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Bulletin Board

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CHEMICAL EFFECTS

Epigenetic Modifications Associated with Exposure to Endocrine Disrupting Chemicals in Patients with Gestational Diabetes Mellitus

2021-04-29

Gestational diabetes mellitus (GDM) remains a significant clinical and public health issue due to its increasing prevalence and the possibility for numerous short- and long-term complications. The growing incidence of GDM seems to coincide with the widespread use of endocrine disrupting chemicals (EDCs). The extensive production and common use of these substances in everyday life has resulted in constant exposure to harmful substances from the environment. That may result in epigenetic changes, which may manifest themselves also after many years and be passed on to future generations. It is important to consider the possible link between environmental exposure to endocrine disrupting chemicals (EDCs) during pregnancy, epigenetic mechanisms and an increased risk for developing gestational diabetes mellitus (GDM). This manuscript attempts to summarize data on epigenetic changes in pregnant women suffering from gestational diabetes in association with EDCs. There is a chance that epigenetic marks may serve as a tool for diagnostic, prognostic, and therapeutic measures.

Authors: Mateusz Kunysz, Olimpia Mora-Janiszewska, Dorota Darmochwa□-Kolarz

Full Source: International journal of molecular sciences 2021 Apr 29;22(9):4693. doi: 10.3390/ijms22094693.

Gestational diabetes mellitus (GDM) remains a significant clinical and public health issue due to its increasing prevalence and the possibility for numerous short- and long-term complications.

ENVIRONMENTAL RESEARCH

The effects of ionizing radiation on domestic dogs: a review of the atomic bomb testing era

2021-05-13

Dogs were frequently employed as laboratory subjects during the era of atomic bomb testing (1950-1980), particularly in studies used to generate predictive data regarding the expected effects of accidental human occupational exposure to radiation. The bulk of these studies were only partly reported in the primary literature, despite providing vital information regarding the effects of radiation exposure on a model mammalian species. Herein we review this literature and summarize the biological effects in relation to the isotopes used and the method of

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radionuclide exposure. Overall, these studies demonstrate the wide range of developmental and physiological effects of exposure to radiation and radionuclides in a mid-sized mammal.

Authors: Gabriella J Spatola, Elaine A Ostrander, Timothy A Mousseau

Full Source: Biological reviews of the Cambridge Philosophical Society 2021 May 13. doi: 10.1111/brv.12723.

Spatial and temporal baseline of perfluorooctanesulfonic acid retained in sediment core samples from Puget Sound, Washington, USA

2021-05-04

Per- and poly-fluorinated alkyl substances (PFAS) are a group of highly persistent synthetic chemicals utilized in many industrial and consumer products, and - significantly toward introduction to the marine environment - in fire-fighting foams. Recently, PFAS have been linked to adverse health effects, prompting the need to better understand transport, lability, and fate. Perfluorooctanesulfonic acid (PFOS), a manufactured PFAS and biodegradation product, partitions to marine sediments and thus can be used as a primary indicator toward regulatory efforts. The current study offers a spatial and temporal analysis of Puget Sound from cores collected adjacent Tacoma and Seattle, WA, as well as cores from central Hood Canal and Carr Inlet. Temporal fluxes reflected releases into the environment corresponding with initial production and subsequent increases in use. Biologically active layers ranged from 434 pg/g (Carr Inlet) to 824 pg/g (Hood Canal) PFOS, producing benthic community risk quotients between 0.11 and 0.17.

Authors: Jonathan E Strivens, Li-Jung Kuo, Yina Liu, Kimberly L Noor

Full Source: Marine pollution bulletin 2021 May 4;167:112381. doi: 10.1016/j.marpolbul.2021.112381.

Per- and poly-fluorinated alkyl substances (PFAS) are a group of highly persistent synthetic chemicals utilized in many industrial and consumer products, and - significantly toward introduction to the marine environment - in fire-fighting foams.

Plastic additives: challenges in ecotox hazard assessment

2021-04-16

The risk of plastic debris, and specifically micro(nano)plastic particles, to ecosystems remains to be fully characterized. One particular issue that warrants further characterization is the hazards associated with chemical additives within micro(nano)plastic as they are not chemically bound within the polymers and can be persistent and biologically active. Most plastics contain additives and are therefore potential vectors for the introduction of these chemicals into the environment as they leach from plastic, a process that can be accelerated through degradation and weathering processes. There are knowledge gaps on the ecotoxicological effects of plastic

additives and how they are released from parent plastic materials as they progressively fragment from the meso to micro and nano scale. This review summarizes the current state of knowledge of the ecotoxicity of plastic additives and identifies research needs to characterize the hazard they present to exposed biota. The potential ecological risk of chemical additives is of international concern so key differences in governance between the European Union and New Zealand to appropriately characterize their risk are highlighted.
Authors: Andrew Barrick, Olivier Champeau, Amélie Chatel, Nicolas Manier, Grant Northcott, Louis A Tremblay
Full Source: PeerJ 2021 Apr 16;9:e11300. doi: 10.7717/peerj.11300.

