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ENVIRONMENTAL RESEARCH

Endocrine disrupting effects in western mosquitofish *Gambusia affinis* in two rivers impacted by untreated rural domestic wastewaters

2019-08-12

Domestic wastewaters are an important source of endocrine disrupting chemicals in the receiving aquatic environment. Most rural domestic wastewaters (RDWs) in China have been directly discharged into the aquatic environment without any treatment. In the present study, the authors investigated the effects of RDWs on the western mosquitofish (*Gambusia affinis*) from two rural rivers receiving untreated RDWs. Mosquitofish samples were collected at 5 sampling sites along two rivers during dry and wet seasons. Sex ratios, secondary sex characteristics and transcriptional levels of target genes related to the endocrine system in adult females and males were determined. In parallel, various pollutants including steroid hormones, phenolic compounds, pesticides, polycyclic aromatic hydrocarbons (PAHs) and heavy metals were measured in the water samples at all sites. The results showed that the androgenic effects in the fish were evidenced by significant increase in male to female ratio in fish populations at two sampling sites and by the presence of modified hemal spines in females at four sampling sites when compared to the reference site. The males from the two rivers had increased Vtg mRNA expressions with a maximal 6.2-fold increase relative to the reference site and a delayed development of hemal spines. The redundancy analysis (RDA) showed that some physiological parameters were related to steroid hormones, phenolic compounds and PAHs. The findings from this study suggest that RDWs can lead to masculinisation in females and feminisation in males.

Authors: Huang GY, Liu YS, Liang YQ, Shi WJ, Yang YY, Liu SS, Hu LX, Chen HX, Xie L, Ying GG.

Full Source: *Sci Total Environ.* 2019 Sep 15; 683:61-70. doi: 10.1016/j.scitotenv.2019.05.231. Epub 2019 May 19.

In the present study, the authors investigated the effects of rural domestic waste on the western mosquitofish (*Gambusia affinis*) from two rural rivers.

Trends in the Bioremediation of Pharmaceuticals and Other Organic Contaminants Using Native or Genetically Modified Microbial Strains: A Review

2019-08-12

Nowadays, numerous synthetic chemicals are extensively produced and consequently used worldwide for many different purposes, such as

pharmaceuticals, pesticides, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and other organic species. The presence of the aforementioned xenobiotic substances not only in various environmental matrices (water, air, and soil), but also in biological tissues (organisms) as well as in several compartments of raw or processed food (of fruit, vegetal, and animal origin), has raised global scientific concerns regarding their potential toxicity towards non target organisms including humans. Additionally, the ability of those persistent organic pollutants to be magnified through the food chain has become a serious health hazard for humankind. Microbial degradation is considered one of the major factors influencing the persistence of those toxicants in each matrix. The technique of bioremediation, either with microorganisms (native or genetically modified) which are applied directly (in a reactor or in situ), or with cell extracts or purified enzymes preparations, is reported as a low cost and potential detoxification technology for the removal of toxic chemicals. After a brief introduction and an outline of the sources and harmful effects of each chemical family of selected pollutants, bioremediation applications of pharmaceuticals and other organic contaminants using microbial strains are critically reviewed. The recent advances in understanding the biodegradation of organic contaminants focusing on the processes, pathways, genes/enzymes and factors affecting the biodegradation have also been presented in this review article. Research needs and future trends in the decontamination strategies and methods applied are also discussed.

Authors: Petsas AS, Vagi MC.

Full Source: Current Pharmaceutical Biotechnology. 2019 May 27. doi: 10.2174/1389201020666190527113903. [Epub ahead of print]

In this method target chemicals were extracted by tandem SPE and then determined by LC-QTOF-MS-SWATH.

Comprehensive Target Analysis for 484 Organic Micropollutants in Environmental Waters by the Combination of Tandem Solid-Phase Extraction and Quadrupole Time-of-Flight Mass Spectrometry with Sequential Window Acquisition of All Theoretical Fragment-Ion Spectra Acquisition

2019-08-12

There are many thousands of chemicals in use for a wide range of purposes, and highly efficient analytical methods are required to monitor them for protection of the environment. In order to cope with this difficult task, the authors developed a novel, comprehensive method for 484 substances in water samples. In this method target chemicals

were extracted by tandem SPE and then determined by LC-QTOF-MS-SWATH. Targets were unambiguously identified using retention times, accurate masses of a precursor and two product ions, their ion ratios, and accurate MS/MS spectrum. Quantitation was achieved by the internal standard method using a precursor ion. Results of recovery tests at two concentrations (50 and 500 ng L⁻¹) showed average recoveries of 87.5% and 87.0% (RSD, 9.1% and 9.4%), respectively. Limits of detection of one-half of the targets were below 1.0 ng L⁻¹. The method was applied to the influent and effluent of a sewage treatment plant, and around 100 chemicals were detected. Results of examination on matrix effects using their extracts spiked with 209 pesticides showed that the ratios of detected amounts between the extracts and the standard solution were 89.8% (influent) and 91.7% (effluent), respectively. In addition, investigation on the stability of calibration curves by injecting the same standards for 1 year showed that their quantitative results did not change; average accuracy was 103.3% (RSD, 10.0%), indicating that the calibration curves can be used for an extended period of time without calibration, and quantitative retrospective analysis can be done after creating calibration curves for new targets.

