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Photography of MNPs, with an emphasis on various UV sources and their aims to highlight the mechanisms and implications of UV-induced substantially different from those of pristine plastic particles. This review possesses diverse interactive properties and ecotoxicological implications into particles, including micro(nano)plastics (MNPs). Photoaged MNPs to be the primary cause of plastic aging, leading to their fragmentation in the environment, sunlight or ultraviolet (UV) radiation is considered co-occurring chemicals in the environment. Literature showed that photoaged MNPs exhibit a higher sorption capacity for PPCPs, PAHs, PBDEs, pesticides, humic acid, fulvic acid, heavy metals, and metallic nanoparticles than pristine MNPs, potentially causing significant changes in associated ecological and health impacts. Combined exposure to photoaged MNPs and organic and inorganic pollutants significantly altered mortality rate, decreased growth rate, histological alterations, neurological impairments, reproductive toxicity, induced oxidative stress, thyroid disruption, hepatotoxicity, and genotoxicity in vivo, both in aquatic and terrestrial organisms. Limited studies were reported in vitro and found decreased cellular growth and survival, induced oxidative stress, and compromised the permeability and integrity of the cell membrane. In addition, several environmental factors (temperature, organic matter, ionic strength, time, and pH), MNP properties (polymer types, sizes, surface area, shapes, colour, and concentration), and chemical properties (pollutant type, concentration, and physiochemical properties) can influence the photoaging of MNPs and associated impacts. Lastly, the research gaps and prospects of MNP photoaging and associated implications were also summarized. Future research should focus on the photoaging of MNPs under environmentally relevant conditions, exploiting the polydisperse characteristics of environmental plastics, to make this process more realistic for mitigating plastic pollution.

Understanding the environmental health and safety of nanomaterials (NanoEHS) is essential for the sustained development of nanotechnology.
Multiple diseases and disorders are connected with occupational and environmental exposure risk. Based on literature reports highlighting the promising sorption properties of metal-organic frameworks (MOFs), the aim of this study was to evaluate the suitability of NH2-MIL-125 (Ti) and UiO-66 (Ce) as sorbents in passive sampling devices (MOFs-PSDs) for the collection and extraction of a wide group of CECs. Solvothermal methods were used to synthesize MOFs, and the characterization of the obtained materials was performed using field-emission scanning electron microscopy (FE-SEM), powder X-ray diffractometry (pXRD) and Fourier-transform infrared (FTIR) spectroscopy. The research demonstrated the sorption capabilities of the tested MOFs, the ease and rapidity of their chemical regeneration and the possibility of reuse as sorbents. Using chemometric analysis, the structural properties of CECs determining the sorption efficiency on the surface of NH2-MIL-125 (Ti) were identified. The MOFs-PSDs were lab-calibrated to examine the kinetics of analytes sorption and determine the sampling rates (Rs). MOFs-PSDs and CNTs-PSDs (PSDs containing carbon nanotubes as a sorbent) were then placed in the Elbląg River and the Vistula Lagoon to sampling and extraction of the target compounds from the water. CNTs-PSDs were selected, based on our previous research, for the comparison of the effectiveness of the MOFs-PSDs in environmental monitoring. MOFs-PSDs were successfully used in monitoring of CECs in water. The time-weighted average concentrations (CTWA) of 2-hydroxycarbamazepine, carbamazepine-10,11-epoxide, p-nitrophenol, 3,5-dichlorophenol and caffeine were determined in the Elbląg River and CTWA of metoprolol, diclofenac, 2-hydroxycarbamazepine, carbamazepine-10,11-epoxide, p-nitrophenol, 3,5-dichlorophenol and caffeine were determine in the Vistula Lagoon using MOFs-PSDs and a high-performance liquid chromatography coupled with triple quadrupole mass spectrometer.

