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### ENVIRONMENTAL RESEARCH

#### Virucidal effects of common disinfectants against tilapia lake virus.

2019-09-09

Tilapia lake virus (TiLV) is an emerging virus associated with high fish mortality and economic losses. This study investigates the virucidal effects of the following disinfectants (active ingredients) on TiLV: 2.5 ppm iodine, 10 ppm sodium hypochlorite (NaOCl), 300 ppm hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), 80 ppm formalin and 5,000 ppm (0.5%) Virkon®. Factors that affect the disinfectants' efficacy, including temperature, contact time and soiling (organic matter) interference, were examined under conditions mimicking natural aquaculture practices. TiLV inactivation of higher than 5 log<sub>10</sub> TCID<sub>50</sub> ml<sup>-1</sup> was achieved after 10 min and at 28°C for all disinfectants except formalin; similar inactivation levels were reached by NaOCl and Virkon® at 10 min and 4°C. Extended exposure to formalin from 10 to 60 min at 28°C rendered more than 5 log<sub>10</sub> inactivation. Increasing synthetic organic matter in the water to mimic soiling interference reduced the efficacy of NaOCl, iodine and H<sub>2</sub>O<sub>2</sub> when tested at 10 min and 28°C; however, Virkon® still achieved more than 5 log<sub>10</sub> inactivation. This study demonstrates that most common disinfectants effectively reduced viral loads to minimum levels. To limit the spread of TiLV in aquaculture farms and related facilities, the appropriate use of such disinfectants should therefore be promoted and implemented.

Authors: Jaemwimol P, Sirikanchana K, Tattiyapong P, Mongkolsuk S, Surachetpong W.

Full Source: Journal of Fish Diseases. 2019 Jul 19. doi: 10.1111/jfd.13060. [Epub ahead of print]

This study investigates the virucidal effects of the following disinfectants (active ingredients) on TiLV

#### Acute and chronic effects of perfluoroalkyl substance mixtures on larval American bullfrogs (*Rana catesbeiana*)

2019-09-09

Discovery of elevated concentrations of perfluoroalkyl substances (PFAS) in ground and surface waters globally has heightened concern over their potential adverse health effects. The effects of PFAS are known largely from acute toxicity studies of single PFAS compounds in model organisms, while little is understood concerning effects of mixtures on wildlife. To address this gap, the authors examined the acute and chronic effects of two of the most common PFAS (perfluorooctanesulfonic acid [PFOS] and perfluorooctanoic acid [PFOA]) and their mixtures on survival, growth,

and development of American bullfrog (*Rana catesbeiana*) tadpoles. In 96 h acute toxicity tests, PFOS was 10X more toxic than PFOA and effects of the two chemicals in combination appeared additive. The effects of PFOS, PFOA, and their interaction varied by the sublethal endpoint under consideration in a 72 d exposure. Effects of PFAS on tadpole mass and developmental stage were largely driven by PFOS and there was no evidence of interactions suggesting deviations from additivity. However, for snout-vent length, reductions in length in mixture treatments were greater than expected based on the effects of the two chemicals independently (i.e. non-additivity). Further, effects on snout-vent length in single chemical exposures were only observed with PFOA. The results highlight the importance of assessing combined effects of PFAS co-occurring in the environment and suggest caution in extrapolating the effects of acute toxicity studies to more environmentally relevant exposures. Future studies examining effects of environmentally relevant mixtures on wildlife will be essential for effective environmental risk assessment and management.

Authors: Flynn RW, Chislock MF, Gannon ME, Bauer SJ, Tornabene BJ, Hoverman JT, Sepúlveda MS.

Full Source: *Chemosphere*. 2019 Jul 10; 236:124350. doi: 10.1016/j.chemosphere.2019.124350. [Epub ahead of print]

### Methods to Test Endocrine Disruption in *Drosophila melanogaster*

2019-09-09

In recent years there has been growing evidence that all organisms and the environment are exposed to hormone-like chemicals, known as endocrine disruptor chemicals (EDCs). These chemicals may alter the normal balance of endocrine systems and lead to adverse effects, as well as an increasing number of hormonal disorders in the human population or disturbed growth and reduced reproduction in the wildlife species. For some EDCs, there are documented health effects and restrictions on their use. However, for most of them, there is still no scientific evidence in this sense. In order to verify potential endocrine effects of a chemical in the full organism, it needs to be tested in appropriate model systems, as well as in the fruit fly, *Drosophila melanogaster*. In the present study, the authors report detailed in vivo protocols to study endocrine disruption in *Drosophila*, addressing EDC effects on the fecundity/fertility, developmental timing, and lifespan of the fly. In the last few years, we used these *Drosophila* life traits to investigate the effects of exposure to 17- $\alpha$ -ethinylestradiol (EE2), bisphenol A (BPA), and bisphenol AF (BPA

