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CHEMICAL EFFECTS

[Responses of Cd Accumulation in Rice and Spectral Characteristics of Soil Dissolved Organic Matter Regulated by Soil Amendments]

2022-06-08

Studying the chemical composition and characteristic differences of soil dissolved organic matter (DOM) is significant for understanding the mechanism of Cd immobilization by soil amendments. Soil amendments have been widely applied to contaminated farmlands to reduce the accumulation of heavy metals in crops, but the spectral characteristics of DOM in soils under amendment regulation have rarely been studied. Typical Cd-contaminated paddy soil from South China was collected, three categories of amendments (organic-based, inorganic-based, and lime-based, a total of 11 types) were applied, rice planting pot trials were done, and the effects of different amendments on soil DOM were investigated. The spectral characteristics of rhizosphere soil DOM under the regulation of different amendments were comparatively analyzed using UV-Vis spectroscopy, 3D fluorescence spectroscopy, and parallel factor analysis (PARAFAC). The results showed that the lime-based amendments increased the soil pH and promoted the dissolution of organic matter from the soil solid phase, resulting in a significant increase in soil DOM content. Compared with that of the control, organic-based amendments increased the relative molecular weight and recent autochthonous origin contribution of soil DOM, inorganic-based amendments increased the aromatic content and hydrophobic components of soil DOM, and lime-based amendments increased the chromogenic components and the degree of humification of soil DOM. Four fluorescence components, C1 (255/465), C2 (325/400), C3 (275/390), and C4 (240/460), were identified using PARAFAC and verified with the OpenFluor database, all of which were humic-like. Two types of spectra corroborated with each other, indicating that soil DOM dominated by humus-like matter originated from terrestrial source input. The correlation analysis showed that the fluorescent component C4 of soil DOM could be used to predict Cd accumulation in brown rice in the red limestone soil-rice system. These

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results will provide a reference for the selection of the appropriate soil amendments.

Authors: Hui-Long Luo, Juan Chen, Yun-Hui Zhang, Bei Yuan, Bin Yang, Hao Zhang, Ping Du

Full Source: Huan jing ke xue= Huanjing kexue 2022 Jun 8;43(6):3315-3327. doi: 10.13227/j.hj.kx.202110112.

Associating Increased Chemical Exposure to Hurricane Harvey in a Longitudinal Panel Using Silicone Wristbands

2022-05-30

Hurricane Harvey was associated with flood-related damage to chemical plants and oil refineries, and the flooding of hazardous waste sites, including 13 Superfund sites. As clean-up efforts began, concerns were raised regarding the human health impact of possible increased chemical exposure resulting from the hurricane and subsequent flooding. Personal sampling devices in the form of silicone wristbands were deployed to a longitudinal panel of individuals (n = 99) within 45 days of the hurricane and again one year later in the Houston metropolitan area. Using gas chromatography-mass spectroscopy, each wristband was screened for 1500 chemicals and analyzed for 63 polycyclic aromatic hydrocarbons (PAHs). Chemical exposure levels found on the wristbands were generally higher post-Hurricane Harvey. In the 1500 screen, 188 chemicals were detected, 29 were detected in at least 30% of the study population, and of those, 79% (n = 23) were found in significantly higher concentrations (p < 0.05) post-Hurricane Harvey. Similarly, in PAH analysis, 51 chemicals were detected, 31 were detected in at least 30% of the study population, and 39% (n = 12) were found at statistically higher concentrations (p < 0.05) post-Hurricane Harvey. This study indicates that there were increased levels of chemical exposure after Hurricane Harvey in the Houston metropolitan area.

Authors: Samantha M Samon, Diana Rohlman, Lane G Tidwell, Peter D Hoffman, Abiodun O Oluyomi, Kim A Anderson

Full Source: International journal of environmental research and public health 2022 May 30;19(11):6670. doi: 10.3390/ijerph19116670.

