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### ENVIRONMENTAL RESEARCH

#### An insight into the cytotoxicity, genotoxicity, and mutagenicity of smoked cigarette butt leachate by using *Allium cepa* as test system

2019-02-04

Smoked cigarette butt (SCB) discharged in the environment became an issue of unknown consequences for plants. In this study, the authors aim at assessing the impact of water containing SBC leachate on the meristem cells of *Allium cepa* roots. The following experimental groups were defined: negative control (water), positive control (cyclophosphamide); water with SCB leachate at environmental concentration (1.9 µg/L of nicotine) (EC1× group) and water with SCB leachate concentration 1000 times higher than EC1 (EC1000× group). Mitotic index, total number of abnormal cells, index of abnormal cells per mitotic/phase, relative growth index, and inhibition index were calculated after 48 exposure hours. Root meristems were used to prepare slides in order to investigate chromosomal and nuclear abnormalities. According to the data, plants exposed to SCB leachate presented low relative growth index, high inhibition index, large number of abnormal cells, and high abnormality frequency at metaphase/anaphase. The exposed *A. cepa* recorded a wide variety of abnormalities such as diagonal metaphase/anaphase, metaphase/anaphase presenting chromosome fragments, binucleated cells, displaced nucleus, chromosome bridges, micronuclei, necrotic cells, stick metaphase, chromosome adherence, notched nucleus, among other cell disturbances. The chemicals in the SBC leachate had aneugenic and clastogenic effect on the genetic material of the tested plants, either when they acted individually, synergistically, or additively. Thus, this study is a pioneer in reporting that the mere disposal of cigarette butts in the environment can have cytotoxic, genotoxic, and mutagenic effects on plants.

Authors: Montalvão MF, Sampaio LLG, Gomes HHF, Malafaia G.

Full Source: Environmental Science & Pollution Research International.

2018 Nov 20. doi: 10.1007/s11356-018-3731-2. [Epub ahead of print]

In this study, the authors aim at assessing the impact of water containing smoked cigarette butt leachate on the meristem cells of *Allium cepa* roots.

#### Enhanced coagulation of low-turbidity micro-polluted surface water: Properties and optimisation

2019-02-04

Micro-polluted surface water with low turbidity and low content of dissolved organic matter (DOM) is usually inefficiently purified. In this

study, a combined technique for the enhanced coagulation of this surface water was proposed and investigated using cationic grafted starch (St-G) and polyaluminum chloride (PACl) as co-coagulants, followed by a magnetic ion-exchange resin (MIER). St-G was fed before PACl, and this procedure not only efficiently removes turbidity but also largely reduces the doses of the two coagulants. MIER remarkably removed DOM, and raw water was effectively purified. The entire coagulation process was further optimised through response surface methodology based on a central composite design by using the doses of St-G, PACl, and MIER as input variables. The dose effects of the three chemicals on the coagulation performance for turbidity and DOM removal were examined, and the coagulation mechanisms, including the interactive effect among various chemicals, were discussed in detail. This study provided a new strategy for the efficient treatment of low-turbidity micro-polluted surface water by utilising organic and inorganic co-coagulants with magnetic ion-exchange resin in practical applications.

Authors: Liu Z, Wei H, Li A, Yang H.

Full Source: Journal of Environmental Management. 2018 Nov 2. pii: S0301-4797(18)30979-4. doi: 10.1016/j.jenvman.2018.08.101. [Epub ahead of print]

### Regulation of ROS through proficient modulations of antioxidative defence system maintains the structural and functional integrity of photosynthetic apparatus and confers drought tolerance in the facultative halophyte *Salvadora persica* L

2019-02-04

The facultative halophyte *Salvadora persica* L. grow in arid, semiarid and saline areas. In present study, drought induced alterations in growth, ion homeostasis, photosynthesis, chlorophyll fluorescence, ROS regulation and antioxidative defence components were analysed in *S. persica* with an aim to elucidate the drought tolerance mechanisms. In response to drought, significant reductions in growth, photosynthesis, and photosynthetic pigments were observed in *S. persica*. However, leaf relative water content (RWC %) did not change significantly. In *S. persica* seedlings, the growth, photosynthetic pigment contents and photosynthesis were resumed to control level within 7 d, when the drought treated plants were re-irrigated. However, quantum yield of PSII ( $\Phi$ PSII), rate of electron transport (ETR), maximum efficiency of PSII (Fv/Fm), and photochemical quenching (qP) remained unaffected under

In present study, drought induced alterations in growth, ion homeostasis, photosynthesis, chlorophyll fluorescence, ROS regulation and antioxidative defence components were analysed in *S. persica*

