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ENVIRONMENTAL RESEARCH

Biological Concepts for the Control of Aquatic Zoosporic Diseases

2019-06-16

Aquatic zoosporic diseases are threatening global biodiversity and ecosystem services, as well as economic activities. Current means of controlling zoosporic diseases are restricted primarily to chemical treatments, which are usually harmful or likely to be ineffective in the long term. Furthermore, some of these chemicals have been banned due to adverse effects. As a result, there is a need for alternative methods with minimal side-effects on the ecosystem or environment. In the present study, the authors integrate existing knowledge of three poorly interconnected areas of disease research - amphibian conservation, aquaculture, and plankton ecology - and arrange it into seven biological concepts to control zoosporic diseases. These strategies may be less harmful and more sustainable than chemical approaches. However, more research is needed before safe application is possible.

Authors: Frenken T, Agha R, Schmeller DS, van West P, Wolinska J.

Full Source: Trends in Parasitology. 2019 May 7. pii: S1471-4922(19)30076-5. doi: 10.1016/j.pt.2019.04.003. [Epub ahead of print]

A systematic assessment of carcinogenicity of chemicals in hydraulic-fracturing fluids and flowback water

2019-06-16

Thousands of chemicals exist in hydraulic-fracturing (HF) fluids and wastewater from unconventional oil gas development. The carcinogenicity of these chemicals in HF fluids and wastewater has never been systematically evaluated. In this study, the authors assessed the carcinogenicity of 1,173 HF-related chemicals in the HF chemical data from the US Environmental Protection Agency (EPA). The HF chemical data was linked with the agent classification data from the International Agency for Research on Cancer (IARC) at the World Health Organization (WHO) (N = 998 chemicals) to evaluate human carcinogenic risk of the chemicals and with the Carcinogenic Potency Database (CPDB) from Toxnet (N = 1,534 chemicals) to evaluate potential carcinogenicity of the chemicals. The Chemical Abstract Service Registry Numbers (CASRN) for chemicals were used for data linkage. Among 1,173 chemicals, 1,039 were identified only in HF fluids, 97 only in wastewater, and 37 in both. Compared with IARC, the authors found information of 104 chemicals,

In the present study, the authors integrate existing knowledge of three poorly interconnected areas of disease research - amphibian conservation, aquaculture, and plankton ecology - and arrange it into seven biological concepts to control zoosporic diseases.

and 48 of them may have potentially carcinogenic risk to human, among which 14 are definitely carcinogenic, 7 probably carcinogenic, and 27 possibly carcinogenic. Using the CPDB data, it suggests that 66 chemicals are potentially carcinogenic based on rats and mouse models. The authors concluded that the evaluation suggests that exposure to some chemicals in HF fluids and wastewater may increase cancer risk, and the identified chemicals could be selected as the priority list for drinking water exposure assessment or cancer-related health studies.

Authors: Xu X, Zhang X, Carrillo G, Zhong Y, Kan H, Zhang B.

Full Source: Environmental Pollution. 2019 Apr 6; 251:128-136. doi: 10.1016/j.envpol.2019.04.016. [Epub ahead of print]

Leaching behaviour of fluorescent additives from microplastics and the toxicity of leachate to *Chlorella vulgaris*

2019-06-16

Chemical additives leaching from microplastics and their effects on physiology of microalgae are of environmental significance. So far, these issues remain unclear. This study investigated the leaching behaviour of fluorescent additives from polyurethane sponge microplastics in simulated (acidic, saline, and basic water) and natural waters (river, lake, wetland, and sea water). Release amount of additives increased with increasing solution pH and leaching time. The maximum release amount was reached at the leaching time of 12-24 h and the 3,3'-diaminobenzidine-like substances were identified in the leachate. The leached concentrations of fluorescent additives in simulated and natural waters followed the order of basic water > saline water > seawater > West Lake > River > Wetland. Effects of leachate and microplastics on growth and photosynthesis of *Chlorella vulgaris* were further evaluated. The maximum quantum efficiency of photosystem II (Fv/Fm) decreased with increasing leachate concentrations. Only high content (1.6 g L⁻¹) of microplastics exerted significant inhibitory influence on cell photosynthesis when microalgae were exposed to microplastics alone. Retention of algal cells inside the porous sponge microplastics did not change their photosynthetic efficiency. These findings indicate that leaching process of additives from microplastics depends mainly on water environments and the leached chemicals may pose ecological risks to aquatic organisms.

Authors: Luo H, Xiang Y, He D, Li Y, Zhao Y, Wang S, Pan X.

Full Source: Science of the Total Environment. 2019 Aug 15; 678:1-9. doi: 10.1016/j.scitotenv.2019.04.401. Epub 2019 Apr 28.

