

Bulletin Board

Contents

NOV. 19, 2021

(click on page numbers for links)

CHEMICAL EFFECTS

Machine Learning for Investigation on Endocrine-Disrupting Chemicals with Gestational Age and Delivery Time in a Longitudinal Cohort..... 3

ENVIRONMENTAL RESEARCH

Emission of BTEX compounds from the frying process: Quantification, environmental effects, and probabilistic health risk assessment 3

Vertical profile and assessment of soil pollution from a typical coking plant by suspect screening and non-target screening using GC/QTOF-MS 4

The mediating role of vascular inflammation in traffic-related air pollution associated changes in insulin resistance in healthy adults 5

Environmental and occupational pesticide exposure and human sperm parameters: a Navigation Guide review 6

OCCUPATIONAL

Parkinson's disease in a worker exposed to insecticides at a greenhouse... 7
[Healthcare professionals and COVID-19 in Morocco: accident at work or occupational disease?]..... 8

Association between nicotine dependency with occupational injury in Korean men..... 8

PHARMACEUTICAL/TOXICOLOGY

Peripherally administered persistent organic pollutants distribute to the brain of developing chicken embryo in concentrations relevant for human exposure..... 9

Biodegradation of per- and polyfluoroalkyl substances (PFAS): A review..10

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Bulletin Board

Technical

NOV. 19, 2021

CHEMICAL EFFECTS

Machine Learning for Investigation on Endocrine-Disrupting Chemicals with Gestational Age and Delivery Time in a Longitudinal Cohort

2021-10-18

Endocrine-disruptin

g chemicals (EDCs) are widespread environmental chemicals that are often considered as risk factors with weak activity on the hormone-dependent process of pregnancy. However, the adverse effects of EDCs in the body of pregnant women were underestimated. The interaction between dynamic concentration of EDCs and endogenous hormones (EHs) on gestational age and delivery time remains unclear. To define a temporal interaction between the EDCs and EHs during pregnancy, comprehensive, unbiased, and quantitative analyses of 33 EDCs and 14 EHs were performed for a longitudinal cohort with 2317 pregnant women. We developed a machine learning model with the dynamic concentration information of EDCs and EHs to predict gestational age with high accuracy in the longitudinal cohort of pregnant women. The optimal combination of EHs and EDCs can identify when labor occurs (time to delivery within two and four weeks, AUROC of 0.82). Our results revealed that the bisphenols and phthalates are more potent than partial EHs for gestational age or delivery time. This study represents the use of machine learning methods for quantitative analysis of pregnancy-related EDCs and EHs for understanding the EDCs' mixture effect on pregnancy with potential clinical utilities.

Authors: Hemi Luan, Hongzhi Zhao, Jiufeng Li, Yanqiu Zhou, Jing Fang, Hongxiu Liu, Yuanyuan Li, Wei Xia, Shunqing Xu, Zongwei Cai

Full Source: Research (Washington, D.C.) 2021 Oct 18;2021:9873135. doi: 10.34133/2021/9873135.

ENVIRONMENTAL RESEARCH

Emission of BTEX compounds from the frying process: Quantification, environmental effects, and probabilistic health risk assessment

2021-10-28

Frying is one of the cooking methods which generates mono aromatic hydrocarbons, including benzene, toluene, ethylbenzene, and xylene (BTEX); subsequently, it affects health through carcinogenic (CR) and non-

Endocrine-disruptin

Bulletin Board

Technical

NOV. 19, 2021

carcinogenic risks (n-CR). However, their environmental effects known by secondary organic aerosols (SOA) and ozone formation potential (OFP) were also attended by many scientists. Therefore, this study quantified the BTEX emissions from 4 types of most commonly used edible oils (canola, corn, sunflower, and blend) under various frying conditions of temperatures and food additives. Furthermore, the effects of the chemicals in the light of health (CR and n-CR) and environment (SOA and OFP) were also investigated. The study results showed that higher temperatures could significantly increase the emissions, while the addition of food ingredients significantly reduces the emissions. The rank order of emitted chemical was obtained as $T > B > E > X$. The blend had the most emission among oils, followed by, in descending order, corn, sunflower, and canola. In association with environmental effects, the orders of $X > T > E > B$ and $T > E > X > B$ were obtained for OFP and SOA, respectively. THQ for blend, corn, canola, and sunflower oils was higher than 1 (1.76, 1.35, 1.27, and 1.002, respectively), showing a considerable n-CR when the hood was off. In this respect, TCR for the oils (1.78×10^{-4} , 1.45×10^{-4} , 1.39×10^{-4} , and 1.05×10^{-4} , respectively) shown the probable risk for all oils. Moreover, hood switching reduced the risk by about 11-81%.

