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ENVIRONMENTAL RESEARCH

Zinc: A promising material for electrocatalyst-assisted microbial electrosynthesis of carboxylic acids from carbon dioxide

2019-07-12

Microbial electrosynthesis (MES) has been proposed as a sustainable platform to simultaneously achieve wastewater treatment, renewable energy generation and chemicals production. Currently, the CO₂ valorization via MES is restricted by the low production rate, while that via electrochemical reduction is limited by the production of C₁ products with high efficiency and selectivity. The electrocatalyst-assisted MES could potentially solve these bottlenecks of both MES and electrochemical reduction technology by increasing the production rate and expanding the product range. In the present study, four types of metals were evaluated for mixed culture-based, electrocatalyst-assisted MES with the fabrication of electrical-biological hybrid cathodes. Cathodes based on In, Zn, Ti and Cu showed high parallelism at 30 A/m². However, no parallelism was observed at 50 A/m², and only Zn experienced a further increase of the maximum acetic acid production rate (1.23 ± 0.02 g/L/d, 313 ± 5 g/m²/d) and titre (9.2 ± 0.1 g/L), with the highest value of the production rate normalized to the project area of the fibre cathodes. Other volatile fatty acids and ethanol were below 0.5 g/L. Moreover, it was the sharp H₂ generation, which mainly caused the fluctuation of coulombic efficiency. The application of such Zn-based electrical-biological hybrid system shall provide a more efficient route for CO₂ valorisation.

Authors: Jiang Y, Chu N, Zhang W, Ma J, Zhang F, Liang P, Zeng RJ.

Full Source: Water Research. 2019 Aug 1; 159:87-94. doi: 10.1016/j.watres.2019.04.053. Epub 2019 May 1.

In the present study, four types of metals were evaluated for mixed culture-based, electrocatalyst-assisted MES with the fabrication of electrical-biological hybrid cathodes.

Oestrogenic compounds as exogenous modulators of physiological functions in molluscs: Signalling pathways and biological responses

2019-07-12

Molluscs have been widely utilised to evaluate the effects of oestrogenic compounds, one of the most widespread classes of Endocrine Disrupting Chemicals-EDCs. However, knowledge on steroid signalling and metabolism in molluscs has considerably increased in the last decade: from these studies, a considerable debate emerged on the role of 'natural' steroids in physiology, in particular in reproduction, of this invertebrate

group. In this study, available information on the effects and mechanisms of action of oestrogens in molluscs will be reviewed, with particular emphasis on bivalves that, widespread in aquatic ecosystems, are most likely affected by exposure to oestrogenic EDCs. Recent advances in steroid uptake and metabolism, and estrogen receptors-ERs in molluscs, as well as in oestrogen signalling in vertebrates, will be considered. The results so far obtained with 17β -oestradiol and different estrogenic compounds in the model bivalve *Mytilus* spp., demonstrate specific effects on immune function, development and metabolism. Transcriptomic data reveal non genomic oestrogen signalling pathways in mussel tissues that are supported by new observations at the cellular level. In vitro and in vivo data show, through independent lines of evidence, that oestrogens act through non-genomic signalling pathways in bivalves. In this light, regardless of whether molluscs synthesise oestrogens de novo or not, and despite their ERs are not directly activated by ligand binding, estrogens can interact with multiple signalling components, leading to modulation of different physiological functions. Increasing knowledge in endocrine physiology of molluscs will provide a framework for a better evaluation and interpretation of data on the impact of estrogenic EDCs in this invertebrate group.

Authors: Balbi T, Ciacci C, Canesi L.

Full Source: Comparative Biochemistry and Physiology - Part C: Toxicology & Pharmacology. 2019 Aug; 222:135-144. doi: 10.1016/j.cbpc.2019.05.004. Epub 2019 May 3.

Occurrence, distribution, bioaccumulation, and ecological risk of bisphenol analogues, parabens and their metabolites in the Pearl River Estuary, South China

2019-07-12

Bisphenol analogues and alkyl esters of p-hydroxybenzoic (parabens) can be defined as emerging endocrine-disrupting compounds (EDCs) due to their similar characteristics. This study analysed eight bisphenol analogues, six parabens, and five paraben metabolites in seawater (including aqueous and suspended particle matter (SPM)), as well as organism samples from the Pearl River Estuary, in order to determine their occurrence, distribution, bioaccumulation, and ecological and human health risk in South China's marine environment. The aggregation concentrations of bisphenol analogues, parabens, and paraben metabolites were 106 ng/L, 4.53 ng/L, and 231 ng/L in aqueous samples, 868 ng/g, 173 ng/g, and 9320 ng/g in SPM samples, 41.6 ng/g, 6.46 ng/g, and 460 ng/g in marine organisms, respectively. This study identified significantly higher

This study analysed eight bisphenol analogues, six parabens, and five paraben metabolites in seawater, as well as organism samples from the Pearl River Estuary.

