CHEMWATCH

# Bulletin Board

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## CHEMICAL EFFECTS

### Acute toxic effect of typical chemicals and ecological risk assessment based on two marine microalgae, Phaeodactylum tricornutum and Platymonas subcordiformis

2021-03-31

With the increasing demand for typical hazardous and noxious substances (HNS) in chemical industry, there is an increased leakage risk of these HNS during transportation by vessel and storage nearby seashore. In this study, the acute toxicity of nonylphenol, butyl acrylate and 1, 2-dichloroethane to Phaeodactylum tricornutum (P. tricornutum) and Platymonas subcordiformis (P. subcordiformis), was investigated to assess their ecological risk. The results showed that the three kinds of HNS showed significant time- and dose-dependent patterns on the growth inhibition of two marine microalgae. The 96 h-EC50 of nonylphenol, butyl acrylate and 1, 2-dichloroethane on P. tricornutum was 1.088, 45.908 and 396 mg L-1, respectively, and the 96 h-EC50 of that on P. subcordiformis was 0.851, 52.621 and 389 mg L-1, respectively. It was a common method to evaluate the harm of pollutants to organisms by calculating HC5 value (the minimum pollutant concentration value harmful to 95 % of the studied species, which was no-effect concentration) with Species Sensitivity Distribution (SSD). On the basis of EC50, the ecological risk assessment was further carried out, and HC5 value of nonylphenol and 1, 2-dichloroethane to aquatic organism was 0.079 and 44 mg L-1, respectively.

Authors: Xiufen Wang, Yun Li, Shouxiang Wei, Luqing Pan, Jingjing Miao, Yufei Lin, Jiangyue Wu

Full Source: Environmental toxicology and pharmacology 2021 Mar 31;85:103649. doi: 10.1016/j.etap.2021.103649.

### In silico prediction of polyethylene-aqueous and air partition coefficients of organic contaminants using linear and nonlinear approaches

2021-03-31

Low-density polyethylene (LDPE) passive sampling is very attractive for use in determining chemicals concentrations. Crucial to the measurement is the coefficient (KPE) describing partitioning between LDPE and environmental matrices. 255, 117 and 190 compounds were collected for the development of datasets in three different matrices, i.e., water, air

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and seawater, respectively. Further, 3 pp-LFER models and 9 QSPR models based on classical multiple linear regression (MLR) coupled with prevalent nonlinear algorithms (artificial neural network, ANN and support vector machine, SVM) were performed to predict LDPE-water (KPE-W), LDPE-air (KPE-A) and LDPE-seawater (KPE-SW) partition coefficients. These developed models have satisfying predictability (R2adj: 0.805-0.966, 0.963-0.991 and 0.817-0.941; RMSEtra: 0.233-0.565, 0.200-0.406 and 0.260-0.459) and robustness (Q2ext: 0.840-0.943, 0.968-0.984 and 0.797-0.842; RMSEext: 0.308-0.514, 0.299-0.426 and 0.407-0.462) in three datasets (water, air and seawater), respectively. In particular, the reasonable mechanism interpretations revealed that the molecular size, hydrophobicity, polarizability, ionization potential, and molecular stability were the most relevant properties, for governing chemicals partitioning between LDPE and environmental matrices. The application domains (ADs) assessed here exhibited the satisfactory applicability. As such, the derived models can act as intelligent tools to predict unknown KPE values and fill the experimental gaps, which was further beneficial for the construction of enormous and reliable database to facilitate a distinct understanding of the distribution for organic contaminants in total environment.

Authors: Tengyi Zhu, Zaizhi Cao, Rajendra Prasad Singh, Haomiao Cheng, Ming Chen

Full Source: Journal of environmental management 2021 Mar 31;289:112437. doi: 10.1016/j.jenvman.2021.112437.

## ENVIRONMENTAL RESEARCH

### Occurrence and abundance of poly- and perfluoroalkyl substances (PFASs) on microplastics (MPs) in Pearl River Estuary (PRE) region: Spatial and temporal variations

2021-03-27

Although the occurrence and distribution of various chemicals on microplastics (MPs) has been widely studied, little was known about the concentrations of poly- and perfluoroalkyl substances (PFASs) on MPs. In this study, MPs from eight rivers draining into Pearl River Estuary (PRE) region were collected and analyzed. Higher concentrations of PFASs on MPs (105-9.07 × 103 ng g-1) were found in the drain outlets receiving wastewater from most urbanized cities with large population densities. On the other hand, lower concentrations of PFASs on MPs (10.3-227.8 ng g-1) were found in the drain outlets receiving wastewater mostly from agricultural and forested areas. Specially, 8:2 disubstituted polyfluoroalkyl