What Dermatologists Should Know About Thiazides

2022-05

Hydrochlorothiazide and other thiazide diuretics have been used for decades to treat high blood pressure, heart failure, and chronic kidney disease. Thiazides have been linked to photosensitivity with heterogeneous clinical manifestations and recovery times. Diagnosis

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can be aided by phototesting, photopatch testing, and skin biopsy. Long-term use of hydrochlorothiazide has been linked to an increased dose-dependent risk of certain types of skin cancer in recent years. In this review, we also look at other less common or lesser-known adverse effects of thiazide diuretics that have been described in isolated reports.

Authors: J M Llamas-Molina, F J Navarro-Triviño, R Ruiz-Villaverde
Full Source: Actas dermo-sifiliograficas 2022 May;113(5):498-504. doi: 10.1016/j.ad.2021.12.015.

ENVIRONMENTAL RESEARCH

Soil ecotoxicology needs robust biomarkers - a meta-analysis approach to test the robustness of gene expression-based biomarkers for measuring chemical exposure effects in soil invertebrates

2022-06-14

Gene expression-based biomarkers are regularly proposed as rapid, sensitive and mechanistically informative tools to identify whether soil invertebrates experience adverse effects due to chemical exposure. However, before biomarkers could be deployed within diagnostic studies, systematic evidence of the robustness of such biomarkers to detect effects is needed. Here, we present an approach for conducting a meta-analysis of the robustness of gene expression-based biomarkers in soil invertebrates. The approach was developed and trialled for two measurements of gene expression commonly proposed as biomarkers in soil ecotoxicology: earthworm metallothionein (MT) gene expression for metals and earthworm heat shock protein 70 (HSP70) gene expression for organic chemicals. We collected 294 unique gene expression data points from the literature and used linear mixed-effect models to assess concentration, exposure duration and species effects on the quantified response. The meta-analysis showed that the expression of earthworm MT was strongly metal concentration dependent, stable over time and species independent. The metal concentration-dependent response was strongest for cadmium indicating that this gene is a suitable biomarker for this metal. For copper, no clear concentration-dependent response of MT gene expression in earthworms was found, indicating MT is not a reliable biomarker for this metal. For HSP70, overall marginal upregulation and lack of a concentration-dependent response indicated that this gene is not suitable as a biomarker for organic pollutant effects in earthworms. This work demonstrates how meta-analysis can be used to assess the status of

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biomarkers. We encourage colleagues to apply this open-access approach to other biomarkers, as such quantitative assessment is a prerequisite to ensuring that the suitability and limitations of proposed biomarkers are known and stated. This article is protected by copyright. All rights reserved. © 2022 SETAC.

Authors: Elmer Swart, Ellie Martell, Claus Svendsen, David J Spurgeon
Full Source: Environmental toxicology and chemistry 2022 Jun 14. doi: 10.1002/etc.5402.

Drinking water sources and water quality in a prospective agricultural cohort

2022-05-25

We describe drinking water sources and water quality for a large agricultural cohort. We used questionnaire data from the Agricultural Health Study (N = 89,655), a cohort of licensed pesticide applicators and their spouses in Iowa (IA) and North Carolina (NC), to ascertain drinking water source at enrollment (1993-1997). For users of public water supplies (PWS), we linked participants' geocoded addresses to contaminant monitoring data [five haloacetic acids (HAA5), total trihalomethanes (TTHM), and nitrate-nitrogen (NO₃-N)]. We estimated private well nitrate levels using random forest models accounting for well depth, soil characteristics, nitrogen inputs, and other predictors. We assigned drinking water source for 84% (N = 74,919) of participants. Among these, 69% of IA and 75% of NC participants used private wells; 27% in IA and 21% in NC used PWS. Median PWS nitrate concentrations (NO₃-N) were higher in IA [0.9 mg/L, interquartile range (IQR): 0.4-3.1 mg/L] than NC (0.1 mg/L, IQR: 0.1-0.2 mg/L), while median HAA5 and TTHM concentrations were higher in NC (HAA5: 11.9 µg/L, IQR: 5.5-33.4 µg/L; TTHM: 37.7 µg/L, IQR: 10.7-54.7 µg/L) than IA (HAA5: 5.0 µg/L, IQR: 3.7-10.7 µg/L; TTHM: 13.0 µg/L, IQR: 4.2-32.4 µg/L). Private well nitrate concentrations in IA (1.5 mg/L, IQR: 0.8-4.9 mg/L) and NC (1.9 mg/L, IQR: 1.4-2.5 mg/L) were higher than PWS. More private wells in IA (12%) exceeded 10 mg/L NO₃-N (regulatory limit for PWS) than NC (<1%). Due to the proximity of their drinking water sources to farms, agricultural communities may be exposed to elevated nitrate levels.

