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Technical

CHEMWATCH

ENVIRONMENTAL RESEARCH

Native seed, soil and atmosphere respond to boreal forest topsoil (LFH) storage

2019-11-26

During mining topsoil is salvaged and stockpiled until ready for reclamation, stockpiling can have detrimental effects on seed viability and soil quality. Research has assessed effects of salvage and placement depth of forest topsoil on plant community establishment, with little work on effects of storage, particularly in the boreal forest. In this study, the authors assessed boreal forest topsoil storage methods to determine effects on soil chemical and physical properties, native seed viability and germination and rhizome viability and emergence. Factors were topsoil stockpiling length, stockpile size, season of construction and soil texture. Four replicates of large and small stockpiles were constructed in the mineable oil sands, in northeastern Alberta. During construction seeds and rhizomes from a variety of native boreal plant species were buried within large (0.05, 1.0, 2.0, 4.0, 6.0 m) and small (0.05, 1.0, 3.0 m) stockpiles. Soil gas probes were installed at similar depths as seed and rhizomes were placed. Seeds and rhizomes were extracted eight months and sixteen months after construction; during that time soil samples were collected for various chemical analyses. Irrespective of stockpile size, the majority of species seeds and rhizomes buried below 1 m lost viability and did not germinate after eight months. Anaerobic soil conditions developed soon after construction and persisted at depths below 1.0 m in large stockpiles, and over time anaerobic conditions developed in smaller stockpiles. Only seeds of *Geranium bicknellii* and *Dracocephalum parviflorum* had a high survival rate in stockpiles; both species have hard seed coats and are physically dormant. Various soil nutrients increased in concentrations in their soluble forms after stockpiling. Direct placement of topsoil is a preferred soil handling technique; however, if topsoil has to be stockpiled increasing the surface area of stockpiles will help preserve some seed and rhizome viability.

Authors: Mackenzie DD, Naeth MA.

Full Source: PLoS One. 2019 Sep 16;14(9): e0220367. doi: 10.1371/journal.pone.0220367. eCollection 2019.

In this study, the authors assessed boreal forest topsoil storage methods to determine effects on soil chemical and physical properties, native seed viability and germination and rhizome viability and emergence.

Pesticides and herbicides

2019-11-26

This study provides a review of some important scientific articles published in the year 2018 about pesticides and herbicides. The literature review presented in this paper cover pesticides and herbicides presence as well as occurrence in the environment. The review is divided into four sections. Each of these sections highlight issues related to pesticides and herbicides on toxicology, ecology, risk assessment, modelling, and treatment strategies.

Authors: Choudri BS, Charabi Y.

Full Source: Water Environment Research. 2019 Oct;91(10):1342-1349. doi: 10.1002/wer.1227. Epub 2019 Sep 15.

Transcriptomic analysis reveals potential mechanisms of toxicity in a combined exposure to dibutyl phthalate and diisobutyl phthalate in zebrafish (*Danio rerio*) ovary

2019-11-26

Phthalate esters (PAEs), which are notable plasticisers, can be prolific contaminants in aquatic environments, and have been shown to induce reproductive toxicity. However, the studies concerning their toxicity towards aquatic species are based on individual chemicals, and the combined toxicity of PAEs to aquatic organisms remains unclear. The aim of this study was to explore the potential toxicity mechanisms associated with combined exposure to dibutyl phthalate (DBP) and diisobutyl phthalate (DiBP) in adult female zebrafish ovaries. Zebrafish were exposed to DBP, DiBP and their mixtures for 30 days, and their effects on ovarian histology, plasma sex hormones and ovarian transcriptomics were investigated. Plasma oestradiol (E2) levels were significantly decreased by 38.9% in the DBP-1133 exposure group and 41.0% in the DiBP-1038 exposure group. The percentage of late/mature oocytes was also significantly decreased by 17.3% under DBP-1133 exposure and 16.2% under DiBP-1038 exposure, while that under combined exposure was not significantly affected. Nevertheless, transcriptome sequencing revealed 2564 differentially expressed genes (DEGs) in zebrafish ovaries after exposure to the mixtures. Kyoto Encyclopedia of Genes and Genomes (KEGG) enrichment analysis showed that the DEGs were involved in the neuroactive ligand-receptor interaction, GnRH, progesterone-mediated oocyte maturation, oocyte meiosis and steroid hormone biosynthesis

This study provides a review of some important scientific articles published in the year 2018 about pesticides and herbicides.

signalling pathways. These results revealed that combined exposure exerts potential reproductive toxicity at the molecular level.

Authors: Chen H, Feng W, Chen K, Qiu X, Xu H, Mao G, Zhao T, Ding Y, Wu X.

