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### ENVIRONMENTAL RESEARCH

#### Horticultural oils: possible alternatives to chemical pesticides and insecticides

2019-10-01

The farmers and agrochemical industries lack science-based knowledge about sustainable utilisation of pesticides and insecticides. The investigation on rising use of chemical pesticides and insecticides has remarkable issue related to environment pollution, soil fertility, and human health; as such, nowadays, many people prefer natural alternatives over synthetic chemicals. Natural products, like horticultural oils, play a significant role for sustainable and safe integrated pest management, providing natural alternatives to chemical pesticides and insecticides. For several decades, both plant- and petroleum-based spray oils have been always used to control various pests, mites, and insects. Currently, these horticultural oils are used as a part of the integrated pest management, which utilises secure and non-chemical pesticides rather than conventional pesticides. Horticultural oil refers to a complex mixture of hydro-carbons with traces of sulfur- and nitrogen-based compounds, extracted from plants. The key components of horticultural oils include paraffin and olefin. The horticultural oils are considered suitable since they are non-toxic to both plants and animals, are applied easily, have low risk properties, cost-effective, and play significant role in pest control, but show little effects on the beneficial insects. As a result, these attributes make horticultural oils to be considered as secure and effective alternative for chemical insecticides and pesticides for both commercial and domestic agriculture.

Authors: Nile AS, Kwon YD, Nile SH.

Full Source: Environmental Science & Pollution Research International. 2019 Jul;26(21):21127-21139. doi: 10.1007/s11356-019-05509-z. Epub 2019 May 29.

Natural products, like horticultural oils, play a significant role for sustainable and safe integrated pest management, providing natural alternatives to chemical pesticides and insecticides.

#### Characterisation of bacterial communities in wastewater with enhanced taxonomic resolution by full-length 16S rRNA sequencing

2019-10-01

Wastewater treatment is crucial to environmental hygiene in urban environments. However, wastewater treatment plants (WWTPs) collect chemicals, organic matter, and microorganisms including pathogens and multi-resistant bacteria from various sources which may be potentially

released into the environment via WWTP effluent. To better understand microbial dynamics in WWTPs, the authors characterised and compared the bacterial community of the inflow and effluent of a WWTP in Berlin, Germany using full-length 16S rRNA gene sequences, which allowed for species level determination in many cases and generally resolved bacterial taxa. Significantly distinct bacterial communities were identified in the wastewater inflow and effluent samples. Dominant operational taxonomic units (OTUs) varied both temporally and spatially. Disease associated bacterial groups were efficiently reduced in their relative abundance from the effluent by the WWTP treatment process, except for *Legionella* and *Leptospira* species which demonstrated an increase in relative proportion from inflow to effluent. This indicates that WWTPs, while effective against enteric bacteria, may enrich and release other potentially pathogenic bacteria into the environment. The taxonomic resolution of full-length 16S rRNA genes allows for improved characterisation of potential pathogenic taxa and other harmful bacteria which is required to reliably assess health risk.

Authors: Numberger D, Ganzert L, Zoccarato L, Mühldorfer K, Sauer S, Grossart HP, Greenwood AD.  
Full Source: Science Reports. 2019 Jul 4;9(1):9673. doi: 10.1038/s41598-019-46015-z.

### Parameters affecting azoxystrobin and imidacloprid degradation in biobed substrates in the North Indian tropical environment

2019-10-01

This study reports degradation of azoxystrobin (AZOXY) and imidacloprid (IMIDA) in the rice straw (RS)/corn cob (CC) and peat (P)/compost (C)-based biomixtures. The effect of biomixture preconditioning (10 days incubation prior to pesticide application), pesticide concentration and moisture content was evaluated. Results suggested that conditioning of biomixture greatly affected IMIDA degradation where half-life ( $t_{1/2}$ ) was reduced by 5-9 times. This was attributed to higher microbial biomass carbon content and dehydrogenase activity in the conditioned biomixtures. Pesticide application in the conditioned biomixture did not show any negative impact on soil microbial parameters. Both pesticides degraded at faster rate in the rice straw-based biomixtures than in the corn cob-based biomixtures. Degradation slowed down with increase in initial concentration of pesticides in biomixture and 1.6-3.0 (AZOXY) and 2.4-3.6 (IMIDA) times increase in  $t_{1/2}$  values was observed. The moisture content of biomixture showed positive effect on degradation which increased

This study reports degradation of azoxystrobin (AZOXY) and imidacloprid (IMIDA) in the rice straw (RS)/corn cob (CC) and peat (P)/compost (C)-based biomixtures.

when moisture content was increased from 60 to 80% water holding capacity. The effect was significant for IMIDA degradation in the corn cob-based biomixtures and AZOXY degradation in the peat biomixtures. The rice straw-based biomixtures were better in degrading AZOXY and IMIDA and can be used in biopurification systems.