Authors: Klaudia Godlewska, Anna Białk-Bielińska, Paweł Mazierski, Szymon Zdybel, Anita Sosnowska, Daniel Gózryński, Tomasz Puzyn, Adriana Zaleska-Medynska, Tomasz Klimczuk, Monika Paszkiewicz


Authors: Klaudia Godlewska, Anna Białk-Bielińska, Paweł Mazierski, Szymon Zdybel, Anita Sosnowska, Daniel Gózryński, Tomasz Puzyn, Adriana Zaleska-Medynska, Tomasz Klimczuk, Monika Paszkiewicz


ENVIRONMENTAL RESEARCH

Occupational and Environmental Exposure Influences the Inflammatory (Pro-and Anti-) Status in Benign Prostate Hyperplasia and Prostate Carcinoma Patients: A Retrospective Analysis

2024-04

Multiple diseases and disorders are connected with occupational and environmental exposure risk. It is also well-established that chemicals and chemical mixtures have an influence on the immune cells of humans. This is an important field of research that has been pursued extensively in relation to autoimmune illnesses, allergy/asthma, and lung cancer, but Prostate Carcinoma has received rare reports. Chronic chemical exposure is known to produce inflammation, which is one of the most prominent characteristics of all malignancies. Changes in the ratio of pro-inflammatory to anti-inflammatory molecules are thought to be a key factor in the emergence of inflammation. Prostate gland cells express the pro-inflammatory cytokine interleukin-18 (IL-18), which is a major facilitator of immunological responses. Conversely, interleukin-10 (IL-10) is an anti-inflammatory cytokine that is linked to immune responses and inhibits the development of an inflammatory environment. Our goal is to investigate the inflammatory status of IL-18 (pro-) and IL-10 (anti-) in a variety of occupationally exposed populations in patients with Benign Prostate Hyperplasia (BPH) and patients with Prostate Carcinoma. The present study was conducted with 664 subjects, comprising 285 Prostate Carcinoma patients, 94 BPH patients and 285 controls. All subjects were categorized as per their occupational exposure into various groups. The pro-inflammatory and anti-inflammatory Interleukins (IL-18 and IL-10) and serum PSA levels were analysed by using corresponding quantitative ELISA kits. The results showed that as compared to control participants, the serum PSA levels were higher in the Prostate Carcinoma and BPH groups. When mean levels of IL-18 were compared between various occupational groups, Tanners (tanning industry), Agriculture, and Ordnance workers had significantly higher levels (P < 0.05) of IL-18 than sedentary workers. The pro-inflammatory cytokine (IL-18) levels were also found to be aggravated in Prostate Carcinoma compared to BPH and controls. According to the findings of the current study, the levels of inflammatory cytokines (IL-18 and IL-10) in various occupational groups of BPH, Prostate Carcinoma,
Personal environmental exposure to plasticizers and organophosphate flame retardants using silicone wristbands and urine: Patterns, comparisons, and correlations

2024-04-04

Plasticizers (PLs) and organophosphate flame retardants (OPFRs) are ubiquitous in the environment due to their widespread use and potential for leaching from consumer products. Environmental exposure is a critical aspect of the human exposome, revealing complex interactions between environmental contaminants and potential health effects. Silicone wristbands (SWBs) have emerged as a novel and non-invasive sampling device for assessing personal external exposure. In this study, SWBs were used as a proxy to estimate personal dermal adsorption (EDdermal) to PLs and OPFRs in Belgian participants for one week; four morning urine samples were also collected and analyzed for estimated daily intake (EDI).

The results of the SWBs samples showed that all the participants were exposed to these chemicals, and the exposure was found to be highest for the legacy and alternative plasticizers (LP and AP), followed by the plasticizers and OPFRs, and controls were altered. Long-term occupational exposure may have a negative influence on inflammation levels and the immune system; therefore, preventative measures should be explored for improved health.

Authors: Shailendra Dwivedi, Praveen Sharma, Apul Goel, Sanjay Khattri, Sanjeev Misra, Kamlesh Kumar Pant


PHARMACEUTICAL/TOXICOLOGY

Phase 1, first-in-human study of TYRP1-TCB (RO7293583), a novel TYRP1-targeting CD3 T-cell engager, in metastatic melanoma: active drug monitoring to assess the impact of immune response on drug exposure

