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CHEMICAL EFFECTS

Addition of lemon before boiling chlorinated tap water: A strategy to control halogenated disinfection byproducts

2020-08-13

Chlorine disinfection is required to inactivate pathogens in drinking water, but it inevitably generates potentially toxic halogenated disinfection byproducts (halo-DBPs). A previous study has reported that the addition of ascorbate to tap water before boiling could significantly decrease the concentration of overall halo-DBPs in the boiled water. Since the fruit lemon is rich in vitamin C (i.e., ascorbic acid), adding it to tap water followed by heating and boiling in an effort to decrease levels of halo-DBPs was investigated in this study. We examined three approaches that produce lemon water: (i) adding lemon to tap water at room temperature, termed "Lemon"; (ii) adding lemon to boiled tap water (at 100 °C) and then cooling to room temperature, termed "Boiling + Lemon"; and (iii) adding lemon to tap water then boiling and cooling to room temperature, termed "Lemon + Boiling". The concentrations of total and individual halo-DBPs in the resultant water samples were quantified with high-performance liquid chromatography-tandem mass spectrometry and the cytotoxicity of DBP mixtures extracted from the water samples was evaluated using human epithelial colorectal adenocarcinoma Caco-2 cells and hepatoma HepG2 cells. Our results show that the "Lemon + Boiling" approach substantially decreased the concentrations of halo-DBPs and the cytotoxicity of tap water. This strategy could be applied to control halo-DBPs, as well as to lower the adverse health effects of halo-DBPs on humans through tap water ingestion.

Authors: Jiaqi Liu, Christie M Sayes, Virender K Sharma, Yu Li, Xiangru Zhang

Full Source: Chemosphere 2020 Aug 13;263:127954. doi: 10.1016/j.chemosphere.2020.127954.

GAPS-megacities: A new global platform for investigating persistent organic pollutants and chemicals of emerging concern in urban air

2020-08-14

A pilot study was initiated in 2018 under the Global Atmospheric Passive Sampling (GAPS) Network named GAPS-Megacities. This study included 20 megacities/major cities across the globe with the goal of better understanding and comparing ambient air levels of persistent organic

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pollutants and other chemicals of emerging concern, to which humans residing in large cities are exposed. The first results from the initial period of sampling are reported for 19 cities for several classes of flame retardants (FRs) including organophosphate esters (OPEs), polybrominated diphenyl ethers (PBDEs), and halogenated flame retardants (HFRs) including new flame retardants (NFRs), tetrabromobisphenol A (TBBPA) and hexabromocyclododecane (HBCDD). The two cities, New York (USA) and London (UK) stood out with 3.5 to 30 times higher total FR concentrations as compared to other major cities, with total concentrations of OPEs of 15,100 and 14,100 pg/m³, respectively. Atmospheric concentrations of OPEs significantly dominated the FR profile at all sites, with total concentrations in air that were 2-5 orders of magnitude higher compared to other targeted chemical classes. A moderately strong and significant correlation ($r = 0.625$, $p < 0.001$) was observed for Gross Domestic Product index of the cities with total OPEs levels. Although large differences in FR levels were observed between some cities, when averaged across the five United Nations regions, the FR classes were more evenly distributed and varied by less than a factor of five. Results for Toronto, which is a 'reference city' for this study, agreed well with a more in-depth investigation of the level of FRs over different seasons and across eight sites representing different urban source sectors (e.g. traffic, industrial, residential and background). Future sampling periods under this project will investigate trace metals and other contaminant classes, linkages to toxicology, non-targeted analysis, and eventually temporal trends. The study provides a unique urban platform for evaluating global exposome.

Authors: Amandeep Saini, Tom Harner, Sita Chinnadhurai, Jasmin K Schuster, Alan Yates, Andrew Sweetman, Beatriz H Aristizabal-Zuluaga, Begoña Jiménez, Carlos A Manzano, Eftade O Gaga, Gavin Stevenson, Jerzy Falandysz, Jianmin Ma, Karina S B Miglioranza, Kurunthachalam Kannan, Maria Tominaga, Narumol Jariyasopit, Nestor Y Rojas, Omar Amador-Muñoz, Ravindra Sinha, Rose Alani, R Suresh, Takahiro Nishino, Tamer Shoeib

Full Source: Environmental pollution (Barking, Essex : 1987) 2020 Aug 14;267:115416. doi: 10.1016/j.envpol.2020.115416.

