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CHEMICAL EFFECTS

Indoor metabolites and chemicals outperform microbiome in classifying childhood asthma and allergic rhinitis

2023-08-22

Indoor microorganisms impact asthma and allergic rhinitis (AR), but the associated microbial taxa often vary extensively due to climate and geographical variations. To provide more consistent environmental assessments, new perspectives on microbial exposure for asthma and AR are needed. Home dust from 97 cases (32 asthma alone, 37 AR alone, 28 comorbidity) and 52 age- and gender-matched controls in Shanghai, China, were analyzed using high-throughput shotgun metagenomic sequencing and liquid chromatography-mass spectrometry. Homes of healthy children were enriched with environmental microbes, including *Paracoccus*, *Pseudomonas*, and *Psychrobacter*, and metabolites like keto acids, indoles, pyridines, and flavonoids (astragalin, hesperidin) (False Discovery Rate < 0.05). A neural network co-occurrence probability analysis revealed that environmental microorganisms were involved in producing these keto acids, indoles, and pyridines. Conversely, homes of diseased children were enriched with mycotoxins and synthetic chemicals, including herbicides, insecticides, and food/cosmetic additives. Using a random forest model, characteristic metabolites and microorganisms in Shanghai homes were used to classify high and low prevalence of asthma/AR in an independent dataset in Malaysian schools (N = 1290). Indoor metabolites achieved an average accuracy of 74.9% and 77.1% in differentiating schools with high and low prevalence of asthma and AR, respectively, whereas indoor microorganisms only achieved 51.0% and 59.5%, respectively. These results suggest that indoor metabolites and chemicals rather than indoor microbiome are potentially superior environmental indicators for childhood asthma and AR. This study extends the traditional risk assessment focusing on allergens or air pollutants in childhood asthma and AR, thereby revealing potential novel intervention strategies for these diseases.

Authors: Yu Sun, Hao Tang, Shuang Du, Yang Chen, Zheyuan Ou, Mei Zhang, Zhuoru Chen, Zhiwei Tang, Dongjun Zhang, Tianyi Chen, Yanyi Xu, Jiufeng Li, Dan Norback, Jamal Hisham Hashim, Zailina Hashim, Jie Shao, Xi Fu, Zhuohui Zhao

Full Source: *Eco-Environment & Health* (Online) 2023 Aug 22;2(4):208-218. doi: 10.1016/j.eehl.2023.08.001.

Indoor microorganisms impact asthma and allergic rhinitis (AR), but the associated microbial taxa often vary extensively due to climate and geographical variations.

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Hydrogen inhalation: in vivo rat genotoxicity tests

2024-02

Preclinical and clinical studies have shown that molecular hydrogen (H₂) has anti-oxidant, anti-inflammatory, and anti-apoptotic properties. Safety data are available in the literature and acute toxicity has been tested in isolated cells and laboratory animals. We have evaluated the genotoxicity of H₂ in vivo in rats after 72 h exposure, following the International Council for Harmonization guidelines ICH S2 (R1). The study was conducted on three groups of male Wistar rats: a negative control group, a positive control group receiving methyl methanesulfonate, and a H₂-treated group receiving a 3.1% H₂ gas mixture for 72 h. Alkaline comet, formamidopyrimidine DNA glycosylase (Fpg)-modified comet and bone marrow micronucleus assays were performed. H₂ exposure increased neither comet-tail DNA intensity (DNA damage) nor frequency of "hedgehogs" in blood, liver, lungs, or bronchoalveolar lavage fluid. No increase in Fpg-sensitive sites in lungs, no induction of micronucleus formation, and no imbalance of immature erythrocyte to total erythrocyte ratio (IME%) was observed in rats exposed to H₂. The ICH S2 (R1) test-battery revealed no in vivo genotoxicity in Wistar rats after 72 h inhalation of a mixture containing 3.1% H₂.

Authors: Cordélia Salomez-Ihl, Stéphane Tanguy, Jean-Pierre Alcaraz, Chloé Davin, Victor Pascal-Moussellard, Mariem Jabeur, Pierrick Bedouch, Ludovic Le Hegarat, Valérie Fessard, Anne-Louise Blier, Sylvie Huet, Philippe Cinquin, François Boucher

Full Source: *Mutation research. Genetic toxicology and environmental mutagenesis* 2024 Feb-Mar;894:503736. doi: 10.1016/j.mrgentox.2024.503736.

Preclinical and clinical studies have shown that molecular hydrogen (H₂) has anti-oxidant, anti-inflammatory, and anti-apoptotic properties.