Authors: Cherrel K Manley, Maya Spaur, Jessica M Madrigal, Jared A Fisher, Rena R Jones, Christine G Parks, Jonathan N Hofmann, Dale P Sandler, Laura Beane Freeman, Mary H Ward
Full Source: Environmental epidemiology (Philadelphia, Pa.) 2022 May 25;6(3):e210. doi: 10.1097/EE9.0000000000000210.

We describe drinking water sources and water quality for a large agricultural cohort.

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PHARMACEUTICAL/TOXICOLOGY

Elastin Degradation and Lung Function Deterioration with Remote Secondhand Tobacco Smoke Exposure in Never-smokers

2022-06-13

Background: Prolonged past exposure to secondhand tobacco smoke (SHS) in never-smokers is associated with abnormal lung function and reduced diffusing capacity suggestive of an associated lung tissue injury and damage. The mechanisms by which past SHS exposure may contribute to lung tissue damage are unknown. Elastin is a major constituent of extracellular matrix in lung parenchyma. **Objective:** To determine whether past exposure to SHS is associated with ongoing lung tissue damage as indicated by elevated elastin degradation products that are linked to lung function. **Methods:** We measured the plasma levels of elastin degradation markers (EDM) from 193 never-smoking flight attendants with history of remote SHS exposure in aircraft cabin and 103 nonsmoking flight attendants or sea-level control participants without such history of cabin SHS exposure, and examined those levels versus their lung function with adjustment for covariates. The cabin SHS exposure was estimated based on airline employment history and years of smoking ban enactment. **Results:** The median [interquartile range] plasma EDM level for all participants was 0.30 [0.24-0.36] ng/mL with a total range of 0.16-0.65 ng/mL. Plasma EDM levels were elevated in those with history of exposure to cabin SHS compared to those not exposed (0.33 ± 0.08 vs. 0.26 ± 0.06 ng/mL; age- and sex-adjusted $P < 0.001$). In those with history of cabin SHS-exposure, higher EDM levels were associated with lower diffusing capacity (parameter estimate (PE) [95%CI]=4.2 [0.4-8.0] %predicted decrease per 0.1 ng/mL increase in EDM; $P=0.030$). Furthermore, EDM levels were inversely associated with FEV1, FEV1/FVC, and FEF25-75 (PE [95%CI]=5.8 [2.1-9.4], 4.0 [2.2-5.7], and 12.5 [5.8-19.2] %predicted decrease per 0.1 ng/mL increase in EDM, respectively; $P < 0.001$). Plasma EDM mediated a substantial fraction of the association of SHS with FEV1, FVC, and FEF25-75 ($P < 0.05$). **Conclusions:** Long after past exposure to SHS, there is ongoing elastin degradation beyond what is expected from the aging process,

Background: Prolonged past exposure to secondhand tobacco smoke (SHS) in never-smokers is associated with abnormal lung function and reduced diffusing capacity suggestive of an associated lung tissue injury and damage.

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which likely contributes to lower lung function and reduced pulmonary capillary bed as seen in COPD.