Authors: Kumari A, Singh N, Ramakrishnan B.

Full Source: Journal of Environmental Science & Health B. 2019 Jul 4:1-15.

doi: 10.1080/03601234.2019.1633857. [Epub ahead of print]

### Combined chemically enhanced primary sedimentation and biofiltration process for low cost municipal wastewater treatment

2019-10-01

The main objective of wastewater treatment is to remove carbon and other nutrients from municipal and industrial effluents in order to protect the environment and human health. Typical wastewater treatment is usually achieved by a combination of physical, chemical and biological methods. In this study, municipal wastewater was depurated using chemically enhanced primary treatment (CEPT) in combination with a pilot-scale trickling filter. Lab scale experiments (Jar-tests) were carried out in order to determine the optimum dosage of chemicals. Selection criteria were the organic load removal efficiency and the low operational cost. Coagulation-flocculation process was conducted through polyaluminium chloride (PAC) and the cationic polyelectrolyte (Zetag 8180) addition. By combining CEPT and trickling filter, tCOD (total Chemical Oxygen Demand), sCOD (soluble Chemical Oxygen Demand), BOD5 (5-day Biochemical Oxygen Demand), NH<sub>4</sub><sup>+</sup>-N, TSS (Total Suspended Solids), VSS (Volatile Suspended Solids) and PO<sub>4</sub><sup>3-</sup>-P removal efficiencies were estimated to be 89, 82, 93, 60, 96, 96 and 78%, respectively. It is concluded that biological filtration contributed significantly in nutrients removal processes. Moreover, the obtained effluent was low in carbon and rich in nitrogen, which can be applied for restricted irrigation after disinfection, complying with the discharge limits set in the Greek Joint Ministerial Decree 145116/2011.

Authors: Bezirgiannidis A, Plesia-Efstathopoulou A, Ntougias S, Melidis P.

Full Source: Journal of Environmental Science and Health - Part A Toxic/Hazardous Substances and Environmental Engineering 2019 Jul 2:1-6. doi: 10.1080/10934529.2019.1633842. [Epub ahead of print]

In this study, municipal wastewater was depurated using chemically enhanced primary treatment (CEPT) in combination with a pilot-scale trickling filter.

## Technical

CHEMWATCH

### Chlorinated Paraffins in Car Tires Recycled to Rubber Granulates and Playground Tiles

2019-10-01

Chlorinated paraffins (CPs) are used in various products to improve their physicochemical characteristics. Due to recycling, CPs may end up in “new” recycled products. In this study, the authors investigated CPs present in end-of-life car tires that are recycled to rubber granulates used on artificial soccer fields, and playground tiles. The  $\Sigma$ CP(C10-C30) concentrations ranged from 1.5 to 67  $\mu\text{g/g}$  in car tires, 13-67  $\mu\text{g/g}$  in rubber granulates, and 16-74  $\mu\text{g/g}$  in playground tiles. MCCPs were the dominant CP group with an average contribution of 72%. LCCPs up to C30, were detected for the first time in car tires, rubber granulates, and playground tiles. The CPs application in tires is unclear, the low CP concentrations found in this study ( $<0.007\%$ ) could possibly indicate contamination during the manufacturing process. The presence of CPs in the granulates and tiles, in addition to the multiple chemicals already detected, emphasises the need to further investigate the migration and leaching behaviour, in order to assess potential risks of CPs for humans and the environment. The presence of CPs in car tires may be another source of CPs for the environment. The CP volume brought into the environment by tire wear particles (TWP) from car tires in the European Union, is estimated at 2.0-89 tons annually.

Authors: Brandsma SH, Brits M, Groenewoud QR, van Velzen MJM, Leonards PEG, de Boer J.

Full Source: Environmental Science & Technology. 2019 Jul 2;53(13):7595-7603. doi: 10.1021/acs.est.9b01835. Epub 2019 Jun 22.

In this study, the authors investigated chlorinated paraffins present in end-of-life car tires that are recycled to rubber granulates used on artificial soccer fields, and playground tiles.