In the present study, the authors report detailed in vivo protocols to study endocrine disruption in *Drosophila*, addressing EDC effects on the fecundity/fertility, developmental timing, and lifespan of the fly.

F). Altogether, these assays covered all *Drosophila* life stages and made it possible to evaluate endocrine disruption in all hormone-mediated processes. Fecundity/fertility and developmental timing assays were useful to measure the EDC impact on the fly reproductive performance and on developmental stages, respectively. Finally, the lifespan assay involved chronic EDC exposures to adults and measured their survivorship. However, these life traits can also be influenced by several experimental factors that had to be carefully controlled. So, in this work, a series of procedures that have been optimised for the right outcome of these assays have been suggested. These methods allow scientists to establish endocrine disruption for any EDC or for a mixture of different EDCs in *Drosophila*, although to identify the endocrine mechanism responsible for the effect, further essays could be needed.

Authors: Bovier TF, Cavaliere D, Colombo M, Peluso G, Giordano E, Digilio FA.

Full Source: Journal of Visualized Experiments. 2019 Jul 3;(149). doi: 10.3791/59535.

### Investigation of inflammation inducing substances in PM2.5 particles by an elimination method using thermal decomposition

2019-09-09

In this study, the substances associated with PM2.5-induced inflammatory response were investigated using an elimination method. PM2.5 were heated at temperatures of 120, 250, and 360°C. The results demonstrated microbial substances such as LPS and b-glucan, and chemicals including BaP, 1,2-NQ, and 9,10-PQ were reduced drastically in PM2.5 heated at 120°C. On the other hand, DBA, 7,12-BAQ, and BaP-1,6-Q were not noticeably reduced. Most of these substances had disappeared in PM2.5 heated at 250°C and 360°C. Metals (eg, Fe, Cu, Cr, Ni) in PM2.5 exhibited a slight thermo-dependent increase. RAW264.7 macrophages with or without NAC were exposed to unheated PM2.5, oxidative stress-related and unrelated inflammatory responses were induced. PM2.5-induced lung inflammation in mice is caused mainly by thermo-sensitive substances (LPS, b-glucan, BaP, 1,2-NQ, 9,10-PQ, etc.). Also, a slight involvement of thermo-resistant substances (DBA, 7,12-BAQ, BaP-1,6-Q, etc.) and transition

In this study, the substances associated with PM2.5-induced inflammatory response were investigated using an elimination method.

metals was observed. The thermal decomposition method could assist to evaluate the PM2.5-induced lung inflammation.

Authors: He M, Ichinose T, Ito T, Toriba A, Yoshida S, Kaori S, Nishikawa M, Sun G, Shibamoto T.

Full Source: Environmental Toxicology. 2019 Jul 18. doi: 10.1002/tox.22816. [Epub ahead of print]

### Effect of Cu, Fe, Mn, Ni, and Zn and Bioaccessibilities in the Hazelnuts Growing in Sakarya, Turkey using In-Vitro Gastrointestinal Extraction Method

2019-09-09

Total concentrations of heavy metals such as Cu, Fe, Mn, Ni, and Zn in different hazelnut samples obtained by different regions of Sakarya city, Turkey were identified for the determination of heavy metal in the first section of this study. In the second section of the study, metal concentrations that can pass to the body by stomach and intestine in case of consuming hazelnuts as in vitro with gastrointestinal methods. It is performed by using enzymes and hydrochloric acid with model intestine and stomach system. In vitro gastrointestinal extraction method aims to identify how much the chemicals obtained by the sample matrices as vegetables, fruits, and soil, which are obtained within daily diet and examines the bioefficacy and bioaccessibility ingesting, used for evaluation of the chemical risk for humans were released. Total metal concentrations in the hazelnuts and metal concentrations passing to the stomach and intestines via in vitro gastrointestinal extraction method were identified with ICP-OES. As the result, heavy metal amounts of hazelnut samples are below the limits identified by Turkish Food Codex (TFC) and World Health Organization (WHO) and in harmony with the literature results so there is no objection in terms of health.

