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CHEMICAL EFFECTS

E-Cigarettes Reexamined: Product Toxicity

2022-09

The introduction of e-cigarettes, or electronic nicotine delivery systems (ENDS), has been accompanied by controversy regarding their safety and effectiveness as a cessation aid and by an explosion in their use by youth. Their use does not involve the combustion of tobacco and the creation of harmful combustion products; they have been seen as a “harm reduction” tool that may be of assistance in promoting smoking cessation. Recognition that ENDS can deliver an array of chemicals and materials with known adverse consequences has spurred more careful examination of these products. Nicotine, nitrosamines, carbonyl compounds, heavy metals, free radicals, reactive oxygen species, particulate matter, and “emerging chemicals of concern” are among the constituents of the heated chemical aerosol that is inhaled when ENDS are used. They raise concerns for cardiovascular and respiratory health that merit the attention of clinicians and regulatory agencies. Frequently cited concerns include evidence of disordered respiratory function, altered hemodynamics, endothelial dysfunction, vascular reactivity, and enhanced thrombogenesis. The absence of evidence of the consequences of their long-term use is of additional concern. Their effectiveness as cessation aids and beneficial impact on health outcomes continue to be examined. It is important to ensure that their production and availability are thoughtfully regulated to optimise their safety and permit their use as harm reduction devices and potentially as smoking-cessation aids. It is equally vital to effectively prevent them from becoming ubiquitous consumer products with the potential to rapidly induce nicotine addiction among large numbers of youth. Clinicians should understand the nature of these products and the implications of their use.

Authors: Andrew L Pipe, Hassan Mir

Full Source: The Canadian journal of cardiology 2022 Sep;38(9):1395-1405.

doi: 10.1016/j.cjca.2022.08.001.

Assessment of health risk and dose-effect of DNA oxidative damage for the thirty chemicals mixture of parabens, triclosan, benzophenones, and phthalate esters

2022-09-10

Humans are constantly exposed to parabens (PBs), triclosan (TCS), benzophenones (BPs), and phthalate esters (PAEs) due to the widespread

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existence of these chemicals in personal care products (PCPs), and the high frequency of usage for humans. Previous studies indicated each class of the above-mentioned chemicals can exhibit potential adverse effects on humans, in particular DNA oxidative damage. However, the health risk assessment of combined exposures to multiple PCPs is limited, especially the overall dose-effect of mixtures of these chemicals on DNA oxidative damage. In this study, we measured the urinary levels of 6 PBs, TCS, 8 BPs, 15 metabolites of PAEs (mono-PAEs), and 8-hydroxy-2'-deoxyguanosine (8-OHdG) from 299 adults simultaneously. PBs, TCS, BPs, and mono-PAEs were frequently detected in urinary samples with median concentrations of 52.888, 0.737, 1.305, and 141.381 ng/ml, suggesting a broad, low-level exposure among participants. Risk assessments indicated approximately 22% and 15% of participants suffered health risks (Hazard index >1) from exposure to TCS and PAEs. The relationship between 8-OHdG levels and chemical exposure was estimated by Bayesian kernel machine regression (BKMR) models. It indicated an overall positive correlation between the mixture of these chemicals and 8-OHdG, with methylparaben and mono-benzyl phthalate contributing the most to this association. Of note, sex-related differences were observed, in which exposure to PCPs led to higher health risks and more pronounced dose-effect on DNA damage in the female population. Our novel findings reveal the health risks of exposure to low-level PCPs mixtures and further point out the overall dose-response relationship between DNA oxidative damage and PCP mixtures.

Authors: Qilong Liao, Hehai Huang, Xue Zhang, Xiaojun Ma, Jing Peng, Zhaorui Zhang, Chuanying Chen, Yanrong Lv, Xiaohui Zhu, Jing Zheng, Xiaowen Zeng, Xiumei Xing, Qifei Deng, Guanghui Dong, Qing Wei, Mengjun Hou, Yongmei Xiao

Full Source: Chemosphere 2022 Sep 10;308(Pt 2):136394. doi: 10.1016/j.chemosphere.2022.136394.

