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CHEMICAL EFFECTS

Cytotoxicity and Antibacterial Activity of Toothpastes and Mouthwashes Available in the Iranian Market

2021-02-17

Objectives: Toothpastes and mouthwashes contain chemicals that may be harmful to oral tissues. This study assessed the cytotoxicity and antibacterial activity of toothpastes and compare the Iranian and foreign toothpastes and mouthwashes available in the Iranian market in this respect. Materials and Methods: Twenty samples (13 toothpastes and 4 mouthwashes) were selected. The cytotoxicity of 1, 10, and 50 mg/mL of toothpastes and 0.05, 2 and 10 µL of mouthwashes was measured after 1, 15 and 30 min of exposure to human gingival fibroblasts, each in triplicate. The methyl thiazolyl tetrazolium (MTT) assay was used for cytotoxicity testing. The serial dilution method was utilized to determine the minimum inhibitory concentration (MIC) of each sample against Lactobacillus acidophilus (L. acidophilus) and Streptococcus mutans (S. mutans). Two-way ANOVA and Tukey's test were used for data analysis. Results: A significant difference in cytotoxicity was noted among different products (P=0.00). The difference in cytotoxicity of each sample was not significant at 1, 15 and 30 min (P=0.08). The obtained MIC for all toothpastes and mouthwashes was between 0.0039 mg/mL and 0.0156 mg/mL, except for Sensodyne toothpaste and Oral B mouthwash. Conclusion: Some brands of toothpastes have higher cytotoxicity due to their composition, and their cytotoxicity should not be overlooked. The antibacterial activity of the samples was almost equal when they were in contact with L. acidophilus and S. mutans except for the Irsha mouthwash, Sehat, Darugar and Bath toothpastes. The antibacterial effect of toothpastes and mouthwashes increased with an increase in exposure time.

Authors: Zahra Shahidi, Shiva Tavakol Davani, Faranak Noori, Masoumeh Hasani Tabatabaei, Fatemeh Sodeif, Ardavan Etemadi, Nasim Chiniforush, Zohreh Moradi

Full Source: Frontiers in dentistry 2021 Feb 17;18:7. doi: 10.18502/fid.v18i7.5650.

Objectives: Toothpastes and mouthwashes contain chemicals that may be harmful to oral tissues.

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Toxic Substances Control Act (TSCA) Implementation: How the Amended Law Has Failed to Protect Vulnerable Populations from Toxic Chemicals in the United States

2022-08-18

Exposures to industrial chemicals are widespread and can increase the risk of adverse health effects such as cancer, developmental disorders, respiratory effects, diabetes, and reproductive problems. The amended Toxic Substances Control Act (amended TSCA) requires the U.S. Environmental Protection Agency (EPA) to evaluate risks of chemicals in commerce, account for risk to potentially exposed and susceptible populations, and mitigate risks for chemicals determined to pose an unreasonable risk to human health and the environment. This analysis compares EPA's first 10 chemical risk evaluations under amended TSCA to best scientific practices for conducting risk assessments. We find EPA's risk evaluations underestimated human health risks of chemical exposures by excluding conditions of use and exposure pathways; not considering aggregate exposure and cumulative risk; not identifying all potentially exposed or susceptible subpopulations, and not quantifying differences in risk for susceptible groups; not addressing data gaps; and using flawed systematic review approaches to identify and evaluate the relevant evidence. We present specific recommendations for improving the implementation of amended TSCA using the best available science to ensure equitable, socially just safeguards to public health. Failing to remedy these shortcomings will result in continued systematic underestimation of risk for all chemicals evaluated under amended TSCA.

Authors: Swati D G Rayasam, Patricia D Koman, Daniel A Axelrad, Tracey J Woodruff, Nicholas Chartres

Full Source: Environmental science & technology 2022 Aug 18. doi: 10.1021/acs.est.2c02079.

Exposures to industrial chemicals are wide-spread and can increase the risk of adverse health effects such as cancer, developmental disorders, respiratory effects, diabetes, and reproductive problems.

