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CHEMWATCH

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### ENVIRONMENTAL RESEARCH

#### Volatile compounds released by microalgae-water phase from Taihu Lake in China

2019-08-19

The spectrum of Volatile Organic Compounds (VOCs) released by the microalgae-water phase of Taihu Lake in China was examined, then release behaviours were studied using non-methane hydrocarbons (NMHC, including a few polar organics) to describe the total amount of the released VOCs. Coupled dynamic headspace sampling with on-line monitoring of methane and NMHC was used to reflect the quasi-realtime release behaviour of methane and NMHC by the microalgae-water phase. Alkanes, alkenes, oxygenated VOCs (OVOCs) and volatile sulfide chemicals (VOSCs) were detected. Their relative contents over time varied markedly from the stationary to the apoptosis phase, with their release rates as described by NMHC estimated from 0.02 to 0.59  $\mu\text{gC}/(\text{h g})$ . Methane was investigated simultaneously, and its release rate was found to be 0.05-3.96  $\mu\text{gC}/(\text{h g})$ . The release rates of both NMHC and methane were found to relate to the culture phase of the microalgae.

Authors: Yu YJ, Li CY, Shen W, Wang Z, Xu PQ, Yu HX.

Full Source: Harmful Algae. 2019 Apr; 84:56-63. doi: 10.1016/j.hal.2019.01.009. Epub 2019 Mar 17.

#### Ecotoxicological QSAR modelling of organic compounds against fish: Application of fragment-based descriptors in feature analysis

2019-08-19

Organic compounds (OCs) constitute an enormously large class of highly persistent and toxic chemicals widely used for various purposes throughout the world. Their increased detection in water bodies, mainly sewage treatment plants via industrial discharge, has rendered them to become a cause for ecological concern. The limited availability of experimental toxicological data has necessitated development of models that can help us identify the most hazardous and potentially toxic compounds thus prioritising the experiments on the selected chemicals. Computational tools such as quantitative structure-activity relationship (QSAR) can be used to predict the missing data and classify the chemicals based on their acute predicted responses for existing as well as not yet synthesised chemicals. In the current study, novel, externally validated, highly robust local QSAR models for different chemical classes and

The spectrum of Volatile Organic Compounds (VOCs) released by the microalgae-water phase of Taihu Lake in China was examined, then release behaviours were studied using non-methane hydrocarbons (NMHC, including a few polar organics) to describe the total amount of the released VOCs.

moderately robust global QSAR models were developed using partial least squares (PLS) regression technique using a large dataset of 1121 OCs for the fish mortality endpoint. For feature selection, genetic algorithm along with stepwise regression was used while model validation was performed using various stringent validation criteria following the strict rules of OECD guidelines of QSAR validation. The variables included in the models were obtained from simplex representation of molecular structures (SiRMS) (Version 4.1.2.270), Dragon (Version 7.0) and PaDEL-descriptor software (Version 2.20). The final developed models were robust, externally predictive and characterized by a large chemical as well as biological domain. The predictive efficiency of the developed models was then compared with the ECOSAR tool in order to justify the applicability of the developed models in ecotoxicological predictions for organic chemicals. Better predictive efficiency of the developed QSAR models compared to the ECOSAR derived predictions signifies their applicability in early risk assessment of known as well as untested chemicals in order to design safer alternatives to the environment.

Authors: Khan K, Baderna D, Cappelli C, Toma C, Lombardo A, Roy K, Benfenati E.

Full Source: *Aquatic Toxicology*. 2019 Jul; 212:162-174. doi: 10.1016/j.aquatox.2019.05.011. Epub 2019 May 17.

### Nisin Production by *Enterococcus hirae* DF105Mi Isolated from Brazilian Goat Milk

2019-08-19

The purpose of this study was to select the promising biopreservation bacteriocin producer strain from goat milk and characterise the expressed bacteriocin, related to its physiological and biochemical properties and specificity of operon encoding production and expression of antimicrobial peptide. Brazilian goat milk was used as the source for the selection of bacteriocin-producing lactic acid bacteria. One strain (DF105Mi) stood out for its strong activity against several *Listeria monocytogenes* strains. Selected strain was identified based on the biochemical and physiological characteristics and 16s rRNA analysis. The bacteriocin production and inhibitory spectrum of strain DF105Mi were studied, together with the evaluation of the effect of temperature, pH, and chemicals on bacteriocin stability and production, activity, and adsorption to target cells as well as to the cell surface of bacteriocin producers. Physiological and bio-molecular analyses based on targeting of different genes, parts of nisin operon were performed in order to investigate the hypothesis that the studied strain can produce and express nisin. Based on biochemical,

The purpose of this study was to select the promising biopreservation bacteriocin producer strain from goat milk and characterise the expressed bacteriocin, related to its physiological and biochemical properties and specificity of operon encoding production and expression of antimicrobial peptide.

