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CHEMICAL EFFECTS

Hematological indices as indicators of inflammation induced by exposure to pesticides

2022-10-14

Pesticide toxicity, both acute and chronic, is a global public health concern. Pesticides are involved in abnormal inflammatory responses by interfering with the normal physiology and metabolic status of cells. In this regard, inflammatory indices aggregate index of systemic inflammation (AISI), monocyte-to-high-density lipoprotein ratio, monocyte-to-lymphocyte ratio (MLR), neutrophil-to-lymphocyte platelet ratio (NLPR), neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio, systemic immune inflammation index, and systemic inflammation response index (SIRI) have been used as predictive markers of inflammatory status in several diseases and also in acute poisoning events. This study aimed to determine systemic inflammation indices and their relationship with pesticide exposure from urban sprayers in 302 individuals categorized into three groups (reference group and moderate and high exposure groups). The data suggest that the AISI, MLR, NLPR, and SIRI indices were significantly higher in the exposed groups compared with the reference group. In conclusion, this study proposes that inflammation indices warrant further attention in order to assess their value as early biomarkers of acute and chronic pesticide intoxication.

Authors: Miguel Alfonso Ruíz-Arias, Irma Martha Medina-Díaz, Yael Yvette Bernal-Hernández, Juan Manuel Agraz-Cibrián, Cyndia Azucena González-Arias, Briscia Socorro Barrón-Vivanco, José Francisco Herrera-Moreno, Francisco Alberto Verdín-Betancourt, José Francisco Zambrano-Zaragoza, Aurora Elizabeth Rojas-García

Full Source: Environmental science and pollution research international 2022 Oct 14;1-11. doi: 10.1007/s11356-022-23509-4.

Effects of organic chemicals from diesel exhaust particles on adipocytes differentiated from human mesenchymal stem cells

2022-10-10

Exposure to fine particulate matter (PM2.5) from incomplete fossil fuel combustion (coal, oil, gas and diesel) has been linked to increased morbidity and mortality due to metabolic diseases. PM2.5 exaggerate adipose inflammation and insulin resistance in mice with diet-induced obesity. Here we elucidate the hypothesis that such systemic effects

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may be triggered by adhered particle components affecting adipose tissue directly. Studying adipocytes differentiated from primary human mesenchymal stem cells, we found that lipophilic organic chemicals (OC) from diesel exhaust particles induced inflammation associated genes and increased secretion of the chemokine CXLC8/interleukin-8 as well as matrix metalloprotease 1. The oxidative stress response gene heme oxygenease-1 and tumour necrosis factor alpha were seemingly not affected, while aryl hydrocarbon receptor regulated genes, cytochrome P450 1A1 (CYP1A1) and CYP1B1 and plasminogen activator inhibitor-2, were clearly upregulated. Finally, expression of β-adrenergic receptor, known to regulate adipocyte homeostasis, was downregulated by exposure to these lipophilic OC. Our results indicate that low concentrations of OC from combustion particles have the potential to modify expression of genes in adipocytes which may be linked to metabolic disease. Further studies on mechanisms linking PM exposure and metabolic diseases are warranted.

Authors: Bendik C Brinchmann, Jørn A Holme, Nadine Frerker, Mia H Rambøl, Tommy Karlsen, Jan E Brinchmann, Alena Kubátová, Klara Kukowski, Tonje Skuland, Johan Øvrevik

Full Source: Basic & clinical pharmacology & toxicology 2022 Oct 10. doi: 10.1111/bcpt.13805.

Fetal exposure to phthalates and bisphenols and DNA methylation at birth: the Generation R Study

2022-10-10

Background: Phthalates and bisphenols are non-persistent endocrine disrupting chemicals that are ubiquitously present in our environment and may have long-lasting health effects following fetal exposure. A potential mechanism underlying these exposure-outcome relationships is differential DNA methylation. Our objective was to examine the associations of maternal phthalate and bisphenol concentrations during pregnancy with DNA methylation in cord blood using a chemical mixtures approach.

Methods: This study was embedded in a prospective birth cohort study in the Netherlands and included 306 participants. We measured urine phthalates and bisphenols concentrations in the first, second and third trimester. Cord blood DNA methylation in their children was processed using the Illumina Infinium HumanMethylation450 BeadChip using an epigenome-wide association approach. Using quantile g-computation, we examined the association of increasing all mixture components by one quartile with cord blood DNA methylation.

Background: Phthalates and bisphenols are non-persistent endocrine disrupting chemicals that are ubiquitously present in our environment and may have long-lasting health effects following fetal exposure.