## MEDICAL RESEARCH

### Initial Development toward Non-Invasive Drug Monitoring via Untargeted Mass Spectrometric Analysis of Human Skin

2019-10-01

Drug monitoring is crucial for providing accurate and effective care; however, current methods (e.g., blood draws) are inconvenient and unpleasant. In the present study, the authors aim to develop a non-invasive method for the detection and monitoring of drugs via human skin. The initial development toward this aim required information about which drugs, taken orally, can be detected via the skin. Untargeted liquid chromatography-mass spectrometry (LC-MS) was used as it was unclear if drugs, known drug metabolites, or other transformation products

were detectable. The authors analysed samples obtained by swabbing the skin of 15 kidney transplant recipients in five locations (forehead, nasolabial area, axillary, backhand, and palm), bilaterally, on two different clinical visits. Untargeted LC-MS data were processed using molecular networking via the Global Natural Products Social Molecular Networking platform. Herein, the qualitative detection and location of drugs and drug metabolites is reported. For example, escitalopram/citalopram and diphenhydramine, taken orally, were detected in forehead, nasolabial, and hand samples, whereas N-acetyl-sulfamethoxazole, a drug metabolite, was detected in axillary samples. In addition, chemicals associated with environmental exposure were also detected from the skin, which provides insight into the multifaceted chemical influences on our health. The proof-of-concept results presented support the finding that the LC-MS and data analysis methodology is currently capable of the qualitative assessment of the presence of drugs directly via human skin.

Authors: Jarmusch AK, Elijah EO, Vargas F, Bouslimani A, da Silva R, Ernst M, Wang M, Del Rosario KK, Dorrestein PC, Tsunoda SM.

Full Source: Analytical Chemistry. 2019 Jul 2; 91(13):8062-8069. doi: 10.1021/acs.analchem.8b05854. Epub 2019 Jun 10.

### Embryonic stem cell- and transcriptomics-based in vitro analyses reveal that bisphenols A, F and S have similar and very complex potential developmental toxicities

2019-10-01

Bisphenol A (BPA) is a very versatile industrial chemical. Many reports have associated BPA with several health effects. Some bisphenol alternatives have been introduced to replace BPA in its many applications. However, comprehensive toxicological evaluations for these replacements are still lacking. In this study, the authors examined the potential effects of BPA, bisphenol F (BPF) and bisphenol S (BPS), on embryonic development with an in vitro stem cell toxicology system and transcriptomics analyses. Mouse embryonic stem cells (mESCs) were differentiated via embryoid body formation, either globally towards the three primary germ layers and their lineages, or specifically into neuroectoderm/neural progenitor cells. During the differentiation, cells were treated with BPA, BPF, BPS, or DMSO control. Samples were collected at different time points, for qRT-PCR and RNA-seq analyses. BPA, BPF and BPS disrupted many processes, during mESC global and neural differentiations, in very similar manners. In fact, at each time point the three chemicals differentially regulated analogous gene categories, particularly the ones involved in cell-matrix and cell-cell adhesion, signal transduction pathways, and medical conditions such

In this study, the authors examined the potential effects of BPA, bisphenol F (BPF) and bisphenol S (BPS), on embryonic development with an in vitro stem cell toxicology system and transcriptomics analyses.

as cardiovascular diseases and cancer. The findings demonstrate once more than BPA substitutes may not be very safe. They potentially have a very complex developmental toxicity, similarly to BPA, and seem more toxic than BPA itself. In addition, the results reveal that stem cell-based developmental toxicity assays can be very comprehensive.

Authors: Yin N, Liang X, Liang S, Liang S, Yang R, Hu B, Cheng Z, Liu S, Dong H, Liu S, Faiola F.

Full Source: *Ecotoxicology & Environmental Safety*. 2019 Jul 30; 176:330-338. doi: 10.1016/j.ecoenv.2019.03.115. Epub 2019 Apr 2.

### Lactational exposure to phthalates impaired the neurodevelopmental function of infants at 9 months in a pilot prospective study