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phosphates (8:2 diPAP) was detected with the highest frequency, in 92.5% of the samples. Furthermore, a positive Spearman correlation was found between 6:2 disubstituted polyfluoroalkyl phosphates (6:2 diPAP) and perfluorotetradecanoic acid (PFTeDA) (rs = 0.621, p = 0.012), indicating they might share similar sources. PFASs on MPs were found to vary significantly with different seasons. Higher concentrations of PFASs on MPs were found in dry seasons, while lower concentrations were observed in wet seasons. The results of this study should be important for the understanding of PFAS occurrence and distribution on MPs and the partitioning mechanism of PFASs on MPs in estuary systems.

Authors: Yao Cheng, Lei Mai, Xingwen Lu, Zhe Li, Ying Guo, Da Chen, Fei Wang

Full Source: Environmental pollution (Barking, Essex : 1987) 2021 Mar 27;281:117025. doi: 10.1016/j.envpol.2021.117025.

## Effective remediation of petrochemical originated pollutants using engineered materials with multifunctional entities

2021-03-29

The highly robust, effective, and sustainable remediation of hydrocarbon-contaminated wastewater matrices, which is mainly generated from petroleum and related petrochemical industries, is of supreme interest. Owing to the notable presence of suspended solids, oil, and grease, organic matter, highly toxic elements, high salts, and recalcitrant chemicals, crude oil emulsions, and hydrocarbon-contaminated wastewater are considered a potential threat to the environments, animals, plants, and humans. To effectively tackle this challenging issue, magnetic hybrid materials assembled at nano- and micro-scale with unique structural, chemical, and functional entities are considered robust candidates for demulsification purposes. The current research era on magnetic materials has superwettability, leading to an effective system of superwettability, which is vibrant and promising. The wettability of magnetic and magnetic hybrid materials explaining the theme of superhydrophobicity and superhydrophilicity under the liquid. Herein, we reviewed the applications of magnetic nanoparticles (MNPs) as effective demulsifiers. The demulsifier wettability, dose, pH, salinity, and surface morphology of compelling, magnetic nanoparticles are the main hidden factors in effective demulsifiers. There is a comprehensive discussion on the reuse and recyclability of MNPs after oil, water separation. Furthermore, the main challenges, coupled with the magnetic nanoparticles in the effective separation of emulsions, are intensified in

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detail. This review will compare the current literature and the utilization of MNPs for the demulsification of oil and water emulsions. This is envisioned that the MNPs would be critical in the petroleum and petrochemical industry to effectively eliminate water from a crude oil emulsion.

Authors: Nisar Ali, Buame Jacinta Hellen, Chuansong Duanmu, Yong Yang, Shahid Nawaz, Adnan Khan, Farman Ali, Xiaoyan Gao, Muhammad Bilal, Hafiz M N Iqbal

Full Source: Chemosphere 2021 Mar 29;278:130405. doi: 10.1016/j.chemosphere.2021.130405.

## Environmental applications of microbial extracellular polymeric substance (EPS): A review

2021-06-01

During the last decade, water demand and wastewater generation has increased due to urbanization around the globe which had led to an increase in the utilization of chemicals/synthetic polymers for treating the wastewaters. These synthetic polymers used during the coagulation/flocculation process are non-renewable, non-biodegradable, and have a potential neurotoxic and carcinogenic effect. From the literature it is clear that extracellular polymer substance (EPS) is a potential bioflocculant, moreover it is renewable, biodegradable, eco-friendly, non-toxic as well as economically valued product. The various identification techniques and extraction methods of EPS are elaborated. Further application of EPS as absorbent in removing the dye from the industrial effluent is presented. Moreover EPS as a potential adsorbent for heavy metal removal from the various effluent is discussed. In addition, EPS is also utilized for soil remediation and soil erosion control. Mainly, EPS as bioflocculant in treating raw water, wastewater treatment, leachate and sludge management are summarized in this review.

Authors: T Siddharth, P Sridhar, V Vinila, R D Tyagi

Full Source: Journal of environmental management 2021 Jun 1;287:112307. doi: 10.1016/j.jenvman.2021.112307.

During the last decade, water demand and wastewater generation has increased due to urbanization around the globe which had led to an increase in the utilization of chemicals/synthetic polymers for treating the wastewaters.

