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Bulletin Board

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CHEMICAL EFFECTS

Disinfection technology of hospital wastes and wastewater: suggestions for disinfection strategy during Coronavirus disease 2019 (COVID-19) pandemic in China

2020-07-01

Hospitals are important sources of pollutants resulted from diagnostic, laboratory and research activities as well as medicine excretion by patients, which include active component of drugs and metabolite, chemicals, residues of pharmaceuticals, radioactive markers, iodinated contrast media, etc. The discharge of hospital wastes and wastewater, especially those without appropriate treatment would expose the public in danger of infection. In particular, under the Coronavirus Disease 2019 (COVID-19) pandemic context in China, it is of great significance to reduce the health risks to the public and environment. In this study, technologies of different types of hospital wastes and wastewater disinfection have been summarized. Liquid chlorine, sodium hypochlorite, chlorine dioxide, ozone, and ultraviolet irradiation disinfection are commonly used for hospital wastewater disinfection. While incineration, chemical disinfection, and physical disinfection are commonly used for hospital wastes disinfection. In addition, considering the characteristics of various hospital wastes, the classification and selection of corresponding disinfection technologies are discussed. On this basis, this study provides scientific suggestions for management, technology selection, and operation of hospital wastes and wastewater disinfection in China, which is of great significance for development of national disinfection strategy for hospital wastes and wastewater during COVID-19 pandemic.

Authors: Jiao Wang, Jin Shen, Dan Ye, Xu Yan, Yujing Zhang, Wenjing Yang, Xinwu Li, Junqi Wang, Liubo Zhang, Lijun Pan
Full Source: Environmental Pollution (Barking, Essex: 1987). 2020 Jul;262:114665. doi: 10.1016/j.envpol.2020.114665. Epub 2020 Apr 24.

A full evaluation of Chiral Phenylpyrazole pesticide Flufiprole and the metabolites to non-target organism in paddy field

2020-05-13

Pesticides applied to paddy fields may pose considerable danger to non-target aquatic organisms and further threaten human health. Flufiprole is a pesticide used in rice fields; considering the widespread existence of

The discharge of hospital wastes and wastewater, especially those without appropriate treatment would expose the public in danger of infection.

rice-fish-farming ecosystems, the acute toxicities of flufiprole enantiomers and its six metabolites (fipronil, flufiprole sulfide, flufiprole sulfone, detrifluoromethylsulfinyl flufiprole, desulfinyl flufiprole, and flufiprole amide) to four common aquatic organisms in rice fields including Misgurnus anguillicaudatus (pond loach), Carassius gibelio (Prussian carp), Pelophylax nigromaculatus (black-spotted frog), and Daphnia magna (water flea) were investigated. Genotoxicity, pathological changes and the effects on the antioxidant system of M. anguillicaudatus were also evaluated after exposure. The LC_{50} (EC_{50}) values showed that fipronil and desulfinyl flufiprole were the most toxic compounds and were approximately about six times as toxic as flufiprole. No enantioselective toxicity was observed between the two enantiomers. The activity of antioxidant defense enzymes and the content of malondialdehyde (MDA) in the liver and gills of M. anguillicaudatus were significantly increased by the chemicals in most cases. In addition, fipronil and desulfinyl flufiprole were found to induce an increase in the micronucleus rate in M. anguillicaudatus. Histopathological analysis showed that the liver of M. anguillicaudatus was not significantly affected by flufiprole. Our study demonstrated a potential negative effect on flufiprole-treated aquatic organisms. As an alternative to fipronil, the environmental risk of flufiprole and its metabolites to non-target organisms in rice fields cannot be ignored.

Authors: Jing Gao, Fang Wang, Wenqi Jiang, Jingwen Miao, Penny Wang, Zhiqiang Zhou, Donghui Liu
Full Source: Environmental Pollution (Barking, Essex: 1987): 2020 May 13;264:114808. doi: 10.1016/j.envpol.2020.114808. Online ahead of print.

Filaggrin and Filaggrin 2 processing are linked together through skin aspartic acid protease activation

2020-05-21

Skin aspartic acid protease (SASPase) is believed to be a key enzyme involved in filaggrin processing during epidermal terminal differentiation. Since little is known about the regulation of SASPase function, the aim of this study was to identify involved protein partners in the process. Yeast two hybrid analyses using SASPase as bait against a human reconstructed skin library identified that the N-terminal domain of filaggrin 2 binds to the N-terminal fragment of SASPase. This interaction was confirmed in reciprocal yeast two hybrid screens and by Surface Plasmon Resonance analyses. Immunohistochemical studies in human skin, using specific antibodies to SASPase and the N-terminal domain of filaggrin 2, showed that the two proteins partially co-localized to the stratum granulosum.