2019-10-01

Phthalates are widespread endocrine-disrupting chemicals (EDCs) that have been suggested to affect neurodevelopment. However, association between lactational exposure to phthalates and neurodevelopmental effects has rarely been reported in epidemiological studies. In the present study, the authors conducted a pilot prospective study of 138 mother-infant pairs to evaluate whether lactational exposure to phthalates was associated with neurodevelopmental effects in infants. At baseline survey, the spot urine samples from both mothers and infants were collected for measuring ten metabolites of phthalates, and the food intake information of infants was assessed by the food-frequency questionnaire (FFQ). At the follow-up survey in 9 months of age, the neurodevelopmental Function of infants was assessed using the Ages and Stages Questionnaire Edition 3 (ASQ-3). Multivariate logistic regression models were used to calculate the odds ratio (OR) for delayed development according to the level of exposure to phthalates. The results indicated that MnBP and MiBP were high in lactating infants and mothers. In the overall study population, most metabolites showed positive associations with delayed development of most ASQ-3 domains. In male, MMP, MEP, MiBP and MnBP but not DEHP metabolites were significantly associated with increased odds of delayed development of all domains. In female, most LMWP metabolites and the four oxidative metabolites of DEHP were significantly associated with increased odds of delayed development of most domains. In conclusion, the authors found a significant negative association between lactational exposure to phthalates and ASQ-3 domains. Some of the sex-specific observations warrant further investigation. The dietary source of

In the present study, the authors conducted a pilot prospective study of 138 mother-infant pairs to evaluate whether lactational exposure to phthalates was associated with neurodevelopmental effects in infants.

lactational phthalates exposure may not be the breast milk or infant formula but the complementary food.

Authors: Dong R, Wu Y, Chen J, Wu M, Li S, Chen B.

Full Source: Chemosphere. 2019 Jul; 226:351-359. doi: 10.1016/j.chemosphere.2019.03.159. Epub 2019 Mar 28.

### Adenomatous polyposis coli as a predictor of environmental chemical-induced transgenerational effects related to male infertility

2019-10-01

Exposure to toxic environmental chemicals during pregnancy is a ubiquitous threat to health with potentially transgenerational consequences. However, the underlying mechanism of how transgenerational effects occur as part of environmental chemical exposure are not well understood. This study investigated the potential molecular changes associated with dibutyl phthalate exposure that induced transgenerational effects, using a rat model. Through the analysis of the Gene Expression Omnibus database, the authors found some similar studies of environmental exposure induced transgenerational effects. Then, one of the studies and our results were analysed to identify the adenomatous polyposis coli (APC) gene. This gene participated the most of the pathways and was upregulated in both studies. The miRWALK data set was used to predict the microRNAs which targeted the APC gene. The authors confirmed the miR-30 family were significantly downregulated in F3 testis tissues and targeted the APC gene. In conclusion, the miR-30 family/APC interaction is a potential mechanism for the transgenerational effects induced by the environmental chemical.

Authors: Yuan B, Wu W, Zhang H, Gu H, Guo D, Jiang J, Wang X.

Full Source: Journal of Biochemistry & Molecular Toxicology. 2019 Jul;33(7): e22331. doi: 10.1002/jbt.22331. Epub 2019 Apr 1.

### A comparison of endocrine disruption potential of nonylphenol ethoxylate, vanillin ethoxylate, 4-n-nonylphenol and vanillin in vitro

2019-10-01

The widely used surfactant nonylphenol ethoxylate (NPEO) and its raw material 4-n-nonylphenol (4-n-NP), as well as its degradation products, are recognised as endocrine disrupting chemicals. The USA Environmental Protection Agency (EPA) released an assessment that looked for safe alternatives to NPEO. Vanillin ethoxylate (VAEO) is a novel substitute for

This study investigated the potential molecular changes associated with dibutyl phthalate exposure that induced transgenerational effects, using a rat model.

NPEO and is quite similar to NPEO in structure; there is a risk that it has similar endocrine disrupting effects to NPEO. However, their effects on various nuclear hormone receptors have not been thoroughly examined. In this study, the effects of NPEO, VAEO, 4-n-NP and Vanillin on the oestrogen receptor  $\alpha$  (ER $\alpha$ ), androgen receptor (AR), thyroid hormone receptor (TR), retinoic X receptor  $\beta$  (RXR $\beta$ ) and oestrogen-related receptor  $\gamma$  (ERR $\gamma$ ) were determined and compared using a battery of recombinated yeast strains expressing  $\beta$ -galactosidase. The results showed that NPEO and 4-n-NP acted as significant antagonists of ER, AR, TR and ERR $\gamma$ . In addition, 4-n-NP also had antagonistic activity toward RXR $\beta$ . Moreover, VAEO was shown to be a very weak antagonist of TR and ERR $\gamma$ , and Vanillin had no interaction with any nuclear receptors. For the first time, it was found that NPEO had AR, TR and ERR $\gamma$  antagonistic effects and that 4-n-NP was an antagonist of RXR $\beta$ . The *in vitro* data indicated that NPEO, 4-n-NP and VAEO have the potential to act as endocrine disruptors involving more than one nuclear hormone receptor, but VAEO has much lower endocrine disrupting potential than NPEO. Thus, it is critical to find safe substitutes for NPEO and a substitute of NPEO with structural analogues should be carried out with caution. Furthermore, to look for preferable alternatives for NPEO, more *in vivo* and *in vitro* studies of the alternatives concerning endocrine disruption are needed, especially *in vitro* studies need to involve various target points, not only focus on their effects on ER but also take other nuclear hormone receptor pathways into consideration.

