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CHEMICAL EFFECTS

Formation and Inventory of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans and Other Byproducts along Manufacturing Processes of Chlorobenzene and Chloroethylene

2023-01-22

Chlorinated organic chemicals are produced and used extensively worldwide, and their risks to the biology and environment are of increasing concern. However, chlorinated byproducts [e.g., polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs)] formed during the commercial manufacturing processes and present in organochlorine products are rarely reported. The knowledge on the occurrences and fate of unintentional persistent organic chemicals in the manufacturing of organochlorine chemical is necessary for accurate assessment of the risks of commercial chemicals and their production. Here, PCDD/Fs were tracked throughout chlorobenzene and chloroethylene production processes (from raw materials to final products) by target analysis. Other byproducts that can further transform into PCDD/Fs were also identified by performing non-target screening. As a result, the PCDD/F concentrations were mostly the highest in bottom residues, and the octachlorinated congeners were dominant. Alkali/water washing stages may cause the formation of oxygen-containing byproducts including PCDD/Fs and acyl-containing compounds, so more attention should be paid to these stages. PCDD/Fs were of 0.17 and 0.21-1.2 ng/mL in monochlorobenzene and chloroethylene products, respectively. Annual PCDD/F emissions (17 g toxic equivalent in 2018) during chlorobenzene and chloroethylene production were estimated using PCDD/F emission factors. The results can contribute to the improvement of PCDD/F inventories for the analyzed commercial chemicals.

Authors: Xiaoyun Liu, Guorui Liu, Minxiang Wang, Jiajia Wu, Qiuting Yang, Shuting Liu, Mingxuan Wang, Lili Yang, Minghui Zheng

Full Source: Environmental science & technology 2023 Jan 22. doi: 10.1021/acs.est.2c07322.

Chlorinated organic chemicals are produced and used extensively worldwide, and their risks to the biology and environment are of increasing concern.

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Growth and Volatile Organic Compound Production of Pseudomonas Fish Spoiler Strains on Fish Juice Agar Model Substrate at Different Temperatures

2023-01-12

Microbial spoilage is the main cause of quality deterioration in seafood. Several strains of psychotropic Pseudomonas have been found to dominate in such products, producing a plethora of volatile organic compounds (VOC). Herein, we investigated the growth of and VOC production by seven strains of Pseudomonas associated with spoiled fish after inoculation as single and mixed cultures on model fish substrate and storage at 0, 4 and 8 °C. The results indicated a strain-dependent VOC profile that was also affected by the storage temperature. Hierarchical cluster analysis (HCA) successfully grouped the strains based on VOC profile at each studied temperature, while some potential Chemical Spoilage Indices (CSI) were revealed. The findings of the present work will contribute to the understanding of the metabolic activity of particular strains of Pseudomonas and to reveal any potential CSI for rapid evaluation of fish spoilage/freshness status.

Authors: Foteini F Parlapani, Dimitrios A Anagnostopoulos, Evangelia Karamani, Athanasios Mallouchos, Serkos A Haroutounian, Ioannis S Boziaris

Full Source: Microorganisms 2023 Jan 12;11(1):189. doi: 10.3390/microorganisms11010189.

Microbial spoilage is the main cause of quality deterioration in seafood.

Toxicity of POEA-containing glyphosate-based herbicides to amphibians is mainly due to the surfactant, not to the active ingredient

2023-01-21

Current international legislation regarding agrochemicals requires thorough toxicological testing mainly of the active ingredients. In a 96-h acute toxicity test we exposed Rana dalmatina and Bufo bufo tadpoles to either one of three concentrations of glyphosate, three concentrations of the surfactant (POEA), three concentrations of the two components together, or to non-contaminated water (control), and subsequently assessed mortality and body mass. To investigate whether simultaneous exposure to another stress factor influences effects of the contaminants, we performed tests both in the presence or absence of predator chemical cues. We found that the surfactant had significant harmful effects on tadpoles; survival was lowered by the highest concentration of the surfactant in case of R. dalmatina, while in B. bufo tadpoles it reduced

survival already at medium concentrations. Body mass was significantly influenced by medium and high surfactant concentrations in both species. The presence of glyphosate did not have a significant effect by itself, but it slightly increased mortality in tadpoles exposed to medium concentrations of the surfactant in both species. The presence of chemical cues did not have an effect on the examined variables. Our study confirms that the toxicity of glyphosate-based herbicides is mainly due to the examined surfactant. Nonetheless, we found that glyphosate can enhance the harmful effect of the surfactant. These results stress that during the authorization process of new pesticide formulations, not only the active ingredients would need to be examined but the excipients should also be taken into account in an obligatory and systematic manner.