Authors: Kadokami K, Ueno D.

Full Source: Analytical Chemistry. 2019 Jun 18;91(12):7749-7755. doi: 10.1021/acs.analchem.9b01141. Epub 2019 Jun 7.

Occurrence and Degradation Potential of Fluoroalkylsilane Substances as Precursors of Perfluoroalkyl Carboxylic Acids

2019-08-12

Polyfluoroalkylsilanes (PFASis) are a class of artificial chemicals with wide applications in surface coating, which arouse attention due to their hydrophobic/oleophobic properties and potential biological effects. In this study, a robust high-resolution mass spectrometry method through direct injection into a Fourier transform ion cyclotron resonance instrument was established, with the aid of CF₂-scaled Kendrick mass defect analysis and isotope fine structure elucidation. The occurrence of 8:2 polyfluoroalkyl trimethoxysilane (8:2 PTrMeOSi) and 8:2 polyfluoroalkyl triethoxysilane (8:2 PTrEtOSi), as well as their cationic adducts, solvent substitutions, and other compound analogues, were identified in commercial antifingerprint liquid products. In the hydroxyl radical-based total oxidizable precursor assay, differential molar yields of products were observed with regard to varied PFASi carbon-chain lengths and terminal groups. The yields of perfluoroalkyl carboxylic acids (PFCAs) from 8:2 PTrMeOSi conversion were the highest (92 ± 9%, n = 3), with the C (n - 1) perfluoroheptanoic acid

In this study, a robust high-resolution mass spectrometry method through direct injection into a Fourier transform ion cyclotron resonance instrument was established

(PFHpA, $49 \pm 11\%$, $n = 3$) as the dominating product. Distinct conversion of 8:2 PTrMeOSi in the simulated solar exposure experiments found that C (n) perfluorooctanoic acid (PFOA, $0.6 \pm 0.04\%$, $n = 3$) was predominant, and 8:2 fluorotelomer carboxylic acid (8:2 FTCA, $0.59 \pm 0.08\%$, $n = 3$), 8:2 fluorotelomer unsaturated carboxylic acid (8:2 FTUCA, $0.09 \pm 0.00\%$, $n = 3$) intermediates were also observed. The authors concluded that this is the first report regarding the occurrence and degradation potential of several fluoroalkylsilane substances as PFCA precursors.

Authors: Zhu B, Jiang W, Wang W, Lin Y, Ruan T, Jiang G.

Full Source: Environmental Science & Technology. 2019 Apr 26. doi: 10.1021/acs.est.9b00690. [Epub ahead of print]

Electrophilicity index as a critical indicator for the biodegradation of the pharmaceuticals in aerobic activated sludge processes

2019-08-12

Improving biodegradation of pharmaceuticals during wastewater treatment is critical to control the release of emerging micropollutants to natural waters. In this study, biodegradation of six model pharmaceuticals was investigated at different initial concentrations in two discrete activated sludge systems, and moreover, the correlation was explored between the biodegradation rate and key molecular properties of the contaminants. First, the biodegradation rates of the pharmaceuticals were measured fitting a pseudo first-order kinetic model to the experimental kinetic data. The degradation rate constants (k_{bio}) were found to negatively correlate to the initial concentration of the chemicals, indicating an inhibitory effect on the microorganisms by the pharmaceuticals. Further examinations of the rate data against the key molecular properties of the pharmaceuticals revealed, for the first time, that the electrophilicity index (ω), a measure of electrophilic power, served as a better indicator of the biodegradability and predictive parameter for the k_{bio} than the conventional log KOW (a measure of hydrophobicity) in the two discrete aerobic activated sludge systems. However, the correlation strength (goodness of fit) between ω and k_{bio} deteriorated when the reactor turned from aerobic to anoxic and anaerobic conditions, suggesting that electron transfer from pharmaceutical molecules to enzymes was inhibited when dissolved oxygen was deficit or absent. The results show that ω can potentially serve as a straightforward and

In this study, biodegradation of six model pharmaceuticals was investigated at different initial concentrations in two discrete activated sludge systems, and moreover, the correlation was explored between the biodegradation rate and key molecular properties of the contaminants.

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robust indicator for predicting the biodegradability of pharmaceutical in conventional activated sludge processes.

Authors: Wei Z, Li W, Zhao D, Seo Y, Spinney R, Dionysiou DD, Wang Y, Zeng W, Xiao R.

Full Source: Water Research. 2019 Sep 1; 160:10-17. doi: 10.1016/j.watres.2019.05.057. Epub 2019 May 18.