Results: We did not find evidence for statistically significant associations of a maternal mixture of phthalates and bisphenols during any of the trimesters of pregnancy with DNA methylation in cord blood (all p values > 4.01 * 10-8). However, we identified one suggestive association (p value < 1.0 * 10-6) of the first trimester maternal mixture of phthalates and bisphenols and three suggestive associations of the second trimester maternal mixture of phthalates and bisphenols with DNA methylation in cord blood.
Conclusions: Although we did not identify genome-wide significant results, we identified some suggestive associations of exposure to a maternal mixture of phthalates and bisphenols in the first and second trimester with DNA methylation in cord blood that need further exploration in larger study samples.
Authors: Chalana M Sol, Abigail Gaylord, Susana Santos, Vincent W V Jaddoe, Janine F Felix, Leonardo Trasande
Full Source: Clinical epigenetics 2022 Oct 10;14(1):125. doi: 10.1186/s13148-022-01345-0.

ENVIRONMENTAL RESEARCH

Sources of copper into the European aquatic environment

2022-10-14
Chemical contamination from point source discharges in developed (resource-rich) countries has been widely regulated and studied for decades; however, diffuse sources are largely unregulated and widespread. In the European Union, large dischargers report releases of some chemicals; yet, little is known of total emissions (point and diffuse) and their relative significance. We estimated copper loadings from all significant sources including industry, sewage treatment plants, surface runoff (from traffic, architecture and atmospheric deposition), septic tanks, agriculture, mariculture, marine transport (antifoulant leaching), and natural processes. A combination of European datasets, literature and industry data were utilised to generate export coefficients. These were then multiplied by activity rates to derive loads. A total of around 8 kilotons of copper per annum (ktpa) is estimated to enter freshwaters in the European Union and another 3.5 ktpa enters transitional and coastal waters. The main inputs to freshwater are natural processes (3.7 ktpa), agriculture (1.8 ktpa) and runoff (1.8 ktpa). Agricultural emissions are dominated by copper-based plant protection products and farmyard manure. Urban runoff is influenced by copper use in architecture and by vehicle brake linings. Antifoulant leaching from boats (3.2 ktpa) dominates

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saline water loads of copper. It is noteworthy that most of the emissions originate from a limited number of copper uses where environmental exposure and pathways exist, compared with the bulk of copper use within electrical and electronic equipment and infrastructure that has no environmental pathway during its use. A sensitivity analysis indicated significant uncertainty in data from abandoned mines and urban runoff load estimates. This study provided for the first time a methodology and comprehensive metal load apportionment to European aquatic systems, identifying data gaps and uncertainties which may be refined over time. Source apportionments using this methodology can inform more cost-effective environmental risk assessment and management. This article is protected by copyright. All rights reserved. © 2022 SETAC.
Authors: S Comber, G Deviller, I Wilson, A Peters, G Merrington, P Borrelli, S Baken
Full Source: Integrated environmental assessment and management 2022 Oct 14. doi: 10.1002/ieam.4700.

[Role and Mechanism of Low Molecular-Weight-Organic Acids in Enhanced Phytoremediation of Heavy Metal Contaminated Soil]

2022-10-08
Phytoremediation is an environmentally friendly technology to remove heavy metals from polluted soil by using the physical and chemical roles of plants. This can effectively reduce the production of secondary pollutants and is economically feasible. Low molecular-weight-organic acids (LMWOAs) are biodegradable and environmentally friendly and have strong application potential in the phytoremediation of heavy metal-contaminated soils. The role and mechanism of LMWOAs in phytoremediation was elaborated on in this study with the aim to: regulate the development of roots, stems, and leaves; increase plant biomass; and enhance plant enrichment of heavy metals; improve photosynthesis, enhance plant resistance, and promote tolerance to heavy metals; change the properties of rhizosphere soil, improve rhizosphere microbial activity, and promote the absorption of heavy metals; and change the form of heavy metals, reduce the toxicity of heavy metals, and improve transport efficiency. Moreover, the advantages, disadvantages, and application of LMWOAs in enhanced phytoremediation of heavy metal-contaminated soil were explored in this study. Finally, the research direction of LMWOAs in the phytoremediation of heavy metal-contaminated soils was proposed, which will have practical scientific

Phytoremediation is an environmentally friendly technology to remove heavy metals from polluted soil by using the physical and chemical roles of plants.

significance for the research and application of LMWOAs in future phytoremediation.
Authors: Zhi-Guo Fang, Jun-Ting Xie, Qing Yang, Ye-Zhen Lu, Hai Huang, Yun-Xian Zhu, Si-Min Yin, Xin-Tao Wu, Shao-Ting Du
Full Source: Huan jing ke xue= Huanjing kexue 2022 Oct 8;43(10):4669-4678. doi: 10.13227/j.hjkx.202201062.

