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CHEMICAL EFFECTS

Pollution profiles, pathogenicity, and toxicity of bioaerosols in the atmospheric environment of urban general hospital in China

2025-01-23

Airborne microorganisms in hospitals present significant health risks to both patients and employees. However, their pollution profiles and associated hazards in different hospital areas remained largely unknown during the extensive use of masks and disinfectants. This study investigated the characteristics of bioaerosols in an urban general hospital during the COVID-19 pandemic and found that airborne bacteria and fungi concentrations range from 87±35 to 1037±275 CFU/m3 and 21±15 to 561±132 CFU/m3, respectively, with the outpatient clinic and internal medicine ward showing the highest levels. The operating room (OR) and clinical laboratory (LA) had lower bioaerosol levels but higher microbial activities, suggesting that disinfection procedures used to clean bioaerosols may change them into a viable but non-culturable state. The dominant fungi were Cladosporium, Aspergillus, and Penicillium, while the most common viruses were human associated gemykibivirus 2 and human alpha herpesvirus 1. Besides, the dominant pathogens were Staphylococcus aureus, Salmonella enterica, and Pseudomonas aeruginosa. Bacitracin and macrolides resistance genes bacA and ermC were the most prevalent subtypes of antibiotic resistance genes. Compared to the control sample, hospital-acquired bioaerosols, particularly from the outpatient examination room and emergency room can trigger higher levels of inflammatory factors and cell toxicity but lower cell proliferation rates. Lower cell toxicity was observed in low-risk areas (intensive care unit, LA, and OR). This study provides a new method for assessing bioaerosol health risks and enhances understanding of nosocomial and opportunistic infections and their control.

Authors: Simin Huang, Yuxuan Wei, Weibang Yang, Yufei Zhao, Qiwen Wang, Ranjit Das, Chunyou Zhu, Xiaofeng Jiang, Zhishu Liang

Full Source: Environmental pollution (Barking, Essex : 1987) 2025 Jan 23:125739. doi: 10.1016/j.envpol.2025.125739.

The extensive application of cement kiln industry results in substantial stack gas emissions, posing a potential risk of discharging organic pollutants.

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Higher potential leaching of inorganic and organic additives from biodegradable compared to conventional agricultural plastic mulch film

2025-01-07

Plastic mulch films support global food security, however, their composition and the potential release rates of organic, metal and metalloid co-contaminants remains relatively unknown. This study evaluates the low molecular weight organic additives, metal and metalloid content and leaching from low density polyethylene (LDPE) and biodegradable plastic mulch films. We identified 59 organic additives, and non-intentionally added substances in the new LDPE films (39.8 mg m-2) and 60 in the new biodegradable films (129 mg m-2). The leaching of organic compounds of high concern for ecosystem and human health (e.g. phthalates, organophosphite antioxidants) was comparable to those of low concern (fatty acids, fatty amides, alkanols). However, the majority of leached compounds have undergone no regulatory scrutiny and their environmental fate and toxicity remain unknown. Leaching of heavy metals (Cu, Zn, Pb) was low relative to inert fillers (Ca, Na). Leaching was higher for both organic and metal/metalloid additives from the biodegradable films (74.6 mg m-2) than the LDPE films (23.7 mg m-2). This untargeted approach allowed assessment of the chemical burden posed to individual farms, based on existing use patterns of plastic mulch films, with higher chemical burden coming from biodegradable films, raising the potential for pollution swapping. This research emphasises the need to include the complex mixture of leached additives when assessing the environmental risks presented by plastic mulch films, balancing yield benefits with the protection of our agricultural soils.

Authors: Michaela K Reay, Martine Graf, Madelyn Murphy, Gupeng Li, Changrong Yan, Mondira Bhattacharya, Henny Osbahr, Ji Ma, Wen Chengtao, Xiner Shi, Siyang Ren, Jixiao Cui, Christopher Collins, Dave Chadwick, Davey L Jones, Richard P Evershed, Charlotte E M Lloyd

Potential emission risks of organic compounds from cement kilns

2025-01-21

The extensive application of cement kiln industry results in substantial stack gas emissions, posing a potential risk of discharging organic pollutants. Cement industry is not considered as a primary contributor to persistent organic pollutants like polychlorinated dibenzo-p-dioxins and furans (PCDD/Fs), owing to its extremely low emission factor.