Full Source: *Aquatic Toxicology*. 2019 Aug 29; 216:105290. doi: 10.1016/j.aquatox.2019.105290. [Epub ahead of print]

Potential effects of internal physio-ecological changes on the online biomonitoring of water quality: The behaviour responses with circadian rhythms of zebrafish (*Danio rerio*) to different chemicals

2019-11-26

The online biomonitoring of aquatic accidental pollution is very important to realise the assessment of complex toxicity. However, the monitoring results would be affected greatly by the internal physio-ecological changes of test organisms, and circadian rhythms might contribute greatly to this kind of effects. In the present study, the behaviour responses of zebrafish (*Danio rerio*) to different concentrations of Deltamethrin, Atrazine, and Thallium (TI) in 15 days were investigated using an online behaviour monitoring system. The results showed that the average behaviour strength (BS) value of dark period (0.71 ± 0.16) was lower than that of light period (0.88 ± 0.09) in the control group. Similar pattern was observed in all other treatments with negative relationship between exposure concentrations and mean BS values. It is concluded that the 24 h circadian rhythms in the behaviour responses of zebrafish (*Danio rerio*) could be observed clearly in the online biomonitoring system, and the online monitoring results would be affected obviously in the characteristics of behaviour periodicity abnormal and time delay. Therefore, it is suggested that internal physio-ecological characteristics of organisms must be considered once they have the chance to play roles in bio-induced technologies. More investigations are warranted to clear the effects of internal physio-ecological changes on the exported results.

Authors: Zhao R, Hu Y, Li B, Chen M, Ren Z.

Full Source: *Chemosphere*. 2019 Sep 4; 239:124752. doi: 10.1016/j.chemosphere.2019.124752. [Epub ahead of print]

In the present study, the behaviour responses of zebrafish (*Danio rerio*) to different concentrations of Deltamethrin, Atrazine, and Thallium (TI) in 15 days were investigated using an online behaviour monitoring system.

Technical

CHEMWATCH

Computational and experimental analysis of the glycoposphatidylinositol-anchored proteome of the human parasitic nematode *Brugia malayi*

2019-11-26

Further characterisation of essential systems in the parasitic filarial nematode *Brugia malayi* is needed to better understand its biology, its interaction with its hosts, and to identify critical components that can be exploited to develop novel treatments. The production of glycoposphatidylinositol-anchored proteins (GPI-APs) is essential for eukaryotic cellular and physiological function. In addition, GPI-APs perform many important roles for cells. In this study, the authors characterised the *B. malayi* GPI-anchored proteome using both computational and experimental approaches. The authors used bioinformatic strategies to show the presence or absence of *B. malayi* GPI-AP biosynthetic pathway genes and to compile a putative *B. malayi* GPI-AP proteome using available prediction programs. These were verified in silico analyses using proteomics to identify GPI-AP candidates prepared from the surface of intact worms and from membrane enriched extracts. The study represents the first description of the GPI-anchored proteome in *B. malayi* and lays the groundwork for further exploration of this essential protein modification as a target for novel anthelmintic therapeutic strategies.

Authors: Mersha FB, Cortes LK, Luck AN, McClung CM, Ruse CI, Taron CH, Foster JM.

Full Source: PLoS One. 2019 Sep 12;14(9): e0216849. doi: 10.1371/journal.pone.0216849. eCollection 2019.

In study, metabolic impairments caused by the joint exposure of p,p'-dichloro diphenyl trichloroethane (DDE) and selenium (Se) have been issued for the first time.

MEDICAL RESEARCH

Metabolic Impairments Caused by a "Chemical Cocktail" of DDE and Selenium in Mice Using Direct Infusion Triple Quadrupole Time-of-Flight and Gas Chromatography-Mass Spectrometry

2019-11-26

Among organic contaminants, pesticides are one of the most important groups of chemicals due to their persistent character and toxicity. However, the biological systems are exposed to a complex environment in which the contaminants can interact in a synergistic/antagonistic fashion, and for this reason, the study of "chemical cocktails" is of great

interest to fully understand the final biological effect. In this way, selenium is known for its antagonistic action against several toxicants. In study, metabolic impairments caused by the joint exposure of p,p'-dichloro diphenyl trichloroethane (DDE) and selenium (Se) have been issued for the first time. A metabolomic workflow was applied to mice fed DDE and DDE with Se diet, on the basis of the complementary use of two organic mass spectrometric techniques, combining direct infusion mass spectrometry (DI-ESI-QqQ-TOF MS) and gas chromatography-mass spectrometry (GC-MS). The results show a good classification between the studied groups caused by about 70 altered metabolites in the liver, kidney, or brain, including the pathways of energy metabolism, degradation of phospholipidic membrane, β -oxidation, and oxidative stress, which confirm the potential of combined metabolomic platforms in environmental studies.