concentrations of paraben metabolites than their parent parabens in the marine environment, which has not yet been reported in previous studies. These findings call for greater attention on the contamination of paraben metabolites in marine environments. Moreover, the median values of the logarithm of bioaccumulation factors (BAF) for the detected 20 target compounds ranged from 0.11 to 5.07. Bisphenol analogues including bisphenol A (BPA), bisphenol S (BPS), bisphenol F (BPF), bisphenol B (BPB), bisphenol P (BPP), and Fluoren-9-bisphenol (BPFL) ($3.3 < \lg \text{BAF} < 3.7$), and three paraben metabolites including 4-hydroxybenzoic acid (4-HB) ($3.3 < \lg \text{BAF} < 3.7$), methyl protocatechuate (OH-MeP), and ethyl protocatechuate (OH-EtP) ($\text{Log BAF} > 3.7$), exhibited varying degrees of potential bioaccumulation effect in the majority of organism samples. Furthermore, all tested chemicals in this study were at low risk quotient (RQ) levels for acute and chronic toxicity in seawater. However, the target hazard quotient (THQ) values of two paraben metabolites, 4-HB and benzoic acid (BA), were higher than 1, which indicates that paraben metabolites have the potential to adsorb into organisms, and their associated human health risks should be of great concern. Overall, the study results suggest that the occurrence and risks of emerging EDCs in coastal waters are deserving of further studies, especially in densely populated regions of the world.

Authors: Zhao X, Qiu W, Zheng Y, Xiong J, Gao C, Hu S.

Full Source: *Ecotoxicology & Environmental Safety*. 2019 May 4; 180:43-52. doi: 10.1016/j.ecoenv.2019.04.083. [Epub ahead of print]

Perfluoroalkyl substances (PFASs) in the marine environment: Spatial distribution and temporal profile shifts in shellfish from French coasts

2019-07-12

Perfluoroalkyl substances (PFASs) were investigated in filter-feeding shellfish collected from 2013 to 2017 along the English Channel, Atlantic and Mediterranean coasts of France. PFOS (perfluorooctane sulfonate), PFTTrDA (perfluorotridecanoic acid), PFTTeDA (perfluorotetradecanoic acid), PFDoDA (perfluorododecanoic acid) and PFUnDA (perfluoroundecanoic acid) were detected in more than 80% of samples, thus indicating widespread contamination of the French coastal environment by these chemicals. The distribution of PFAS concentrations showed differences according to sampling locations and years. PFOS was the predominant PFAS in most samples collected from English Channel and Atlantic coasts until 2014, but the opposite was observed in 2015, 2016 and 2017, while perfluoroalkyl carboxylic acids (PFCAs) prevailed in Mediterranean

Perfluoroalkyl substances (PFASs) were investigated in filter-feeding shellfish collected from 2013 to 2017 along the English Channel, Atlantic and Mediterranean coasts of France.

samples in all study years. Among PFCAs, PFTTrDA showed the highest maximum (1.36 ng g⁻¹ ww) and median (0.077 ng g⁻¹ ww) concentrations in 2016-2017. Other PFAS median concentrations were within the 0.014 (PFNA) - 0.055 (PFTTeDA) ng g⁻¹ ww range. The profiles determined each year in most Mediterranean samples suggest distinctive sources. PFOS median concentrations showed a significant decrease over the study years, from 0.118 to 0.126 ng g⁻¹ ww in 2013-2015 to 0.066 ng g⁻¹ ww in 2016 and 2017. ΣPFCAs showed no trends in concentration ranges over the same years. The shift in PFAS profiles from PFOS to long-chain PFCAs over the study period reflects PFOS production phase-out, combined with continuous inputs of PFCAs into the marine environment. These results provide reference data for future studies of the occurrence of contaminants of emerging concern on European coasts.

Authors: Catherine M, Nadège B, Charles P, Yann A.

Full Source: Chemosphere. 2019 Aug; 228:640-648. doi: 10.1016/j.chemosphere.2019.04.205. Epub 2019 Apr 29.

Separate and joint eco-toxicological effects of sulfadimidine and copper on soil microbial biomasses and ammoxidation microorganisms abundances

2019-07-12

Heavy metals and antibiotics residues in agricultural soils are attracting more and more attention. A laboratory study was conducted to evaluate the single and combined effects of sulfadimidine (SM2) (0.05, 0.20, 0.80 mmol/kg) and copper (Cu) (1.60 mmol/kg) on soil microbial biomasses and ammoxidation microorganisms abundances after 7, 14, 21 and 28 days. The results demonstrated that the single and combined contaminations had a significant and persistent inhibitory effect on soil bacteria, fungi and actinomycetes populations and amoA gene copies of ammonia-oxidising archaea (AOA) and ammonia-oxidizing bacteria (AOB) (Except SM2 0.05 and 0.20 mmol/kg on 7 and 14 d and SM2 0.05 mmol/kg on 21 d led to a stimulatory effect on fungi and AOA-amoA gene, respectively). With higher dosage and longer exposure time, the toxic effect of single and combined contaminants on soil bacteria, fungi and actinomycetes as well as on the amoA gene of AOA and AOB was greatly reinforced. Combined contaminants produced more toxicity than the chemicals were used alone. Overall, the interaction effects of SM2 and Cu on bacteria (on 14, 21 and 28 d), fungi and AOA-amoA were mainly synergism, in contrast, on actinomycetes (on 14, 21 and 28 d) and AOB-amoA were mainly antagonism. The order of the toxic effects of the single Cu and combined contaminants on microbial activity was:

