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ENVIRONMENTAL RESEARCH

Selective isolation of agents of chromoblastomycosis from insect-associated environmental sources

2020-04-01

Chromoblastomycosis is a neglected disease characterized by cutaneous, subcutaneous or disseminated lesions. It is considered an occupational infectious disease that affects mostly rural workers exposed to contaminated soil and vegetal matter. Lesions mostly arise after a traumatic inoculation of herpotrichiellaceous fungi from the Chaetothyriales order. However, the environmental niche of the agents of the disease remains obscure. Its association with insects has been predicted in a few studies. Therefore, the present work aimed to analyze if social insects, specifically ants, bees, and termites, provide a suitable habitat for the fungi concerned. The mineral oil flotation method was used to isolate the microorganisms. Nine isolates were recovered and phylogenetic analysis identified two strains as potential agents of chromoblastomycosis, i.e., *Fonsecaea pedrosoi* CMRP 3076, obtained from a termite nest (n = 1) and *Rhinochlamydia similis* CMRP 3079 from an ant exoskeleton (n = 1). In addition, we also identified *Fonsecaea brasiliensis* CMRP 3445 from termites (n = 1), *Exophiala xenobiotica* CMRP 3077 from ant exoskeleton (n = 1), *Cyphellophoraceae* CMRP 3103 from bees (n = 1), *Cladosporium* sp. CMRP 3119 from bees (n = 1), *Hawksworthiomyces* sp. CMRP 3102 from termites (n = 1), and *Cryptendoxyla* sp. from termites (n = 2). The environmental isolate of *F. pedrosoi* CMRP 3076 was tested in two animal models, *Tenebrio molitor* and Wistar rat, for its pathogenic potential with fungal retention in *T. molitor* tissue. In the Wistar rat, the cells resembling muriform cells were observed 30 d after inoculation.

Authors: Lima BJFS, Voidaleski MF, Gomes RR, Fornari G, Soares JMB, Bombassaro A, Schneider GX, Soley BDS, de Azevedo CMPES, Menezes C, Moreno LF, Attili-Angelis D, Klisiowicz DDR, de Hoog S, Vicente VA
Full Source: Fungal Biology. 2020 Mar - Apr;124(3-4):194-204. doi: 10.1016/j.funbio.2020.02.002. Epub 2020 Feb 12.

Therefore, the present work aimed to analyze if social insects, specifically ants, bees, and termites, provide a suitable habitat for the fungi concerned.

An indoor study of the combined effect of industrial pollution and turbulence events on the gut environment in a marine invertebrate.

2020-03-09

Natural storms are able to determine reworking of seabed up to considerable depths and favour suspension of sediment-associated

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chemicals. Yet, a direct link between exposure to resuspended contaminants and the biological effects on marine organisms have to be fully established. We exposed adults of a suspension feeder, the ascidian *Ciona robusta*, to polluted sediment (e.g., containing mixtures of polycyclic aromatic hydrocarbons and heavy metals) from the industrial area of Bagnoli-Coroglio under two temporal patterns ('aggregated' vs. 'spaced') of turbulence events. Then, we assessed the impact of resuspended pollutants on the ascidian gut environment via four broad categories: oxidative stress, innate immunity, host-microbiota interactions, and epithelium. An early oxidative stress response was seen after a week of exposure to static sediment. Instead, water turbulence had no effect on the antioxidant defence. The first episode of turbulent suspension induced a minimal pro-inflammatory response in the 'spaced' pattern. Mucus overproduction and a complete occlusion of the crypt lumen were found following sediment reworking. This study suggests a protective response of the gut environment in marine invertebrates exposed to environmental extremes, leading to increased susceptibility to disease and to concerns on the combined effects of chronic environmental contamination and acute disturbance events possibly associated with climate change.

Authors: Liberti A, Bertocci I, Pollet A, Musco L, Locascio A, Ristortore F, Spagnuolo A, Sordino P

Full Source: *Marine environmental research*. 2020 Mar 9;158:104950. doi: 10.1016/j.marenvres.2020.104950. [Epub ahead of print]

Occurrence of caffeine in the freshwater environment: Implications for ecopharmacovigilance

2020-03-17

Owing to the substantial consumption of caffeinated food, beverages, and medicines worldwide, caffeine is considered the most representative pharmaceutically active compound (PhAC) pollutant based on its high abundance in the environment and its suitability as an indicator of the anthropogenic inputs of PhACs in water bodies. This review presents a worldwide analysis of 132 reports of caffeine residues in freshwater environments. The results indicated that more than 70% of the studies reported were from Asia and Europe, which have densely populated and industrially developed areas. However, caffeine pollution was also found to affect areas isolated from human influence, such as Antarctica. In addition, the maximum concentrations of caffeine in raw wastewater, treated wastewater, river, drinking water, groundwater, lake, catchment, reservoir, and rainwater samples were reported to be 3.60 mg/L, 55.5, 19.3, 3.39, 0.683, 174, 44.6, 4.87, and 5.40 µg/L, respectively. The seasonal

However, caffeine pollution was also found to affect areas isolated from human influence, such as Antarctica.