Authors: Altundag H, Mutlu E, Altintig E, Tuzen M.

Full Source: Biological Trace Element Research. 2019 Jul 16. doi: 10.1007/s12011-019-01813-4. [Epub ahead of print]

In the present study, the authors aimed to generate robust hypotheses spatially linking mixtures and the occurrence of adverse birth outcomes using a spatial data mining algorithm and subsequent geographical and statistical analysis.

### MEDICAL RESEARCH

#### Interdisciplinary-driven hypotheses on spatial associations of mixtures of industrial air pollutants with adverse birth outcomes

2019-09-09

Adverse birth outcomes (ABO) such as prematurity and small for gestational age confer a high risk of mortality and morbidity. ABO have been linked to air pollution; however, relationships with mixtures of industrial emissions are poorly understood. The exploration of relationships between ABO and mixtures is complex when hundreds of chemicals are analysed simultaneously, requiring the use of novel approaches. In the present study, the authors aimed to generate robust hypotheses spatially linking mixtures and the occurrence of ABO using a spatial data mining algorithm and subsequent geographical and statistical analysis. The spatial data mining approach aimed to reduce data dimensionality and efficiently identify spatial associations between multiple chemicals and ABO. The authors discovered co-location patterns of mixtures and ABO in Alberta, Canada (2006-2012). An ad-hoc spatial data mining algorithm allowed the extraction of primary co-location patterns of 136 chemicals released into the air by 6279 industrial facilities (National Pollutant Release Inventory), wind-patterns from 182 stations, and 333,247 singleton live births at the maternal postal code at delivery (Alberta Perinatal Health Program), from which cases of preterm birth, small for gestational age, and low birth weight at term were identified. Secondary patterns were selected using a lift ratio metric from ABO and non-ABO impacted by the same mixture. The relevance of the secondary patterns was estimated using logistic models (adjusted by socioeconomic status and ABO-related maternal factors) and a geographic-based assignment of maternal exposure to the mixtures as calculated by kernel density. From 136 chemicals and three ABO, spatial data mining identified 1700 primary patterns from which five secondary patterns of three-chemical mixtures, including particulate matter, methyl-ethyl-ketone, xylene, carbon monoxide, 2-butoxyethanol, and n-butyl alcohol, were subsequently analysed. The significance of the associations (odds ratio > 1) between the five mixtures and ABO provided statistical support for a new set of hypotheses. This study demonstrated that, in complex research settings, spatial data mining followed by pattern selection and geographic

and statistical analyses can catalyse future research on associations between air pollutant mixtures and adverse birth outcomes.

Authors: Serrano-Lomelin J, Nielsen CC, Jabbar MSM, Wine O, Bellinger C, Villeneuve PJ, Stieb D, Aelicks N, Aziz K, Buka I, Chandra S, Crawford S, Demers P, Erickson AC, Hystad P, Kumar M, Phipps E, Shah PS, Yuan Y, Zaiane OR, Osornio-Vargas AR.

Full Source: Environment International. 2019 Jul 9; 131:104972. doi: 10.1016/j.envint.2019.104972. [Epub ahead of print]

### Validation of the $\gamma$ H2AX biomarker for genotoxicity assessment: a review

2019-09-09

The H2AX histone protein is rapidly phosphorylated at the serine-139 position ( $\gamma$ H2AX) in response to a broad range of DNA lesions.  $\gamma$ H2AX induction is one of the earliest events in the DNA damage response (DDR) and plays a central role in sensing and repairing DNA damage. Since its discovery, measuring  $\gamma$ H2AX formation using numerous methods in in vitro and in vivo experiments has been an attractive endpoint for the detection of genotoxic agents. This review focuses on validation studies performed using this biomarker to detect the genotoxicity of model chemicals using different methods. To date, nearly two hundred genotoxic and carcinogenic model chemicals have been shown to induce in vitro  $\gamma$ H2AX in different cell lines by numerous laboratories. Based on 27 published reports comprising 329 tested chemicals, we compared the performance of the  $\gamma$ H2AX assay with other genotoxic endpoints (Ames assay, micronucleus, HPRT and comet) regularly used for in vitro genotoxicity assessment. Notably, the  $\gamma$ H2AX assay performs well (91% predictivity) and efficiently differentiates aneugenic and clastogenic compounds when coupled with the pH3 biomarker. Currently, no formal guidelines have been approved for the  $\gamma$ H2AX assay for regular genotoxicity studies, but the authors suggest the  $\gamma$ H2AX biomarker could be used as a new standard genotoxicity assay and discuss its future role in genotoxicity risk assessment.

