

Bulletin Board

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CHEMICAL EFFECTS

Toxicity of the emerging pollutants propylparaben and dichloropropylparaben to terrestrial plants

2024-07-08

Propylparaben (PrP) and dichloropropylparaben (diClPrP) are found in soil worldwide, mainly due to the incorporation of urban sludge in crop soils and the use of non-raw wastewater for irrigation. Studies on the adverse effects of PrP on plants are incipient and not found for diClPrP. PrP and diClPrP were evaluated at concentrations 4, 40, and 400 µg/L for their phytotoxic potential to seeds of *Allium cepa* (onion), *Cucumis sativus* (cucumber), *Lycopersicon esculentum* (tomato), and *Lactuca sativa* (lettuce), and cytotoxic, genotoxic potential, and for generating oxygen-reactive substances in root meristems of *A. cepa* bulbs. PrP and diClPrP caused a significant reduction in seed root elongation in all four species. In *A. cepa* bulb roots, PrP and diClPrP resulted in a high prophase index; in addition, PrP at 400 µg/L and diClPrP at the three concentrations significantly decreased cell proliferation and caused alterations in a significant number of cells. Furthermore, diClPrP concentrations induced the development of hooked roots in onion bulbs. The two chemical compounds caused significant changes in the modulation of catalase, ascorbate peroxidase, and guaiacol peroxidase, disarming the root meristems against hydroxyl radicals and superoxides. Therefore, PrP and diClPrP were phytotoxic and cytogenotoxic to the species tested, proving dangerous to plants.

Authors: Caio Okon, Mylena Bathke Rocha, Lizandra de Souza Ratuchinski, Diego Espirito Santo, Charla Chaionara Schults Duarte, Lidiane de Lima Feitoza, Osvaldo Valarini Junior, Paulo Michel Pinheiro Ferreira, Edson Araújo de Almeida, Maria Cristina Oliveira Halmemam, Danielle Cristina Dade SilvaOliveira, Regiane da Silva Gonzalez, Débora Cristina de Souza, Ana Paula Peron

Full Source: Environmental science and pollution research international 2024 Jul 8. doi: 10.1007/s11356-024-34178-w.

Visible intruders: Tracing (micro-) plastic in organic fertilizers

2024-07-04

Agricultural soils have been identified as potential reservoirs for plastic pollution, with adverse effects on soil properties. Primary sources of plastic input in agricultural landscapes are associated with the application of

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sewage sludge or compost. Understanding the sources and anticipated plastic content is crucial in mitigating plastic pollution in agricultural fields. This study presents one of the first investigations into the plastic content and other impurities, e.g. glass, of seven organic fertilizers (biowaste compost, digested pig slurry, sewage sludge compost, dry chicken manure, green waste compost, sewage sludge, and a mixed digestate comprising pig slurry, chicken manure, and 74 % renewable raw materials). Potentially visible foreign substances were assessed on the surface of each fertilizer pile. No impurities could be detected in digested pig slurry, chicken manure, and mixed digestate. For the remaining fertilizers, visible potential foreign substances were collected, cleaned, visually described, weighed, photographed, size measured, and chemically characterized using ATR-FTIR. The quantification revealed that plastic particles are the most abundant and are contained in all other fertilizers, in contrast to glass and metal. An increasing trend in plastic particle number per m²: green waste < biowaste < sewage sludge compost < sewage sludge, which is about 4 times greater in sewage sludge than in green waste compost, could be observed. However, sewage sludge compost has the largest plastic mass and surface area per square meter. This illustrates that sewage sludge compost application can be a significant entry pathway for visual plastics into agricultural soils.

Authors: Daniela Thomas, Elke Bloem

Full Source: The Science of the total environment 2024 Jul 4:174311. doi: 10.1016/j.scitotenv.2024.174311.

ENVIRONMENTAL RESEARCH

Associations of ambient air pollution exposure and lifestyle factors with incident dementia in the elderly: A prospective study in the UK Biobank

2024-07-04

Objective: Dementia is an important disease burden among the elderly, and its occurrence may be profoundly affected by environmental factors. Evidence of the relationship between air pollution and dementia is emerging, but the extent to which this can be offset by lifestyle factors remains ambiguous.

Methods: This study comprised 155,828 elder adults aged 60 years and above in the UK Biobank who were dementia-free at baseline. Cox proportional hazard models were conducted to examine the associations of annual average levels of air pollutants in 2010, including nitrogen

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dioxide (NO₂), nitrogen oxides (NO_x), particulate matter (PM_{2.5}, PM₁₀, and PM_{coarse}) and lifestyle factors recorded at baseline [physical activity (PA), sleep patterns, or smoking status] with incident risk of dementia, and their interactions on both multiplicative and additive scales.

