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CHEMICAL EFFECTS

Toxicological effects of aqueous extract of Genipa americana L. leaves on adult zebrafish (Danio rerio): Chemical profile, histopathological effects and lack of genotoxicity

2023-10-13

Genipa americana is a native plant of Brazil with potential applications in folk medicine. Whereas most of the phytochemical and pharmacological studies on this plant have focused on its fruits, the crude extracts of its leaves contain chemical metabolites that may have toxicity to organisms, which have yet to be investigated. This study aimed to determine the main groups of secondary metabolites in the aqueous extract of the leaves of G. americana by phytochemistry and qualitative HPLC, and to evaluate the possible toxicological effects and histopathological changes caused by this extract in zebrafish (Danio rerio) adults, through micronucleus test, nuclear abnormalities and histopathological analyses of gills and liver. While three metabolites of high intensity (phenolic compounds, flavonoids and triterpenes) were found in the phytochemical evaluation, the HPLC showed results compatible with flavonoids and iridoids, all belonging to common classes for this species and the Rubiaceae family. The acute toxicity test did not induce mortality or genotoxicity in zebrafish, but after exposure for 96 h, it was possible to observe injuries to the fish gill tissue, such as lamellar fusion, vasodilation and telangiectasia; in the liver, necrosis was visualized at 40 mg/L, and at higher concentrations (80 and 100 mg/L) induced sinusoidal widening was identified. In conclusion, the results demonstrated the toxic potential of this plant for aquatic species.

Authors: Raquel Oliveira Claro, Carla Letícia Gediel Rivero-Wendt, Ana Luisa Miranda-Vilela, Cesar Koppe Grisolia, Gilberto Golçalves Facco, Davyson de Lima Moreira, Rosemary Matias

Full Source: Toxicon : official journal of the International Society on Toxinology 2023 Oct 13:107305. doi: 10.1016/j.toxicon.2023.107305.

Genipa americana is a native plant of Brazil with potential applications in folk medicine.

Biodegradable Nanofiber/Metal-Organic Framework/Cotton Air Filtration Membranes Enabling Simultaneous Removal of Toxic Gases and Particulate Matter

2023-09-30

The typical filters that protect us from harmful components, such as toxic gases and particulate matter (PM), are made from petroleum-based

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materials, which need to be replaced with other environmentally friendly materials. Herein, we demonstrate a route to fabricate biodegradable and dual-functional filtration membranes that effectively remove PM and toxic gases. The membrane was integrated using two layers: (i) cellulose-based nanofibers for PM filtration and (ii) metal-organic framework (MOF)-coated cotton fabric for removal of toxic gases. Zeolitic imidazolate framework (ZIF-8) was grown from the surface of the cotton fabric by the treatment of cotton fabric with an organic precursor solution and subsequent immersion in an inorganic precursor solution. Cellulose acetate nanofibers (NFs) were deposited on the MOF-coated cotton fabric via electrospinning. At the optimal thickness of the NF layer, the quality factor of 18.8 × 10-2 Pa-1 was achieved with a filtration efficiency of 93.1%, air permeability of 19.0 cm3/cm2/s, and pressure drop of 14.2 Pa. The membrane exhibits outstanding gas adsorption efficiencies (>99%) for H2S, formaldehyde, and NH3. The resulting membrane was highly biodegradable, with a weight loss of 62.5% after 45 days under standard test conditions. The proposed strategy should provide highly sustainable material platforms for practical multifunctional membranes in personal protective equipment.

Authors: Sujin Ryu, Doyeon Kim, Hyewon Lee, Yoonjin Kim, Youngbok Lee, Myungwoong Kim, Heedong Lee, Hoik Lee

Full Source: Polymers 2023 Sep 30;15(19):3965. doi: 10.3390/polym15193965.

The selective and rapid elimination of refractory organic pollutants from surface water is significant.

Selective oxidation of organic pollutants based on reactive oxygen species and the molecular structure: Degradation behavior and mechanism analysis

2023-10-04

The selective and rapid elimination of refractory organic pollutants from surface water is significant. However, the relationship of between reactive oxygen species (ROSs) and diversified pollutants molecular structures still needs to be further clarified. Here, we utilize polydopamine (PDA)-assisted coating strategy to prepare hollow 2D carbon nanosheet (ZPL-HCNS) and 2D Co3O4 nanosheet (ZPL-Co3O4) by thermolysis of PDA coated ZIF-L (ZIF-L@PDA) precursor under different gas atmosphere, which realizes the controlled generation of radicals and non-radicals. Organic pollutants including bisphenols, sulfonamides, quinolones, tetracyclines, and azo dyes are applied to assess the catalytic performance. Results show that dyes containing azo structure are more likely to be degraded by radical process, which is due to that the energy (ΔE) requirements to break the azo bond is higher than energy released from singlet oxygen to

oxygen molecule and lower than that of sulfate radical to sulfate. Frontier molecular orbital theory HOMO-LUMO and Fukui function expounded the possible selectivity mechanism. In addition, the degradation pathway and biotoxicity test are carried out. This work provides a reference to illustrate the selective degradation for ROSs and molecular structure of pollutants.
Authors: Ming Zhang, Jingqi Ruan, Xinhao Wang, Weizhen Shao, Zhonglin Chen, Zhanghao Chen, Cheng Gu, Weichuan Qiao, Jiansheng Li
Full Source: Water research 2023 Oct 4:246:120697. doi: 10.1016/j.watres.2023.120697.