Humans are constantly exposed to parabens (PBs), triclosan (TCS), benzophenones (BPs), and phthalate esters (PAEs) due to the widespread existence of these chemicals in personal care products (PCPs)

ENVIRONMENTAL RESEARCH

Evaluating the dynamic distribution process and potential exposure risk of chlorinated paraffins in indoor environments of Beijing, China

2022-09-06

Chlorinated paraffins (CPs) are typical semi-volatile chemicals (SVOCs) that have been used in copious quantities in indoor material additives. SVOCs distribute dynamically between the gas phase and various condensate phases, especially organic films. Investigating the dynamic behaviors

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of existing CPs in indoor environments is necessary for understanding their potential risk to humans from indoor exposure. We investigate the distribution profiles of CPs in both gas phase and organic films in indoor environments of residential buildings in Beijing, China. The concentrations of CPs were in the range of 32.21-1447 ng/m³ in indoor air and in the range of 42.30-431.1 µg/m² and in organic films. Cooking frequency was identified as a key factor that affected the distribution profiles of CPs. Furthermore, a film/gas partitioning model was constructed to explore the transportation and fate of CPs. Interestingly, a re-emission phenomenon from organic films was observed for chemical groups with lower log K_{oa} components, and, importantly, their residue levels in indoor air were well predicted. The estimated exposure risk of CPs in indoor environment was obtained. For the first time, these results produced convincing evidence that the co-exposure risk of short-chain CPs (SCCPs), medium-chain CPs (MCCPs), and long-chain CPs (LCCPs) in indoor air could be further increased by film/gas distribution properties, which is relevant for performing risk assessments of exposure to these SVOCs in indoor environments.

Authors: Lu Bai, Kun Lv, Juan Li, Wei Gao, Chunyang Liao, Yawei Wang, Guibin Jiang

Full Source: Journal of hazardous materials 2022 Sep 6;441:129907. doi: 10.1016/j.jhazmat.2022.129907.

Multi-class organic pollutants in atmospheric particulate matter (PM 2.5) from a Southwestern Europe industrial area: Levels, sources and human health risk

2022-11

The occurrence of 50 multi-class pollutants comprising 18 polycyclic aromatic hydrocarbons (PAHs), 12 phthalate esters (PAEs), 12 organophosphorus flame retardants (OPFRs), 6 synthetic musk compounds (SMCs) and 2 bisphenols was studied in atmospheric particulate matter (PM_{2.5}) samples collected at an industrial area focused on automotive manufacturing located at the Southwestern Atlantic European region (Vigo city, Spain) during 1-year period. Among all quantitated pollutants in PM_{2.5} samples, bisphenol A (BPA) was the most predominant with an average concentration of 6180 pg m⁻³, followed by PAHs comprising benzo(b+j)fluoranthene (BbF + BjF) and benzo(g,h,i)perylene (BghiP), accounting for 546 pg m⁻³ and 413 pg m⁻³ respectively. In addition, two OPFRs concerning tris(chloropropyl) phosphate (TCPP) and triphenyl phosphine oxide (TPPO) were the next following the concentration order, accounting for 411 pg m⁻³ and 367 pg

Chlorinated paraffins (CPs) are typical semi-volatile chemicals (SVOCs) that have been used in copious quantities in indoor material additives.

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m-3 respectively; being butyl benzyl phthalate (BBP) the most profuse PAE (56.1 pg m⁻³ by average). High relative standard deviations (RSDs) were observed during the whole sampling period, while statistically significant differences were only observed for PAHs concentrations during cold and warm seasons. Furthermore, some water-soluble ions and metal(oid)s were analysed in PM_{2.5} samples to be used as PM source tracers, whose concentrations were quite below the target levels set in the current legislation. Data obtained from principal component analysis (PCA) and PAHs molecular indices suggested a pyrogenic and petrogenic origin for PAHs, whereas occurrence of the remaining compounds seems to be attributed to resources used in the automotive industrial activity settled in the sampling area. Moreover, although a substantial anthropogenic source to PM_{2.5} in the area was observed, marine and soil resuspension contributions were also accounted. Finally, carcinogenic and non-carcinogenic risks posed by PM_{2.5}-bound pollutants inhalation were assessed, being both averages within the safe level considering the whole period.

Authors: Joel Sánchez-Piñero, Natalia Novo-Quiza, Jorge Moreda-Piñeiro, Isabel Turnes-Carou, Soledad Muniategui-Lorenzo, Purificación López-Mahía

Full Source: Environmental research 2022 Nov;214(Pt 4):114195. doi: 10.1016/j.envres.2022.114195.