2024-03-21

Introduction: Although checkpoint inhibitors (CPIs) have improved outcomes for patients with metastatic melanoma, those progressing on CPIs have limited therapeutic options. To address this unmet need and overcome CPI resistance mechanisms, novel immunotherapies, such as T-cell engaging agents, are being developed. The use of these agents has sometimes been limited by the immune response mounted against them in the form of anti-drug antibodies (ADAs), which is challenging to predict preclinically and can lead to neutralization of the drug and loss of efficacy. Methods: TYRP1-TCB (RO7293583; RG6232) is a T-cell engaging bispecific (TCB) antibody that targets tyrosinase-related protein 1 (TYRP1), which is expressed in many melanomas, thereby directing T cells to kill TYRP1-expressing tumor cells. Preclinical studies show TYRP1-TCB to have potent anti-tumor activity. This first-in-human (FIH) phase 1 dose-escalation study characterized the safety, tolerability, maximum tolerated dose/optimal biological dose, and pharmacokinetics (PK) of TYRP1-TCB in patients with metastatic melanoma (NCT04551352).

Results: Twenty participants with cutaneous, uveal, or mucosal TYRP1-positive melanoma received TYRP1-TCB in escalating doses (0.045 to 0.4 mg). All participants experienced ≥1 treatment-related adverse event (TRAE); two participants experienced grade 3 TRAEs. The most common toxicities were grade 1-2 cytokine release syndrome (CRS) and rash. Fractionated dosing mitigated CRS and was associated with lower levels of interleukin-6 and tumor necrosis factor-alpha. Measurement of active drug (dual TYRP1- and CD3-binding) PK rapidly identified loss of active drug exposure in all participants treated with 0.4 mg in a flat dosing schedule for ≥3 cycles. Loss of exposure was associated with development
of ADAs towards both the TYRP1 and CD3 domains. A total drug PK assay, measuring free and ADA-bound forms, demonstrated that TYRP1-TCB-ADA immune complexes were present in participant samples, but showed no drug activity in vitro.

Discussion: This study provides important insights into how the use of active drug PK assays, coupled with mechanistic follow-up, can inform and enable ongoing benefit/risk assessment for individuals participating in FIH dose-escalation trials. Translational studies that lead to a better understanding of the underlying biology of cognate T- and B-cell interactions, ultimately resulting in ADA development to novel biotherapeutics, are needed.

Authors: Anna Spreafico, Eva Muñoz Couselo, Anja Irmisch, Juliana Bessa, George Au-Yeung, Oliver Bechter, Inge Marie Svane, Miguel F Sanmamed, Valentina Gambardella, Meredith McKean, Margaret Callahan, Reinhard Dummer, Christian Klein, Pablo Umana, Nicole Justies, Florian Heil, Linda Fahmi, Eugenia Opolka-Hoffmann, Inja Waldhauer, Conrad Bleul, Roland F Staaack, Vaios Karanikas, Stephen Fowler


Antifungal plant flavonoids identified in silico with potential to control rice blast disease caused by Magnaporthe oryzae

2024-04-05

Rice blast disease, caused by the fungus Magnaporthe oryzae, poses a severe threat to rice production, particularly in Asia where rice is a staple food. Concerns over fungicide resistance and environmental impact have sparked interest in exploring natural fungicides as potential alternatives. This study aimed to identify highly potent natural fungicides for combating rice blast disease, with 2-Coumaroylquinic acid, Myricetin, Rosmarinic Acid, and Quercetin standing out as promising and confirmed their biological activity as nuclear receptor ligands and enzyme inhibitors. Overall, this study offers valuable insights into potential natural fungicides for combating rice blast disease, with 2-Coumaroylquinic acid, Myricetin, Rosmarinic Acid, and Quercetin standing out as promising and environmentally friendly alternatives to conventional fungicides. These findings have significant implications for developing crop protection strategies and enhancing global food security, particularly in rice-dependent regions.


OCCUPATIONAL

Squalene Depletion in Skin Following Human Exposure to Ozone under Controlled Chamber Conditions

2024-04-05

A major component of human skin oil is squalene, a highly unsaturated hydrocarbon that protects the skin from atmospheric oxidants. Squalene is also quickly consumed through reactions with ozone and other oxidants. This study examined the extent of squalene depletion in the skin oils of the forearm of human volunteers after exposure to ozone in a climate chamber. Temperature, relative humidity (RH), skin coverage by clothing, and participants’ age were varied in a controlled manner. Concentrations of squalene were determined in skin wipe samples collected before and after ozone exposure. Exposures to ozone resulted in statistically significant decreases in post-exposure squalene concentrations compared to pre-exposure squalene concentrations in the skin wipes when squalene concentrations were normalized by concentrations of co-occurring cholesterol but not by co-occurring pyroglutamic acid (PGA). The rate of squalene loss due to ozonolysis...
was lower than its replenishment on the skin surface. Within the ranges examined, temperature and RH did not significantly affect the difference between normalized squalene levels in post-samples versus pre-samples. Although not statistically significant, skin coverage and age of the volunteers (three young adults, three seniors, and three teenagers) did appear to impact squalene depletion on the skin surfaces.

