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CHEMICAL EFFECTS

Adverse Impact of Environmental Chemicals on Developmental Origins of Kidney Disease and Hypertension

2021-10-14

Chronic kidney disease (CKD) and hypertension are becoming a global health challenge, despite developments in pharmacotherapy. Both diseases can begin in early life by so-called "developmental origins of health and disease" (DOHaD). Environmental chemical exposure during pregnancy can affect kidney development, resulting in renal programming. Here, we focus on environmental chemicals that pregnant mothers are likely to be exposed, including dioxins, bisphenol A (BPA), phthalates, per- and polyfluoroalkyl substances (PFAS), polycyclic aromatic hydrocarbons (PAH), heavy metals, and air pollution. We summarize current human evidence and animal models that supports the link between prenatal exposure to environmental chemicals and developmental origins of kidney disease and hypertension, with an emphasis on common mechanisms. These include oxidative stress, renin-angiotensin system, reduced nephron numbers, and aryl hydrocarbon receptor signaling pathway. Urgent action is required to identify toxic chemicals in the environment, avoid harmful chemicals exposure during pregnancy and lactation, and continue to discover other potentially harmful chemicals. Innovation is also needed to identify kidney disease and hypertension in the earliest stage, as well as translating effective reprogramming interventions from animal studies into clinical practice. Toward DOHaD approach, prohibiting toxic chemical exposure and better understanding of underlying mechanisms, we have the potential to reduce global burden of kidney disease and hypertension.

Authors: Chien-Ning Hsu, You-Lin Tain

Full Source: *Frontiers in endocrinology* 2021 Oct 14;12:745716. doi: 10.3389/fendo.2021.745716.

Summary of 17 chemicals evaluated by OECD TG229 using Japanese Medaka, *Oryzias latipes* in EXTEND 2016

2021-11-02

In June 2016, the Ministry of the Environment of Japan announced a program "EXTEND2016" on the implementation of testing and assessment for endocrine active chemicals, consisting of a two-tiered strategy. The aim of the Tier 1 screening and the Tier 2 testing is to identify the impacts on the endocrine system and to characterize the adverse effects

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to aquatic animals by endocrine disrupting chemicals detected in the aquatic environment in Japan. For the consistent assessment of the effects on reproduction associated with estrogenic, anti-estrogenic, androgenic, and/or anti-androgenic activities of chemicals throughout Tier 1 screening to Tier 2 testing, a unified test species, Japanese medaka (*Oryzias latipes*), has been used. For Tier 1 screening, the in vivo Fish Short-Term Reproduction Assay (OECD test guideline No. 229) was conducted for 17 chemicals that were nominated based on the results of environmental monitoring, existing knowledge obtained from a literature survey, and positive results in reporter gene assays using the estrogen receptor of Japanese medaka. In the 17 assays using Japanese medaka, adverse effects on reproduction (i.e., reduction in fecundity and/or fertility) were suggested for 10 chemicals, and a significant increase of hepatic vitellogenin in males, indicating estrogenic (estrogen receptor agonistic) potency, was found for eight chemicals at the concentrations in which no overt toxicity was observed. Based on these results, and the frequency and the concentrations detected in the Japanese environment, estrone, 4-nonylphenol (branched isomers), 4-tert-octylphenol, triphenyl phosphate, and bisphenol A were considered as high priority candidate substances for the Tier 2 testing.

Authors: Yukio Kawashima, Yuta Onishi, Norihisa Tatarazako, Hiroataka Yamamoto, Masaaki Koshio, Tomohiro Oka, Yoshifumi Horie, Haruna Watanabe, Takashi Nakamoto, Jun Yamamoto, Hidenori Ishikawa, Tomomi Sato, Kunihiko Yamazaki, Taisen Iguchi

Full Source: *Journal of applied toxicology* : JAT 2021 Nov 2. doi: 10.1002/jat.4255.