physiological, and 16s rRNA analysis, the strain DF105Mi was classified as *Enterococcus hirae*. The selected strain produces a bacteriocin which is stable in a wide range of pH (2.0-12.0), temperature (up to 120 C), presence of selected chemicals and presents adsorption affinity to different test organisms, process influenced by environmental conditions. Higher bacteriocin production by *Ent. hirae* DF105Mi was recorded during stationary growth phase, but only when the strain was cultured at 37°C. The strain's genetic analysis indicated presence of the genes coding for the production of the bacteriocin nisin. This result was confirmed by cross-checking the sensitivity of the produced strain to commercial nisin A. The strong anti-*Listeria* activity, bacteriocin adsorption, and stability of produced bacteriocin indicate that *Ent. hirae* DF105Mi presents a differentiated potential application for biopreservation of fermented dairy products.

Authors: Furtado DN, Favaro L, Nero LA, de Melo Franco BDG, Todorov SD.

Full Source: Probiotics and Antimicrobial Proteins. 2019 May 23. doi: 10.1007/s12602-019-09553-6.[Epub ahead of print]

### Analysis of chemical constituents in mainstream bidi smoke

2019-08-19

Bidi, an indigenous form of cigarette in South Asian countries, is popular because of its low cost and multi-flavored variants. Although recent studies have shown that bidi smokers suffer from various adverse health effects including cancer, research on bidi smoke composition and exposure levels is still very limited. In this research, the vapor and particulate phases of bidi were characterised using gas chromatography coupled with mass spectrometry (GC-MS) and Fourier-transform infrared spectrometry (FTIR). The amounts of nicotine, cotinine, indole, substituted phenols, substituted pyridines, and phytol found in different size fractions of the particulate matter collected using a cascade impactor were reported. Due to the low combustibility of the tendu leaf in bidi, a six-second puff interval was used to sample the smoke constituents for analysis. Significant levels of carbon monoxide, hydrogen cyanide, and hydrocarbons like ethylene, methane and 1, 3-butadiene were detected in the mainstream bidi smoke. In addition, 3-methylpyridine, cotinine,  $\alpha$ -amyrin, and  $\beta$ -amyrin were also present at high levels in bidi smoke. Despite having less tobacco compared to conventional cigarette, bidi smokers are potentially exposed to significantly higher concentrations of nicotine due to the greater puffing frequency. The non-porous nature and higher moisture content of tendu leaf in bidis compared to cigarette wrapping paper led to higher levels of carbon monoxide and tar in bidi

In this research, the vapor and particulate phases of bidi were characterised using gas chromatography coupled with mass spectrometry (GC-MS) and Fourier-transform infrared spectrometry (FTIR).

smoke compared to regular cigarette smoke. Results of this study indicate the presence of harmful and carcinogenic chemicals in the mainstream bidi smoke that could be harmful to human health.

Authors: Oladipupo OA, Dutta D, Chong NS.

Full Source: BMC Chemistry. 2019 Jul 22;13(1):93. doi: 10.1186/s13065-019-0614-7. eCollection 2019 Dec.

### Environmental impact assessment model for substitution of hazardous substances by using life cycle approach

2019-08-19

Regulations that are indirectly driving the substitution of hazardous chemicals, such as the EU REACH regulation, necessitate improvements in chemical alternatives assessment frameworks. In those frameworks, life cycle thinking lacks some important aspects such as systematic and quantitative occupational safety methods and risks from intermediate chemicals that are not released to the environment under normal operating conditions. Concerns of companies about regulatory drivers regarding substances of very high concern often lead to inadequate evaluation of the baseline situation; an issue also overlooked by the frameworks. Moreover, life cycle assessment is optional for assessors with limited resources, such as small and medium enterprises. However, the success of substitution should not be evaluated without life cycle concerns. An environmental impact assessment model has been suggested to overcome these shortcomings of the chemical alternatives assessment frameworks. The model was applied to a case study of primed metal sheet production, where the company was driven to substitute reprotoxic 2-methoxypropanol used in their formulations. The results show that the proposed model is promising for solving the mentioned shortcomings, informing the assessor about substances of very high concern along the life cycle, and it has the potential to be further improved with the help of supporting software and databases. Particularly, in the occupational safety area that concerns risks of accidents at work, improvements to the EU occupational health database can drastically increase the accuracy of the assessments. Besides, the development of methodologies for the quantification of the impacts of reprotoxic, bioaccumulative and endocrine disruptor substances is necessary.

Authors: Oguzcan S, Dvarioniene J, Tugnoli A, Kruopiene J.