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Suspect screening analysis in house dust from Belgium using high resolution mass spectrometry; prioritization list and newly identified chemicals

2020-08-03

In recent years, several changes have been made to the composition of various products which are used indoors. Plenty of new chemical additives have been incorporated to materials to comply with current legislation and safety rules. Consequently, the emission profiles of contaminants detected indoors may change over time, requiring continuous monitoring. In this study, dust samples were collected from 25 homes located in the Flemish region of Belgium during different seasons (winter and summer). Our aim was the development of a suspect screening workflow for the identification of new chemicals which might have been applied to indoor goods, released into the indoor environment, and accumulated in dust. An in-house suspect list was curated including selected groups of compounds, namely "phthalates", "phosphates", "terephthalates", "citrate", "trimellitates", [di-, tri-, tetra-] "carboxylic acids", "adipates", "azelates", "sebacates", [di-] "benzoates", and "succinates". 63 chemicals were prioritized based on their level of identification and detection frequency in samples. Seasonal comparison was tested, indicating that higher temperatures of summer might facilitate the release of few chemicals from the products into the indoor environment. Seven chemicals, to the best of our knowledge not previously reported, were selected out of the 63 listed and identified for structure confirmation using high-resolution mass spectrometry. Tributyl trimellitate (TBTM), bis (3,5,5-trimethylhexyl) phosphate (Bis-3,5,5-TMHP), iso-octyl 2-phenoxy ethyl terephthalate (IOPhET), dimethyl azelate (DMA), dimethyl sebacate (DMS), dipropylene glycol dibenzoate (DiPGDB) and 3,5-di-tert-butyl-4-hydroxybenzaldehyde (BHT-CHO) were detected at frequencies ranging from 8 to 52% in winter and 4-56% in summer dust.

Authors: Christina Christia, Giulia Poma, Noelia Caballero-Casero, Adrian Covaci

Full Source: Chemosphere 2020 Aug 3;263:127817. doi: 10.1016/j.chemosphere.2020.127817.

In recent years, several changes have been made to the composition of various products which are used indoors.

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ENVIRONMENTAL RESEARCH**[Effects of air pollution exposure on olfaction of rats in Beijing]**

2020-07-06

Objective: To evaluate the effects of exposure of fine particle matter (PM_{2.5}) and ozone (O₃) in Beijing as the main pollutants on olfaction of SD rats. Methods: In October 16, 2018, twenty 8-week-old SD rats were randomly divided into two groups, 10 rats in the exposure group and 10 rats in the control group. They were fed in air pollutant exposure system and clean experimental environment respectively, and the concentrations of PM_{2.5} and O₃ in each system were measured. The degree of olfaction damage of SD rats at different feeding time was assessed by using the buried food test (BFT). The difference of BFT time between the two groups was analyzed by performing the repeated measures analysis of variance. Results: The results showed that the concentrations of PM_{2.5} and O₃ in the exposure group were (22.65±11.47) µg/m³ and (12.36±5.87) µg/m³, respectively, while those in the control group were both 0 µg/m³. The repeated measures analysis of variance showed that the time of BFT in the exposure group was longer than that in the control group (F=6.49, P=0.031). With the increase of feeding time, the time of BFT was prolonged (F=61.69, P<0.001). Conclusion: Exposure to PM_{2.5} and O₃ in the atmosphere might lead to olfaction damage in rats.

Authors: T L Yan, J Xia, J Y Xu, P Zheng, S P Zhou, T Chen, G Jia
Full Source: Zhonghua yu fang yi xue za zhi [Chinese journal of preventive medicine] 2020 Jul 6;54(7):774-778. doi: 10.3760/cma.j.cn112150-20200508-00699.