This study was conducted to evaluate the single and combined effects of sulfadimidine and copper on soil microbial biomasses and ammoxidation microorganisms abundances.

bacteria > actinomycetes > fungi. Furthermore, AOB-amoA was more sensitive to both contaminants' toxicity than AOA-amoA, while AOA-amoA gene copies were greater than AOB-amoA gene copies about one order of magnitude.

Authors: Wang L, Xia X, Zhang W, Wang J, Zhu L, Wang J, Wei Z, Ahmad Z.
Full Source: Chemosphere. 2019 Aug; 228:556-564. doi: 10.1016/j.chemosphere.2019.04.165. Epub 2019 Apr 25.

MEDICAL RESEARCH

Safety and tolerability of ranibizumab in uni/bilateral neovascular age-related macular degeneration: 12-month TWEYEs study

2019-07-12

This study evaluated the safety and tolerability of ranibizumab 0.5 mg in patients with uni/bilateral neovascular age-related macular degeneration (nAMD) and best-corrected visual acuity (BCVA) < 2/10 and/or second eye affected, regardless of BCVA. In this 12-month, prospective, multicentre, open-label, single arm, pragmatic interventional study, patients (N=941) aged ≥ 50 years were to receive ranibizumab as per approved label, monthly until maximum stable visual acuity (VA) was achieved (initially, three or more injections may be required). Thereafter, patients were to be monitored monthly for VA and treatment was to be resumed if VA was reduced due to disease activity. Of the 936 patients treated with ranibizumab at least once during the study, 823/113 were unilaterally/bilaterally (not simultaneously) treated. The mean (SD) number of ranibizumab injections during the study was 5.4 (2.9)/10.6 (5.0) injections in uni/bilaterally treated patients. Three systemic drug-related adverse events (AEs) (all serious, all in unilaterally treated patients) and 18 systemic AE of special interest (AESIs) (11 serious, 16/2 in unilaterally/bilaterally treated patients) occurred during the study. The annual incidence rate (AIR) (events/1000 person-years) for systemic drug-related AEs, considering a 15-day/30-day risk period, 11.0/8.5 for unilaterally treated patients. Considering the same risk period, the AIR (events/1000 person-years) for systemic AESIs for unilaterally treated patients was 22.1/19.9. Considering a 30-day risk period, the AIR (events/1000 treated eye-years) of ocular drug-related AEs was 23 and AESIs was 11.5. The low incidence of AEs and AESIs demonstrated the good safety and tolerability of

This study evaluated the safety and tolerability of ranibizumab 0.5 mg in patients with uni/bilateral neovascular age-related macular degeneration

ranibizumab in unilaterally/bilaterally treated patients with nAMD in this real-world setting.

Authors: Bandello F, Staurenghi G, Ricci F, Midena E, Viola F, Lupieri Sinibaldi T, Colombo L, Peruzzi E, Bassanini S.

Full Source: British Journal of Ophthalmology. 2019 May 11. pii: bjophthalmol-2019-313907. doi: 10.1136/bjophthalmol-2019-313907. [Epub ahead of print]

BPA activates EGFR and ERK1/2 through PPAR γ to increase expression of steroidogenic acute regulatory protein in human cumulus granulosa cells

2019-07-12

Bisphenol A (BPA) negatively affects steroid production in human luteinised granulosa cells (GC). This study was designed to address two important questions: (1) whether BPA exerts the same disruptive effect in human cumulus granulosa cells (hCGC) and (2) to reveal the molecular mechanism underlying the BPA's action on steroidogenesis. The authors used cultured hCGC since these cells exert the properties of GC from early antral follicles. Results showed that BPA at 100 μ M decreased oestradiol level and CYP19A1 mRNA, but increased progesterone production, steroidogenic acute regulatory protein (STAR) and peroxisome proliferator-activated receptor gamma (PPAR γ) mRNA expression after 48 h. Shorter (6 h) exposure to BPA elevated PPAR γ mRNA level in hCGC. Addition of ERK1/2 (U0126), EGFR (AG1478) and PPAR γ (GW9662) inhibitors prevented the BPA-induced STAR and PPAR γ mRNA expression. Western blot analysis showed that BPA induced a rapid EGFR and ERK1/2 activation. The BPA-induced EGFR phosphorylation was prevented by addition of the PPAR γ inhibitor, whereas the BPA-induced ERK1/2 activation was prevented by addition of the EGFR or PPAR γ inhibitor. These data show that BPA increases the progesterone and decreases the oestradiol biosynthetic pathway in hCGC. Augmentation of the progesterone biosynthetic pathway is mediated through the PPAR γ -dependent activation of EGFR and ERK1/2, leading to increased expression of STAR mRNA.