10-year time course of Hg and organic compounds in Augusta Bay: Bioavailability and biological effects in marine organisms

2022-09-21
In the last century, many Mediterranean coastal areas have been subjected to anthropogenic disturbances from industrial activities, uncontrolled landfills, shipyards, and high maritime traffic. The Augusta Bay (eastern Sicily, Italy) represents an example of a strongly impacted coastal environment with an elevated level of sediments contamination due to the presence of one of the largest European petrochemical plants, combined with an extensive commercial and military harbor. The most significant contaminants were represented by mercury (Hg) and hexachlorobenzene (HCB), derived from a former chlor-alkali plant, and other organic compounds like polycyclic aromatic hydrocarbons (PAHs) and polychlorobiphenyls (PCBs). Since the 1970s, Augusta Bay has become internationally recognized as a contaminated marine environment, although very little information is available regarding the temporal trend of contaminants bioavailability and biological impacts on aquatic organisms. In this study, the Hg and HCB concentrations were investigated over 10 years (from 2003 to 2013) in sediments and invertebrate and vertebrate organisms; these two contaminants' ecotoxicity was further evaluated at a biochemical and cellular level by analyzing the induction of organic biotransformation processes and DNA damages. The results showed high concentrations of Hg and HCB in sediments and their strong bioaccumulation in different species with significantly higher values than those measured in reference sites. This trend was paralleled by increased micronuclei frequency (DNA damage biomarker) and activity of the biotransformation system. While levels of chemicals in sediments remained elevated during the time course, their bioavailability and biological effects showed a gradual decrease after 2003, when the chlor-alkali plant was closed. Environmental persistence of Hg and HCB availability facilitates their bioaccumulation and affects the health status

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of marine organisms, with possible implications for environmental risk, pollutants transfer, and human health.
Authors: Maura Benedetti, Elena Romano, Antonella Ausili, Daniele Fattorini, Stefania Gorbi, Chiara Maggi, Andrea Salmeri, Daniela Salvagio Manta, Giulio Sesta, Mario Sprovieri, Francesco Regoli
Full Source: Frontiers in public health 2022 Sep 21;10:968296. doi: 10.3389/fpubh.2022.968296.

PHARMACEUTICAL/TOXICOLOGY

Lead Exposure Induced Neural Stem Cells Death via Notch Signaling Pathway and Gut-Brain Axis

2022-10-04
Numerous studies have examined the effects of lead (Pb) on cognitive ability. It is essential for the brain to maintain its functions through the differentiation of neural stem cells into various types of cells. Despite this, it remains unclear how Pb exposure affects neural stem cells and how it does, so the Pb-exposed mice were treated with the Notch inhibitor DAPT after we established the Pb exposure models. Neuronal stem cells and autophagy were assessed by immunofluorescence staining and western blot. The microbiota of the feces was also analyzed using the 16S rRNA amplicon sequencing technique. In this study, we found that Pb exposure caused neural injuries and deficits in neural stem cells, whereas DAPT rescued the damage. With DAPT, Pb-induced autophagy was partially reversed. Exposure to Pb also reduced inflammation and damaged gut barrier function. Furthermore, Pb exposure led to low bacterial diversity, an increase in pathogen abundance, and an unusual mode of interaction. Taken together, this study revealed that damages in neural stem cells contributed largely to cognitive impairment during Pb exposure, and this process was partially dependent on the Notch pathway and gut dysbiosis.
Authors: Lijuan Sun, Yuankang Zou, Peng Su, Chong Xue, Diya Wang, Fang Zhao, Wenjing Luo, Jianbin Zhang
Full Source: Oxidative medicine and cellular longevity 2022 Oct 4;2022:7676872. doi: 10.1155/2022/7676872.

Numerous studies have examined the effects of lead (Pb) on cognitive ability.

Endocrine Disrupting Chemicals' Effects in Children: What We Know and What We Need to Learn?