Authors: Ji X, Li N, Yuan S, Zhou X, Ding F, Rao K, Ma M, Wang Z.

Full Source: *Ecotoxicology & Environmental Safety*. 2019 Jul 15; 175:208-214. doi: 10.1016/j.ecoenv.2019.03.060. *Epup* 2019 Mar 19.

In this study, the authors aimed to analyse various cancer risks among a cohort of Korean air transportation industry workers.

## OCCUPATIONAL RESEARCH

### Cancer Incidence Among Air Transportation Industry Workers Using the National Cohort Study of Korea

2019-10-01

There are increasing concerns regarding increased cancer risks in professional flight attendants due to their exposure to occupational hazards that are known or suspected to be carcinogenic. In this study, the authors aimed to analyse various cancer risks among a cohort of Korean air transportation industry workers. Data from the Korean National Health Insurance Service (NHIS) database from 2002 to 2015 was used. The age-standardised incidence ratios (SIRs) for all types of cancers in the aircraft transport industry workers compared to government employees and the entire employee population were calculated with adjustment for

five-year age ranges via the indirect standardised method with gender stratification. Leukemia (ICD-10; C91-C95) showed significantly higher SIRs (95% confidence interval (CI)) compared to the government employee group (1.86, 1.15-2.84) and the whole employee group (1.77, 1.10-2.70). Air transportation industry workers have an increased risk of leukaemia compared to other occupational groups.

Authors: Lee W, Kang MY, Yoon JH.

Full Source: International Journal of Environmental Research & Public Health. 2019 Aug 14;16(16). pii: E2906. doi: 10.3390/ijerph16162906.

### Occupational exposure to asbestos and silica and risk of developing rheumatoid arthritis: findings from a Swedish population-based case-control study

2019-10-01

Airborne agents including cigarette smoke associate with an increased risk of rheumatoid arthritis (RA). In this study, the authors analysed to which extent occupational exposure to asbestos and silica confers an increased risk of developing serologically defined subsets of RA. This Swedish population-based case-control study enrolled incident RA cases between 1996 and 2013 (n=11 285), identified through national public authority and quality registers, as well as from the Epidemiological Investigation of Rheumatoid Arthritis (EIRA) Study. Controls (n=1 15 249) were randomly selected from Sweden's population register and matched on sex, age, index year and county. Occupational histories were obtained from national censuses. Exposure to asbestos and silica was assessed by job-exposure matrices. Logistic regression was used to calculate ORs adjusted for age, sex, county, index year, alcohol use and smoking. Results showed that male workers exposed to asbestos had higher risk of seropositive RA (OR=1.2, 95% CI 1.0 to 1.4) and seronegative RA (OR=1.2, 95% CI 1.0 to 1.5) compared with unexposed workers. The risk was highest among workers exposed to asbestos from 1970, before a national ban was introduced. Male workers exposed to silica also had higher risk of RA (seropositive RA: OR=1.4, 95% CI 1.2 to 1.6; seronegative RA: OR=1.3, 95% CI 1.0 to 1.5). For the largest subset, seropositive RA, the OR increased with the number of years exposed to silica, up to OR=2.3 (95% CI 1.4 to 3.8, p for trend <0.0001). Women overall had lower ORs than men, but the duration and intensity of their exposure were lower. In conclusion, the authors observed an association between asbestos exposure and risk of developing RA and

In this study, the authors analysed to which extent occupational exposure to asbestos and silica confers an increased risk of developing serologically defined subsets of rheumatoid arthritis

extended previous findings of an association between silica exposure and RA risk, where a dose-response relationship was observed.

Authors: Ilar A, Klareskog L, Saevarsdottir S, Wiebert P, Askling J, Gustavsson P, Alfredsson L.

Full Source: RMD Open. 2019 Jul 11;5(2): e000978. doi: 10.1136/rmdopen-2019-000978. eCollection 2019.

