

# Bulletin Board

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### ENVIRONMENTAL RESEARCH

#### Biodegradation of Chiral Flufiprole in *Chlorella pyrenoidosa*: Kinetics, Transformation Products, and Toxicity Evaluation

2020-02-19

Pesticide pollution of surface water represents a considerable risk for algae and thus affects the structure and stability of aquatic ecosystems. To investigate the risk of flufiprole to phytoplankton, the digestion and uptake of flufiprole as well as the toxic effects of flufiprole enantiomers and the six metabolites to *Chlorella pyrenoidosa* were investigated. Flufiprole enantiomers were mainly metabolized to flufiprole amide and detri-fluoromethylsulfinyl flufiprole in culture medium, while various metabolites were formed in algae, notably the amide derivative and fipronil. *Chlorella pyrenoidosa* showed a strong absorption capacity for the flufiprole series. The  $EC_{50}$  values (96 h) indicated that fipronil was the most toxic compound, approximately 5 times as toxic as rac-flufiprole. R-flufiprole was more toxic than S-flufiprole. The contents of chlorophylls, malondialdehyde (MDA), reactive oxygen species (ROS), and total antioxidant capacity (T-AOC) were significantly altered by the chemicals in most cases, especially fipronil. Our results supported the potential detrimental effect of the metabolites of flufiprole on algae.

Authors: Gao J, Wang F, Jiang W, Han J, Wang P, Liu D, Zhou Z

Full Source: Journal of agriculture and food chemistry. 2020 Feb 19;68(7):1966-1973. doi: 10.1021/acs.jafc.9b05860. Epub 2020 Feb 7

The  $EC_{50}$  values (96 h) indicated that fipronil was the most toxic compound, approximately 5 times as toxic as rac-flufiprole

#### Mixture toxicity of copper and nonylphenol on the embryonal development of *Rhinella arenarum*

2020-02-08

Copper and nonylphenol are two commonly found chemicals in the aquatic environment, particularly in the distribution area of the amphibian *Rhinella arenarum*. The current work evaluated the lethal toxicity of equitoxic and non-equitoxic binary mixtures of copper and nonylphenol on embryos and larvae of the South America toad by means of the standardized test, AMPHITOX. Joint toxicity of mixtures was assessed in several proportions of these compounds at different exposure times and was analyzed at different level of mortality effect (LC10, LC50 and LC90). Considering the LC50, the equitoxic mixture was always antagonistic independently of the exposure time and the developmental stage. Joint toxicity showed mainly an antagonistic pattern; nonetheless, some time-dependent additive interactions were observed. Regarding the LC10,

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synergistic interactions were found in embryos and larvae exposed to two different mixture proportions at several exposure times. This highlights the possible synergism of these chemicals at environmentally relevant concentrations. These results point out the relevance of assessing joint toxicity of environmental pollutants for environmental risk assessment.

Authors: Aronzon CM, Peluso J, Coll CP

Full Source: Environmental science and pollution research international. 2020 Feb 8. doi: 10.1007/s11356-020-07857-7. [Epub ahead of print]

### Skin Irritation Testing beyond Tissue Viability: Fucoxanthin Effects on Inflammation, Homeostasis, and Metabolism

2020-02-05

UV light catalyzes the ozone formation from air pollutants, like nitrogen oxides. Since ozone reacts with cutaneous sebum lipids to peroxides and, thus, promotes inflammation, tumorigenesis, and aging, even broad-spectrum sunscreens cannot properly protect skin. Meanwhile, xanthophylls, like fucoxanthin, proved their antioxidant and cytoprotective functions, but the safety of their topical application in human cell-based models remains unknown. Aiming for a more detailed insight into the cutaneous fucoxanthin toxicity, we assessed the tissue viability according to OECD test guideline no. 439 as well as changes in inflammation (IL-1 $\alpha$ , IL-6, IL-8), homeostasis (EGFR, HSPB1) and metabolism (NAT1). First, we proved the suitability of our 24-well-based reconstructed human skin for irritation testing. Next, we dissolved 0.5% fucoxanthin either in alkyl benzoate or in ethanol and applied both solutions onto the tissue surface. None of the solutions decreased RHS viability below 50%. In contrast, fucoxanthin ameliorated the detrimental effects of ethanol and reduced the gene expression of pro-inflammatory interleukins 6 and 8, while increasing NAT1 gene expression. In conclusion, we developed an organ-on-a-chip compatible RHS, being suitable for skin irritation testing beyond tissue viability assessment. Fucoxanthin proved to be non-irritant in RHS and already showed first skin protective effects following topical application.