2022-10-07
Thousands of natural or manufactured chemicals were defined as endocrine-disrupting chemicals (EDCs) because they can interfere with

hormone activity and the endocrine system. We summarize and discuss what we know and what we still need to learn about EDCs' pathogenic mechanisms of action, as well as the effects of the most common EDCs on endocrine system health in childhood. The MEDLINE database (PubMed) was searched on 13 May 2022, filtering for EDCs, endocrine diseases, and children. EDCs are a group of compounds with high heterogeneity, but usually disrupt the endocrine system by mimicking or interfering with natural hormones or interfering with the body's hormonal balance through other mechanisms. Individual EDCs were studied in detail, while humans' "cocktail effect" is still unclear. In utero, early postnatal life, and/or pubertal development are highly susceptible periods to exposure. Human epidemiological studies suggest that EDCs affect prenatal growth, thyroid function, glucose metabolism, obesity, puberty, and fertility through several mechanisms. Further studies are needed to clarify which EDCs can mainly act on epigenetic processes. A better understanding of EDCs' effects on human health is crucial to developing future regulatory strategies to prevent exposure and ensure the health of children today, in future generations, and in the environment.

Authors: Barbara Predieri, Lorenzo Iughetti, Sergio Bernasconi, Maria Elisabeth Street

Full Source: International journal of molecular sciences 2022 Oct 7;23(19):11899. doi: 10.3390/ijms231911899.

OCCUPATIONAL

Paternal Occupational Exposure to Heavy Metals and Welding Fumes and Testicular Germ Cell Tumours in Sons in France

2022-10-10

Testicular cancer is the most common cancer in young men.

Testicular cancer is the most common cancer in young men. Its causes are largely unknown, although prenatal occupational and environmental exposures have been suggested. We investigated paternal occupational exposure to heavy metals and welding fumes and the risk of testicular germ cell tumors (TGCT) in their offspring. A total of 454 cases and 670 controls were included from a French nationwide case-control study. The INTEROCC job exposure matrix was used to assign occupational exposures (cadmium, chromium, iron, nickel, lead, and welding fumes) to the fathers' jobs. Odds ratios (ORs) for TGCT were estimated using conditional logistic regression models for frequency-matched sets. Three complementary analytical approaches were used: (1) single-agent analysis, (2) analysis by groups, and (3) principal component analysis (PCA). The proportion of paternal exposure to different heavy metals and welding fumes ranged from 0.7% (cadmium) to 11.3% (lead). Based on PCA, three principal components explained 93.5% of the cumulative variance. No associations were found between heavy metals or welding fumes and TGCT. In this study, paternal occupational exposure to heavy metals or welding fumes was not associated with TGCT development in their sons.

Authors: Shukrullah Ahmadi, Margot Guth, Astrid Coste, Liacine Bouaoun, Aurélie Danjou, Marie Lefevre, Brigitte Dananché, Delphine Praud, Martie Van Tongeren, Louis Bujan, Olivia Pérol, Joachim Schüz, Barbara Charbotel, Béatrice Fervers, Ann Olsson, The Testis Study Group

Full Source: Cancers 2022 Oct 10;14(19):4962. doi: 10.3390/cancers14194962.

Profile of Dermatological Disorders Among Workers Involved in Fruit Growing Industry of Kashmir Valley in North India

2022-05-05

Introduction: Skin disorders represent a major proportion of occupational disorders.

Introduction: Skin disorders represent a major proportion of occupational disorders. Dermatoses are becoming a source of concern in various population groups. In Kashmir valley, a large number of people are associated directly or indirectly with horticulture. Fruit cultivation is the main occupation of around 33 lakh people in the Union Territory.
Aim: To study the profile of dermatological disorders in workers involved in fruit growing industry of Kashmir valley.
Materials and methods: This study was a cross-sectional observational study, carried out over a period of 2 years, in which 701 workers of fruit growing industry of Kashmir valley were screened.
Results: 276 (39.37%) of these workers were found to have skin lesions while the rest, that is, 425 (60.63%) were not found to have any dermatoses. Out of the total dermatological lesions observed, occupational dermatoses contributed to 94 cases (34.05%), while non-occupational dermatoses accounted for 182 cases (65.94%). Among the occupational dermatoses, friction-related disorders (callosities and cuts) were predominant (15.9%) followed by allergic (12%) and irritant contact dermatitis (6.2%). Out of the non-occupational dermatoses group, the major portion was comprised by polymorphic light eruption (6.2%) in non-infectious type while in infectious type, onychomycoses predominated (3.3%).

Conclusion: Dermatological conditions form a major group of occupational dermatoses among workers involved in fruit cultivation.

Authors: Yaqzata Bashir, Iffat Hassan, Sumaya Zeerak, Manzoor Ahmad Bhat, Shazia Jeelani, Yasmeen Jabeen Bhat, Shugufta P Rather, Shahnawaz Bashir

Full Source: Indian dermatology online journal 2022 May 5;13(3):334-339. doi: 10.4103/idoj.idoj_597_21.