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variation in caffeine residues in the freshwater environment has been demonstrated. In addition, despite the fact that there was a small proportion of wastewater treatment plants in which the elimination rates of caffeine were below 60%, wastewater treatment is generally believed to have a high caffeine removal efficiency. From a pharmacy perspective, we proposed to adopt effective measures to minimize the environmental risks posed by PhACs, represented by caffeine, through a new concept known as ecopharmacovigilance (EPV). Some measures of EPV aimed at caffeine pollution have been advised, as follows: improving knowledge and perceptions about caffeine pollution among the public; listing caffeine as a high-priority PhAC pollutant, which should be targeted in EPV practices; promoting green design and production, rational consumption, and environmentally preferred disposal of caffeinated medicines, foods, and beverages; implementing intensive EPV measures in high-risk areas and during high-risk seasons; and integrating EPV into wastewater treatment programs.

Authors: Li S, Wen J, He B, Wang J, Hu X, Liu J

Full Source: *Environmental Pollution (Barking, Essex: 1987)*. 2020 Mar 17;263(Pt B):114371. doi: 10.1016/j.envpol.2020.114371. [Epub ahead of print]

Characterization and comparison of groundwater quality and redox conditions in the Arakawa Lowland and Musashino Upland, southern Kanto Plain of the Tokyo Metropolitan area, Japan

2020-03-06

Groundwater is essential for the Earth biosphere but is often contaminated by harmful chemical compounds due to both anthropogenic and natural causes. A key factor controlling the fate of harmful chemicals in groundwater is the reduction/oxidation (redox) conditions. The formation factors for the groundwater redox conditions are insufficiently understood. In this study, long-term groundwater quality beneath one of the world megacities was monitored and evaluated. We measured and compared hydrogeochemical conditions including groundwater quality (35 chemical parameters) and redox conditions of five aquifers in the Arakawa Lowland and Musashino Upland, southern Kanto Plain of the Tokyo Metropolitan area, Japan. Monitoring results suggested the following: The main origin of groundwater is precipitation in both the Lowland and Upland areas. The three aquifers in the Arakawa Lowland are likely fully separated, with one unconfined and two confined aquifers under iron reducing and methanogenic conditions, respectively. Oppositely, in the Musashino

A key factor controlling the fate of harmful chemicals in groundwater is the reduction/oxidation (redox) conditions.

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Upland, the water masses in the two aquifers are likely partly connected, under aerobic conditions, and undergoing the same groundwater recharge and flow processes under similar hydrogeological conditions. The different groundwater redox conditions observed are likely caused by the very different groundwater residence times for the Arakawa Lowland and Musashino Upland.

Authors: Saito T, Spadini L, Saito H, Martins JMF, Oxarango L, Takemura T, Hamamoto S, Moldrup P, Kawamoto K, Komatsu T

Full Source: The science of the total environment. 2020 Mar 6;722:137783. doi: 10.1016/j.scitotenv.2020.137783. [Epub ahead of print]

Signaling pathways of oxidative stress in aquatic organisms exposed to xenobiotics

2020-03-26

Oxidative stress is frequently generated in cells of organisms exposed to environmental pollutants. The production of reactive oxygen species can have either adaptive or maladaptive consequences for the organism as well as for the entire population. However, regarding fish species and other invertebrates exposed to aquatic xenobiotics, the signaling pathways of oxidative stress still lacks a comprehensive characterization. After reviewing the recent literature, we show that important pathways described in mammals are also activated in aquatic species in response to a variety of xenobiotics. A central actor is the Nrf2/Keap1 pathway, which regulates the expression of ARE-driven genes including Gr, Gpx, or Cat. Other important activated pathways concern PPAR, MAPKs, NF- κ B, and even AhR. Moreover, the autophagy and apoptosis pathways are also involved in the cellular response to oxidative stress. Importantly, there exists crosstalks between these pathways, which together activate a complex cellular antioxidative machinery in response to different xenobiotics. However, our knowledge of these responses in aquatic organisms is still fragmentary. Efforts should be made to extend the number of studied species and better characterize the organ-dependency and age-dependency of the responses. However, the huge number and variety of chemicals present in the environment makes the task difficult. Deciphering these key pathways can help to understand the mode of action of pollutants and consequently help to assess the environmental risk in aquatic ecosystems.

Authors: Silvestre F

Full Source: Journal of experimental zoology. Part A, Ecological and integrative physiology. 2020 Mar 26. doi: 10.1002/jez.2356. [Epub ahead of print]

The production of reactive oxygen species can have either adaptive or maladaptive consequences for the organism as well as for the entire population.