Authors: Spagolla Napoleão Tavares R, Maria-Engler SS, Colepicolo P, Debonsi HM, Schäfer-Korting M, Marx U, Gaspar LR, Zoschke C

Full Source: Pharmaceutics. 2020 Feb 5;12(2). pii: E136. doi: 10.3390/pharmaceutics12020136.

Since ozone reacts with cutaneous sebum lipids to peroxides and, thus, promotes inflammation, tumorigenesis, and aging, even broad-spectrum sunscreens cannot properly protect skin.

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### Sustainable production of alkyl esters via thermal process in the presence of carbon black

2020-01-30

In this study, it is introduced a sustainable synthetic route of alkyl esters, considered value-added industrial chemicals and fuels, from volatile fatty acids (VFAs) that can potentially be generated from organic waste. In the presence of a porous carbon material, the thermally induced reaction could be conducted under an initial pressure of 1 atm. Even though the reaction was finished within <10 s, they gave a high yield of target products: the conversion of six VFAs into their corresponding methyl esters which can be further converted into gasoline alternatives with >90 wt% yields. The carbon black showed better performance for both reactions than other commercially available porous material such as silica. This work suggests that carbon is a good option of being used as a porous material for thermal esterification to produce renewable alternative chemicals from waste-derived feedstocks.

Authors: Kwon EE, Jung JM, Kim HJ, Lee J

Full Source: Environmental Research. 2020 Jan 30;183:109199. doi: 10.1016/j.envres.2020.109199. [Epub ahead of print]

### Recognition of Trace Element Contamination Using Ficus macrophylla Leaves in Urban Environment

2020-01-31

Urban areas are characterized by numerous pollutants emitted by anthropic sources both in the form of solid and gaseous particulates. Biomonitoring is an easy, economical, and accessible approach for the determination of atmospheric pollutants. In this study, we used the leaves of *Ficus macrophylla* Desf. ex Pers., collected in the city of Palermo (Italy), to determine major and trace elements. Geogenic elements exhibited the highest concentrations, making up 99% of the weight of the analyzed elements (Ca, K, Mg, P, S, Na, Fe, and Al); they range 21,400 (Ca) to 122  $\mu\text{g g}^{-1}$  (Al). The remaining elements showed median concentrations in the range 47.5-0.05  $\mu\text{g g}^{-1}$  in the following order of abundance: Sr > Cu > Mn > Zn > Br > Rb > Ba > Pb > Cr > Sb > As > Mo = Sc. Cluster analysis, with Spearman's coefficient to measure sample similarity, identified five main groups, namely, three clusters related to the geogenic background and marine spray; one cluster linked to elements essential to plants, and a final group attributed to the influence of traffic emissions. Calculated enrichment factors (EF) showed that the enrichments found for P and K were linked to plant metabolism; Na and Mg confirmed the role of

The carbon black showed better performance for both reactions than other commercially available porous material such as silica.

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sea spray; Cu and Zn underlined the contribution linked to anthropic processes and the role of micronutrients in plants.. As, Cr, and Mo had EF values ranging from 10 and 20, and Sb had EF > 90. From geochemical distribution maps of As, Cr, Mo, and Sb it was observed that metal and metalloid concentrations were higher in urban areas and immediately decreased as one moved away from these areas. Local pollution sources play a great role in trace element concentrations in airborne particulate matter. The present study confirms that *Ficus macrophylla* leaves are suitable for screening an urban environment to identify concentrations of inorganic chemicals, since they have high tolerance to pollution.

Authors: Alaimo MG, Varrica D

Full Source: International Journal of environmental research and public health. 2020 Jan 31;17(3). pii: E881. doi: 10.3390/ijerph17030881.

### Selective removal of lignin to enhanced the process of preparing fermentable sugars and platform chemicals from lignocellulosic biomass

2020-01-22

The economic dependency on fossil fuels and the resulting effects on climate and environment have put more focus on finding alternative renewable sources (e.g. lignocellulose) for the production of fuels and chemicals. Nevertheless, the yield and quality of fermentable sugar and platform chemical produced by directly degradation of lignocellulose are severely restricted owing to the presence of lignin and its derivatives. Therefore, the present study was aimed to selective removal of lignin to enhance the process of preparing fermentable sugars and platform chemicals from lignocellulosic biomass. The results showed that the highest degree of delignification was 92.01%. Reducing sugar obtained by enzymatic hydrolysis of lignocellulose was suitable for L-lactic acid fermentation without appreciable inhibition. The highest cellulose digestibility and yield of 5-HMF were 90.67% and 61.02%, respectively.  $\text{SO}_4^{2-}/\text{ZrO}_2$  could be reused at least 5 times without appreciable loss of catalytic performance, which shows an industrial application prospects in biorefinery.

