

Bulletin Board

Contents

NOV. 05, 2021

(click on page numbers for links)

CHEMICAL EFFECTS

- Several typical endocrine-disrupting chemicals in human urine from general population in China: Regional and demographic-related differences in exposure risk..... 3
- Endocrine disrupting chemicals differentially alter intranuclear dynamics and transcriptional activation of estrogen receptor- α 3

ENVIRONMENTAL RESEARCH

- Long-term air pollution, noise, and structural measures of the Default Mode Network in the brain: Results from the 1000BRAINS cohort. 4
- Pollution characteristics, exposure assessment and potential cardiotoxicities of PM 2.5-bound benzotriazole and its derivatives in typical Chinese cities..... 5
- The association of wildfire air pollution with COVID-19 incidence in New South Wales, Australia 6
- Interpreting Risk from Sunscreens in the Marine Environment 7

OCCUPATIONAL

- [A definition of work-related asthma and its social and occupational consequences in adults and teenagers] 8
- The safety programme as a tool of improvement for safety culture in the workplace: an exploratory follow-up study from the Danish offshore oil and gas sector..... 8
- The Effects of Lead and Cadmium Co-exposure on Serum Ions in Residents Living Near a Mining and Smelting Area in Northwest China..... 9

PHARMACEUTICAL/TOXICOLOGY

- Results of a 30-day safety assessment in young mice orally exposed to polystyrene nanoparticles 10

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Bulletin Board

Technical

NOV. 05, 2021

CHEMICAL EFFECTS

Several typical endocrine-disrupting chemicals in human urine from general population in China: Regional and demographic-related differences in exposure risk

2021-10-10

Endocrine-disrupting chemicals (EDCs) are ubiquitous in the environment, and human exposure to these pollutants has caused great public concern. Five groups of EDCs, including parabens, antimicrobials (triclosan (TCS) and triclocarban (TCC)), bisphenols (BPs), tetrabromobisphenol A and its alternatives (TBBPAs), and benzophenones, in urines of general populations from three cities with different economic levels in China were determined simultaneously to evaluate the coexposure levels of such chemicals. The total concentration of target compounds was approximately two times higher in the urines from Chengdu (a first-tier city; geometric mean: 2.50 µg/L) than that from Nantong (a second-tier city; 1.34 µg/L), and was one order of magnitude higher than that from Shehong (a fifth-tier city; 0.73 µg/L). Urinary target compounds were significantly correlated with gender, age, body mass index (BMI), education level, occupation, and diet. The estimated daily intakes of target chemicals ranged from 0.002 (benzophenones) to 10.2 µg/kg-bw/day (parabens). The exposure estimate showed that females were more vulnerable to exposure to these EDCs. This study profiles the regional and demographic-related differences in the concentrations and exposure risks of several typical EDCs in urines from general populations in three cities with different economic levels in China.

Authors: Longyao Xu, Yu Hu, Qingqing Zhu, Chunyang Liao, Guibin Jiang
Full Source: Journal of hazardous materials 2021 Oct 10;424(Pt B):127489. doi: 10.1016/j.jhazmat.2021.127489.

Endocrine disrupting chemicals differentially alter intranuclear dynamics and transcriptional activation of estrogen receptor-α

2021-10-07

Transcription is a highly regulated sequence of stochastic processes utilizing many regulators, including nuclear receptors (NR) that respond to stimuli. Endocrine disrupting chemicals (EDCs) in the environment can compete with natural ligands for nuclear receptors to alter transcription. As nuclear dynamics can be tightly linked to transcription, it is important to determine how EDCs affect NR mobility. We use an EPA-assembled

Bulletin Board

Technical

NOV. 05, 2021

set of 45 estrogen receptor-α (ERα) ligands and EDCs in our engineered PRL-Array model to characterize their effect upon transcription using fluorescence in situ hybridization and fluorescence recovery after photobleaching (FRAP). We identified 36 compounds that target ERα-GFP to a transcriptionally active, visible locus. Using a novel method for multi-region FRAP analysis we find a strong negative correlation between ERα mobility and inverse agonists. Our findings indicate that ERα mobility is not solely tied to transcription but affected highly by the chemical class binding the receptor.

Authors: Michael J Bolt, Pankaj Singh, Caroline E Obkirchner, Reid T Powell, Maureen G Mancini, Adam T Szafran, Fabio Stossi, Michael A Mancini
Full Source: iScience 2021 Oct 7;24(11):103227. doi: 10.1016/j.isci.2021.103227.