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CHEMICAL EFFECTS

Arsenic induces transgenerational behavior disorders in *Caenorhabditis elegans* and its underlying mechanisms

2020-03-16

The present study aimed to identify the effects of arsenic on behaviors in *Caenorhabditis elegans* (*C. elegans*) and the transgenerational effects. The synchronized *C. elegans* (P generation) were exposed to 0, 0.2, 1.0, and 5.0 mM NaAsO₂ and the subsequent generations (F1 and F2) were maintained on fresh nematode growth medium (NGM). The behaviors and growth were recorded at 0, 12, 24, 36, 48, 60, and 72 h post synchronization. The results demonstrated that arsenic affected various indicators regarding the behavior (head thrash, body bend, movement speed, wavelength, amplitude and so on) and in general the effects started to accumulate from 24 h and lasted throughout the exposure. The behavior impairments were transgenerational with varying patterns, amongst the head thrash and body bend responded most sensitively though the responses gradually declined across generations. Arsenic exposure inhibited the growth (body length, body width, and body area) in P *C. elegans* from 24 h to 60 h, however there was no difference between treatments groups and the control at 72 h. Arsenic led to a dose-dependent degeneration of dopaminergic neurons in *C. elegans*, and inhibition of BAS-1 and CAT-2 expressions. The expressions of GCS-1, GSS-1, and SKN-1 were induced by arsenic exposure. Overall, chronic arsenic exposure impaired the behaviors and there were transgenerational effects. The head thrash and body bend responded most sensitively. Arsenic induced behavioral disorders might be attributed to degeneration of dopaminergic neurons which was associated with oxidative stress.

Authors: Zhang X, Zhong HQ, Chu ZW, Zuo X, Wang L, Ren XL, Ma H, Du RY, Ju JJ, Ye XL, Huang CP, Zhu JH, Wu HM

Full Source: Chemosphere. 2020 Mar 16;252:126510. doi: 10.1016/j.chemosphere.2020.126510. [Epub ahead of print]

Effects of Brominated and Organophosphate Ester Flame Retardants on Male Reproduction

2020-03-25

BACKGROUND:

Environmental chemicals that interfere with the production and/or action of hormones may have adverse effects on male reproduction. This review focuses on the possible impact of exposure to flame retardant chemicals

Arsenic led to a dose-dependent degeneration of dopaminergic neurons in *C. elegans*, and inhibition of BAS-1 and CAT-2 expressions.

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on male reproduction. Flame retardants are added to a wide variety of combustible materials to prevent fires from starting, slow their spread and provide time to escape. However, these chemicals are often additive so they leach out into the environment. Governments have restricted the use of polybrominated diphenyl ether (PBDE) flame retardants based on evidence that they are persistent, bioaccumulate and have adverse effects on health. The phasing out of these "legacy" flame retardants has resulted in their replacement with alternatives, such as tetrabromobisphenol A (TBBPA) and the organophosphate esters (OPEs).

OBJECTIVE:

To review the literature on the effects of brominated and organophosphate ester flame retardant chemicals on male reproduction.

METHODS:

PubMed database was searched for studies reporting the effects of brominated and organophosphate ester flame retardants on male reproduction.

RESULTS:

Cell-based, animal model, and human studies provide evidence that the PBDEs act as endocrine disrupting chemicals; further, exposure during critical windows of development may be associated with a permanent impact on male reproduction. In vitro and animal model data are accumulating with respect to the effects of TBBPA and OPEs but few studies have evaluated their impact on human health.

CONCLUSIONS:

More research on human exposure to replacement flame retardants and the possibility that they may be associated with adverse reproductive health outcomes is a high priority.

Authors: Hales BF, Robaire B

Full Source: Andrology. 2020 Mar 25. doi: 10.1111/andr.12789. [Epub ahead of print]

In-vehicle carbon dioxide and adverse effects: An air filtration-based intervention study

2020-03-19

Drowsiness is considered a potential risk for traffic accidents. Exposure to high carbon dioxide (CO₂) levels in vehicles may result in unpleasant feeling, fatigue, drowsiness or lethargy among drivers and passengers. However, little is known about whether reducing CO₂ levels in vehicles by air filtration can relieve adverse effects among human subjects during driving. We recruited a panel of 84 healthy participants to drive a

However, these chemicals are often additive so they leach out into the environment.

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vehicle equipped with a CO₂ filtration system for 1 h on a coastal road in a Northern Taiwan rural area. The operation modes of the CO₂ filtration system, including fresh air from open windows without a CO₂ filtration system (Control-mode), fresh air from an air conditioning (AC) system with closed windows and a false CO₂ filtration system in operation (Off-mode) or a true CO₂ filtration system in operation (On-mode), were examined. The repeated measurements of heart rate (HR), blood pressure (BP), CO₂, total volatile organic compounds (TVOCs), particulate matter ≤2.5 μm in aerodynamic diameter (PM_{2.5}) and a simple question about drowsiness were obtained for each participant in three different modes. We found that decreased HR, systolic BP (SBP) and diastolic BP (DBP) and increased drowsiness were associated with increased levels of in-vehicle CO₂. The effects of in-vehicle CO₂ on adverse effects were highest in the Off-mode during driving. In the On-mode, the participants showed slight decreases in HR, SBP and DBP and slight increases in drowsiness. We concluded that the utilization of a CO₂ filtration system can reduce in-vehicle CO₂ levels and modify the effect of in-vehicle CO₂ on HR, BP and drowsiness among human subjects during driving.