Objective: To evaluate the effects of exposure of fine particle matter (PM_{2.5}) and ozone (O₃) in Beijing as the main pollutants on olfaction of SD rats.

Latex balloons do not degrade uniformly in freshwater, marine and composting environments

2020-08-14

Latex balloons are a poorly-studied aspect of anthropogenic pollution that affects wildlife survival, aesthetic value of waterways, and may adsorb and leach chemicals. Pure latex needs to be vulcanised with sulphur and requires many additional compounds to manufacture high quality balloons. Yet, balloons are often marketed as "biodegradable", which is confusing to consumers. Due to the persistence of latex balloons in the environment and the lethal, documented threat to wildlife, degradation behaviours of latex balloons were quantified in freshwater, saltwater and industrial compost. Using the metrics mass change, ultimate tensile strength

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(UTS) and superficial composition via attenuated total reflectance Fourier transform infrared spectroscopy (ATR-FTIR), latex balloon degradation was documented for 16 weeks. Overall, latex balloons retained their original shape and size. Composted balloons lost 1-2% mass, but some balloons in freshwater gained mass, likely due to osmotic processes. Balloons' UTS decreased from 30.7 ± 10.8 - 9.5 ± 4.1 Newtons in water, but remained constant (34.3 ± 13.4 N) in compost. ATR-FTIR spectra illustrated compositional and temporal differences between treatments. Taken together, latex balloons did not meaningfully degrade in freshwater, saltwater, or compost indicating that when released into the environment, they will continue to contribute to anthropogenic litter and pose a threat to wildlife that ingest them.

Authors: Morgan E Gilmour, Jennifer L Lavers

Full Source: Journal of hazardous materials 2020 Aug 14;403:123629.

doi: 10.1016/j.jhazmat.2020.123629.

OCCUPATIONAL

Using geographic information systems to estimate potential pesticide exposure at the population level in Canada

2020-08-24

Residents in close proximity to agricultural land are at risk of higher pesticide exposures. The purpose of this study was to generate national population-level exposure estimates for Canada for three commonly applied pesticides that are suspected carcinogens (2,4-dichlorophenoxyacetic acid (2,4-D), glyphosate and chlorothalonil). Using geographic information systems, pesticide exposure was estimated for every - census subdivision (CSD) in Canada (n = 5054) by combining raster-based surfaces for the distribution of crops with average crop-specific pesticide application rates data. Analyses examined all identified crops in combination with different pesticide application rates to obtain a cumulative potential total exposure. Specifically, the number of acres of particular crops were calculated for each CSD and then multiplied by the average pesticide application rates data, summed across crops, and combined with population data by CSD to provide a potential pesticide exposure estimate for each CSD. Results demonstrate that the population exposure varies greatly depending on agricultural production by CSD region. For example, in Ontario, the 2,4-D application rate was an average of 361 kg/km², while in Saskatchewan, which primarily grows field/cereal crops, 2,4-D application rates were

Residents in close proximity to agricultural land are at risk of higher pesticide exposures.

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much higher (3810 kg/km²). The highest potential exposures to all three pesticides were in the prairie provinces (Alberta, Saskatchewan, Manitoba) along with Prince Edward Island, Southern Quebec and British Columbia. This work can be used in conjunction with other exposure assessment approaches to better understand overall pesticide exposure among Canada's general population.

Authors: Kristian Larsen, Paleah Black, Ela Rydz, Anne-Marie Nicol, Cheryl E Peters

Full Source: Environmental research 2020 Aug 24;191:110100. doi: 10.1016/j.envres.2020.110100.