Authors: Rodríguez-Moro G, Abril N, Jara-Biedma R, Ramírez-Acosta S, Gómez-Ariza JL, García-Barrera T.

Full Source: Chemical Research in Toxicology. 2019 Sep 18. doi: 10.1021/acs.chemrestox.9b00102. [Epub ahead of print]

Effect of a beta-cypermethrin and emamectin benzoate pesticide mixture on reproductive toxicity in male mice in a greenhouse environment

2019-11-26

With the widespread use of pesticides, the resistance to pesticides of pests has gradually increased, caused mixed pesticides to become even more widely used for practical applications. To investigate the effects of mixed pesticides on reproductive health in an occupational greenhouse environment, the greenhouse environment and the characteristics of the actual application were constructed, and then the male mice were comprehensively exposed to a mixture of the beta-cypermethrin and emamectin benzoate environmental. Additionally, the effect of the beta-cypermethrin and emamectin benzoate mixture on the reproductive health of male mice was known. The results showed that with the prolongation of exposure duration, the activities of Glutathione Peroxidase (GSH-Px), Total Superoxide Dismutase (T-SOD), Lactate dehydrogenase (LDH) and Acid phosphatase (ACP) in the testes of mice gradually decreased and the activity of Malondialdehyde (MDA) gradually increased. It was also found that the apoptosis rate of murine testicular cells increased and that DNA damage occurred with prolonged exposure duration. Therefore, it can be inferred that exposure to a mixture of the pesticides beta-cypermethrin and emamectin benzoate in the greenhouse

With the widespread use of pesticides, the resistance to pesticides of pests has gradually increased, caused mixed pesticides to become even more widely used for practical applications.

environment may have adverse effects on the reproductive health of male mice.

Authors: Zhang Y, Kong C, Chi H, Li J, Xing J, Wang F, Shao L, Zhai Q.

Full Source: Chemical Research in Toxicology. 2019 Sep 25;1-7. doi:

10.1080/15376516.2019.1669241. [Epub ahead of print]

Efficacy of an Antiaging Treatment Against Environmental Factors: *Deschampsia antarctica* Extract and High-tolerance Retinoids Combination

2019-11-26

Effects of environmental contaminants, such as air pollution and cigarette smoking on skin include increased oxidation, subclinical inflammation, and degradation of the dermal matrix, which can accelerate the skin aging process. An open-label, prospective study was conducted to assess the efficacy and tolerability of a topical anti-aging regimen comprising high-concentration retinoids, *Deschampsia antarctica* extract, and niacinamide in participants living in a heavily polluted (Level III, World Health Organization) city. **Methods.** Twenty-two female Caucasian volunteers with Fitzpatrick Skin Types III and IV were treated for 90 days with the topical anti-aging regimen. Subjective clinical assessments using the Rao-Goldman Scoring for Facial Aging, Patient's Global Assessment (PGA), and Investigator's Global Assessment (IGA). Additionally, objective instrumental assessments for wrinkles using Visia® (Canfield Scientific, Parsippany, New Jersey) and Visioline® (Courage+Khazaka Electronic GmbH, Cologne, Germany) and viscoelasticity and firmness using Cutometer® (Courage+Khazaka Electronic GmbH) were completed at baseline, Day 30, and Day 90. **Results.** At Day 30, wrinkles in the periocular area significantly improved by 35.7 percent ($p=0.003$) compared to baseline. At the end of the study (Day 90), a significant improvement in firmness (41.7%) and viscoelasticity (12.8%) were observed. Tolerance for treatment was assessed as "good" or "very good" in 86.5 percent of the volunteers. This novel antiaging treatment regimen could potentially serve as an effective and long-term topical treatment option for improving signs of facial aging and protecting the skin from external factors associated with acceleration of the skin aging process, such exposure to UV radiation, air pollution, and cigarette smoke. Larger and longer-term, randomised, controlled clinical trials in more diverse population samples are needed to confirm our results.

Authors: Pérez Davó A, Truchuelo MT, Vitale M, Gonzalez-Castro J.

Full Source: The Journal of Clinical and Aesthetic Dermatology. 2019

Jul;12(7):E65-E70. Epub 2019 Jul 1.

An open-label, prospective study was conducted to assess the efficacy and tolerability of a topical anti-aging regimen comprising high-concentration retinoids, *Deschampsia antarctica* extract, and niacinamide in participants living in a heavily polluted city.