However, knowledge on the previously unrecognized chemicals that may possess higher emission factors from cement industry is lacking. In this study, non-target screening of pollutants from cement industries were conducted using gas chromatography-quadrupole time-of-flight mass spectrometry. Priority pollutants from cement industry were identified. Alkylated polycyclic aromatic hydrocarbons and chlorobenzene were noteworthy pollutants from cement industry. By comparing the toxicity data and semi-quantitative of the pollutants, 9 chemical compounds, including 1-Methylphenanthrene, were identified as priority pollutants. The emission factors of these selected pollutants from cement industries were about 3-6 orders higher than PCDD/Fs, suggesting a potentially high risk of emission. The nationwide emission estimation indicates a significant release of approximately 300 kg of 1-Methylphenanthrene emanating from the cement industry, necessitating heightened attention. The results are helpful for comprehensive risk assessment of organic pollutants from cement industry.

Authors: Changzhi Chen, Guorui Liu, Chenyan Zhao, Mingxuan Wang, Yujue Yang, Lili Yang, Minghui Zheng

Full Source: Journal of hazardous materials 2025 Jan 21:488:137270. doi: 10.1016/j.jhazmat.2025.137270.

ENVIRONMENTAL RESEARCH

Ambient coarse particulate matter pollution and hospital admissions for schizophrenia

2025-01-24

Objective: To investigate the association between ambient coarse particulate matter (PM2.5-10) pollution and risk of acute schizophrenia episodes.

Methods: A time-stratified case-crossover study with a two-stage analytical approach was conducted to investigate the association between ambient PM2.5-10 pollution and schizophrenia admissions (an indicator for acute schizophrenia episodes) across 259 Chinese cities of prefecture-level or above during 2013-2017. A conditional logistic regression model was constructed to estimate city-specific changes in hospital admissions for schizophrenia associated with per interquartile range (IQR) increase in ambient PM2.5-10, and the overall associations were obtained by pooling the city-specific associations using the random-effects model.

Results: A total of 817,296 schizophrenia admissions were included in the analysis. Per IQR increase (28.43 μg/m3) in PM2.5-10 at lag01 was associated with an increase of 1.66 % (95 % CI: 0.68 %, 2.65 %) in

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schizophrenia admissions. Compared to concentrations <30 μg/m3, PM2.5-10 concentrations of 30-49 μg/m3 and ≥50 μg/m3 were associated with increases of 2.25 % (95 % CI: 0.73 %%, 3.79 %) and 4.03 % (95 % CI: 1.92 %, 6.18 %) in schizophrenia admissions, respectively. City-level urbanization has the potential to attenuate the association between ambient PM2.5-10 and schizophrenia admissions (P = 0.0002).

Conclusions: Our study provides novel evidence for the acute adverse effects of ambient PM2.5-10 on schizophrenia and calls for special attention on the control of high PM2.5-10 pollution in disease prevention.

Authors: Yating Ma, Lijun Bai, Yunxing Jiang, Jinxi Wang, Chen Wei, Yinxiang Li, Yumei Tian, Shaowei Wu

Full Source: Schizophrenia research 2025 Jan 24:276:79-87. doi: 10.1016/j.schres.2025.01.004.

Long-term exposure to air pollution and greenness in association with respiratory emergency room visits and hospitalizations: The Life-GAP project

2025-01-23

Background: Air pollution has been linked to respiratory diseases, while the effects of greenness remain inconclusive.

Objective: We investigated the associations between exposure to particulate matter (PM2.5 and PM10), black carbon (BC), nitrogen dioxide (NO2), ozone (O3), and greenness (normalized difference vegetation index, NDVI) with respiratory emergency room visits and hospitalizations across seven Northern European centers in the European Community Respiratory Health Survey (ECRHS) study.

Methods: We used modified mixed-effects Poisson regression to analyze associations of exposure in 1990, 2000 and mean exposure 1990-2000 with respiratory outcomes recorded duing ECRHS phases II and III. We assessed interactions of air pollution and greenness, and of atopic status (defined by nasal allergies and hay fever status) and greenness, on these outcomes.

