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CHEMICAL EFFECTS

Heme oxygenase-1 (HO-1) assists inorganic arsenic-induced immune tolerance in murine dendritic cells

2020-09-30

Inorganic arsenic, a well-known human carcinogen, poses a major threat to global health. Given the immunosuppressive potentials of inorganic arsenic as well as limited understanding of this metalloid on antigen-presenting dendritic cells (DCs), we systematically screened the immune targets in response to arsenic treatment, as well as its possible molecular mechanism in cultured murine DCs. Our results denoted that arsenite (As) significantly induced immune tolerance by down-regulating the expression of phenotypic molecules, pro-inflammatory factors and T-lymphocyte helper (Th)1/Th17-inducible cytokines in lipopolysaccharides (LPS)-stimulated myeloid-derived dendritic cells (BMDCs). Inconsistent with dampened phosphorylation of immune-related proteins (nuclear factor kappa-B) NF- κ B, p38 and JNK, the metalloid drastically induced the expression of Heme oxygenase-1 (HO-1) protein, which enlightened us to continuously explore the possible roles of HO-1 pathway in As-induced immune tolerance in BMDCs. In this respect, immunosuppressive properties of HO-1 pathway in BMDCs were firstly confirmed through pharmacological overexpression of HO-1 by both CoPP and CORM-2. By contrast, limited HO-1 expression by HO-1 inhibitor ZnPP specifically alleviated As-mediated down-regulation of CD80, chemokine factor C-C chemokine receptor 7 (CCR7), tumor necrosis factor (TNF)- α , Interleukin (IL)-23 and IL-6, which reminds us the peculiarity of HO-1 in As-induced immune tolerance in murine DCs. Based on these experimental findings, we postulated the immunosuppressive property of inorganic arsenic might be mediated partially by HO-1 in DCs, thus contributing to the interactions of DCs-polarized differentiation of T-lymphocyte subtype as well as the development of infections and malignant diseases.

Authors: Jinlong Li, Yuanyuan Guo, Xiaoxu Duan, Bing Li

Full Source: Chemosphere 2020 Sep 30;264(Pt 2):128452. doi: 10.1016/j.chemosphere.2020.128452.

Inorganic arsenic, a well-known human carcinogen, poses a major threat to global health.

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Endocrine-disruptive chemicals as contaminants of emerging concern in wastewater and surface water: A review

2020-10-10

Population growth followed by rapid development of industrialisation has caused serious environmental pollution with contaminants of emerging concern found in wastewater and surface water. As one of the most important resources for human survival, water is daily polluted by endocrine-disruptive chemicals (EDCs) including pharmaceuticals and personal care products, organic pollutants and heavy metals. Even at low concentrations in water bodies, chronic exposure to EDCs can cause adverse effects on human and environment health. The main concern with EDCs is the diseases they can generate in humans or wildlife by affecting the function of hormones in the body. Problems in the reproductive system, thyroid problems, Alzheimer's, cancer and obesity are some of the major effects of EDCs in humans. In wildlife, the reproductive system may be affected, including its levels of hatchability and vitellogenin. The efforts of the present review are on emphasising on the environmental concern on the occurrence and risk assessment of EDCs, their harmful effects in the ecosystem, human life, and wildlife, as a result of their incomplete removal from wastewater treatment plants. The review focuses on studies conducted in South Africa highlights the use of fungal bioreactors as a low-cost and eco-effective environmentally friendly wastewater treatment processes.

Authors: Teddy Kabeya Kasonga, Martie A A Coetzee, Ilunga Kamika, Veronica M Ngole-Jeme, Maggy Ndombo Benteke Momba

Full Source: Journal of environmental management 2020 Oct 10;277:111485. doi: 10.1016/j.jenvman.2020.111485.

Towards setting public health guidelines for chemicals in indoor settled dust?

2020-10-11

Indoor settled dust may result in substantial human exposure to chemicals, especially by ingestion following hand-to-mouth or hand-to-object-to-mouth contact. As with other environmental media related to exposure, dust may thus be subject to regulation. An international scientific workshop was convened in Paris in September 2019 firstly to assess the relevance for public health of setting guidelines for indoor settled dust, and secondly to discuss scientific and technical challenges related to such guidelines. The main discussions and conclusions, with consensus achieved, are reported

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herein. Discussions concerned general considerations, objectives and definitions, relevance for a health-based guideline, units of measure, and finally derivation of the guideline. These points should be addressed when considering an indoor settled dust guideline as part of a policy to reduce exposure indoors to a given chemical or group of chemicals.