Authors: Ali Atamaleki, Saeed Motesaddi Zarandi, Mohamadreza Massoudinejad, Ali Esrafil, Amin Mousavi Khaneghah

Full Source: Environmental research 2021 Oct 28;112295. doi: 10.1016/j.envres.2021.112295.

Vertical profile and assessment of soil pollution from a typical coking plant by suspect screening and non-target screening using GC/QTOF-MS

2021-10-28

A comprehensive workflow for suspect screening and non-target screening with gas chromatography coupled with quadrupole time-of-flight mass spectrometry (GC/QTOF-MS) was used to characterize the pollution characteristics of soil samples in a typical coking plant in China. Suspect screening confirmed 57 chemicals including PAHs, alkyl PAHs, and phthalates contained in high-resolution personal compound database and library (PCDL). Non-target screening detected 88 chemicals from soil samples in the NIST 17 library. A total of 122 chemicals were screened in soil samples, and many of them were of emerging concern. Their presence in the soil obtained from coking operations has been underestimated, such as the oxygenated PAHs (naphtho[2,1-b]furan and 9H-fluoren-9-one), and the alkyl biphenyls compounds (4,4'-dimethylbiphenyl, 3,3'-dimethylbiphenyl, 4-methyl-1,1'-biphenyl and 2,2',5,5'-tetramethyl-

A comprehensive workflow for suspect screening and non-target screening with gas chromatography coupled with quadrupole time-of-flight mass spectrometry (GC/QTOF-MS) was used to characterize the pollution characteristics of soil samples in a typical coking plant in China.

Bulletin Board

Technical

NOV. 19, 2021

1,1'-biphenyl). Toxicity assays by luminescent bacteria proved that the extracts from soil samples at different depths showed varying toxicity to *V. qinghaiensis* sp.-Q67. Soil extracts from a depth of 20-40 cm exhibited the greatest toxicity to luminescent bacteria compared with the other six-layered soil samples, which was correlated with the number of detectable pollutants and total organic carbon content. This study provided a screening method for suspect and non-target contaminants in urban industrial soil sites, which was important in identifying localized contamination sources.

Authors: Mingyuan Liu, Changsheng Guo, Chaofei Zhu, Jiapei Lv, Wenlong Yang, Linlin Wu, Jian Xu

Full Source: The Science of the total environment 2021 Oct 28;151278. doi: 10.1016/j.scitotenv.2021.151278.

The mediating role of vascular inflammation in traffic-related air pollution associated changes in insulin resistance in healthy adults

2021-10-30

Aim: The precise pathophysiologic pathway linking traffic-related air pollution (TRAP) to diabetes mellitus is not well elucidated. We aimed to investigate whether activation of vascular inflammation can be a mechanistic linkage between ambient TRAP and insulin resistance. **Methods:** Study outcomes were determined by assessing a series of circulating biomarkers indicative of insulin resistance and vascular inflammation among 73 healthy adults who underwent repeated clinical visits in Beijing, China, 2014-2016. Concomitantly, concentrations of ambient TRAP indices, including particulate matter in diameter <2.5 μm (PM_{2.5}), particles in size fractions of 5-560 nm, black carbon, carbon monoxide, nitrogen dioxide, and oxides of nitrogen, were continuously monitored. **Results:** Participants experienced extremely high levels of TRAP exposures, with mean (standard deviation) PM_{2.5} concentrations of 91.8 (48.3) $\mu\text{g}/\text{m}^3$, throughout the study. We found that interquartile range increases in exposure to moving average concentrations of various TRAP indices at prior up to 7 days were associated with significant elevations of 8.9-49.6% in insulin levels. Higher pollutant levels were also related to worsening metrics of insulin resistance (soluble insulin receptor ectodomain, adipokines, and homeostasis model assessment of insulin resistance) and heightened vascular inflammatory responses, particularly disruptions of the receptor activator of nuclear factor κB ligand/osteoprotegerin system balance and elevations of monocyte/macrophage and T cell activation markers. Mediation analyses showed that activation

Aim: The precise pathophysiologic pathway linking traffic-related air pollution (TRAP) to diabetes mellitus is not well elucidated.