Results: During a 12-year period of follow-up, 4,389 incidents of all-cause dementia were identified. For each standard deviation increase in ambient NO₂, NO_x or PM_{2.5}, all-cause dementia risk increases by 1.07-fold [hazard ratio (HR) and 95 % confidence interval (CI) = 1.07 (1.04, 1.10)], 1.05-fold (95 % CI: 1.02, 1.08) and 1.07-fold (95 % CI: 1.04, 1.10), whereas low levels of PA, poor sleep patterns, and smoking are associated with an elevated risk of dementia [HR (95 % CI) = 1.17 (1.09, 1.26), 1.13 (1.00, 1.27), and 1.14 (1.07, 1.21), respectively]. Furthermore, these air pollutants show joint effects with low PA, poor sleep patterns, and smoking on the onset of dementia. The moderate to high levels of PA could significantly or marginally significantly modify the associations between NO₂, NO_x or PM_{2.5} (P-int = 0.067, 0.036, and 0.067, respectively) and Alzheimer's disease (AD), but no significant modification effects are found for sleep patterns or smoking status.

Conclusion: The increased exposures of NO₂, NO_x, or PM_{2.5} are associated with elevated risk of dementia among elderly UK Biobank population. These air pollutants take joint effects with low PA, poor sleep patterns, and smoking on the development of dementia. In addition, moderate to high levels of PA could attenuate the incident risk of AD caused by air pollution. Further prospective researches among other cohort populations are warranted to validate these findings.

Authors: Yichi Zhang, Ye Fu, Xin Guan, Chenming Wang, Ming Fu, Yang Xiao, Shiru Hong, Yuhan Zhou, Chenliang Liu, Guorong Zhong, Tianhao Wu, Yingqian You, Hui Zhao, Shengli Chen, Yuxi Wang, Huan Guo
Full Source: Environment international 2024 Jul 4:190:108870. doi: 10.1016/j.envint.2024.108870.

Prenatal exposure to environmental phenols and phthalates and altered patterns of DNA methylation in childhood

2024-06-30

Introduction: Epigenetic marks are key biomarkers linking the prenatal environment to health and development. However, DNA methylation associations and persistence of marks for prenatal exposure to multiple Endocrine Disrupting Chemicals (EDCs) in human populations have not been examined in great detail.

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Methods: We measured Bisphenol-A (BPA), triclosan, benzophenone-3 (BP3), methyl-paraben, propyl-paraben, and butyl-paraben, as well as 11 phthalate metabolites, in two pregnancy urine samples, at approximately 13 and 26 weeks of gestation in participants of the Center for the Health Assessment of Mothers and Children of Salinas (CHAMACOS) study (N = 309). DNA methylation of cord blood at birth and child peripheral blood at ages 9 and 14 years was measured with 450K and EPIC arrays. Robust linear regression was used to identify differentially methylated probes (DMPs), and comb-p was used to identify differentially methylated regions (DMRs) in association with pregnancy-averaged EDC concentrations. Quantile g-computation was used to assess associations of the whole phenol/phthalate mixture with DMPs and DMRs.

Results: Prenatal BPA exposure was associated with 1 CpG among males and Parabens were associated with 10 CpGs among females at Bonferroni-level significance in cord blood. Other suggestive DMPs (unadjusted p-value < 1 × 10⁻⁶) and several DMRs associated with the individual phenols and whole mixture were also identified. A total of 10 CpG sites at least suggestively associated with BPA, Triclosan, BP3, Parabens, and the whole mixture in cord blood were found to persist into adolescence in peripheral blood.

Conclusions: We found sex-specific associations between prenatal phenol exposure and DNA methylation, particularly with BPA in males and Parabens in females. Additionally, we found several DMPs that maintained significant associations with prenatal EDC exposures at age 9 and age 14 years.

Authors: Dennis Khodasevich, Nina Holland, Kim G Harley, Brenda Eskenazi, Lisa F Barcellos, Andres Cardenas

Full Source: Environment international 2024 Jun 30:190:108862. doi: 10.1016/j.envint.2024.108862.