Effectiveness of UV/SO₃²⁻ advanced reduction process for degradation and mineralization of trichlorfon pesticide in water: identification of intermediates and toxicity assessment

2021-11-04

This study aimed to investigate the degradability, mineralization, proposed decomposition pathway, intermediate products, and toxicity of effluent from trichlorfon (TCF) degradation in water by UV/sulfite-advanced reduction process (UV/S-ARP). This study was experimentally performed in a photochemical reactor as a batch operation. The source of light was a UV lamp. Sulfite ion was used as the reducing agent. After the treatment, the residual concentration of TCF was measured by liquid chromatography equipped with tandem mass spectrometry (LC-MS/MS). UV/S-ARP had the highest performance at an initial pH of 7, a sulfite ion concentration

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of 120 mg/L, a contact time of 60 min, and a TCF concentration of 10 mg/L. Under such conditions, the degradation efficiency of TCF was 96.0%, and the amount of mineralization based on the removal of TOC and COD was 74.6% and 79.5%, respectively. The results of the degradation mechanism showed that eaq^- and SO_3^- have played the greatest role in dechlorination and transformation of TCF. Based on the identified intermediates, more complex compounds are transformed into compounds with simpler structures by UV/S-ARP. Evaluating the toxicity of TCF by-products via ECOSAR bioassay showed that as-generated intermediates do not have acute and chronic adverse effects on fish. The results of our study indicated that the advanced reduction process could be an effective process for the purification of TCF-contaminated water.

Authors: Bahareh Jafari, Hatam Godini, Reza Darvishi Cheshmeh Soltani, Enayatollah Seydi

Full Source: Environmental science and pollution research international 2021 Nov 4. doi: 10.1007/s11356-021-17274-z.

ENVIRONMENTAL RESEARCH

Preventing Parkinson's Disease: An Environmental Agenda

2021-10-26

Fueled by aging populations and continued environmental contamination, the global burden of Parkinson's disease (PD) is increasing. The disease, or more appropriately diseases, have multiple environmental and genetic influences but no approved disease modifying therapy. Additionally, efforts to prevent this debilitating disease have been limited. As numerous environmental contaminants (e.g., pesticides, metals, industrial chemicals) are implicated in PD, disease prevention is possible. To reduce the burden of PD, we have compiled preclinical and clinical research priorities that highlight both disease prediction and primary prevention. Though not exhaustive, the "PD prevention agenda" builds upon many years of research by our colleagues and proposes next steps through the lens of modifiable risk factors. The agenda identifies ten specific areas of further inquiry and considers the funding and policy changes that will be necessary to help prevent the world's fastest growing brain disease.

Authors: Briana R De Miranda, Samuel M Goldman, Gary W Miller, J Timothy Greenamyre, E Ray Dorsey

Full Source: Journal of Parkinson's disease 2021 Oct 26. doi: 10.3233/JPD-212922.

Fueled by aging populations and continued environmental contamination, the global burden of Parkinson's disease (PD) is increasing.

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Accumulation of chemical elements and occurrence of microplastics in small pelagic fish from a neritic environment

2021-11-02

The assessment of contaminant exposure in marine organisms often focuses on the most toxic chemical elements from upper trophic level species. Information on mid-trophic level species and particularly on potentially less harmful elements is lacking. Additionally, microplastics have been considered emergent contaminants in aquatic environments which have not been extensively studied in species from mid-trophic levels in food chains. This study aims to contribute to an overall assessment of environmental impacts of such chemicals in a community of small pelagic fish in the North Atlantic. The concentrations of 16 chemical elements, rarely simultaneously quantified (including minerals, trace elements and heavy metals), and the presence of microplastics were analysed in sardines (*Sardina pilchardus*) and mackerels (*Scomber* spp. and *Trachurus trachurus*) sampled along the Portuguese coast. Biochemical stress assessments and stable isotope analyses were also performed. The chemical element concentrations in *S. pilchardus*, *T. trachurus*, and *Scomber* spp. were relatively low and lower than the levels reported for the same species in the North Atlantic and adjacent areas. No clear relationships were found between chemical elements and oxidative damage in fish. However, the concentration of several chemical elements showed differences among species, being related with the species' habitat use, trophic niches, and specific feeding strategies. The presence of plastic pieces in the stomachs of 29% of the sampled fishes is particularly concerning, as these small pelagic fish from mid-trophic levels compose a significant part of the diet of humans and other top predators. This study highlights the importance of multidisciplinary approaches focusing on the individual, including position data, stable isotopes, and oxidative stress biomarkers as complementary tools in contamination assessment of the marine mid-trophic levels in food chains.

Authors: Joana M da Silva, Luís M F Alves, Maria I Laranjeiro, Filipa Bessa, Andreia V Silva, Ana C Norte, Marco F L Lemos, Jaime A Ramos, Sara C Novais, Filipe R Ceia

Full Source: Environmental pollution (Barking, Essex : 1987) 2021 Nov 2;292(Pt B):118451. doi: 10.1016/j.envpol.2021.118451.

The assessment of contaminant exposure in marine organisms often focuses on the most toxic chemical elements from upper trophic level species.