Real-world comorbidities and treatment patterns among patients with non-alcoholic fatty liver disease receiving phosphatidylcholine as adjunctive therapy in Russia

2019-11-26

Previous research conducted in Russia showed that the number of patients with non-alcoholic fatty liver disease (NAFLD) and associated metabolic comorbidities is large. The authors conducted an observational study to describe the management of NAFLD in patients with metabolic syndrome in Russia. A total of 2843 adult patients from 174 medical sites across 6 federal districts of Russia with newly diagnosed NAFLD, who had at least one of four comorbidities, namely overweight/obesity, hypertension, type 2 diabetes mellitus, and hypercholesterolaemia, and who received phosphatidylcholine (PPC) as an adjunctive treatment to standard care, were enrolled during 2015-2016. Overall, 2263 patients (79.6%) had at least two metabolic comorbidities associated with NAFLD; overweight/obesity was the most common comorbidity reported in 2298 patients (80.8%). Simple steatosis was the most frequently identified clinical form of NAFLD, diagnosed in 2128 patients (74.9%). Among hypertensive patients, ACE inhibitors, statins, and sartans were most commonly prescribed. Biguanides were administered in more than half of diabetic patients. In patients with overweight/obesity and hypercholesterolaemia, statins were the most frequently prescribed medications. Almost all patients (2837/2843; 99.8%) were treated with 1.8 g of PPC three times per day. PPC therapy was associated with a 90.5% 6-month compliance rate, high treatment satisfaction, and a favourable safety profile. However, almost 15% of diabetic patients and 40% of overweight/obese patients received no further treatment. In Russia, patients with newly diagnosed NAFLD represent a population heavily burdened by comorbidities, mainly overweight/obesity and hypercholesterolaemia. A significant part of these patients did not receive a comprehensive pharmacotherapy, highlighting the existing unmet need in the current management of NAFLD patients with metabolic syndrome in Russia.

Authors: Maev IV, Samsonov AA, Palgova LK, Pavlov CS, Shirokova E, Starostin KM.

Full Source: *BMJ Open Gastroenterol.* 2019 Aug 18;6(1):e000307. doi: 10.1136/bmjgast-2019-000307. eCollection 2019.

Previous research conducted in Russia showed that the number of patients with non-alcoholic fatty liver disease (NAFLD) and associated metabolic comorbidities is large.

In silico study of molecular mechanisms of action: Oestrogenic disruptors among phthalate esters

2019-11-26

Phthalate esters (PAEs), as widely used plasticisers, have been concerned for their possible disruption of oestrogen functions via binding to and activating the transcription of estrogen receptors (ERs). Nevertheless, the computational interpretation of the mechanism of ERs activities modulated by PAEs at the molecular level is still insufficient, which hinders the reliable screening of the ERs-active PAEs with high speed and high throughput. To bridge the gap, the in-silico simulations considering the effects of coactivators were accomplished to explore the molecular mechanism of action for the purpose of predicting the oestrogenic potencies of PAEs. The transcriptional activation functions of human ER α (hER α) modulated by PAEs is predicted via the simulations including binding interaction of PAEs and hER α , conformational changes of PAEs-hER α complexes and recruitment of coactivators. Molecular insight into the diverse oestrogen mechanism of action among PAEs with regard to hER α agonists and selective oestrogen receptor modulators (SERMs) is provided. Agonist-modulated conformational change of hER α leads to the optimal exposure of its Activation Function 2 (AF-2) surface which, in turn, facilitates the recruitment of coactivators, therefore promoting the transcriptional activation functions of hER α . Conversely, binding interaction of hER α with SERMs among PAEs leads to the conformational change with blocked AF-2 surface, thus preventing the recruitment of coactivators and consequently inhibiting the AF-2 activity. The two-hybrid recombinant yeast is experimentally used for verification. The established in silico evaluation methodology exhibits great promise to speed up the prediction of chemicals which work as hER α agonist or SERMs.

Authors: Zhu Q, Liu L, Zhou X, Ma M.

Full Source: Environmental Pollution. 2019 Sep 7;255(Pt 1):113193. doi: 10.1016/j.envpol.2019.113193. [Epub ahead of print]

Phthalate esters (PAEs), as widely used plasticisers, have been concerned for their possible disruption of oestrogen functions via binding to and activating the transcription of estrogen receptors (ERs).