Authors: Chem RY, Ho KF, Chang Ty, Hong Gb, Liu CW, Chuang KJ

Full Source: The science of the total environment. 2020 Mar 19;723:138047. doi: 10.1016/j.scitotenv.2020.138047. [Epub ahead of print]

Iodine and bromine in fish consumed by indigenous peoples of the Russian Arctic

2020-03-25

Fish muscle may constitute one of the main sources of iodine (I) for the indigenous peoples of the Russian Arctic, although limited information is available about its content in commonly consumed fish species. In the current study, bromine (Br), I, the essential elements (copper, selenium and zinc) and other non-essential elements - specifically mercury, arsenic (As), cadmium, lead and nickel - have been quantified in 10 fish species consumed by people living in the Nenets and Chukotka Regions. Fish muscle was analysed by ICP-MS after nitric acid or tetramethylammonium hydroxide digestion. Certified reference materials were employed and concentrations are reported as geometric means (GMs). Atlantic cod (6.32 mg/kg) and navaga (0.934 mg/kg) contained substantially higher amounts of I than all other fish species, while broad whitefish had the lowest (0.033 mg/kg). By comparison, navaga contained more Br (14.5 mg/kg) than the other fish species, ranging 7.45 mg/kg in Atlantic cod to 2.39 mg/kg in northern pike. A significant inter-fish association between As and I in freshwater and marine fish was observed, suggesting common

However, little is known about whether reducing CO₂ levels in vehicles by air filtration can relieve adverse effects among human subjects during driving.

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sources and perhaps parallel absorption patterns. Only Atlantic cod and, to lesser extent, navaga constituted significant dietary sources of I.

Authors: Sobolev N, Aksenov A, Sorokina T, Chashchin V, Ellingsen DG, Nieboer E, Varakina Y, Plakhina E, Onuchina A, Thomassen MS, Thomassen Y

Full Source: Scientific Reports. 2020 Mar 25;10(1):5451. doi: 10.1038/s41598-020-62242-1.

PHARMACEUTICAL/TOXICOLOGY

Serum Metabolites in Hand-Arm Vibration Exposed Workers

2020-03-20

OBJECTIVE:

To investigate whether low molecular organic biomarkers could be identified in blood samples from vibration exposed workers using a metabolomics.

METHODS:

The study population consisted of 38 metalworkers. All participants underwent a standardized medical examination. Blood samples were collected before and after work shift and analyzed with GC-TOFMS. Multivariate modeling (orthogonal partial least-squares analysis with discriminant analysis [OPLS-DA]) were used to verify differences in metabolic profiles.

RESULTS:

Twenty-two study participants reported vascular symptoms judged as vibration-related. The metabolic profile from participants with vibration-induced white fingers (VWF) was distinctly separated from participants without VWF, both before and after vibration exposure.

CONCLUSION:

Metabolites that differed between the groups were identified both before and after exposure. Some of these metabolites might be indicators of health effects from exposure to vibrations. This is the first time that a metabolomic approach has been used in workers exposed to vibrations.

Authors: Vihlborg P, Graff P, Hagenbjörk A, Hadrévi J, Bryngelsson IL, Eriksson K

Full Source: Journal of occupational and environmental medicine. 2020 Mar 20. doi: 10.1097/JOM.0000000000001864. [Epub ahead of print]

Metabolites that differed between the groups were identified both before and after exposure.

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Estimating inorganic arsenic exposure from rice intake in Chinese Urban Population

2020-03-17

BACKGROUND:

Rice intake is a major route of oral exposure to inorganic arsenic (iAs), a known human carcinogen. The recent risk assessment on iAs in rice conducted by the US Food & Drug Administration (FDA) didn't propose an action level for iAs in rice mainly because of the relatively low consumption rate in the general US population. However, this decision may not be applicable to high rice-intake populations, such as the Chinese population.

OBJECTIVE:

The objective of this study was to probabilistically characterize the exposure of iAs via rice intake in Chinese population with a focus on the urban population.

METHODS:

With the consideration of bioaccessibility of iAs in rice, iAs exposure is mainly determined by rice intake rate and iAs concentration in rice. To estimate the daily rice consumption, a dietary survey consisting of 1873 subjects was conducted in three major Chinese cities (Beijing, Guangzhou, and Hangzhou). Speciated As concentration in rice was measured using 480 rice samples collected from markets in these three cities. Monte Carlo simulation approach was applied to distributionally estimate the average daily dose (ADD) of iAs through rice intake.

RESULTS:

The estimated distribution of daily iAs exposure of the study population has a mean of 10.5 $\mu\text{g}/\text{day}$ with a 95th percentile interval from 0.1 to 75.3 $\mu\text{g}/\text{day}$. The estimated distribution of ADD has a mean of 0.179 $\mu\text{g}/\text{kg}/\text{day}$ with a 95th percentile interval from 0.001 to 1.224 $\mu\text{g}/\text{kg}/\text{day}$. Greater level of iAs exposure (due to higher rice intake) was observed in males than females, and in summer than other seasons with lower temperature. Geographically, the ADD of iAs exposure from rice intake reduces from south to north.

CONCLUSIONS:

About 13% of the Chinese urban population are exposed to iAs via rice intake higher than the Reference Dose (RfD) level.

