old group was generally higher for all work schedule categories than in the 41- to 60-year-old group. In particular, the highest percentage (90.9%) of smoking-cessation failure was in the fixed overnight work group. After adjusting for demographic characteristics and work organization variables, the odds ratio for failed smoking cessation across all ages was 3.30 (95%CI 2.23-4.86) among the fixed overnight workers compared to the daytime workers. Both of the age-stratified subgroups maintained this relationship,

The objective of this study was to examine the relationship between employee work schedule and failure in smoking cessation.

with a notably higher OR in the 19- to 40-year-old group (OR 3.74, 95% CI 1.80-7.77).

Conclusions: Fixed overnight work is likely to negatively affect smoking cessation compared to other work schedules. Tailored anti-smoking intervention programs are required based on work schedule.

Authors: Cho YM, Kim HR, Kang MY, Myong JP, Koo JW.

Full Source: Journal of Occupational & Medicinal Toxicology. 2019 Aug 5; 14:23. doi: 10.1186/s12995-019-0243-z. eCollection 2019.

Senior managers' awareness of sun protection policy predicts implementation of worksite sun safety in a randomised trial

2019-10-08

Outdoor workers experience chronic exposure to harmful ultraviolet radiation (UV) elevating their risk for skin cancer. A controlled randomised trial promoted the adoption of workplace sun safety policy and employee education at 98 public organisations in Colorado. A 2-year follow-up study with 68 organisations assessed the association of senior manager awareness of sun safety policies and implementation of sun safety actions. Senior managers' awareness of existing sun safety policies, but not their personal sun protection behaviours, predicted implementation of sun safety actions including the number of sun protection messages and sun protection items in the workplace and increased communication about sun safety to employees. Organisational adoption of sun safety policy must include efforts to broadly inform a workplace's senior management to ensure the policies are actually implemented and provide support for sun protection behaviours by outdoor workers to reduce UV exposure and skin cancer risk.

Authors: Walkosz BJ, Buller DB, Buller MK, Wallis A, Liu X.

Full Source: American Journal of Industrial Medicine. 2019 Oct;62(10):893-900. doi: 10.1002/ajim.23033. Epub 2019 Aug 12.

Outdoor workers experience chronic exposure to harmful ultraviolet radiation (UV) elevating their risk for skin cancer.

Current Review of Pneumoconiosis Among US Coal Miners

2019-10-08

This review summarises recent research on pneumoconiosis in coal workers following the identification of the resurgence of this disease among US coal miners in the early 2000s. The authors describe the impact of this research and how this has led to increased public attention, benefitting affected miners. The latest research shows that the prevalence of pneumoconiosis, including progressive massive fibrosis, continues to

increase, especially in central Appalachia. Contributing factors may include mining of thin coal seams or cutting rock to access coal, which may expose miners to coal mine dust with a higher content of silica and silicates than in the past. The impact of recently implemented changes, such as the reduced occupational exposure limit for respirable coal mine dust and the introduction of continuous personal dust monitors, will likely take years to appropriately evaluate.

Authors: Hall NB, Blackley DJ, Halldin CN, Laney AS.

Full Source: Current Environmental Health Reports. 2019 Sep 6. doi: 10.1007/s40572-019-00246-4. [Epub ahead of print]

Effects of occupational exposure to dust on chest radiograph, pulmonary function, blood pressure and electrocardiogram among coal miners in an eastern province, China

2019-10-08

Coal dust is one of the most serious risk factors that leads to respiratory diseases and cardiovascular diseases in miners. This study aimed to observe the effects of occupational dust exposure on chest radiograph, pulmonary function (PF), blood pressure (BP) and electrocardiogram (ECG) indexes in coal miners and explore the related risk factors. In the Chinese Occupational Disease Monitoring and Occupational Health Risk Assessment Program, a total of 11,061 subjects in 2015 and 12,597 subjects in 2016 were recruited in this study. The chest radiograph, PF, BP and ECG of coal miners were surveyed using radiograph machine, spirometer, sphygmomanometer and electrocardiograph, respectively. The prevalence of aberrant BP was the highest in coal miners, followed by abnormal ECG, PF and radiograph. Significant differences in abnormal BP, ECG, PF and radiograph of coal miners were closely associated with age, years of dust exposure, smoking, drinking, working types and size of mines. A total of 80 persons diagnosed with coal workers' pneumoconiosis (CWP) in 2015-2016, which occupied 0.34% of the coal miners. Abnormal BP, ECG, PF and radiograph of coal miners are highlighted health problems in China and require serious attention. Feasible health promotion and protective facilities should be adopted to guarantee coal miners' health.