Chemical additives leaching from microplastics and their effects on physiology of microalgae are of environmental significance.

Air Emissions from Natural Gas Facilities in New York State

2019-06-16

While New York has banned fracking, new and expanded natural gas pipelines are being constructed across the state. In previous studies, the authors have reported that compressor stations are a major source of air pollution at fracking sites. Two federal datasets, the U.S. Environmental Protection Agency's (EPA) National Emissions Inventory and Greenhouse Gas Inventory, were used to determine what is known concerning emissions from the compressor stations along natural gas pipelines in the state. From a total of 74 compressor stations only 18 report to EPA on emissions. In the seven-year period between 2008 and 2014 they released a total of 36.99 million pounds of air pollutants, not including CO₂ and methane. This included emissions of 39 chemicals known to be human carcinogens. There was in addition 6.1 billion pounds of greenhouse gases release from ten stations in a single year. These data clearly underestimate the total releases from the state's natural gas transportation and distribution system. However, they demonstrate significant releases of air pollutants, some of which are known to cause human disease. In addition, they release large amounts of greenhouse gases that contribute to climate change.

Authors: Russo PN, Carpenter DO.

Full Source: International Journal of Environmental Research & Public Health. 2019 May 7;16(9). pii: E1591. doi: 10.3390/ijerph16091591.

Development of a Passive Sampling Technique for Measuring Pesticides in Waters and Soils

2019-06-16

It is essential to monitor pesticides in the environment to help ensure water and soil quality. The diffusive gradients in thin-films (DGT) technique can measure quantitative in situ labile (available) concentrations of chemicals in water, soil, and sediments. This study describes the systematic development of the DGT technique for nine current pesticides, selected to be representative of different classes with a wide range of properties, with two types of resins (HLB (hydrophilic-lipophilic-balanced) and XAD 18) as binding layer materials. The masses of pesticides accumulated by DGT devices were proportional to the deployment time and in inverse proportion to the thickness of the diffusive layer, in line with DGT theoretical predictions. DGT with both resin gels were tested in the laboratory for the effects of typical environmental factors on the DGT measurements. DGT performance was independent of the following: pH in the range of 4.7-8.2; dissolved organic matter concentrations <20 mg L⁻¹;

While New York has banned fracking, new and expanded natural gas pipelines are being constructed across the state.

and ionic strength from 0.01 to 0.25 M, although it was slightly affected at 0.5 M in some cases. This confirms DGT as a sampler suitable for controlled studies of environmental processes affecting pesticides. Field applications of DGT to measure pesticides in situ in waters and controlled laboratory measurements on five different soils (prepared at fixed soil/water ratios) demonstrated DGT is a suitable tool for environmental monitoring in waters and for investigating chemical processes in soils.

Authors: Li Y, Chen CL, Chen W, Chen J, Cai X, Jones KC, Zhang H.

Full Source: Journal of Agriculture & Food Chemistry. 2019 Jun 5;67(22):6397-6406. doi: 10.1021/acs.jafc.9b00040. Epub 2019 May 24.

MEDICAL RESEARCH

Cigarette smoke exposure combined with lipopolysaccharides induced pulmonary fibrosis in mice

2019-06-16

Cigarette smoke (CS) is a risk factor for pulmonary fibrosis and lipopolysaccharides (LPS) are associated with human occupational lung diseases; however, their combined role in pulmonary fibrosis remains unknown. In the present study, the authors investigated whether CS combined with LPS induces pulmonary fibrosis in mice. C57BL/6 mice were exposed to CS or normal air for 21 or 35 days, followed by LPS or saline instillation on day 14, 21, and 28. Lung function was tested, and lung tissues were harvested for histological and molecular analyses. Compared to the control, CS and LPS groups, the CS + LPS group showed reduced body weight and survival rate, increased respiratory resistance, decreased lung compliance, marked alveolar structure destruction, and fibrotic lesion formation. Lung tissues showed a considerable increase in IL-6, TNF- α , IL-1 β , α -SMA, and TGF- β levels and collagen content. Our results indicate that cigarette smoke exposure followed by LPS in mice induces pulmonary fibrosis with pathophysiology consistent with that of human pulmonary fibrosis.

Authors: Fang L, Cheng Q, Zhao F, Cheng H, Luo Y, Bao X, Li Y, Liang X, Huang Y, Xu J, Han J, Tang Y, Tang S, Liu W, Luo Z, Feng D.

Full Source: Respiratory Physiology & Neurobiology. 2019 Apr 22; 266:9-17. doi: 10.1016/j.resp.2019.04.010. [Epub ahead of print]

In the present study, the authors investigated whether cigarette smoke combined with LPS induces pulmonary fibrosis in mice.