OCCUPATIONAL RESEARCH

Declining blood lead levels among small-scale miners participating in a safer mining pilot programme in Nigeria

2019-11-26

In this study, the authors aimed to monitor blood lead levels (BLLs) of miners and ore processors participating in a pilot program to reduce lead poisoning and take-home exposures from artisanal small-scale

gold mining. A medical surveillance program was established to assess exposures as new methods aimed at reducing lead exposures from ore were introduced in a community in Nigeria where children experienced substantial lead-related morbidity and mortality. Extensive outreach and education were offered to miners, and investments were made to adopt wet methods to reduce exposures during mining and processing. The authors conducted medical surveillance, including a physical exam and repeated blood lead testing, for 61 miners selected from among several hundred who participated in the safer mining pilot programme and consented to testing. Venous blood lead concentrations were analysed using the LeadCare II device at approximately 3-month intervals over a period of 19 months. Overall geometric mean (GM) BLLs decreased by 32% from 31.6 to 21.5 $\mu\text{g}/\text{dL}$ during the 19-month project. Women had a somewhat lower reduction in GM BLLs (23%) compared with men (36%). There was a statistically significant reduction in log BLLs from baseline to the final test taken by each participant ($p < 0.001$). The observed reductions in GM BLLs during the pilot intervention among this representative group of miners and ore processors demonstrated the effectiveness of the safer mining program in this community. Such measures are feasible, cost-effective and can greatly improve health outcomes in mining communities.

Authors: Gottesfeld P, Meltzer G, Costello S, Greig J, Thurtle N, Bil K, Mwangombe BJ, Nota MM.

Full Source: Occupational & Environmental Medicine. 2019 Sep 5. pii: oemed-2019-105830. doi: 10.1136/oemed-2019-105830. [Epub ahead of print]

Antifibrotic treatment response and prognostic predictors in patients with idiopathic pulmonary fibrosis and exposed to occupational dust

2019-11-26

Idiopathic Pulmonary Fibrosis (IPF) is an aggressive interstitial lung disease with an unpredictable course. Occupational dust exposure may contribute to IPF onset, but its impact on antifibrotic treatment and disease prognosis is still unknown. In the present study, the authors evaluated clinical characteristics, respiratory function and prognostic predictors at diagnosis and at 12-month treatment of pirfenidone or nintedanib in IPF patients according to occupational dust exposure. A total of 115 IPF patients were recruited. At diagnosis, the authors collected demographic, clinical characteristics, occupational history. Pulmonary function tests were performed and two prognostic indices [Gender, Age, Physiology (GAP)

In the present study, the authors evaluated clinical characteristics, respiratory function and prognostic predictors at diagnosis and at 12-month treatment of pirfenidone or nintedanib in IPF patients according to occupational dust exposure.

and Composite Physiologic Index (CPI)] calculated, both at diagnosis and after the 12-month treatment. The date of long-term oxygen therapy (LTOT) initiation was recorded during the entire follow-up (mean = 37.85, range 12-60 months). At baseline, patients exposed to occupational dust [≥ 10 years ($n=62$)] showed a lower percentage of graduates (19.3% vs 54.7%; $p=0.04$) and a higher percentage of asbestos exposure (46.8% vs 18.9%; $p=0.002$) than patients not exposed [< 10 years ($n=53$)]. Both at diagnosis and after 12 months of antifibrotics, no significant differences for respiratory function and prognostic predictors were found. The multivariate analysis confirmed that occupational dust exposure did not affect neither FVC and DLCO after 12-month therapy nor the timing of LTOT initiation. Occupational dust exposure lasting 10 years or more does not seem to influence the therapeutic effects of antifibrotics and the prognostic predictors in patients with IPF.

Authors: Casillo V, Cerri S, Ciervo A, Stendardo M, Manzoli L, Flacco ME, Manno M, Bocchino M, Luppi F, Boschetto P.

Full Source: BMC Pulmonary Medicine. 2019 Sep 5;19(1):170. doi: 10.1186/s12890-019-0930-7.

Setting up a collaborative European human biological monitoring study on occupational exposure to hexavalent chromium

2019-11-26

The EU human biomonitoring initiative, HBM4EU, aims to co-ordinate and advance human biomonitoring (HBM) across Europe. Within its remit, the project is gathering new, policy relevant, EU-wide data on occupational exposure to relevant priority chemicals and developing new approaches for occupational biomonitoring. In this study, the hexavalent chromium [Cr(VI)] study design is presented as the first example of this HBM4EU approach. This study involves eight European countries and plans to recruit 400 workers performing Cr(VI) surface treatment e.g. electroplating or stainless- steel welding activities. The aim is to collect new data on current occupational exposure to Cr(VI) in Europe and to test new methods for Cr biomonitoring, specifically the analysis of Cr(VI) in exhaled breath condensate (EBC) and Cr in red blood cells (RBC) in addition to traditional urinary total Cr analyses. Furthermore, exposure data will be complemented with early biological effects data, including genetic and epigenetic effects. Personal air samples and wipe samples are collected in parallel to help informing the biomonitoring results. We present standard operational procedures (SOPs) to support the harmonised methodologies

The aim is to collect new data on current occupational exposure to Cr(VI) in Europe and to test new methods for Cr biomonitoring, specifically the analysis of Cr(VI) in exhaled breath condensate (EBC) and Cr in red blood cells (RBC) in addition to traditional urinary total Cr analyses.

for the collection of occupational hygiene and HBM samples in different countries.