MEDICAL RESEARCH

Exploring the Effects of Vitamin D Supplementation on Cognitive Functions and Mental Health Status in Subjects Under Methadone Maintenance Treatment

2019-08-12

Vitamin D deficiency may be linked to several mental complications including cognitive deficits, depression, and anxiety in patients under methadone maintenance treatment (MMT). This study was designed to explore the effect of vitamin D supplementation on cognitive functions and mental health parameters in subjects under MMT. This randomised, double-blinded, placebo-controlled clinical trial was carried out among 64 patients under MMT. Participants were randomly allocated to receive either 50,000 IU vitamin D supplements (n=32) or placebo (n=32) every 2 weeks for 24 weeks. Cognitive functions and mental health parameters were taken at baseline and posttreatment to evaluate relevant variables. After the 24-week intervention, compared with the placebo, serum 25(OH) vitamin D levels significantly increased in participants who received vitamin D supplements (β 14.50; 95% confidence interval [CI], 13.17-15.83; $P < 0.001$). In addition, compared with the placebo, subjects who received vitamin D had a significant reduction in Iowa Gambling Task (β -6.25; 95% CI, -8.60 to -3.90; $P < 0.001$), and significant increases in Verbal Fluency Test (β 2.82; 95% CI, 0.78-4.86; $P = 0.007$), Immediate Logic Memory (β 1.32; 95% CI, 0.27-2.37; $P = 0.01$), Reverse Digit Span (β 2.06; 95% CI, 1.18-2.94; $P < 0.001$) and visual working memory (β 0.75; 95% CI, 0.33-1.16; $P = 0.001$). Also, vitamin D supplementation significantly improved BDI (β -2.76; 95% CI, -3.97 to -1.55; $P < 0.001$) compared with the placebo. When we applied Bonferroni correction, LM-Immediate ($P = 0.07$) became nonsignificant, and other mental health parameters did not alter. Overall, taking 50,000 IU vitamin D supplements every 2 weeks for 24 weeks by patients under

This study was designed to explore the effect of vitamin D supplementation on cognitive functions and mental health parameters in subjects under methadone maintenance treatment.

MMT had beneficial effects on cognitive functions and some mental health parameters. Further studies are needed to confirm the findings.

Authors: Ghaderi A, Rasouli-Azad M, Farhadi MH, Mirhosseini N, Motmaen M, Pishyareh E, Omid A, Asemi Z.

Full Source: Journal of Addiction Medicine. 2019 May 24. doi: 10.1097/ADM.0000000000000550. [Epub ahead of print]

α 7 Nicotinic Acetylcholine Receptor Signalling Modulates Ovine Foetal Brain Astrocytes Transcriptome in Response to Endotoxin

2019-08-12

Neuroinflammation in utero may result in lifelong neurological disabilities. Astrocytes play a pivotal role in this process, but the mechanisms are poorly understood. No early postnatal treatment strategies exist to enhance neuroprotective potential of astrocytes. The authors hypothesised that agonism on α 7 nicotinic acetylcholine receptor (α 7nAChR) in foetal astrocytes will augment their neuroprotective transcriptome profile, while the inhibition of α 7nAChR will achieve the opposite. Using an in vivo-in vitro model of developmental programming of neuroinflammation induced by lipopolysaccharide (LPS), the authors validated this hypothesis in primary foetal sheep astrocytes cultures re-exposed to LPS in the presence of a selective α 7nAChR agonist or antagonist. The RNAseq findings show that a pro-inflammatory astrocyte transcriptome phenotype acquired in vitro by LPS stimulation is reversed with α 7nAChR agonistic stimulation. Conversely, α 7nAChR inhibition potentiates the pro-inflammatory astrocytic transcriptome phenotype. Furthermore, we conducted a secondary transcriptome analysis against the identical α 7nAChR experiments in foetal sheep primary microglia cultures. Similar to findings in foetal microglia, in foetal astrocytes the authors observed a memory effect of in vivo exposure to inflammation, expressed in a perturbation of the iron homeostasis signalling pathway (hemoxygenase 1, HMOX1), which persisted under pre-treatment with α 7nAChR antagonist but was reversed with α 7nAChR agonist. For both glia cell types, common pathways activated due to LPS included neuroinflammation signalling and NF- κ B signalling in some, but not all comparisons. However, overall, the overlap on the level of signalling pathways was rather minimal. Astrocytes, not microglia-the primary immune cells of the brain, were characterised by unique inhibition patterns of STAT3 pathway due to agonistic stimulation of α 7nAChR prior

The authors hypothesised that agonism on α 7 nicotinic acetylcholine receptor (α 7nAChR) in foetal astrocytes will augment their neuroprotective transcriptome profile, while the inhibition of α 7nAChR will achieve the opposite.

to LPS exposure. Lastly, the implications of the findings for foetal and postnatal brain development were discussed.

Authors: Cao M, MacDonald JW, Liu HL, Weaver M, Cortes M, Durosier LD, Burns P, Fecteau G, Desrochers A, Schulkin J, Antonelli MC, Bernier RA, Dorschner M, Bammler TK, Frasch MG.

Full Source: *Frontiers in Immunology*. 2019 May 9; 10:1063. doi: 10.3389/fimmu.2019.01063. eCollection 2019.