Authors: P Glorennec, D G Shendell, P E Rasmussen, R Waeber, P Egeghy, K Azuma, A Pelfrène, B Le Bot, W Esteve, G Perouel, V Pernelet Joly, Y Noack, M Delannoy, M Keirsbulck, C Mandin

Full Source: Indoor air 2020 Oct 11. doi: 10.1111/ina.12722.

ENVIRONMENTAL RESEARCH

Influence of lockdown caused by the COVID-19 pandemic on air pollution and carcinogenic content of particulate matter observed in Croatia

2020-10-07

Due to the pandemic of SARS-CoV-2 in Croatia, all unnecessary activities were prohibited during the designated lockdown period (March-May 2020). With reduced human activity, levels of some air pollutants decreased. In this study, mass concentrations of the PM1 particle fraction (particulate matter with an equivalent aerodynamic diameter < 1 µm) and polycyclic aromatic hydrocarbons (PAHs) in PM1 and NO2 were measured and compared with concentrations measured in the same period the year before. Air pollutant concentrations were measured at two measuring sites: urban residential and urban traffic. Our results show a concentration decrease by 35% for NO2 and PM1 particles and by 26% for total PAHs at the traffic measuring site. At the residential measuring site, only concentrations of NO2 decreased slightly, but PM1 particles and PAHs were similar to the year before.

Authors: Ivana Jakovljević, Zdravka Sever Štrukil, Ranka Godec, Silvije Davila, Gordana Pehnec

Full Source: Air quality, atmosphere, & health 2020 Oct 7;1-6. doi: 10.1007/s11869-020-00950-3.

Bacterial communities as indicators of environmental pollution by POPs in marine sediments

2020-09-25

Decades of intensive discharge from industrial activities into coastal systems has resulted in the accumulation of a variety of persistent organic pollutants (POPs) in marine waters and sediments, having detrimental

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impacts on aquatic ecosystems and the resident biota. POPs are among the most hazardous chemicals originating from industrial activities due to their biotoxicity and resistance to environmental degradation. Bacterial communities are known to break down many of these aromatic compounds, and different members of naturally occurring bacterial consortia have been described to work in syntrophic association to thrive in heavily contaminated waters and sediments, making them potential candidates as bioindicators of environmental pollution. In this study environmental, sampling was combined with chemical analysis of pollutants and high-resolution sequencing of bacterial communities using Next Generation Sequencing molecular biology tools. The aim of the present study was to describe the bacterial communities from marine sediments containing high loads of POPs and to identify relevant members of the resident microbial communities that may act as bioindicators of contamination. Marine sediments were collected from a coastal bay area of the Baltic Sea historically influenced by intense industrial activity, including metal smelting, oil processing, and pulp and paper production. Different types of POPs were detected at high concentrations. Fiberbank sediments, resulting from historic paper industry activity, were found to harbour a clearly distinct bacterial community including a number of bacterial taxa capable of cellulolytic and dechlorination activities. Our findings indicate that specific members of the bacterial communities thrive under increasing levels of POPs in marine sediments, and that the abundances of certain taxa correlate with specific POPs (or groups), which could potentially be employed in monitoring, status assessment and environmental management purposes.

Authors: Juanjo Rodríguez, Christine M J Gallampo, Peter Haglund, Sari Timonen, Owen Rowe

Full Source: Environmental pollution (Barking, Essex : 1987) 2020 Sep 25;268(Pt A):115690. doi: 10.1016/j.envpol.2020.115690.

Global distribution of two polystyrene-derived contaminants in the marine environment: A review

2020-10-08

Plastic pollution is one of the major issues impacting on the marine environment. Plastic polymers are known to leach industrial chemicals and associated contaminants. In this review, we focused on assessing the global distribution and concentration of two polystyrene-derived contaminants, hexabromocyclododecanes (HBCDs) and styrene oligomers (SOs), in marine sediments and seawater. Overall, most of the studies were carried out in Asia, North America, and Europe. Relatively high

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concentrations of these contaminants are generally attributed to the proximity of urban cities, plastic industries, polystyrene pollution, and aquaculture. Moreover, the concentrations in sediments are many times higher than in seawater. HBCDs were found to be a negligible risk to marine biota when compared to the ecotoxicological endpoints. However, realistic concentrations of SOs could compromise the wellbeing of certain species in highly polluted sites. The future perspectives and research were discussed.