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Monitoring of emerging contaminants of concern in the aquatic environment: a review of studies showing the application of effect-based measures

2021-11-02

Water scarcity is increasingly a global cause of concern mainly due to widespread changes in climate conditions and increased consumptive water use driven by the exponential increase in population growth. In addition, increased pollution of fresh water sources due to rising production and consumption of pharmaceuticals and organic chemicals will further exacerbate this concern. Although surface water contamination by individual chemicals is often at very low concentration, pharmaceuticals for instance are designed to be efficacious at low concentrations, creating genuine concern for their presence in freshwater sources. Furthermore, the additive impact of multiple compounds may result in toxic or other biological effects that otherwise will not be induced by individual chemicals. Globally, different legislative frameworks have led to pre-emptive efforts which aim to ensure good water ecological status. Reports detailing the use and types of effect-based measures covering specific bioassay batteries that can identify specific mode of actions of chemical pollutants in the aquatic ecosystem to evaluate the real threat of pollutants to aquatic lives and ultimately human lives have recently emerged from monitoring networks such as the NORMAN network. In this review, we critically evaluate some studies within the last decade that have implemented effect-based monitoring of pharmaceuticals and organic chemicals in aquatic fauna, evaluating the occurrence of different chemical pollutants and the impact of these pollutants on aquatic fauna with special focus on pollutants that are contaminants of emerging concern (CEC) in urban wastewater. A critical discussion on studies that have used effect-based measures to assess biological impact of pharmaceutical/organic compound in the aquatic ecosystem and the endpoints measurements employed is presented. The application of effect-based monitoring of chemicals other than assessment of water quality status is also discussed.

Authors: Azeez Yusuf, Dylan O'Flynn, Blanaid White, Linda Holland, Anne Parle-McDermott, Jenny Lawler, Thomas McCloughlin, Denise Harold, Belinda Huerta, Fiona Regan

Full Source: Analytical methods : advancing methods and applications 2021 Nov 2. doi: 10.1039/d1ay01184g.

Water scarcity is increasingly a global cause of concern mainly due to widespread changes in climate conditions and increased consumptive water use driven by the exponential increase in population growth.

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OCCUPATIONAL

Allergic contact dermatitis to rubber accelerators in protective gloves: Problems, challenges, and solutions for occupational skin protection

2021-10-22

Protective gloves are an elementary component of personal protective equipment in many occupations and are intended to protect the hands from various hazards (e.g., wetness, chemicals, mechanical forces, or thermal stress). This is particularly important when other occupational safety measures (e.g., technical-organizational measures) cannot be implemented or are insufficient. However, it is not uncommon for protective gloves themselves to become a problem, as some of their ingredients (e.g., rubber accelerators) can cause allergic reactions. Accelerators in rubber gloves include thiurams, dithiocarbamates, thiazoles, guanidines, and thioureas. If no alternative means of protection are available, this may even result in abandoning the profession. This article is about rubber accelerators, which are often contained in protective gloves made of different rubber materials (e.g., natural rubber (latex) and nitrile rubber) and may cause delayed-type allergies, as well as related challenges, problems, and solutions for occupational skin protection.

Authors: Andreas Hansen, Richard Brans, Flora Sonsmann

Full Source: Allergologie select 2021 Oct 22;5:335-344. doi: 10.5414/ALX02265E.

[Discussion on noise exposure level measurement and risk assessment of typical posts in coal-fired power plants]

2021-10-20

Objective: To study the group noise exposure level of typical coal-fired power plants and explore the establishment of risk assessment methods for noise exposed posts. Methods: In April 2020, 295 typical workers in 11 coal-fired power plants were selected as the study subjects. The noise exposure dose of typical posts and the proportion of exposure groups under different exposure doses were analyzed, and the risk assessment based on the dose-response relationship was conducted. Results: The exposure level of typical noise posts in coal-fired power plants was (84.24±4.10) dB (A), and the over-standard rate was 44.07% (130/295). The highest noise over-standard rate in main posts were desulfurization inspectors (51.52%), followed by steam turbine inspectors (47.92%) and

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belt inspectors (46.32%) . Taking 30 years as an example, the incidence rate of occupational noise deafness of noise-exposed posts in coal-fired power plants was 12.30%. The position with the highest incidence rate was belt inspector (13.21%) , followed by steam turbine inspector (12.97%) , desulfurization inspectors (12.42%) , boiler inspectors (11.59%) and chemical water inspectors (6.89%) . Conclusion: The risk of noise exposure in coal-fired power plants is relatively high. Comprehensive control measures are recommended to effectively reduce the risk of noise deafness.