Authors: Zhou Z, Kang Y, Li H, Cao S, Xu J, Duan X, Yang G, Shao K
Full Source: Environmental Pollution (Barking, Essex: 1987). 2020 Mar 17;263(Pt A):114397. doi: 10.1016/j.envpol.2020.114397. [Epub ahead of print]

Geographically, the ADD of iAs exposure from rice intake reduces from south to north.

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Effect of fructose and its epimers on postprandial carbohydrate metabolism: A systematic review and meta-analysis

2020-03-10

AIMS:

To synthesize the evidence of the effect of small doses (≤ 30 -g/meal) of fructose and its epimers (allulose, tagatose, and sorbose) on the postprandial glucose and insulin response to carbohydrate-containing meals.

METHODS:

MEDLINE, EMBASE, and the Cochrane Central Register of Controlled Trials were searched through to April 9, 2019. We included randomized (RCTs) and non-randomized acute, single-meal, controlled feeding trials that added ≤ 30 -g of fructose or its epimers either prior to or with a carbohydrate-containing meal compared with the same meal alone. Outcomes included the incremental area under the curve (iAUC) for glucose and insulin, the Matsuda Insulin Sensitivity Index, and the Early Insulin Secretion Index. Data were expressed as ratio of means (RoM) with 95% CIs and pooled using the inverse variance method. The overall certainty of the evidence was evaluated using GRADE.

RESULTS:

Forty trial comparisons ($n = 400$) were included (none for sorbose). Allulose significantly reduced the postprandial iAUC glucose response by 10% (0.90 [0.84 to 0.96], $P < 0.01$). Tagatose significantly reduced the postprandial iAUC insulin response by 25% (0.75 [0.62 to 0.91], $P < 0.01$) and showed a non-significant 3% reduction in the postprandial iAUC glucose response (0.97 [0.94 to 1.00], $P = 0.07$). There was no effect of fructose on any outcome. The certainty of the evidence was graded as low to moderate for fructose, moderate for allulose, and low for tagatose.

CONCLUSIONS:

Small doses of allulose and tagatose, but not fructose, lead to modest improvements on postprandial glucose and insulin regulation. There is a need for long-term RCTs to confirm the sustainability of these improvements.

Authors: Braunstein CR, Noronha JC, Khan TA, Mejia SB, Wolever TM, Josse RG, Kendall CW, Sievenpiper JL

Full Source: Clinical nutrition (Edinburgh, Scotland). 2020 Mar 10. pii: S0261-5614(20)30104-7. doi: 10.1016/j.clnu.2020.03.002. [Epub ahead of print]

Small doses of allulose and tagatose, but not fructose, lead to modest improvements on postprandial glucose and insulin regulation.

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Human in vitro percutaneous absorption of bisphenol S and bisphenol A: A comparative study

2020-03-18

Bisphenol A (BPA) is widely used in industrial products. Due to the toxicity of this compound, and to comply with restrictions and regulations, manufacturers have progressively replaced it by substitutes. One of the main substitutes used is bisphenol S (BPS). Despite increasing use in many products, the effects of BPS on human health have been little investigated, and studies on percutaneous BPS absorption and particularly toxicokinetic data are lacking. However, the endocrine-disrupting activity of BPA and BPS appears comparable. Dermal contact is a significant source of occupational exposure and is the main route during handling of bisphenol-containing receipts by cashiers. Here, percutaneous BPS absorption was investigated and compared to that of BPA. Experiments were performed according to OECD guidelines. Test compounds dissolved in a vehicle - acetone, artificial sebum or water - were applied in vitro to fresh human skin samples in static Franz diffusion cells. Flux, cumulative absorbed dose and distribution of dose recovered were measured. BPA absorption was vehicle-dependent ranging from 3% with sebum to 41% with water. BPS absorption was much lower than BPA absorption whatever the vehicle tested (less than 1% of applied dose). However, depending on the vehicle 20% to 47% of the applied BPS dose remained in the skin, and was consequently potentially absorbable. Both BPA and BPS were mainly absorbed without biotransformation. Taken together, these results indicate that workers may be exposed to BPS through skin when handling products containing it. This exposure is of concern as its toxicity is currently incompletely understood.

Authors: Champmartin C, Marquet F, Chedik L, Décret MJ, Aubertin M, Ferrari E, Grandclaude MC, Cosnier F

Full Source: Chemosphere. 2020 Mar 18;252:126525. doi: 10.1016/j.chemosphere.2020.126525. [Epub ahead of print]

The dog as a sentinel species for environmental effects on human fertility

2020-03-01

Despite the vast body of evidence that environmental toxicants adversely affect reproductive development and function across species, demonstrating true cause and effect in the human remains a challenge. Human meta-analytical data, showing a temporal decline in male sperm quality, is paralleled by a single laboratory study showing a similar 26 year

Due to the toxicity of this compound, and to comply with restrictions and regulations, manufacturers have progressively replaced it by substitutes.