Authors: Wu Q, Han L, Xu M, Zhang H, Ding B, Zhu B.

Full Source: BMC Public Health. 2019 Sep 5;19(1):1229. doi: 10.1186/s12889-019-7568-5.

This study aimed to observe the effects of occupational dust exposure on chest radiograph, pulmonary function (PF), blood pressure (BP) and electrocardiogram (ECG) indexes in coal miners and explore the related risk factors.

PUBLIC HEALTH RESEARCH

Formaldehyde in "Nontoxic" Nail Polish

2019-10-08

Nail polish is known to contain potentially hazardous chemicals that have been linked to adverse health effects after overexposure. Formaldehyde is used as an antimicrobial, preservative, and nail hardener in select nail products, yet it is a recognised carcinogen and potent allergen in allergic contact dermatitis. The aim of this study was to investigate whether formaldehyde is present in nail polishes marketed as formaldehyde-free. Twenty-nine cosmetic nail polishes were purchased for analysis; of these, 28 were advertised as formaldehyde-free and/or did not declare formaldehyde in their ingredient lists. Initial testing was pursued using the chromotropic acid method, which uses a red-purple colour change to indicate the presence of formaldehyde. Products were subsequently analysed at least twice using high-performance liquid chromatography, quantifying formaldehyde amount above the detection limit of 2 ppm. High-performance liquid chromatography analysis found 5 of 29 products containing formaldehyde, 4 of which were advertised as formaldehyde-free. All other products were negative for formaldehyde (<2 ppm). Further investigation is warranted among brands testing positive and whether multiple products within the same line contain formaldehyde. Nail products must be labelled appropriately to avoid adverse reactions among individuals with cutaneous sensitivities.

<https://www.ncbi.nlm.nih.gov/pubmed/31261225>

Identifying Compounds with Genotoxicity Potential Using Tox21 High-Throughput Screening Assays

2019-10-08

Genotoxicity is a critical component of a comprehensive toxicological profile. The Tox21 Program used five quantitative high-throughput screening (qHTS) assays measuring some aspect of DNA damage/repair to provide information on the genotoxic potential of over 10 000 compounds. Included were assays detecting activation of p53, increases in the DNA repair protein ATAD5, phosphorylation of H2AX, and enhanced cytotoxicity in DT40 cells deficient in DNA-repair proteins REV3 or KU70/RAD54. Each assay measures a distinct component of the DNA damage response signalling network; >70% of active compounds were detected in only one of the five assays. When qHTS results were compared with results from three standard genotoxicity assays (bacterial mutation, in

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vitro chromosomal aberration, and in vivo micronucleus), a maximum of 40% of known, direct-acting genotoxicants were active in one or more of the qHTS genotoxicity assays, indicating low sensitivity. This suggests that these qHTS assays cannot in their current form be used to replace traditional genotoxicity assays. However, despite the low sensitivity, ranking chemicals by potency of response in the qHTS assays revealed an enrichment for genotoxicants up to 12-fold compared with random selection, when allowing a 1% false positive rate. This finding indicates these qHTS assays can be used to prioritise chemicals for further investigation, allowing resources to focus on compounds most likely to induce genotoxic effects. To refine this prioritisation process, models for predicting the genotoxicity potential of chemicals that were active in Tox21 genotoxicity assays were constructed using all Tox21 assay data, yielding a prediction accuracy up to 0.83. Data from qHTS assays related to stress-response pathway signalling (including genotoxicity) were the most informative for model construction. By using the results from qHTS genotoxicity assays, predictions from models based on qHTS data, and predictions from commercial bacterial mutagenicity QSAR models, the authors prioritised Tox21 chemicals for genotoxicity characterisation.

Authors: Hsieh JH, Smith-Roe SL, Huang R, Sedykh A, Shockley KR, Auerbach SS, Merrick BA, Xia M, Tice RR, Witt KL.

Full Source: Chemical Research & Toxicology. 2019 Jul 15;32(7):1384-1401. doi: 10.1021/acs.chemrestox.9b00053. Epub 2019 Jun 18.