ENVIRONMENTAL RESEARCH

Long-term air pollution, noise, and structural measures of the Default Mode Network in the brain: Results from the 1000BRAINS cohort

2021-10-27

Background: While evidence suggests that long-term air pollution (AP) and noise may adversely affect cognitive function, little is known about whether environmental exposures also promote structural changes in underlying brain networks. We therefore investigated the associations between AP, traffic noise, and structural measures of the Default Mode Network (DMN), a functional brain network known to undergo specific changes with age.

Methods: We analyzed data from 579 participants (mean age at imaging: 66.5 years) of the German 1000BRAINS study. Long-term residential exposure to particulate matter (diameter ≤10 µm [PM10]; diameter ≤2.5 µm [PM2.5]), PM2.5 absorbance (PM2.5abs), nitrogen dioxide (NO2), and accumulation mode particulate number concentration (PNAM) was estimated using validated land use regression and chemistry transport models. Long-term outdoor traffic noise was modeled at participants' homes based on a European Union's Environmental Noise Directive. As measures of brain structure, cortical thickness and local gyrification index (IGI) values were calculated for DMN regions from T1-weighted structural brain images collected between 2011 and 2015. Associations between environmental exposures and brain structure measures were estimated

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Bulletin Board

Technical

NOV. 05, 2021

using linear regression models, adjusting for demographic and lifestyle characteristics.

Results: AP exposures were below European Union standards but above World Health Organization guidelines (e.g., PM10 mean: 27.5 $\mu\text{g}/\text{m}^3$). A third of participants experienced outdoor 24-h noise above European recommendations. Exposures were not consistently associated with IGI values in the DMN. We observed weak inverse associations between AP and cortical thickness in the right anterior DMN (e.g., -0.010 mm [-0.022, 0.002] per 0.3 unit increase in PM2.5abs) and lateral part of the posterior DMN.

Conclusion: Long-term AP and noise were not consistently associated with structural parameters of the DMN in the brain. While weak associations were present between AP exposure and cortical thinning of right hemispheric DMN regions, it remains unclear whether AP might influence DMN brain structure in a similar way as aging.

Authors: Sarah Lucht, Lina Glaubitz, Susanne Moebus, Sara Schramm, Christiane Jockwitz, Svenja Caspers, Barbara Hoffmann
Full Source: International journal of hygiene and environmental health 2021 Oct 27;239:113867. doi: 10.1016/j.ijheh.2021.113867.

Pollution characteristics, exposure assessment and potential cardiotoxicities of PM 2.5-bound benzotriazole and its derivatives in typical Chinese cities

2021-10-22

Benzotriazole and its derivatives (BTRs), classified as high-volume production chemicals, have been widely detected in various environmental media, including the atmosphere, water, soil and dust, as well as organisms. However, studies on the pollution characteristics and health impact of PM2.5 related BTRs are so far limited. This study is the first to demonstrate the regional scale distribution of PM2.5-bound BTRs and their potential cardiotoxicities. Optimized methods of extraction, purification and GC-EI-MS/MS were applied to characterize and analyze PM2.5-bound BTRs from three cities in China during the winter of 2018. The concentration of ΣBTRs in Taiyuan (6.28 $\text{ng}\cdot\text{m}^{-3}$) was more than three times that in Shanghai (1.53 $\text{ng}\cdot\text{m}^{-3}$) and Guangzhou (1.99 $\text{ng}\cdot\text{m}^{-3}$). Benzotriazole (BTR) and 5-methyl-1H-benzotriazole (5TTR) contributed more than 80% of ΣBTRs concentration as the major pollutants among three cities. The correlation analysis indicated that there was a positive correlation between temperature and concentration of BTR and a negative correlation between temperature and concentration of 5TTR. In addition, the risk of BTRs exposure to toddlers should be paid more

Benzotriazole and its derivatives (BTRs), classified as high-volume production chemicals, have been widely detected in various environmental media, including the atmosphere, water, soil and dust, as well as organisms.

Bulletin Board

Technical

NOV. 05, 2021

attention in Taiyuan by the human exposure assessment. Furthermore, toxicity screening by experimental methods indicated that 4-methyl-1H-benzotriazole (4TTR) was the most harmful to cardiomyocytes. The western blot assay showed a ROS-mediated mitochondrial apoptosis signaling pathway was activated after exposure to 4TTR in neonatal rat cardiomyocytes (NRCMs). On the other hand, metabolomics revealed that exposure of 4TTR to NRCMs disturbed mitochondrial energy metabolism by disturbing pantothenate and coenzyme A synthesis pathway. Our study not only clarifies the contamination profiles of PM2.5-bound BTRs in typical Chinese cities but also reveals their cardiotoxicities associated with mitochondrial dysfunction.

Authors: Chun Yang, Shiyao He, Shimin Lu, Xiaoliang Liao, Yuanyuan Song, Zhi-Feng Chen, Guoxia Zhang, Ruijin Li, Chuan Dong, Zenghua Qi, Zongwei Cai

Full Source: The Science of the total environment 2021 Oct 22;151132. doi: 10.1016/j.scitotenv.2021.151132.