Exposure to source-specific air pollution in residential areas and its association with dementia incidence: a cohort study in Northern Sweden

2024-07-05

The aim of this study was to investigate the relationship between source-specific ambient particulate air pollution concentrations and the incidence of dementia. The study encompassed 70,057 participants from the Västerbotten intervention program cohort in Northern Sweden with a median age of 40 years at baseline. High-resolution dispersion models were employed to estimate source-specific particulate matter (PM) concentrations, such as PM₁₀ and PM_{2.5} from traffic, exhaust, and biomass

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(mainly wood) burning, at the residential addresses of each participant. Cox regression models, adjusted for potential confounding factors, were used for the assessment. Over 884,847 person-years of follow-up, 409 incident dementia cases, identified through national registers, were observed. The study population's average exposure to annual mean total PM10 and PM2.5 lag 1-5 years was 9.50 $\mu\text{g}/\text{m}^3$ and 5.61 $\mu\text{g}/\text{m}^3$, respectively. Increased risks were identified for PM10-Traffic (35% [95% CI 0-82%]) and PM2.5-Exhaust (33% [95% CI -2 to 79%]) in the second exposure tertile for lag 1-5 years, although no such risks were observed in the third tertile. Interestingly, a negative association was observed between PM2.5-Wood burning and the risk of dementia. In summary, this register-based study did not conclusively establish a strong association between air pollution exposure and the incidence of dementia. While some evidence indicated elevated risks for PM10-Traffic and PM2.5-Exhaust, and conversely, a negative association for PM2.5-Wood burning, no clear exposure-response relationships were evident.

Authors: Anna Oudin, Wasif Raza, Erin Flanagan, David Segersson, Pasi Jalava, Katja M Kanninen, Topi Rönkkö, Rosalba Giugno, Thomas Sandström, Ala Muala, Jan Topinka, Johan Sommar

Full Source: Scientific reports 2024 Jul 5;14(1):15521. doi: 10.1038/s41598-024-66166-y.

PHARMACEUTICAL/TOXICOLOGY

Polygenic inheritance and its interplay with smoking history in predicting lung cancer diagnosis: a French-Canadian case-control cohort

2024-07-05

Background: The most near-term clinical application of genome-wide association studies in lung cancer is a polygenic risk score (PRS).

Methods: A case-control dataset was generated consisting of 4002 lung cancer cases from the LORD project and 20,010 ethnically matched controls from CARTaGENE. A genome-wide PRS including >1.1 million genetic variants was derived and validated in UK Biobank (n = 5419 lung cancer cases). The predictive ability and diagnostic discrimination performance of the PRS was tested in LORD/CARTaGENE and benchmarked against previous PRSs from the literature. Stratified analyses were performed by smoking status and genetic risk groups defined as low (<20th percentile), intermediate (20-80th percentile) and high (>80th percentile) PRS.

Background: The most near-term clinical application of genome-wide association studies in lung cancer is a polygenic risk score (PRS).

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Findings: The phenotypic variance explained and the effect size of the genome-wide PRS numerically outperformed previous PRSs. Individuals with high genetic risk had a 2-fold odds of lung cancer compared to low genetic risk. The PRS was an independent predictor of lung cancer beyond conventional clinical risk factors, but its diagnostic discrimination performance was incremental in an integrated risk model. Smoking increased the odds of lung cancer by 7.7-fold in low genetic risk and by 11.3-fold in high genetic risk. Smoking with high genetic risk was associated with a 17-fold increase in the odds of lung cancer compared to individuals who never smoked and with low genetic risk.

Interpretation: Individuals at low genetic risk are not protected against the smoking-related risk of lung cancer. The joint multiplicative effect of PRS and smoking increases the odds of lung cancer by nearly 20-fold.

Funding: This work was supported by the CQDM and the IUCPQ Foundation owing to a generous donation from Mr. Normand Lord.

Authors: Véronique Boumtje, Hasanga D Manikpurage, Zhonglin Li, Nathalie Gaudreault, Victoria Saavedra Armero, Dominique K Boudreau, Sébastien Renaut, Cyndi Henry, Christine Racine, Aida Eslami, Stéphanie Bougeard, Evelyne Vigneau, Mathieu Morissette, Benoit J Arsenault, Catherine Labbé, Anne-Sophie Laliberté, Simon Martel, François Maltais, Christian Couture, Patrice Desmeules, Patrick Mathieu, Sébastien Thériault, Philippe Joubert, Yohan Bossé

Full Source: EBioMedicine 2024 Jul 5;106:105234. doi: 10.1016/j.ebiom.2024.105234.