water deficit stress. The results suggest that both non-stomatal as well as stomatal limitations can account for photosynthetic reduction. The ionomics studies revealed no significant alterations in levels of Na<sup>+</sup>, K<sup>+</sup>, Ca<sup>2+</sup>, B, Cu<sup>2+</sup>, Fe<sup>2+</sup>, Mo, and Zn<sup>2+</sup> in leaf tissue during drought. However, there was increase in levels of Na<sup>+</sup>, K<sup>+</sup>, Ca<sup>2+</sup> and Mg<sup>2+</sup> in root tissue in response to drought. The activity of different enzymatic antioxidants like SOD, APX, and GR remained unaffected during drought, whereas POX activity increased and CAT activity declined under drought stress in comparison to control. This result proposes that vital ROS scavenging enzymes like SOD, APX and GR are at threshold levels to maintain the appropriate concentration of ROS. In *S. persica*, the ratio of AsA/DHA and GSH/GSSG (which are the indicators of redox potential of cell) remained steady or increased under drought which indicates that cellular redox level is maintained in this halophyte. Although ROS levels (H<sub>2</sub>O<sub>2</sub> and O<sub>2</sub><sup>-</sup>) increased significantly under drought stress, electrolyte leakage and lipid peroxidation level remained unchanged in response to water deficit condition which indicates that minimal increase in ROS level under drought stress act in signalling for activation of ROS scavenging enzymes. These results propose that decline in growth and photosynthesis is a vital energy conservation strategy of *S. persica* under drought condition. The rapid recovery of growth, photosynthesis and water relations in *S. persica* following drought seems to be a critical mechanism permitting this plant to withstand and survive under drought environment. In addition, the results implicate that efficient regulations of antioxidative enzymes in leaf tissue contribute in regulating the ROS level and cellular redox status, thereby protecting the plant from drought induced oxidative damage in *S. persica*. Consequently, ion homeostasis, plant water status, and integrity of photosynthetic apparatus is maintained in *S. persica* subjected to drought. The results of present study propose that *S. persica* is a drought tolerant halophyte and it can be a potential candidate for restoration of degraded saline lands of coastal ecosystem.

Authors: Rangani J, Panda A, Patel M, Parida AK.

Full Source: Journal of Photochemistry and Photobiology B. 2018 Oct 31; 189:214-233. doi: 10.1016/j.jphotobiol.2018.10.021. [Epub ahead of print]

### Assessing the level and sources of Polycyclic Aromatic Hydrocarbons (PAHs) in soil and sediments along Jhelum riverine system of lesser Himalayan region of Pakistan

2019-02-04

Lesser Himalayan Region (LHR) is an important mountain ecosystem which supports a wide range of biodiversity for native flora and fauna.

Surface soil and sediment were collected from four different altitudinal ranges of Lesser Himalayan Region and analysed for priority Polycyclic Aromatic Hydrocarbons.

Human population in this region is largely dependent upon local sources for their livelihood. Surface soil (n = 32) and sediment (n = 32) were collected from four different altitudinal ranges of LHR and analysed for priority Polycyclic Aromatic Hydrocarbons (PAHs) recommended by US EPA. Level, sources and distribution pattern of PAHs were assessed in soil and sediments samples collected from four altitudinal zones in LHR. Total PAHs concentration level of PAHs in soil and sediments ranged from 62.79 to 1080 ng g<sup>-1</sup> and 14.54-437.43 ng g<sup>-1</sup>, respectively. Compositional profile of PAHs in both soil and sediment were dominated by low and medium molecular weight PAHs, ranged from 18.02 to 402.18 ng g<sup>-1</sup> in soil and 0.32-96.34 ng g<sup>-1</sup> in sediments. In the context of spatial distribution trend, highest mean concentrations of PAHs in soil were recorded in zone D (sites from the rural region) and for sediments highest concentrations were detected at zone A, which includes dam sites. In all four zones, no altitudinal trend of PAHs in soil and sediments was observed. Source apportionment through receptor modelling by positive matrix factorisation (PMF) revealed that local sources such as biomass combustion and vehicular emissions are important sources of PAHs in this region. The prevalence of monsoon atmospheric circulation system in LHR implicated that this region is also influenced by medium and long-range atmospheric transportation of PAHs from neighbouring countries where potential sources and high level of PAHs has been reported.

Authors: Riaz R, Ali U, Li J, Zhang G, Alam K, Sweetman AJ, Jones KC, Malik RN.

Full Source: Chemosphere. 2019 Feb; 216:640-652. doi: 10.1016/j.chemosphere.2018.10.139. Epub 2018 Oct 23.

In this study, the effects of 17 $\alpha$ -ethinylestradiol (EE2), a synthetic estrogen, were assessed on the regenerative capacity of larval zebrafish.

### Effects of 17 $\alpha$ -ethinylestradiol on caudal fin regeneration in zebrafish larvae

2019-02-04

The ability to restore tissue function and morphology after injury is a key advantage of many fish for a greater chance of survival. The tissue regeneration process is regulated by multiple pathways, and it can therefore be hypothesised that environmental contaminants targeting components of these signalling pathways, may disrupt the fish's capability to repair or regenerate. This could lead to higher mortality and eventually even to a decline in populations. In this study, the effects of 17 $\alpha$ -ethinylestradiol (EE2), a synthetic estrogen, were assessed on the regenerative capacity of larval zebrafish. Zebrafish aged 2- hour post fertilisation (hpf) were exposed to 1, 10, or 100 ng/L EE2, and the caudal fins were amputated at 72 hpf. It was found that EE2 exposure

significantly inhibited fin regeneration and changed locomotor behaviour. The transcription levels for most of the genes involved in the signalling networks regulating the fin regeneration, such as *axin2*, *fgfr1*, *bmp2b* and *igf2b*, were down-regulated in the amputated fish in response to EE2 exposure, which was in contrast to their increased patterns in the vehicle-exposed control fish. Additionally, the mRNA levels of several immune-related genes, such as *il-1 $\beta$* , *il-6*, *il-10* and *nf- $\kappa$ b2*, were significantly decreased after EE2 exposure, accompanied by a lower density of neutrophils migrated into the wound site. In conclusion, the present study indicated for the first time that estrogenic endocrine disrupting chemicals (EEDCs) could inhibit the regenerative capacity of zebrafish, and this effect was speculated to be mediated through the alteration in regeneration-related signalling pathways and immune competence. This study expands our knowledge of the potential effects of EEDCs on injured aquatic organisms, and highlights the ecotoxicological significance of relationships between regenerative process and endocrine system. This study also implies the potential application of fin regeneration assay for assessing immunotoxicity in ecotoxicological risk assessment.