Authors: Santonen T, Alimonti A, Bocca B, Duca RC, Galea KS, Godderis L, Göen T, Gomes B, Hanser O, Iavicoli I, Janasik B, Jones K, Kiilunen M, Koch HM, Leese E, Leso V, Louro H, Ndaw S, Porras SP, Robert A, Ruggieri F, Scheepers PTJ, Silva MJ, Viegas S, Wasowicz W, Castano A, Sepai O.

Full Source: Environmental Research. 2019 Jul 10; 177:108583. doi: 10.1016/j.envres.2019.108583. [Epub ahead of print]

Physical and chemical characterisation of McIntyre Powder: An aluminium dust inhaled by miners to combat silicosis

2019-11-26

McIntyre Powder (MP) is a finely ground aluminium powder that was used between 1943 and 1979 as a prophylaxis for silicosis. Silicosis is a chronic lung disease caused by the inhalation of crystalline silica dust and was prevalent in the Canadian mining industry during this time period. The McIntyre Research Foundation developed, patented, and produced the MP and distributed it to licensees in Canada, the United States, Mexico, Chile, Belgian Congo, and Western Australia. In the province of Ontario, Canada it is estimated that at least 27,500 miners between 1943 and 1979 were exposed to MP. The present study was undertaken to examine the chemical and physical characteristics of two variations of MP (light grey and black). Chemical analyses (using X-ray Fluorescence and Inductively Coupled Plasma approaches) indicate that the black MP contains significantly higher concentrations of aluminium and metal impurities than the light grey MP ($p < 0.001$). X-ray diffractometry shows that while aluminium hydroxide dominates the aluminium speciation in both variations, the higher total aluminium content in the black MP is attributable to a greater proportion of elemental aluminium. Physical characterisation (using electron microscopy, light microscopy, and dynamic light scattering) indicates that the light grey MP consists of particles ranging from 5 nm to 5 μ m in diameter. Atomic Force Microscopy shows that the light grey MP particles in the nanoparticle range (< 100 nm) have a mode between 5 and 10 nm. Consequently, it is possible that inhaled smaller MP nanoparticles may be transported via blood and lymph fluid circulation to many different organs including the brain. It is also possible for inhaled larger MP particles to deposit onto lung tissue and for potential health effects to arise from inflammatory responses through immune activation. This MP characterisation will provide crucial data to help inform future toxicological, epidemiological, and biological studies

The present study was undertaken to examine the chemical and physical characteristics of two variations of McIntyre Powder, finely ground aluminium powder, that was used as a prophylaxis for silicosis.

of any long-term effects related to the inhalation of aluminium dust and nanomaterials.

Authors: Zarnke A, Rasmussen PE, David MO, Eidi H, Kennedy K, Hedges K, Irick T, Thome C, Pirkkanen J, Boreham D.

Full Source: Journal of Occupational & Environmental Hygiene. 2019 Sep 18:1-12. doi: 10.1080/15459624.2019.1657581. [Epub ahead of print]

Thyroid function and decabromodiphenyl ethane (DBDPE) exposure in Chinese adults from a DBDPE manufacturing area

2019-11-26

Polybrominated diphenyl ethers (PBDEs), which are persistent organic pollutants, affect thyroid function. Human exposure to decabromodiphenyl ethane (DBDPE), which has a similar structure to PBDEs, has recently increased, and the health effects of DBDPE have not been well studied. The objective of this study was to determine whether human exposure to DBDPE was associated with thyroid hormone levels in adults from a DBDPE manufacturing area. Three hundred-two blood samples were collected from two populations in the largest DBDPE manufacturing area located in North China: 133 DBDPE occupationally exposed workers from a DBDPE manufacturing plant and 169 non-DBDPE occupationally exposed residents from a nearby food processing plant. The levels of DBDPE, and thyroid function parameters [total thyroxine (TT4), free T4 (FT4), total triiodothyronine (TT3), free T3 (FT3), thyroid-stimulating-hormone (TSH), thyroglobulin antibody (TG-Ab), and thyroid peroxidase antibody (TPO-Ab)] were measured in serum samples. Serum concentrations of DBDPE ranged from 3.148 to 54,360 ng g⁻¹ lipid weight (lw), with a geometric mean of 332.6 ng g⁻¹ lw. A 10-fold increase in the DBDPE concentration was associated with increase of 4.73 nmol L⁻¹ [95% confidence interval (CI): 2.75, 6.71] TT4 and 0.046 nmol L⁻¹ TT3 [95% CI: 0.012, 0.081], corresponding to increases of approximately of 4.73% (95% CI: 2.75%-6.71%) and 2.38% (95% CI: 0.62%-4.20%), respectively. DBDPE in serum was also significantly and positively associated with the concentrations of TG-Ab and TPO-Ab. The results of the study showed that exposure to DBDPE was associated with changes in thyroid activity in adults exposed to a high concentration of DBDPE, mainly increases of TT4, TT3, TPO-Ab, and TG-Ab. The association between DBDPE exposure

The objective of this study was to determine whether human exposure to DBDPE was associated with thyroid hormone levels in adults from a DBDPE manufacturing area.

and thyroid homeostasis requires further investigation because increasing DBDPE exposure has emerged in recent years.