### Exposure to crystalline silica in Canadian workplaces and the risk of kidney cancer

2019-10-01

The causes of kidney cancer are not well understood though occupational exposures are thought to play a role. Crystalline silica is a known human carcinogen, and despite previous links with kidney disease, there have been few studies investigating its association with kidney cancer. The authors addressed this research gap using a population-based case-control study of Canadian men. Questionnaire data were obtained from individuals with histologically confirmed kidney cancer, and population-based controls recruited from eight Canadian provinces (1994-1997). An industrial hygienist characterised participants' lifetime occupational exposure, and their confidence in the assessment (possibly, probably or definitely exposed) to silica on three dimensions (intensity, frequency and duration), and cumulative exposure was estimated. Logistic regression was used to estimate ORs and 95% CIs, adjusting for potential confounders. Nearly half of the 689 kidney cancer cases (49%) and 2369 controls (44%) had ever been occupationally exposed to crystalline silica. In a fully adjusted model, workers ever-exposed to silica had a slightly increased risk of kidney cancer relative to those who were unexposed (OR 1.10, 95% CI 0.92 to 1.32). Odds were modestly (and generally not statistically significantly) increased for models with duration of exposure and cumulative exposure, though exposure-response relationships were not evident. The findings do not provide evidence that occupational exposure to crystalline silica increases risk of kidney cancer in men.

Authors: Peters CE, Bogaert L, Latifovic L, Kachuri L, Harris SA, Parent ME, Villeneuve PJ; Canadian Cancer Registries Epidemiology Group.

Collaborators: McCrate F, Dewar R, Kreiger N, Turner D.

Full Source: Occupational & Environmental Medicine. 2019 Sep;76(9):668-671. doi: 10.1136/oemed-2019-105870.

The causes of kidney cancer are not well understood though occupational exposures are thought to play a role.

### Occupational risk of salmonellosis and campylobacteriosis: a nationwide population-based registry study

2019-10-01

Occupational exposure to animals and foods is a poorly characterised risk factor for salmonellosis and campylobacteriosis, the main causes of bacterial gastroenteritis in the Western world. In this study, the authors performed a population-based registry study in the Netherlands to assess whether differences exist in the incidence of reported salmonellosis and campylobacteriosis cases among occupational groups, and whether they can be explained by differences in the magnitude of exposure to these pathogens, as defined by serology. Person-level occupational data for all Dutch residents were linked to lab-confirmed salmonellosis and campylobacteriosis data, and to serological data from a previous national serosurvey. SIRs for salmonellosis and campylobacteriosis among occupational sectors and specific high-risk occupations were calculated based on the total employed population. Moreover, *Salmonella* and *Campylobacter* seroincidence rates were compared among sectors and high-risk occupations. Occupational exposure to live animals or manure and working in the sale of animal-derived food products were associated with significantly increased risks of salmonellosis (SIR 1.55-1.82) and campylobacteriosis (SIR 1.36-1.65). Moreover, incidences were significantly higher in specific industrial sectors, as well as healthcare and social work sectors. Mean seroincidence rates ranged from 1.28 to 2.30 infections/person-year for *Campylobacter*, and from 0.36 to 0.99 for *Salmonella*, with only slightly higher rates for people in high-risk occupations. Significant differences in reported salmonellosis and campylobacteriosis incidence exist among occupational sectors, with the highest incidence in those persons occupationally exposed to live animals. These differences are only partially reflected in the serology.

Authors: Duijster JW, Franz E, Neeffjes JJC, Mughini-Gras L.

Full Source: Occupational & Environmental Medicine. 2019 Sep;76(9):617-624. doi: 10.1136/oemed-2019-105868.

Occupational exposure to animals and foods is a poorly characterised risk factor for salmonellosis and campylobacteriosis, the main causes of bacterial gastroenteritis in the Western world.

### Characteristics of PM2.5 and Black Carbon Exposure Among Subway Workers

2019-10-01

This study aimed to assess the characteristics of exposure to both PM2.5 and black carbon (BC) among subway workers. A total of 61 subway workers, including 26, 23, and 12 subway station managers, maintenance engineers, and train drivers, respectively, were investigated in 2018.