Authors: Sun L, Gu L, Tan H, Liu P, Gao G, Tian L, Chen H, Lu T, Qian H, Fu Z, Pan X.

Full Source: *Science of the Total Environment*. 2018 Oct 21; 653:10-22. doi: 10.1016/j.scitotenv.2018.10.275. [Epub ahead of print]

### Triclosan at environmentally relevant concentrations promotes horizontal transfer of multidrug resistance genes within and across bacterial genera

2019-02-04

Antibiotic resistance poses an increasing threat to public health. Horizontal gene transfer (HGT) promoted by antibiotics is recognized as a significant pathway to disseminate antibiotic resistance genes (ARGs). However, it is unclear whether non-antibiotic, anti-microbial (NAAM) chemicals can directly promote HGT of ARGs in the environment. In the present study, the authors aimed to investigate whether triclosan (TCS), a widely-used NAAM chemical in personal care products, is able to stimulate the conjugative transfer of antibiotic multi-resistance genes carried by plasmid within and across bacterial genera. Two model mating systems were established, to investigate intra-genera transfer and inter-genera transfer. *Escherichia coli* K-12 LE392 carrying IncP- $\alpha$  plasmid RP4 was used as the donor, and *E. coli* K-12 MG1655 or *Pseudomonas putida* KT2440 were the intra- and inter-genera recipients, respectively. The mechanisms of the HGT promoted by TCS were unveiled by detecting oxidative

In the present study, the authors aimed to investigate whether triclosan is able to stimulate the conjugative transfer of antibiotic multi-resistance genes carried by plasmid within and across bacterial genera.

## Technical

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stress and cell membrane permeability, in combination with Nanopore sequencing, genome-wide RNA sequencing and proteomic analyses. Exposure of the bacteria to environmentally relevant concentrations of TCS (from 0.02 µg/L to 20 µg/L) significantly stimulated the conjugative transfer of plasmid-encoded multi-resistance genes within and across genera. The TCS exposure promoted ROS generation and damaged bacterial membrane, and caused increased expression of the SOS response regulatory genes *umuC*, *dinB* and *dinD* in the donor. In addition, higher expression levels of ATP synthesis encoding genes in *E. coli* and *P. putida* were found with increased TCS dosage. TCS could enhance the conjugative ARGs transfer between bacteria by triggering ROS overproduction at environmentally relevant concentrations. These findings improve our awareness of the hidden risks of NAAM chemicals on the spread of antibiotic resistance.

Authors: Lu J, Wang Y, Li J, Mao L, Nguyen SH, Duarte T, Coin L, Bond P, Yuan Z, Guo J.

Full Source: Environment International. 2018 Oct 30. pii: S0160-4120(18)31726-4. doi: 10.1016/j.envint.2018.10.040. [Epub ahead of print]

## MEDICAL RESEARCH

### miR-542-5p Attenuates Fibroblast Activation by Targeting Integrin $\alpha 6$ in Silica-Induced Pulmonary Fibrosis

2019-02-04

Silicosis is a very serious occupational disease and it features pathological manifestations of inflammatory infiltration, excessive proliferation of fibroblasts and massive depositions of the extracellular matrix in the lungs. Recent studies described the roles of a variety of microRNAs (miRNAs) in fibrotic diseases. In the present study, the authors aimed to explore the potential mechanism of miR-542-5p in the activation of lung fibroblasts. To induce a pulmonary fibrosis mouse model, silica suspension and the miR-542-5p agomir were administered to mice by intratracheal instillation and tail vein injection. We found that miR-542-5p was significantly decreased in mouse fibrotic lung tissues and up-regulation of miR-542-5p visually attenuated a series of fibrotic lesions, including alveolar structural damage, alveolar interstitial thickening and silica-induced nodule formation. The down-regulation of miR-542-5p was also observed in mouse fibroblast (NIH-3T3) treated with transforming growth factor  $\beta 1$  (TGF- $\beta 1$ ). The proliferation and migration ability of NIH-3T3 cells were also inhibited by the transfection of miR-542-5p mimic. Integrin  $\alpha 6$  (*Itga6*), reported as a cell surface protein associated with fibroblast proliferation, was confirmed

In the present study, the authors aimed to explore the potential mechanism of miR-542-5p in the activation of lung fibroblasts.

to be a direct target of miR-542-5p. The knockdown of Itga6 significantly inhibited the phosphorylation of FAK/PI3K/AKT. In conclusion, miR-542-5p has a potential function for reducing the proliferation of fibroblasts and inhibiting silica-induced pulmonary fibrosis, which might be partially realised by directly binding to Itga6. Our data suggested that miR-542-5p might be a new therapeutic target for silicosis or other pulmonary fibrosis.

Authors: Yuan J, Li P, Pan H, Li Y, Xu Q, Xu T, Ji X, Liu Y, Yao W, Han L, Ni C.

