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CHEMICAL EFFECTS

Non-Target Screening of Chemicals in Selected Cotton Products by GC/MS and Their Safety Assessment

2024-07-30

Cotton is used for the production of textiles, hygiene and cosmetic materials. During cultivation and technological processes, various types of substances (surfactants, softeners, lubricants, etc.) penetrate cotton, which can have a harmful effect on both the human body and the environment. The aim of this study was to analyze selected cotton products in order to identify the substances contained and to describe the potential possibilities of inducing textile contact dermatitis (CD). The impact of the identified compounds on the aquatic environment was also taken into account. Nine samples of cotton clothing and seven samples of cotton pads from various manufacturers were tested. Samples after extraction using the FUSLE (Focused Ultrasonic Liquid Extraction) technique were analyzed with GC/MS. Qualitative analysis was based on comparing mass spectra with library spectra using the following mass spectra deconvolution programs: MassHunter (Agilent), AMDIS (NIST), and PARADISE (University of Copenhagen). The parameter confirming the identification of the substance was the retention index. Through the non-target screening process, a total of 36 substances were identified, with an average AMDIS match factor of approximately 900 ("excellent match"). Analyzing the properties of the identified compounds, it can be concluded that most of them have potential properties that can cause CD, also due to the relatively high content in samples. This applies primarily to long-chain alkanes (C25-C31), saturated fatty acids, fatty alcohols (e.g., oleyl alcohol), and fatty acid amides (e.g., oleamide). However, there are not many reports describing cases of cotton CD. Information on the identified groups of compounds may be helpful in the case of unexplained sources of sensitization when the skin comes into contact with cotton materials. Some of the identified compounds are also classified as dangerous for aquatic organisms, especially if they can be released during laundering.

Authors: Łukasz Dąbrowski

Full Source: *Molecules* (Basel, Switzerland) 2024 Jul 30;29(15):3584. doi: 10.3390/molecules29153584.

Cotton is used for the production of textiles, hygiene and cosmetic materials.

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Do Microplastics Have Neurological Implications in Relation to Schizophrenia Zebrafish Models? A Brain Immunohistochemistry, Neurotoxicity Assessment, and Oxidative Stress Analysis

2024-07-30

The effects of exposure to environmental pollutants on neurological processes are of increasing concern due to their potential to induce oxidative stress and neurotoxicity. Considering that many industries are currently using different types of plastics as raw materials, packaging, or distribution pipes, microplastics (MPs) have become one of the biggest threats to the environment and human health. These consequences have led to the need to raise the awareness regarding MPs negative neurological effects and implication in neuropsychiatric pathologies, such as schizophrenia. The study aims to use three zebrafish models of schizophrenia obtained by exposure to ketamine (Ket), methionine (Met), and their combination to investigate the effects of MP exposure on various nervous system structures and the possible interactions with oxidative stress. The results showed that MPs can interact with ketamine and methionine, increasing the severity and frequency of optic tectum lesions, while co-exposure (MP+Met+Ket) resulted in attenuated effects. Regarding oxidative status, we found that all exposure formulations led to oxidative stress, changes in antioxidant defense mechanisms, or compensatory responses to oxidative damage. Met exposure induced structural changes such as necrosis and edema, while paradoxically activating periventricular cell proliferation. Taken together, these findings highlight the complex interplay between environmental pollutants and neurotoxicants in modulating neurotoxicity.

Authors: Alexandra Savuca, Alexandrina-Stefania Curpan, Luminita Diana Hritcu, Teodora Maria Buzenchi Proca, Ioana-Miruna Balmus, Petru Fabian Lungu, Roxana Jijie, Mircea Nicusor Nicoara, Alin Stelian Ciobica, Gheorghe Solcan, Carmen Solcan

Full Source: *International journal of molecular sciences* 2024 Jul 30;25(15):8331. doi: 10.3390/ijms25158331.