Authors: Chen T, Yu D, Yang L, Sui S, Lv S, Bai Y, Sun W, Wang Y, Chen L, Sun Z, Tian L, Wang D, Niu P, Shi Z.

Full Source: Environment International. 2019 Oct 15;133(Pt A):105179. doi: 10.1016/j.envint.2019.105179. [Epub ahead of print]

PUBLIC HEALTH RESEARCH

Do stressful life events during pregnancy modify associations between phthalates and anogenital distance in newborns?

2019-11-26

Anogenital distance (AGD) has been used as a marker of foetal androgen action to identify endocrine disrupting chemicals. A US study (TIDES) has reported that the association between some phthalates and reduced AGD in males was only apparent in sons of mothers reporting no stressful life events (SLEs) during pregnancy. The objective of the current study was to examine the potential modifying effect of SLEs and their subjective impact on associations between prenatal phthalates and AGD. First trimester urines from the MIREC Study were analysed for phthalate metabolites and AGD was measured in neonates. Post-delivery, the women answered questions on SLEs during the pregnancy. Women reporting 1 or more SLEs during pregnancy were considered a "higher stressor" group, whereas women reporting no SLEs or who reported a SLE that was perceived as not at all stressful were considered a "lower stressor" group. Multivariable linear regression models were fit stratified by stressor group. Maternal stressor, AGD and phthalates results were available for 153 females and 147 males. A summary measure of androgen-disrupting phthalates (Σ AD) was associated with significantly longer AGDs in females from the higher stressor group. These effect sizes were increased when the perceived impact was restricted to moderately or very much stressful. In males, all phthalates were associated with longer anopenile distance (APD), regardless of stressor group; however, higher Σ AD was associated with significantly longer APD in the lower stressor group. In contrast to the TIDES study, the authors did not observe shorter AGDs in male infants prenatally exposed to di-(2-ethylhexyl) phthalates, regardless of maternal stressor level. In conclusion, we were unable to replicate the findings of the TIDES study, but did find some evidence that prenatal SLEs may modify associations between phthalates and female AGD. Further research with

The objective of the current study was to examine the potential modifying effect of stressful life events and their subjective impact on associations between prenatal phthalates and anogenital distance.

other populations and measures of prenatal stress may shed more light on whether prenatal stress is an important effect modifier of associations between phthalates (or other chemicals) and anogenital distance.

Authors: Arbuckle TE, MacPherson S, Barrett E, Muckle G, Séguin JR, Foster WG, Sathyanarayana S, Dodds L, Fisher M, Agarwal A, Monnier P, Walker M, Fraser WD.

Full Source: Environmental Research. 2019 Jul 19; 177:108593. doi: 10.1016/j.envres.2019.108593. [Epub ahead of print]

Associations between Indoor Air Pollution and Acute Respiratory Infections among Under-Five Children in Afghanistan: Do SES and Sex Matter?

2019-11-26

Low-income families often depend on fuels such as wood, coal, and animal dung for cooking. Such solid fuels are highly polluting and are a primary source of indoor air pollutants (IAP). In this study, the authors examined the association between solid fuel use (SFU) and acute respiratory infection (ARI) among under-five children in Afghanistan and the extent to which this association varies by socioeconomic status (SES) and gender. This is a cross-sectional study based on de-identified data from Afghanistan's first standard Demographic and Health Survey (DHS) conducted in 2015. The sample consists of ever-married mothers with under-five children in the household ($n = 27,565$). The authors used mixed-effect Poisson regression models with robust error variance accounting for clustering to examine the associations between SFU and ARI among under-five children after adjusting for potential confounders. We also investigated potential effect modification by SES and sex. Additional analyses were conducted using an augmented measure of the exposure to IAP accounting for both SFU and the location of cooking/kitchen (High Exposure, Moderate, and No Exposure). Around 70.2% of households reported SFU, whereas the prevalence of ARI was 17.6%. The prevalence of ARI was higher in children living in households with SFU compared to children living in households with no SFU (adjusted prevalence ratio (aPR) = 1.10; 95% CI: (0.98, 1.23)). We did not observe any effect modification by SES or child sex. When using the augmented measure of exposure incorporating the kitchen's location, children highly exposed to IAP had a higher prevalence of ARI compared to unexposed children (aPR = 1.17; 95% CI: (1.03, 1.32)). SES modified this association with the strongest associations observed among children from the middle wealth quintile. The findings have significant policy implications and suggest that ARI risk

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Technical

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in children may be reduced by ensuring there are clean cookstoves as well as clean fuels and acting on the socio-environmental pathways.