Full Source: Environmental Pollution. 2019 Jul 26;254(Pt A):112945. doi: 10.1016/j.envpol.2019.07.113. [Epub ahead of print]

### MEDICAL RESEARCH

#### Cost and Utilisation Outcomes After Exclusion of Dipeptidyl Peptidase-4 Inhibitors and Other Diabetes Drug Category Changes in a Self-Funded, State Employee Managed Care Plan

2019-08-19

Dipeptidyl peptidase-4 (DPP-4) inhibitors have repeatedly shown no reduction in the clinical outcomes of cardiovascular death, myocardial infarction, stroke, or all-cause mortality. Because the treatment of diabetes is generally one of the top drug categories by cost to health plans and self-funded employers, it is necessary to evaluate coverage of DPP-4 inhibitors, considering their lack of cardiovascular benefit relative to other treatment options. This study described the cost and utilisation outcomes of drugs used to treat diabetes after exclusion of DPP-4 inhibitors in a self-funded managed care plan. This study was a retrospective, descriptive analysis of the cost and utilisation outcomes after exclusion of DPP-4 inhibitors. Pharmacy claims data and plan membership were analysed 6 months before DPP-4 inhibitor exclusion (pre-period: December 1, 2016-May 31, 2017) and 6 months after DPP-4 inhibitor coverage ended for all users (post-period: September 1, 2017-February 28, 2018). The allowed amount, which is not influenced by overlapping plan co-pay changes, and utilisation per member per month (PMPM) were used to estimate the effect of the DPP-4 inhibitor benefit exclusion on plan costs for the antidiabetic class. From pre-period to post-period, all DPP-4 inhibitor products decreased in utilisation by 3.02 claims per 1,000 members per month (PTMPM). Glucagon-like peptide-1 receptor agonists, insulins, sodium-glucose cotransporter-2 inhibitors, and thiazolidinedione claims increased by 0.72, 0.43, 0.30, and 0.48 claims PTMPM, respectively, but there was an absolute decrease of 1.35 claims for antidiabetic medications per 1,000 plan members. However, the days supplied PMPM increased from 2.55 to 2.61 (2.3%) days. Allowed amount PMPM increased by \$0.27 from \$12.19 in the pre-period to \$12.31 in the post-period (2.2%). However, it is estimated that drug cost inflation accounted for over half of the PMPM increase in allowed costs. The observed increase in the allowed amount PMPM was attributable in similar amounts by an increase in utilisation of medications with higher cost per day supplied and higher drug prices. Future research will evaluate patient-level effects

This study described the cost and utilisation outcomes of drugs used to treat diabetes after exclusion of DPP-4 inhibitors in a self-funded managed care plan.

of this benefit change in terms of antidiabetic medication utilisation and outcomes.

Authors: King J, McAdam-Marx C, McCaleb R, Davis D, Bemberg GB, Johnson JT.

Full Source: Journal of Managed Care & Specialty Pharmacy. 2019 Jun;25(6):646-651. doi: 10.18553/jmcp.2019.25.6.646.

### LC-UV-MS and MS/MS Characterise Glutathione Reactivity with Different Isomers (2,2' and 2,4' vs. 4,4') of Methylene Diphenyl-Diisocyanate

2019-08-19

Methylene diphenyl diisocyanate (MDI), the most abundantly produced diisocyanate worldwide, is among the best recognised chemical causes of occupational asthma. The bulk of synthesized MDI, the 4,4' isomer, has been the focus of most biochemical research to date. The biological reactivity of other MDI isomers (2,2' and 2,4'), present at concentrations approaching 50% in some commercial products, remains less clear. In this study, the authors hypothesised 2,2' and 2,4' MDI react with glutathione (GSH), a major anti-oxidant of the lower airways, similarly to 4,4' MDI, and that the products could be characterised using a combination of LC-UV-MS and MS/MS. Purified 2,2' and 2,4' MDI isomers were mixed with GSH in pH-buffered aqueous phase at 37°C and reaction products were analysed at varying time points. Within minutes, S-linked bis(GSH)-MDI conjugates were detectable as the dominant  $[M+H]^+$  ion, with an 865.25 m/z and more intense  $[M+2H]^{2+}$  ions of the same nominal mass. Upon longer reaction,  $[M+H]^+$  ions with greater retention times and the 558.17 m/z expected for mono(GSH)-MDI reaction products were observed, and exhibited MS/MS collision-induced dissociation (CID)-fragmentation patterns consistent with cyclised structures. Compared with 4,4' MDI, 2,2' and 2,4' isomers exhibit similar rapid reactivity with GSH and formation of bis(GSH)-MDI conjugates, but greater formation of cyclised mono(GSH) conjugates following extended reaction times (10 minutes to 2 hours). Further translational studies will be required to determine if the present in vitro findings extend to the complex lower airway microenvironment in vivo.

Authors: Wisnewski AV, Liu J, Nassar AF.