Yeast two hybrid analyses using SAS-Pase as bait against a human reconstructed skin library identified that the N-terminal domain of filaggrin 2 binds to the N-terminal fragment of SASPase.

In vitro enzymatic assays showed that the N-terminal domain of filaggrin 2 enhanced the autoactivation of SASPase to its 14 kDa active form. Taken together, the data suggest that the N-terminal domain of filaggrin 2 regulates the activation of SASPase that may be a key event upstream of filaggrin processing to natural moisturizing factors in the human epidermis.

Authors: Mark Donovan, Mélanie Salamito, Angnès Thomas-Collignon, Lucie Simonetti, Stephanie Desbouis, Jean-Christophe, Etienne Formstecher, Dominique Bernard

ENVIRONMENTAL RESEARCH

Clean vehicles, polluted waters: empirical estimates of water consumption and pollution loads of the carwash industry

2020-05-13

Carwash stations use large volumes of water and release harmful chemicals into the environment through their operations. While a significant body of literature has focused on exploring water use in the carwash industry, none has provided comprehensive information on both the pollution loads of the wastewater emanating from this industry and water consumption. Understanding how much water is used and the pollution loads of wastewater from this industry is useful to ensure adoption of water conservation measures and design wastewater recycling systems given the dwindling freshwater resources globally. This study estimated the freshwater quantities used to wash different vehicle types and the pollution loads of the resulting wastewater in the Kumasi Metropolis. Seven proxy carwash stations were purposively selected and monitored to estimate the water used to wash six different categories of vehicles. Composite wastewater samples from three carwash stations were analysed for concentrations of different contaminants which were used to compute pollution loads. Using R software, one-way ANOVA with Tukey's (HSD) post-hoc testing and 2-sample t-test at 95% confidence interval were employed to test statistical differences. After an 8-week monitoring campaign involving 3,667 vehicles, the study showed that average water used for each vehicle type were in the order: Motorbike - 97L (95% CI: 90-103L); Salon car - 158L (95% CI: 154-161L); SUV - 197L (95% CI:191-203L); Buses/Coaches - 370L (95%CI:351-381L);

Composite wastewater samples from three carwash stations were analysed for concentrations of different contaminants which were used to compute pollution loads.

Articulated truck 1,139L (95% CI:916-1,363L); Graders/Loaders - 1405L (95% CI:327-2,483L). Overall, the carwash industry in the Metropolis uses about 1000m^3 of freshwater daily and discharges the resulting wastewater into waterways untreated. The wastewater has a low Biodegradability Index (0.3-0.4) and is characterized by a mildly alkali pH (7.6-8.6) with high levels of Sulphates (40.8-69.8 mg/L), COD (990-1413 mg/L), TSS (1260-3417 mg/L) and E. coli (2.3-4.7 × 10^3 CFU/100mL). Pollution loads of BOD and COD were up to 2tons/year and 6tons/year respectively. Stipulated effluent discharge guideline values were mostly exceeded - in some cases by up to 68 times. To avert the unbridled wastage of freshwater, the study recommends enforcement of wastewater recycling for all carwash stations and promulgation of a tax system that rewards stations that recycle wastewater and surcharges those wasting freshwater.

Authors: Isaac Monney, Emmanuel Amponsah Donkor, Richard Buamah

Occurrence and toxicity of antibiotics in the aquatic environment: a review

2020-07-01

In recent years, antibiotics have been used for human and animal disease treatment, growth promotion, and prophylaxis, and their consumption is rising worldwide. Antibiotics are often not fully metabolized by the body and are released into the aquatic environment, where they may have negative effects on the non-target species. This review examines the recent researches on eight representative antibiotics (erythromycin, trimethoprim, sulfamethoxazole, tetracycline, oxytetracycline, ofloxacin, ciprofloxacin, and amoxicillin). A detailed overview of their concentrations in surface waters, groundwater, and effluents is provided, supported by recent global human consumption and veterinary use data. Furthermore, we review the ecotoxicity of these antibiotics towards different groups of organisms, and assessment of the environmental risks to aquatic organisms. This review discusses and compares the suitability of currently used ecotoxicological bioassays, and identifies the knowledge gaps and future challenges. The risk data indicate that selected antibiotics may pose a threat to aquatic environments. Cyanobacteria were the most sensitive organisms when using standard ecotoxicological bioassays. Further studies on their chronic effects to aquatic organisms and the toxicity of

Antibiotics are often not fully metabolized by the body and are released into the aquatic environment, where they may have negative effects on the non-target species.

antibiotic mixtures are necessary to fully understand the hazards these antibiotics present.