The effects of exposure to environmental pollutants on neurological processes are of increasing concern due to their potential to induce oxidative stress and neurotoxicity.

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ENVIRONMENTAL RESEARCH

Effect of Packaging Method and Storage Environment on Activity of Magnesium Oxide and Mechanical Properties of Basic Magnesium Sulfate Cement

2024-07-23

As one of the raw materials of basic magnesium sulfate cement (BMSC), the activity of light-burned magnesium oxide (MgO) has an important effect on the hydration rate, hydration products, and mechanical properties of BMSC. To reveal the influence of packaging method, storage environment, and storage time on the activity of MgO and the mechanical properties of BMSC, an experiment was conducted by using ordinary woven bags, peritoneal woven bags, and plastic and paper compound bags to store the finished BMSC and the raw materials (light-burned MgO, MgSO₄·7H₂O, fly ash, and a chemical additive) under the conditions of natural environment, sealed environment, and wet environment, respectively. Comparative analysis of the effects of packaging method, storage conditions, and storage time on the activity of MgO and the mechanical properties of BMSC was performed through the mechanical strength test of mortar specimens. The results showed that in a sealed environment, the loss of a-MgO content in light-burned MgO was minimized, which was more conducive to keeping the mechanical properties of BMSC stable. In the wet environment, the mechanical strength of BMSC was significantly reduced in the early stage (1 day) due to the significant reduction in the activity of MgO, and the mechanical strength of the finished BMSC and prepared BMSC after 120 days of storage was still lost, regardless of the packaging method. However, the storage environment and packaging method had relatively little effect on the late mechanical strength (28 days) of BMSC. It is advisable to use ordinary woven bags for packaging in natural and sealed environments as this is more economical for engineering applications. Plastic and paper compound bags are superior to ordinary woven bags and peritoneal woven bags in wet environments.

Authors: Yuxiao Wu, Peini Shi, Qingsong Yang, Na Zhang

Full Source: Materials (Basel, Switzerland) 2024 Jul 23;17(15):3628. doi: 10.3390/ma17153628.

As one of the raw materials of basic magnesium sulfate cement (BMSC), the activity of light-burned magnesium oxide (MgO) has an important effect on the hydration rate, hydration products, and mechanical properties of BMSC.

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Early signs of plastic degradation and fragmentation: A 40-day study in marine environments

2024-08-09

Conventional plastics are widely present in the ocean as marine plastic debris. This in-situ study investigates the degradability and fragmentation of seven common conventional plastics (PET, PVC, PS, EPS, PP, HDPE, and LDPE) in natural marine environments over a 40-day period. All plastics showed significant chemical changes and oscillating plastic oxidation levels, indicating the synergistic processes of oxidation and removal of oxidation products. Polystyrenes and polymers with heteroatoms showed the largest degradation potentials, while pure polyolefins exhibited the highest fragmentation risks. SEM images suggest potentials of EPS and pure polyolefins in generating microplastic fragments, and polymers with heteroatoms in generating nanoplastic fragments. PS did not exhibit any surface degradation signs, potentially due to enhanced crystallinity through oxidation. The findings highlight the need for reduced usage of EPS and pure polyolefins which are commonly applied as disposable utensils and food packaging, and prioritized cleanup of these polymers to reduce microplastic pollution in the environment.

Authors: Coco Ka Hei Cheung, Christelle Not

Full Source: Marine pollution bulletin 2024 Aug 9;207:116809. doi: 10.1016/j.marpolbul.2024.116809.

Conventional plastics are widely present in the ocean as marine plastic debris.