Full Source: EC Pharmacology and Toxicology. 2019 Mar;7(3):205-219.

In this study, the authors hypothesised 2,2' and 2,4' MDI react with glutathione (GSH), a major anti-oxidant of the lower airways, similarly to 4,4' MDI, and that the products could be characterised using a combination of LC-UV-MS and MS/MS.

### Androgenic/antiandrogenic activities of PAEs determined by a novel AR-mediated reporter gene assay based on LLC-MK2 cells

2019-08-19

Recent reports have concentrated on some androgens/antiandrogens and confirmed that certain chemicals have demonstrated androgenic/antiandrogenic activities in vitro. However, it is still unknown whether more chemicals in the human environment possess endocrine toxicity. A novel AR-mediated reporter gene assay based on LLC-MK2 cells was established by transiently co-transfecting with pARE-sv40-Luc, hAR-pcDNA3.1 and pRL-tk. pARE-sv40-Luc was constructed using a pGL3-promoter plasmid with three repeated androgen responsive elements. hAR-pcDNA3.1 was constructed using pcDNA3.1 with a hAR sequence. After transfection for 12 h, the culture medium was exposed to various concentrations of dihydrotestosterone (DHT) and other test chemicals (phthalic acid esters and dexamethasone) in order to measure the androgenic/antiandrogenic activity. The assay possessed a concentration-dependent response to DHT from  $10^{-12}$  M to  $10^{-6}$  M. Nilutamide concentrations of over  $10^{-7}$  M completely blocked the luciferase expression induced by  $10^{-9}$  M DHT. Other data showed that DBP, DEHP and MEHP possessed weak androgenic activity for certain concentration ranges, while DMP, DINP and DIBP did not show any androgenic activity. Moreover, five PAEs (DBP, DEHP, DINP, DIBP and MEHP) showed corresponding antiandrogenic activities for certain concentrations with an approximate tendency (MEHP > DBP > DEHP > DIBP > DINP). The assay is high-throughput, specific, and sensitive for the detection of androgenic/antiandrogenic chemicals. In addition, PAEs (especially transitional PAEs) exhibited corresponding androgenic/antiandrogenic activities for certain concentration ranges.

Authors: Ma X, Yang J, Jia H, Li X, Wang D, Fu H, Yuan J, Li Y, Zheng G, Huang X.

Full Source: Toxicology Research. 2019 Mar 21;8(4):522-530. doi: 10.1039/c9tx00008a. eCollection 2019 Jul 1.

### A Tri-fusion Reporter Mouse Reveals Tissue-Specific FGF1B Promoter Activity in vivo

2019-08-19

Transgenic mice harbouring imaging reporters take full advantage of imaging technologies in studies using living mice. In the present study, the authors established a tri-fusion multimodal reporter gene containing

Recent reports have concentrated on some androgens/antiandrogens and confirmed that certain chemicals have demonstrated androgenic/antiandrogenic activities in vitro.

fragments from firefly luciferase, enhanced green fluorescent protein, and herpes simplex virus type 1 thymidine kinase and generated tri-fusion reporter Tg mice. Fibroblast growth factor type 1 (FGF1), a multifunctional mitogen to a wide range of tissues, regulates proliferation of neural stem cells of the brain, where FGF1 expression is initiated through activation of the FGF1B (F1B) promoter. The reporter mouse under the control of the human F1B promoter enables visualization *in vivo* where F1B activity is elevated, including tissues not only in the brain but also in the nasopharynx, skull, spine, and testes, particularly in Leydig cells. Treating Tg mice with the alkylating agent busulfan, which is known to eradicate Leydig cells and disrupt spermatogenesis in mice, eliminated the reporter signals. Restoring Leydig cells recovered reporter expression, indicating that the reporter can be used as a surrogate marker for Leydig cells. The F1B tri-fusion reporter mouse model can be utilised in longitudinal monitoring of the health status of the male reproductive system, such as in studies exploring the toxicity of chemicals to spermatogenesis.

Authors: Liu SW, Hsu CH, Chen MR, Chiu IM, Lin KM.

Full Source: Science Reports. 2019 Jul 31;9(1):11143. doi: 10.1038/s41598-019-47641-3.