Authors: Kopp B, Khoury L, Audebert M.

Full Source: Archives in Toxicology. 2019 Jul 9. doi: 10.1007/s00204-019-02511-9. [Epub ahead of print]

This review focuses on validation studies performed using this biomarker to detect the genotoxicity of model chemicals using different methods.

### Assessing Toxicity and in Vitro Bioactivity of Smoked Cigarette Leachate Using Cell-Based Assays and Chemical Analysis

2019-09-09

Smoked cigarettes are the most prevalent form of litter worldwide, often finding their way into oceans and inland waterways. Cigarette smoke contains more than 4000 individual chemicals, some of them carcinogenic or otherwise toxic. In this study, the authors examined the cytotoxicity, genotoxicity, aryl hydrocarbon receptor (AhR), oestrogen receptor (ER), and p53 response pathways of smoked cigarette leachate in vitro. Both seawater and freshwater leachates of smoked cigarettes were tested.

Cytotoxicity and genotoxicity were negligible at 100 smoked cigarettes/L, while statistically significant AhR, ER, and p53 responses were observed in the extracts of both leachates, suggesting a potential risk to human health through exposure to cigarette litter in the environment. To identify responsible chemicals for the AhR response, an effect directed analysis approach was coupled with nontargeted chemical analysis based on comprehensive two-dimensional gas chromatography coupled to time-of-flight mass spectrometry (GC × GC/TOF-MS). Eleven compounds potentially responsible for the AhR response were identified. Among them, 2-methylindole was partially responsible for the AhR response.

Authors: Xu EG, Richardot WH, Li S, Buruaem L, Wei HH, Dodder NG, Schick SF, Novotny T, Schlenk D, Gersberg RM, Hoh E.

Full Source: Chemical Research in Toxicology. 2019 Jul 29. doi: 10.1021/acs.chemrestox.9b00201. [Epub ahead of print]

In this review, the authors discuss the studies performed seeking to define the role of bystander activation in systemic and organ-specific autoimmune diseases.

### Regulation of cytochrome P450 expression by microRNAs and long noncoding RNAs: Epigenetic mechanisms in environmental toxicology and carcinogenesis

2019-09-09

Environmental exposures to hazardous chemicals are associated with a variety of human diseases and disorders, including cancers. Phase I metabolic activation and detoxification reactions catalysed by cytochrome P450 enzymes (CYPs) affect the toxicities of many xenobiotic compounds. Proper regulation of CYP expression influences their biological effects.

Noncoding RNAs (ncRNAs) are involved in regulating CYP expression, and ncRNA expression is regulated in response to environmental chemicals. The mechanistic interactions between ncRNAs and CYPs associated with the toxicity and carcinogenicity of environmental chemicals are described in this review, focusing on microRNA-dependent CYP regulation. The role

of long noncoding RNAs in regulating CYP expression is also presented and new avenues of research concerning this regulatory mechanism are described.

Authors: Li D, Tolleson WH, Yu D, Chen S, Guo L, Xiao W, Tong W, Ning B.  
Full Source: The Journal of Environmental Science and Health, Part C: Environmental Carcinogenesis and Ecotoxicology Review. 2019;37(3):180-214. doi: 10.1080/10590501.2019.1639481. Epub 2019 Jul 15.

### Bystander activation and autoimmunity

2019-09-09

The interaction over time of genetic, epigenetic and environmental factors (i.e., autoimmune ecology) increases or decreases the liability an individual would have to develop an autoimmune disease (AD) depending on the misbalance between risk and protective effects. Pathogens have been the most common antecedent events studied, but multiple other environmental factors including xenobiotic chemicals, drugs, vaccines, and nutritional factors have been implicated into the development of ADs. Three main mechanisms have been offered to explain the development of autoimmunity: molecular mimicry, epitope spreading, and bystander activation. The latter is characterised by auto-reactive B and T cells that undergo activation in an antigen-independent manner, influencing the development and course of autoimmunity. Activation occurs due to a combination of an inflammatory milieu, co-signalling ligands, and interactions with neighbouring cells. In this review, the authors discuss the studies performed seeking to define the role of bystander activation in systemic and organ-specific ADs. In all cases, the authors are cognizant of individual differences between hosts and the variable latency time for clinical expression of disease, all of which have made the understanding of the aetiology of loss of immune tolerance difficult and enigmatic.