ENVIRONMENTAL RESEARCH

Long-term exposure to ambient air pollution and greenness in relation to pulmonary tuberculosis in China: A nationwide modelling study

2022-08-18

Previous studies have attempted to clarify the relationship between the occurrence of pulmonary tuberculosis (PTB) and exposure to air pollutants. However, evidence from multi-centres, particularly at the national level, is scarce, and no study has examined the modifying effect of greenness on

air pollution-TB associations. In this study, we examined the association between long-term exposure to ambient air pollutants (PM10 p.m.2.5, and O3) and monthly PTB or smear-positive pulmonary tuberculosis (SPPTB) incidence to further evaluate whether these associations were affected by greenness in mainland China using a two-stage analytic procedure. PM2.5 was positively associated with both PTB and SPPTB incidence, with relative risk (RR) of 1.12 (95% confidence interval [CI]: 1.03, 1.22) and 1.08 (95% CI: 1.02, 1.10) per 10 μg/m3 increase, respectively. Furthermore, PM10 was positively associated with PTB incidence, with RR of 1.07 (95% CI: 1.01, 1.13). However, O3 was not associated with the monthly incidence of PTB or SPPTB. The normalized difference vegetation index (NDVI) exhibited a modifying effect on the association between PM2.5 exposure and SPPTB incidence in northern areas, with RR of 1.16 (95% CI: 1.03, 1.31) in lower mean annual NDVI areas than in the higher areas (RR = 0.98, 95% CI: 0.87, 1.09). This nationwide analysis indicated that NDVI could reduce the effect of air pollutants on TB incidence particularly in the northern areas. Long-term exposure to particulate matter (PM) may increase the occurrence of PTB or SPPTB in China, and further studies involving larger numbers of SPPTB cases are required to confirm the effects of PM exposure on SPPTB incidence in the future.

Authors: Sui Zhu, Ya Wu, Qian Wang, Lijie Gao, Liang Chen, Fangfang Zeng, Pan Yang, Yanhui Gao, Jun Yang

Full Source: Environmental research 2022 Aug 18;214(Pt 3):114100. doi: 10.1016/j.envres.2022.114100.

The environmental pollution caused by cemeteries and cremations: A review

2022-08-16

In recent years the funeral industry has drawn attention from the scientific community concerning the potential pollution of the environment and the urban environment. In this review, the pollution caused by the cemeteries and crematoria around the world was addressed. The traditional burial leads to the production of ions, in the form of organic and heavy metals, bacteria, fungi, and viruses, that spread along with the soil and underwater. The crematoria produce small particles, trace gases (SOx, NOx, CO), and toxic organic volatiles. The effluent generated by both methods can lead to several environmental problems and further threaten human health. The current solution for the cemeteries in the development of a system in which effluent generated by the traditional burials are collected and treated before realizing in the environment. In addition to that, the green burial should be an alternative, since the corpse does not

In recent years the funeral industry has drawn attention from the scientific community concerning the potential pollution of the environment and the urban environment.

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go through the embalming process, thus eliminating the presence of any undesired chemicals, that are further leached onto the environment. The crematoria should be employed as it is, however, the gas treatment station should be employed, to ensure the minimization of the impact on the environment. Last, future researches regarding the treatment of the cemeteries leached still need to be explored as well as the optimization and further development of the crematoria gas treatment process.

Authors: Dison Sp Franco, Jordana Georgin, Luis Angel Villarreal Campo, Maria Arango Mayoral, Jose Orozco Goenaga, Carolina Moreno Fruto, Alcindo Neckel, Marcos Leandro Oliveira, Claudete Gindri Ramos

Full Source: Chemosphere 2022 Aug 16;136025. doi: 10.1016/j.chemosphere.2022.136025.

PHARMACEUTICAL/TOXICOLOGY

Percutaneous absorption and exposure risk assessment of organophosphate esters in children's toys

2022-08-08

The percutaneous penetration and exposure risk of organophosphate esters (OPEs) from children's toys remains largely unknown. Percutaneous penetration of OPEs was evaluated by EPISkin™ model. Chlorinated OPEs (Cl-OPEs) and alkyl OPEs, except tris(2-ethylhexyl) phosphate, exhibited a fast absorption rate and good dermal penetration ability with cumulative absorptions of 57.6-127 % of dosed OPEs. Cumulative absorptions of OPEs through skin cells were inversely associated with their molecular weight and log octanol-water partition coefficient. Additionally, a quantitative structure-activity relationship model indicated that topological charge and steric features of OPEs were closely related to the transdermal permeability of these chemicals. With the clarification of the factors affecting the transdermal penetration of OPEs, the level and exposure risk of OPEs in actual toys were studied. The summation of 18 OPE concentrations in 199 toy samples collected from China ranged from 6.82 to 228,254 ng/g, of which Cl-OPEs presented the highest concentration. Concentrations of OPEs in toys exhibited clear type differences. Daily exposure to OPEs via dermal, hand-to-mouth contact, and mouthing was evaluated, and dermal contact was a significant route for children's exposure to OPEs. Hazard quotients for noncarcinogenic risk assessment