# OCCUPATIONAL

## Plastic additives and personal care products in south China house dust and exposure in child-mother pairs

2020-12-18

Indoor environment constitutes an important source of industrial additive chemicals to human exposure. We hypothesized that the influence of

residential environment on human exposure varies among different types of additive chemicals and differs between children and mothers. This study determined a suite of additive chemicals in house dust from South China dwellings (n = 47) and urine from child-mother pairs. Concentrations of phthalates (PAEs; median 601 μg/g) were 2-3 orders of magnitude greater than those of parabens (0.82 μg/g), bisphenols (3.31 μg/g), and benzophenone-related chemicals (2.69 μg/g). Urinary concentrations differed between children and mothers, but the pattern of differences varied between chemical groups. Children exhibited greater urinary levels of mono-PAEs than mothers (510 versus 395 ng/mL, p = 0.152), while the latter population exhibited greater levels of parabens and benzophenones. Regression analyses indicate a lack of association between dust and urinary levels for most chemicals, suggesting that other exposure pathways can complicate human exposure scenarios. Indeed, we estimated that the daily intake via dust ingestion only constituted 0.002-0.81% of total daily intake estimated based on urine data for mothers and 0.04-5.61% for children. Future efforts are needed to better characterize source-specific exposure for different populations.

Authors: Yumeng Shi, Xiaotu Liu, Qitong Xie, Xiong-Fei Pan, Zhixiong Mei
Full Source: Environmental pollution (Barking, Essex : 1987) 2020 Dec 18;281:116347. doi: 10.1016/j.envpol.2020.116347.

## Occupational Exposure to Second-Hand Tobacco Smoke: Development of a Job Exposure Matrix

2021-04-03

Exposure to second-hand tobacco smoke (SHS) in the workplace has been largely controlled in most workplaces in many countries that have adopted smoke-free laws and regulations. Workers in offices, bars, restaurants, and many other settings have experienced substantial reductions in the frequency and intensity of their exposure to SHS. While current exposure to SHS of most non-smoking adults arises from living with a smoker there are likely to be some jobs where non-negligible exposure to SHS continues to occur. This study describes the development of a simple job exposure matrix (JEM) for SHS exposure for the UK working population in 2020 and identifies that at least 1.04 million workers are likely to be exposed to SHS while performing their job. Occupations with the highest frequency and intensity of exposure include those where workers carry out work tasks in private, domestic settings: including care workers and home carers. This SHS-JEM provides a novel method for assessing occupational exposure

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to SHS in other countries, and can act as a tool to identify priorities for policies to protect those workers who continue to be at risk from SHS.

Authors: Ruaraidh Dobson, Evangelia Demou, Sean Semple
Full Source: Annals of work exposures and health 2021 Apr 3;wxab019. doi: 10.1093/annweh/wxab019.

## Relationship between the expression of TNFR1-RIP1/RIP3 in peripheral blood and cognitive function in occupational Al-exposed workers: A mediation effect study

2021-04-03

Aluminium (Al), not essential for biological activities, accumulates in the tissues. It exerts toxic effects on the nervous system, inducing in humans' irreversible cognitive impairment. In this study, a cluster sampling method was used to observe the cognitive function of long-term occupational Al-exposed workers in a large Al factory, and determine the expression of peripheral blood tumour necrosis factor receptor 1 (TNFR1), receptor-interacting protein 1 (RIP1), and RIP3. TNF-alpha, expressed in blood macrophages and microglia, with its receptors TNFR1, TR1 and TR3, enhances the necroptosis of neurons. Additionally, the relationship between the expression of TNFR1, RIP1, and RIP3 in the peripheral blood of long-term occupational Al-exposed workers and changes in their cognitive function was explored. The differences in the distributions of clock drawing test (CDT) scores among the three groups were statistically significant ($P < 0.05$). The results of correlation analysis showed that RIP1 and RIP3 protein contents were negatively correlated with mini-mental state examination (MMSE) and CDT scores ($P < 0.05$). Plasma Al content was positively correlated with other biological indicators ($P < 0.05$), and negatively correlated with MMSE and CDT scores ($P < 0.05$). Results showed that RIP3 protein had an incomplete mediation effect between plasma Al content and cognitive function. This suggests that Al may affect cognitive function by influencing the expression of TNFR1, RIP1, and RIP3 in the nervous system.

Authors: Jingsi Zhang, Yanxia Hao, Yanni Wang, Yingchao Han, Shuhui Zhang, Qiao Niu
Full Source: Chemosphere 2021 Apr 3;278:130484. doi: 10.1016/j.chemosphere.2021.130484.

Aluminium (Al), not essential for biological activities, accumulates in the tissues.