Authors: Pacheco Y, Acosta-Ampudia Y, Monsalve DM, Chang C, Gershwin ME, Anaya JM.

Full Source: Journal of Autoimmunity. 2019 Jul 17:102301. doi: 10.1016/j.jaut.2019.06.012. [Epub ahead of print]

The authors hypothesised that individuals with relatively low DNA repair capacity would suffer greater damage from cumulative genotoxic exposures, some of which would persist, causing ongoing problems.

### OCCUPATIONAL RESEARCH

#### Preliminary Evidence for a Hormetic Effect on DNA Nucleotide Excision Repair in Veterans with Gulf War Illness

2019-09-09

Veterans of the 1991 Gulf War were potentially exposed to a mixture of stress, chemicals and radiation that may have contributed to the persistent symptoms of Gulf War Illness (GWI). The genotoxic effects of some of these exposures are mediated by the DNA nucleotide excision repair (NER) pathway. The authors hypothesised that individuals with relatively low DNA repair capacity would suffer greater damage from cumulative genotoxic exposures, some of which would persist, causing ongoing problems. Blood samples were obtained from symptomatic Gulf War veterans and age-matched controls. The unscheduled DNA synthesis assay, a functional measurement of NER capacity, was performed on cultured lymphocytes, and lymphocyte mRNA was extracted and analysed by sequencing. Despite the hypothesis that GWI would be associated with DNA repair deficiency, NER capacity in lymphocytes from affected GWI veterans actually exhibited a significantly elevated level of DNA repair ( $p = 0.016$ ). Both total gene expression and NER gene expression successfully differentiated individuals with GWI from unaffected controls. The observed functional increase in DNA repair capacity was accompanied by an overexpression of genes in the NER pathway, as determined by RNA sequencing analysis. The authors suggest that the observed elevations in DNA repair capacity and NER gene expression are indicative of a "hormetic," i.e., induced or adaptive protective response to battlefield exposures. Normally such effects are short-term, but in these individuals this response has resulted in a long-term metabolic shift that may also be responsible for the persistent symptoms of GWI.

Authors: Latimer JJ, Alhamed A, Sveiven S, Almutairy A, Klimas NG, Abreu M, Sullivan K, Grant SG.

Full Source: Military Medicine. 2019 Jul 23. pii: usz177. doi: 10.1093/milmed/usz177. [Epub ahead of print]

#### An Online Survey of Occupational Hazards in Brazilian Aquaculture

2019-09-09

Information on occupational health and safety practices in Brazilian aquaculture is limited. This study reports preliminary results from an online survey based on research questions to identify occupational hazards,

This study reports preliminary results from an online survey based on research questions to identify occupational hazards, risk assessment practices, and prevention measures adopted in Brazilian aquaculture.

risk assessment practices, and prevention measures adopted in Brazilian aquaculture. Data were collected through an online questionnaire, comprising 25 questions, on a voluntary and anonymous basis. Aquaculture stakeholders were invited to participate in the study through email and social media channels. The demographic data demonstrated that the majority of respondents were men (72%) and having a higher education (95%). Most respondents employed administrative controls and personal protective equipment (PPE) rather than substitution and other risk elimination measures to reduce exposure. The most commonly adopted measures were PPE use (87%), adequate handling of chemicals (86%), and imparting knowledge of risks (90%). However, only 12% of participants reported the presence of safety protocols at their workplace, and 17% had some form of immunisation of workers. In this study, it was possible to identify a lack of hazard signage in the workplace and lack of occupational health and safety training. The results further indicate that risk management in aquaculture continues to be a challenge in low-income countries. Aquaculture farmers should be encouraged and supported in adopting measures and appropriate technologies to eliminate risks in Brazilian aquaculture.