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decline in the dog, which shares the same environment. These data are indicative of a common cause. Environmental chemicals (ECs) detected in reproductive tissues and fluids induce similar, short term, adverse effects on human and dog sperm. Both pre and post natal stages of early life development are sensitive to chemical exposures and such changes could potentially cause long term effects in the adult. The environmental "pollutome" (mixtures of ECs), is determined by industrialisation, atmospheric deposition, and bio-accumulation, and characterises real-life exposure. In Arctic ecosystems, dietary and non-dietary chemical contaminants are detectable in biological tissues and linked with adverse health effects in both dogs and their handlers. In the female, such exposure could contribute to disorders such as ovarian insufficiency, dysregulated follicle development, ovarian cancer and polycystic ovarian syndrome. In the dog, ovarian chemical concentrations are greater than in the testis, and preliminary studies indicate that dietary exposures may influence the sex ratio in the offspring in favour of females. Within this article, we review current knowledge on chemical effects on human reproduction and suggest that the dog, as a sentinel species for such effects, is an essential tool for addressing critical data gaps in this field.

Authors: Sumner RN, Harris IT, Van Der Mescht M, Byers A, England GCW, Lea RG

Full Source: Reproduction. 2020 Mar 1. pii: REP-20-0042.R1. doi: 10.1530/REP-20-0042. [Epub ahead of print]

OCCUPATIONAL

Knowledge and attitude among Lebanese woman towards hazardous chemicals used in nail cosmetics

2020-03-26

Middle Eastern women seek frequently for self-adornment. Harmful effects of chemicals used in nail care services have involved women worldwide. This study was performed to determine Lebanese women's knowledge and attitudes toward adverse effects of compounds used in nail cosmetics. A national cross-sectional study was carried out using an online questionnaire and targeting women in Lebanon. Data was collected on sociodemographic characteristics, nail cosmetics' application, preventive measures, perceived knowledge and self-reported side effects associated with nail cosmetic's use. A total cumulative knowledge score was calculated to categorize consumer knowledge. A total of 573 women completed the survey. Young women with a high school education or beyond were overrepresented. Most of the participants preferred applying

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classic manicure and removers on a weekly basis. Over 82% had poor/fair knowledge about health hazards associated with chemical compounds used in nail cosmetics with their levels of education acting as a key factor. Skin and neurological symptoms were the more frequently self-reported symptoms. Interestingly, the use of a nail hardener was linked to a higher prevalence of headache, nausea, allergy, skin irritation, itching and burn. The prevalence of the three later symptoms was higher among gel users. Moreover, few participants read nail cosmetics' labels or questioned their safety. Although nail cosmetics' application was common among Lebanese women, there is poor knowledge regarding their harmful effects. Based on these findings, it is warranted to launch health awareness campaigns and introduce a cosmetovigilance system to ensure the safety of the consumer products.

Authors: Lteif M, Samia El Hayek M, Azouri H, Antonios D

Full Source: Journal of Community Health. 2020 Mar 26. doi: 10.1007/s10900-020-00810-2. [Epub ahead of print]

Occupational exposure to secondhand cannabis smoke along law enforcement officers providing security at outdoor concert events

2020-03-27

OBJECTIVES:

Numerous states within the USA have legalized cannabis for medical or non-medical (adult/recreational) use. With the increased availability and use of cannabis, occupational and environmental exposures to secondhand cannabis smoke (SHCS) raise concerns over whether non-users may be at risk for a 'contact high', impaired neurocognitive function, harm from irritants and carcinogens in smoke, or potentially failing a cannabis screening test. The extent of health effects from potential occupational exposure to SHCS is unknown. This is a study of occupational exposures to SHCS among law enforcement officers (LEOs) providing security at outdoor concerts on a college campus in a state where adult use of cannabis is legal.

METHODS:

Investigators evaluated a convenience sample of LEOs' potential exposure to SHCS and symptoms experienced while providing security during two open-air stadium rock-n-roll concerts on consecutive days in July 2018. During each event, full-shift area and LEO personal air samples were collected for $\Delta 9$ -tetrahydrocannabinol ($\Delta 9$ -THC), the psychoactive component of cannabis. Urine (pre- and postevent; n = 58) and blood (postevent; n = 29) were also collected and analyzed for $\Delta 9$ -THC and two

Environmental chemicals (ECs) detected in reproductive tissues and fluids induce similar, short term, adverse effects on human and dog sperm.

The extent of health effects from potential occupational exposure to SHCS is unknown.

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of its metabolites [11-nor-delta-9-tetrahydrocannabinol-9-carboxylic acid (THC-COOH) and 11-nor-hydroxy-delta-9-tetrahydrocannabinol (OH-THC)]. Urine samples were analyzed using ultrahigh performance liquid chromatography coupled with positive electrospray ionization tandem mass spectrometry and results were compared with the Department of Transportation guidelines for urine screening for cannabis. Blood (postevent) samples were also collected and the plasma fraction was tested for Δ 9-THC, THC-COOH, and OH-THC using high-performance liquid chromatography coupled with mass spectrometry. LEOs also completed a medical questionnaire asking about symptoms experienced during the concerts.