Authors: Zsanett Mikó, Attila Hettyey

Full Source: Ecotoxicology (London, England) 2023 Jan 21. doi: 10.1007/s10646-023-02626-x.

ENVIRONMENTAL RESEARCH

Airborne bacterial community and antibiotic resistome in the swine farming environment: Metagenomic insights into livestock relevance, pathogen hosts and public risks

2023-01-13

Globally extensive use of antibiotics has accelerated antimicrobial resistance (AMR) in the environment. As one of the biggest antibiotic consumers, livestock farms are hotspots in AMR prevalence, especially those in the atmosphere can transmit over long distances and pose inhalation risks to the public. Here, we collected total suspended particulates in swine farms and ambient air of an intensive swine farming area. Bacterial communities and antibiotic resistomes were analyzed using amplicon and metagenomic sequencing approaches. AMR risks and inhalation exposure to potential human-pathogenic antibiotic-resistant bacteria (HPARB) were subsequently estimated with comparison to the reported hospital samples. The results show that swine farms shaped the airborne bacterial community by increasing abundances, reducing diversities and shifting compositions. Swine feces contributed 77% of bacteria to swine farm air, and about 35% to ambient air. Airborne antibiotic resistomes in swine farms mainly conferred resistance to tetracyclines, aminoglycosides and lincosamides, and over 48% were originated from swine feces. Distinct to the hospital air, Firmicutes were dominant bacteria in swine farming environments with conditional

Globally extensive use of antibiotics has accelerated antimicrobial resistance (AMR) in the environment.

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pathogens including Clostridium, Streptococcus and Aerococcus being major hosts of antibiotic resistance genes (ARGs). Therein, genomes of S. alactolyticus carrying (transposase/recombinase-associated) ARGs and virulence factor genes were retrieved from the metagenomes of all swine feces and swine farm air samples, but they were not detected in any hospital air samples. This suggests the indication of S. alactolyticus in swine farming environments with potential hazards to human health. Swine farm air faced higher AMR risks than hospital air and swine feces. The inhalation intake of HPARB by a swine farm worker was about three orders of magnitude higher than a person who works in the hospital. Consequently, this study depicted atmospheric transmission of bacteria and antibiotic resistomes from swine feces to the environment.

Authors: Fang-Zhou Gao, Liang-Ying He, Hong Bai, Lu-Xi He, Min Zhang, Zi-Yin Chen, You-Sheng Liu, Guang-Guo Ying

Full Source: Environment international 2023 Jan 13;172:107751. doi: 10.1016/j.envint.2023.107751.

Bacterial diversity in the aquatic system in India based on metagenome analysis-a critical review

2023-01-21

Microbial analysis has become one of the most critical areas in aquatic ecology and a crucial component for assessing the contribution of microbes in food web dynamics and biogeochemical processes. Initial research was focused on estimating the abundance and distribution of the microbes using microscopy and culture-based analysis, which are undoubtedly complex tasks. Over the past few decades, microbiologists have endeavored to apply and extend molecular techniques to address pertinent questions related to the function and metabolism of microbes in aquatic ecology. Metagenomics analysis has revolutionized aquatic ecology studies involving the investigation of the genome of a mixed community of organisms in an ecosystem to identify microorganisms, their functionality, and the discovery of novel proteins. This review discusses the metagenomics analysis of bacterial diversity in and around different aquatic systems in India.

Authors: Jasna Vijayan, Vinod Kumar Nathan, Parvathi Ammini, Abdulla Mohamed Hatha Ammanamveetil

Full Source: Environmental science and pollution research international 2023 Jan 21. doi: 10.1007/s11356-023-25195-2.

Microbial analysis has become one of the most critical areas in aquatic ecology and a crucial component for assessing the contribution of microbes in food web dynamics and biogeochemical processes.