Authors: Marques FB, Bettoni GN, de Brito B, de Brito KCT, Fermino MH, Ngajilo D, Peixoto Ramos AS, Dos Santos BGT, Stech MR, Watterson A, Cavalli LS.

Full Source: Journal of Agromedicine. 2019 Jul 29:1-7. doi: 10.1080/1059924X.2019.1647323. [Epub ahead of print]

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

2019-09-09

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 manuscript, 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

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.

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 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]

### Dermatitis among workers in Ontario: results from the Occupational Disease Surveillance System

2019-09-09

Dermatitis is the most common occupational skin disease, and further evidence is needed regarding preventable risk factors. The Occupational Disease Surveillance System (ODSS) derived from administrative data was used to investigate dermatitis risk among industry and occupation groups in Ontario. ODSS cohort members were identified from Workplace Safety and Insurance Board (WSIB) accepted lost time claims. A case was defined as having  $\geq 2$  dermatitis physician billing claims during a 12-month period within 3 years of cohort entry. A 3-year look-back period prior to cohort entry was used to exclude prevalent cases without a WSIB claim. Workers were followed for 3 years or until dermatitis diagnosis, age 65 years, emigration, death or end of follow-up (31 December 2016), whichever occurred first. Age-adjusted and sex-adjusted Cox proportional hazard models estimated HRs and 95% CIs. The risk of dermatitis was explored using a job exposure matrix that identifies exposure to asthmagens, many of which also cause contact dermatitis. Among 597 401 workers, 23 843 cases of new-onset dermatitis were identified. Expected elevated risks were observed among several groups including furniture and fixture industries, food and beverage preparation and chemicals, petroleum, rubber, plastic and related materials processing occupations and workers exposed to metal working fluids and organic solvents. Decreased risk was observed among farmers, nurses and construction industries, and occupations exposed to latex and indoor cleaning products. ODSS can contribute to occupational dermatitis surveillance in Ontario by

Dermatitis is the most common occupational skin disease, and further evidence is needed regarding preventable risk factors.

identifying occupational groups at risk of dermatitis that can then be prioritised for prevention activities.

Authors: Shakik S, Arrandale V, Holness DL, MacLeod JS, McLeod CB, Peter A, Demers PA.

Full Source: Occupational & Environmental Medicine. 2019 Jul 18. pii: oemed-2018-105667. doi: 10.1136/oemed-2018-105667. [Epub ahead of print]

### Do Gulf War veterans with high levels of deployment-related exposures display symptoms suggestive of Parkinson's disease?

2019-09-09

Veterans of the 1991 Gulf War (GW) were exposed to a myriad of potentially hazardous chemicals during deployment. Epidemiological data suggest a possible link between chemical exposures and Parkinson's disease (PD); however, there have been no reliable data on the incidence or prevalence of PD among GW veterans to date. This study included the following 2 questions: 1. Do deployed GW veterans display PD-like symptoms? and 2. Is there a relationship between the occurrence and quantity of PD-like symptoms, and the levels of deployment-related exposures in GW veterans? Self-reports of symptoms and exposures to deployment-related chemicals were filled out by 293 GW veterans, 202 of whom had undergone 3 Tesla volumetric measurements of basal ganglia volumes. Correlation analyses were used to examine the relationship between the frequency of the veterans' self-reported exposures to deployment-related chemicals, motor and non-motor symptoms of PD, and the total basal ganglia volumes. Healthy deployed GW veterans self-reported few PD-like non-motor symptoms and no motor symptoms. In contrast, GW veterans with Gulf War illness (GWI) self-reported more PD-like motor and non-motor symptoms, and more GW-related exposures. Compared to healthy deployed veterans, those with GWI also had lower total basal ganglia volumes. Although little is known about the long-term consequences of GWI, findings from this study suggest that veterans with GWI show more symptoms as those seen in PD/prodromal PD, compared to healthy deployed GW veterans.

Author: Chao L.

Full Source: International Journal of Occupational Medicine & Environmental Health. 2019 Jul 15;32(4):503-526. doi: 10.13075/ijomeh.1896.01346.

The authors investigated the trends in potential human health impacts and ecotoxicity of waste mobile phones through quantitative life cycle impact assessment (LCIA) methods and regulatory total threshold limit concentrations.