RESULTS:

Twenty-nine LEOs participated in the evaluation. Measurable amounts of Δ 9-THC were found in area (concentrations ranged from non-detectable to 330 ng m⁻³) and personal air samples (53-480 ng m⁻³). Small amounts (<1.0 ng ml⁻¹) of a Δ 9-THC metabolite (THC-COOH) were found in the postevent urine of 34% of LEOs. Neither Δ 9-THC nor its metabolites were detected in any blood sample. LEOs reported experiencing non-specific symptoms during the concerts, such as burning, itchy, or red eyes (31%); dry mouth (21%); headache (21%); and coughing (21%).

CONCLUSIONS:

Identification of Δ 9-THC in the breathing zone for some LEOs indicates the potential for airborne exposure to the psychoactive component of cannabis. However, the magnitude of these exposures was small compared with those that would result in a dose of Δ 9-THC associated with psychotropic effects. Similarly, THC-COOH was found in the postevent urine of some LEOs at concentrations that were orders of magnitude below active use cut-points used during a cannabis screening test (50 ng ml⁻¹). Exposure to SHCS was not high enough to detect concentrations of THC, THC-COOH, to OH-THC in the blood, which could be due to differences between the limits of detection for the tests employed. The ocular and respiratory symptoms reported by LEOs may be related to irritants in SHCS. However, the health effects of SHCS remain unclear, and further research concerning occupational and environmental exposures is warranted.

Authors: Wiegand DM, Methner MM, Grimes GR, Couch JR, Wang L, Zhang L, Blout BC

Full Source: Annals of work exposures and health. 2020 Mar 27. pii: wxaa025. doi: 10.1093/annweh/wxaa025. [Epub ahead of print]

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Demonstration of subclinical early nephrotoxicity induced by occupational exposure to Silica among workers in pottery industry

2020-04-01

BACKGROUND:

For many years, several studies drew attention to the possible nephrotoxic effects of silica and distinct renal dysfunction involving glomerular and renal tubules in workers exposed to silica.

OBJECTIVE:

To determine the early signs of subclinical nephrotoxic effects among some Egyptian workers exposed to silica in the pottery industry.

METHODS:

This study was carried out in El-Fawakhir handicraft pottery area, in Greater Cairo, Egypt. The studied population included 29 non-smoking male workers occupationally exposed to silica in addition to 35 non-smoking administrative male subjects who represented the comparison group in the study. Measured urinary parameters were concentrations of total protein (TP), microalbumin (Malb), activities of alkaline phosphatase (ALP), γ -glutamyl transferase (γ -GT), lactate dehydrogenase (LDH), kidney injury molecule-1 (KIM-1), and silicon (Si).

RESULTS:

Silica-exposed workers showed significantly ($p < 0.05$) increased levels of urinary TP, Malb, ALP, γ -GT, LDH, and KIM-1 compared with the comparison group. Among the silicaexposed group, increased urinary Si levels were positively and significantly correlated (Spearman's $\rho > 0.60$, $p < 0.001$ for all variables) with the elevated urinary proteins (including KIM-1) and enzymes levels. All measured urinary parameters were positively and significantly correlated ($\rho > 0.75$, $p < 0.001$ for all variables) with the duration of work among exposed subjects. No significant correlation was observed between the measured variables and the age of workers.

CONCLUSION:

There is associated subclinical glomerular and tubular affection among silicaexposed workers, which is related to the duration and intensity of exposure.

Authors: Mourad BH, Ashour YA

Full Source: The international journal of occupational and environmental medicine. 2020 Apr;11(2):85-94. doi: 10.34172/ijoem.2020.1886.

To determine the early signs of sub-clinical nephrotoxic effects among some Egyptian workers exposed to silica in the pottery industry.

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Cobalt-containing dust exposures: Prediction of whole blood and tissue concentrations using a biokinetic model

2020-03-16

Biokinetic models estimating cobalt (Co) tissue burden can help assess the potential for systemic effects. Such models, however, have not been used to estimate remote tissue concentrations associated with inhalation exposure to Co-containing dust in general environments, work spaces, or animal toxicity tests. We have therefore updated a Co biokinetic model previously developed for oral dosing to include the inhalation pathway by incorporating the International Commission on Radiological Protection (ICRP) Human Respiratory Tract Model. Further, data from animal studies allowed for characterization of testes Co tissue concentration supplementing previous predictions for the liver, heart and blood. Reasonable agreement (within a factor of two) was found between modeled and measured blood, liver, testes and tissue concentrations when animal doses were modeled using human equivalent concentrations to account for species differences in regional lung deposition. We applied the updated model to occupational inhalation exposure scenarios, and found that upper-bound plausible human systemic body burden associated with Co ingestion is much higher than the burden associated with Co inhalation. Chronic ingestion of Co at a previously proposed oral reference dose (RfD) of 0.03 mg/kg-day resulted in predicted tissue levels of 22-54 µg/L (blood), 0.05-0.1 µg/g (heart), 0.01-0.02 µg/g (testes), and 0.2-0.5 µg/g (liver), which were at least 5-fold more than the systemic burden associated with various Co inhalation occupational exposure limits (OELs) of 0.1 mg/m³ or less (for 8 h/d and 5 d/w). Overall, our analysis indicated that Co-metal or dust induced systemic health effects, including myocardial damage, are unlikely for the inhalation pathway when personal exposures levels are below concentrations associated with local respiratory effects such as pulmonary fibrosis.