PFDA promotes cancer metastasis through macrophage M2 polarization mediated by Wnt/ β -catenin signaling

2024-07-03

Perfluoroundecanoic acid (PFDA) is extensively utilized in the textile and food processing industries and may have a tumor-promoting effect by modulating the tumor microenvironment. Macrophages play crucial roles in tumor microenvironment as key regulators of tumor immunity. However, further investigation is needed to elucidate how PFDA interacts with macrophages and contributes to tumor progression. In this study, we treated the macrophage cell line RAW264.7 with various concentrations of PFDA and found that RAW264.7 transitioned into an M2 tumor-promoting phenotype. Through bioinformatic analysis and subsequent verification of molecular assays, we uncovered that PFDA could activate β -catenin and enhance its nuclear translocation. Additionally, it was also observed that inhibiting β -catenin nuclear translocation partly attenuated RAW264.7 M2 polarization induced by PFDA. The conditioned medium derived from

Perfluoroundecanoic acid (PFDA) is extensively utilized in the textile and food processing industries and may have a tumor-promoting effect by modulating the tumor microenvironment.

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PFDA-pretreated RAW264.7 cells significantly promoted the migration and invasion abilities of human ovarian cancer cells. Furthermore, in vivo studies corroborated that PFDA-pretreated RAW264.7 could promote tumor metastasis, which could be mitigated by pretreatment with the β -catenin inhibitor ICG001. In conclusion, our study demonstrated that PFDA could promote cancer metastasis through regulating macrophage M2 polarization in a Wnt/ β -catenin-dependent manner.

Authors: Zhenyan Cui, Zekun Liu, Xiaoyu Yuan, Kean Lu, Mengyao Li, Sinan Xu, Kelie Chen, Fang Zheng, Ying Li, Paul Héroux, Yihua Wu, Dajing Xia
Full Source: Chemosphere 2024 Jul 3:362:142758. doi: 10.1016/j.chemosphere.2024.142758.

OCCUPATIONAL

Exposure to golimumab during pregnancy: Results from the Company's global safety database

2024-08

Data on the use of golimumab (GLM) during pregnancy are limited. This study evaluated pregnancy outcomes in women treated with GLM during pregnancy. Cumulative data on GLM-exposed pregnancies from the Company's global safety database (GSD) are summarized. Cases were medically confirmed maternal exposures to GLM during pregnancy or within 3 months prior to conception with a reported pregnancy outcome. Pregnancy outcomes (e.g., live births) and congenital anomalies in prospectively reported cases (i.e., pregnancy outcome not known when first reported to the company) are presented in a descriptive manner. As of May 31, 2022, 261 prospectively reported pregnancies exposed to GLM were reported in the GSD: 214 (82.0%) live births (including six sets of twins), 31 (11.9%) spontaneous abortions (including one set of twins), 13 (5.0%) induced/elective abortions, 2 (0.8%) reported intrauterine death/still birth, and 1 (0.4%) fetal adverse event in an ongoing pregnancy. The majority of pregnancies had exposure to GLM at least in the first trimester of pregnancy. In total, seven congenital anomalies (7/261; 2.7%) were reported. Of these seven congenital anomalies, five were considered major according to EUROCAT classification version 1.4. Among the five prospectively reported congenital anomalies noted in live births (5/214; 2.3%), four were classified as major (4/214; 1.8%). The rates of adverse pregnancy outcomes and major congenital anomalies in prospectively reported pregnancy cases with exposure to GLM in the Company's

Data on the use of golimumab (GLM) during pregnancy are limited.

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GSD were consistent with published background rates for the general population.

Authors: Marijo Otero-Lobato, Adesoji Adeyemo, Michelle Higley, Kathleen G Lomax, Anja Geldhof, Suzan Esslinger

Full Source: Pharmacology research & perspectives 2024 Aug;12(4):e1240. doi: 10.1002/prp2.1240.