Real-time measurements of airborne PM<sub>2.5</sub> and BC were simultaneously conducted around the breathing zones of workers. Maintenance engineers had the highest average levels of exposure to both PM<sub>2.5</sub> and BC (PM<sub>2.5</sub>, 76 µg/m<sup>3</sup>; BC, 9.3 µg/m<sup>3</sup>), followed by train drivers (63.2 µg/m<sup>3</sup>, 5.9 µg/m<sup>3</sup>) and subway station managers (39.7 µg/m<sup>3</sup>, 2.2 µg/m<sup>3</sup>). In terms of the relationship between mass concentrations of PM<sub>2.5</sub> and BC, train drivers demonstrated the strongest correlation ( $R = 0.72$ ), indicating that the proportion of BC contained in PM<sub>2.5</sub> is relatively steady. The average proportion of BC in PM<sub>2.5</sub> among maintenance engineers (13.0%) was higher than that among train drivers (9.4%) and subway station managers (6.4%). Univariate and mixed effect multiple analyses demonstrated the type of task and worksite to be significant factors affecting exposure levels in maintenance engineers and subway station managers. The use of diesel engine motorcars in tunnel maintenance was found to be a key contributor to PM<sub>2.5</sub> and BC exposure levels among subway workers.

Authors: Choi S, Park JH, Kim SY, Kwak H, Kim D, Lee KH, Park DU.

Full Source: International Journal of Environmental Research & Public Health. 2019 Aug 13;16(16). pii: E2901. doi: 10.3390/ijerph16162901.

## PUBLIC HEALTH RESEARCH

### "Chemophobia" Today: Consumers' Knowledge and Perceptions of Chemicals

2019-10-01

This mixed-methods study investigated consumers' knowledge of chemicals in terms of basic principles of toxicology and then related this knowledge, in addition to other factors, to their fear of chemical substances (i.e., chemophobia). Both qualitative interviews and a large-scale online survey were conducted in the German-speaking part of Switzerland. A Mokken scale was developed to measure laypeople's toxicological knowledge. The results indicate that most laypeople are unaware of the similarities between natural and synthetic chemicals in terms of certain toxicological principles. Furthermore, their associations with the term "chemical substances" and the self-reported affect prompted by these associations are mostly negative. The results also suggest that knowledge of basic principles of toxicology, self-reported affect evoked by the term "chemical substances," risk-benefit perceptions concerning synthetic chemicals, and trust in regulation processes are all negatively associated with chemophobia, while general health concerns are positively related to chemophobia. Thus, to enhance informed consumer decision-making, it might be necessary to tackle the stigmatisation of

This mixed-methods study investigated consumers' knowledge of chemicals in terms of basic principles of toxicology and then related this knowledge, in addition to other factors, to their fear of chemical substances (i.e., chemophobia).

the term “chemical substances” as well as address and clarify prevalent misconceptions.

Authors: Saleh R, Bearth A, Siegrist M.

Full Source: Risk Analysis. 2019 Jul 9. doi: 10.1111/risa.13375. [Epub ahead of print]

### Update of the DevTox data database for harmonized risk assessment and alternative methodologies in developmental toxicology: Report of the 9th Berlin Workshop on Developmental Toxicity

2019-10-01

Representatives of applied science (e.g. governmental organisations, academia, and industry) met to discuss the progress towards a harmonised human health risk assessment in developmental toxicology of plant protection products, biocidal products, and other environmental chemicals at the 9th Berlin Workshop on Developmental Toxicity held in September 2018. Within the focus of the scientific discussion were the future of in-vitro methods for developmental and reproductive toxicology, the potential relevance of alternative species in testing of developmental effects, and risk and hazard assessment of developmental and endocrine effects. Furthermore, the need for a harmonised terminology for classification of anomalies in laboratory animals in developmental toxicity studies aiming for human health risk assessment was determined. Here, the DevTox database was identified as an extremely valuable tool. Overall, the participants agreed that still one of the biggest challenges for testing developmental toxicity in the 21st century is the development of animal-free test strategies and alternatives to animal testing that could provide human-relevant information in a rapid, efficient, and mechanistically informative manner.

Authors: Solecki R, Rauch M, Gall A, Buschmann J, Kellner R, Kucheryavenko O, Schmitt A, Delrue N, Li W, Hu J, Fujiwara M, Kuwagata M, Mantovani A, Makris SL, Paumgarten F, Schönfelder G, Schneider S, Vogl S, Kleinstreuer N, Schneider M, Schulze F, Fritsche E, Clark R, Shiota K, Chahoud I.

Full Source: Reproductive Toxicology. 2019 Jul 6; 89:124-129. doi: 10.1016/j.reprotox.2019.07.003. [Epub ahead of print]

In 2017 the Dutch National Institute for Public Health and the Environment (RIVM) and the European Chemical Agency (ECHA) concluded that the risks for children are negligible.