Authors: Gabriel Enrique De-la-Torre, Diana Carolina Dioses-Salinas, Carlos Ivan Pizarro-Ortega, Miguel Saldaña-Serrano

Full Source: Marine pollution bulletin 2020 Oct 8;161(Pt A):111729. doi: 10.1016/j.marpolbul.2020.111729.

OCCUPATIONAL

Contamination and washing of cloth masks and risk of infection among hospital health workers in Vietnam: a post hoc analysis of a randomised controlled trial

2020-09-28

Background: In a previous randomised controlled trial (RCT) in hospital healthcare workers (HCWs), cloth masks resulted in a higher risk of respiratory infections compared with medical masks. This was the only published RCT of cloth masks at the time of the COVID-19 pandemic. **Objective:** To do a post hoc analysis of unpublished data on mask washing and mask contamination from the original RCT to further understand poor performance of the two-layered cotton cloth mask used by HCWs in that RCT.

Setting: 14 secondary-level/tertiary-level hospitals in Hanoi, Vietnam.

Participants: A subgroup of 607 HCWs aged ≥ 18 years working full time in selected high-risk wards, who used a two-layered cloth mask and were part of a randomised controlled clinical trial comparing medical masks and cloth masks.

Intervention: Washing method for cloth masks (self-washing or hospital laundry). A substudy of contamination of a sample of 15 cloth and medical masks was also conducted.

Outcome measure: Infection rate over 4 weeks of follow up and viral contamination of masks tested by multiplex PCR.

Results: Viral contamination with rhinovirus was identified on both used medical and cloth masks. Most HCW (77% of daily washing) self-washed their masks by hand. The risk of infection was more than double among

Background: In a previous randomised controlled trial (RCT) in hospital healthcare workers (HCWs), cloth masks resulted in a higher risk of respiratory infections compared with medical masks.

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HCW self-washing their masks compared with the hospital laundry (HR 2.04 [95% CI 1.03 to 4.00]; $p=0.04$). There was no significant difference in infection between HCW who wore cloth masks washed in the hospital laundry compared with medical masks ($p=0.5$).

Conclusions: Using self-reported method of washing, we showed double the risk of infection with seasonal respiratory viruses if masks were self-washed by hand by HCWs. The majority of HCWs in the study reported hand-washing their mask themselves. This could explain the poor performance of two layered cloth masks, if the self-washing was inadequate. Cloth masks washed in the hospital laundry were as protective as medical masks. Both cloth and medical masks were contaminated, but only cloth masks were reused in the study, reiterating the importance of daily washing of reusable cloth masks using proper method. A well-washed cloth mask can be as protective as a medical mask.

Trial registration number: ACTRN12610000887077.

Authors: Chandini Raina MacIntyre, Tham Chi Dung, Abrar Ahmad Chughtai, Holly Seale, Bayzidur Rahman

Full Source: BMJ open 2020 Sep 28;10(9):e042045. doi: 10.1136/bmjopen-2020-042045.

Exposure to Radiation During Work Shifts and Working at Night Act as Occupational Stressors Alter Redox and Inflammatory Markers

2020-10-07

Background: Studies of breast cancer etiology suggest evidence that night shift working and occupational exposure to ionizing radiation (IR) are defined risk factors for breast cancer development. There are few studies to clarify neuroendocrine and inflammatory status and the possible consequences particularly in occupational exposure.

Aim of the study: Our aim was to associate the redox and inflammatory biomarkers with either nightshift working or occupational radiation exposure, and to compare their levels between the two groups at Alexandria University Hospitals, Alexandria, Egypt.