Associations between long-term ambient PM2.5 exposure and the incidence of cardiopulmonary diseases and diabetes, attributable years lived with disability, and policy implication

2024-07-05

Long-term exposure to ambient PM2.5 is known associated with cardiovascular and respiratory health effects. However, the heterogeneous concentration-response function (CRF) between PM2.5 exposure across different concentration range and cardiopulmonary disease and diabetes mellitus (DM) incidence, and their implications on attributable years lived with disability (YLD) and regulation policy has not been well-studied. In this retrospective longitudinal cohort study, disease-free participants (approximately 170,000 individuals, aged ≥ 30 years) from the MJ Health Database were followed up (2007-2017) regarding incidents of coronary heart disease (CHD), ischemic stroke, chronic obstructive pulmonary disease (COPD), lower respiratory tract infections (LRIs), and DM. We used a time-dependent nonlinear weight-transformation Cox regression model for the CRF with an address-matched 3-year mean PM2.5 exposure estimate. Town/district-specific PM2.5-attributable YLD were calculated by multiplying the disease incidence rate, population attributable fraction, disability weight, and sex-age group specific subpopulation for each disease separately. The estimated CRFs for cardiopulmonary diseases were heterogeneously with the hazard ratios (HRs) increased rapidly for CHD and ischemic stroke at PM2.5 concentration lower than $10 \mu\text{g}/\text{m}^3$, whereas the HRs for DM (LRIs) increased with PM2.5 higher than $15 (20) \mu\text{g}/\text{m}^3$. Women had higher HRs for ischemic stroke and DM but not CHD. Relative to the lowest observed PM2.5 concentration of $6 \mu\text{g}/\text{m}^3$ of the study population, the PM2.5 level with an extra risk of 0.1 % (comparable to the disease incidence) for CHD, ischemic stroke, DM, and LRIs were 8.59, 11.85, 22.09, and $24.23 \mu\text{g}/\text{m}^3$, respectively. The associated attributable YLD decreased by 51.4 % with LRIs reduced most (83.6 %), followed by DM (63.7 %) as a result of PM2.5 concentration reduction from 26.10 to $16.82 \mu\text{g}/\text{m}^3$ during 2011-2019 in Taiwan. The proportion of YLD due to CHD and ischemic stroke remained dominant (56.4 %-69.9 %). The cost-

Long-term exposure to ambient PM2.5 is known associated with cardiovascular and respiratory health effects.

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benefit analysis for the tradeoff between avoidable YLD and mitigation cost suggested an optimal PM_{2.5} exposure level at 12 µg/m³. CRFs for cardiopulmonary diseases, attributable YLD, and regulation level, may vary depending on the national/regional background and spatial distribution of PM_{2.5} concentrations, as well as demographic characteristics.

Authors: Chu-Chih Chen, Yin-Ru Wang, Jih-Shin Liu, Hsing-Yi Chang, Pau-Chung Chen

Full Source: Ecotoxicology and environmental safety 2024 Jul 5:282:116688. doi: 10.1016/j.ecoenv.2024.116688.

Hematological and neurological impact studies on the exposure to naturally occurring radioactive materials

2024-07-03

Naturally Occurring Radioactive Materials (NORM) contribute to everyone's natural background radiation dose. The technologically advanced activities of the gas and oil sectors produce considerable amounts of radioactive materials as industrial by-products or waste products. The goal of the current study is to estimate the danger of long-term liability to Technologically Enhanced Naturally Occurring Radioactive Materials (TE-NORM) on blood indices, neurotransmitters, oxidative stress markers, and β-amyloid in the cerebral cortex of rats' brains. Twenty adult male albino rats were divided into two equal groups (n = 10): control and irradiated. Irradiated rats were exposed to a total dose of 0.016 Gy of TE-NORM as a whole-body chronic exposure over a period of two months. It should be "The results showed no significant changes in RBC count, Hb concentration, hematocrit percentage (HCT%), and Mean Corpuscular Hemoglobin Concentration (MCHC). However, there was a significant increase in the Mean Corpuscular Volume of RBCs (MCV) and a significant decrease in cell distribution width (RDW%) compared to the control. Alteration in neurotransmitters is noticeable by a significant increase in glutamic acid and significant decreases in serotonin and dopamine. Increased lipid peroxidation, decreased glutathione content, superoxide dismutase, catalase, and glutathione peroxidase activities indicating oxidative stress were accompanied by increased β-amyloid in the cerebral cortex of rats' brains. The findings of the present study showed that chronic radiation liability has some harmful effects, that may predict the risks of future health problems in occupational radiation exposure in the

Naturally Occurring Radioactive Materials (NORM) contribute to everyone's natural background radiation dose.

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oil industries. Therefore, the control of exposure and application of sample dosimetry is recommended for health and safety.

Authors: Mohamed H El-Banna, Mahmoud H Abdelgawad, Noaman Eltahawy, Fatma R Algeda, Tamer M Elsayed

Full Source: Applied radiation and isotopes : including data, instrumentation and methods for use in agriculture, industry and medicine 2024 Jul 3:211:111424. doi: 10.1016/j.apradiso.2024.111424.