Bulletin Board

Technical

NOV. 19, 2021

of vascular inflammation could explain up to 66% of the alterations in metrics of insulin resistance attributable to air pollution.

Conclusion: Our results suggest that ambient traffic pollution exposure was capable of promoting insulin resistance possibly via generating vascular inflammation.

Authors: Hongbing Xu, Shengcong Liu, Yang Wang, Rongshan Wu, Tiedi Yi, Tong Wang, Yutong Zhu, Jiakun Fang, Yunfei Xie, Qian Zhao, Xiaoming Song, Jie Chen, Sanjay Rajagopalan, Robert D Brook, Jianping Li, Junji Cao, Wei Huang

Full Source: International journal of hygiene and environmental health 2021 Oct 30;239:113878. doi: 10.1016/j.ijheh.2021.113878.

Environmental and occupational pesticide exposure and human sperm parameters: a Navigation Guide review

2021-10-28

Global sperm counts have declined in recent decades, coinciding with the proliferation of endocrine-disrupting chemicals, of which pesticides are some of the most common. Previous systematic reviews of epidemiologic studies published between 1991 through 2013 have reported associations between environmental and occupational pesticide exposure and reduced sperm quality, particularly associations with reduced sperm concentration. This systematic review used the Navigation Guide to critically evaluate the current body of evidence examining sperm quality and pesticide exposure in epidemiological studies. PubMed, Scopus, and Web of Science databases were searched for all English-language articles published after September 2012 until August 2021. Original observational studies that assessed human sperm quality parameters, defined as concentration, motility, morphology, and DNA integrity, and individual-level pesticide exposure were included. The risk of bias for each included study and the strength of evidence were evaluated using the Navigation Guide protocol. Nineteen studies assessing environmental or occupational pesticide exposure and sperm parameters were included. Eighteen studies were cross-sectional studies and one prospective cohort; sample sizes ranged from 42 to 2122 men from 14 different countries. Fifteen (79%) studies found at least one significant association between pesticide exposure and reduced sperm quality. The overall risk of bias across studies was classified as low to moderate. The quality of evidence was determined to be moderate based on systematic evaluation criteria. There were consistent adverse associations between pesticide exposure and sperm motility (63% of studies) and DNA integrity (80% of studies). For sperm concentration and morphology, 42% and 36% of studies found significant negative

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Bulletin Board

Technical

NOV. 19, 2021

associations, respectively. The strength of the body of evidence overall was rated as having sufficient evidence of toxicity. Regarding specific sperm endpoints, there was sufficient evidence that pesticides are toxic for sperm motility and DNA integrity; limited evidence of toxicity for sperm concentration; and inadequate evidence of toxicity for sperm morphology. The studies reviewed here showed consistent associations between pesticide exposure and diminished sperm parameters, particularly sperm motility and sperm DNA integrity. These findings are largely consistent with results of previous reviews, which have found significant negative associations between pesticide exposure and sperm quality in 13 of 20 (65%) studies published between 1991 and 2008, and in 14 of 17 (82%) studies published between 2008 and 2012. After thirty years of mounting evidence, actions are needed to reduce pesticide risks to testicular function and male fertility.

Authors: Eric T Knapke, Danielly de P Magalhaes, Mohamed Aqiel Dalvie, Daniele Mandrioli, Melissa J Perry
Full Source: *Toxicology* 2021 Oct 28;153017. doi: 10.1016/j.tox.2021.153017.

OCCUPATIONAL

Parkinson's disease in a worker exposed to insecticides at a greenhouse

2021-02-05

Background: Parkinson's disease (PD) is a rare, neurodegenerative disease with various occupational and environmental risk factors. Exposure to specific pesticides contributes significantly to the incidence of PD. However, it is difficult to measure the level of pesticide exposure in workers. This study presents the first case recognized the work-relatedness between PD and pesticide exposure.