Authors: H N Wang, P Li, X J Zhang, Z W Song, D S Niu

Full Source: Zhonghua lao dong wei sheng zhi ye bing za zhi = Zhonghua laodong weisheng zhiyebing zazhi = Chinese journal of industrial hygiene and occupational diseases 2021 Oct 20;39(10):791-793. doi: 10.3760/cma.j.cn121094-20200512-00253.

Association between physical capacity and occupational falls among middle-aged and older farmers in Thailand: Using the self-check risk assessment tool in Japan

2021-01

Objectives: Declining physical capacity caused by aging increases the risk of occupational falls on the same level and to lower levels. In emerging countries in Asia, the development of a program for older farmers to assess their risk of occupational falls is valuable. The current study aimed to evaluate the relationship between physical capacity and experience of occupational falls among middle-aged and older Thai farmers.

Methods: We conducted a cross-sectional survey of 419 Thai farmers aged 40 years and over during March and April, 2021. For the assessment of physical capacity, we used the Self-Check Risk Assessment of Falls and Other Accidents in the Workplace tool developed in Japan, consisting of five physical test components. Multiple logistic regression and receiver operating characteristic curves were used to analyze the data.

Results: The results revealed that 25.5% of participants had experienced occupational falls in the past 12 months. For each of the five physical test components, there was no significant association between physical capacity and experience of occupational falls. The area under the receiver operating characteristic curve was less than 0.60 for each of the five physical test components. A similar trend was observed when the analysis was limited to participants aged 50 years and over.

Conclusions: The current study did not reveal any associations between physical capacity in each test and experience of occupational falls among middle-aged and older Thai farmers. Because the mechanisms underlying

Objectives: Declining physical capacity caused by aging increases the risk of occupational falls on the same level and to lower levels.

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occupational falls are complex, multiple intervention approaches may be important for preventing accidents.

Authors: Sara Arphorn, Teepapipat Lertvarayut, Kanpitcha Kiatkitroj, Chalerm Siri Theppitak, Aniruth Manothum, Kunio Hara, Tomohiro Ishimaru
Full Source: Journal of occupational health 2021 Jan;63(1):e12287. doi: 10.1002/1348-9585.12287.

PHARAMACEUTICAL/TOXICOLOGY

A regulatory relic: After 60 years of research on cancer risk, the Delaney Clause continues to keep us in the past

2021-10-29

The Delaney Clause of the Federal Food, Drug, and Cosmetic Act became law in 1958 because of concerns that potentially harmful chemicals were finding their way into foods and causing cancer. It states, "[n]o additive shall be deemed to be safe if it is found to induce cancer when ingested by man or animal, or if it is found, after tests which are appropriate for the evaluation of the safety of food additives, to induce cancer in man or animal." The United States Food and Drug Administration (US FDA) and United States Environmental Protection Agency (US EPA, prior to implementation of the Food Quality Protection Act) were charged with implementing this clause. Over 60 years, advances in cancer research have elucidated how chemicals induce cancer. Significant advancements in analytical methodologies have allowed for accurate and progressively lower detection limits, resulting in detection of trace amounts. Based on current scientific knowledge, there is a need to revisit the Delaney Clause's utility. The lack of scientific merit to the Delaney Clause was very apparent when recently the US FDA had to revoke the food additive approvals of 6 synthetic flavoring substances because high dose testing in animals demonstrated a carcinogenic response. However, US FDA determined that these 6 synthetic flavoring substances do not pose a risk to public health under the conditions of intended use. The 7th substance, styrene, was delisted because it is no longer used by industry. The scientific community is committed to improving public health by promoting relevant science in risk assessment and regulatory decision making, and this was discussed in scientific sessions at the American Association for the Advancement of Science (AAAS) 2020 Annual Meeting and the Society of Toxicology (SOT) 2019 Annual Meeting. Expert presentations included advances in cancer research since the 1950s; the role of the Delaney Clause in the current regulatory paradigm with a focus on synthetic food additives; and the impact of the clause on scientific advances and regulatory decision

The Delaney Clause of the Federal Food, Drug, and Cosmetic Act became law in 1958 because of concerns that potentially harmful chemicals were finding their way into foods and causing cancer.

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making. The sessions concluded with panel discussions on making the clause more relevant based on 21st-century science.

Authors: Mansi Krishan, Lisa Navarro, Barbara Beck, Ricardo Carvajal, Michael Dourson

Full Source: Toxicology and applied pharmacology 2021 Oct 29;433:115779. doi: 10.1016/j.taap.2021.115779.