Evaluation of hazard distances related to toxic releases in a gas refinery: comparison of chemical exposure index and consequence modelling approaches

2019-10-08

The release of toxic chemicals is an important hazard of chemical plants. The purpose of this study is to compare the chemical exposure index (CEI) and

consequence modelling to determine the hazard distance of toxic chemical release, utilising a gas refinery as the case study. The CEI was utilized and considerable release scenarios were determined. The process hazard analysis software tool model was performed for consequence modelling of the scenarios with the highest airborne quantity. In the case of toxic chemical release based on both the CEI and consequence modelling, the sludge catcher unit was identified as the most dangerous unit. Hazard distances calculated by the CEI are significantly greater than those using consequence modelling. This is acceptable in terms of safety, but may not be applicable in reality. The results of the study showed a

procedure for selecting an appropriate method in order to reduce costs and time.

Authors: Cheraghi M, Bagherian-Sahlavani A, Noori H, Mohammad-Fam I.
Full Source: International Journal of Occupational Safety & Ergonomics. 2019 Jul 8:1-13. doi: 10.1080/10803548.2019.1621023. [Epub ahead of print]

Determination of nine preservatives in processed foods using a modified QuEChERS extraction and quantified by HPLC-PDA

2019-10-08

In this study, a new method was developed for simultaneously determining nine preservatives, that is, benzoic acid (BA), sorbic acid (SOA), dehydroacetic acid (DHA) and PHBAs (methyl p-hydroxybenzoate [PHBA-me], ethyl p-hydroxybenzoate [PHBA-et], isopropyl p-hydroxybenzoate [PHBA-ipro], propyl p-hydroxybenzoate [PHBA-npro]), isobutyl p-hydroxybenzoate [PHBA-ibut] and butyl p-hydroxybenzoate [PHBA-nbut]), in processed foods, employing liquid chromatography (LC). This procedure accelerated sample preparation and improved efficiency by employing modified quick, easy, cheap, effective, rugged and safe (QuEChERS) extraction without clean-up. Samples were prepared with 20 mL of acetonitrile/water (1:1) with the assistance of a ceramic stone. The extract solutions were diluted 10 times or according to the detection amount and then injected into an LC-PDA. This method showed good linearity, and the LOQs were 10 mg/kg for BA, SOA and DHA and 5 mg/kg for the PHBAs. When validating this method, the recoveries of the nine preservatives were in the range 77.0-99.6%, RSDr values were in the range 0.7-5.3% and those of RSDwr were in the range 2.3-8.4%. These results suggest that this new method is highly reproducible.

Authors: Iwakoshi K, Shiozawa Y, Yamajima Y, Baba I, Monma K, Kobayashi C, Sasamoto T.

Full Source: Food Additives & Contaminants Part A, Chemistry, analysis, control, exposure & risk assessment. 2019 Jul;36(7):1020-1031. doi: 10.1080/19440049.2019.1615644. Epub 2019 May 17

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Organochlorine pesticides in the soils from Benevento provincial territory, southern Italy: Spatial distribution, air-soil exchange, and implications for environmental health

2019-10-08

This study comprehensively interprets the contamination status of organochlorine pesticides (OCPs) in the soils from Benevento provincial territory, southern Italy, and its implications for environmental health by means of a systematic grid sampling method and geostatistics. The total concentrations of OCPs in the soils ranged from 0.058 to 16.9 ng/g, with a geometric mean (GM) of 0.72 ng/g and an arithmetic mean (AM) of 1.71 ng/g. The levels of OCPs were dominated by p,p'-DDE, p,p'-DDD, HCB, contributing together to 73.5% of the total OCPs. The higher levels of HCB, DDTs, and HCHs found in southwestern, central and east Benevento provincial territory, all occurring adjacent to landfill sites. The residues of OCPs in soil are largely ascribed to their historical use. The OCP inventories in soils of Benevento provincial territory ranged from 0.13 to 4.84 metric tons, with GM = 0.42 metric tons and AM = 0.44 metric tons. The soil is likely to be a sink for DDTs under the influence of regional air transport from pollution hotspots and has the potential to release other chemicals with a high vapor pressure, e.g., HCB, HCHs, and α -Endosulfan. And the mean level of the air-soil exchange flux of HCB, HCHs, and DDTs is estimated to be -1.59, -0.72, and 0.10 ng/m²/day respectively. The potential ecological and human health risks caused by OCPs in the soils are deemed essentially negligible in Benevento provincial territory.

Authors: Qu C, Albanese S, Li J, Cicchella D, Zuzolo D, Hope D, Cerino P, Pizzolante A, Doherty AL, Lima A, De Vivo B.

Full Source: Science of the Total Environment. 2019 Jul 15; 674:159-170. doi: 10.1016/j.scitotenv.2019.04.029. Epub 2019 Apr 4.