Biomonitoring: A tool to assess PFNA body burdens and evaluate the effectiveness of drinking water intervention for communities in New Jersey

2021-05-04

Elevated perfluorononanoic acid (PFNA) levels, one of many manmade per- and polyfluoroalkyl substances (PFAS), were detected in public water systems/private wells in New Jersey communities. Interventions to end exposure through drinking water were carried out from 2014 to 2016. To evaluate the effectiveness of interventions, a community biomonitoring study was conducted for the communities between 2017 and 2020. A convenience sampling design was used with 120 participants in Year 1 between ages of 20-74 who consumed PFNA-contaminated water. Three blood samples, one year apart, were drawn from each participant and completed for 99 participants. Separated serum samples were measured for 12 PFAS including PFNA. Questionnaires were administered to collect information on demographics and potential sources. Drinking water and house dust collected at the first visit were analyzed for 14 PFAS including PFNA. The PFNA sera levels (Year 1) found 84 out of 120 (70%) participants were higher than the 95th percentile of a nationally representative sample of US adults (NHANES2015-16). Current drinking water and house dust were not significant contributing sources for the study participants. On average, PFNA sera levels were 12 ± 16% (Year 2) and 27 ± 16% (Year 3) lower than the level measured in Year 1 ($p < 0.01$). The PFNA half-life was estimated around 3.52 years, using a mixed model from 68 high-exposed participants (>95th percentile of NHANES2015-16) with controlling for physiological covariates. The decline in adult serum PFNA levels seen in the years following a community drinking water

Elevated perfluorononanoic acid (PFNA) levels, one of many manmade per- and polyfluoroalkyl substances (PFAS), were detected in public water systems/private wells in New Jersey communities.

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intervention suggests the intervention effectively reduced PFNA exposure via drinking water.
Authors: Chang Ho Yu, Clifford P Weisel, Shahnaz Alimokhtari, Panos G Georgopoulos, Zhihua Tina Fan
Full Source: International journal of hygiene and environmental health 2021 May 4;235:113757. doi: 10.1016/j.ijheh.2021.113757.

OCCUPATIONAL

Genetic damage in coal and uranium miners

2021-06

Mining has a direct impact on the environment and on the health of miners and is considered one of the most hazardous occupations worldwide. Miners are exposed to several occupational health risks, including genotoxic substances, which may cause adverse health effects, such as cancer. This review summarizes the relation between DNA damage and mining activities, focusing on coal and uranium miners. The search was performed using electronic databases, including original surveys reporting genetic damage in miners. Additionally, a temporal bibliometric analysis was performed using an electronic database to create a map of cooccurrence terms. The majority of studies were performed with regard to occupational exposure to coal, whereas genetic damage was assessed mainly through chromosomal aberrations (CAs), micronuclei (MNs) and comet assays. The bibliometric analysis demonstrated associations of coal exposure with silicosis and pneumoconiosis, uranium miners with lung cancer and tumors and some associated factors, such as age, smoking, working time and exposure to radiation. Significantly higher DNA damage in miners compared to nonexposed groups was observed in most of the studies. The timeline reveals that classic biomarkers (comet assay, micronucleus test and chromosomal aberrations) are still important tools to assess genotoxic/mutagenic damage in occupationally exposed miners; however, newer studies concerning genetic polymorphisms and epigenetic changes in miners are being conducted. A major challenge is to investigate further associations between miners and DNA damage and to encourage further studies with miners of other types of ores.
Authors: Flavio Manoel Rodrigues da Silva Júnior, Ronan Adler Tavella, Caroline Lopes Feijo Fernandes, Marina Dos Santos
Full Source: Mutation research 2021 Jun;866:503348. doi: 10.1016/j.mrgentox.2021.503348.

Mining has a direct impact on the environment and on the health of miners and is considered one of the most hazardous occupations worldwide.