Ischemic Heart Disease Mortality and Occupational Radiation Exposure in a Nested Matched Case-Control Study of British Nuclear Fuel Cycle Workers: Investigation of Confounding by Lifestyle, Physiological Traits and Occupational Exposures

2020-08-27

Epidemiological studies have suggested a link between low-level radiation exposure and an increased risk of cardiovascular disease, but the possibility of bias or confounding must be considered. We analyzed data from a matched case-control study nested in a cohort of British male industrial (i.e., blue-collar) nuclear fuel cycle workers using paired conditional logistic regression. The cases were comprised of workers from two nuclear sites who had died from ischemic heart disease (IHD) and were matched to controls on nuclear site, date of birth and first year of employment (1,220 pairs). Radiation doses from external sources and to the liver from internally deposited plutonium and uranium were obtained. Models were adjusted for age at start of employment at either site, decade of start, age at exit from study (death or censoring), process/other worker and socio-economic status. Included potential confounding factors of interest were occupational noise, shift work, pre-employment blood pressure, body mass index and tobacco smoking. Cumulative external doses ranged from 0-1,656 mSv and cumulative internal doses for those monitored for radioactive intakes ranged from 0.004-5,732 mSv. In a categorical analysis, additionally adjusted for whether or not a worker was monitored for internal exposure, IHD mortality risk was associated with cumulative external unlagged dose with a 42% excess risk (95% CI: 4%, 95%) at >103 mSv (highest quartile relative to lowest quartile), and 35% (95% CI: -1%, 84%) at >109 mSv 15-year lagged dose. The log-linear increase in risk per 100 mSv was 2% (95% CI: -4%,

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8%) for unlagged external dose and 5% [95% CI: -2%, 11%] for 15-year lagged dose. Associations with external dose for workers monitored for exposure to external radiation only reflected those previously reported for the cohort from which the cases and controls were drawn. There was little evidence of excess risk associated with cumulative doses from internal sources, which had not been assessed in the cohort study. The impact of the included potential confounding variables was minimal, with the possible exception of occupational noise exposure. Subgroup analyses indicated evidence of heterogeneity between sites, occupational groups and employment duration, and an important factor was whether workers were monitored for the potential presence of internal emitters, which was not explained by other factors included in the study. In summary, we found evidence for an increased IHD mortality risk associated with external radiation dose, but little evidence of an association with internal dose. External dose associations were minimally affected by important confounders. However, the considerable heterogeneity in the associations with external doses observed between subgroups of workers is difficult to explain and requires further work.

Authors: Frank de Vocht, Mira Hidajat, Richard M Martin, Raymond Agius, Richard Wakeford

Full Source: Radiation research 2020 Aug 27. doi: 10.1667/RADE-19-00007.1.

Effect of occupational exposure to petrol and gasoline components on liver and renal biochemical parameters among gas station attendants, a review and meta-analysis

2020-08-27

Objectives Kidney and liver are of the most affected organs during permanent exposure to petrol and gasoline components in gas stations. This study aims to investigate the renal and liver involvements in these workers using meta-analysis. Methods PubMed, Scopus, Science direct, ISI web of science, and Google scholar motor engine were searched using Mesh terms of the relevant keywords. Screening of titles, abstracts and full texts was continued until the eligible articles meeting the inclusion/exclusion criteria were selected. Quality assessment was conducted using NOS (Newcastle-Ottawa Quality score). The pooled standard mean difference of the renal and liver indices between exposed/unexposed groups was estimated using Stata ver. 11 software. Results In this systematic review, 22 papers were entered. The pooled standard mean difference [95% confidence interval] between exposed and unexposed

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groups was estimated as of 0.74 [0.28, 1.21] for alkaline phosphatase (ALP), 2.44 [1.80, 3.08] for aspartate transaminase (AST), 2.06 [1.42, 2.69] for alanine transaminase (ALT), 0.10 [-0.09, 0.29] for total Bilirubin (TB), 0.74 [-0.42, -1.90] for total protein (TP), -0.49 [-0.82, -0.15] for albumin, 0.88 [-0.10, 1.87] for uric acid, 1.02 [0.45, 1.59] for creatinine and 1.44 [0.75, 2.13] for blood urea nitrogen (BUN). Conclusion Our meta-analysis showed that the serum AST, ALT, ALP, total protein, total bilirubin, BUN, uric acid and creatinine levels were higher among workers exposed to petrol and gasoline than control group, while albumin was lower in the serum of the exposed workers. Therefore, occupational exposure to gasoline stations can create adverse effects on kidney and liver function.