Authors: Zhang J, Wang Y, Du X, Qu Y

Full Source: Biosource Technology. 2020 May;303:122846. doi: 10.1016/j.biortech.2020.122846. Epub 2020 Jan 22.

The results showed that the highest degree of delignification was 92.01%

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### CHEMICAL EFFECTS

#### Pregnancy Outcome in Occupational Tobacco Exposure: A Cohort Study from South India

2020-01-14

##### BACKGROUND:

Women constitute a significant labor pool in the Indian tobacco industry as bidi (hand-rolled cigarette) rollers. On an average, they roll around 600 bidis/day and are exposed to 120 g of tobacco and 3 g of nicotine. Bidis do not have chemical preservatives or stabilizing agents, and therefore, the rollers are exposed only to nicotine by handling and inhalation. The study objective was to assess pregnancy outcome in these women with occupational tobacco exposure.

##### MATERIALS AND METHODS:

A prospective cohort study of bidi-rollers (n = 177) and women with no tobacco exposure (n = 354), followed up for pregnancy outcome, neonatal anthropometry, and nicotine absorption by cotinine assays. Adjusted risk and adjusted mean differences with a 95% confidence interval were derived.

##### RESULTS:

Outcomes included increased adjusted risk for gestational hypertension (3.54 [1.21, 10.31]; P = 0.021) and fetal growth restriction (2.71 [1.39, 5.29]; P = 0.004). Risk for prematurity was not statistically significant (1.81 [0.74, 4.45]; P = 0.194). Lower adjusted mean difference of birth weight (-104 g [-177, -31]; P = 0.005), length (-0.4 cm [-0.8, -0.1]; P = 0.006), and head circumference (-0.4 cm [-0.6, -0.1]; P = 0.002) were seen with increased risk for small for gestational age (1.75 [1.12, 2.73]; P = 0.015). Nicotine absorption was evident in one-third of maternal and cord blood estimations.

##### CONCLUSION:

Occupational passive tobacco exposure results in adverse pregnancy outcome.

Authors: Shenoy RD, Sindgikar SP, Shenoy V, Uppoor R, Rao R, Singh S

Full Source: Indian Journal of community medicine: official publication of Indian Association of Preventative & Social Medicine. 2020 Jan-Mar;45(1):54-59. doi: 10.4103/ijcm.IJCM\_195\_19.

The study objective was to assess pregnancy outcome in these women with occupational tobacco exposure.

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### Non-target and suspected-target screening for potentially hazardous chemicals in food contact materials: investigation of paper straws

2020-02-07

A non-target screening strategy was developed for the safety evaluation of potentially hazardous chemicals in paper food contact materials (FCMs). A tentative list of suspect analytes was generated using publicly available FCM substance inventories, the presence of contaminants in paper straws was confirmed by high-resolution Orbitrap mass spectrometry. Data-independent and data-dependent MS and MS/MS results for candidate compounds were processed using a workflow including peak detection by deconvolution, blank subtraction, retention time alignment, formula assignment and fragmentation spectra search against spectral libraries followed by in silico generated spectra annotation. This workflow allowed for the identification of 74 suspect compounds, of which 40 were assigned a high confidence level of detection. A tentative in silico toxicity evaluation for mutagenic and carcinogenic activities was carried out. Using quantitative structure-activity relationship (QSAR) models it was found that two of the detected compounds tested positive for mutagenicity and three for carcinogenicity.

Authors: Rusko J, Perkons I, Rasinger JD, Bartkevics V

Full Source: Food additives & containments. Part A, Chemistry, analysis, control, exposure & risk assessment. 2020 Feb 7:1-16. doi: 10.1080/19440049.2020.1711969. [Epub ahead of print]

This workflow allowed for the identification of 74 suspect compounds, of which 40 were assigned a high confidence level of detection.

### Two-Stage Crystallization Combining Direct Succinimide Synthesis for the recovery of Succinic Acid From Fermentation Broth

2020-01-15

Succinic acid is an important chemical and raw material widely used in medicine, food, biodegradable materials, fine chemicals, and other industrial fields. However, traditional methods for purifying succinic acid from fermentation broth are costly, poorly efficient, and harmful to the environment. In this study, an efficient method for purifying succinic acid from the fermentation broth of *Escherichia coli* NZN111 was developed through crystallization and co-crystallization with urea. First, the filtrate was collected by filtering the fermentation broth, and pH was adjusted to 2.0 by supplementing sulfuric acid. Crystallization was carried out at 8°C for 4 h to obtain succinic acid crystals. The recovery rate and purity of succinic acid were 73.4% and over 99%, respectively. Then, urea was added