The percutaneous penetration and exposure risk of organophosphate esters (OPEs) from children's toys remains largely unknown.

were below 1, indicating that the health risk of OPEs via toys was relatively low.
Authors: Ruirui Zhang, Ningqi Li, Juan Li, Chunyan Zhao, Yadan Luo, Yawei Wang, Guibin Jiang
Full Source: Journal of hazardous materials 2022 Aug 8;440:129728. doi: 10.1016/j.jhazmat.2022.129728.

Emerging Plasticizers in South China House Dust and Hand Wipes: Calling for Potential Concern?

2022-08-17
Following regulations on legacy plasticizers, a large variety of industrial chemicals have been employed as substitutes to manufacture consumer products. However, knowledge remains limited on their environmental distributions, fate, and human exposure risks. In the present work, we screened for a total of 34 emerging plasticizers in house dust from South China and matched hand wipes collected from volunteers (n = 49 pairs). The results revealed a frequent detection of 27 emerging plasticizers in house dust, with the total concentrations reaching a median level of 106 700 ng/g. Thirteen of them had never been investigated by any environmental studies prior to our work, which included glycerol monooleate (median: 61 600 ng/g), methyl oleate (16 400 ng/g), butyl oleate (411 ng/g), 2,2,4-trimethyl-1,3-pentanediol monoisobutyrate (341 ng/g), 2,2,4-trimethyl-1,3-pentanediol diisobutyrate (105 ng/g), isopropyl myristate (154 ng/g), di(2-ethylhexyl) sebacate (69.1 ng/g), triisononyl trimellitate (64.4 ng/g), as well as a few others. Emerging plasticizers were also frequently detected in hand wipes, with a median total level of 4680 ng, indicating potential exposure via hand-to-mouth contact. Several chemicals, including acetyl tributyl citrate, tributyl citrate, di-n-butyl maleate, isopropyl myristate, and isopropyl palmitate, exhibited significant correlations between dust and hand wipe. However, other plasticizers did not follow this pattern, and the chemical compositional profiles differed between dust and hand wipe, suggesting chemical-specific sources and exposure pathways. Although the estimation of daily intake (EDI) indicated no substantial risks through dust ingestion or hand-to-mouth transfer of emerging plasticizers, continuous monitoring is needed to explore whether some of the important plasticizers are safe replacements or regrettable substitutions of the legacy ones.
Authors: Lin Tao, Hongli Tan, Xinhang Qiao, Liangzhong Li, Yunjiang Yu, Jinxin Xie, Da Chen
Full Source: Environmental science & technology 2022 Aug 17. doi: 10.1021/acs.est.2c02106.

Following regulations on legacy plasticizers, a large variety of industrial chemicals have been employed as substitutes to manufacture consumer products.

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Unconventional Oil and Gas Development Exposure and Risk of Childhood Acute Lymphoblastic Leukemia: A Case-Control Study in Pennsylvania, 2009-2017