Biomonitoring of metals in blood and urine of electronic waste (E-waste) recyclers at Agbogbloshie, Ghana

2021-04-27

There is growing evidence that e-waste recyclers may be exposed to potentially high levels of metals though associations between such exposures and specific work activities is not well established. In addition, studies have focused on metals traditionally biomonitored and there is no data on the exposure of recyclers to elements increasingly being used in new technologies. In the current study, levels of metals were measured in blood and urine of e-waste recyclers at Agbogbloshie (Ghana) and a control group. Blood and urine samples (from 100 e-waste recyclers and 51 controls) were analyzed for 17 elements (Ag, As, Ba, Cd, Ce, Cr, Eu, La, Mn, Nd, Ni, Pb, Rb, Sr, Tb, Tl, Y) using the ICP-MS. Most e-waste recyclers reported performing at least 4 different tasks in decreasing order as e-waste dismantling (54%), trading/selling of e-waste (45%), burning wires only (40%), and collecting wires after burning (34%). Mean levels of blood Pb, Sr, Tl, and urinary Pb, Eu, La, Tb, and Tl were significantly higher in recyclers versus controls. In general, the collectors and sorters tended to have higher elemental levels than other work groups. Blood Pb levels (mean 92.4 µg/L) exceeded the U.S. CDC reference level in 84% of the e-waste recyclers. Likewise, blood Cd, Mn, and urinary As levels in recyclers and controls were higher than in reference populations elsewhere. E-waste recyclers are exposed to metals traditionally studied (e.g., Pb, Cd, As) and several other technology-critical and rare earth elements which previously have not been characterized through human biomonitoring.

Authors: Sylvia A Takyi, Niladri Basu, John Arko-Mensah, Duah Dwomoh, Karel G Houessionon, Julius N Fobil

Full Source: Chemosphere 2021 Apr 27;280:130677. doi: 10.1016/j.chemosphere.2021.130677.

Respirable stone particles differ in their ability to induce cytotoxicity and pro-inflammatory responses in cell models of the human airways

2021-05-06

Background: Respirable stone- and mineral particles may be a major constituent in occupational and ambient air pollution and represent a possible health hazard. However, with exception of quartz and asbestos, little is known about the toxic properties of mineral particles. In the present study, the pro-inflammatory and cytotoxic responses to six stone particle samples of different composition and with diameter below 10 µm were assessed in human bronchial epithelial cells (HBEC3-KT), THP-1 macrophages and a HBEC3-KT/THP-1 co-culture. Moreover, particle-induced lysis of human erythrocytes was assessed to determine the ability of the particles to lyse biological membranes. Finally, the role of the NLRP3 inflammasome was assessed using a NLRP3-specific inhibitor and detection of ASC oligomers and cleaved caspase-1 and IL-1. A reference sample of pure -quartz was included for comparison.

Results: Several stone particle samples induced a concentration-dependent increase in cytotoxicity and secretion of the pro-inflammatory cytokines CXCL8, IL-1, IL-1 and TNF. In HBEC3-KT, quartzite and anorthosite were the most cytotoxic stone particle samples and induced the highest levels of cytokines. Quartzite and anorthosite were also the most cytotoxic samples in THP-1 macrophages, while anorthosite and hornfels induced the highest cytokine responses. In comparison, few significant differences between particle samples were detected in the co-culture. Adjusting responses for differences in surface area concentrations did not fully account for the differences between particle samples. Moreover, the stone particles had low hemolytic potential, indicating that the effects were not driven by membrane lysis. Pre-incubation with a NLRP3-specific inhibitor reduced stone particle-induced cytokine responses in THP-1 macrophages, but not in HBEC3-KT cells, suggesting that the effects are mediated through different mechanisms in epithelial cells and macrophages. Particle exposure also induced an increase in ASC oligomers and cleaved caspase-1 and IL-1 in THP-1 macrophages, confirming the involvement of the NLRP3 inflammasome.

Conclusions: The present study indicates that stone particles induce cytotoxicity and pro-inflammatory responses in human bronchial epithelial cells and macrophages, acting through NLRP3-independent and -dependent mechanisms, respectively. Moreover, some particle samples induced cytotoxicity and cytokine release to a similar or greater extent than -quartz. Thus, these minerals warrant further attention in future research.

Authors: Vegard Sæter Grytting, Magne Refsnes, Johan Øvrevik, Marit Sigrid Halle, Jasmin Schönenberger, Roelant van der Lelij, Brynhild Snilsberg, Tonje Skuland, Richard Blom, Marit Låg

Full Source: Particle and fibre toxicology 2021 May 6;18(1):18. doi: 10.1186/s12989-021-00409-y.