Prenatal toxicity and maternal-foetal distribution of 1,3,5,8-tetrachloronaphthalene (1,3,5,8-TeCN) in Wistar rats

2019-06-16

1,3,5,8-tetrachloronaphthalene (1,3,5,8-TeCN) is a Persistent Organic Pollutant (POP) that belongs to the group of polychlorinated naphthalenes (PCNs). The aim of the study was to investigate the maternal-foetal distribution and prenatal toxicity of 1,3,5,8-TeCN after its administration to pregnant Wistar rats during organogenesis. Radiolabelled 1,3,5,8-tetrachloronaphthalene-[ring-U-3H] was given by gavage at a dose of 0.3 mg per dam to evaluate its tissue distribution, and that of unlabelled 1,3,5,8-TeCN, at daily doses of 0.3, 1.0 or 3.0 mg kg b.w.⁻¹ to assess prenatal toxicity. After a single administration of 1,3,5,8-TeCN, the highest concentration was detected in maternal adipose tissue. The concentration in the brain, uterus, kidneys, adrenals, ovaries, lungs and liver established in dams were two to nine times higher than in the maternal blood. 1,3,5,8-TeCN penetrated the blood-brain-barrier and the placenta. The results obtained from developmental toxicity indicate that 1,3,5,8-TeCN did not cause maternal toxicity and was not embryotoxic or teratogenic. However, fetotoxic effects were observed after non-toxic doses for dams (1.0 and 3.0 mg.b.w.⁻¹.day⁻¹). 1,3,5,8-TeCN did not induce congenital skeletal defects but increased the number of foetuses with sternum ossification delay. After a dose of 3.0 mg kg b.w.⁻¹.day⁻¹, significantly more foetuses were found with enlargement of the renal pelvis: unilateral in female offspring and bilateral in male offspring. At the doses used, 1,3,5,8-TeCN, unlike hexachloronaphthalene, was not a CYP1A1 inducer.

Authors: Kilanowicz A, Sitarek K, Stragierowicz J, Klimczak M, Bruchajzer E.
Full Source: Chemosphere. 2019 Mar 19; 226:75-84. doi: 10.1016/j.chemosphere.2019.03.107. [Epub ahead of print]

The aim of the study was to investigate the maternal-foetal distribution and prenatal toxicity of 1,3,5,8-TeCN after its administration to pregnant Wistar rats during organogenesis.

Adverse Maternal, Foetal, and Postnatal Effects of Hexafluoropropylene Oxide Dimer Acid (GenX) from Oral Gestational Exposure in Sprague-Dawley Rats

2019-06-16

Hexafluoropropylene oxide dimer acid [(HFPO-DA), GenX] is a member of the per- and polyfluoroalkyl substances (PFAS) chemical class, and elevated levels of HFPO-DA have been detected in surface water, air, and treated drinking water in the United States and Europe. The authors aimed to characterise the potential maternal and postnatal toxicities of oral HFPO-DA in rats during sexual differentiation. Given that some PFAS activate peroxisome proliferator-activated receptors (PPARs), the

authors sought to assess whether HFPO-DA affects androgen-dependent development or interferes with oestrogen, androgen, or glucocorticoid receptor activity. Steroid receptor activity was assessed with a suite of in vitro transactivation assays, and Sprague-Dawley rats were used to assess maternal, foetal, and postnatal effects of HFPO-DA exposure. Dams were dosed daily via oral gavage during male reproductive development (gestation days 14-18). Foetal testes, maternal and foetal livers, maternal serum clinical chemistry, and reproductive development of F1 animals were evaluated. HFPO-DA exposure resulted in negligible in vitro receptor activity and did not impact testosterone production or expression of genes key to male reproductive development in the foetal testis; however, in vivo exposure during gestation resulted in higher maternal liver weights ([Formula: see text]), lower maternal serum thyroid hormone and lipid profiles ([Formula: see text]), and up-regulated gene expression related to PPAR signalling pathways in maternal and foetal livers ([Formula: see text]). Further, the pilot postnatal study indicated lower female body weight and lower weights of male reproductive tissues in F1 animals. HFPO-DA exposure produced multiple effects that were similar to prior toxicity evaluations on PFAS, such as perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), but seen as the result of higher oral doses. The mean dam serum concentration from the lowest dose group was 4-fold greater than the maximum serum concentration detected in a worker in an HFPO-DA manufacturing facility. The authors concluded that research is needed to examine the mechanisms and downstream events linked to the adverse effects of PFAS as are mixture-based studies evaluating multiple PFAS.

Authors: Conley JM, Lambright CS, Evans N, Strynar MJ, McCord J, McIntyre BS, Travlos GS, Cardon MC, Medlock-Kakaley E, Hartig PC, Wilson VS, Gray LE Jr.