### PUBLIC HEALTH RESEARCH

#### Toxicity trends in E-Waste: A comparative analysis of metals in discarded mobile phones

2019-09-09

Mobile phones and various electronic products contribute to the world's fastest-growing category of hazardous waste with international repercussions. The authors investigated the trends in potential human health impacts and ecotoxicity of waste mobile phones through quantitative life cycle impact assessment (LCIA) methods and regulatory total threshold limit concentrations. A market-dominant sample of waste basic phones and smartphones manufactured between 2001 and 2015, were analysed for toxicity trends based on 19 chemicals. The results of the LCIA (using USEtox model) show an increase in the relative mass of toxic materials over the 15-year period. No significant changes in the use of toxic components in basic phones were found, whereas smartphones contained a statistically significant increase in the content of toxic materials from 2006 to 2015. Nickel contributed the largest risk for carcinogens in mobile phones, but the contributions of lead and beryllium were also notable. Silver, zinc and copper contents were associated with non-cancer health risks. Copper components at 45,818-77,938 PAF m3/kg dominated ecotoxicity risks in mobile phones. Overall, these results highlight the increasing importance of monitoring trends in materials use for electronic product manufacturing and electronic-waste management processes that should prevent human and environmental exposures to toxic components.

Authors: Singh N, Duan H, Ogunseitan OA, Li J, Tang Y.

Full Source: Journal of Hazardous Material. 2019 Jul 18; 380:120898. doi: 10.1016/j.jhazmat.2019.120898. [Epub ahead of print]

#### Construction of a flexible electrochemiluminescence platform for sweat detection

2019-09-09

Flexible and wearable chemical sensors show great capability and potential in retrieving physiologically related chemical or biochemical information from elastic and curvilinear living bodies. However, so far, no flexible electrochemiluminescence (ECL) device has been reported, though ECL measurements have been extensively investigated and widely applied in many fields. In the present study, the authors designed and fabricated a flexible ECL sensor by immobilising highly luminescent

In the present study, the authors designed and fabricated a flexible ECL sensor by immobilising highly luminescent nanospheres on Au nanotube (Au NT) networks, and subsequently coating an elastic molecularly imprinted polymer (MIP) thereon.

nanospheres on Au nanotube (Au NT) networks, and subsequently coating an elastic molecularly imprinted polymer (MIP) thereon. The as-prepared flexible ECL platform displayed successive and desirable mechanical compliance while generating a very stable ECL signal during deformation, facilitating highly selective detection of physiologically relevant chemicals from bodies. On-body wearable sampling and subsequent detection of lactate and urea from sweat showed the ECL performance of this sensor displaying desirable fidelity, reusability and high stability against disturbance. This work successfully incorporated the ECL sensing model into a flexible and wearable device, therefore providing a promising new path for non-invasively monitoring the products of metabolism for health care and biomedical investigations.

Authors: Chen MM, Cheng SB, Ji K, Gao J, Liu YL, Wen W, Zhang X, Wang S, Huang WH.

Full Source: Chem Sci. 2019 May 22;10(25):6295-6303. doi: 10.1039/c9sc01937e. eCollection 2019 Jul 7.

### Population-based incidence of lymphomas in the French Nord-Pas-de-Calais region between 2001 and 2005: Annual estimations and spatial analysis

2019-09-09

Non-Hodgkin's lymphomas (NHL) are the seventh most commonly diagnosed cancer in France. Nord-Pas-de-Calais is ranked as the region with the highest incidence of cancers and deaths by cancer in France. With its rich industrial past and its contrasted population densities between urban and rural territories, Nord-Pas-de-Calais represents a geographic area of interest to study the overall incidence of NHL and examine spatial variation of NHL incidence between the 170 cantons of the region. LYMPHONOR was a population-based multicentre retrospective study of patients residing in the Nord-Pas-de-Calais region and diagnosed with NHL between January 2001 and December 2005. Spatial distribution of NHL incidence in Nord-Pas-de-Calais was explored using two complementary approaches: adjusted smoothed standardised incidence ratio (SIR) and spatial scan statistics (detection of atypical clusters). Between 2001 and 2005, 2132 new cases of NHL were diagnosed in the Nord-Pas-de-Calais region. In 2005, age-standardised NHL incidence rates were 10.2 and 7.0 cases per 100,000 person-years in male and female residents, respectively. No significant spatial disparities in NHL incidence were found within the Nord-Pas-de-Calais region. The age-adjusted smoothed SIR varied from 0.82 to 1.25 between cantons. Consistently, spatial scan statistics did not detect any significant atypical cluster of high

In this study, the authors investigated the association between in utero concentrations of PCBs and girls' body fatness.