High toxicity of agro-industrial wastewater on aquatic fauna of a South American stream: Mortality of aquatic turtles and amphibian tadpoles as bioindicators of environmental health

2024-03

The aim of this study was to characterize an aquatic system of Santa Fe province (Argentina) receiving wastewater from agro-industrial activities (mainly dairy) by in situ assessment (fauna mortality, physicochemical, microbiological, and pesticide residues measurement), and ecotoxicity bioassays on amphibian tadpoles. Water and sediment samples were obtained from the Los Troncos Stream (LTS), previous to the confluence with the "San Carlos" drainage channel (SCC), and from the SCC. Biological

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parameters (mortality and sublethal biomarkers) were used to evaluate ecotoxicity during 10-day exposure of *Rhinella arenarum* tadpoles to LTS and SCC samples. Nine pesticides were detected in both LTS and SCC. Chemical and biochemical oxygen demand, ammonia, and coliform count recorded in SCC greatly exceeded limits for aquatic life protection. At SCC and LTS after the confluence with SCC, numerous dying and dead aquatic turtles (*Phrynops hilarii*) were recorded. In the ecotoxicity assessment, no mortality of tadpoles was observed in LTS treatment, whereas total mortality (100%) was observed in SCC treatments in dilution higher than 50% of water and sediment. For SCC, median lethal concentration and the 95% confidence limits was 18.30% (14.71-22.77) at 24 h; lowest-observed and no-observed effect concentrations were 12.5% and 6.25%, respectively. Oxidative stress and neurotoxicity were observed in tadpoles exposed to 25% SCC dilution treatment. In addition, there was a large genotoxic effect (micronuclei test) in all sublethal SCC dilution treatments (6.25%, 12.5%, and 25%). These results alert about the high environmental quality deterioration and high ecotoxicity for aquatic fauna of aquatic ecosystems affected by agro-industrial wastewater. PRACTITIONER POINTS: Great mortality of turtles was observed in a basin with a high load of agro-industrial wastewater. San Carlos Channel (SCC), where effluents are spilled, is environmentally deteriorated. The water-sediment matrix of SCC caused 100% lethality in tadpoles. SCC dilutions caused neurotoxicity, oxidative stress, and genotoxicity on tadpoles.

Authors: Ana P Cuzziol Boccioni, Paola M Peltzer, Andrés M Attademo, Leonardo Leiva, Carlina L Colussi, María R Repetti, Karen Russell-White, Noelia Di Conza, Rafael C Lajmanovich

Full Source: Water environment research : a research publication of the Water Environment Federation 2024 Mar;96(3):e11010. doi: 10.1002/wer.11010.

ENVIRONMENTAL RESEARCH

Airborne Suspended Particulate Matter and the Prevalence of Allergic Conjunctivitis in Japan

2024-01-31

Background This study aimed to examine the association of suspended particulate matter (SPM) with outpatient attendance for allergic conjunctivitis. Methodology The information on air pollution, encompassing total hydrocarbons, non-methane hydrocarbons, methane, carbon monoxide, nitrogen oxide, nitric oxide, oxidants, and SPM alongside data concerning daily weather conditions such as temperature,

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wind speed, and humidity, was gathered. Subsequently, the weekly mean values for outpatient visits, air pollution, and weather parameters were computed. Results The number of outpatient visits for allergic conjunctivitis was significantly associated with SPM levels ($r = 0.70$, $p = 0.0037$), oxidant levels ($r = 0.70$, $p = 0.0038$), wind speed ($r = 0.48$, $p = 0.0472$), and humidity ($r = 0.77$, $p = 0.0009$) from January to March, as well as SPM levels ($r = 0.53$, $p = 0.0309$) and carbon monoxide ($r = 0.56$, $p = 0.0230$) from April to June. Multivariate analysis showed that SPM (odds ratio = 1.37, $p = 0.0161$) and wind velocity (odds ratio = 1.52, $p = 0.0038$) were significant predictors of the number of outpatient visits from January to December. Conclusions SPM levels were the only independent predictor of outpatient visits for allergic conjunctivitis, suggesting that SPM contributes to the pathophysiology of this condition.

Authors: Tatsuya Mimura, Takamichi Ichinose, Ken-Ichiro Inoue, Yasuhiro Yoshida, Hiroshi Fujishima

Full Source: Cureus 2024 Jan 31;16(1):e53292. doi: 10.7759/cureus.53292.