Authors: Jelena Mustra Rakic, Siyang Zeng, Linnea Rohdin-Bibby, Erin L Van Blarigan, Xingjian Liu, Shuren Ma, John P Kane, Rita F Redberg, Gerard M Turino, Eveline Oestreicher Stock, Mehrdad Arjomandi
Full Source: Chronic obstructive pulmonary diseases (Miami, Fla.) 2022 Jun 13. doi: 10.15326/jcopdf.2022.0289.

OCCUPATIONAL

Current status and high-risk factors of blood-borne occupational exposure among midwives in China: A cross-sectional survey

2022-06-12

Background: To identify the problems and high-risk factors of blood-borne occupational exposure among midwives in China. **Methods:** Midwives from the obstetrics department and delivery room of hospitals in institutions. The self-compiled questionnaire on the current status of blood-borne occupational exposure of Chinese midwives was used for data collection. **Results:** The incidence rate of blood-borne occupational exposure was 46.77%. The independent risk factors were working years ≤ 5 years ($p=0.001$), unable to take standard prevention at work ($p=0.000$), unaware of HIV treatment procedures ($p=0.000$), and average daily working hours of 8 hours ($p=0.002$), the high risk of blood-borne occupational exposure at work ($p=0.000$), and contact with patient fluids, blood without gloves ($p=0.000$). **Discussion:** Midwives are at high risk of blood-borne occupational exposure, and midwives with ≤ 5 years of service are the focus group. Failure to achieve standard prevention, the length of working hours and the ignorance of the treatment process of AIDS have a certain impact on the occurrence of blood-borne occupational exposure. **Conclusion:** It is necessary to focus on cultivating high-level midwifery talents to overcome the shortage of midwives and rationally use midwifery resources, as well as to strengthen standard prevention and improve the occupational protection and guarantee system for midwives.

Authors: Jing Li, Haixia Zhang, Yanhua Zhang, Lijuan Wang, Li Li, Meiling Chen

Full Source: American journal of infection control 2022 Jun 12;S0196-6553(22)00481-3. doi: 10.1016/j.ajic.2022.06.009.

Background: To identify the problems and high-risk factors of blood-borne occupational exposure among midwives in China.

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Integrated approaches to testing and assessment for grouping nanomaterials following dermal exposure

2022-06-15

Exposure to different nanoforms (NFs) via the dermal route is expected in occupational and consumer settings and thus it is important to assess their dermal toxicity and the contribution of dermal exposure to systemic bioavailability. We have formulated four grouping hypotheses for dermal toxicity endpoints which allow NFs to be grouped to streamline and facilitate risk assessment. The grouping hypotheses are developed based on insight into how physicochemical properties of NFs (i.e. composition, dissolution kinetics, size, and flexibility) influence their fate and hazard following dermal exposure. Each hypothesis is accompanied by a tailored Integrated Approach to Testing and Assessment (IATA) that is structured as a decision tree and tiered testing strategies (TTS) for each relevant question (at decision nodes) that indicate what information is needed to guide the user to accept or reject the grouping hypothesis. To develop these hypotheses and IATAs, we gathered and analyzed existing information on skin irritation, skin sensitization, and dermal penetration of NFs from the published literature and performed experimental work to generate data on NF dissolution in sweat simulant fluids. We investigated the dissolution of zinc oxide and silicon dioxide NFs in different artificial sweat fluids, demonstrating the importance of using physiologically relevant conditions for dermal exposure. All existing and generated data informed the formulation of the grouping hypotheses, the IATAs, and the design of the TTS. It is expected that the presented IATAs will accelerate the NF risk assessment for dermal toxicity via the application of read-across.

Authors: Luisana Di Cristo, Gemma Janer, Susan Dekkers, Matthew Boyles, Anna Giusti, Johannes G Keller, Wendel Wohlleben, Hedwig Braakhuis, Lan Ma-Hock, Agnes G Oomen, Andrea Haase, Vicki Stone, Fiona Murphy, Helinor J Johnston, Stefania Sabella

Full Source: *Nanotoxicology* 2022 Jun 15;1-23. doi: 10.1080/17435390.2022.2085207.