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to the remaining solution with a mass ratio of urea to residual succinic acid of 4:1 ( $m_{\text{urea}}/m_{\text{SA}}$ ). The second crystallization was carried out at pH 2 and 4°C for 12 h to obtain succinic acid-urea co-crystal. The recovery rate of succinic acid residue was 92.0%. The succinic acid-urea crystal was further mixed with phosphorous acid (4.2% of the mass of succinic acid co-crystal) and maintained at 195°C for 6 h to synthesize succinimide, and the yield was >80%. This novel and efficient purification process was characterized by the significantly reduced urea consumption, and high succinic acid recovery (totally 95%), and high succinimide synthesis yield (80%). Thus, this study potentially provided a novel and efficient strategy for the industrial production of succinic acid and succinimide.

Authors: Xiao Y, Zhang Z, Wang Y, Gao B, Chang J, Zhu D

Full Source: Frontiers in bioengineering and biotechnology. 2020 Jan 15;7:471. doi: 10.3389/fbioe.2019.00471. eCollection 2019.

## PHARMACEUTICAL/TOXICITY

### Vaping: Anesthesia Considerations for Patients Using Electronic Cigarettes

2020-02-01

Anesthetists are generally familiar with the perioperative implications of patients' cigarette smoking. Electronic cigarettes are, however, a relatively newly popular phenomenon among adolescents and young adults. There is a generalized lack of knowledge among healthcare providers regarding the overall health effects of electronic cigarettes, which often are advertised as a harmless smoking-cessation tool. US health protection agencies have reported that electronic cigarettes contain cytotoxic compounds and harmful byproducts such as nicotine, heavy metals, propylene glycol, diacetyl, and other impurities. The current literature suggests that components of these devices (the liquid and heating element) produce chemicals that can cause acute and chronic multiorgan toxicities. On a cellular level, the pulmonary, cardiovascular, immunologic, and pharmacologic effects of electronic cigarettes are most noteworthy. The purpose of this article is to inform anesthesia providers regarding the pathophysiological effects and anesthetic implications of electronic cigarette use.

Authors: Hobson A, Arndt K, Barenklau S

Full Source: AANA Journal 2020 Jan;88(1):27-34.

Electronic cigarettes are, however, a relatively newly popular phenomenon among adolescents and young adults

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**A closed vitrification system enables a murine ovarian follicle bank for high-throughput ovotoxicity screening, which identifies endocrine disrupting activity of microcystins**

2020-02-01

Increasing evidence reveals that a broad spectrum of environmental chemicals and pharmaceutical compounds cause female ovarian toxicity (ovotoxicity). The current gold standard of ovotoxicity testing largely relies on whole laboratory animals, but *in vivo* models are time consuming, costly, and present animal welfare concerns. We previously demonstrated that the 3D encapsulated *in vitro* follicle growth (eIVFG) is a robust *in vitro* model for ovotoxicity testing. However, the follicle preparation process is complex and highly dependent on technical skills. Here, we aimed to use vitrification method to cryopreserve murine immature follicles for a high-content eIVFG, chemical exposure, and ovotoxicity screening. Results indicated that a closed vitrification system combined with optimized vitrification protocols preserved mouse follicle viability and functionality and vitrified follicles exhibited comparable follicle and oocyte reproductive outcomes to freshly harvested follicles during eIVFG, including follicle survival and development, ovarian steroidogenesis, and oocyte maturation and ovulation. Moreover, vitrified follicles consistently responded to ovotoxic chemical, doxorubicin (DOX). We further used vitrified follicles to test the response of microcystins (MCs), an emerging category of environmental contaminants produced by cyanobacteria associated with harmful algal blooms (HABs), and found that different congeners of MCs exhibited differential ovotoxicities. In summary, our study demonstrates that vitrification enables a long-term-storage and ready-to-use ovarian follicle bank for high-throughput ovotoxicity screening, which identifies endocrine disrupting effects of MCs.

Authors: Wang Y, Xu J, Stanley JE, Brooks BW, Scott GI, Chatterjee S, Zhang Q, Zelinski MB, Xiao S

Full Source: Reproductive Toxicology (Elmsford N.Y.). 2020 Feb 1;93:118-130. doi: 10.1016/j.reprotox.2020.01.009. [Epub ahead of print]

The current gold standard of ovotoxicity testing largely relies on whole laboratory animals, but *in vivo* models are time consuming, costly, and present animal welfare concerns.