Full Source: International Journal of Molecular Science. 2018 Nov 22;19(12). pii: E3717. doi: 10.3390/ijms19123717.

### Pulmonary impact of titanium dioxide nanorods: examination of nanorod-exposed rat lungs and human alveolar cells

2019-02-04

Titanium dioxide nanoparticles have numerous applications, resulting in human exposure. Nonetheless, available toxicological and safety data are insufficient regarding aspherical particles, such as rod-shaped nanoparticles. In a combined in vitro-in vivo approach, cultured A549 lung alveolar adenocarcinoma cells were treated with approximately 15×65 nm TiO<sub>2</sub> nanorod-containing medium, while young adult rats received the same substance by intratracheal instillation for 28 days in 5 and 18 mg/kg body-weight doses. Nanoparticle accumulation in the lungs and consequent oxidative stress, cell damage, and inflammation were assessed by biochemical and histopathological methods. Titanium was detected in tissue samples by single-particle inductively coupled plasma mass spectrometry. Nanoparticles were visualised inside cultured A549 cells, within pulmonary macrophages, and in hilar lymph nodes of the rats. A549 cells showed dose-dependent oxidative stress and lethality, and the observed nanoparticle-laden endosomes suggested deranged lysosomal function and possible autophagy. Strongly elevated Ti levels were measured in the lungs of nanorod-treated rats and moderately elevated levels in the blood of the animals. Numerous cytokines, indicating acute and also chronic inflammation, were identified in the lung samples of TiO<sub>2</sub>-exposed rodents. Several signs of cell and tissue damage were detected in both the cultured alveolar cells and in treated rats' lungs. Rod-shaped nanoparticulate TiO<sub>2</sub> may consequently be more harmful than has

generally been supposed. The occupational health risk suggested by the results calls for improved safety measures.

Authors: Horváth T, Papp A, Igaz N, Kovács D, Kozma G, Trenka V, Tiszlavicz L, Rázga Z, Kónya Z, Kiricsi M, Vezér T.

Full Source: International Journal of Nanomedicine. 2018 Nov 2; 13:7061-7077. doi: 10.2147/IJN.S179159. eCollection 2018.

### Biosafety evaluation of Janus Fe<sub>3</sub>O<sub>4</sub>-TiO<sub>2</sub> nanoparticles in Sprague Dawley rats after intravenous injection

2019-02-04

Newly synthesized Janus-structured Fe<sub>3</sub>O<sub>4</sub>-TiO<sub>2</sub> nanoparticles (NPs) appear to be a promising candidate for the diagnosis and therapy of cancer. Although the toxicity of individual Fe<sub>3</sub>O<sub>4</sub> or TiO<sub>2</sub> NPs has been studied extensively, the toxicity of Janus Fe<sub>3</sub>O<sub>4</sub>-TiO<sub>2</sub> NPs is not clear. In this study, the biosafety of both Janus Fe<sub>3</sub>O<sub>4</sub>-TiO<sub>2</sub> NPs (20-25 nm) and the maternal material TiO<sub>2</sub> NPs (7-10 nm) were evaluated in Sprague Dawley rats after one intravenous injection into the tail vein. Healthy rats were randomly divided into one control group and six experimental groups. Thirty days after treatment, rats were killed, then blood and tissue samples were collected for haematological, biochemical, element-content, histopathological, and Western blot analysis. The results show that only a slight Ti element accumulation in the heart, spleen, and liver could be found in the Janus Fe<sub>3</sub>O<sub>4</sub>-TiO<sub>2</sub> NP groups ( $P > 0.05$  compared with control). However, significant Ti element accumulation in the spleen, lungs, and liver was found in the TiO<sub>2</sub> NP-treated rats. Both Fe<sub>3</sub>O<sub>4</sub>-TiO<sub>2</sub> NPs and TiO<sub>2</sub> NPs could induce certain histopathological abnormalities. Western blot analysis showed that both NPs could induce certain apoptotic or inflammatory-related molecular protein upregulation in rat livers. A certain degree of alterations in liver function and electrolyte and lipid parameters was also observed in rats treated with both materials. However, compared to Janus structure Fe<sub>3</sub>O<sub>4</sub>-TiO<sub>2</sub> NP-treated groups, TiO<sub>2</sub> NPs at 30 mg/kg showed more severe adverse effects. The results showed that under a low dose (5 mg/kg), both NP types had no significant toxicity in rats. Janus NPs certainly seem less toxic than TiO<sub>2</sub> NPs in rats at 30 mg/kg. To ensure safe use of these newly developed Janus NPs in cancer diagnosis and therapy, further animal studies are needed to evaluate long-term bioeffects.

Authors: Su H, Song X, Li J, Iqbal MZ, Kenston SSF, Li Z, Wu A, Ding M, Zhao J.

Full Source: International Journal of Nanomedicine. 2018 Oct 31; 13:6987-7001. doi: 10.2147/IJN.S167851. eCollection 2018.

Newly synthesized Janus-structured Fe<sub>3</sub>O<sub>4</sub>-TiO<sub>2</sub> nanoparticles (NPs) appear to be a promising candidate for the diagnosis and therapy of cancer.