### Bisphenol AF compromises blood-testis barrier integrity and sperm quality in mice

2019-08-19

The profound influence of environmental chemicals on human health including inducing life-threatening gene mutation has been publicly recognised. Being a substitute for the extensively used endocrine-disrupting chemical BPA, Bisphenol AF (BPAF) has been known as teratogen with developmental toxicities and therefore potentially putting human into the risk of biological hazards. In this study, the authors deciphered the detrimental effects of BPAF on spermatogenesis and spermiotiliosis in sexual maturity of mice exposing to BPAF (5, 20, 50 mg/kg/d) for consecutive 28 days. BPAF exposure significantly compromises blood-testis barrier integrity and sperm quantity and quality in a dose-dependent manner. Sperms from BPAF exposure mice are featured by severe DNA damage, altered SUMOylation and ubiquitination dynamics and interfered epigenetic inheritance with hypermethylation of H3K27me3 presumably due to the aggregation of cellular reactive oxygen species (ROS). Furthermore, BPAF treatment (50  $\mu$ M for 24 h) compromises cytoskeleton architecture and tight junction permeability in primary cultured Sertoli cells evidenced by dysfunction of actin regulatory proteins (e.g. Arp3 and Palladin) via activation of ERK signalling, thereby

In this study, the authors deciphered the detrimental effects of BPAF on spermatogenesis and spermiotiliosis in sexual maturity of mice exposing to BPAF (5, 20, 50 mg/kg/d) for consecutive 28 days.

perturbing the privilege microenvironment created by Sertoli cells for spermatogenesis. Overall, this study determines BPAF is deleterious for male fertility, leading to a better appreciation of its toxicological features in our life.

Authors: Wu D, Huang CJ, Jiao XF, Ding ZM, Zhang SX, Miao YL, Huo LJ.  
Full Source: Chemosphere. 2019 Jul 20; 237:124410. doi: 10.1016/j.chemosphere.2019.124410. [Epub ahead of print]

## OCCUPATIONAL HEALTH RESEARCH

### Serum cholesterol levels preceding to suicide death in Japanese workers: A nested case-control study

2019-08-19

In this study, the authors investigated the association between suicide death and serum cholesterol levels as measured at times close to suicide death. A nested case-control study was conducted of 41 cases of suicide deaths and 205 matched controls with serum total cholesterol (TC) levels till three years before suicide death in a large cohort of Japanese workers. Individuals in the lowest vs. highest tertile/predefined category of TC in a Japanese working population had a three- to four-fold greater risk of suicide death. Each 10 mg/dL decrement of average TC was associated with an 18% increased chance of suicide death (95% confidence interval, 2-35%). Similar results were found for TC levels at each year. These results suggest that a low serum TC level in recent past is associated with an increased risk of suicide death.

Authors: Chen S, Mizoue T, Hu H, Kuwahara K, Honda T, Yamamoto S, Nakagawa T, Miyamoto T, Okazaki H, Shimizu M, Murakami T, Eguchi M, Kochi T, Yamamoto M, Ogasawara T, Sasaki N, Uehara A, Imai T, Nishihara A, Hori A, Nagahama S, Tomita K, Konishi M, Kabe I, Dohi S; Japan Epidemiology Collaboration on Occupational Health Study Group.

### Biological and environmental exposure monitoring of volatile organic compounds among nail technicians in the Greater Boston area

2019-08-19

Nail technicians are exposed to volatile organic compounds (VOCs) from nail products, but no studies have previously measured VOC biomarkers for these workers. This study of 10 nail technicians aimed to identify VOCs in nail salons and explore relationships between air concentrations and biomarkers. Personal and area air samples were collected using

In this study, the authors investigated the association between suicide death and serum cholesterol levels as measured at times close to suicide death.

thermal desorption tubes during a work shift and analysed using gas chromatography/mass spectrometry (GC/MS) for 71 VOCs. Whole blood samples were collected pre-shift and post-shift, and analysed using GC/MS for 43 VOCs. Ventilation rates were determined using continuous CO<sub>2</sub> measurements. Predominant air VOC levels were ethyl methacrylate (median 240 µg/m<sup>3</sup>), methyl methacrylate (median 205 µg/m<sup>3</sup>), toluene (median 100 µg/m<sup>3</sup>), and ethyl acetate (median 639 µg/m<sup>3</sup>). Blood levels were significantly higher post-shift than pre-shift for toluene (median pre-shift 0.158 µg/L and post-shift 0.360 µg/L) and ethyl acetate (median pre-shift <0.158 µg/L and post-shift 0.510 µg/L); methacrylates were not measured in blood because of their instability. Based on VOCs measured in these seven nail salons, the authors estimated that emissions from Greater Boston area nail salons may contribute to ambient VOCs. Ventilation rates did not always meet the ASHRAE guideline for nail salons. There is a need for changes in nail product formulation and better ventilation to reduce VOC occupational exposures.

Authors: Ceballos DM, Craig J, Fu X, Jia C, Chambers D, Chu MT, Fernandez AT, Fruh V, Petropoulos ZE, Allen JG, Vallarino J, Thornburg L, Webster TF.  
Full Source: Indoor Air. 2019 Jul;29(4):539-550. doi: 10.1111/ina.12564.  
Epub 2019 May 21.