**Triclosan at environmental concentrations can enhance the spread of extracellular antibiotic resistance genes through transformation**

2020-04-15

The dissemination of antibiotic resistance mediated by horizontal transfer of antibiotic resistance genes (ARGs) is exacerbating the

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global antibiotic crisis. Currently, little is known about whether non-antibiotic, anti-microbial (NAAM) chemicals are associated with the dissemination of ARGs in the environment. In this study, we aimed to evaluate whether a ubiquitous NAAM chemical, triclosan (TCS), is able to promote the transformation of plasmid-borne antibiotic resistance genes (ARGs). By using the plasmid pUC19 carrying ampicillin resistance genes as the extracellular ARG and a model microorganism *Escherichia coli* DH5 $\alpha$  as the recipient, we found that TCS at environmentally detected concentrations (0.2  $\mu\text{g/L}$  to 20  $\mu\text{g/L}$ ) significantly enhanced the transformation of plasmid-borne ARGs into *E. coli* DH5 $\alpha$  for up to 1.4-fold. The combination of phenotypic experiments, genome-wide RNA sequencing and proteomic analyses revealed that TCS exposure stimulated the reactive oxygen species (ROS) production for 1.3- to 1.5-fold, induced bacterial membrane damage and up-regulated the translation of outer membrane porin. Moreover, general secretion system Sec (1.4-fold), twin arginine translocation system Tat (1.2-fold) and type IV pilus secretion systems (2.5-fold) were enhanced by TCS, which might contribute to the DNA searching/capture by pilus. Together, TCS might increase the transformation frequency of ARGs into *E. coli* DH5 $\alpha$  by ROS over-production, damaging cell membrane barrier, mediating the pilus capture of plasmid and the translocation of plasmid via cell membrane channels. This study reports that TCS could accelerate the transformation of extracellular ARGs to competent bacteria at environmentally relevant concentrations. The findings advance our understanding of the fate of ARGs in ecosystems and call for risk assessments of NAAM chemicals on disseminating antibiotic resistance.

Authors: Lu J, Wang Y, Zhang S, Bond P, Yuan Z, Guo J

Full Source *The Science of the total environment*. 2020 Apr 15;713:136621.

doi: 10.1016/j.scitotenv.2020.136621. Epub 2020 Jan 10.

### Bisphenol A induces a shift in sex differentiation gene expression with testis-ova or sex reversal in Japanese medaka (*Oryzias latipes*)

2020-02-04

Bisphenol A (BPA), a very important raw material in the plastics industry, is an endocrine-disrupting chemical in teleost fish. Although BPA induces testis-ova and sex reversal in teleost fish species, the molecular mechanism remains unclear. We evaluated the effects of BPA (measured concentrations: 45, 92, 326, 1030 and 3406  $\mu\text{g/L}$ ) on Japanese medaka (*Oryzias latipes*) using OECD TG234 (2011, Fish Sexual Development Test, OECD Guidelines for the Testing of Chemicals, Section 2). BPA at 1030 and

Although BPA induces testis-ova and sex reversal in teleost fish species, the molecular mechanism remains unclear

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3406 µg/L induced testis-ova and sex reversal with female-type secondary sexual characteristics in XY males at 30 and 60 days posthatching (dph). Then we examined the BPA effect on the expression of sex differentiation genes related to the testis-ova and sex reversal in XY medaka. BPA exposure (1030 and 3406 µg/L) suppressed *gsdf* mRNA expression and increased *cyp19a1a* mRNA expression in XY individuals at stage 38 and 30 dph, although *foxl2* mRNA expression showed no change. Interestingly, the concentration of BPA that suppressed *gsdf* mRNA expression at the larval stage was consistent with that needed to induce testis-ova and sex reversal. These results suggest that the *gsdf* gene at the embryonic stage can be used as a useful biomarker for predicting the impact of estrogenic endocrine-disrupting chemicals on sexual differentiation in Japanese medaka.

Authors: Horie Y, Kanazawa N, Takahashi N, Iguchi T

Full Source: Journal of Applied Toxicology: JAT. 2020 Feb 4. doi: 10.1002/jat.3945. [Epub ahead of print]

### A Retrospective Study of the Clinical Characteristics Associated with Alcohol and Cannabis use in Early Phase Psychosis

2020-02-04

#### OBJECTIVE:

Alcohol and cannabis misuse are common in patients with early phase psychosis (EPP); however, research has tended to focus primarily on cannabis misuse and EPP outcomes, with a relative lack of data on alcohol misuse. This retrospective cross-sectional EPP study investigated the relationship between cannabis, alcohol, and cannabis combined with alcohol misuse, on age, gender, psychotic, depressive and anxiety symptom severity, and social/occupational functioning, at entry to service.