### BCT score predicts chemotherapy benefit in Asian patients with hormone receptor-positive, HER2-negative, lymph node-negative breast cancer

2019-02-04

The Breast Cancer Test (BCT) score has been validated for its ability to predict the risk of distant metastasis in hormone receptor-positive, human epidermal growth factor receptor 2 (HER2)-negative early breast cancer. This study aimed to examine the value of the BCT score for predicting the benefit of adjuvant chemotherapy for Korean women with hormone receptor-positive, HER2-negative, lymph node-negative breast cancer. The study included 346 patients treated with either hormone therapy alone (n = 203) or hormone therapy plus chemotherapy (n = 143), and compared patient survival between the two treatment groups. The effect of BCT score on patient survival by treatment group was assessed using Cox proportional hazards models. Based on the results, the BCT score was prognostic for distant metastasis-free survival and breast cancer-specific survival in the hormone therapy alone group. There was no significant difference between the treatment groups in terms of 10-year distant metastasis-free survival in the overall patient population. However, when patients were classified as low risk (n = 266) and high risk (n = 80) according to the BCT score, addition of adjuvant chemotherapy to hormone therapy for patients classified as BCT high-risk group led to a significant improvement in 10-year distant metastasis-free survival, from 65.4% to 91.9% (hazard ratio, 0.18; 95% confidence interval, 0.05-0.64; P = 0.003); in contrast, there was no benefit for the BCT low-risk group. The stratification of patients according to the BCT score also identified clinically high-risk patients who may not benefit from chemotherapy. Results were similar for breast cancer-specific survival. In conclusion, the BCT score was not only of prognostic value but was also a predictor of chemotherapy benefit for Korean patients with hormone receptor-positive, HER2-negative, lymph node-negative breast cancer.

Authors: Kwon MJ, Lee SB, Han J, Lee JE, Lee JW, Gong G, Beitsch PD, Nam SJ, Ahn SH, Nam BH, Shin YK.

Full Source: PLoS One. 2018 Nov 21;13(11): e0207155. doi: 10.1371/journal.pone.0207155. eCollection 2018.

This study aimed to examine the value of the BCT score for predicting the benefit of adjuvant chemotherapy for Korean women with hormone receptor-positive, HER2-negative, lymph node-negative breast cancer.

### OCCUPATIONAL RESEARCH

#### A Cross-Sectional Investigation of Cardiovascular and Metabolic Biomarkers among Conventional and Organic Farmers in Thailand

2019-02-04

Pesticide exposure has been implicated as a risk factor for developing a wide range of adverse health issues. Some examples are metabolic syndromes, including diabetes. This study investigated the relationship between current occupational use of pesticides and metabolic and cardiovascular biomarker levels among organic and conventional farmers in Thailand. In total, 436 recruited farmers were divided into two groups: conventional farmers (n = 214) and organic farmers (n = 222). Participants, free of diabetes, were interviewed and submitted to a physical examination. Serum samples were collected for clinical laboratory analyses, i.e., serum glucose and lipid profiles (triglycerides, total cholesterol, high-density lipoproteins, and low-density lipoproteins). Potential risk factors such as smoking, alcohol consumption, and heavy exercise were significantly different between the two groups. There were significant differences in terms of the years of pesticide use, pesticide use at home, sources of drinking water, and distance between the farmers' homes and farms between the groups. After adjusting for confounders, current conventional farmers had significantly higher abnormal body mass index (BMI), waist circumference, body fat percentage (% body fat), triglyceride, total cholesterol, and low-density lipoprotein values as compared to organic farmers. Conventional farmers had higher risk of many metabolic and cardiovascular risk factors as compared to organic farmers, putting them at higher risk of metabolic diseases in the future.

Authors: Kongtip P, Nankongnab N, Tipayamongkholgul M, Bunnamchairat A, Yimsabai J, Pataitiemthong A, Woskie S.

Full Source: International Journal of Environmental Research & Public Health. 2018 Nov 20;15(11). pii: E2590. doi: 10.3390/ijerph15112590.

This study investigated the relationship between current occupational use of pesticides and metabolic and cardiovascular biomarker levels among organic and conventional farmers in Thailand.

#### Decreased 8-oxoguanine DNA glycosylase 1 (hOGG1) expression and DNA oxidation damage induced by Cr (VI)

2019-02-04

Occupational exposure to Cr (VI) can cause DNA damage, genetic instability and elevate the risk of cancer. In the present study, the authors investigated Cr (VI)-induced DNA damage and 8-oxoguanine DNA glycosylase 1 (hOGG1) gene expression in electroplating workers.

The hOGG1 gene encodes a DNA repair enzyme that is crucial in DNA oxidation damage repair. Deficiency in hOGG1 DNA repair capacity contributes to the accumulation of DNA damage and genetic instability. To address the issues, the authors collected peripheral blood samples and urine samples from 162 electroplating workers and 84 control subjects. We measured blood chromium levels, urine chromium levels, DNA damage, and hOGG1 mRNA expression. Significantly higher levels of blood chromium, urine chromium, and DNA damage were found in electroplating workers compared with controls, whereas mRNA levels of the hOGG1 gene were significantly lower in the exposed workers. Furthermore, in electroplating workers we found that blood Cr had a positive association with DNA damage as measured with the tail DNA%. Meanwhile, tail DNA% was positively associated with hOGG1 mRNA expression. Finally, the effect of potassium dichromate treatment was investigated in a human B lymphoblastoid cell line (LCL). It was observed that potassium dichromate induced a concentration-dependent decrease in hOGG1 mRNA. After removing the K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>-containing medium for 3 days and 7 days, the abundance of hOGG1 mRNA expression recovered to a similar level as the controls. Collectively, our findings suggest that decreased hOGG1 mRNA expression in occupationally exposed populations partially contribute to Cr (VI) induced DNA damage.