Taurine induces hormesis in multiple biological models: May have transformative implications for overall societal health

2024-03-01

This paper represents the first integrative assessment and documentation of taurine-induced hormetic effects in the biological and biomedical areas, their dose response features, mechanistic frameworks, and possible public health, therapeutic and commercial applications. Taurine-induced hormetic effects are documented in a wide range of experimental models, cell types and for numerous biological endpoints, with most of these experimental findings being reported within the past five years. It is suggested that the concept of hormesis may have a transformative effect on taurine research and its public health and therapeutic applications.

Authors: Edward J Calabrese, Peter Pressman, A Wallace Hayes, Rachna Kapoor, Gaurav Dhawan, Evgenios Agathokleous, Vittorio Calabrese

Full Source: Chemico-biological interactions 2024 Mar 1:110930. doi: 10.1016/j.cbi.2024.110930.

This paper represents the first integrative assessment and documentation of taurine-induced hormetic effects in the biological and biomedical areas, their dose response features, mechanistic frameworks, and possible public health, therapeutic and commercial applications.

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PHARMACEUTICAL/TOXICOLOGY

The association of fatigue and cognitive complaints with work-related outcomes and cancer-related anxiety among employees 2-10 years after cancer diagnosis

2024-03-04

This study investigated the association of fatigue and cognitive complaints among employees post-cancer diagnosis, with work-related outcomes, and moderation by cancer-related anxiety. A survey was carried out among workers 2-10 years after cancer diagnosis. Employees without cancer recurrence or metastases were selected (N = 566). Self-reported fatigue and cognitive complaints were classified into three groups.

ANOVA's and regression analyses were used, controlling for age. Group 1 (cognitive complaints, n = 25, 4.4%), group 2 (fatigue, n = 205, 36.2%), and group 3 (cognitive complaints and fatigue, n = 211, 37.3%) were associated with higher burnout complaints and lower work engagement, and group 2 and 3 with lower work ability. Cancer-related anxiety positively moderated the association of group 3 with higher burnout complaints. Employees with both fatigue and cognitive complaints report less favorable work functioning. Cancer-related anxiety needs attention in the context of burnout complaints.

Authors: Ingrid G Boelhouwer, Tinka van Vuuren

Full Source: Journal of health psychology 2024 Mar 4:13591053241234748. doi: 10.1177/13591053241234748.

Metals, nonmetals and metalloids in cigarette smoke as hazardous compounds for human health

2024-03-01

Cigarette smoke contains many chemicals that are harmful to both smokers and non-smokers. Breathing just a little cigarette smoke can be harmful. There are >7000 chemicals in cigarette smoke, at least 250 are known to be harmful and many of them can cause cancer. Currently, many studies reported the types of harmful organic compounds in cigarette smoke; instead, there are almost no works that describe the presence of inorganic compounds. In this work, a cost-effective self-made passive sampler (SMPS) was tested as a tool to collect different types of particulate matter (PM) from cigarette smoke containing metals as hazardous compounds (HCs). To determine the nature of the metals, nonmetals and metalloids as HCs, a direct qualitative analysis of the particulate matter (PM) was conducted without developing any special

This study investigated the association of fatigue and cognitive complaints among employees post-cancer diagnosis, with work-related outcomes, and moderation by cancer-related anxiety.

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sample preparation procedure. For that, non-invasive elemental (Scanning Electron Microscope coupled to Energy Dispersive X-ray Spectrometry) and molecular (Raman microscopy) micro-spectroscopic techniques were used. Thanks to this methodology, it was possible to determine in deposited PM, the presence of metals such as Fe, Cr, Ni, Ti, Co, Sn, Zn, Ba, Al, Cu, Zr, Ce, Bi, etc. most of them as oxides but also embedded in different clusters with sulfates, aluminosilicates, even phosphates.

Authors: Héctor Morillas, Euler Gallego-Cartagena, Settakorn Upasen

Full Source: The Science of the total environment 2024 Mar 1:171351. doi: 10.1016/j.scitotenv.2024.171351.