PHARMACEUTICAL/TOXICOLOGY

Associations of prenatal urinary Phthalate exposure with preterm birth: the Maternal-Infant Research on Environmental Chemicals (MIREC) study

2020-05-21

Objectives: To examine the relation between prenatal urinary phthalate metabolite concentrations and preterm birth (PTB).

Methods: The data were drawn from the Maternal-Infant Research on Environmental Chemicals (MIREC) Study, a pan-Canadian cohort of 1857 pregnant women enrolled between 2008 and 2011. We quantified urinary concentrations of 7 phthalate metabolites that were detected in > 70% of urine samples collected during the first trimester. Gestational age was obtained from either the last menstrual period or early ultrasound. We used Cox proportional hazard models to examine the associations of urinary phthalate metabolite concentrations, plus the molar sum of di-2-ethylhexyl phthalate metabolites (∑DEHP), with time to delivery before 37 weeks of gestation. We also examined PTB by clinical presentation. PTBs presented with either spontaneous labour or premature rupture of the membrane were considered spontaneous PTB (sPTB). Additionally, we used multiple linear regression to model changes in mean gestational age in relation to phthalate exposure.

Results: We found no evidence of an association between first trimester phthalate metabolite concentrations and PTB among the MIREC study participants. For example, each 2-fold increase in any of the 7 phthalate concentrations or ∑DEHP was associated with hazard ratios (HRs) for PTB ranging from 0.95 to 1.07 with 95% confidence intervals including the null. An assessment of non-linear trends showed some evidence of non-monotonic dose-response relationships between phthalates and PTB. Furthermore, male infants exposed to MCPP showed higher sPTB risk compared with female infants.

> Gestational age was obtained from either the last menstrual period or early ultrasound.

Conclusion: Phthalate exposure during early pregnancy is not clearly associated with the risk of PTB among this Canadian population.

Thyroid hormones ratio is a major prognostic marker in advanced metstatic colorectal cancer: results from the phase III randomized CORRECT trial

2020-05-20

Background: Free triiodothyronine (FT3)/free thyroxine (FT4) ratio is an index estimating the peripheral activity of thyroid hormones. In a previous experience, we identified a prognostic role for FT3/FT4 ratio in chemorefractory patients treated with regorafenib. Therefore, we planned this post hoc analysis of the phase III CORRECT trial of regorafenib versus placebo.

Methods: Seven hundred fifty-eight out of 760 randomised patients (503 in the regorafenib and 255 in the placebo arm) were evaluable for the present analyses, based on availability of FT3 and FT4 baseline values. Co-primary objectives were to explore the predictive role of FT3/FT4 ratio in patients treated with regorafenib compared with placebo and to validate the prognostic value of FT3/FT4 ratio in the CORRECT trial.

Results: For patients randomised to regorafenib, median overall survival (OS) was 4.0, 7.5 and 9.8 months in low, intermediate and high FT3/FT4 ratio subgroups, respectively. Hazard ratio (HR) for OS was 0.40 (p < 0.0001) when comparing intermediate versus low and 0.32 (p < 0.0001) when comparing high versus low FT3/FT4 ratio. In the placebo arm, median OS was 3.3, 5.6 and 7.7 months, in the three subgroups. HR for OS was 0.47 (p < 0.0001) when comparing intermediate versus low and 0.33 (p < 0.0001) when comparing high versus low. FT3/FT4 ratio retained its association with OS in the multivariate model in both arms.

Conclusions: While rejecting the predictive effect of baseline FT3/FT4 ratio, present data strengthen the prognostic role of the ratio, pave the way for direct clinical application, underline the need for a better biological

> For patients randomised to regorafenib, median overall survival (OS) was 4.0, 7.5 and 9.8 months in low, intermediate and high FT3/FT4 ratio subgroups, respectively.

understanding and suggest possible therapeutic implications for thyroid hormones.