Results: The analysis included 1,675 participants, resulting in 119 emergency visits and 48 hospitalizations. Increased PM2.5 by 5 μg/m^3 was associated with higher relative risk (RR) of emergency visits (1990: RR 1.16, 95% CI: 1.00-1.35; 2000: RR 1.24, 95% CI: 0.98-1.57; 1990-2000: RR 1.17, 95% CI: 0.97-1.41) and hospitalizations (1990: RR 1.42, 95% CI: 1.00-2.01; 2000: RR 2.20, 95% CI: 1.43-3.38; 1990-2000: RR 1.44, 95% CI: 1.04-2.00). Similar trends were observed for PM10, BC, and NO2, with only PM10 showing significant associations with hospitalizations across all periods. No associations were found for O3. Greenness exposure was linked to

more emergency visits in 2000 but to fewer hospitalizations in 1990. Significant interactions were observed between greenness and atopic status for emergency visits, and between NDVI with O3 and BC for some time windows.
Conclusion: Long-term exposure to particulate matter was associated with increased emergency room visits and hospitalizations. Significant associations were observed for BC and NO2 with hospitalizations. No link was found with O3. Greenness indicated a lower risk of hospitalizations, but increased risks for emergency visits for those with atopic status.
Authors: Shanshan Xu, Alessandro Marcon, Randi Jacobsen Bertelsen, Bryndis Benediktsdottir, Jørgen Brandt, Lise Marie Frohn, Camilla Geels, Thorarinn Gislason, Joachim Heinrich, Mathias Holm, Christer Janson, Iana Markevych, Lars Modig, Hans Orru, Vivi Schlünssen, Torben Sigsgaard, Ane Johannessen
Full Source: Environmental research 2025 Jan 23:120938. doi: 10.1016/j.envres.2025.120938.

The hypercapnic environment on the International Space Station (ISS): A potential contributing factor to ocular surface symptoms in astronauts

2025-02
With increasing advancements and efforts towards space exploration, there is a pressing need to understand the impacts of spaceflight on astronauts' health. Astronauts have reported signs and symptoms of dry eye disease upon traveling to the International Space Station (ISS), thus necessitating an evaluation of the factors that contribute to the onset of spaceflight associated dry eye disease. Prior literature describes the hypercapnic environment of the ISS; however, the link between the high CO2 levels and astronauts' symptoms of dry eye disease remains unexplored. Due to the terrestrial relationship between a hypertonic environment and ocular irritation as well as the terrestrial association between CO2 exposure and subsequent corneal acidosis, there is a strong necessity to investigate the relationship between the elevated CO2 levels in the closed environment of the ISS and astronauts' risk for dry eye disease development.
Authors: Ritu Sampige, Joshua Ong, Ethan Waisberg, John Berdahl, Andrew G Lee
Full Source: Life sciences in space research 2025 Feb:44:122-125. doi: 10.1016/j.lssr.2024.09.002.

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PHARMACEUTICAL/TOXICOLOGY

Encorafenib, cetuximab and chemotherapy in BRAF-mutant colorectal cancer: a randomized phase 3 trial

2025-01-25
Encorafenib + cetuximab (EC) is approved for previously treated BRAF V600E-mutant metastatic colorectal cancer (mCRC) based on the BEACON phase 3 study. Historically, first-line treatment of BRAF V600E-mutant mCRC with chemotherapy regimens has had limited efficacy. The phase 3 BREAKWATER study investigated EC+mFOLFOX6 versus standard of care (SOC) in patients with previously untreated BRAF V600E mCRC. The dual primary endpoint of progression-free survival is event driven; data were not mature at data cutoff. BREAKWATER met the other dual primary endpoint of objective response rate, demonstrating significant and clinically relevant improvement in objective response rate (EC+mFOLFOX6: 60.9%; SOC: 40.0%; odds ratio, 2.443; 95% confidence interval (CI): 1.403-4.253; 99.8% CI: 1.019-5.855; one-sided P = 0.0008). Median duration of response was 13.9 versus 11.1 months. At this first interim analysis of overall survival, the hazard ratio was 0.47 (95% CI: 0.318-0.691; repeated CI: 0.166-1.322). Serious adverse event rates were 37.7% versus 34.6%. The safety profiles were consistent with those known for each agent. BREAKWATER demonstrated a significantly improved response rate that was durable for first-line EC+mFOLFOX6 versus SOC in patients with BRAF V600E mCRC. ClinicalTrials.gov identifier: NCT04607421 .
Authors: Scott Kopetz, Takayuki Yoshino, Eric Van Cutsem, Cathy Eng, Tae Won Kim, Harpreet Singh Wasan, Jayesh Desai, Fortunato Ciardiello, Rona Yaeger, Timothy S Maughan, Elena Beyzarov, Xiaoxi Zhang, Graham Ferrier, Xiaosong Zhang, Josep Tabernero
Full Source: Nature medicine 2025 Jan 25. doi: 10.1038/s41591-024-03443-3.