Authors: Sarka Langer, Charles J Weschler, Gabriel Bekö, Glenn Morrison, Ann Sjöblom, Georgios Giovanoulis, Pawel Wargocki, Nijing Wang, Nora Zannoni, Shen Yang, Jonathan Williams

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The asbestos-asbestos exposure-response relationship: a cohort study of the general working population

2024-04-05

Objectives: The association between asbestos exposure and asbestosis in high-exposed industrial cohorts is well-known, but there is a lack of knowledge about the exposure-response relationship for asbestosis in a general working population setting. We examined the exposure-response relationship between occupational asbestos exposure and asbestosis in asbestos-exposed workers of the Danish general working population.

Methods: We followed all asbestos-exposed workers from 1979 to 2015 and identified incident cases of asbestosis using the Danish National Patient Register. Individual asbestos exposure was estimated with a quantitative job exposure matrix (SYN-JEM) from 1976 onwards and back-extrapolated to age 16 for those exposed in 1976. Exposure-response relations for cumulative exposure and other exposure metrics were analyzed using a discrete time hazard model and adjusted for potential confounders.

Results: The range of cumulative exposure in the population was 0.001 to 18 fibers per milliliter-year (f/ml-year). We found increasing incidence rate ratios (IRR) of asbestosis with increasing cumulative asbestos exposure with a fully adjusted IRR per 1 f/ml-years of 1.18 (95% confidence interval [CI] 1.15–1.22). The IRR was 1.94 (95% CI 1.53–2.47) in the highest compared to the lowest exposure tertile. We similarly observed increasing risk with increasing cumulative exposure in the inception population.

Conclusions: This study found exposure-response relations between cumulative asbestos exposure and incident asbestosis in the Danish general working population with mainly low-level exposed occupations, but there is some uncertainty regarding the exposure levels.

Authors: Inge Brobøl Iversen, Jesper Medom Vestergaard, Johan Ohlander, Susan Peters, Elisabeth Bendorstrup, Jens Peter E Bonde, Vivi Schlünnensen, Jakob H Bønløkke, Finn Rasmussen, Zara A Stokholm, Michael B Andersen, Hans Kromhout, Henrik A Kolstad


Assessment of occupational musculoskeletal disorders (MSDs) among heavy vehicle drivers

2024-04-02

Background: Professional driving requires long hours of work, uncomfortable seats, negotiating rough terrain and highways, and possibly minor repairs and other auxiliary transportation duties. Heavy vehicle drivers driving vehicles such as trucks, bulldozers, etc. due to such working structures are more prone to various musculoskeletal disorders (MSDs) and pain, which is of great concern.

Objectives: In the present study, it is planned to investigate possible ergonomic risk factors such as age, weight, driving exposure, seat suspension systems, lifting heavy weights causing MSDs in drivers of various heavy vehicles. The results of the study are expected to help drivers reduce the risk of MSDs.

Methods: For the present study, the Nordic questionnaire on musculoskeletal disorders was modified and standardized and was administered to the 48 heavy vehicle drivers randomly selected to collect the data.

Results: The analysis divulged that over the past 12 months, lower back pain (LBP) emerged as the most dominant pain experienced by 56% of drivers, followed by knee pain (KP) (43%) and neck pain (NP) (39%) respectively. The prevalence of shoulder pain (SP) was observed to be much lower than in previous literature. The logistic regression model further revealed that increasing age, poor suspension system and poor body posture were significantly associated with lower back pain. Additionally, a poor suspension system and lifting heavy weights had significant effect on the drivers' knee pain.

Conclusion: The results demonstrated the evident necessity for ergonomic consideration in vehicle designing and ergonomic training for heavy vehicle drivers.

Authors: Mohammad Raza, Rajesh Kumar Bhushan, Abid Ali Khan