#### METHODS:

Two-hundred and sixty-four EPP patients were divided into 4 groups based on substance use measured by the Alcohol, Smoking and Substance Involvement Screening Test: (1) no to low-level cannabis and alcohol misuse (LU), (2) moderate to high alcohol misuse only (AU), (3) moderate to high cannabis misuse only (CU), and (4) moderate to high alcohol and cannabis misuse (AU + CU).

#### RESULTS:

We found significant between group differences in age (with the AU group being the oldest and AU + CU group the youngest) as well as gender (with the CU group having the highest percentage of men). There were also group differences in positive psychotic symptoms (lowest in AU

We found significant between group differences in age (with the AU group being the oldest and AU + CU group the youngest) as well as gender (with the CU group having the highest percentage of men)

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group), trait anxiety (highest in AU + CU group), and social/occupational functioning (highest in AU group). Further regression analyses revealed a particularly strong relationship between AU + CU group and trait anxiety (3-fold increased odds of clinical trait anxiety for combined misuse of alcohol and cannabis compared to non/low users).

### CONCLUSIONS:

This study demonstrates the unique demographic and clinical characteristics found in the EPP population at entry to care associated with alcohol and cannabis misuse both separately and in combination. This work highlights the importance of including the assessment of alcohol misuse in addition to cannabis misuse in future treatment guidelines and research.

Authors: Cookey J, McGavin, Crocker CE, Matheson K, Stewart SH, Tibbo PG

Full Source: Canadian Journal of Psychiatry. 2020 Feb 4;706743720905201.

doi: 10.1177/0706743720905201. [Epub ahead of print]

## Levosimendan Improves Oxidative Balance in Cardiogenic Shock/Low Cardiac Output Patients

2020-01-30

The beneficial effects exerted by levosimendan against cardiac failure could be related to the modulation of oxidative balance. We aimed to examine the effects of levosimendan in patients with cardiogenic shock or low cardiac output on cardiac systo-diastolic function and plasma oxidants/antioxidants (glutathione, GSH; thiobarbituric acid reactive substances, TBARS). In four patients undergoing coronary artery bypass grafting or angioplasty, cardiovascular parameters and plasma GSH and TBARS were measured at T0 (before levosimendan infusion), T1 (1 h after the achievement of the therapeutic dosage of levosimendan), T2 (end of levosimendan infusion), T3 (72 h after the end of levosimendan infusion), and T4 (end of cardiogenic shock). We found an improvement in the indices of systolic (ejection fraction, cardiac output, cardiac index) and diastolic (E to early diastolic mitral annular tissue velocity, E'; early to late diastolic transmitral flow velocity, EA) cardiac function at early T2. A reduction of central venous pressure and pulmonary wedge pressure was also observed. Plasma levels of GSH and TBARS were restored by levosimendan at T1, as well. The results obtained indicate that levosimendan administration can regulate oxidant/antioxidant balance as an early effect in cardiogenic shock/low cardiac output patients.

Modulation of oxidative status on a mitochondrial level could thus play a

Plasma levels of GSH and TBARS were restored by levosimendan at T1, as well

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role in exerting the cardio-protection exerted by levosimendan in these patients.

Authors: Grossini E, Farruggio S, Pierelli D, Bolzani, Rossi L, Pollesello P, Monaco C

Full Source: Journal of clinical medicine. 2020 Jan 30;9(2). pii: E373. doi: 10.3390/jcm9020373.

## OCCUPATIONAL

### Exposure of polychlorinated naphthalenes (PCNs) to Pakistani populations via non-dietary sources from neglected e-waste hubs: A problem of high health concern