Nanoparticle exposure driven circulating bioactive peptidome causes systemic inflammation and vascular dysfunction

2019-08-12

The mechanisms driving systemic effects consequent pulmonary nanoparticle exposure remain unclear. Recent work has established the existence of an indirect process by which factors released from the lung into the circulation promote systemic inflammation and cellular dysfunction, particularly on the vasculature. However, the composition of circulating contributing factors and how they are produced remains unknown. Evidence suggests matrix protease involvement; thus, here we used a well-characterised multi-walled carbon nanotube (MWCNT) oropharyngeal aspiration model with known vascular effects to assess the distinct contribution of nanoparticle-induced peptide fragments in driving systemic pathobiology. Data-independent mass spectrometry enabled the unbiased quantitative characterisation of 841 significant MWCNT-responses within an enriched peptide fraction, with 567 of these factors demonstrating significant correlation across animal-paired bronchoalveolar lavage and serum biofluids. A database search curated for known matrix protease substrates and predicted signalling motifs enabled identification of 73 MWCNT-responsive peptides, which were significantly associated with an abnormal cardiovascular phenotype, extracellular matrix organisation, immune-inflammatory processes, cell receptor signalling, and a MWCNT-altered serum exosome population. Production of a diverse peptidomic response was supported by a wide number of upregulated matrix and lysosomal proteases in the lung after MWCNT exposure. The peptide fraction was then found bioactive, producing endothelial cell inflammation and vascular dysfunction *ex vivo* akin to that induced with whole serum. Results implicate receptor ligand functionality in driving systemic effects, exemplified by an identified 59-merthrombospondin fragment, replete with CD36 modulatory motifs, that when synthesised produced an anti-angiogenic response *in vitro* matching that of the peptide fraction. Other identified peptides

point to integrin ligand functionality and more broadly to a diversity of receptor-mediated bioactivity induced by the peptidomic response to nanoparticle exposure. The authors concluded that the present study demonstrates that pulmonary-sequestered nanoparticles, such as multi-walled carbon nanotubes, acutely upregulate a diverse profile of matrix proteases, and induce a complex peptidomic response across lung and blood compartments. The serum peptide fraction, having cell-surface receptor ligand properties, conveys peripheral bioactivity in promoting endothelial cell inflammation, vasodilatory dysfunction and inhibiting angiogenesis. Results here establish peptide fragments as indirect, non-cytokine mediators and putative biomarkers of systemic health outcomes from nanoparticle exposure.

Authors: Mostovenko E, Young T, Muldoon PP, Bishop L, Canal CG, Vucetic A, Zeidler-Erdely PC, Erdely A, Campen MJ, Ottens AK.

Full Source: Particle and Fibre Toxicology. 2019 May 29;16(1):20. doi: 10.1186/s12989-019-0304-6.

Nickel allergy and allergic contact dermatitis: A clinical review of immunology, epidemiology, exposure, and treatment.

2019-08-12

Nickel is the most frequent cause of contact allergy worldwide and has been studied extensively. This clinical review provides an updated overview of the epidemiology, exposure sources, methods for exposure quantification, skin deposition and penetration, immunology, diagnosis, thresholds for sensitisation and elicitation, clinical pictures, prevention, and treatment. The implementation of a nickel regulation in Europe led to a decrease in the prevalence of nickel allergy, and changes in the clinical picture and disease severity. Nevertheless, the prevalence of nickel allergy in the European general population are approximately 8% to 19% in adults and 8% to 10% in children and adolescents, with a strong female predominance. Well-known consumer items such as jewellery and metal in clothing are still the main causes of nickel allergy and dermatitis, although a wide range of items for both private and occupational use may cause dermatitis. Allergic nickel dermatitis may be localised to the nickel exposure site, be more widespread, or present as hand eczema. Today, efficient methods for exposure quantification exist, and new insights regarding associated risk factors and immunological mechanisms underlying the disease have been obtained. Nevertheless, questions

This clinical review provides an updated overview of the epidemiology, exposure sources, methods for exposure quantification, skin deposition and penetration, immunology, diagnosis, thresholds for sensitisation and elicitation, clinical pictures, prevention, and treatment.

remain in relation to the pathogenesis, the persistent high prevalence, and the treatment of severe cases.

Authors: Ahlström MG, Thyssen JP, Wennervaldt M, Menné T, Johansen JD.

Full Source: Contact Dermatitis. 2019 May 28. doi: 10.1111/cod.13327.

[Epub ahead of print]

Attack-related damage of thalamic nuclei in neuromyelitis optica spectrum disorders

2019-08-12

In neuromyelitis optica spectrum disorders (NMOSD) thalamic damage is controversial, but thalamic nuclei were never studied separately. In the present study, the authors aimed at assessing volume loss of thalamic nuclei in NMOSD. We hypothesised that only specific nuclei are damaged, by attacks affecting structures from which they receive afferences: the lateral geniculate nucleus (LGN), due to optic neuritis (ON) and the ventral posterior nucleus (VPN), due to myelitis. Thirty-nine patients with aquaporin 4-IgG seropositive NMOSD (age: 50.1 ± 14.1 years, 36 women, 25 with prior ON, 36 with prior myelitis) and 37 healthy controls (age: 47.8 ± 12.5 years, 32 women) were included in this cross-sectional study. Thalamic nuclei were assessed in magnetic resonance images, using a multi-atlas-based approach of automated segmentation. Retinal optical coherence tomography was also performed. Patients with ON showed smaller LGN volumes (181.6 ± 44.2 mm³) compared with controls (198.3 ± 49.4 mm³; $B = -16.97$, $p = 0.004$) and to patients without ON (206.1 ± 50 mm³; $B = -23.74$, $p = 0.001$). LGN volume was associated with number of ON episodes ($Rho = -0.536$, $p < 0.001$), peripapillary retinal nerve fibre layer thickness ($B = 0.70$, $p < 0.001$) and visual function ($B = -0.01$, $p = 0.002$). Although VPN was not smaller in patients with myelitis (674.3 ± 67.5 mm³) than controls (679.7 ± 68.33 ; $B = -7.36$, $p = 0.594$), the authors found reduced volumes in five patients with combined myelitis and brainstem attacks ($B = -76.18$, $p = 0.017$). Volumes of entire thalamus and other nuclei were not smaller in patients than controls. These findings suggest attack-related anterograde degeneration rather than diffuse thalamic damage in NMOSD. They also support a potential role of LGN volume as an imaging marker of structural brain damage in these patients.