PHARMACEUTICAL/TOXICOLOGY

Ocoxin Oral Solution Triggers DNA Damage and Cell Death in Ovarian Cancer

2024-07-25

Ovarian cancer is the most fatal of all the reproductive cancers within the female population, mainly due to its late diagnosis that limits surgery and medical treatment. Classically, ovarian cancer therapy has included conventional chemotherapy, and other therapeutic approaches are now being used to treat these patients, but the outcomes of the disease are still poor. Therefore, new strategies are needed to improve life expectancy and life quality of ovarian cancer patients. Considering that, we investigated the effect of the nutritional supplement Ocoxin Oral Solution (OOS) in ovarian cancer models. OOS contains several nutritional supplements, some of them with demonstrated antitumoral action. In vitro studies showed that OOS inhibited the proliferation of several ovarian cancer cell lines, especially of those representative of the endometrioid subtype, in a

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time- and dose-dependent manner. A fast cell death induction after OOS treatment was observed, and when the molecular mechanisms leading to this effect were investigated, an activation of the DNA damage checkpoint was detected, as shown by activation (phosphorylation) of CHK1 and CHK2 kinases that was followed by the phosphorylation of the target protein histone H2AX. When tested in animal models of ovarian cancer, OOS reduced tumor growth without any observed secondary effects. Moreover, such reduction in tumor proliferation was caused by the induction of DNA damage as corroborated by the *in vivo* phosphorylation of CHK2 and Histone H2AX. Finally, OOS potentiated the action of carboplatin or olaparib, the standard of care treatments used in ovarian clinics, opening the possibility of including OOS in combination with those standard of care agents in patients with ovarian cancer.

Authors: Sheila Almaraz-Postigo, Eduardo Sanz, Atanasio Pandiella, Elena Díaz-Rodríguez

Full Source: *Nutrients* 2024 Jul 25;16(15):2416. doi: 10.3390/nu16152416.

Prenatal mercury exposure and the secondary sex ratio: The Japan Environment and Children's Study

2024-08-08

Prior research into the association between prenatal mercury (Hg) exposure and the secondary sex ratio has yielded inconclusive and conflicting results. Notably, no study has used cord blood Hg measurement in this context. Also, the differences in Hg species and the potential modifying role of selenium (Se) on this association remain unexplored. Using data from the Japan Environment and Children's Study, we analyzed mother-child pairs with available data for concentrations of total mercury (THg) and Se in maternal blood during late pregnancy, and THg, inorganic mercury (IHg), methylmercury (MeHg), and Se in cord blood. Logistic regression models were employed to examine the association between Hg and Se biomarkers and the secondary sex ratio. Out of the total sample of 3,698 children, 1,877 (50.8%) were male, corresponding to an overall secondary sex ratio of 1.03. After adjusting for maternal age and parity, no significant associations were observed between THg concentrations of maternal blood and the secondary sex ratio. Nevertheless, we identified that two-fold increases in THg, IHg, and MeHg concentrations in cord blood were positively associated with increased odds of having a male child, yielding adjusted odds ratios of 1.13 (95%CI: 1.04, 1.22), 1.12 (1.03, 1.21), and 1.12 (1.03, 1.22), respectively. When stratified by the median Se concentrations, no apparent differences were detected in the associations between Hg concentrations and the

Prior research into the association between prenatal mercury (Hg) exposure and the secondary sex ratio has yielded inconclusive and conflicting results.

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secondary sex ratio. In summary, elevated Hg concentrations in cord blood, but not maternal blood, were associated with an increased probability of male births.

Authors: Kohei Hasegawa, Yuji Inaba, Hirokazu Toubou, Takumi Shibasaki, Miyuki Iwai-Shimada, Shin Yamazaki, Michihiro Kamijima, Teruomi Tsukahara, Tetsuo Nomiyama, Japan Environment and Children's Study (JECS) Group

Full Source: *Reproductive toxicology* (Elmsford, N.Y.) 2024 Aug 8:108685. doi: 10.1016/j.reprotox.2024.108685.