ENVIRONMENTAL RESEARCH

Environmental friendly utilization of plant wastes in combination as a source of natural colorants for binary mordanted silk dyeing

2023-10-16
This study investigates the absorption behavior of natural dyes on silk fabric: madder roots (red dye) and amaltas (brown dye). The dyes were extracted under optimized conditions in an acidic medium. Binary mixtures of these dyes in different proportions were employed to develop various shades. This research work has explored the impact of single as well as binary mixture of chemical mordants on the dyeing behavior of natural dyes on silk. Al (Alum), iron (Fe), and tannic acid (T.A.) were used as pre- and post-mordants. Different concentrations of the dye mixtures were used to achieve different shades. The absorption behavior of the binary mixture of natural dyes was assessed using a spectra photometer Colori-spectra SF600. The study found that the highest color strength was achieved when an acidic extract with a table salt concentration of 2 g/100 mL was applied to silk fabric at 65 °C for 55 min and subjected to microwave treatment for 6 min. The study revealed excellent results for the selected binary mixtures of chemical mordants, such as (Al + Fe), (Al + T.A.), and (Fe + T.A.), in comparison by employing single mordants such as (Al, Fe, and T.A.).
Authors: Nimra Amin, Shahid Adeel, Fazal-Ur-Rehman, Muhammad Naveed Anjum
Full Source: Environmental science and pollution research international 2023 Oct 16. doi: 10.1007/s11356-023-30162-y.

This study investigates the absorption behavior of natural dyes on silk fabric: madder roots (red dye) and amaltas (brown dye).

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Experimental and Computational Study on Inhibitory Effect and Adsorption Properties of N-Acetylcysteine Amino Acid in Acid Environment

2023-09-25
Potentiodynamic polarization (PDP) and electrochemical impedance spectroscopy (EIS) were applied to study the inhibitory effect of N-acetylcysteine (NAC) on corrosion inhibition of carbon steel in hydrochloric acid solution. N-acetylcysteine influenced the iron dissolution to a greater extent than the hydrogen evolution reaction acting as a mixed inhibitor, predominantly anodic. The charge transfer resistance (Rct) gradually increased with the inhibitor concentration. From both methods, the inhibition efficiency (IE) reached a value of 89 ± 1% and NAC adsorption followed the Temkin isotherm. The value of adsorption Gibbs energy (ΔGadso), around -35 kJ mol-1, indicated a spontaneous adsorption and mixed action mechanism, with NAC chemical adsorption prevailing over physical one. New data will be reported by the computational study, that was performed using the density functional theory (DFT) method in aqueous phase. Quantum chemical descriptors were determined by B3LYP theory level with 6-31G+(d) basis set. Metropolis Monte Carlo atomistic simulation was used to reveal the adsorption configuration and interactions between acetylcysteine molecules and the carbon steel surface. Theoretical results were consistent with the experimental data, showing that the inhibitor action mechanism consisted of mainly chemisorption of its molecules on the carbon steel surface accompanied by van der Waals forces and electrostatic interactions.
Authors: Adriana Samide, Aurelian Dobrițescu, Cristian Tigae, Cezar Ionuț Spînu, Bogdan Oprea
Full Source: Molecules (Basel, Switzerland) 2023 Sep 25;28(19):6799. doi: 10.3390/molecules28196799.

Potentiodynamic polarization (PDP) and electrochemical impedance spectroscopy (EIS) were applied to study the inhibitory effect of N-acetylcysteine (NAC) on corrosion inhibition of carbon steel in hydrochloric acid solution.

Associations between air pollution, residential greenness, and glycated hemoglobin (HbA1c) in three prospective cohorts of U.S. adults

2023-10-13
Background: While studies suggest impacts of individual environmental exposures on type 2 diabetes (T2D) risk, mechanisms remain poorly characterized. Glycated hemoglobin (HbA1c) is a biomarker of glycemia and diagnostic criterion for prediabetes and T2D. We explored associations between multiple environmental exposures and HbA1c in non-diabetic adults.