Case presentation: A 68-year-old male was diagnosed with PD after working with pesticides at a tomato greenhouse for 12 years and 5 months. From the results of a field study, it was reasonable to assume that the patient had been exposed to a significant level of various insecticides. In the present report, we described the first accepted case of work-relatedness between PD and exposure to pesticides. The evaluation was conducted using the following steps: we ruled out other possible risk factors including additional occupational history and personal risk factors, we assessed the work environment, surveyed possible exposures, found proper epidemiological evidence, and calculated the probability of causation. The work-relatedness was determined through the review of

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Bulletin Board

Technical

NOV. 19, 2021

epidemiological evidence and estimation of exposure situation and level, and biological plausibility. We also decided work-relatedness based on the exposure of PD related pesticides with identified biologically plausible and the presumption that the exposure level would be high due to the working process.

Conclusions: In this case, the field study and epidemiological results supported the work-relatedness of PD and exposure to pesticides. Moreover, the results of previous studies have confirmed a causal relationship between exposure to pesticides and PD.

Authors: Yangwoo Kim, Inah Kim, Jung-Min Sung, Jaechul Song
Full Source: *Annals of occupational and environmental medicine* 2021 Feb 5;33:e6. doi: 10.35371/aoem.2021.33.e6.

[Healthcare professionals and COVID-19 in Morocco: accident at work or occupational disease?]

2021-08-31

Self-denial and sense of duty are fundamental ethical principles in health care. Since the outbreak of health crisis, healthcare workers have been the first bulwark against the spread of coronavirus, and therefore, the occupational category at higher risk of contamination. In this regard, in a statement dated 23 March 2020, the World Health Organization published a guidance regarding the management of the disease caused by Covid-19 in health workers, but also in workers employed in all sectors exposed to the risk of contamination. In Morocco, the Ministry of Health published on April 6, on its official website, a condolence message to the families of the first two doctors died following contraction of coronavirus, while specifying that coronavirus infection was not due to the exercise of their professional functions. The Minister of Labor and Professional Integration recently appointed an internal committee to undertake a reflection on this issue. At present, given Morocco's law, what are the chances to categorize coronavirus as an occupational disease?

Authors: Meryem Bouchalta, Ahmed Belhousse, Ghizlane Mouttarazouk
Full Source: *The Pan African medical journal* 2021 Aug 31;39:283. doi: 10.11604/pamj.2021.39.283.30471.

Association between nicotine dependency with occupational injury in Korean men

2021-05-04

Background: The relationship between smoking status or second-hand smoking and occupational injuries has been the subject of considerable

Self-denial and sense of duty are fundamental ethical principles in health care.

Bulletin Board

Technical

NOV. 19, 2021

study, but few have studied the relationship between nicotine dependence and occupational injuries. The objective of this study was to investigate the relationship between nicotine dependence and occupational injury among employees at a range of Korean companies. Methods: Initially, the personal and occupational characteristics and nicotine dependences of workers were measured, and 12 months later a survey was used to determine whether subjects had experienced any occupational injury. This study was conducted in several workplaces on 6,893 male workers in manufacturing and service industries that received health screening at Inha University Hospital in Incheon. Results: The adjusted odds ratios (ORs) of occupational injury in the low, moderate, and high nicotine dependence groups were 1.38 (95% confidence interval [CI]: 1.04-1.84), 1.52 (95% CI: 1.10-2.10), and 1.71 (95% CI: 0.92-3.19), respectively. For smokers only, adjusted ORs tended to increase linearly (p for trend < 0.05). When only smokers were included, analysis of continuous FTND (Fagerstrom Test of Nicotine Dependence) scores showed that adjusted OR increased by 1.10 (95% CI: 1.03-1.19) per FTND point. After stratifying the data by working type and working hours per week, the non-shift work group maintained this relationship (OR: 1.13, 95% CI: 1.04-1.24) and OR was higher in the group that works more than 60 hours per week with FTND score as a continuous variable (OR: 1.24, 95% CI: 1.07-1.44). Conclusions: The study shows nicotine dependency might affect occupational injury. From a short-term perspective, addressing worker's nicotine dependence by giving an adequate break time or smoking area might reduce work-related injuries.