Authors: Unice KM, Kovoichich M, Monnot AD

Full Source: The science of the total environment. 2020 Mar 16;723:137968. doi: 10.1016/j.scitotenv.2020.137968. [Epub ahead of print]

Respirator usage protects brain white matter from welding fume exposure: a pilot magnetic resonance imaging study of welders

2020-03-23

Welding fume exposure has been associated with structural brain changes and a wide variety of clinical and sub-clinical outcomes including

Further, data from animal studies allowed for characterization of testes Co tissue concentration supplementing previous predictions for the liver, heart and blood.

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cognitive, behavioral and motor abnormalities. Respirator use has been shown to decrease exposure to welding fumes; however, the associations between respirator use and health outcomes, particularly neurologic health, have been understudied. In this preliminary study, we used diffusion tensor imaging (DTI) to investigate the effectiveness of respirator use in protecting workers' white matter (WM) from the harmful effects related to welding fume exposure. Fractional anisotropy (FA), a common DTI measurement of water diffusion properties, was used as a marker of WM microstructure integrity. We hypothesized that FA in brain regions involved in motor and neurocognitive functions would differ between welders reporting respirator use compared to those not using a respirator. We enrolled a pilot cohort of 19 welders from labor unions in the New York City area. All welders completed questionnaires to assess welding history and occupational health. All completed a DTI acquisition on a 3T Siemens scanner. Partial least squares discriminant analysis (PLS-DA), a bioinformatic analytical strategy, was used to model the divergence of WM microstructures in 48 regions defined by the ICBM-DTI-81 atlas between respirator users compared to non-users. This yielded an effective discrimination of respirator users from non-users, with the uncinate fasciculus, the cerebellar peduncle and the superior longitudinal fasciculus contributing most to the discrimination of these groups. These white matter tracts are involved in widespread motor and cognitive functions. To our knowledge, this study is the first to suggest a protective effect of respirator on WM microstructure, indicating that the lack of respirator may present unsafe working conditions for welders. These preliminary findings may inform a larger, longitudinal intervention study that would be more appropriate to investigate the potential protective effect of respirator usage on brain white matter in welders.

Authors: Rechtman E, Curtin P, Onyebeke LC, Wnag VX, Papazaharias DM, Hazeltine D, de Water E, Nabeel I, Mani V, Zuckerman N, Lucchini RG, Gaughan D, Tang CY, Horton MK

Full Source: Neurotoxicology. 2020 Mar 23. pii: S0161-813X(20)30050-4. doi: 10.1016/j.neuro.2020.03.008. [Epub ahead of print]

Environmental monitoring of PAHs exposure, biomarkers and vital status in Coke oven workers

2020-03-25

A follow-up study of a cohort of workers from a coke plant compared with a control group from the same industrial area was conducted in 2019. The recruitment and environmental and biomarker measurements were performed during 1993/1994. The environmental concentrations of

We hypothesized that FA in brain regions involved in motor and neurocognitive functions would differ between welders reporting respirator use compared to those not using a respirator.

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polycyclic aromatic hydrocarbons (PAH), B(a)P, pyrene and nitro-PAH were measured. Personal data were collected via an individual semi-structured questionnaire by a trained physician. All biomarkers were measured after a specific blood drawing for every test. Significant risks (ORs) were observed for nitro-PAH ($\geq 0.12 \mu\text{g}/\text{m}^3$) [OR = 7.96 (1.01-62.82)], urinary 1-hydroxypyrene (1-OHpy) ($\geq 0.99 \mu\text{moles}/\text{moles}$ of creatinine) [OR = 11.71 (1.47-92.90)], PAH DNA adducts (P^{32}) (≥ 2.69 adducts/ 10^8 nucleotides) [OR = 5.46 (1.17-25.58)], total nitro-PAH hemoglobin adducts ($\geq 161.68 \text{ fg}/\mu\text{g}$ of Hb) [OR = 5.92 (1.26-27.86)], sister chromatid exchange (SCE) with TCR (≥ 377.84 SCE/cell chromosomes) [OR = 13.06 (3.95-93.10)], sister chromatid exchange with T (≥ 394.72 total SCE) [OR = 13.06 (3.95-93.10)], and sister chromatid exchange with X (≥ 8.19 mean SCE) [OR = 13.06 (3.95-93.10)]. Significant risk of death for all causes and chromosomal aberrations (48 h) (OR = 7.19 [1.19-43.44]) or micronuclei in culture at 48 h (OR = 3.86 [1.04-14.38]) were also found.

Authors: Vimercati L, Bisceglia L, Cavone D, Caputi A, De Maria L, Delfino MC, Corrado V, Ferri GM

Full Source: International journal of environmental research and public health. 2020 Mar 25;17(7). pii: E2199. doi: 10.3390/ijerph17072199.

The environmental concentrations of polycyclic aromatic hydrocarbons (PAH), B(a)P, pyrene and nitro-PAH were measured.