2019-12-27

To date limited information's are available concerning unintentional productions, screening, profiling, and health risks of polychlorinated naphthalenes (PCNs) in ambient environment and occupational environment. Literature reveals that dust is a neglected environmental matrix never measured for PCNs. To our knowledge, this is the first study to investigate the concentrations and health risks of PCNs in indoor dust, air, and blood of major e-waste recycling hubs in Pakistan. Indoor air (n = 125), dust (n = 250), and serum (n = 250) samples were collected from five major e-waste hubs and their vicinity to measure 39 PCN congeners using GC-ECNI-MS.  $\Sigma_{39}$ PCN concentrations in indoor air, dust, and serum (worker > resident > children) samples ranged from 7.0 to 9583 pg/m<sup>3</sup>, from 0.25 to 697 ng/g, and from 0.15 to 401 pg/g lipid weight, respectively. Predominant PCN congeners in indoor air and dust were tri- and tetra-CNs, while tetra- and penta-CNs were dominant in human serum samples. The higher PCNs contribution was recorded at the recycling units, while the lower was observed at the shops of the major e-waste hubs. Higher contribution of combustion origin CNs in air, dust and human samples showed combustion sources at the major e-waste hubs, while Halowax and Aroclor based technical mixture showed minor contribution in these samples. Mean toxic equivalent (TEQ) concentrations of PCNs were 2.79E<sup>+00</sup> pg-TEQ/m<sup>3</sup>, 1.60E<sup>-02</sup> ng-TEQ/g, 8.11E<sup>-01</sup> pg-TEQ/g, 7.14E<sup>-01</sup> pg-TEQ/g, and 6.37E<sup>-01</sup> pg-TEQ/g for indoor air, dust, and serum samples from workers, residents, and children, respectively. In our study, CNs- 66/67 and -73 in indoor air, dust, and human serum were the great contributors to total TEQ concentrations of PCNs. This first base line data directs government and agencies to implement rules, regulation to avoid

To our knowledge, this is the first study to investigate the concentrations and health risks of PCNs in indoor dust, air, and blood of major e-waste recycling hubs in Pakistan

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negative health outcomes and suggests further awareness in regard of provision of proper knowledge to the target population.

Authors: Waheed S, Khan MU, Sweetman AJ, Jones KC, Moon HB, Malik RN

Full Source: Environmental Pollution (Barking, Essex: 1987)

### Alteration of protein profile in cerebral cortex of rats exposed to bisphenol a: a proteomics study

2020-02-01

Bisphenol A (BPA) is one of the most widely used chemicals in plastic industry, which enters the human body through occupational and food contact. We studied the protein changes in rat cerebral cortex to evaluate the neurotoxicity of BPA. Twenty-four adult male rats were randomly selected and divided into four groups and each group respectively received 0, 0.5, 5 and 50 mg/kg of BPA for 4 weeks orally. To determine the oxidative status, reduced glutathione content and the level of malondialdehyde were measured in brain cortical tissue. The proteins of each sample extracted and separated on a two-dimensional acrylamide gel electrophoresis. From the obtained protein map, the 10 most altered protein spots were used for mass spectroscopy analysis. The lipid peroxidation in both doses of 0.5 and 5 mg/kg was significantly higher than the control group, but the glutathione content had no significant difference between the groups. Based on the results of the MS data analysis by the MASCOT database search engine, 10 proteins with altered intensity were identified as pyruvate kinase, alpha-enolase, aconitate hydratase, creatine kinase B-type, phosphatidylethanolamine-binding protein 1, 14-3-3 protein eta, guanine nucleotide-binding protein subunit beta-1, dihydropyrimidinase-related protein 2, glutamine synthetase and the neurofilament light polypeptide. There are several reports suggesting that the increase or decrease in the level and activity of these 10 proteins, similar to those observed in this study, is related to some neurological and psychosocial disorders including neurodegenerative diseases, schizophrenia, depression, epilepsy and some brain tumors.

Authors: Tavakkoli A, Abnous K, Vahdati Hassani F, Hosseinzadeh H, Birner-Gruenberger R, Mehri S

Full Source: Neurotoxicology. 2020 Feb 1;78:1-10. doi: 10.1016/j.neuro.2020.01.013. [Epub ahead of print]

We studied the protein changes in rat cerebral cortex to evaluate the neurotoxicity of BPA

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### Pesticide Use and Serum Acetylcholinesterase Levels among Flower Farm Workers in Ethiopia-A Cross-Sectional Study

2020-02-04

The flower industry in East Africa has grown in recent years, especially in the production and export of roses. The aim of this study was to assess pesticide use on selected flower farms in Ethiopia. Serum cholinesterase levels in workers were used as a marker of pesticide exposure. This study was a cross-sectional study involving 588 workers from 15 different flower farms. It had a response rate of 95.5%. The participants included 277 males (mean age 26 years; 148 pesticide sprayers and 129 non-sprayers) and 311 females (mean age 25 years; 156 working in greenhouses and 155 working outside the greenhouses). The researchers undertook structured interviews, blood sampling, and walkthrough surveys. Descriptive statistics and Poisson regression were used in the statistical analyses. A total of 154 different trade names of pesticides were found. Of them, 31 (27%) were classified as moderately hazardous by the WHO, and 9% were organophosphates. Serum levels of cholinesterase deviating from 50-140 Michel units were considered abnormal. Abnormal serum cholinesterase levels (above 140 Michel units) were found in 97 participants (16.5%, 95% confidence interval 13.7-19.7%). There were no differences between the four job groups regarding cholinesterase levels. The high prevalence of abnormal serum cholinesterase levels might indicate the presence of pesticide intoxication. Thus, there is a need for routine monitoring of all workers exposed to pesticides, not only sprayers.