Authors: Sung Wook Jang, Hwan-Cheol Kim, Ji Ho Kim, Min Sun Kim, Youna Won, Hyeonwoo Ju, Hyung Doo Kim, Go Choi, Shin-Goo Park, Jong-Han Leem

Full Source: Annals of occupational and environmental medicine 2021 May 4;33:e14. doi: 10.35371/aoem.2021.33.e14.

PHARMACEUTICAL/TOXICOLOGY

Peripherally administered persistent organic pollutants distribute to the brain of developing chicken embryo in concentrations relevant for human exposure

2021-10-29

Persistent organic pollutants (POPs) can reach the fetal brain and contribute to developmental neurotoxicity. To explore the distribution of POPs to the fetal brain, we exposed chicken embryos to a POP

Persistent organic pollutants (POPs) can reach the fetal brain and contribute to developmental neurotoxicity.

Bulletin Board

Technical

NOV. 19, 2021

mixture, containing 29 different compounds with concentrations based on blood levels measured in the Scandinavian human population. The mixture was injected into the allantois at embryonic day 13 (E13), aiming at a theoretical concentration of 10 times human blood levels. POPs concentrations in the brain were measured at 0.5, 1, 2, 4, 6, 24, 48, and 72 h after administration. Twenty-seven of the individual compounds were detected during at least one of the time-points analyzed. Generally, the concentrations of most of the measured compounds were within the order of magnitude of those reported in human brain samples. Differences in the speed of distribution to the brain were observed between the per- and polyfluoroalkyl substances (PFASs), which have protein binding potential, and the lipophilic polychlorinated biphenyls (PCBs), organochlorine pesticides (OCPs) and brominated flame retardants (BFRs). Based on pharmacokinetic modeling, PFASs were best described by a one compartment model. PFASs displayed relatively slow elimination (K_{el}) and persisted at high levels in the brain. Lipophilic OCPs and PCBs could be fitted to a 2-compartment model. These showed high levels in the brain relative to the dose administered as calculated by area under the curve (AUC)/Dose. Altogether, our study showed that chicken is a suitable model to explore the distribution of POPs into the developing brain at concentrations which are relevant for humans.

Authors: Ajay Yadav, Steven Verhaegen, Mussie Ghezu Hadera, Hanne Friis Berntsen, Vidar Berg, Jan Ludvig Lyche, Azemira Sabaredzovic, Line Småstuen Haug, Oddvar Myhre, Karin Elisabeth Zimmer, Ragnhild Elisabeth Paulsen, Erik Ropstad, Fernando Boix
Full Source: Neurotoxicology 2021 Oct 29;88:79-87. doi: 10.1016/j.neuro.2021.10.013.

Biodegradation of per- and polyfluoroalkyl substances (PFAS): A review

2021-10-28

Per- and polyfluoroalkyl substances (PFAS) are a group of chemicals widely manufactured for industrial and commercial applications in the past decades due to their remarkable stability as well as hydrophobic and lipophobic nature. PFAS species have been recognized as emerging environmental contaminants of concern due to their toxicity and environmental persistence, thereby attracting intensive research seeking effective technologies for their removal from the environment. The objective of this review is to provide a thorough analysis of the biodegradation of PFAS in multiple environmental matrices and offer a future outlook. By discussing targeted PFAS species, degradation

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Bulletin Board

Technical

NOV. 19, 2021

intermediates, degradation efficiencies, and microbial species, a comprehensive summary of the known microbial species and their degradation pathways are presented. The biodegradation pathways for different types of PFAS species are summarized in two major categories, biodegradation with and without the cleavage of C-F bond. Existing uncertainties and future research directions for PFAS biodegradation are provided.

Authors: Zhiming Zhang, Dibyendu Sarkar, Jayanta Kumar Biswas, Rupali Datta

Full Source: [Bioresource technology 2021 Oct 28;126223. doi: 10.1016/j.biortech.2021.126223.](https://doi.org/10.1016/j.biortech.2021.126223)