Authors: Papadopoulou A, Oertel FC, Gaetano L, Kuchling J, Zimmermann H, Chien C, Siebert N, Asseyer S, Bellmann-Strobl J, Ruprecht K, Chakravarty MM, Scheel M, Magon S, Wuerfel J, Paul F, Brandt AU.

Full Source: Journal of Neurology, Neurosurgery, and Psychiatry. 2019 May 24. pii: jnnp-2018-320249. doi: 10.1136/jnnp-2018-320249. [Epub ahead of print]

In the present study, the authors aimed at assessing volume loss of thalamic nuclei in NMOSD.

OCCUPATIONAL RESEARCH

An Online Survey of Occupational Hazards in Brazilian Aquaculture.

2019-08-12

Information on occupational health and safety practices in Brazilian aquaculture is limited. This study reports preliminary results from an online survey based on research questions to identify occupational hazards, risk assessment practices, and prevention measures adopted in Brazilian aquaculture. Data were collected through an online questionnaire, comprising 25 questions, on a voluntary and anonymous basis.

Aquaculture stakeholders were invited to participate in the study through email and social media channels. The demographic data demonstrated that the majority of respondents were men (72%) and having a higher education (95%). Most respondents employed administrative controls and personal protective equipment (PPE) rather than substitution and other risk elimination measures to reduce exposure. The most commonly adopted measures were PPE use (87%), adequate handling of chemicals (86%), and imparting knowledge of risks (90%). However, only 12% of participants reported the presence of safety protocols at their workplace, and 17% had some form of immunisation of workers. In this study, it was possible to identify a lack of hazard signage in the workplace and lack of occupational health and safety training. The results further indicate that risk management in aquaculture continues to be a challenge in low-income countries. Aquaculture farmers should be encouraged and supported in adopting measures and appropriate technologies to eliminate risks in Brazilian aquaculture.

Authors: Marques FB, Bettoni GN, de Brito B, de Brito KCT, Fermino MH, Ngajilo D, Peixoto Ramos AS, Dos Santos BGT, Stech MR, Watterson A, Cavalli LS.

Full Source: Journal of Agromedicine. 2019 Jul 29:1-7. doi: 10.1080/1059924X.2019.1647323. [Epub ahead of print]

Reduction of operator radiation exposure using a passive robotic device during fluoroscopy-guided arterial puncture: an experimental study in a swine model

2019-08-12

Vascular interventions imply radiation exposure to the operating physician (OP). To reduce radiation exposure, the authors propose a novel passive robotic device for fluoroscopy-guided arterial puncturing.

This study reports preliminary results from an online survey based on research questions to identify occupational hazards, risk assessment practices, and prevention measures adopted in Brazilian aquaculture.

Technical

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X-ray dose rates were measured for a total of 30 fluoroscopy-guided puncture femoral arteries in 15 pigs. Fifteen punctures were performed with the device while the other 15 were performed without the device by an interventional cardiologist with 10 years of experience. Parametric t test was used. The success rate with the device was 100%. Overall, the OP received more radiation (0.41 mSv/h) as compared to the assistant (0.06 mSv/h) ($p < 0.001$) and, amongst OP's body parts, hands received more radiation than other body parts ($p < 0.001$). The radiation dose rate to the OP's hands during arterial puncturing performed manually without the device was 0.95 ± 0.25 mSv/h whereas it was 0.14 ± 0.006 mSv/h using the device, resulting in an 85% reduction ($p < 0.001$). For the head, the dose was reduced from 0.16 mSv/h to 0.08 mSv/h (50% reduction, $p < 0.001$), and for the dominant arm, from 0.12 mSv/h to 0.07 mSv/h (42% reduction, $p < 0.001$). The fluoroscopy time was reduced from 4.5 ± 0.15 min to 4.3 ± 0.11 min device ($p = 0.002$). In a swine model, fluoroscopy time and radiation exposure for the OP puncturing femoral artery were significantly reduced by using the passive robotic device.

Authors: Khan MUA, Yoon CH, Yi BJ.

Full Source: European Radiology Experimental. 2019 May 29;3(1):20. doi: 10.1186/s41747-019-0098-1.