Authors: Shentema MC, Kumie A, Bråtveit M, Deressa C, Ngowi AV, Moen BE

Full Source: International journal of environmental research and public health. 2020 Feb 4;17(3). pii: E964. doi: 10.3390/ijerph17030964.

This study was a cross-sectional study involving 588 workers from 15 different flower farms

### Association of occupational exposures with ex vivo functional immune response in workers handling carbon nanotubes and nonfibers

2020-02-07

The objective of this study was to evaluate the association between carbon nanotube and nanofiber (CNT/F) exposure and ex vivo responses of whole blood challenged with secondary stimulants, adjusting for potential confounders, in a cross-sectional study of 102 workers. Multi-day exposure was measured by CNT/F structure count (SC) and elemental carbon (EC) air concentrations. Demographic, lifestyle and

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other occupational covariate data were obtained via questionnaire. Whole blood collected from each participant was incubated for 18 hours with and without two microbial stimulants (lipopolysaccharide/LPS and staphylococcal enterotoxin type B/SEB) using TruCulture technology to evaluate immune cell activity. Following incubation, supernatants were preserved and analyzed for protein concentrations. The stimulant:null response ratio for each individual protein was analyzed using multiple linear regression, followed by principal component (PC) analysis to determine whether patterns of protein response were related to CNT/F exposure. Adjusting for confounders, CNT/F metrics (most strongly, the SC-based) were significantly ( $p < 0.05$ ) inversely associated with stimulant:null ratios of several individual biomarkers: GM-CSF, IFN- $\gamma$ , interleukin (IL)-2, IL-4, IL-5, IL-10, IL-17, and IL-23. CNT/F metrics were significantly inversely associated with PC1 (a weighted mean of most biomarkers, explaining 25% of the variance in the protein ratios) and PC2 (a biomarker contrast, explaining 14%). Among other occupational exposures, only solvent exposure was significant (inversely related to PC2). CNT/F exposure metrics were uniquely related to stimulant responses in challenged whole blood, illustrating reduced responsiveness to a secondary stimulus. This approach, if replicated in other exposed populations, may present a relatively sensitive method to evaluate human response to CNT/F or other occupational exposures.

Authors: Schubauer-Berigan MK, Dahm MM, Toennis Ca, Sammons DL, Eye T, Kodali V, Zeidler-Erdely PC, Erdely A

Full Source: *Nanotoxicology*. 2020 Feb 7:1-16. doi:

10.1080/17435390.2020.1717007. [Epub ahead of print]

### Temporal trends in respirable dust and respirable quartz concentrations within the European industrial sector over a 15-year period (2002-2016)

2020-02-07

#### OBJECTIVES:

Since 2000 the European Industrial Minerals Association's Dust Monitoring Programme (IMA-DMP) has systematically collected respirable dust and respirable quartz measurements from 35 companies producing industrial minerals. The IMA-DMP initiative allowed for estimating overall temporal trends in exposure concentrations for the years 2002-2016 and for presenting these trends by type of mineral produced, by jobs performed and by time of enrolment into the DMP.

#### METHODS:

However, overall decreases in exposure levels were shown for the European minerals industry over the 15-year period

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Approximately 32 000 personal exposure measurements were collected during 29 sampling campaigns during a 15-year period (2002-2016). Temporal trends in respirable dust and respirable quartz concentrations were studied by using linear mixed effects models.

### RESULTS:

Concentrations varied widely (up to three to four orders of magnitude). However, overall decreases in exposure levels were shown for the European minerals industry over the 15-year period. Statistically significant overall downward temporal trends of -9.0% and -3.9% per year were observed for respirable dust and respirable quartz, respectively. When analyses were stratified by time period, no downward trends (and even slight increasing concentrations) were observed between 2008 and 2012, most likely attributable to the recent global economic crisis. After this time period, downward trends became visible again.

### CONCLUSIONS:

Consistent and statistically significant downward trends were found for both exposure to respirable dust and respirable quartz. These downward trends became less or even reversed during the years of the global economic crisis. To our knowledge, this is the first time that analyses of long-term temporal trends point at an effect of a global economic crisis on personal exposure concentrations of workers from sites across Europe.

Authors: Zilaout H, Houba R, Kromhout H

Full Source: Occupational and environmental medicine. 2020 Feb 7. pii: oemed-2019-106074. doi: 10.1136/oemed-2019-106074. [Epub ahead of print]