Authors: Xia H, Ying S, Feng L, Wang H, Yao C, Li T, Zhang Y, Fu S, Ding D, Guo X, Tong Y, Wang X, Chen Z, Jiang Z, Zhang X, Lemos B, Lou J.

Full Source: *Chemico-Biological Interactions*. 2019 Feb 1; 299:44-51. doi: 10.1016/j.cbi.2018.11.019. Epub 2018 Nov 27.

This exploratory study evaluated the exposure to organophosphate (OP) and pyrethroid pesticides among migrant farmworkers.

### Migrant Farmworkers' Exposure to Pesticides in Sonora, Mexico

2019-02-04

Expanding agribusiness in Sonora, a state in Northern Mexico, has increased the demand for temporary migrant agricultural workers. Sonora is one of the top states in Mexico for pesticide utilisation. This exploratory study evaluated the exposure to organophosphate (OP) and pyrethroid pesticides among migrant farmworkers. A sample of 20 migrant farmworkers was recruited from a large commercial grape farm during the harvest season. We administered a questionnaire on work activities, exposure characteristics, and socio-demographics. The authors collected urine samples to quantify pesticide metabolite concentrations. Most participants were originally from the state of Chiapas, Mexico, none had completed high school, and about half spoke an indigenous language as well as Spanish. The majority of participants

had detectable concentrations of pyrethroid and organophosphate biomarkers. Geometric mean creatinine-adjusted concentrations for 3-phenoxybenzoic acid (1.83 µg/g), trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid (0.88 µg/g), 4-fluoro-3-phenoxybenzoic acid (0.94 µg/g), 3,5,6-trichloro-2-pyridinol (3.56 µg/g), and para-nitrophenol (0.63 µg/g) were significantly higher than in the general United States' population and Mexican Americans. These results also suggest that migrant farmworkers in this region are exposed to pesticides at higher levels than other farmworkers' studies. Farmworkers' age, language, training on personal protective equipment, time at the farm, and season, were significant exposure determinants.

Authors: López-Gálvez N, Wagoner R, Beamer P, de Zapien J, Rosales C.  
Full Source: International Journal of Environmental Research & Public Health. 2018 Nov 26;15(12). pii: E2651. doi: 10.3390/ijerph15122651.

### Evaluation of occupational exposure to different levels of mixed organic solvents and cognitive function in the painting unit of an automotive industry

2019-02-04

The cognitive function could be affected following exposure to organic solvents. The purpose of this study was to examine the cognitive performance of workers exposed to different levels of organic solvents in a painting unit of an automotive industry. This case-control study was conducted, in 2017, on 121 and 111 workers from the painting and assembly units of an automotive industry as the case and control groups, respectively. Exposure of workers to organic solvents were determined according to National Institute for Occupational Safety and Health (NIOSH) method. The cognitive performance of the studied population was evaluated by the computerized tests. The obtained scores of the N-Back in 1 and 2 blocks and the simple reaction time tests (SRTTs) were significantly differed in the exposed group ( $p < 0.05$ ). No significant difference was observed between case and control groups in the Stroop test score ( $p > 0.05$ ). Moreover, a significant relationship between the hazard quotient and the cognitive function test scores were observed except the Stroop test. The authors concluded that exposure to organic solvents affect the cognitive functions even below the Occupational Exposure Limits (OELs). Moreover, workers with high exposure levels of organic solvents had highest risk of poor memory and reaction time.

Authors: Golbabaie F, Dehghani F, Saatchi M, Zakerian SA.

Full Source: Health Promotion Perspectives. 2018 Oct 27;8(4):296-302. doi: 10.15171/hpp.2018.42. eCollection 2018.

The purpose of this study was to examine the cognitive performance of workers exposed to different levels of organic solvents in a painting unit of an automotive industry.

### PUBLIC HEALTH RESEARCH

#### Tooth enamel ESR doses and cytogenetic doses of Nagasaki atomic-bomb survivors in comparison with DS02R1 doses

2019-02-04

Cancer risks for Nagasaki survivors once appeared to be lower than for Hiroshima survivors. The possibility that this was due to overestimation of the doses for the Nagasaki survivors was tested by measuring biological doses of Nagasaki survivors and comparing them with DS02R1 individual doses as previously done for Hiroshima survivors. The electron spin resonance (ESR) method and cytogenetic method were used to estimate radiation doses for 24 Nagasaki survivors, and the results were compared to calculated DS02R1 doses. Six factory workers and 10 other survivors showed ESR or cytogenetically estimated doses that were in reasonably good agreement with their DS02R1 doses, while one factory worker was found to have an ESR dose estimate of nearly one half of the DS02R1 dose to the eye lens (a proxy organ for teeth). A few outliers were also observed. Although apparently lower cancer risks were observed in the past for Nagasaki survivors when compared to Hiroshima survivors, the present results do not indicate the existence of a trend that DS02R1 doses are overestimated when compared with biologically estimated tooth or cytogenetic doses. This observation is in line with the recent disappearance of the city difference in cancer risks.

Authors: Hirai Y, Cordova KA, Kodama Y, Hamasaki K, Awa AA, Tomonaga M, Mine M, Cullings HM, Nakamura N.