Exposure patterns among Coast Guard responders to the Deepwater Horizon Oil Spill: A latent class analysis

2022-05-02

Background: The Deepwater Horizon Oil Spill was an environmental crisis for which multiple groups, including the United States Coast Guard (USCG), provided emergency response services. A cohort

Exposure to different nanoforms (NFs) via the dermal route is expected in occupational and consumer settings and thus it is important to assess their dermal toxicity and the contribution of dermal exposure to systemic bioavailability.

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of 5,665 USCG oil spill responders completed postdeployment surveys eliciting information on a variety of topics, including oil spill-related exposures and experiences. Our objective was to determine the most common exposure patterns among USCG responders. Methods: We used latent class analysis based on six indicator variables reflecting different aspects of the responders' experiences: exposure to oil, exposure to engine exhaust fumes or carbon monoxide, hand sanitizer use, sunblock use, mosquito bites, and level of anxiety. We validated our interpretation of these latent classes using ancillary variables. Results: The model distinguished four distinct exposure profiles, which we interpreted as "low overall exposure" (prevalence estimate = 0.18), "low crude oil/exhaust and moderate time outdoors/anxiety" (prevalence estimate = 0.18), "high crude oil/exhaust and moderate time outdoors/anxiety" (prevalence estimate = 0.25), and "high overall exposure" (prevalence estimate = 0.38). The validation analysis was consistent with our interpretation of the latent classes. Conclusions: The exposure patterns identified in this analysis can help inform future studies of the health impacts of exposure mixtures among USCG oil spill responders.

Authors: Matthew O Gribble, Taj Keshav, Hristina Denic-Roberts, Lawrence S Engel, Jennifer A Rusiecki

Full Source: *Environmental epidemiology* (Philadelphia, Pa.) 2022 May 2;6(3):e211. doi: 10.1097/EE9.0000000000000211.

Microbial diversity and metaproteomic analysis of activated sludge responses to naphthalene and anthracene exposure

2019-07-24

The activated sludge process can effectively remove polycyclic aromatic hydrocarbons (PAHs) from wastewater via biodegradation. However, the degradable microorganisms and functional enzymes involved in this process remain unclear. In this study, we successfully employed a laboratory-scale sequential batch reactor to investigate variations in microbial community and protein expression in response to the addition of different PAHs and process time. The analysis of bacterial community structure by 454 pyrosequencing of the 16S rRNA gene indicated that bacteria from Burkholderiales order were dominant in PAHs treated sludge. Mass spectrometry performed with 2D protein profiles of all sludge samples demonstrated that most proteins exhibiting differential expression profiles during the process were derived from Burkholderiales populations; these proteins are involved in DNA replication, fatty acid and glucose metabolism, stress response, protein synthesis, and aromatic hydrocarbon metabolism. Nevertheless, the protein expression

The activated sludge process can effectively remove polycyclic aromatic hydrocarbons (PAHs) from wastewater via biodegradation.

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profiles indicated that naphthalene, but not anthracene, can induce the expression of PAH-degrading proteins and accelerate its elimination from sludge. Though only naphthalene and anthracene were added into our experimental groups, the differentially expressed enzymes involved in other PAHs (especially biphenyl) metabolism were also detected. This study provides apparent evidence linking the metabolic activities of Burkholderiales populations with the degradation of PAHs in activated sludge processes. Overall, our findings highlighted the successful application of metaproteomics integrated with microbial diversity analysis by high-throughput sequencing technique on the analysis of environmental samples, which could provide a convenience to monitor the changes in proteins expression profiles and their correlation with microbial diversity.

Authors: Shanshan Li, Shaoda Hu, Sanyuan Shi, Lu Ren, Wei Yan, Huabing Zhao

Full Source: RSC advances 2019 Jul 24;9(40):22841-22852. doi: 10.1039/c9ra04674g.