Authors: Rana J, Uddin J, Peltier R, Oulhote Y.

Full Source: International Journal of Environmental Research & Public Health. 2019 Aug 14;16(16). pii: E2910. doi: 10.3390/ijerph16162910.

Residential sources of pesticide exposure during pregnancy and the risks of hypospadias and cryptorchidism: the French ELFE birth cohort.

2019-11-26

Prenatal occupational exposure to pesticides has been associated with male reproductive tract abnormalities. Little is known about the possible impact of non-occupational pesticide exposure on foetal and child development in the general population. Using data from a nationwide birth cohort, the authors aimed to assess the association between residential sources of prenatal pesticide exposure and the risks of hypospadias and cryptorchidism. Of the 9281 boys in ELFE (French Longitudinal Study of Children), the national French birth cohort, 53 were diagnosed with hypospadias and 137 with cryptorchidism. Residential exposure sources were assessed from self-reported domestic use of eight types of pesticide products and French spatial land use data with acreage within a 1000 m radius around each family's home for 21 crop types. Logistic regression modelling was used, adjusted for possible confounders that included estimated dietary pesticide intake. Multiple imputations were used to handle missing data. An increased risk of hypospadias was associated with domestic pesticide use against fleas and ticks (OR=2.28, 95% CI 1.09 to 4.75); no associations were found between cryptorchidism and any domestic pesticide use. Slightly increased risks of cryptorchidism were observed in association with all crop acreages near homes during pregnancy, especially for orchards, and no association was observed for hypospadias. The results suggest a possible increased risk of hypospadias associated with prenatal use of some domestic pesticide products, likely to contain insecticides, and of cryptorchidism with nearby orchard acreage (crops repeatedly sprayed with pesticides). This work is limited by its modest number of cases.

Authors: Cognez N, Warembourg C, Zaros C, Metten MA, Bouvier G, Garlantézec R, Charles MA, Béranger R, Chevrier C.

Full Source: Occupational & Environmental Medicine. 2019 Sep;76(9):672-679. doi: 10.1136/oemed-2019-105801.

Using data from a nationwide birth cohort, the authors aimed to assess the association between residential sources of prenatal pesticide exposure and the risks of hypospadias and cryptorchidism.

Isopropylated and tert-butylated triarylphosphate isomers in house dust from South China and Midwestern United States

2019-11-26

In the present study, the authors determined the concentrations and compositions of a suite of isopropylated and tert-butylated triarylphosphate ester (ITP and TBPP) isomers in house dust from the city of Guangzhou located in South China and the city of Carbondale in Midwestern United States. These two groups of organophosphate esters (OPE) are structurally analogous to triphenyl phosphate (TPHP), but have rarely been investigated for environmental occurrences and human exposure risks. The majority of target ITP and TBPP isomers were 100% detected in house dust from the two locations. Median concentrations of Σ ITPs (including all ITP isomers) and Σ TBPPs (including all TBPP isomers) were 63.4 ng/g (range: 16.0-500 ng/g) and 35.4 ng/g (8.1-198 ng/g) in South China house dust, respectively, compared with 476 ng/g (140-1610 ng/g) for Σ ITPs and 81.3 ng/g (35.2-800 ng/g) for Σ TBPPs in Midwestern U.S. dust. The profiles of ITP or TBPP isomers were similar between the two locations and were dominated by 2-isopropylphenyl diphenyl phosphate (2IPDP) and 4-tert-butylphenyl diphenyl phosphate (4tBPDPP), respectively. Although the levels of Σ ITPs and Σ TBPPs were generally one order of magnitude lower than those of TPHP in the same dust samples, the broad occurrences of most of these isomers in house dust from the two locations likely suggest their wide applications in household consumer products. Estimated intakes of Σ ITPs and Σ TBPPs via dust ingestion were generally three orders of magnitude lower than the reference dose proposed for TPHP. However, these emerging OPE chemicals merit continuous environmental surveillance, given their possible applications as specific commercial mixtures or as components/impurities in other flame retardant/plasticiser mixtures.

Authors: Guan Q, Tan H, Yang L, Liu X, Fiedler H, Li X, Chen D.

Full Source: Science of the Total Environment. 2019 Oct 10; 686:1113-1119.

doi: 10.1016/j.scitotenv.2019.06.055. Epub 2019 Jun 5.

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