### Health risk in transport workers. Part II. Dietary compounds as modulators of occupational exposure to chemicals

2019-08-19

Professional drivers are exposed to a number of factors that have a negative influence on their health status. These include vibrations, noise, the lack of fresh air in the car cabin, shift work (frequently at night), monotony resulting from permanent repetition of certain actions, static loads due to immobilisation in a sitting position, stress resulting from the need to ensure safety in heavy traffic, as well as air pollution (dust, volatile organic substances, nitrogen and sulfur oxides, polycyclic aromatic hydrocarbons, heavy metals, dioxins, furans and others). Factors associated with the specificity of the profession of a driver, including exposure to chemical substances, result in an increased risk of the development of many diseases, i.e., obesity, diabetes, heart disease, hypertension, extensive genitourinary pathology experienced by taxi drivers, lung cancer and other forms of cancer. In the case of drivers, especially those covering long distances, there are also actual difficulties related to ensuring a proper diet. Although attempts at interventional research that would change the principles of nutrition, as well as ensure physical activity and weight reduction, have been made, their results have not

been satisfactory. This study focuses on the discussion on the role of a diet and dietary phytochemicals in the prevention of adverse health effects of such chemicals as a mix of chemicals in the polluted air, benzo(a)pyrene, benzene and metals (lead, cadmium, chromium, nickel), which are the main sources of exposure in the case of transport workers.

Authors: Kozłowska L, Gromadzińska J, Wąsowicz W.

Full Source: International Journal of Occupational Medicine & Environmental Health. 2019 Jul 15;32(4):441-464. doi: 10.13075/ijomh.1896.01434. Epub 2019 May 8.

### Semi-quantitative health risk assessment of exposure to chemicals in an aluminium rolling mill

2019-08-19

The main goal of this study was to evaluate the health risks resulting from occupational exposure to chemicals in an aluminium rolling mill to propose effective control measures. Exposure of workers to chemicals was assessed based on the Singapore Health Department's methodology. The health risks of exposure to the identified chemicals and the relative risk of developing cancer due to exposure to benzene were assessed. According to the results, the risk level of exposure to sulfuric acid in the washing line and to manganese in the manufacturing unit were high. In assessing the risk of developing cancer arising from benzene exposure, the lifetime cancer risk was found in the range 10<sup>-4</sup>-10<sup>-6</sup> (the possible range). The results indicated that in the aluminium rolling industry, occupational exposure to 75% of the chemicals had a low risk level, 15% had a moderate risk level and 10% had a high-risk level.

Authors: Sanjari A, Saeedi R, Khaloo SS.

Full Source: International Journal of Occupational Safety & Ergonomic. 2019 Jul 24;1-8. doi: 10.1080/10803548.2019.1617459. [Epub ahead of print]

The main goal of this study was to evaluate the health risks resulting from occupational exposure to chemicals in an aluminium rolling mill to propose effective control measures.

### Agricultural Exposures and Breast Cancer Among Latina in the San Joaquin Valley of California

2019-08-19

The aim of this study was to assess the role of agricultural work, pesticide exposure, and age at first farm labour exposure in breast cancer (BC) risk among Hispanic women in Central California. A BC case control study was conducted. Latina BC cases were identified through the California Cancer Registry and controls were recruited. Both cases and controls completed a detailed questionnaire. Pesticide exposure data were

obtained by linking the crops, work locations, and dates worked in specific farm jobs with the California Department of Pesticide Regulation (DPR) Pesticide Use Reports (PUR). Chemicals associated with BC risk included organophosphates, organochlorines, and a phthalimide, Captan. Age at first work in farm labour was younger in cases than controls ( $P=0.03$ ). The authors concluded that agricultural work may be associated with the increased BC risk in female Hispanic farm workers.

Authors: Mills PK, Dodge JL, Bush J, Thompson Y, Shah P.

Full Source: Journal of Occupational & Environmental Medicine. 2019 Jul;61(7):552-558. doi: 10.1097/JOM.0000000000001598.

## PUBLIC HEALTH RESEARCH

### Association between in utero perfluoroalkyl substance exposure and anti-Müllerian hormone levels in adolescent females in a British cohort