The association of wildfire air pollution with COVID-19 incidence in New South Wales, Australia

2021-10-22

The 2020 COVID-19 outbreak in New South Wales (NSW), Australia, followed an unprecedented wildfire season that exposed large populations to wildfire smoke. Wildfires release particulate matter (PM), toxic gases and organic and non-organic chemicals that may be associated with increased incidence of COVID-19. This study estimated the association of wildfire smoke exposure with the incidence of COVID-19 in NSW. A Bayesian mixed-effect regression was used to estimate the association of either the average PM10 level or the proportion of wildfire burned area as proxies of wildfire smoke exposure with COVID-19 incidence in NSW, adjusting for sociodemographic risk factors. The analysis followed an ecological design using the 129 NSW Local Government Areas (LGA) as the ecological units. A random effects model and a model including the LGA spatial distribution (spatial model) were compared. A higher proportional wildfire burned area was associated with higher COVID-19 incidence in both the random effects and spatial models after adjustment for sociodemographic factors (posterior mean = 1.32 (99% credible interval: 1.05-1.67) and 1.31 (99% credible interval: 1.03-1.65), respectively). No evidence of an association between the average PM10 level and the COVID-19 incidence was found. LGAs in the greater Sydney and Hunter regions had the highest increase in the risk of COVID-19. This study identified wildfire smoke exposures were associated with increased

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Bulletin Board

Technical

NOV. 05, 2021

risk of COVID-19 in NSW. Research on individual responses to specific wildfire airborne particles and pollutants needs to be conducted to further identify the causal links between SARS-Cov-2 infection and wildfire smoke. The identification of LGAs with the highest risk of COVID-19 associated with wildfire smoke exposure can be useful for public health prevention and or mitigation strategies.

Authors: J Cortes-Ramirez, R N Michael, L D Knibbs, H J Bambrick, M R Haswell, D Wraith

Full Source: The Science of the total environment 2021 Oct 22;151158. doi: 10.1016/j.scitotenv.2021.151158.

Interpreting Risk from Sunscreens in the Marine Environment

2021

Recent and pending bans in specific jurisdictions of some organic ultraviolet (UV) filters have resulted in significant concern and controversy over the potential impacts of these contaminants in the marine environment. Organic UV filters have been quantified in the aquatic environment as contaminants in water, sediments, and the tissues of aquatic organisms. The limited available laboratory studies on the toxicity of UV filters to keystone marine species such as reef-building corals describe a wide variety of impacts, from significant acute effects to no observed effects. However, interpretation of results is complicated by differences in methodology, and exposures to single agents in vitro may not reflect the effects of longer exposure to finished sunscreens containing UV filters in combination with numerous other chemicals. Relatively short-term observations of laboratory effects thus may not translate to real-life field conditions, where organisms may be subject to the effects of long-term chronic exposure to UV filters as well as other environmental contaminants and stressors. The lack of current understanding of the full impacts of UV filters, both in the laboratory and in the environment, represents a significant challenge in interpreting the environmental risk associated with the widespread use of sunscreens.

Authors: Abigail Renegar, Denis K Dudley

Full Source: Current problems in dermatology 2021;55:259-265. doi: 10.1159/000517636.

Recent and pending bans in specific jurisdictions of some organic ultraviolet (UV) filters have resulted in significant concern and controversy over the potential impacts of these contaminants in the marine environment.

Bulletin Board

Technical

NOV. 05, 2021

OCCUPATIONAL

[A definition of work-related asthma and its social and occupational consequences in adults and teenagers]

2021-10-25

Work-related asthma (WRA) accounts for 10-25% of all adult asthma. It therefore seems important to raise questions regarding an asthmatic's approach to occupational or job training activities. WRA takes on two forms: work-exacerbated asthma (WEA) and occupational asthma (OA), which encompasses different subtypes of heterogeneous mechanisms. It currently represents a major challenge for occupational medicine in terms of detailed diagnosis, social care, the economic repercussions for workers and employers and, last but not least, social insurance. This review aims to sensitize health care practitioners to the peculiarities of WRA management in routine practice. More specifically, prognosis depends on early diagnosis, medical care and work adjustment measures. WEA and OA are explained in detail in view of identifying causative agents and at-risk occupations and defining adapted medical strategy. Relevant lines of questioning and complementary exams are presented. In addition, the key role of the occupational physician, especially as regards recognition and identification of occupational disease, is underlined, the objective being to facilitate optimal professional and social management. In future studies, the key role of counseling and orientation mechanisms should be highlighted as means of preventing WRA occurrence.