PHARMACEUTICAL/TOXICOLOGY

The partitioning and distribution of neonicotinoid insecticides in human blood

2023-01-18

The burden of neonicotinoid insecticides (neonics) in humans has attracted widespread attention in recent years due to the potential adverse effects. Nonetheless, information on the partitioning behavior and distribution in human blood is still limited. Herein, we obtained 115 adult whole blood and plasma specimens for analysis of eight neonics to better understand neonics' partitioning and distribution in human blood. At least one neonic was detected in 49.6% of the red blood cells and 55.7% of the plasma. In red blood cells, the highest detection rate and concentration was thiamethoxam (THI) with 19.1% and 3832 ng/L, respectively. Imidacloprid had the highest detection rate with 26.1% in the plasma. The mass fraction (Fp) of neonics detected indicates that thiacloprid, imidacloprid, and dinotefuran are mostly resided in plasma upon entering into human blood, while thiamethoxam is mostly present in red blood cells. The distribution of clothianidin and acetamiprid between plasma and red blood cells is similar. The mass fraction (Fp) values for THI were significantly different compared to other neonics, and the effect of age and gender on THI partitioning concluded that there may not be significant variability in the distribution of THI in the sampled population. Overall, this study was the first to investigate neonics residuals in red blood cells and provided fundamental information on the partitioning and distribution of neonics in human blood.

Authors: Quan Zhang, Shitao Hu, Wei Dai, Sijia Gu, Zeteng Ying, Rui Wang, Chensheng Lu

Full Source: Environmental pollution (Barking, Essex : 1987) 2023 Jan 18;121082. doi: 10.1016/j.envpol.2023.121082.

The burden of neonicotinoid insecticides (neonics) in humans has attracted widespread attention in recent years due to the potential adverse effects.

Association between Dietary Zinc Intake, Serum Zinc Level and Multiple Comorbidities in Older Adults

2023-01-09

Zinc is one of the essential micronutrients in the geriatric population, but the importance of zinc status and dietary zinc intake has been poorly characterized. We aimed to explore the relationships among dietary zinc intake, serum zinc concentrations and multimorbidity in a cross-sectional study of 300 employees of Electric Generating Authority of Thailand aged ≥ 60 years. Comprehensive questionnaires were completed, and clinical and laboratory assessments were performed. Factors associated with low serum zinc concentrations were identified using multivariate multinomial logistic regression analyses. The mean serum zinc level was 80.5 (12.8) µg/dL. After adjustment for baseline characteristics, being female and having been in education for ≤12 years were independent risk factors for the lowest tertile (T1) of serum zinc. After additional adjustment for clinical and biochemical parameters, there was a significant association between depression (Thai Geriatric Depression Scale-15 score > 5) and low serum zinc levels (T1 vs. T3, odds ratio (OR): 2.24; 95% confidence interval (CI): 1.06-4.77). Furthermore, as serum albumin increased, serum zinc concentration substantially increased (T1 vs. T3, OR: 0.01; 95% CI: 0.002-0.070). Therefore, the early detection of risk factors and the further management of depression and low serum albumin may assist physicians in preventing low serum concentrations.

Authors: Sirasa Ruangritchankul, Chutima Sumananusorn, Jintana Sirivarasai, Wutarak Monsuwan, Piyamitr Sritara

Full Source: Nutrients 2023 Jan 9;15(2):322. doi: 10.3390/nu15020322.

Risk Factors Involved in the High Incidence of Bladder Cancer in an Industrialized Area in North-Eastern Spain: A Case-Control Study

2023-01-16

Bladder cancer (BC) is the most common of the malignancies affecting the urinary tract. Smoking and exposure to occupational and environmental carcinogens are responsible for most cases. Vallès Occidental is a highly industrialized area in north-eastern Spain with one of the highest incidences of BC in men. We carried out a case-control study in order to identify the specific risk factors involved in this area. Three hundred and six participants were included (153 cases BC and 153 controls matched for age and sex): in each group, 89.5% (n = 137) were male and the mean age was 71 years (range 30-91; SD = 10.6). There were no differences between groups in family history, body mass index, or dietary habits. Independent risk factors for CV were smoking (OR 2.08; 95% CI 1.30-3.32; p = 0.002), the use of analgesics in nonsmokers (OR 10.00; 95% CI 1.28-78.12; p = 0.028), and profession (OR: 8.63; 95% CI 1.04-71.94; p = 0.046). The consumption of black and blond tobacco, the use of analgesics in nonsmokers, and occupational exposures are risk factors for the development of BC in this area, despite the reduction in smoking in the population and the extensive

Bladder cancer (BC) is the most common of the malignancies affecting the urinary tract.

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measures taken in the last few decades in major industries to prevent exposure to occupational carcinogens.
Authors: José M Caballero, José M Gili, Juan C Pereira, Alba Gomáriz, Carlos Castillo, Montserrat Martín-Baranera
Full Source: Journal of clinical medicine 2023 Jan 16;12(2):728. doi: 10.3390/jcm12020728.