2019-08-19

Evidence indicates that in utero environmental exposures could influence reproduction in female offspring. Perfluoroalkyl substances (PFAS) are synthetic, ubiquitous endocrine disrupting chemicals that can cross the placental barrier. Lower levels of anti-Müllerian hormone (AMH), a biomarker of ovarian reserve, are associated with reduced fertility. In the present study, the authors investigated the association between in utero PFAS exposure and AMH levels in female adolescents using data from the Avon Longitudinal Study of Parents and Children, a British pregnancy cohort recruited between 1991 and 1992. Maternal serum samples were collected during pregnancy and analysed for concentrations of commonly found PFAS-perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), perfluorohexane sulfonate (PFHxS), and perfluorononanoic acid (PFNA). AMH levels were measured in serum of female offspring (mean age, 15.4 years) and log-transformed for analyses. A sample of 446 mother-daughter dyads were used for multivariable linear regression analyses, controlling for maternal age at delivery, pre-pregnancy body-mass index, and maternal education. Multiple imputation was utilised to impute missing values of AMH (61.2%) and covariates. Median PFAS concentrations (ng/mL) were as follows: PFOS 19.8 (IQR:15.1, 24.9), PFOA 3.7 (IQR: 2.8, 4.8), PFHxS 1.6 (IQR: 1.2, 2.2), PFNA 0.5 (IQR: 0.4, 0.7). The geometric mean AMH concentration was 3.9 ng/mL (95% CI: 3.8, 4.0). After controlling for confounders, mean differences in AMH per one ng/mL higher PFOA, PFOS, PFHxS, and PFNA were 3.6% (95% CI:

In the present study, the authors investigated the association between in utero PFAS exposure and AMH levels in female adolescents using data from the Avon Longitudinal Study of Parents and Children, a British pregnancy cohort

## Technical

### CHEMWATCH

1.4%, 8.6%), 0.7% (95% CI: 0.2%, 1.5%), 0.9% (95% CI: 0.4%, 2.2%), and 12.0% (95% CI: 42.8%, 66.8%) respectively. These findings suggest there is no association between in utero PFAS exposure and AMH levels in female adolescents.

Authors: Donley GM, Taylor E, Jeddy Z, Namulanda G, Hartman TJ.  
Full Source: Environmental Research. 2019 Jul 18; 177:108585. doi: 10.1016/j.envres.2019.108585. [Epub ahead of print]

### Occurrence, distribution and human exposure to 20 organophosphate esters in air, soil, pine needles, river water, and dust samples collected around an airport in New York state, United States

2019-08-19

Organophosphate esters (OPEs) are used in aircraft lubricating oil and hydraulic fluids, and, thus, airplane emissions are thought to be an important source of these chemicals in the environment. In this study, concentrations of 20 OPEs, comprising seven alkyl-OPEs, three chlorinated (Cl)-OPEs, seven aryl-OPEs, and three oligomeric-OPEs, were determined in outdoor air, soil, pine needles, river water, and outdoor dust samples collected around an airport in Albany, New York, in 2018. Elevated  $\Sigma$ OPE concentrations were found in outdoor air, soil, pine needles, outdoor dust, and river water in the ranges of 1320-20,700 pg/m<sup>3</sup> (median: 3880), 1.16-73.1 (14.3) ng/g dry weight (dw), 23.2-534 (102) ng/g (dw), 153-2140 (824) ng/g (dw), and 174-24,600 (1250) ng/L, respectively. The total OPE concentrations in air, soil, water, and outdoor dust samples in the study area were dominated by Cl-OPEs, whereas those in pine needles were dominated by aryl-OPEs. The spatial distribution of OPEs in air, soil, and pine needles showed a gradual decreasing trend with increasing distance from the airport. A significant correlation was observed between  $\Sigma$ OPE concentrations in air and soil, and the fugacity ratio showed the flux of OPEs from air to soil. The spatial distribution of OPEs between air and pine needles was similar and highly correlated, suggesting that pine needles are suitable indicators of atmospheric OPE concentrations. In addition to urban activities, aircraft hydraulic/lubricant oils are a major source of OPEs in the vicinity of the airport. The average daily intake of OPEs via air inhalation and outdoor dust ingestion in the vicinity of the airport was up to 1.53 ng/kg bw/day for children and 0.73 ng/kg bw/day for adults.

Authors: Li W, Wang Y, Kannan K.

Full Source: Environment International. 2019 Jul 27; 131:105054. doi: 10.1016/j.envint.2019.105054. [Epub ahead of print]

In this study, concentrations of 20 organophosphate esters were determined in outdoor air, soil, pine needles, river water, and outdoor dust samples collected around an airport in Albany, New York

### Lung health in the Eastern Mediterranean Region: the need to end designated smoking areas in public places

2019-08-19

Tobacco use is a fatal habit that causes harm to almost all organs of the human body and kills up to half of its users. Studies have shown that tobacco contains a poisonous mix of more than 7000 chemicals that have major consequences, including heart attacks and strokes, and are considered major risk factors for many types of cancer (4) and the leading cause of lung cancer. Moreover, tobacco use dramatically affects the respiratory system, damaging its airways and alveoli, and leading to chronic obstructive lung diseases<sup>1</sup> including emphysema and chronic bronchitis.

Authors: El-Awa F, Tageldin MA, Prasad V, Al-Mulla A, Heydari G, Alebshehy R.

Full Source: Eastern Mediterranean Health Journal. 2019 Jul 24;25(5):297-298. doi: 10.26719/2019.25.5.297.