2022-08
Background: Unconventional oil and gas development (UOGD) releases chemicals that have been linked to cancer and childhood leukemia. Studies of UOGD exposure and childhood leukemia are extremely limited. Objective: The objective of this study was to evaluate potential associations between residential proximity to UOGD and risk of acute lymphoblastic leukemia (ALL), the most common form of childhood leukemia, in a large regional sample using UOGD-specific metrics, including a novel metric to represent the water pathway. Methods: We conducted a registry-based case-control study of 405 children ages 2-7 y diagnosed with ALL in Pennsylvania between 2009-2017, and 2,080 controls matched on birth year. We used logistic regression to estimate odds ratios (ORs) and 95% confidence intervals (CIs) for the association between residential proximity to UOGD (including a new water pathway-specific proximity metric) and ALL in two exposure windows: a primary window (3 months preconception to 1 y prior to diagnosis/reference date) and a perinatal window (preconception to birth). Results: Children with at least one UOG well within 2km of their birth residence during the primary window had 1.98 times the odds of developing ALL in comparison with those with no UOG wells [95% confidence interval (CI): 1.06, 3.69]. Children with at least one vs. no UOG wells within 2km during the perinatal window had 2.80 times the odds of developing ALL (95% CI: 1.11, 7.05). These relationships were slightly attenuated after adjusting for maternal race and socio-economic status [odds ratio (OR) =1.74 (95% CI: 0.93, 3.27) and OR=2.35 (95% CI: 0.93, 5.95)], respectively). The ORs produced by models using the water pathway-specific metric were similar in magnitude to the aggregate metric. Discussion: Our study including a novel UOGD metric found UOGD to be a risk factor for childhood ALL. This work adds to mounting evidence of UOGD's impacts on children's health, providing additional support for limiting UOGD near residences. https://doi.org/10.1289/EHP11092.
Authors: Cassandra J Clark, Nicholaus P Johnson, Mario Soriano Jr, Joshua L Warren, Keli M Sorrentino, Nina S Kadan-Lottick, James E Saiers, Xiaomei Ma, Nicole C Deziel
Full Source: Environmental health perspectives 2022 Aug;130(8):87001. doi: 10.1289/EHP11092.

Background: Unconventional oil and gas development (UOGD) releases chemicals that have been linked to cancer and childhood leukemia.

OCCUPATIONAL

In vivo and in vitro toxicity of a stainless-steel aerosol generated during thermal spray coating

2022-08-19

Thermal spray coating is an industrial process in which molten metal is sprayed at high velocity onto a surface as a protective coating. An automated electric arc wire thermal spray coating aerosol generator and inhalation exposure system was developed to simulate an occupational exposure and, using this system, male Sprague-Dawley rats were exposed to stainless steel PMET720 aerosols at 25 mg/m3 × 4 h/day × 9 day. Lung injury, inflammation, and cytokine alteration were determined. Resolution was assessed by evaluating these parameters at 1, 7, 14 and 28 d after exposure. The aerosols generated were also collected and characterized. Macrophages were exposed in vitro over a wide dose range (0-200 µg/ml) to determine cytotoxicity and to screen for known mechanisms of toxicity. Welding fumes were used as comparative particulate controls. In vivo lung damage, inflammation and alteration in cytokines were observed 1 day post exposure and this response resolved by day 7. Alveolar macrophages retained the particulates even after 28 day post-exposure. In line with the pulmonary toxicity findings, in vitro cytotoxicity and membrane damage in macrophages were observed only at the higher doses. Electron paramagnetic resonance showed in an acellular environment the particulate generated free radicals and a dose-dependent increase in intracellular oxidative stress and NF-kB/AP-1 activity was observed. PMET720 particles were internalized via clathrin and caveolar mediated endocytosis as well as actin-dependent pinocytosis/phagocytosis. The results suggest that compared to stainless steel welding fumes, the PMET 720 aerosols were not as overtly toxic, and the animals recovered from the acute pulmonary injury by 7 days.

Authors: Vamsi Kodali, Aliakbar Afshari, Terence Meighan, Walter McKinney, Md Habibul Hasan Mazumder, Nairrita Majumder, Jared L Cumpston, Howard D Leonard, James B Cumpston, Sherri Friend, Stephen S Leonard, Aaron Erdely, Patti C Zeidler-Erdely, Salik Hussain, Eun Gyung Lee, James M Antonini

Full Source: Archives of toxicology 2022 Aug 19. doi: 10.1007/s00204-022-03362-7.

Thermal spray coating is an industrial process in which molten metal is sprayed at high velocity onto a surface as a protective coating.