Full Source: Environmental Health Perspectives. 2019 Mar; 127(3):37008.
doi: 10.1289/EHP4372.

Associations of serum perfluoroalkyl substance and vitamin D biomarker concentrations in NHANES, 2003-2010

2019-06-16

Perfluoroalkyl substances (PFAS) are persistent endocrine disrupting chemicals found in industrial and commercial products. Previous research has shown that other endocrine disrupting chemicals such as phthalates and bisphenol A may alter circulating levels of vitamin D; however, no research has examined associations between PFAS and vitamin D biomarkers. In the present study, the authors conducted a cross-sectional

In this study, multivariable linear regression was used to estimate covariate-adjusted differences in total 25(OH) D or prevalence odds of vitamin D deficiency per log2 change in PFAS concentrations.

analysis of 7040 individuals aged 12 years and older participating in the 2003-2010 cycles of the United States National Health and Nutrition Examination Survey (NHANES). Concentrations of perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorohexane sulfonic acid (PFHxS), perfluorononanoic acid (PFNA), and total 25-hydroxyvitamin D [25(OH)D] were measured in serum samples. Multivariable linear regression was used to estimate covariate-adjusted differences in total 25(OH)D or prevalence odds of vitamin D deficiency per log₂ change in PFAS concentrations. We also assessed potential effect measure modification by gender, age, and race/ethnicity. PFAS were detected in over 98% of the samples. In adjusted models, each 2-fold increase in PFOS was associated with 0.9 nmol/L (95% CI: 0.2, 1.5) lower total 25(OH)D concentrations, with associations significantly stronger among whites (β : -1.7; 95% CI: -2.6, -0.7) and individuals older than 60 years of age (β : -1.7; 95% CI: -2.9, -0.5). Each 2-fold increase in PFHxS was associated with 0.8 nmol/L (95% CI: 0.3, 1.3) higher total 25(OH)D, and this association was not modified by age, gender, and race/ethnicity. PFOA and PFNA were not associated with total 25(OH)D. When assessing prevalence odds of vitamin D deficiency, the authors observed similar patterns of association with PFAS concentrations. These results suggest that some PFAS may be associated with altered vitamin D levels in the United States population, and associations may vary by chemical, age, and race/ethnicity. Prospective epidemiological studies are needed to confirm our findings and determine their implications for vitamin D-associated health outcomes in children and adults.

Authors: Etzel TM, Braun JM, Buckley JP.

Full Source: International Journal of Hygiene & Environmental Health. 2019 Mar;222(2):262-269. doi: 10.1016/j.ijheh.2018.11.003. Epub 2018 Nov 28.

In developing countries with high mortality rates, poisoning is one of the most common causes of admission to emergency rooms.

Epidemiologic profile of deaths due to drug and chemical poisoning in patients referred to Baharloo Hospital of Tehran, 2011 to 2014

2019-06-16

In developing countries with high mortality rates, poisoning is one of the most common causes of admission to emergency rooms. To minimize future deaths related to poisoning, the epidemiological profile of deceased individuals is essential. The medical records of all dead patients due to poisoning during 2011-2014 in Baharloo Hospital, Tehran, were evaluated. Exclusion criteria include: incomplete records, unknown causes of death, and persons less than 6 years of age. Data analysis was done by means of SPSS at the significance level of $P < 0.05$. The study included 184 males

and 65 females. The mean age range was 37.65 ± 16.78 years. The highest mortality rate was seen in the age range of 21-30 years (30.5%). The most common cause of poisoning was aluminium phosphide (101 cases). The average time of hospitalisation was 3.61 days. Most deaths occurred during the first 10 days of admission with intentional poisoning being the most common type (81.5%). The outcome of this study indicates that the main cause of death among young people is intentional poisoning with AIP. This study proves that a greater focus when diagnosing mental health patients, as well as an increase in restrictions when accessing lethal drugs and toxins, is crucial.

Authors: Titidez V, Arefi M, Taghaddosinejad F, Behnoush B, Akbar Pour S, Mahboobi M.