A bibliometric analysis of pre- and post-Stockholm Convention research publications on the Dirty Dozen Chemicals (DDCs) in the African environment

2022-09-08

Persistent organic pollutants (POPs) are toxic chemicals that stay in the environment for a long time. To address the toxicity issues, global nations, including 53 African countries, ratified the Stockholm Convention to minimize or eliminate the production of 12 POPs known as the "Dirty Dozen". However, these Dirty Dozen Chemicals (DDCs) still exist in significant concentration in the African environment, prompting numerous research to investigate the level of their occurrences. Here, we conducted a bibliometric analysis to examine the publication trends in DDCs-related research in Africa using articles published between 1949 and 2021 from the Web of Science and Scopus databases. A total of 884 articles were published within the survey period, with a publication/author and author/publication ratio of 0.36 and 2.76, respectively. South Africa ranked first in terms of number of publications (n = 133, 15.05%), and total citations (n = 3115), followed by Egypt (n = 117), Nigeria (n = 77),

Persistent organic pollutants (POPs) are toxic chemicals that stay in the environment for a long time.

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USA (n = 40), and Ghana (n = 38). Research collaboration was relatively high (collaboration index = 2.88). The insignificant difference between the theoretical and observed Lotka's distribution indicates Lotka's law does not fit the DDC literature. An annual growth rate of 0.57% implies that a substantial increase of articles in years to come is not expected. More research programs should be established in other African countries to measure up to South Africa's supremacy. This is critical in order to provide a basis for effective compliance to the Stockholm Convention on POPs in Africa.

Authors: Chijioke Olisah, Adedapo O Adeola, Kingsley O Iwuzor, Kovo G Akpomie, Jeanet Conradie, Kayode A Adegoke, Kabir O Oyedotun, Joshua O Ighalo, James F Amaku

Full Source: Chemosphere 2022 Sep 8;308(Pt 2):136371. doi: 10.1016/j.chemosphere.2022.136371.

Pollution characteristics of soil heavy metals around two typical copper mining and beneficiation enterprises in Northwest China

2022-09-14

In order to investigate the situation of heavy metal pollution in the heavy metal industry in Gansu Province, a large copper mining province, two large and typical copper mining and beneficiation enterprises with differences in topographic features, climatic conditions, and soil types were selected as the target of this study based on similar ore types and beneficiation processes. Around these two enterprises, geochemical baselines of the six heavy metals were established, while the degree of local soil heavy metal pollution and potential hazards to humans were assessed based on statistical analysis, single-factor and multi-factor index analysis, and health risk evaluation models. In addition, Spearman's correlation analysis and hierarchical cluster analysis were used to explore the intrinsic association between each heavy metal in the two mining industries to reveal the pattern of soil heavy metal pollution in the copper mining and beneficiation industry and to propose targeted measures to improve and prevent soil heavy metal pollution. The results showed that the heavy metal pollution in the soil around Shengxi Mining Co., Ltd. of Subei County (SX enterprise) was higher than that around Yangba Copper Co., Ltd. of Gansu Province (YB enterprise), but the two enterprises had similar patterns of pollution, with an overall medium level of pollution. The carcinogenic and non-carcinogenic risks for children and adults were within acceptable limits for both enterprises. Besides, the correlation between the different heavy metals to similarity in their sources of

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contamination and the different degrees of association between the soil heavy metals of the two enterprises due to their environmental characteristics.

Authors: Lei Liu, Yajing Lu, Yuxin Shan, Jimin Mi, Zepeng Zhang, Fei Ni, Jun Zhang, Wenyan Shao

Full Source: Environmental monitoring and assessment 2022 Sep 14;194(10):788. doi: 10.1007/s10661-022-10416-x.