OCCUPATIONAL

A cohort study of wastewater treatment plant workers: Association between levels of biomarkers of systemic inflammation and exposure to bacteria and fungi, and endotoxin as measured using two methods

2023-01-16
Work in wastewater treatment plants (WWTPs) can be associated with exposure to airborne microorganisms and endotoxin from the working environment. The aim of this study was to obtain knowledge about whether serum levels of the markers of systemic inflammation, C-reactive protein (CRP) and serum amyloid A (SAA), are associated with personal exposure to endotoxin, measured using the Limulus (endotoxinLimulus) and the rFC (endotoxinrFC) assays, as well as bacteria and fungi in a cohort of WWTP workers. Exposure and blood samples were collected for 11 workers over one year. Exposure to endotoxinLimulus-day and endotoxinrFC-day correlated significantly ($r = 0.80$, $p<0.0001$, $n = 104$), but endotoxinLimulus-day was 4.4 (Geometric mean (GM) value) times higher than endotoxinrFC-day ($p<0.0001$). The endotoxinLimulus-day, endotoxinrFC-day, bacteria, and fungal exposure as well as serum levels of CRP-day (GM=1.4 mg/l) and SAA-day (GM=12 mg/l) differed between workers. Serum levels of SAAday correlated significantly with CRPday ($r = 0.30$, $p = 0.0068$). The serum levels of CRPday were associated significantly with exposure to endotoxinLimulus-day. Exposure, SAA and CRP data were also analyzed as av. of each season, and SAAseason was associated positively and significantly with endotoxinLimulus-season and endotoxinrFC-season and negatively with fungalseason exposure. In conclusion, CRPday was associated with the endotoxinLimulus-day and SAAseason with endotoxinLimulus-season and endotoxinrFC-season exposure. Thus, we hereby document that WWTP workers are exposed to airborne endotoxin which seems to have a negative impact on their health.
Authors: Anne Mette Madsen, Katrine Uhrbrand, Victor Carp Kofoed, Thea K Fischer, Margit W Frederiksen
Full Source: Water research 2023 Jan 16;231:119625. doi: 10.1016/j.watres.2023.119625.

Work in wastewater treatment plants (WWTPs) can be associated with exposure to airborne microorganisms and endotoxin from the working environment.

Metabolic Changes and Their Associations with Selected Nutrients Intake in the Group of Workers Exposed to Arsenic

2023-01-01
Arsenic (As) exposure causes numerous adverse health effects, which can be reduced by the nutrients involved in the metabolism of iAs (inorganic As). This study was carried out on two groups of copper-smelting workers: WN, workers with a urinary total arsenic (tAs) concentration within the norm ($n = 75$), and WH, workers with a urinary tAs concentration above the norm ($n = 41$). This study aimed to analyze the association between the intake level of the nutrients involved in iAs metabolism and the signal intensity of the metabolites that were affected by iAs exposure. An untargeted metabolomics analysis was carried out on urine samples using liquid chromatography-mass spectrometry, and the intake of the nutrients was analyzed based on 3-day dietary records. Compared with the WN group, five pathways (the metabolism of amino acids, carbohydrates, glycans, vitamins, and nucleotides) with twenty-five putatively annotated metabolites were found to be increased in the WH group. In the WN group, the intake of nutrients (methionine; vitamins B2, B6, and B12; folate; and zinc) was negatively associated with six metabolites (cytosine, D-glucuronic acid, N-acetyl-D-glucosamine, pyroglutamic acid, uridine, and urocanic acid), whereas in the WH group, it was associated with five metabolites (D-glucuronic acid, L-glutamic acid, N-acetyl-D-glucosamine, N-acetylneuraminic acid, and uridine). Furthermore, in the WH group, positive associations between methionine, folate, and zinc intake and the signal intensity of succinic acid and 3-mercaptolactic acid were observed. These results highlight the need to educate the participants about the intake level of the nutrients involved in iAs metabolism and may contribute to further considerations with respect to the formulation of dietary recommendations for people exposed to iAs.
Authors: Monika Sijko, Beata Janasik, Wojciech Wąsowicz, Lucyna Kozłowska
Full Source: Metabolites 2023 Jan 1;13(1):70. doi: 10.3390/metabo13010070.

Arsenic (As) exposure causes numerous adverse health effects, which can be reduced by the nutrients involved in the metabolism of iAs (inorganic As).