Full Source: Journal of Forensic and Legal Medicine. 2019 Feb 19; 64:31-33. doi: 10.1016/j.jflm.2019.02.009. [Epub ahead of print]

OCCUPATIONAL RESEARCH

Association of urinary metal profiles with serum uric acid: a cross-sectional study of traffic policemen in Wuhan, China

2019-06-16

Serum uric acid (SUA) is both a strong antioxidant and one of the key risk factors of cardiovascular diseases (CVDs). The authors aimed to investigate the associations of urinary metal profile with SUA in traffic policemen in Wuhan, China. A cross-sectional study was carried out in traffic policemen in a seriously polluted Chinese city. A total of 186 traffic policemen were recruited in this study. About 56 of them worked in the logistics department and the other 130 maintained traffic order or dealt with traffic accidents on the roads. All these subjects had worked as a policeman for at least 1 year. The significantly negative association of lead with SUA was consistent between single-metal and multiple-metal models ($p=0.004$ and $p=0.020$, respectively). Vanadium, chromium and tin were reversely associated with SUA levels in the single-metal models after false discovery rate (FDR) adjustment (all $P_{FDR} < 0.05$). One IQR increase in vanadium, chromium, tin and lead was associated with $26.9 \mu\text{mol/L}$ (95% CI -44.6 to -9.2; $p=0.003$), $27.4 \mu\text{mol/L}$ (95% CI -46.1 to -8.8; $p=0.004$), $11.2 \mu\text{mol/L}$ (95% CI -18.9 to -3.4; $p=0.005$) and $16.4 \mu\text{mol/L}$ (95% CI -27.6 to -5.2; $p=0.004$) decrease in SUA, respectively. Significant interaction between smoking and vanadium on decreased SUV was found (p for interaction = 0.007 and $p_{FDR} = 0.028$). Urinary vanadium, chromium, tin and lead were negatively associated with SUA. Vanadium and cigarette smoking jointly

The authors aimed to investigate the associations of urinary metal profile with serum uric acid in traffic policemen in Wuhan, China.

affected SUA levels. Further studies are needed to replicate these findings and to investigate the potential mechanisms.

Authors: Dai X, Deng Q, Guo D, Ni L, Li J, Chen Z, Zhang L, Xu T, Song W, Luo Y, Hu L, Hu C, Yi G, Pan Z.

Full Source: BMJ Open. 2019 May 10;9(5): e022542. doi: 10.1136/bmjopen-2018-022542.

The current burden of cancer attributable to occupational exposures in Canada

2019-06-16

Exposure to occupational carcinogens is often overlooked as a contributor to the burden of cancer. To estimate the proportion of cancer cases attributable to occupational exposure in Canada in 2011, exposure prevalence and levels of 44 carcinogens were informed by data from the Canadian carcinogen exposure surveillance project (CAREX Canada). These were used with Canadian Census (between 1961 and 2011) and Labour Force Survey (annual surveys between 1976 and 2013) data to estimate the number of workers ever exposed to occupational carcinogens. Risk estimates of the association between each carcinogen and cancer site were selected mainly from published literature reviews. Population attributable risks were estimated using Levin's equation and applied to the 2011 cancer statistics from the Canadian Cancer Registry. It is estimated that 15.5 million Canadians alive in 2011 were exposed, during at least one year between 1961 and 2001, to at least one carcinogen in the workplace. Overall, the authors estimated that in 2011, between 3.9% (95% CI: 3.1%-8.1%) and 4.2% (95% CI: 3.3%-8.7%) of all incident cases of cancer were due to occupational exposure, corresponding to lower and upper numbers of 7700-21,800 cases. Five of the cancer sites - mesothelioma, non-melanoma skin cancer, lung, female breast, and urinary bladder - account for a total of 7600 to 21,200 cancers attributable to occupational exposures such as solar radiation, asbestos, diesel engine exhaust, crystalline silica, and night shift work. Our study highlights cancer sites and occupational exposures that need recognition and efforts by all stakeholders to avoid preventable cancers in the future.

Authors: Labrèche F, Kim J, Song C, Pahwa M, Ge CB, Arrandale VH, McLeod CB, Peters CE, Lavoué J, Davies HW, Nicol AM, Demers PA.

Full Source: Preventive Medicine. 2019 May; 122:128-139. doi: 10.1016/j.ypmed.2019.03.016.

Exposure to occupational carcinogens is often overlooked as a contributor to the burden of cancer.

Animal production, insecticide use and self-reported symptoms and diagnoses of COPD, including chronic bronchitis, in the Agricultural Health Study