PHARMACEUTICAL/TOXICOLOGY

Evaluating association of smoking status during pregnancy with adverse birth outcomes using urinary cotinine concentration: The Japan environment and Children's study (JECS)

2022-09-14

Urinary cotinine concentration (UCC) reflects smoking status. However, in pregnant women, its association with adverse birth outcomes related to fetal growth is not widely known. Thus, we aimed to explore this relationship by focusing on dose-response relationships. We investigated 86,638 pregnant women enrolled between 2011 and 2014 in a prospective cohort study in Japan and observed three birth outcomes (preterm birth, low birth weight, and small-for-gestational age). We measured UCC in the second or third trimester, and categorized the participants using cut-off values (negative cotinine concentration, passive cotinine concentration, and active cotinine concentration corresponding to non-smokers, passive smokers, and active smokers, respectively). Logistic regression analyses were conducted to evaluate the risks, and dose-response relationships were visualized using restricted cubic spline curves. Analyses based on self-reported smoking status were also performed. We found that in low active and highly active cotinine concentrations, the adjusted odds ratios (aORs) of birth outcomes were significantly increased (preterm birth, 1.24 [95% CI 1.06-1.46], 1.39 [95% CI 1.19-1.62]; low birth weight, 1.40 [95% CI 1.24-1.58], 2.27 [95% CI 2.05-2.53]; small-for-gestational age, 1.35 [95% CI 1.19-1.52], 2.39 [95% CI 2.16-2.65]). Restricted cubic spline curves demonstrated risk elevations in the active cotinine concentration range. Our research revealed dose-response relationships between UCC during pregnancy and the risks of preterm birth, low birth weight, and small-for-gestational age. Measurement of UCC to ascertain smoking status during

Urinary cotinine concentration (UCC) reflects smoking status.

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pregnancy may be a useful approach for predicting the risks of these birth outcomes.

Authors: Yuki Kunori, Yasuaki Saijo, Eiji Yoshioka, Yukihiko Sato, Tomoko Kanaya, Kentaro Nakanishi, Yasuhito Kato, Ken Nagaya, Satoru Takahashi, Yoshiya Ito, Sachiko Itoh, Sumitaka Kobayashi, Chihiro Miyashita, Atsuko Ikeda-Araki, Reiko Kishi, Japan Environment and Children's Study (JECS) Group, Michihiro Kamijima, Shin Yamazaki, Yukihiko Ohya, Reiko Kishi, Nobuo Yaegashi, Koichi Hashimoto, Chisato Mori, Shuichi Ito, Zentaro Yamagata, Hidekuni Inadera, Takeo Nakayama, Tomotaka Sobue, Masayuki Shima, Hiroshige Nakamura, Narufumi Suganuma, Koichi Kusuhara, Takahiko Katoh

Full Source: Environmental research 2022 Sep 14;114302. doi: 10.1016/j.envres.2022.114302.

OCCUPATIONAL

Skin and respiratory exposure to soluble lead, cobalt, nickel, copper, arsenic and silver at two South African precious metals refineries

2022-09-17

Objectives: Precious metals refinery workers are exposed to soluble platinum group metals (PGMs) during PGM-refining but may also be exposed to hazardous non-PGMs (Pb, Co, Ni, Cu, As and Ag) still present in the matte following base metals refining. The aim of this article was to report the skin and respiratory exposure of workers to soluble non-PGMs during PGM-refining. **Methods:** Skin and respiratory exposure (of 40 workers at two precious metals refineries) were measured simultaneously over two consecutive shifts. Skin exposure was measured on the palm, wrist, neck and forehead using Ghostwipes™ and respiratory exposure was measured using the MDHS method 46/2 during which soluble metals were extracted using 0.07 M HCl and mechanical agitation, followed by ICP-MS analysis. **Results:** The geometric means (GM) of average skin exposure to individual soluble metals on all anatomical areas was found in the order Cu (0.018 µg/cm²) > Ni (0.016 µg/cm²) > Pb (0.008 µg/cm²) > Ag (0.006 µg/cm²) > As (0.004 µg/cm²) > Co (0.0008 µg/cm²) with the palm being the highest exposed anatomical area. The order of the GM respiratory exposure was Pb (0.224 µg/m³) > Ag (0.201 µg/m³) > Cu (0.159 µg/m³) > As (0.079 µg/m³) > Ni (0.034 µg/m³) > Co (0.016 µg/m³) with exposure to As exceeding the South African occupational exposure limit (20 µg/m³) during concentrate handling (max

Objectives: Precious metals refinery workers are exposed to soluble platinum group metals (PGMs) during PGM-refining but may also be exposed to hazardous non-PGMs (Pb, Co, Ni, Cu, As and Ag) still present in the matte following base metals refining.

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66.174 µg/m³). **Conclusions:** Workers were exposed to a mixture of toxic PGM and non-PGMs via the skin and inhalation. Exposure to these metals could lead to the development of diseases, such as contact dermatitis, occupational allergy, or occupational cancer. Non-PGMs must be included in hazardous chemical risk assessments and control strategies implemented at precious metals refineries.