Authors: Pogrmic-Majkic K, Samardzija Nenadov D, Fa S, Stanic B, Trninic Pjevic A, Andric N.

Full Source: Chemosphere. 2019 Aug; 229:60-67. doi: 10.1016/j.chemosphere.2019.04.174. Epub 2019 Apr 27.

Pulmonary toxicity of two different multi-walled carbon nanotubes in rat: Comparison between intratracheal instillation and inhalation exposure

2019-07-12

Multi-walled carbon nanotubes (MWCNTs), which vary in length, diameter, functionalisation and specific surface area, are used in diverse industrial processes. Since these nanomaterials have a high aspect ratio and are biopersistent in the lung, there is a need for a rapid identification of their potential health hazard. In the present study, the authors assessed the pulmonary toxicity of two pristine MWCNTs (the "long and thick" NM-401 and the "short and thin" NM-403) in Sprague-Dawley rats following either intratracheal instillation or 4-week inhalation in order to gain insights into the predictability and intercomparability of the two methods. The deposited doses following inhalation were lower than the instilled doses. Both types of carbon nanotube induced pulmonary neutrophil influx using both exposure methods. This influx correlated with deposited surface area across MWCNT types and means of exposure at two different time points, 1-3 days and 28-30 days post-exposure. Increased levels of DNA damage were observed across doses and time points for both exposure methods, but no dose-response relationship was observed. Intratracheal instillation of NM-401 induced fibrosis at the highest dose while lower lung deposited doses obtained by inhalation did not induce such lung pathology. No fibrosis was observed following NM-403 exposure. When the deposited dose was taken into account, sub-acute inhalation and a single instillation of NM-401 and NM-403 produced very similar inflammation and DNA damage responses. The authors concluded that the data suggest that the dose-dependent inflammatory responses observed after intratracheal instillation and inhalation of MWCNTs are similar and were predicted by the deposited surface area.

Authors: Gaté L, Knudsen KB, Seidel C, Berthing T, Chézeau L, Jacobsen NR, Valentino S, Wallin H, Bau S, Wolff H, Sébillaud S, Lorcin M, Grossmann S, Viton S, Nunge H, Darne C, Vogel U, Cosnier F.

Full Source: Toxicology & Applied Pharmacology. 2019 Jul 15; 375:17-31. doi: 10.1016/j.taap.2019.05.001. Epub 2019 May 7.

In the present study, the authors assessed the pulmonary toxicity of two pristine multi-walled carbon nanotubes

Methanol Poisoning as an Acute Toxicological Basal Ganglia Lesion Model: Evidence from Brain Volumetry and Cognition

2019-07-12

Acute methanol poisoning leads to optic neuropathy and necrotic lesions of basal ganglia (BG) and subcortical white matter. Survivors of methanol poisoning exhibit long-term executive and memory deficits. Associations between brain volumetry parameters and cognitive sequelae of methanol poisoning are not known. The aim of our study was to identify long-term associations between the cognitive performance of survivors of methanol poisoning and the volume of the brain structures that are selectively vulnerable to methanol. The authors conducted a cross-sectional follow-up study on a sample of patients ($n = 33$, age 50 ± 14 years, 82% males) who survived acute methanol poisoning during methanol mass poisoning outbreak from September 2012 till January 2013 in the Czech Republic. A battery of neuropsychological tests and brain magnetic resonance imaging were included in the clinical examination protocol. Specific brain structures (putamen, globus pallidus, nucleus caudatus, and frontal white matter) were selected as regions of interest, and their volumes were estimated using the MorphoBox prototype software. In robust multiple regression models, sustained visual attention performance (as assessed by Trail Making Test and Prague Stroop Test) was positively associated with BG structures and frontal white matter volumes (Wald = 9.03 to 85.50, $p < 0.01$), sensitivity to interference (as assessed by Frontal Battery Assessment) was negatively associated with frontal white matter volume (Wald = 35.44 to 42.25, $p < 0.001$), and motor performance (as assessed by Finger Tapping Test) was positively associated with globus pallidus and frontal white matter volumes (Wald = 9.66 to 13.29, $p < 0.01$). The authors concluded that the results demonstrate that smaller volumes of elements of BG-thalamocortical circuitry, namely the BG and frontal white matter, relate to attention and motor performance in methanol poisoning from a long-term perspective. Disruption of those functional circuits may underlie specific cognitive deficits observed in methanol poisoning.