2019-06-16

Occupational exposure to animal production is associated with chronic bronchitis symptoms; however, few studies consider associations with chronic obstructive pulmonary disease (COPD). In the present study, the authors estimated associations between animal production activities and prevalence of self-reported COPD among farmers in the Agricultural Health Study. During a 2005-2010 interview, farmers self-reported information about: their operations (i.e., size, type, number of animals, insecticide use), respiratory symptoms, and COPD diagnoses (i.e., COPD, chronic bronchitis, emphysema). Operations were classified as small or medium/large based on regulatory definitions. Farmers were classified as having a COPD diagnosis, chronic bronchitis symptoms (cough and phlegm for ≥ 3 months during 2 consecutive years), or both. Polytomous logistic regression was used to estimate odds ratios (OR) and 95% confidence intervals (CI). Of 22,491 participating farmers (median age: 59 years), 922 (4%) reported a COPD diagnosis only, 254 (1%) reported a diagnosis and symptoms, and 962 (4%) reported symptoms only. Compared to raising no commercial animals, raising animals on a medium/large operation was positively associated with chronic bronchitis symptoms with (OR: 1.59; 95% CI: 1.16, 2.18) and without a diagnosis (OR: 1.69; 95% CI: 1.42, 2.01). Ever use of multiple organophosphates, carbaryl, lindane, and permethrin were positively associated with chronic bronchitis symptoms. Animal production work, including insecticide use, was positively associated with chronic bronchitis symptoms; but not consistently with COPD diagnosis alone. Our results support the need for further investigation into the role of animal production-related exposures in the aetiology of COPD and better respiratory protection for agricultural workers.

Authors: Rinsky JL, Richardson DB, Kreiss K, Nylander-French L, Beane Freeman LE, London SJ, Henneberger PK, Hoppin JA.

Full Source: Environment International. 2019 Apr 24; 127:764-772. doi: 10.1016/j.envint.2019.02.049. [Epub ahead of print]

In the present study, the authors estimated associations between animal production activities and prevalence of self-reported COPD among farmers in the Agricultural Health Study.

Toxicogenomics - What added Value Do These Approaches Provide for Carcinogen Risk Assessment?

2019-06-16

It is still a major challenge to protect humans at workplaces and in the environment. To cope with this task, it is a prerequisite to obtain detailed information on the extent of chemical perturbations of biological pathways, in particular, adaptive vs. adverse effects and the dose-response relationships. This knowledge serves as the basis for the classification of non-carcinogens and carcinogens and for further distinguishing carcinogens in genotoxic (DNA damaging) or non-genotoxic compounds. Basing on quantitative dose-response relationships, points of departures can be derived for chemical risk assessment. In recent years, new methods have shown their capability to support the established rodent models of carcinogenicity testing. In vitro high throughput screening assays assess more comprehensively cell response. In addition, omics technologies were applied to study the mode of action of chemicals whereby the term "toxicogenomics" comprises various technologies such as transcriptomics, epigenomics, or metabolomics. This review aims to summarise the current state of toxicogenomic approaches in risk science and to compare them with established ones. For example, measurement of global transcriptional changes generates meaningful information for toxicological risk assessment such as accurate classification of genotoxic/non-genotoxic carcinogens. Alteration in mRNA expression offers previously unknown insights in the mode of action and enables the definition of key events. Based on these, benchmark doses can be calculated for the transition from an adaptive to an adverse state. In this review, the author assesses the potential and challenges of transcriptomics and addresses the impact of other omics technologies on risk assessment in terms of hazard identification and dose-response assessment.

Author: Schmitz-Spanke S.

Full Source: Environmental Research. 2019 Mar 13; 173:157-164. doi: 10.1016/j.envres.2019.03.025. [Epub ahead of print]

Occupational exposure to solvents and lung function decline: A population-based study

2019-06-16

While cross-sectional studies have shown associations between certain occupational exposures and lower levels of lung function, there was little evidence from population-based studies with repeated lung function measurements. In this study, the authors aimed to investigate

In this study, the authors aimed to investigate the associations between occupational exposures and longitudinal lung function decline in the population-based Tasmanian Longitudinal Health Study.

the associations between occupational exposures and longitudinal lung function decline in the population-based Tasmanian Longitudinal Health Study. Lung function decline between ages 45 years and 50 years was assessed using data from 767 participants. Using lifetime work history calendars completed at age 45 years, exposures were assigned according to the ALOHA plus Job Exposure Matrix. Occupational exposures were defined as ever exposed and cumulative exposure -unit- years. The authors investigated effect modification by sex, smoking and asthma status. Compared with those without exposure, ever exposures to aromatic solvents and metals were associated with a greater decline in FEV1 (aromatic solvents 15.5 mL/year (95% CI -24.8 to 6.3); metals 11.3 mL/year (95% CI -21.9 to - 0.7)) and FVC (aromatic solvents 14.1 mL/year 95% CI -28.8 to - 0.7; metals 17.5 mL/year (95% CI -34.3 to - 0.8)). Cumulative exposure (unit years) to aromatic solvents was also associated with greater decline in FEV1 and FVC. Women had lower cumulative exposure years to aromatic solvents than men (mean (SD) 9.6 (15.5) vs 16.6 (14.6)), but greater lung function decline than men. An association was also found between ever exposures to gases/fumes or mineral dust and greater decline in lung function. Exposures to aromatic solvents and metals were associated with greater lung function decline. The effect of aromatic solvents was strongest in women. Preventive strategies should be implemented to reduce these exposures in the workplace.