### Neuro-toxic and reproductive effects of BPA

2019-08-19

Bisphenol A (BPA) is one of the highest volume chemicals produced worldwide. It has recognised activity as an endocrine disrupting chemical and has suspected roles as a neurological and reproductive toxicant. It interferes in steroid signalling, induces oxidative stress, and affects gene expression epigenetically. Gestational, perinatal and neonatal exposures to BPA affect developmental processes, including brain development and gametogenesis, with consequences on brain functions, behaviour, and fertility. This review critically analyses recent findings on the neuro-toxic and reproductive effects of BPA (and its analogues), with focus on neuronal differentiation, synaptic plasticity, glia and microglia activity, cognitive functions, and the central and local control of reproduction. BPA has potential human health hazard associated with gestational, peri-and neonatal exposure. Beginning with BPA's disposition, this review summarises recent findings on the neurotoxicity of BPA and its analogues, on neuronal differentiation, synaptic plasticity, neuro-inflammation, neuro- degeneration, and impairment of cognitive abilities. Furthermore, it reports the recent findings on the activity of BPA along the HPG axis, effects on the hypothalamic Gonadotropin Releasing Hormone (GnRH), and the associated effects on reproduction in both sexes and successful pregnancy. BPA and its analogues impair neuronal activity, HPG axis function, reproduction, and fertility. Contrasting results have emerged in animal models and human. Thus, further studies are needed

Tobacco use is a fatal habit that causes harm to almost all organs of the human body and kills up to half of its users.

to better define their safety levels. This review offers new insights on these issues with the aim to find the “fil rouge”, if any, that characterize BPA’s mechanism of action with outcomes on neuronal function and reproduction.

Authors: Santoro A, Chianese R, Troisi J, Richards S, Nori SL, Fasano S, Guida M, Plunck E, Viggiano A, Pierantoni R, Meccariello R.

Full Source: Current Neuropharmacology. 2019 Jul 26. doi: 10.2174/1570159X17666190726112101. [Epub ahead of print]

### Prenatal exposure to organochlorine compounds and lung function during childhood

2019-08-19

Prenatal exposure to organochlorine compounds (OCs) can increase the risk of reported respiratory symptoms in children. It remains unclear whether these compounds can also impact on lung function. In the present study, the authors assessed the association between prenatal exposure to OCs and lung function during childhood. 1308 mother-child pairs enrolled in a prospective cohort study were included in the study. Prenatal concentrations of p,p'-dichlorodiphenyltrichloroethane [p,p'-DDT], p,p'-dichlorodiphenyldichloroethylene [p,p'-DDE], hexachlorobenzene [HCB], and seven polychlorinated biphenyls [PCBs] were measured in cord blood. Spirometry was performed in the offspring at ages 4 (n = 636) and 7 years

(n = 1192). More than 80% of samples presented quantifiable levels of p,p'-DDE, HCB, PCB-138, PCB-153, and PCB-180; p,p'-DDE was the compound with the highest median concentrations. At 4 years, prenatal p,p'-DDE exposure was associated with a decrease in forced expiratory volume in 1 s (FEV1) in all quartiles of exposure (e.g., third quartile [0.23-0.34 ng/mL]:  $\beta$  for FEV1 -53.61 mL, 95% CI -89.87, -17.35, vs. the lowest). Prenatal p,p'-DDE levels also decreased forced vital capacity (FVC) and FEV1/FVC, but associations did not reach statistical significance in most exposure quartiles. At 7 years, p,p'-DDE was associated with a decrease in FVC and FEV1 in only the second quartile of exposure (e.g.  $\beta$  for FEV1 -36.96 mL, 95% CI -66.22, -7.70, vs. the lowest). Prenatal exposure to HCB was associated with decreased FVC and FEV1, but in only the second quartile and at 7 years (e.g. [0.07-0.14 ng/mL]:  $\beta$  for FEV1 -25.79 mL, 95% CI -55.98, 4.39, vs. the lowest). PCBs were not consistently associated with lung function. Prenatal exposure to p,p'-DDE may decrease lung function during childhood, especially FEV1 and at medium levels of exposure.

In the present study, the authors assessed the association between prenatal exposure to OCs and lung function during childhood.

## Technical

CHEMWATCH

Further and deeper knowledge on the impact of environmental chemicals during pregnancy on lung development is needed.

Authors: Abellan A, Sunyer J, Garcia-Esteban R, Basterrechea M, Duarte-Salles T, Ferrero A, Garcia-Aymerich J, Gascon M, Grimalt JO, Lopez-Espinosa MJ, Zabaleta C, Vrijheid M, Casas M.

Full Source: Environment International. 2019 Jul 27; 131:105049. doi: 10.1016/j.envint.2019.105049. [Epub ahead of print]