Authors: Mana J, Vaneckova M, Klempíř J, Lišková I, Brožová H, Poláková K, Seidl Z, Miovský M, Pelclová D, Bukačová K, Maréchal B, Kober T, Zakharov S, Růžička E, Bezdicek O.

Full Source: Alcoholism: Clinical and Experimental Research. 2019 May 10. doi: 10.1111/acer.14077. [Epub ahead of print]

The present study aimed to explore the role of autophagy in the neurotoxic effect induced by excessive iodine in vivo.

3-Methyladenine alleviates excessive iodine-induced cognitive impairment via suppression of autophagy in rat hippocampus

2019-07-12

Drinking water with high levels of iodine has been identified as the key contributor to iodine excess, but the mechanisms of neurotoxicity induced by excessive iodine remain elusive. The present study aimed to explore the role of autophagy in the neurotoxic effect induced by excessive iodine in vivo. The Morris water maze test results demonstrated that excessive iodine impaired the learning and memory capabilities of rats, which were associated with marked body weight and brain weight abnormalities. In addition, iodine treatment increased malondialdehyde accumulation, decreased superoxide dismutase activity and glutathione (GSH) level, and enhanced levels of autophagy markers in the hippocampus. Notably, inhibition of autophagy with 3-methyladenine (3-MA) could significantly alleviate excessive iodine-induced cognitive impairment. These data imply that autophagy is involved in the cognitive impairment elicited by excessive iodine as a pathway of cell death, and inhibition of autophagy via 3-MA may significantly alleviate the above damage.

Authors: Zhao L, Zhang B, Cui Y, Hou C, Zeng Q, Gao T, Zhang Z, Yu J, Wang Y, Wang A, Liu H.

Full Source: Environmental Toxicology. 2019 May 9. doi: 10.1002/tox.22762. [Epub ahead of print]

OCCUPATIONAL RESEARCH

Radiological progression and lung function decrements among silica-exposed ceramic workers: a longitudinal study

2019-07-12

This follow-up study set out to evaluate the natural course and radiographic progression of silicosis among ceramic workers and describe the risk factors related with disease progression. The authors retrospectively analysed the data of ceramic workers with silicosis who were referred to our hospital between February 2010 and March 2018. A total of 165 ceramic workers followed at least 24 months and with at least two chest radiographs were included in the study. The duration of silica exposure ranged from 5.5 to 27 (median 13.6) years. The numbers of patients according to follow-up time were as follows: 38 (2-2.9) years, 77 (3-3.9) years, 26 (4-4.9) years, 17 (5-5.9) years, and 7 (≥ 6) years. Overall 62 of 165 (37.5%) cases showed radiologic evidences of progression

This follow-up study set out to evaluate the natural course and radiographic progression of silicosis among ceramic workers and describe the risk factors related with disease progression.

ranging from 2 to 8.9 years (mean 3.7 years). Pulmonary function loss rate among silicosis patients was 36.9% (61/165). Multiple logistic regression analysis showed a significant relation between radiographic progression and age (OR, 1.079: 95% CI, 1.011-1.152), follow-up time (OR, 1.557: 95% CI, 1.144-2.118), and the ILO category (category 2 or 3) at first visit (OR, 3.507: 95% CI, 1.505-8.170). The findings suggest that one-third of Turkish ceramic workers with silicosis who were followed up to 8.9 years showed progression that was related to increasing age greater ILO category at time of initial visit and follow-up duration.

Full Source: Karataş M, Gündüzöz M, Büyükşekerci M, Özakıncı OG, Nadir Öziş T.

Full Source: Inhalation Toxicology. 2019 May 10:1-6. doi: 10.1080/08958378.2019.1613459. [Epub ahead of print]

Semi-Quantitative Health Risk Assessment of Exposure to Chemicals in an Aluminium Rolling Mill

2019-07-12

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. The exposure of workers to chemicals was assessed based on the Singapore Health Department's methodology. The health risks of exposure to the identified chemicals as well as 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 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^{-4} - 10^{-6} which could be assessed in the possible range. The results indicated that in the aluminium rolling industry occupational exposure to 75% of the chemicals had a low level, 15% had a moderate and 10% had a high-risk level.

Authors: Sanjari A, Saeedi R, Khaloo SS.

Full Source: International Journal of Occupational & Safety Ergonomics. 2019 May 9:1-20. 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.