Full Source: International Journal of Radiation Biology. 2018 Nov 29:1-24.

doi: 10.1080/09553002.2019.1552807. [Epub ahead of print]

Cancer risks for Nagasaki survivors once appeared to be lower than for Hiroshima survivors.

#### Association between paternal smoking at the time of pregnancy and the semen quality in sons

2019-02-04

Maternal smoking during pregnancy has repeatedly been associated with decreased sperm counts in sons. Nevertheless, researchers recently detected a lower total sperm count in the sons of smoking fathers as compared to sons of non-smoking fathers. Since paternal and maternal tobacco smoking often coincide, it is difficult to discriminate whether effects are mediated paternally or maternally when using questionnaire- or register-based studies. Therefore, getting an objective measure of the maternal nicotine exposure level during pregnancy might help disentangling the impact of paternally and maternally derived exposure.

In this study, the authors aimed to investigate how paternal smoking at the time of the pregnancy was associated with semen quality in the sons after adjusting for the maternal levels of nicotine exposure during pregnancy. 104 men (17-20 years old) were recruited from the general Swedish population. The participants answered a questionnaire about paternal smoking. Associations between smoking and semen volume, total sperm count, sperm concentration, morphology and motility were adjusted for levels of the nicotine metabolite cotinine in stored maternal serum samples obtained from rubella screening between the 6th and 35th week of pregnancy. The authors additionally adjusted for the estimated socioeconomic status. After adjusting for the maternal cotinine, the men of smoking fathers had 41% lower sperm concentration and 51% lower total sperm count than the men of non-smoking fathers ( $p = 0.02$  and  $0.003$ , respectively). This was robust to the additional adjustment. The results suggest a negative association between paternal smoking and sperm counts in the sons, independent of the level maternal nicotine exposure during the pregnancy.

Authors: Axelsson J, Sabra S, Rylander L, Rignell-Hydbom A, Lindh CH, Giwercman A.

Full Source: PLoS One. 2018 Nov 21;13(11): e0207221. doi: 10.1371/journal.pone.0207221. eCollection 2018.

### Reconnaissance of Mixed Organic and Inorganic Chemicals in Private and Public Supply Tapwaters at Selected Residential and Workplace Sites in the United States

2019-02-04

Safe drinking water at the point-of-use (tapwater, TW) is a United States public health priority. Multiple lines of evidence were used to evaluate potential human health concerns of 482 organics and 19 inorganics in TW from 13 (7 public supply, 6 private well self-supply) home and 12 (public supply) workplace locations in 11 states. Only uranium ( $61.9 \mu\text{g L}^{-1}$ , private well) exceeded a National Primary Drinking Water Regulation maximum contaminant level (MCL:  $30 \mu\text{g L}^{-1}$ ). Lead was detected in 23 samples (MCL goal: zero). Seventy-five organics were detected at least once, with median detections of 5 and 17 compounds in self-supply and public supply samples, respectively (corresponding maxima: 12 and 29). Disinfection by-products predominated in public supply samples, comprising 21% of all detected and 6 of the 10 most frequently detected. Chemicals designed to be bioactive (26 pesticides, 10 pharmaceuticals) comprised 48% of detected organics. Site-specific cumulative exposure-activity ratios ( $\Sigma\text{EAR}$ ) were calculated for the 36 detected organics with ToxCast data. Because

these detections are fractional indicators of a largely uncharacterised contaminant space,  $\Sigma$ EAR in excess of 0.001 and 0.01 in 74 and 26% of public supply samples, respectively, provide an argument for prioritised assessment of cumulative effects to vulnerable populations from trace-level TW exposures.

Authors: Bradley PM, Kolpin DW, Romanok KM, Smalling KL, Focazio MJ, Brown JB, Cardon MC, Carpenter KD, Corsi SR, DeCicco LA, Dietze JE, Evans N, Furlong ET, Givens CE, Gray JL, Griffin DW, Higgins CP, Hladik ML, Iwanowicz LR, Journey CA, Kuivila KM, Masoner JR, McDonough CA, Meyer MT, Orlando JL, Strynar MJ, Weis CP, Wilson VS.

Full Source: Environmental Science & Technology. 2018 Nov 21. doi: 10.1021/acs.est.8b04622. [Epub ahead of print]

### Maternal urinary metabolites of PAHs and its association with adverse birth outcomes in an intensive e-waste recycling area

2019-02-04

Polycyclic aromatic hydrocarbons (PAHs) are well-known carcinogenic and endocrine disrupting chemicals that have been concerned over the past few decades. In this study, the authors aimed to determine the hydroxylated PAH (OHPAH) metabolite concentrations in maternal urine collected from the e-waste-contaminated area of Guiyu and the reference area of Haojiang, China, and to evaluate their health effects on birth outcomes. The median OHPAH concentration was 6.87  $\mu\text{g/g}$  creatinine from Guiyu, and 3.90  $\mu\text{g/g}$  creatinine from Haojiang. 2-OHNap and 1-OHPyr were the predominant metabolites. Residence in Guiyu and recycling in houses were associated with elevated 2-OHNap and 1-OHPyr. Standardized mean difference revealed that compared to low PAH metabolite levels in the first quartile, high PAH metabolite levels in the fourth quartile especially for 1-OHPyr, OHPAHs and sometimes hydroxyphenanthrene compounds, presented a reduced size in birth outcomes (overall SMD: -0.09; 95% CI: -0.15, -0.03), including head circumference, BMI and Apgar 1 score, and increased size in height. After adjusting for confounders in regression models, an interquartile increase in  $\Sigma$ OHPAHs was associated with a decrease of 234.56 g in weight (95% CI: -452.00, -17.13), 1.72 cm in head circumference (95% CI: -2.96, -0.48), 1.06 kg/m<sup>2</sup> in BMI (95% CI: -1.82, -0.31) and 0.42 in Apgar 1 score (95% CI: -0.66, -0.18), respectively. These findings suggest high exposure to PAHs during pregnancy in e-waste areas, posing a potential threat to neonatal development, which likely can be attributed to direct e-waste recycling activities. Ongoing studies should be continued to monitor human