There is growing evidence that e-waste recyclers may be exposed to potentially high levels of metals though associations between such exposures and specific work activities is not well established.

PHARAMACEUTICAL/TOXICOLOGY

Associations between urinary phthalate metabolite concentrations and markers of liver injury in the US adult population

2021-05-06

Background: Phthalates have been largely used for years in varieties of products worldwide. However, research on the joint toxic effect of various phthalates exposure on the liver is lacking.

Objectives: We aimed to assess exposure to phthalates on liver function tests (LFTs). Methods: This analysis included data on 6046 adults (≥20 years old) who participated in a National Health and Nutrition Examination Survey (NHANES) in 2007-2016. We employed linear regression and Bayesian kernel machine regression (BKMR), to explore the associations of urinary phthalate metabolites with 8 indicators of LFTs. Results: Di(2-ethylhexyl) phthalate (□DEHP) was found to be positively associated with serum alanine aminotransferase (ALT), gamma-glutamyl transferase (GGT) and alkaline phosphatase (ALP) (all P FDR < 0.05). We found significant positive associations of ∑DEHP, mono-ethyl phthalate (MEP) and mono-(carboxyisononyl) phthalate (MCNP) with total bilirubin (TBIL) (all P FDR < 0.05). □DEHP, mono-n-butyl phthalate (MBP), mono-(3-carboxypropyl) phthalate (MCPP) and mono-benzyl phthalate (MBzP) were negatively associated with serum ALB (all P FDR < 0.05). The BKMR analyses showed a significantly positive overall effect on ALT, AST, ALP and TBIL levels with high concentrations of phthalate metabolites and a significantly negative overall effect on ALB and TP, when all the chemicals at low concentrations.

Conclusions: Our results add novel evidence that exposures to phthalates might be adversely associated with the indicators of LTFs, indicating the potential toxic effect of phthalate exposures on the human liver.

Authors: Linling Yu, Meng Yang, Man Cheng, Lieyang Fan, Xing Wang, Tao Xu, Bin Wang, Weihong Chen

Full Source: Environment international 2021 May 6;155:106608. doi: 10.1016/j.envint.2021.106608.

Background: Phthalates have been largely used for years in varieties of products worldwide.

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Effect of inhaled anaesthetics gases on cytokines and oxidative stress alterations for the staff health status in hospitals

2021-05-06

Objectives: The present study aimed to evaluate the effects of waste anaesthetic gases on cytokines and oxidative stress of hospital health team members following exposure to waste anaesthetic gases (WAGs).

Subjects and methods: In total, 180 participants took part in this study; 60 of these were healthy male controls and the 120 participants in the intervention group were staff who work in the operating room. This latter group comprises six occupational subgroups (1) surgeons, (2) surgical assistants, (3) anaesthesiologists (4) anaesthesiology assistants, (5) nurses and (6) janitors. The following parameters were assessed: catalase (CAT), glutathione peroxidase (GSHpx) and superoxide dismutase (SOD) activities, plasma fluoride, serum interferon gamma (IFN-□), serum interleukin 2 (IL2), serum interleukin 4 (IL4) and plasma thiobarbituric acid reactive substances (TBARS).

Results: Anaesthesiologists and their assistants exhibited the highest levels of plasma fluoride, serum IFN-□ and IL 2, exceeding the levels in detected in all the other occupational subgroups. Furthermore, the serum levels of IL4 were significantly raised in anaesthesiologists and the difference between this group and other groups was statistically significant. However, compared with the other subgroups, surgeons exhibited elevated plasma TBARS and reduced CAT, GSHpx and SOD; these variances were also statistically significant.

Conclusion and recommendations: The findings of this study indicate that operating room staff exposed to WAGs are vulnerable to experiencing immunotoxicity as the WAGs are considered to initiate oxidative stress and increase the levels of cytokines in serum. Thus, an education programme is warranted to inform staff working in environments where they may be subjected to WAGs on the effects that the gases can have upon their health and how to minimise their exposure to WAGs. An ongoing effort is also needed to ensure anaesthesia safety standards are maintained at all times. The findings of this study may provide a springboard for future research into occupational exposure to WAGs and their wider effect upon health.

Authors: Khaled A Al-Rasheedi, Abdulmajeed A Alqasoumi, Ashraf M Emara

Full Source: International archives of occupational and environmental health 2021 May 6. doi: 10.1007/s00420-021-01705-y.

Objectives: The present study aimed to evaluate the effects of waste anaesthetic gases on cytokines and oxidative stress of hospital health team members following exposure to waste anaesthetic gases (WAGs).

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