## Occupational exposure to nanoparticles originating from welding - case studies from the Czech Republic

2021-03-30

Background: Nanomaterials are virtually ubiquitous as they are created by both natural processes and human activities. The amount of occupational exposure to unintentionally released nanoparticles can, therefore, be substantial. The aim of the study was to determine the concentrations of incidental nanoparticles that workers can be exposed to during welding operations and to assess related health risks. The specific focus on welding operations was determined based on the fact that other case studies on the manufacturing industry confirm significant exposure to incidental nanoparticles during welding. In the Czech Republic, 92% of all industrial workers are employed in the manufacturing industry, where welding operations are amply represented.

Material and methods: The particle number concentrations of particles in the size range of 20-1000 nm and particle mass concentrations of inhalable and PM1 fractions were determined via measurements carried out at 15-minute intervals for each welding operation by static sampling in close proximity to the worker. Measurements were obtained using the following instruments: NanoScan SMPS 3910, Optical Particle Sizer OPS 3330, P-TRAK 8525 and DustTrak DRX 8534. The assessed operations were manual arc welding and automatic welding.

Results: The observed average particle number concentrations for electric arc welders ranged 84×103-176×103 #/cm3, for welding machine operators 96×103-147×103 #/cm3, and for a welding locksmith the obtained average concentration was 179×103 #/cm3. The determined average mass concentration of PM1 particles ranged 0.45-1.4 mg/m3.

Conclusions: Based on the conducted measurements, it was confirmed that there is a significant number of incidental nanoparticles released during welding operations in the manufacturing industry as a part of production and processing of metal products. The recommended occupational exposure limits for nanoparticle number concentrations were exceeded approximately 4-8 times for all assessed welding operations. The use of local exhaust ventilation in conjunction with personal protective equipment, including FFP2 or FFP3 particle filters, for welding is, therefore, recommended. Med Pr. 2021;72(3).

Authors: Filip Berger, Šárka Bernatíková, Lucie Kocůrková, Radka Přichystalová, Lenka Schreiberová

Full Source: Medycyna pracy 2021 Mar 30;132389. doi: 10.13075/mp.5893.01058.

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## PHARAMACEUTICAL/TOXICOLOGY

### Knowledge and Practices on the Safe Handling of Cytotoxic Drugs Among Oncology Nurses Working at Tertiary Teaching Hospitals in Addis Ababa, Ethiopia

2021-03-29

Background: Cytotoxic drugs (CDs) administration and occupational exposure is a worldwide concern. Inappropriate handling may cause toxic residues to infiltrate hospital environments and patient care areas, and can even be traced to patients' homes. Hence, the study sought to assess knowledge and practices on the safe handling of cytotoxic drugs Among Oncology Nurses at Tertiary Teaching Hospitals in Addis Ababa, Ethiopia.

Methods: The researchers conducted a hospital-based cross-sectional study among 77 nurses from April 1-30, 2019. Purposive sampling was used in recruiting the respondents. Structured questionnaires were filled through self-administered interviewing. Data were analyzed using SPSS version 23 software. Multiple linear regression was performed to see the association between dependent variables and independent variables at a p-value of less than 0.05.

Results: Mean score of knowledge and practice of nurses was 7.82±2.22 out of 15 and 22.1±5.50 out of 40 respectively. Nearly 69% of nurses reported the lack of training program on the handling of CDs at their workplaces and the use of Personal Protective Equipment (PPE) remains suboptimal as none used all of PPE. Nurses who had not heard about CDs had an average knowledge score of 0.33 points lower than nurses who had heard about CDs ($p \leq 0.01$). Nurses who have scored higher knowledge points had 0.33 points more practice score of safe CD handling than those who had lower knowledge score ($p < 0.05$) and also married nurses had average safe CDs handling practice score 0.27 points lower than their counterparts ($p < 0.05$).

Conclusion: Nurses' knowledge and practice of safe handling of cytotoxic drugs are inadequate. Nurses who have scored higher knowledge points and are married were more likely to practice safe CD handling. Provision of proper PPE and training regarding the handling of CDs for Oncology Nurses are recommended and chemotherapy safety protocol and guidelines should be established.

Authors: Selamawit Asefa, Fekadu Aga, Negalign Getahun Dinegde, Takele Gezahegn Demie

Full Source: Drug, healthcare and patient safety 2021 Mar 29;13:71-80. doi: 10.2147/DHPS.S289025.

Background: Cytotoxic drugs (CDs) administration and occupational exposure is a worldwide concern.