Neurological Disorders Induced by Drug Use: Effects of Adolescent and Embryonic Drug Exposure on Behavioral Neurodevelopment

2024-07-30

Clinical studies demonstrate that the risk of developing neurological disorders is increased by overconsumption of the commonly used drugs, alcohol, nicotine and cannabis. These drug-induced neurological disorders, which include substance use disorder (SUD) and its co-occurring emotional conditions such as anxiety and depression, are observed not only in adults but also with drug use during adolescence and after prenatal exposure to these drugs, and they are accompanied by long-lasting disturbances in brain development. This report provides overviews of clinical and preclinical studies, which confirm these adverse effects in adolescents and the offspring prenatally exposed to the drugs and include a more in-depth description of specific neuronal systems, their neurocircuitry and molecular mechanisms, affected by drug exposure and of specific techniques used to determine if these effects in the brain are causally related to the behavioral disturbances. With analysis of further studies, this review then addresses four specific questions that are important for fully understanding the impact that drug use in young individuals can have on future pregnancies and their offspring. Evidence demonstrates that the adverse effects on their brain and behavior can occur: (1) at low doses with short periods of drug exposure during pregnancy; (2) after pre-conception drug use by both females and males; (3) in subsequent generations following the initial drug exposure; and (4) in a sex-dependent manner, with drug use producing a greater risk in females than males of developing SUDs with emotional conditions and female offspring after prenatal drug exposure responding more adversely than male offspring. With the recent rise in drug use by adolescents and pregnant women that has occurred in association with the legalization of cannabis and increased availability of vaping tools, these conclusions

Clinical studies demonstrate that the risk of developing neurological disorders is increased by overconsumption of the commonly used drugs, alcohol, nicotine and cannabis.

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from the clinical and preclinical literature are particularly alarming and underscore the urgent need to educate young women and men about the possible harmful effects of early drug use and to seek novel therapeutic strategies that might help to limit drug use in young individuals.

Authors: Olga Karatayev, Adam D Collier, Stella R Targoff, Sarah F Leibowitz
Full Source: International journal of molecular sciences 2024 Jul 30;25(15):8341. doi: 10.3390/ijms25158341.

OCCUPATIONAL

Acute Exposure to Polyethylene Microbeads and Effects on the Water Flea *Moina macrocopa*

2024-08-10

Microplastics merit attention as they can be ingested by lower trophic organisms, transferred to the food web, and pose potential risks to higher trophic levels. This study investigated the accumulation and effects of polyethylene microbeads (PEMBs, 63-75 μm) on adult water flea *Moina macrocopa* (600-800 μm), an order-magnitude difference in size, as a result of acute exposure. The organisms were exposed to PEMBs in four treatments of 0 (the Control), 5, 50, and 500 mg PEMB/L for examining PEMB accumulation, survival and reproduction of the organisms after the 24- and 48-h exposures. In general, *M. macrocopa* ingested PEMBs within 24-h exposure and reached the cumulative PEMB accumulation value of 0.17 ± 0.21 beads/adult after 48-h exposure in the 500 mg PEMB/L treatment. Exposure to PEMBs resulted in a statistically significant decrease of the cumulative survival rates, from $93 \pm 12\%$ in the Control to $37 \pm 21\%$ in the 500 mg/L treatment. Nevertheless, exposure to PEMBs did not significantly reduce the cumulative reproduction ($p > 0.05$), although a decrease was observed. This study suggests that the relatively large-size PEMBs could be ingested by the relatively small-size *M. macrocopa* and pose potential risks to these organisms.

Authors: Bao-Son Trinh, Le Thi Lien, Pham Anh Duc

Full Source: Bulletin of environmental contamination and toxicology 2024 Aug 10;113(2):24. doi: 10.1007/s00128-024-03929-3.

Microplastics merit attention as they can be ingested by lower trophic organisms, transferred to the food web, and pose potential risks to higher trophic levels.

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Associations of prenatal and concurrent exposure to phenols mixture with anthropometric measures and blood pressure during childhood: A time-varying mixture approach

2024-08-08

Background: Environmental phenols were recognized as endocrine disrupting chemicals (EDCs). However, their impact on childhood anthropometric measures and blood pressure (BP) is still inconclusive. Limited studies have simultaneously considered prenatal and childhood exposures in analyzing mixtures of phenols.