Assessment and control of exposures to polymeric methylene diphenyl diisocyanate (pMDI) in spray polyurethane foam applicators

2019-07-12

In the present study, the authors characterised personal inhalation and dermal exposures to diphenyl methane diisocyanate (MDI) and other species in polymeric MDI (pMDI) formulations during spray polyurethane foam (SPF) insulation at 14 sites in New England. In addition, the adequacy of current workplace practices and exposure controls was assessed via comparative urinary biomonitoring of the corresponding methylene diphenyl diamine (MDA) pre- and post-shift. MDI and pMDI are potent dermal and respiratory sensitisers and asthmagens, strong irritants of the skin, eyes, and the respiratory tract, and may cause skin burns. This study is the first comprehensive report to-date on the work practices, inhalation and dermal exposures to isocyanates and effectiveness of existing controls during SPF applications. Breathing zone exposures to 4,4' MDI (n = 31; 24 sprayers, 7 helpers) ranged from 0.9 to 123.0 $\mu\text{g}/\text{m}^3$ and had a geometric mean (GM) of 13.8 $\mu\text{g}/\text{m}^3$ and geometric standard deviation (GSD) of 4.8. Stationary near field area samples (n = 15) were higher than personal exposures: GM, 40.9 (GSD, 3.9) $\mu\text{g}/\text{m}^3$, range 1.4-240.8 $\mu\text{g}/\text{m}^3$. Sixteen percent of personal air samples and 35% of area samples exceeded the National Institute for Occupational Health and Safety's (NIOSH) full shift recommended exposure limit (REL) of 50 $\mu\text{g}/\text{m}^3$, assuming zero exposure for the unsampled time. 4,4' MDI load on the glove dosimeters had a GM of 11.4 (GSD 2.9) $\mu\text{g}/\text{glove pair}/\text{min}$, suggesting high potential for dermal exposures. Urinary MDA had a GM of 0.7 (GSD, 3.0) $\mu\text{mol MDA}/\text{mol creatinine}$ (range, nd-14.5 $\mu\text{mol MDA}/\text{mol creatinine}$). Twenty-five % of urine samples exceeded the Health and Safety Executive (HSE) biological monitoring guidance value (BMGV) of 1 $\mu\text{mol MDA}/\text{mol creatinine}$. The authors further report on field observations regarding current exposure controls, discuss implications of these findings and opportunities for improving work practices to prevent isocyanate exposures during SPF insulation.

Authors: Bello A, Xue Y, Gore R, Woskie S, Bello D.

Full Source: International Journal of Hygiene & Environmental Health. 2019 May 8. pii: S1438-4639(19)30027-6. doi: 10.1016/j.ijheh.2019.04.014. [Epub ahead of print]

Aortic pulse wave velocity (aPWV) predicts cardiovascular complications, but the association of central arterial properties with blood lead level (BL) is poorly documented.

Central hemodynamics in relation to blood lead in young men prior to chronic occupational exposure

2019-07-12

Aortic pulse wave velocity (aPWV) predicts cardiovascular complications, but the association of central arterial properties with blood lead level (BL) is poorly documented. The authors therefore assessed their association with BL in 150 young men prior to occupational lead exposure, using baseline data of the Study for Promotion of Health in Recycling Lead (NCT02243904). Study nurses administered validated questionnaires and performed clinical measurements. Venous blood samples were obtained after 8-12 h of fasting. The radial, carotid and femoral pulse waves were tonometrically recorded. Ethnicity, age, anthropometric characteristics, mean arterial pressure, heart rate, smoking and drinking, and total and high-density lipoprotein serum cholesterol, were taken into consideration, as appropriate. Mean values were 4.14 $\mu\text{g}/\text{dL}$ for BL, 27 years for age, 108/79/28 mm Hg for central systolic/diastolic/pulse pressure, 100/10% for the augmentation ratio/index, 1.63 for pressure amplification, 5.94 m/s for aPWV, 27/11 mm Hg for the forward/backward pulse pressure height, and 43% for the reflection index. Per 10-fold BL increase, central diastolic pressure and the augmentation ratio were respectively 5.37 mm Hg (95% confidence interval [CI], 1.00-9.75) and 1.57 (CI, 0.20-2.94) greater, whereas central pulse pressure and the forward pulse pressure height were 3.74 mm Hg (CI, 0.60-6.88) and 3.37 mm Hg (CI, 0.22-6.53) smaller ($p \leq .036$ for all). The other hemodynamic measurements were unrelated to BL. The reflected pulse peak time was inversely correlated with diastolic pressure ($r = -0.20$; $p \leq .017$). At the exposure levels observed in the current study, aPWV, the gold standard to assess arterial stiffness, was not associated with BL. Increased peripheral arterial resistance, as reflected by higher diastolic pressure, might bring reflection points closer to the heart, thereby moving the backward wave into systole and increasing the augmentation ratio in relation to BL.

Authors: Yu CG, Wei FF, Yang WY, Zhang ZY, Mujaj B, Thijs L, Feng YM, Boggia J, Nawrot TS, Struijker-Boudier HAJ, Staessen JA.

Full Source: Blood Pressure. 2019 May 10:1-12. doi: 10.1080/08037051.2019.1610654. [Epub ahead of print]

The authors have developed a portable and wearable sampler that collects environmental VOCs in a person's immediate "exposure envelope" onto custom micro-preconcentrator chips for later bench-top analysis.