Groundwater flowpath characteristics drive variability in per- and polyfluoroalkyl substances (PFAS) loading across a stream-wetland system

2025-01-24
Groundwater-dependent ecosystems in areas with industrial land use are at risk of exposure to a PFAS chemicals. We investigated one such system with several known PFAS source areas, where high and low permeability sediments (glacial) coupled with groundwater-lake and groundwater/surface-water interactions created complex 'source to

seep' dynamics. Using heat-tracing and chemical methods, numerous preferential groundwater discharge zones were identified and sampled across the upper Quashnet River stream-wetland system in Mashpee, MA, USA, downgradient of Joint Base Cape Cod (JBCC). Surface-water and groundwater samples were analyzed for 40 PFAS compounds between March and October 2022. Samples were collected from groundwater seeps identified as preferential discharge points (PDPs), wells upgradient of the stream-wetland system, contributing flow-through kettle lakes, and along Quashnet River surface-waters. PFAS from sampled waters contained perfluorinated carboxylates (PFPea, PFHxA, PFNA), perfluorinated sulfonates (PFBS, PFPeS, PFHxS, PFOS), fluorotelomer sulfonates (6:2, 8:2 FtS), and perfluoroalkyl sulfonamides (PFOSA). Samples from PDPs and wells had measured PFAS concentrations ranging from non-detect to 4677 ng/L ng/L (mean = 418 ng/L, std. = 709 ng/L), and a range of deuterium excess values (3.2 to 15.9 per mil) indicative of varying degrees of groundwater-lake interaction prior to groundwater flowpath emergence at PDPs. Correlations ($p < 0.01$) between deuterium excess, %PFAS precursors, and terminal PFAS compounds highlighted potential precursor transformations associated with lake-groundwater exchange along flowpaths sourcing PDPs. However, some seepages had higher total PFAS concentrations (>1000 ng/L) than upgradient kettle lakes despite showing lake (evaporative) isotopic signatures, indicating the potential for groundwater flowpath convergence at wetland discharge zones and the influence of lakebed PFAS precursor reactions. Results from these synoptic surveys address gaps in the existing PFAS literature by demonstrating the importance of subsurface fate and transport on PFAS compound concentrations and mass loading in preferential groundwater discharge zones.

Authors: David M Rey, Martin A Briggs, Andrea K Tokranov, Hayley G Lind, Patrick T Scordato, Ramona Darlington Iery, Henry E Moore, Lee D Slater, Denis R LeBlanc

Full Source: The Science of the total environment 2025 Jan 24:964:178533. doi: 10.1016/j.scitotenv.2025.178533.

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OCCUPATIONAL

Health effects of occupational exposure to jet fuels used in the military: A systematic review of the epidemiologic literature

2025-01-15

Background: Jet fuels are a common chemical exposure in occupational settings involving aircraft. Jet fuels are heterogeneous mixtures of aromatic and aliphatic hydrocarbons, as well as non-hydrocarbon performance additives. Several components of jet fuels have been linked to adverse health outcomes. The "Sergeant First Class Heath Robinson Honoring Our Promise to Address Comprehensive Toxins Act of 2022" required the U.S. Department of Veterans Affairs (VA) to develop a report to Congress on the health effects of jet fuels used in the military.
Objectives: This investigation assessed the epidemiologic evidence of the health effects associated with occupational exposure to jet fuels in military and non-military settings using robust and reproducible systematic review methods.
Methods: Two scientific databases (PubMed and EBSCOhost), 17 gray literature sources and five review articles were searched for relevant, primary epidemiologic studies through May, 2024. Risk of bias and strength of evidence were evaluated according to the U.S. Environmental Protection Agency's (EPA) Integrated Risk Information System (IRIS) assessment framework for systematic reviews and evidence synthesis.
Results: Twenty-eight studies met the inclusion criteria, including 18 studies in military settings and 10 studies in non-military occupational settings. It was determined that there was slight evidence of associations between jet fuel exposure and neurologic, cognitive and behavioral, respiratory, and cancer outcomes. For all other health outcome categories, the available evidence of jet fuels effect on humans was considered indeterminate.
Discussion: To our knowledge, this is the first systematic review of epidemiologic evidence on the health effects of occupational jet fuel exposure. Available data were sparse for multiple health outcomes, and most studies tended to be of lower quality. Future work will include