Authors: Stephanus J L Linde, Anja Franken, Johannes L du Plessis
Full Source: International archives of occupational and environmental health 2022 Sep 17. doi: 10.1007/s00420-022-01921-0.

Prevention of the Occupational Silicosis Epidemic in Australia: What Do Those Who Assess Workplace Health Risk Think Should Be Done Now?

2022-09-16

An Australian National Dust Disease Taskforce was established to address the re-emergence of occupational lung disease, in particular silicosis. Exposure to respirable crystalline silica (RCS) occurs in various industries in Australia. We asked occupational hygienists about their practical experiences and perspectives on RCS exposure and regulatory action. A total of 105 members of the Australian Institute of Occupational Hygienists completed an anonymous questionnaire, which addressed individual characteristics, experience, perceived level of employer awareness, effectiveness of current regulation, and recommendations for improvement, across three main industrial sectors. Based on professional experience, 71% were concerned about the potential for RCS over-exposure. Barriers to adequate exposure control included lack of management commitment and financial resources. The employment of specialist occupational hygiene inspectors was considered to be the most effective regulatory strategy. Given the large number of exposed workers in the construction industry, with only a moderate awareness, there is the potential for significant cost shifting of the burden of occupational lung disease from employers on to individuals and the public health system. A nationally consistent approach to RCS exposure control across all industrial sectors is now recommended, with an increased focus on measuring and controlling exposure.

Authors: Kate Cole, Deborah Glass, Tracey Bence, Dino Pisaniello, Peter Knott, Shelley Rowett, Sharann Johnson

Full Source: Annals of work exposures and health 2022 Sep 16;wxac064. doi: 10.1093/annweh/wxac064.

An Australian National Dust Disease Taskforce was established to address the re-emergence of occupational lung disease, in particular silicosis.

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Correlates of Positive Thyroid Peroxidase Antibodies Among Firefighters: A Cross-Sectional-Study

2022-08-23

Context: Exposure to endocrine disrupting chemicals (EDCs) are associated with underactive thyroid glands, and possibly autoimmunity. Firefighters are exposed to EDCs from flame retardants; however, the prevalence and risk factor associations of thyroid antibodies among firefighters are unknown.

Context: We aimed to determine the prevalence of thyroid peroxidase antibodies (TPOAb) and associated sociodemographic and occupational risk factors among firefighters.

Methods: Firefighters attending professional health and safety conferences between November 2018 and January 2020, and with no prior diagnosis of thyroid disease were invited ($n = 278$) to submit a health survey, blood samples, and complete a thyroid ultrasound. The survey assessed for sociodemographic and occupational characteristics, including a history of familial thyroid disease, smoking, firefighter tenure, and job rank, radiation exposure, and mitigation practices of occupational exposures. Serum thyroid peroxidase antibody (TPOAb) was also assessed.

Results: Approximately 39.9% of firefighters evaluated had a positive TPOAb test. The mean age for those TPOAb positive was lower than those who tested negative (41.4 ± 7.9 vs 43.1 ± 7.9 years, $P = 0.07$) but this difference was not significant. Firefighters with a family history of thyroid disease had a statistically significant higher prevalence of TPOAb compared with those without a family history (60.0% vs 37.5%, $P = 0.02$); this association remained significant after adjusting for sociodemographic and occupational factors (odds ratio 2.99; CI, 1.31-6.85).

Conclusion: The prevalence of TPOAb is high among firefighters in our study, and family history is a significant determinant of testing positive for TPOAb. Firefighters may benefit from TPOAb and thyroid stimulating hormone tests, and screening for family history of thyroid disease at baseline employee medical check-ups. This finding suggests the need for further studies.

Authors: Kemi Ogunsina, Tulay Koru-Sengul, Valentina Rodriguez, Alberto J Caban-Martinez, Natasha Schaefer-Solle, Soyeon Ahn, Erin N Kobetz-Kerman, David J Lee

Full Source: Journal of the Endocrine Society 2022 Aug 23;6(10):bvac125. doi: 10.1210/jendso/bvac125.

Context: Exposure to endocrine disrupting chemicals (EDCs) are associated with underactive thyroid glands, and possibly autoimmunity.