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Translating nanoparticle dosimetry from conventional in vitro systems to occupational inhalation exposures

2021-06

As encouraged by Toxicity Testing in the 21st Century, researchers increasingly apply high-throughput in vitro approaches to identify and characterize nanoparticle hazards, including conventional aqueous cell culture systems to assess respiratory hazards. Translating nanoparticle dose from conventional toxicity testing systems to relevant human exposures remains a major challenge for assessing occupational risk of nanoparticle exposures. Here, we explored existing computational tools and data available to translate nanoparticle dose metrics from cellular test systems to inhalation exposures of silver nanoparticles in humans. We used the Multiple-Path Particle Dosimetry (MPPD) Model to predict nanoparticle deposition of humans exposed to 20 and 110 nm silver nanoparticles at 0.9 µg/m3 over an 8 h period, the proposed National Institute of Occupational Safety and Health (NIOSH) recommended exposure limit (REL). MPPD predicts 8.1 and 3.7 µg of silver deposited in an 8 h period for 20 and 110 nm nanoparticles, respectively, with 20 nm particles displaying nearly 11-fold higher total surface area deposited. Peak deposited nanoparticle concentrations occurred more proximal in the pulmonary tract compared to mass deposition patterns (generation 4 vs. generations 20-21, respectively) due to regional differences in lung lining fluid volumes. Assuming 0.4% nanoparticle dissolution by mass measured in previous studies predicted peak concentrations of silver ions in cells of 1.06 and 0.89 µg/mL for 20 and 110 nm particles, respectively. Both predicted concentrations are below the measured toxic threshold of 1.7 µg/mL of silver ions in cells from in vitro assessments. Assuming 4% dissolution by mass predicted 10-fold higher silver concentrations in tissues, peaking at 10.6 and 8.9 µg/mL, for 20 and 110 nm nanoparticles respectively, exceeding the observed in vitro toxic threshold and highlighting the importance and sensitivity of dissolution rates. Overall, this approach offers a framework for extrapolating nanotoxicity results from in vitro cell culture systems to human exposures. Aligning appropriate dose metrics from in vitro and in vivo hazard characterizations and human pulmonary doses from occupational exposures are critical components for successful nanoparticle risk assessment and worker protection providing guidance for designing future in vitro studies aimed at relevant human exposures.

Authors: Jordan Ned Smith, Andrew W Skinner

Full Source: Journal of aerosol science 2021 Jun;155:10.1016/j.jaerosci.2021.105771. doi: 10.1016/j.jaerosci.2021.105771.

As encouraged by Toxicity Testing in the 21st Century, researchers increasingly apply high-throughput in vitro approaches to identify and characterize nanoparticle hazards, including conventional aqueous cell culture systems to assess respiratory hazards.

Urinary glyphosate kinetics after occupational exposure

2022-08-15

Glyphosate-surfactant herbicides are the most used and imported herbicide in Thailand. Urinary biomonitoring is a very important tool for evaluating glyphosate exposures and its adverse health effects. However, the data for glyphosate toxicokinetics, especially in Asian populations, is relatively limited. The majority of farmers in Thailand have long term experience with glyphosate use, but they generally follow poor safety practices, including insufficient or incorrect use of personal protective equipment during pesticide handling activities. Therefore, this study aimed to determine the toxicokinetics of glyphosate and its metabolite in urine among maize farmers from the northern region of Thailand. The effects of personal protective equipment usage, as well as farmer behavior during work, on urinary glyphosate levels were also studied. Full-voided spot urine samples were collected over the exposure assessment period (0-72 h). Urinary glyphosate levels were determined by liquid chromatography tandem mass spectrometry. The maximum concentration in urine (uCmax), the time of peak glyphosate levels in urine (uTmax), and the urinary elimination half-life (ut1/2) were analyzed using the PKSolver program. The median of uCmax were 27.9, 29.2 and 17.1 µg/g creatinine in a one-time spray group, a two-time spray group Day 1 and a two-time spray group Day 2, respectively. The uTmax was 11.0 h in both study groups. The median of elimination ut1/2 in the one-time and the two-time spray group were 7.0 and 18.1 h, respectively. Although these estimated urinary elimination half-lives may have been impacted by the variation in exposure doses among the participants, it provides the first urinary toxicokinetic data of glyphosate among the Asian population. The toxicokinetic information could be used to increase knowledge and awareness amongst farmers, particularly to minimize the risk of exposure to glyphosate and reduce possible adverse health effects from using pesticide.

Authors: Kanyapak Kohsuwan, Unchisa Intayoung, Supakit Khacha-Ananda, Ratana Sapbamrer, Nut Koonrungsesomboon, Sujitra Techatoei, Klintean Wunnapuk

Full Source: International journal of hygiene and environmental health 2022 Aug 15;245:114021. doi: 10.1016/j.ijheh.2022.114021.

Glyphosate-surfactant herbicides are the most used and imported herbicide in Thailand.