In this study, the authors aimed to determine the hydroxylated PAH (OHPAH) metabolite concentrations in maternal urine collected from the e-waste-contaminated area of Guiyu and the reference area of Haojiang, China, and to evaluate their health effects on birth outcomes.

exposure and health, in particular for vulnerable individuals in e-waste-polluted areas.

Authors: Huo X, Wu Y, Xu L, Zeng X, Qin Q, Xu X.

Full Source: Environmental Pollution. 2018 Nov 7; 245:453-461. doi: 10.1016/j.envpol.2018.10.098. [Epub ahead of print]

### Evaluation of potential carcinogenicity of organic chemicals in synthetic turf crumb rubber

2019-02-04

Currently, there are >11,000 synthetic turf athletic fields in the United States and >13,000 in Europe. Concerns have been raised about exposure to carcinogenic chemicals resulting from contact with synthetic turf fields, particularly the infill material ("crumb rubber"), which is commonly fabricated from recycled tires. However, exposure data are scant, and the limited existing exposure studies have focused on a small subset of crumb rubber components. The objective of this study was to evaluate the carcinogenic potential of a broad range of chemical components of crumb rubber infill using computational toxicology and regulatory agency classifications from the United States Environmental Protection Agency (US EPA) and European Chemicals Agency (ECHA) to inform future exposure studies and risk analyses. Through a literature review, the authors identified 306 chemical constituents of crumb rubber infill from 20 publications. Utilising ADMET Predictor™, a computational program to predict carcinogenicity and genotoxicity, 197 of the identified 306 chemicals met the carcinogenicity criteria. Of these, 52 chemicals were also classified as known, presumed or suspected carcinogens by the US EPA and ECHA. Of the remaining 109 chemicals which were not predicted to be carcinogenic by our computational toxicology analysis, only 6 chemicals were classified as presumed or suspected human carcinogens by US EPA or ECHA. Importantly, the majority of crumb rubber constituents were not listed in the US EPA (n = 207) and ECHA (n = 262) databases, likely due to an absence of evaluation or insufficient information for a reliable carcinogenicity classification. By employing a cancer hazard scoring system to the chemicals which were predicted and classified by the computational analysis and government databases, several high priority carcinogens were identified, including benzene, benzidine, benzo(a)pyrene, trichloroethylene and vinyl chloride. The findings demonstrate that computational toxicology assessment in conjunction with government classifications can be used to prioritize hazardous chemicals for future exposure monitoring studies for users of

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synthetic turf fields. This approach could be extended to other compounds or toxicity endpoints.

Authors: Perkins AN, Inayat-Hussain SH, Deziel NC, Johnson CH, Ferguson SS, Garcia-Milian R, Thompson DC, Vasiliou V.

Full Source: Environmental Research. 2018 Oct 24; 169:163-172. doi: 10.1016/j.envres.2018.10.018. [Epub ahead of print]

### Sperm epigenome as a marker of environmental exposure and lifestyle, at the origin of diseases inheritance

2019-02-04

Paternal exposure to environmental challenges plays a critical role in the offspring's future health and the transmission of acquired traits through generations. This review summarises current knowledge in the new field of epigenomic paternal transmission of health and disease. Epidemiological studies identified that paternal ageing or challenges (imbalanced diets, stress, toxicants, cigarette smoke, alcohol) increased the risk of offspring to develop diseases such as cancer, metabolic, cardiovascular, and neurological diseases. These data were confirmed and deepened in animal models of exposure to challenges including low-protein, low-folate, high-fat diets, exposure to chemicals such as pesticides and herbicides. Even though some toxicants have mutagenic effect on sperm DNA, changes in sperm epigenome seem to be a common thread between different types of challenges. Indeed, epigenetic changes (DNA methylation, chromatin remodelling, small non-coding RNA) in sperm are described as new mechanisms of intergenerational transmission as demonstrated for dioxin, for example. Those epimutations induce dysregulation in genes expression involved in key cellular pathways such as reactive oxygen species and genome stability regulation, in brain-derived neurotrophic factor, calcium and glucocorticoid signalling, and in lipid and glucose metabolism, leading to diseases in offspring. Finally, since each type of environmental challenges has its own signature by inducing epimutations at specific genomic loci, the sperm epigenome might be used as a biomarker in toxicological and risk assessments.

Authors: Siddeek B, Mauduit C, Simeoni U, Benahmed M.

Full Source: Mutation Research. 2018 Oct - Dec; 778:38-44. doi: 10.1016/j.mrrev.2018.09.001. Epub 2018

This review summarises current knowledge in the new field of epigenomic paternal transmission of health and disease.