Authors: Alif SM, Dharmage S, Benke G, Dennekamp M, Burgess J, Perret JL, Lodge C, Morrison S, Johns DP, Giles G, Gurrin L, Thomas PS, Hopper JL, Wood-Baker R, Thompson B, Feather I, Vermeulen R, Kromhout H, Jarvis D, Garcia Aymerich J, Walters EH, Abramson MJ, Matheson MC.

Full Source: Thorax. 2019 Apr 26. pii: thoraxjnl-2018-212267. doi: 10.1136/thoraxjnl-2018-212267. [Epub ahead of print]

During the present study, the authors examined the exposure to PM smaller 10 μ m (PM10) from short to longer duration and their associations with levels of inflammatory markers in the population-based CoLaus cohort in Lausanne, Switzerland.

PUBLIC HEALTH RESEARCH

Effects of short- and long-term exposures to particulate matter on inflammatory marker levels in the general population

2019-06-16

The effect of particulate matter (PM) on health increases with exposure duration but the change from short to longer term is not well studied. During the present study, the authors examined the exposure to PM smaller 10 μ m (PM10) from short to longer duration and their associations with levels of inflammatory markers in the population-based CoLaus

cohort in Lausanne, Switzerland. Baseline and follow-up CoLaus data were used to study the associations between PM₁₀ exposure and inflammatory markers, including the high-sensitivity C-reactive protein (CRP), as well as interleukin 1-beta (IL-1 β), interleukin 6 (IL-6), and tumour-necrosis-factor alpha (TNF- α) using mixed models. Exposure was determined for each participant's home address from hourly air quality simulations at a 5-m resolution. Short-term exposure intervals were 1 day, 1 week, and 1 month prior to the hospital visit (blood withdrawal); long-term exposure intervals were 3 and 6 months prior to the visit. In most time windows, IL-6, IL-1 β , and TNF- α were positively associated with PM₁₀. No significant associations were identified for CRP. Adjusted associations with long-term exposures were stronger and more significant than those for short-term exposures. In stratified models, gender, age, smoking status, and hypertension only led to small modifications in effect estimates, though a few of the estimates for IL-6 and TNF- α became non-significant. In this general adult cohort exposed to relatively low average PM₁₀ levels, clear associations with markers of systemic inflammation were observed. Longer duration of elevated exposure was associated with an exacerbated inflammatory response. This may partially explain the elevated disease risk observed with chronic PM₁₀ exposure. It also suggests that reducing prolonged episodes of high PM exposure may be a strategy to reduce inflammatory risk.

Authors: Tsai DH, Riediker M, Berchet A, Paccaud F, Waeber G, Vollenweider P, Bochud M.

Full Source: Environmental Science & Pollution Research International. 2019 May 12. doi: 10.1007/s11356-019-05194-y. [Epub ahead of print]

Carcinogenicity assessment: Addressing the challenges of cancer and chemicals in the environment

2019-06-16

Cancer is a key public health concern, being the second leading cause of worldwide morbidity and mortality after cardiovascular diseases. At the global level, cancer prevalence, incidence and mortality rates are increasing. These trends are not fully explained by a growing and ageing population: with marked regional and socioeconomic disparities, lifestyle factors, the resources dedicated to preventive medicine, and the occupational and environmental control of hazardous chemicals all playing a role. While it is difficult to establish the contribution of chemical exposure to the societal burden of cancer, a number of measures can be taken to better assess the carcinogenic properties of chemicals and manage their risks. This paper discusses how these measures can be

informed not only by the traditional data streams of regulatory toxicology, but also by using new toxicological assessment methods, along with indicators of public health status based on biomonitoring. These diverse evidence streams have the potential to form the basis of an integrated and more effective approach to cancer prevention.

Authors: Madia F, Worth A, Whelan M, Corvi R.

Full Source: Environment International. 2019 Jul; 128:417-429. doi: 10.1016/j.envint.2019.04.067. Epub 2019 May 9.

Environmental mercury exposure and selenium-associated biomarkers of antioxidant status at molecular and biochemical level. A short-term intervention study

2019-06-16

Mercury (Hg) is a potent toxicant. In the field of public health, a chronic-low-level environmental Hg exposure resulting from fish consumption in general population is still being discussed. The objective of the study was to assess the influence of real Hg exposure on biomarkers of selenium (Se) status and selected biomarkers of pro-oxidant/anti-oxidant effects in healthy men (n = 67) who participated in the short-term intervention study consisting in daily fish consumption for two weeks. The analysis included Se level, Se-associated antioxidants at molecular (profile of 7 genes encoding selected proteins related to antioxidant defence) and biochemical levels (Se-dependent glutathione peroxidases activities and plasma selenoprotein P concentration). A pro-oxidant/anti-oxidant balance was explored using a biomarker of plasma lipid peroxidation and total antioxidant activity. The study revealed significant correlations ($p < 0.05$) between the biomarkers of exposure to Hg, Se level and Se-dependent antioxidants. Even though the risk of adverse effects of Hg for volunteers was substantially low, biomarkers of Hg altered levels of circulation selenoproteins and their genes expression. Changes in genes expression during study differed between the main enzymes involved in two systems: downregulation of thioredoxin reductase1 and upregulation of glutathione peroxidases. Hg exposure caused imbalance between the biomarkers of pro-oxidant/anti-oxidant effects.