Filaggrin variations are associated with PAH metabolites in urine and DNA alterations in blood

2019-08-12

Dermal chemical exposure is common in many professions. The filaggrin protein is important for the skin barrier and variations in the filaggrin gene (FLG) may influence the uptake of chemicals via the skin, and consequently, the degree of systemic effects. The aim of this study was to investigate, in chimney sweeps with occupational exposure to polycyclic aromatic hydrocarbons (PAH) from soot, the influence of variation in FLG on internal PAH dose and DNA alterations, including epigenetic, previously linked to cancer and cardiovascular disease. TaqMan PCR was used to genotype 151 chimney sweeps and 152 controls for four FLG null variants (R501X, R2447X, S3247X and 2282del4) which cause impaired skin barrier, and FLG copy number variation (12th repeat, CNV12) which potentially is beneficial for the skin barrier. The internal dose of PAH was represented by urinary PAH metabolites (e.g. 1-hydroxypyrene and 3-hydroxybenzo[a]pyrene) that the authors measured by LC-MS/MS. Epigenetic alterations (methylation of AHRR and F2RL3) in blood were measured by pyrosequencing; and DNA alterations (telomere length and mitochondrial DNA copy number) by real-time PCR. Hypomethylation of

The aim of this study was to investigate, in chimney sweeps with occupational exposure to polycyclic aromatic hydrocarbons (PAH) from soot, the influence of variation in FLG on internal PAH dose and DNA alterations, including epigenetic, previously linked to cancer and cardiovascular disease.

AHRR or F2RL3 is a risk factor for lung cancer and shorter telomere length a risk factor for cardiovascular disease. The frequencies of FLG null were 8.6 and 11.8% ($p = 0.35$), and CNV12 27.8 and 19.7% ($p = 0.09$) in chimney sweeps and controls, respectively. It was found that among chimney sweeps working predominately with soot sweeping (high PAH exposure), CNV12 carriers had lower concentrations of PAH metabolites in urine compared with non-carriers (median 1-hydroxypyrene = 0.37 vs 0.86 $\mu\text{g/g}$ creatinine respectively; $p = 0.025$ by linear regression models adjusted for age, BMI and smoking) compared to sweeps not carrying CNV12. Further, FLG null was associated with approximately 2.5% higher methylation of F2RL3 (cg03636183, $p = 0.019$ after adjustment for exposure group, age, BMI and smoking). FLG null was associated with approximately 7% shorter telomere length ($p = 0.015$, adjusted model). These results suggest that FLG variations may influence the dose of PAH in highly exposed workers, possibly via dermal uptake. It also suggests that FLG variation may influence the degree of (epi)genotoxicity in the body. FLG variation is common in the working population and should be considered in risk assessment.

Authors: Wahlberg K, Liljedahl ER, Alhamdow A, Lindh C, Lidén C, Albin M, Tinnerberg H, Broberg K.

Full Source: Environmental Research. 2019 Jul 22; 177:108600. doi: 10.1016/j.envres.2019.108600. [Epub ahead of print]

Removal of F-53B as PFOS alternative in chrome plating wastewater by UV/Sulfite reduction

2019-08-12

Chrome mist suppressants are key chemicals used in the chrome plating industry to reduce exposure of workers by inhalation to airborne chromic acid pollution. Perfluoroalkyl sulfonated compounds are excellent mist suppressants, thanks to their chemical stability and surface activity. Therefore, despite mounting evidence for their persistence, bioaccumulation and toxicity, it is likely that such chemicals will continue to be used for the foreseeable future because of their importance and lack of alternatives. The present study is aimed at assessing the feasibility of advanced reduction as an effective technology to treat chrome plating industry wastewater. In particular, wastewater containing a chlorinated polyfluorinated ether sulfonate (i.e. F-53B), an alternative to perfluorooctanesulfonate (PFOS) used to prepare chrome mist suppressant in China, was treated by UV-activated sulfite. Results demonstrates that in ultrapure water F-53B can be easily degraded within 1 min-much faster than PFOS. Stoichiometric fluoride recovery

The present study is aimed at assessing the feasibility of advanced reduction as an effective technology to treat chrome plating industry wastewater.

was also achieved, confirming significant defluorination of the pollutant. Such superior reducibility was due to the presence of chlorine atoms, as corroborated by quantum chemical calculations. F-53B degradation was also achieved in chrome plating industrial wastewater, which yielded results were slower than those achieved in the laboratory nonetheless obtained complete abatement within 60 min. These results suggest that the proposed advanced reduction process is one of the safest options to control PFAS discharge in the environment and reduce the related risks to ecosystems.

Authors: Bao Y, Huang J, Cagnetta G, Yu G.

Full Source: Water Research. 2019 Jul 23; 163:114907. doi: 10.1016/j.watres.2019.114907. [Epub ahead of print]

Characterisation of airborne particles from cleaning sprays and their corresponding respiratory deposition fractions