PUBLIC HEALTH RESEARCH

Wearable Environmental Monitor To Quantify Personal Ambient Volatile Organic Compound Exposures

2019-07-12

Air pollution can cause acute and chronic health problems. It has many components, and one component of interest is volatile organic compounds (VOCs). While the outdoor environment may have regulations regarding exposure limits, the indoor environment is often unregulated and VOCs often appear in greater concentrations in the indoor environment. Therefore, it is equally critical to monitor both the indoor and outdoor environments for ambient chemical levels that an individual person is exposed to. While a number of different chemical detectors exist, most lack the ability to provide portable monitoring. The authors have developed a portable and wearable sampler that collects environmental VOCs in a person's immediate "exposure envelope" onto custom micro-preconcentrator chips for later benchtop analysis. The system also records ambient temperature and humidity and the GPS location during sampling, and the chip cartridges can be used in sequence over time to complete a profile of individual chemical exposure over the course of hours/days/weeks/months. The system can be programmed to accumulate sample for various times with varying periodicity. The authors first tested the sampler in the laboratory by completing calibration curves and testing saturation times for various common chemicals. The sampler was also tested in the field by collecting both indoor and outdoor personal exposure samples. Additionally, under IRB approval, a teenaged volunteer wore the sampler for 5 days during which it sampled periodically throughout a 12 h period each day and the volunteer replaced the micro-preconcentrator chip each day.

Authors: Fung AG, Rajapakse MY, McCartney MM, Falcon AK, Fabia FM, Kenyon NJ, Davis CE.

Full Source: ACS Sensors. 2019 May 24;4(5):1358-1364. doi: 10.1021/acssensors.9b00304. Epub 2019 May 10.

Complex relationships between greenness, air pollution, and mortality in a population-based Canadian cohort

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Epidemiological studies have consistently demonstrated that exposure to fine particulate matter (PM_{2.5}) is associated with increased risks of mortality. To a lesser extent, a series of studies suggest that living

In the present study, the authors investigated the role of residential greenness in modifying associations between long-term exposures to PM_{2.5} and non-accidental and cardiovascular mortality in a national cohort of non-immigrant Canadian adults

in greener areas is associated with reduced risks of mortality. Only a handful of studies have examined the interplay between PM_{2.5}, greenness, and mortality. In the present study, the authors investigated the role of residential greenness in modifying associations between long-term exposures to PM_{2.5} and non-accidental and cardiovascular mortality in a national cohort of non-immigrant Canadian adults (i.e., the 2001 Canadian Census Health and Environment Cohort). Specifically, associations between satellite-derived estimates of PM_{2.5} exposure and mortality across quintiles of greenness measured within 500 m of individual's place of residence were assessed during 11 years of follow-up. The survival models were adjusted for many personal and contextual measures of socioeconomic position, and residential mobility data allowed us to characterise annual changes in exposures. The cohort included approximately 2.4 million individuals at baseline, 194,270 of whom died from non-accidental causes during follow-up. Adjustment for greenness attenuated the association between PM_{2.5} and mortality (e.g., hazard ratios (HRs) and 95% confidence intervals (CIs) per interquartile range increase in PM_{2.5} in models for non-accidental mortality decreased from 1.065 (95% CI: 1.056-1.075) to 1.041 (95% CI: 1.031-1.050)). The strength of observed associations between PM_{2.5} and mortality decreased as greenness increased. This pattern persisted in models restricted to urban residents, in models that considered the combined oxidant capacity of ozone and nitrogen dioxide, and within neighbourhoods characterised by high or low deprivation. The authors found no increased risk of mortality associated with PM_{2.5} among those living in the greenest areas. For example, the HR for cardiovascular mortality among individuals in the least green areas was 1.17 (95% CI: 1.12-1.23) compared to 1.01 (95% CI: 0.97-1.06) among those in the greenest areas. Studies that do not account for greenness may overstate the air pollution impacts on mortality. Residents in deprived neighbourhoods with high greenness benefitted by having more attenuated associations between PM_{2.5} and mortality than those living in deprived areas with less greenness. The findings from this study extend our understanding of how living in greener areas may lead to improved health outcomes.

Authors: Crouse DL, Pinault L, Balram A, Brauer M, Burnett RT, Martinn RV, van Donkelaar A, Villeneuve PJ, Weichenthal S.

Full Source: Environment International. 2019 Jul; 128:292-300. doi: 10.1016/j.envint.2019.04.047. Epub 2019 May 7.

The aim of the present study was to derive population attributable risks (PAR) to estimate the numbers of incident lung cancer due to residential radon exposure in Canada in 2015.