Methods: We included 150 female nurses at Alexandria University Hospitals: 50 nightshift workers, 50 radiation workers, and 50 dayshift workers as a control group (neither work nightly nor radiation workers). In morning serum sample (7 am), we measured the concentrations of serum melatonin, Cortisol, tumor necrosis factor-alpha (TNF- α) and interferon-gamma (IFN- γ) by ELISA; malondialdehyde (MDA) and total antioxidant capacity (TAC) levels colorimetrically, and C-reactive protein (C-RP) levels by turbidimetric method.

Background: Studies of breast cancer etiology suggest evidence that night shift working and occupational exposure to ionizing radiation (IR) are defined risk factors for breast cancer development.

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Results: Nightshift workers had significantly lower levels of melatonin and TAC, and higher levels of serum inflammatory markers and cortisol, than day shift control group of workers. Workers occupationally exposed to IR had significantly higher levels of serum melatonin, MDA and inflammatory markers, lower levels of serum cortisol, and lower TAC than day shift workers.

Conclusion: Occupational exposure to IR and working nightly alter circulating redox and inflammatory biomarkers.

Authors: Sanaa A El-Benhawy, Rasha A El-Tahan, Sameh F Nakhla

Full Source: Archives of medical research 2020 Oct 7;S0188-4409(19)30919-1. doi: 10.1016/j.arcmed.2020.10.001.

Assessment of chromosomal aberrations among agricultural workers exposed to pesticides in Punjab, India

2020-10-13

Chromosomal aberrations (CAs) are an important tool for assessment of exposure to pesticides. Genotoxic potential of pesticides is a principal risk factor for long-term health effects. The present study was aimed toward the assessment of CAs among agricultural workers exposed to pesticides and comparison with nonagricultural workers not exposed to pesticides. A total of 296 subjects were enrolled in the study: exposed (n = 148) and nonexposed subjects (n = 148) from Punjab. A significantly high frequency of aberrations was seen in peripheral blood lymphocytes of exposed subjects as compared with nonexposed ones. Most CAs were present as loss (aneuploidy) and were observed significantly in subjects having a history of alcohol consumption. It can be, thus, concluded that agricultural workers exposed to a mixture of pesticides, in addition to being alcoholic, are at a greater risk of genotoxic damage. It is highly recommended that the agricultural workers are educated regarding the potential hazards of occupational exposure to pesticides.

Authors: Meenakshi Ahluwalia, Anupam Kaur

Full Source: Journal of biochemical and molecular toxicology 2020 Oct 13;e22646. doi: 10.1002/jbt.22646.

Chromosomal aberrations (CAs) are an important tool for assessment of exposure to pesticides.

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PHARAMACEUTICAL/TOXICOLOGY

Formaldehyde exposure induces regulatory T cell-mediated immunosuppression via calcineurin-NFAT signalling pathway

2020-10-12

In this study, we investigated the effects of Formaldehyde (FA) exposure on splenic immune responses wherein helper T cells become activated and differentiate into effector T and regulatory T cells. BALB/c mice were exposed to two FA concentrations (1.38 mg/m³ and 5.36 mg/m³) for 4 h/day and 5 days/week for 2 weeks. FA-induced immune responses were examined by the production of cytokines, expression of mRNAs, and distributions of helper T cells and regulatory T cells. Moreover, expression of calcineurin and NFATs, regulatory T cell-related signalling proteins, were evaluated. FA exposure suppressed Th2-, Th1-, and Th17-related splenic cytokines in a dose-dependent manner. mRNA expression of splenic cytokines was also decreased by FA exposure, which correlated with decreased cytokine expression. In parallel, FA exposure promoted T cell differentiation into regulatory T cells in a dose-dependent manner supported by the expression of calcineurin and NFAT1. Taken together, our results indicated that FA exposure increases the number of regulatory T cells via calcineurin-NFAT signalling, thereby leading to effector T cell activity suppression with decreased T cell-related cytokine secretion and mRNA expression. These findings provide insight into the mechanisms underlying the adverse effects of FA and accordingly have general implications for human health, particularly in occupational settings.

Authors: Jeongsik Park, Hyo-Seon Yang, Mi-Kyung Song, Dong Im Kim, Kyuhong Lee

Full Source: Scientific reports 2020 Oct 12;10(1):17023. doi: 10.1038/s41598-020-72502-9.

In this study, we investigated the effects of Formaldehyde (FA) exposure on splenic immune responses wherein helper T cells become activated and differentiate into effector T and regulatory T cells.