2019-08-12

Cleaning workers are exposed to many risk factors, including handling of cleaning products. Epidemiological studies show that they have a high incidence of asthma and other respiratory symptoms. Some studies have indicated an even higher incidence of asthma in individuals using cleaning sprays regularly. It is known that sprays produce an aerosol that can expose the respiratory system to chemicals. Knowledge of the physical characteristics of the airborne particles, as well as the characteristics of the gas phase, is needed to determine how they affect the respiratory tract and why they cause airway symptoms. The aim of this study was to characterise the aerosols from seven different ready-to-use trigger cleaning sprays in terms of total airborne mass fraction, particle size distribution, and new particle formation from ozone reactions. An additional aim was to calculate the respiratory deposition fraction of the measured particles. The total airborne mass fraction was determined by comparing the mass deposited on the chamber wall with the mass emitted from the bottle during spraying. Particle number concentration and size distribution of the airborne particles were measured using an aerodynamic particle sizer and a fast aerosol mobility size spectrometer. The total airborne mass fraction was between 2.7% and 32.2% of the mass emitted from the bottle, depending on the product. Between 0.0001% and 0.01% of the total airborne mass fraction consisted of residual particles. However, these particles had a mass median aerodynamic diameter between 1.9 μm and 3.7 μm , constituting a total respiratory deposition of up to 77%. New particle formation in the presence of ozone was also shown to vary between 5,000 cm^{-3} and

The aim of this study was to characterise the aerosols from seven different ready-to-use trigger cleaning sprays in terms of total airborne mass fraction, particle size distribution, and new particle formation from ozone reactions.

35,000 cm⁻³ depending on the product, in the studied settings. These findings confirm that a substantial part (up to 1/3) of the mass sprayed from the bottle does not reach the intended surface. Thus, the use of cleaning sprays can result in chemical airway exposure, with particles in the relevant size range for both nasal and alveolar deposition.

Authors: Lovén K, Isaxon C, Wierzbicka A, Gudmundsson A.

Full Source: Journal of Occupational & Environmental Hygiene. 2019 Jul 30:1-12. doi: 10.1080/15459624.2019.1643466. [Epub ahead of print]

PUBLIC HEALTH RESEARCH

Evaluating access to essential medicines for treating childhood cancers: a medicines availability, price and affordability study in New Delhi, India

2019-08-12

Limited access to essential medicines (EMs) for treating chronic diseases is a major challenge in low-income and middle-income countries. Although India is the largest manufacturer of generic medicines, there is a paucity of information on availability, price and affordability of anti-neoplastic EMs, which this study evaluates. Using a modified WHO/Health Action International methodology, data were collected on availability and price of 33 strength-specific anti-neoplastic EMs and 4 non-cancer EMs. Seven 'survey anchor' hospitals (4 public and 3 private) and 32 private-sector retail pharmacies were surveyed. Median price ratios (MPRs) were calculated by comparing consumer prices with international reference prices (IRPs). On average, across survey anchor areas (hospital and private-sector retail pharmacies combined), the mean availability of anti-neoplastic EMs and non-cancer medicines was 70% and 100%, respectively. Mean availability of anti-neoplastic EMs was 38% in private-sector retail pharmacies, 43% in public hospital pharmacies and 71% in private hospital pharmacies. Median MPR of lowest-priced generic versions was 0.71 in retail pharmacies. The estimated cost of chemotherapy medicines needed for treating a 30 kg child with standard-risk leukaemia was INR 27 850 (US\$442) and INR 17 500 (US\$278) for Hodgkin's lymphoma, requiring 88- and 55-days' wages, respectively, for the lowest paid government worker. Most anti-neoplastic EMs are found in survey anchor areas, however, mean availability was less than non-cancer medicines; not meeting the WHO target of 80%. Medicine prices

were relatively low in New Delhi compared with IRPs. However, the cost of chemotherapy medicines seems unaffordable in the local context.

Authors: Faruqui N, Martiniuk A, Sharma A, Sharma C, Rathore B, Arora RS, Joshi R.

Full Source: BMJ Glob Health. 2019 Apr 23;4(2): e001379. doi: 10.1136/bmjgh-2018-001379. eCollection 2019.

Phthalates in infant cotton clothing: Occurrence and implications for human exposure

2019-08-12

Clothing easily adsorbed the chemicals in the environment, and became a source of human exposure to chemicals. However, large contacted surface area and long exposure duration have elevated human exposure to chemicals from clothing, such as phthalates. Among them, cotton clothing, which infants prefer to wear, has been proven to adsorb phthalates more easily than other fabrics. While infants are developing, they are easily affected by phthalates. In this study, in order to study accumulation of phthalates in infant cotton clothing during the whole process from production to the first wearing, 24 infant cotton clothing samples were collected from shopping malls in Harbin, China. High detection rates and concentrations suggest that phthalates in the environment are widely adsorbed to infant cotton clothing, and traditional laundering for infant clothing cannot remove phthalates completely. The median concentration of the total phthalates was 4.15 µg/g. Di-(2-ethylhexyl) phthalate (DEHP) has become the dominant phthalate. For the estimated daily intakes (EDIs) for infants, dibutyl phthalate (DBP) had the highest contribution, followed by di-iso-butyl phthalate (DiBP) and DEHP. Dermal absorption has become the main route of infant exposure to phthalates, and ingestion contributed very little. The result of comparing with the EDIs via dermal absorption from house air and dust suggests that clothing plays an important role of dermal absorption exposure to phthalates. For risk assessment, the carcinogenic risk of BBP and DEHP indicates that the level of DEHP in infant cotton clothing might pose potential adverse effects to infant health.

Authors: Li HL, Ma WL, Liu LY, Zhang Z, Sverko E, Zhang ZF, Song WW, Sun Y, Li YF.