Authors: Giuseppe Pasqualetti, Marta Schirripa, Emmanuelle Dochy, Matteo Fassan, Pina Ziranu, Marco Puzzoni, Mario Scartozzi, Giula Alberti, Sara Lonardi, Vittorina Zagonel, Fabio Monzani, Fotios Loupakis

Full Source: European Journal of Cancer (Oxford, England: 1990)

Carcinogens in products: inadequate protections raise cancer risks

2020-05-16

Evidence shows, that over their life cycle, chemicals used in everyday products contribute to raising cancer risks, especially for vulnerable populations such as children and communities of color. This article outlines how US policies have not yet incorporated current science in relation to environmental carcinogenesis and recommends improvements to protect public health.

Authors: Veena Singh

Full Source: Trends in cancer. 2020 May 16;S2405-8033(20)30136-9. doi: 10.1016/j.trecan.2020.04.006. Online ahead of print.

OCCUPATIONAL

Biochemical, hematological and immunological parameters and relationship with occupational exposure to pesticides and metals

2020-05-21

This study aimed to evaluate biomarkers of exposure to cholinesterase inhibitors insecticides (AChE and BuChE activities) and metals (As, Cd, Cr, Mn, Ni, and Pb blood levels) and their associations with biochemical, hematological, and immunological parameters in farmers from Southern Brazil. One hundred and sixteen individuals were divided into two groups: 62 farmers (exposed group) and 54 subjects non-occupationally exposed (NOE) to agrochemicals. Erythrocyte (AChE) and serum (BuChE) cholinesterases activities were significantly reduced as well as blood Cd and Pb levels were increased in farmers when compared to NOE group (p < 0.05). Farmers presented increased glucose and urea levels compared to NOE group, which were inversely associated with AChE and positively correlated with Cd (p < 0.05), respectively. In addition, Cd was inversely associated with the hematological cells counts, which were significantly reduced in farmers (p < 0.05). C3 complement was higher in farmers

> This article outlines how US policies have not yet incorporated current science in relation to environmental carcinogenesis and recommends improvements to protect public health.

and was positively associated with blood Pb (p < 0.05). Surface protein expression analysis revealed a downregulation of LFA-1 and ICAM-1 in farmers. Inverse associations were found between LFA-1 and blood As, Cr, and Ni levels (p < 0.05). Taken together, our results pointed to a relationship between agrochemicals and metals exposure and biochemical, hematological, and immunological disorders that can lead to several chronic conditions.

Authors: Larissa V Cestonaro, Solange Cristina Garcia, Sabrina Nascimento, Bruna Gauer, Elisa Sauer, Gabriela Göethel, Caroline Peruzzi, Jessica Nardi, Nuryan Fão, Yasmin Piton, Wesley Braga, Rafael Rocha, Tatiana Saint'Pierre, Adriana Gioda, Marcelo Dutra Arbo

Full Source: Environmental science and pollution research international. 2020 May 21. doi: 10.1007/s11356-020-09203-3. Online ahead of print.

In silico prediction of toxicity and its applications for chemicals at work

2020-05-14

Objective and methods: This study reviewed the concept of in silico prediction of chemical toxicity for prevention of occupational cancer and future prospects in workers' health. In this review, a new approach to determine the credibility of in silico predictions with raw data is explored, and the method of determining the confidence level of evaluation based on the credibility of data is discussed. I searched various papers and books related to the in silico prediction of chemical toxicity and carcinogenicity. The intention was to utilize the most recent reports after 2015 regarding in silico prediction.

Results and conclusion: The application of in silico methods is increasing with the prediction of toxic risks to human and the environment. The various toxic effects of industrial chemicals have triggered the recognition of the importance of using a combination of in silico models in the risk assessments. In silico occupational exposure models, industrial accidents, and occupational cancers are effectively managed and chemicals evaluated. It is important to identify and manage hazardous substances proactively through the rigorous evaluation of chemicals.

Authors: Kyung-Taek Rim

Full Source: Toxicology and environmental health science. 2020 May 14;1-12. doi: 10.1007/s13530-020-00056-4. Online ahead of print.

> In silico occupational exposure models, industrial accidents, and occupational cancers are effectively managed and chemicals evaluated.