Authors: C Gautier, M T Lecam, S Basses, J C Pairon, P Andujar

Full Source: Revue des maladies respiratoires 2021 Oct 25;S0761-8425(21)00367-3. doi: 10.1016/j.rmr.2021.09.006.

Work-related asthma (WRA) accounts for 10-25% of all adult asthma.

The safety programme as a tool of improvement for safety culture in the workplace: an exploratory follow-up study from the Danish offshore oil and gas sector

2021-11-03

Offshore industry has always been a risky working place, and therefore there has always been a strong focus on maintaining the highest safety standards. The present research aims to ascertain the effects of a new safety mindset from both individual employee and organizational angles, and is based on two surveys conducted in 2010 and 2014 on Danish oil production platforms in the North Sea and qualitative data from interviews, observations and documentary analysis. The participating offshore oil company introduced a new safety mindset at the beginning of

Bulletin Board

Technical

NOV. 05, 2021

2010 to all of their employees and subcontractors. The results indicate that there were some significant, positive changes both in individual employee attitudes towards safety and in strong organizational commitment to work closely with employees to ensure the highest workplace safety status on oil platforms. However, the results also show that it is important to maintain a campaign to ensure these positive effects.

Authors: Hanna Barbara Rasmussen, Dewan Ahsan

Full Source: International journal of occupational safety and ergonomics : JOSE 2021 Nov 3;1-10. doi: 10.1080/10803548.2021.1985303.

The Effects of Lead and Cadmium Co-exposure on Serum Ions in Residents Living Near a Mining and Smelting Area in Northwest China

2021-10-28

In this study, we investigated the associations between cadmium (Cd) and lead (Pb) co-exposure, and serum ion levels in two populations living near a mining/smelting area and a nature reserve (control area), respectively. A total of 445 participants were included in this study. Their blood cadmium (BCd), blood lead (BPb), and serum ion levels were determined, and the association between exposure levels and serum ion levels was analyzed. The exposure levels of subjects living in the polluted area were significantly higher ($p < 0.001$). Lower levels of potassium, inorganic phosphorus, and iron were observed in subjects from the polluted area, whereas their sodium and chloride levels were higher ($p < 0.01$). The anion gap in their serum was also significantly lower. We observed positive dose-effect relationships between Cd and/or Pb exposure and serum sodium and chloride, and negative dose-effect relationships between Cd and/or Pb exposure and serum inorganic phosphorus, iron, as well as the anion gap. High Cd-Pb, high Cd, and high Pb exposure led to modification effects in potassium, calcium, inorganic phosphorus, and iron levels, and the anion gap. No synergistic effects were observed in our results. In conclusion, our data demonstrate that Cd and Pb exposure, alone or in combination, can lead to serum ion imbalances.

Authors: Qian Luo, Honglong Zhang, Haiping Wang, Li Ma, Min Huang, Jingping Niu, Bin Luo, Jun Yan, Xun Li

Full Source: Biological trace element research 2021 Oct 28. doi: 10.1007/s12011-021-02991-w.

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Bulletin Board

Technical

NOV. 05, 2021

PHARAMACEUTICAL/TOXICOLOGY

Results of a 30-day safety assessment in young mice orally exposed to polystyrene nanoparticles

2021-09-14

Polystyrene nanoparticles (PSNPs) are a newly emerging pollutant in the natural environment. However, due to the lack of sufficient toxicological studies in mammals, the potential effects of PSNPs on human health remain largely undefined. Therefore, in this study, young mice aged four weeks old were subjected to oral administration of 0, 0.2, 1, or 10 mg/kg PSNPs for 30 days. Our results demonstrated for the first time that oral exposure to PSNPs affected the expressions of mucus secretion-related genes and altered the community composition of intestinal microbiota, although this treatment did not cause behavioral impairments in young mice. No significant alterations in inflammatory or oxidative stress-related indicators were observed in the liver, lung, intestine, cortex or serum of PSNPs-treated animals. Moreover, exposure to PSNPs did not cause pathological changes in the liver, lung, or cortex tissues. Notably, although oral administration of PSNPs did not produce obvious toxic effects in the major organs of young mice, the possible toxicity of PSNPs remains unresolved and it may depend on the dose, exposure route and species. The potential hazardous effects of PSNPs still need to be systematically assessed, especially for children who are susceptible to exposure to nanoparticles.

Authors: Junting Xiao, Xuejun Jiang, Yujian Zhou, Golamaully Sumayyah, Lixiao Zhou, Baijie Tu, Qizhong Qin, Jingfu Qiu, Xia Qin, Zhen Zou, Chengzhi Chen

Full Source: Environmental pollution (Barking, Essex : 1987) 2021 Sep 14;292(Pt B):118184. doi: 10.1016/j.envpol.2021.118184.

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