NHL incidence. Comparison with national data collected during the same period does not show an over incidence of NHL in the Nord-Pas-de-Calais region. In addition, no evidence for spatial heterogeneity and clustering of NHL incidence was found within this region. Future epidemiological research using large-scale registries is needed to better appraise spatial variation of NHL incidence in France and to investigate possible reasons for significant clusters.

Authors: Detournignies L, Leroyer A, Ligier K, Plouvier S, Genin M.

Full Source: Revue d'Epidemiologie et de Sante Publique. 2019 Jul 18. pii: S0398-7620(19)30431-6. doi: 10.1016/j.respe.2019.05.010. [Epub ahead of print]

### Prenatal exposure to Polychlorinated Biphenyls and body fatness in girls

2019-09-09

Polychlorinated biphenyls (PCBs) are synthetic, organochlorine compounds previously used in industrial processes. Although banned in 1980's across Europe, these chemicals persist in the environment and are associated with adverse health outcomes in children. In this study, the authors investigated the association between in utero concentrations of PCBs and girls' body fatness. Concentrations of various PCB congeners (PCB 118, PCB 138, PCB 153, PCB 170, and PCB 180) were measured in maternal serum samples collected in the early 1990's. Body fatness was measured in the daughters at 9 y of age using body mass index (BMI) and dual-energy x-ray absorptiometry (DXA) for percent body fat. Using multivariable linear regression, the authors explored associations between prenatal PCB congener concentrations and body fatness outcomes.

Among 339 mother-daughter dyads, the median and interquartile range (IQR) for PCB congeners ranged between 15.0 ng g<sup>-1</sup> (11.0-20.8) for PCB 118 to 64.6 ng g<sup>-1</sup> (48.6-86.3) for PCB 153. Among daughters, the median was 27.5% (21.7-34.6) for percent body fat, 39.6% (36.4-43.5) for percent trunk fat, 4.9 kg m<sup>-2</sup> (3.5-7.0) for fat mass index and 18.1 kg m<sup>-2</sup> (16.3-20.6) for body mass index. Multivariable-adjusted regression analyses showed little or no association between prenatal PCB concentrations with daughters' body fatness measures. Prenatal concentrations of PCB congeners were not strongly associated with measures of body fatness in girls.

Authors: Wang A, Jeddy Z, Sjodin A, Taylor EV, Marks KJ, Hartman TJ.

Full Source: Chemosphere. 2019 Jul 12; 236:124315. doi: 10.1016/j.chemosphere.2019.07.046. [Epub ahead of print]

The authors present an approach that systematically links multiple data sources to relate chemical risk values to diseases and gene-disease variants.

### Determination of chemical-disease risk values to prioritise connections between environmental factors, genetic variants, and human diseases

2019-09-09

Traditional methods for chemical risk assessment are too time-consuming and resource-intensive to characterise either the diversity of chemicals to which humans are exposed or how that diversity may manifest in population susceptibility differences. The advent of novel toxicological data sources and their integration with bioinformatic databases affords opportunities for modern approaches that consider gene-environment (GxE) interactions in population risk assessment. The authors present an approach that systematically links multiple data sources to relate chemical risk values to diseases and gene-disease variants. These data sources include high-throughput screening (HTS) results from Tox21/ToxCast, chemical-disease relationships from the Comparative Toxicogenomics Database (CTD), hazard data from resources like the Integrated Risk Information System, exposure data from the ExpoCast initiative, and gene-variant-disease information from the DisGeNET database. We use these integrated data to identify variants implicated in chemical-disease enrichments and develop a new value that estimates the risk of these associations toward differential population responses. Finally, this value was used to prioritise chemical-disease associations by exploring the genomic distribution of variants implicated in high-risk diseases. This modular approach, termed DisQGOS (Disease Quotient Genetic Overview Score), is offered for relating overall chemical-disease risk to potential for population variable responses, as a complement to methods aiming to modernise aspects of risk assessment.

Authors: Kosnik MB, Reif DM.

Full Source: Toxicology & Applied Pharmacology. 2019 Jul 16; 379:114674. doi: 10.1016/j.taap.2019.114674. [Epub ahead of print]