OCCUPATIONAL

Association Between Augmentation Index and Total Sleep Time in Night Shift Workers

2024-03-03

Augmentation index and pulse wave velocity are markers of vascular compromise and independent predictors of cardiovascular risk and mortality. While the link between shift work and heightened cardiovascular risk is established, the intricate genesis of early cardiovascular outcomes in shift workers remains incompletely understood. However, there is evidence that sleep duration plays a role in this regard. Here we evaluate the association of total sleep time with pulse wave velocity, augmentation index, and central blood pressure in night shift workers. This study cross-sectionally evaluated the association of total sleep time evaluated by 10-day monitoring actigraphy with augmentation index, pulse wave velocity, and brachial and central blood pressure evaluated by oscillometry in nursing professionals, 63 shift workers (89% women; age = 45.0 ± 10.5 years), and 17 (100% women; age = 41.8 ± 15.6) day workers. There were no differences in the studied variables between shift workers and day workers. Results of correlation analysis demonstrated that pulse wave velocity, central systolic blood pressure, central diastolic blood pressure, brachial systolic blood pressure, and brachial diastolic blood pressure tended to have significant correlation with each other, while these measures did not have a significant relationship with augmentation index in both groups. However, results of adjusted restricted cubic spline analysis showed a U-shaped-curve association between total sleep time and augmentation index (p < 0.001 for trend) with a nadir at 300-360 min of total sleep time in shift workers. The present study showed that total sleep time, assessed by actigraphy, had a U-shaped association with augmentation index in shift workers,

Augmentation index and pulse wave velocity are markers of vascular compromise and independent predictors of cardiovascular risk and mortality.

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which indicated better characteristics of vascular functionality when sleep time was 5-6 h in the workers studied.

Authors: Waléria D P Gusmão, Victor M Silva, Annelise M G Paiva, Marco Antonio Mota-Gomes, Wilson Nadruz, Claudia R C Moreno

Full Source: Journal of biological rhythms 2024 Mar 3:7487304241229180. doi: 10.1177/07487304241229180.

The Effects of Heat Stress on Bakery Workers: A Systematic Review

2023-12

Background: Working in hot environments can cause diseases and reduce performance by upsetting the balance of physiological parameters of workers' bodies. Bakers are among the people exposed to heat stress continuously and daily. This review study aimed to investigate the effect of heat stress on bakers.

Methods: In this review study, the related articles based on keywords were reviewed using "IranMedex", "Science Direct", "PubMed", "Scopus", "Web of Science", "SID", "Google Scholar", and "Magiran" databases from the years 2000 to 2021. The used search terms were "Heat stress", "Heat strain", "Heat exposure", "Heat waves", "Workplace", "Baker", and "health effects". In order to extract the required data, all parts of the articles have been reviewed.

Results: Out of the 16 studies reviewed in this study, 43.75% were cross-sectional, 25% were descriptive cross-sectional, and 31.25% were performed according to other study designs. In all of the studies, the WBGT index was used to assess ambient heat stress. In most studies, the mean exposure temperature was higher than the WBGT-ACGIH limit, especially among traditional bakery workers. The findings showed that exposure to thermal stress significantly affects some hematological parameters of blood, oxidative stress, heart rate, and body temperature. Conclusion: The situation of heat stress in the bakery environment is worrying in terms of health and reduced productivity of employees. Therefore, it is essential to take the necessary preventive and control measures to reduce heat stress and the resulting strain.

Authors: Parvaneh Khazaei, Ali Salehi Sahlabadi, Soleiman Ramezanifar, Younes Mehrifar, Elahe Khadiv, Pedram Rastegari, Noradin Gharari

Background: Working in hot environments can cause diseases and reduce performance by upsetting the balance of physiological parameters of workers' bodies.

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Airway diseases related to the use of cleaning agents in occupational settings

2024-03-01

Exposure to disinfectants and cleaning products (DCP) is now a well-established risk factor for work-related asthma (WRA). However, questions remain on the specific causal agents and pathophysiological mechanisms. Few studies have also reported an association between DCP and rhinitis or chronic obstructive pulmonary disease. This review discusses the recent evidence pertaining to airway diseases attributable to occupational exposure to DCP. In contrast to other agents, the incidence of WRA due to DCP has increased over time. The use of DCP in spray form has clearly been identified as an added risk factor. The mechanisms for WRA associated with DCP remain poorly studied, however, both allergic and nonallergic responses have been described, with irritant mechanisms thought to play a major role. An early diagnostic work-up based on clinical assessment accompanied by evaluation of lung function, immunological and airway inflammatory markers is important to guide optimal care and exposure avoidance to the implicated agent. Future research should focus on the effects of "green" products, pathophysiological mechanisms and quantitative exposure assessment including the use of barcode-based methods to identify specific agents. There is an urgent need to strengthen preventive measures and interventions to reduce the burden of airway diseases associated with DCP.

Authors: Hussein H Mwanga, Oriane Dumas, Nicolas Miguères, Nicole Le Moual, Mohamed F Jeebhay

Full Source: The journal of allergy and clinical immunology. In practice 2024 Mar 1:S2213-2198(24)00214-9. doi: 10.1016/j.jaip.2024.02.036.

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