Full Source: Science of the Total Environment. 2019 Sep 15; 683:109-115. doi: 10.1016/j.scitotenv.2019.05.132. Epub 2019 May 11.

This study investigated the accumulation of phthalates in infant cotton clothing from production to first wearing.

Building and Applying Quantitative Adverse Outcome Pathway Models for Chemical Hazard and Risk Assessment

2019-08-12

An important goal in toxicology is the development of new ways to increase the speed, accuracy and applicability of chemical hazard and risk assessment approaches. A promising route for this is the integration of in vitro assays with biological pathway information. In the present study, the authors examine how the Adverse Outcome Pathway (AOP) framework can be used to develop pathway based quantitative models useful for regulatory chemical safety assessment. By using AOPs as initial conceptual models and the AOP knowledge base as a source of data on key event relationships, different methods can be applied to develop computational quantitative AOP models (qAOPs) relevant for decision making. A qAOP model may not necessarily have the same structure as the AOP it is based on. Useful AOP modelling methods range from statistical, Bayesian networks, regression, and ordinary differential equations to individual-based models and should be chosen according to the questions being asked and the data available. The authors discuss the need for toxicokinetic models to provide linkages between exposure and qAOPs, to extrapolate from in vitro to in vivo, and to extrapolate across species. Finally, we identified best practices for modelling, model building and the necessity for transparent and comprehensive documentation to gain confidence in the use of a quantitative AOP models and ultimately their use in regulatory applications.

Authors: Perkins EJ, Ashauer R, Burgoon L, Conolly R, Landesmann B, Mackay C, Murphy CA, Pollesch N, Wheeler JR, Zupanic A, Scholz S.

Full Source: Environmental Toxicology & Chemistry. 2019 May 25. doi: 10.1002/etc.4505. [Epub ahead of print]

In the present study, the authors examine how the Adverse Outcome Pathway (AOP) framework can be used to develop pathway based quantitative models useful for regulatory chemical safety assessment.

Non-targeted screening and analysis of volatile organic compounds in drinking water by DLLME with GC-MS

2019-08-12

Volatile organic compounds (VOCs) in drinking water may potentially be hazardous. The authors developed a novel non-targeted analysis method of VOCs in drinking water that uses dispersive liquid-liquid microextraction coupled with gas chromatography-mass spectrometry. Analysis parameters were selected from range-finding tests on the peak number and average area of the extracted compounds. The optimised method was applied to analyse VOCs in tap water samples collected from Wuhan City, China. Twenty-seven compounds with high match degrees

and a high prevalence were selected for quantification and evaluation. The authors used structure-activity relationships to predict the carcinogenicity of these compounds. Although most of the compounds were non-toxic, compounds such as dibutyl phthalate and diacetone alcohol should be investigated further. Untargeted analysis of the tap water samples identified 75-200 VOCs, including 67 highly prevalent compounds. Industrial and pharmaceutical chemicals accounted for approximately 70% of the VOCs in the samples. This method of non-targeted analysis and in silico toxicity prediction is simple and economic, and could be used in screening VOCs in drinking water.

Authors: Yang X, Wang C, Shao H, Zheng Q.

Full Source: Science of the Total Environment. 2019 Jul 19; 694:133494. doi: 10.1016/j.scitotenv.2019.07.300. [Epub ahead of print]

Association between perfluoroalkyl substance concentrations and blood pressure in adolescents

2019-08-12

The effects of exposure to some environmental chemicals on blood pressure have been determined, but the association between non-occupational exposure to perfluoroalkyl substances (PFASs) and blood pressure in adolescents remains unknown. The association between blood pressure and PFAS concentrations was studied by analysing data from 2251 participants filtered from the population enrolled in the National Health and Nutrition Examination Survey (NHANES) from 2003 to 2012. After adjusting for age, sex, race, BMI, cotinine level, dietary intake of calcium, caloric intake, sodium consumption, potassium consumption and sampling year, we estimated the coefficients (betas) and 95% confidence intervals (CIs) for the relationship between PFAS concentrations and blood pressure with multiple linear regression models. Potential non-linear relationships were assessed with restricted cubic spline models. Blood levels of perfluorooctane sulfonic acid (PFOS) had a strong positive association with diastolic blood pressure (DBP) in adolescents in the linear model, while the result was not significant in the non-linear model. No significant association was observed between the concentration of any other PFASs and blood pressure. According to the fully adjusted linear regression model ($P = 0.041$), the mean DBP values in boys in the higher PFOS quintile were 2.70% greater than the mean DBP values of boys in the lowest PFOS quintile. Furthermore, serum PFOS concentrations predominantly affected blood pressure in male adolescents compared with female adolescents. These results provide epidemiological evidence

The association between blood pressure and PFAS concentrations was studied by analysing data from 2251 participants filtered from the population enrolled in the National Health and Nutrition Examination Survey

Technical

CHEMWATCH

of PFOS-related increases in DBP. Further research is needed to address related issues.

Authors: Ma S, Xu C, Ma J, Wang Z, Zhang Y, Shu Y, Mo X.

Full Source: Environmental Pollution. 2019 Jul 30;254(Pt A):112971. doi: 10.1016/j.envpol.2019.112971. [Epub ahead of print]