Authors: Kuras R, Kozłowska L, Reszka E, Wiczorek E, Jabłonska E, Gromadzinska J, Stanisławska M, Janasik B, Wasowicz W.

Full Source: Food Chemistry & Toxicology. 2019 Aug; 130:187-198. doi: 10.1016/j.fct.2019.04.056. Epub 2019 May 10.

The objective of the study was to assess the influence of real Hg exposure on biomarkers of selenium (Se) status and selected biomarkers of pro-oxidant/anti-oxidant effects in healthy men (n = 67) who participated in the short-term intervention study consisting in daily fish consumption for two weeks.

Associations of residential greenness, traffic noise, and air pollution with birth outcomes across Alpine areas

2019-06-16

This explorative study aimed to investigate the association of residential greenness, traffic noise, and air pollution with birth outcomes in several Alpine areas with unique topography. The authors used data from two cross-sectional studies (UIT, $n = 573$ and BBT, $n = 518$) in the Tyrol Region (Austria/Italy). Only mothers who had lived in their current residence during the whole pregnancy were included. They completed a questionnaire, and medical records were used to draw data on birth weight, low birth weight (LBW), preterm birth, and small for gestational age (SGA). Normalised Difference Vegetation Index (NDVI) in the year of birth was assigned at the residential address as a measure of greenness. Road/railway traffic noise (Ldn) and air pollution (NO₂) were calculated about 10 years after birth and used as surrogates for exposure levels during pregnancy. In the UIT survey, higher NDVI500-m was consistently associated with lower odds for LBW and SGA, while an increase of Ldn was associated with higher odds for LBW. Other effect estimates were in the expected direction albeit non-significant. In the BBT survey, most findings were inconclusive (for NDVI) or present only in subgroups (for Ldn and NO₂). This study provides inconclusive evidence that the surrounding environment might be associated with birth outcomes in mountainous areas. Given the disparate associations across the study areas, further research in larger representative samples is warranted.

Authors: Dzhambov AM, Markevych I, Lercher P.

Full Source: Science of the Total Environment. 2019 Aug 15; 678:399-408. doi: 10.1016/j.scitotenv.2019.05.019. Epub 2019 May 3.

This explorative study aimed to investigate the association of residential greenness, traffic noise, and air pollution with birth outcomes in several Alpine areas with unique topography.

Ozone in urban China: Impact on mortalities and approaches for establishing indoor guideline concentrations

2019-06-16

Reducing indoor ozone levels may be an effective strategy to reduce total exposure and associated mortality. In the present study, the authors estimate (a) premature mortalities attributable to ozone for China's urban population ≥ 25 years of age; (b) the fraction of total exposure occurring indoors; and (c) mortalities that can be potentially avoided through meeting current and more stringent indoor ozone standards/guidelines based on 1-hour daily maxima. To estimate ozone-attributable premature mortalities, the hourly outdoor ozone concentrations measured

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at 1497 monitoring stations located in 339 Chinese cities was used and a published concentration-response model. The authors proceeded to estimate province-specific infiltration factors and co-occurring hourly indoor ozone concentrations. For the year 2015, we estimated that indoor exposures accounted for 59% (95% confidence interval (CI): 26%-79%) of the total ozone exposure that resulted in 70800 (95% CI: 35 900-137 700) premature all-cause mortalities in urban China. If the current Chinese indoor ozone standards (80 ppbv (160 $\mu\text{g}/\text{m}^3$); 56 ppbv (112 $\mu\text{g}/\text{m}^3$)) were met, the mean estimates of reduction in mortalities would be indistinguishable from zero. With stricter 1-hour indoor ozone guidelines, the expected mortality reductions increase exponentially per unit decrease in indoor ozone. The analysis in this paper should help facilitate formulating present and future indoor ozone guidelines.

Authors: Xiang J, Weschler CJ, Zhang J, Zhang L, Sun Z, Duan X, Zhang Y.

Full Source: Indoor Air. 2019 Jul;29(4):604-615. doi: 10.1111/ina.12565.

Epub 2019 Jun 5.