Objective: We investigated the relationships between combined prenatal and childhood exposures (two periodic exposures) to phenol mixtures and anthropometric measure and BP, to further identify the vulnerable periods of phenol exposure and to explore the important individual contribution of each phenol.

Methods: We analyzed 434 mother-child dyads from the Sheyang Mini Birth Cohort Study (SMBCS). The urinary concentrations of 11 phenolic compounds were measured using gas chromatography tandem mass spectrometry. Generalized linear regression models (GLMs) and hierarchical Bayesian Kernel Machine Regression (hBKMR) were used to examine the effects of individual phenolic compounds at each period and of two periodic exposures.

Results: In the single-chemical analysis, prenatal or childhood exposure to specific phenols, especially Benzophenone-3 (BP3), 4-tert-Octylphenol (4-tOP), and Benzyl paraben (BePB) were associated with BMI z-scores (BAZ), Waist-to-height ratio (WHtR), and BP. In the hBKMR models, two periodic exposures to phenol mixtures had a U-shaped association with WHtR, primarily driven by childhood BePB exposure. Moreover, among the phenol mixtures analysis, childhood 4-tOP exposure was identified as the primary contributor to the positive association with diastolic BP. Concurrent exposure to phenol mixtures resulted in greater susceptibility. Conclusions: We found that prenatal and childhood exposure to phenol mixtures might influence childhood obesity and elevate blood pressure levels. Concurrent exposure to 4-tOP may be the primary driver of the positive associations with BP.

Authors: Yiming Dai, Jiayun Ding, Zheng Wang, Boya Zhang, Qin Guo, Jianqiu Guo, Xiaojuan Qi, Dasheng Lu, Xiuli Chang, Chunhua Wu, Jiming Zhang, Zhijun Zhou

Full Source: Environmental research 2024 Aug 8;261:119766. doi: 10.1016/j.envres.2024.119766.

Background: Environmental phenols were recognized as endocrine disrupting chemicals (EDCs).

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Pre-task planning for construction worker safety and health: Implementation and assessment

2024-08-10

Background: Compared to other industry sectors, construction workers experience a disproportionately high rate of occupational injuries and fatalities. As research findings suggest, most of these incidents could be prevented if hazards were proactively recognized and properly addressed. In the construction industry, pre-task planning (PTP) is a preventive process intended to describe each step of work, identify associated safety and health hazards, and recommend controls to eliminate or mitigate the hazards before work begins. Despite its importance, the construction industry lacks comprehensive guidelines to design and implement PTP in a consistent and effective manner. To fill this gap, this study pursued two objectives:

- (1) identify shortcomings in current PTP practices and explore recommended solutions from practitioners' perspectives and
- (2) translate research findings into an applied tool to help practitioners assess and improve the quality of their PTP process.

Methods: To fill the gap, 28 construction safety and health professionals and 104 workers were interviewed, and seven onsite PTP sessions were directly observed.

Results: Shortcomings of current PTP practices as well as recommended solutions were categorized as

- (1) planning and implementation,
- (2) all-trades coordination,
- (3) engagement and buy-in,
- (4) training and logistics,
- (5) workforce diversity and the language barrier, and
- (6) PTP content accessibility.

Discussion/conclusions: An effective PTP process should be based on workers' direct involvement and input on task requirements and hazards. It needs to be regularly updated to reflect the changing work conditions. In addition to task-related information, to increase workers' awareness, PTP should paint a holistic view of the project and other trades' scopes.

Authors: Babak Memarian, Sara B Brooks, Jean Christophe Le

Full Source: American journal of industrial medicine 2024 Aug 10. doi: 10.1002/ajim.23647.

Background: Compared to other industry sectors, construction workers experience a disproportionately high rate of occupational injuries and fatalities.