Estimates of the current and future burden of lung cancer attributable to residential radon exposure in Canada

2019-07-12

Radon is widely recognised as a human carcinogen and findings from epidemiologic studies support a causal association between residential radon exposure and lung cancer risk. The aim of the present study was to derive population attributable risks (PAR) to estimate the numbers of incident lung cancer due to residential radon exposure in Canada in 2015. Potential impact fractions for 2042 were estimated based on a series of counterfactuals. A meta-analysis was conducted to estimate the relative risk of lung cancer per 100 Becquerels (Bq)/m³ increase in residential radon exposure, with a pooled estimate of 1.16 (95% CI: 1.07-1.24). The population distribution of annual residential radon exposure was estimated based on a national survey with adjustment for changes in the population distribution over time, the proportion of Canadians living in high-rise buildings, and to reflect annual rather than winter levels. An estimated 6.9% of lung cancer cases in 2015 were attributable to exposure to residential radon, accounting for 1741 attributable cases. If mitigation efforts were to reduce all residential radon exposures that are above current Canadian policy guidelines of 200 Bq/m³ (3% of Canadians) to 50 Bq/m³, 293 cases could be prevented in 2042, and 2322 cumulative cases could be prevented between 2016 and 2042. The results show that mitigation that exclusively targets Canadian homes with radon exposures above current Canadian guidelines may not greatly alleviate the future projected lung cancer burden. Mitigation of residential radon levels below current guidelines may be required to substantially reduce the overall lung cancer burden in the Canadian population.

Authors: Gogna P, Narain TA, O'Sullivan DE, Villeneuve PJ, Demers PA, Hystad P, Brenner DR, Friedenreich CM, King WD; ComPARe Study Team.
Full Source: Preventative Medicine. 2019 May; 122:100-108. doi: 10.1016/j.ypmed.2019.04.005.

Outbreak investigation of lead neurotoxicity in children from artificial jewellery cottage industry

2019-07-12

Although lead neurotoxicity is a known phenomenon, it can often be missed at a primary or secondary care level especially if detailed environmental exposure history is missed. This is an outbreak investigation where 15 paediatric cases with neurologic signs and symptoms clustered in a slum area known for an unorganised artificial jewellery industry,

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were observed. Their clinical, biochemical, and epidemiological features were compared with 14 other children from the same region reporting with non-neurological symptoms who were considered as unmatched controls. Cases with neurological manifestations had a higher in-house lead smelting activity [OR 7.2 (95% CI 1.4-38.3)] as compared to controls. Toddlers below 3 years of age were more vulnerable to the effects of lead. This study emphasises that many focal sources of lead poisoning still remain especially in the unorganized sector. In cases presenting with unexplained neurotoxicity, specific occupational and environmental inquiry for chemical poisoning, with special consideration for lead, should be actively pursued.

Authors: Goel AD, Chowgule RV.

Full Source: Environmental Health & Preventative Medicine. 2019 May 10;24(1):30. doi: 10.1186/s12199-019-0777-9.

Thyroid hormones and neurobehavioral functions among adolescents chronically exposed to groundwater with geogenic arsenic in Bangladesh

2019-07-12

Groundwater, the major source of drinking water in Bengal Delta Plain, is contaminated with geogenic arsenic (As) enrichment affecting millions of people. Children exposed to tubewell water containing As may be associated with thyroid dysfunction, which in turn may impact neurodevelopmental outcomes. However, data to support such relationship is sparse. The purpose of this study was to examine if chronic water As (WAs) from Holocene alluvial aquifers in this region was associated with serum thyroid hormone (TH) and if TH biomarkers were related to neurobehavioral (NB) performance in a group of adolescents. A sample of 32 healthy adolescents were randomly drawn from a child cohort in the Health Effects of Arsenic Longitudinal Study (HEALS) in Araihasar, Bangladesh. Half of these participants were consistently exposed to low WAs (<10 µg/L) and the remaining half had high WAs exposure (≥10 µg/L) since birth. Measurements included serum total triiodothyronine (tT3), free thyroxine (fT4), thyrotropin (TSH) and thyroperoxidase antibodies (TPOAb); concurrent WAs and urinary arsenic (UAs); and adolescents' NB performance. WAs and UAs were positively and significantly correlated with TPOAb but were not correlated with TSH, tT3 and fT4. After accounting for covariates, both WAs and UAs demonstrated positive but non-significant relationships with TSH and TPOAb and negative but non-significant relationships with tT3 and fT4. TPOAb was significantly associated with reduced NB performance

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indicated by positive associations with latencies in simple reaction time ($b = 82.58$; $p < 0.001$) and symbol digit ($b = 276.85$; $p = 0.005$) tests. TSH was significantly and negatively associated with match-to-sample correct count ($b = -0.95$; $p = 0.05$). Overall, we did not observe significant associations between arsenic exposure and TH biomarkers although the relationships were in the expected directions. The authors observed TH biomarkers to be related to reduced NB performance as hypothesised. The study indicated a possible mechanism of As-induced neurotoxicity, which requires further investigations for confirmatory findings.

Authors: Khan KM, Parvez F, Zoeller RT, Hocevar BA, Kamendulis LM, Rohlman D, Eunus M, Graziano J.

Full Source: Science of the Total Environment. 2019 Aug 15; 678:278-287. doi: 10.1016/j.scitotenv.2019.04.426. Epub 2019 Apr 29.