### Rubber granules on synthetic turf pitches: safe or not safe for children?

2019-10-01

Rubber granules from old car tyres used in synthetic turf pitches contain a significant number of carcinogenic and endocrine-disrupting chemicals. In 2017 the Dutch National Institute for Public Health and the Environment (RIVM) and the European Chemical Agency (ECHA) concluded that the risks for children are negligible. However, their reports contain some scientific inaccuracies and omissions which may have led them to underestimate the risks for children. It is therefore premature to conclude that it is safe for children to play on synthetic turf pitches with rubber granules. It is now primarily up to the parents to decide whether or not playing sports is acceptable in these circumstances. The Dutch government should, in accordance with ECHA recommendations, advise parents that their children ought to avoid hand-and-mouth contact with these granules as much as possible.

Authors: van den Berg M, de Bruin A, Tervaert JC, Sauer PJJ.

Full Source: Nederlands Tijdschrift voor Geneeskunde. 2019 Jul 5;163. pii: D2339.

### Health Needs Assessment of Five Pennsylvania Plain Populations

2019-10-01

The authors performed a health needs assessment for five Plain communities in Pennsylvania from a random sample of households, comparing them to the general population of Pennsylvania adults. Plain respondents were more likely to drink well water, as likely to eat fruit and vegetables and much more likely to drink raw milk and be exposed to agricultural chemicals. Plain respondents were less likely to receive screening exams compared to the general population and there was variation from settlement to settlement in whether respondents had a regular doctor, whether they received preventive screenings or had their children vaccinated, with Mifflin County Amish generally lowest in these and Plain Mennonites highest. Plain respondents reported good physical and mental health compared to the general population but Groffdale Mennonite respondents had a high proportion of diagnoses of depression and were more likely to be receiving treatment for a mental health condition. Most Plain respondents would want a spouse tested for genetic disease with Mifflin County Amish least in favour of these tests. Despite

The authors performed a health needs assessment for five Plain communities in Pennsylvania from a random sample of households, comparing them to the general population of Pennsylvania adults.

their geographic and genetic isolation, the health of Plain communities in Pennsylvania is similar to that of other adults in the state.

Authors: Miller K, Yost B, Abbott C, Thompson Buckland S, Dlugi E, Adams Z, Rajagopalan V, Schulman M, Hilfrank K, Cohen MA.

Full Source: International Journal of Environmental Research & Public Health. 2019 Jul 4;16(13). pii: E2378. doi: 10.3390/ijerph16132378.

### Prenatal and childhood exposure to chlordecone and sex-typed toy preference of 7-year-old Guadeloupean children

2019-10-01

Chlordecone was used intensively as an insecticide in the French West Indies. Because of its high persistence, the resulting contamination of food and water has led to chronic exposure of the general population as evidenced by its presence in the blood of people of Guadeloupe, in particular in pregnant women and newborns, and in maternal breast milk. Chlordecone is recognised as a reproductive and developmental toxicant, is neurotoxic and carcinogenic in rodents, and is considered as an endocrine-disrupting compound with well-established oestrogenic and progestogenic properties both in vitro and in vivo. The question arises of its potential consequences on child neurodevelopment following prenatal and childhood exposure, in particular on behavioural sexual dimorphism in childhood. The authors followed 116 children from the TIMOUN mother-child cohort study in Guadeloupe, who were examined at age 7. These children were invited to participate in a 7-min structured play session in which they could choose between different toys considered as feminine, masculine, or neutral. The play session was video recorded, and the percentage of the time spent playing with feminine or masculine toys was calculated. The associations between playtime and prenatal exposure to chlordecone (assessed by concentration in cord blood) or childhood exposure (determined from concentrations in child blood obtained at the 7-year follow-up) was estimated, taking into account confounders and co-exposures to other environmental chemicals. A two-group regression model was used to take into account sex differences in play behaviour. The results do not indicate any modification in sex-typed toy preference among 7-year-old children in relation with either prenatal or childhood exposure to chlordecone.

Authors: Cordier S, Forget-Dubois N, Desrochers-Couture M, Rouget F, Michineau L, Monfort C, Thome JP, Kadhel P, Multigner L, Muckle G.

Full Source: Environmental Science & Pollution Research International. 2019 Jul 1. doi: 10.1007/s11356-019-05686-x. [Epub ahead of print]

This study investigated the potential consequences of chlordecone on child neurodevelopment following prenatal and childhood exposure,