Authors: Somayeh Rahimi Moghadam, Mahdi Afshari, Ali Ganjali, Mahmood Moosazadeh

Full Source: Reviews on environmental health 2020 Aug 27;:j/reveh.ahead-of-print/reveh-2019-0107/reveh-2019-0107.xml. doi: 10.1515/reveh-2019-0107.

Exposure to additives or multigrain flour is associated with high risk of work-related allergic symptoms among bakers

2020-08-27

Objectives: Wheat flour exposure in bakers can elicit respiratory and skin symptoms. Scarce data are available on the prevalence of such conditions in bakers. We investigated the prevalence of work-related rhinitis, asthma-like symptoms and dermatitis in bakers according to job task and type of allergens involved.

Methods: Of the 229 traditional bakeries in Verona area who were invited to participate in a cross-sectional survey, 211 (92%) accepted; 727 employees in these bakeries answered a modified version of a questionnaire on job tasks; allergen exposure within the bakery; and work-related nasal, asthma-like and skin symptoms during 2010-2014. Determinants of work-related nasal, asthma-like or skin disorders were separately evaluated using different logistic models.

Results: The prevalence of work-related nasal and asthma-like symptoms was, respectively, 15.1% and 4.2% in bakery shop assistants, increasing to 25.7% and 9.5% in bakers using only wheat flour, and further to 31.8% and 13.6% in bakers using flour and additives, and then to 34.1% and 18.2% in bakers using flour with additives and multigrain ($p < 0.001$). The risk of work-related asthma-like symptoms was more than doubled in bakers using additives without or with multigrain than in shop assistants (OR 2.3, 95% CI 1.0 to 5.5 and OR 3.4, 95% CI 1.1 to 10.8, respectively).

Objectives: Wheat flour exposure in bakers can elicit respiratory and skin symptoms.

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Making bread with additives alone or with multigrain significantly increased the risk of work-related nasal symptoms in shop assistants, while the risk of skin symptoms was not significantly affected.

Conclusions: Bakers using additives alone or with multigrain are at a high risk of experiencing nasal and asthma-like symptoms.

Authors: Mario Olivieri, Nicola Murgia, Gianluca Spiteri, Carlo Alberto Biscardo, Pierpaolo Marchetti, Ilenia Folletti, Giuseppe Verlato

Full Source: Occupational and environmental medicine 2020 Aug 27;oemed-2019-106052. doi: 10.1136/oemed-2019-106052.

PHARMACEUTICAL/TOXICOLOGY

Deoxyribonucleic acid (DNA) methylation in children exposed to air pollution: a possible mechanism underlying respiratory health effects development

2020-08-28

Air pollution is a substantial environmental threat to children and acts as acute and chronic disease risk factors alike. Several studies have previously evaluated epigenetic modifications concerning its exposure across various life stages. However, findings on epigenetic modifications as the consequences of air pollution during childhood are rather minimal. This review evaluated highly relevant studies in the field to analyze the existing literature regarding exposure to air pollution, with a focus on epigenetic alterations during childhood and their connections with respiratory health effects. The search was conducted using readily available electronic databases (PubMed and ScienceDirect) to screen for children's studies on epigenetic mechanisms following either pre- or post-natal exposure to air pollutants. Studies relevant enough and matched the predetermined criteria were chosen to be reviewed. Non-English articles and studies that did not report both air monitoring and epigenetic outcomes in the same article were excluded. The review found that epigenetic changes have been linked with exposure to air pollutants during early life with evidence and reports of how they may deregulate the epigenome balance, thus inducing disease progression in the future. Epigenetic studies evolve as a promising new approach in deciphering the underlying impacts of air pollution on

Air pollution is a substantial environmental threat to children and acts as acute and chronic disease risk factors alike.

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deoxyribonucleic acid (DNA) due to links established between some of these epigenetic mechanisms and illnesses.

Authors: Nur Faseeha Suhaimi, Juliana Jalaludin, Suhaili Abu Bakar

Full Source: Reviews on environmental health 2020 Aug 28;/j/reveh.ahead-of-print/reveh-2020-0065/reveh-2020-0065.xml. doi: 10.1515/reveh-2020-0065.