Methods: HbA1c was assessed once in 12,315 women and men in three U.S.-based prospective cohorts: the Nurses' Health Study (NHS), Nurses' Health Study II (NHSII), and Health Professionals Follow-up Study (HPFS). Residential greenness within 270 m and 1,230 m (normalized difference vegetation index, NDVI) was obtained from Landsat. Fine particulate matter (PM2.5) and nitrogen dioxide (NO2) were estimated from nationwide spatiotemporal models. Three-month and one-year averages prior to blood draw were assigned to participants' addresses. We assessed associations between single exposure, multi-exposure, and component scores from Principal Components Analysis (PCA) and HbA1c. Fully-adjusted models built on basic models of age and year at blood draw, BMI, alcohol use, and neighborhood socioeconomic status (nSES) to include diet quality, race, family history, smoking status, postmenopausal hormone use, population density, and season. We assessed interactions between environmental exposures, and effect modification by population density, nSES, and sex.
Results: Based on HbA1c, 19% of participants had prediabetes. In single exposure fully-adjusted models, an IQR (0.14) higher 1-year 1,230 m NDVI was associated with a 0.27% (95% CI: 0.05%, 0.49%) lower HbA1c. In basic component score models, a SD increase in Component 1 (high loadings for 1-year NDVI) was associated with a 0.19% (95% CI: 0.04%, 0.34%) lower HbA1c. CI's crossed the null in multi-exposure and fully-adjusted component score models. There was little evidence of associations between air pollution and HbA1c, and no evidence of effect modification. Conclusions: Among non-diabetic adults, environmental exposures were not consistently associated with HbA1c. More work is needed to elucidate biological pathways between the environment and prediabetes.
Authors: Melissa R Fiffer, Huichu Li, Hari S Iyer, Rachel C Nethery, Qi Sun, Peter James, Jeff D Yanosky, Joel D Kaufman, Jaime E Hart, Francine Laden
Full Source: Environmental research 2023 Oct 13:117371. doi: 10.1016/j.envres.2023.117371.

Per- and polyfluoroalkyl substances (PFAS) are man-made chemicals known for their adverse effects on humans.

PHARMACEUTICAL/TOXICOLOGY

Environmental exposure to legacy and emerging per- and polyfluoroalkyl substances and endometriosis in women of childbearing age

2023-10-13
Per- and polyfluoroalkyl substances (PFAS) are man-made chemicals known for their adverse effects on humans. Growing concern has risen

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regarding the reproductive toxicity of PFAS, but whether PFAS affect endometriosis remains to be explored. This hospital-based case-control study included 240 laparoscopic-confirmed endometriosis cases and 334 normal controls in China from 2014 to 2018. Concentrations of thirty-three legacy and emerging PFAS were measured in the plasma samples. Associations between single PFAS and endometriosis were estimated by binary logistic regression. The elastic net regression (ENR) model was used to identify dominant PFAS related to endometriosis. The joint effect of the PFAS mixture on endometriosis was assessed by principal component analysis (PCA), Bayesian kernel machine regression (BKMR), and quantile-based g-computation (q-gcomp). In the single-PFAS model, significant positive associations of PFOA [adjusted odds ratio (95 % CI): 1.22 (1.00, 1.51)], total PFOS [1.19 (1.05, 1.34)] and two branched PFOS isomers [1.16 (1.09, 1.22) for 1m-PFOS; 1.18 (1.04, 1.34) for 6m-PFOS] with increased endometriosis odds were observed. Mixture models showed that the joint effect of PFAS mixture on endometriosis was significant [1.24 (1.05, 1.48)], mainly driven by 1m-PFOS. The PFOS isomers profile suggested a PFOS precursor biotransformation source of 1m-PFOS in our population. Our study suggests that branched isomers of PFOS may be associated with endometriosis.
Authors: Junjie Ao, Rongrong Zhang, Xiaona Huo, Wenting Zhu, Jun Zhang
Full Source: The Science of the total environment 2023 Oct 13:167838. doi: 10.1016/j.scitotenv.2023.167838.

Environmental and lifestyle exposures have a huge impact on cancer risk; neverthe-less, the biological mechanisms underlying this association remain poorly understood.

Effect of environmental exposures on cancer risk: Emerging role of non-coding RNA shuttled by extracellular vesicles

2023-10-10
Environmental and lifestyle exposures have a huge impact on cancer risk; nevertheless, the biological mechanisms underlying this association remain poorly understood. Extracellular vesicles (EVs) are membrane-enclosed particles actively released by all living cells, which play a key role in intercellular communication. EVs transport a variegate cargo of biomolecules, including non-coding RNA (ncRNA), which are well-known regulators of gene expression. Once delivered to recipient cells, EV-borne ncRNAs modulate a plethora of cancer-related biological processes, including cell proliferation, differentiation, and motility. In addition, the ncRNA content of EVs can be altered in response to outer stimuli. Such changes can occur either as an active attempt to adapt to the changing environment or as an uncontrolled consequence of cell homeostasis loss. In either case, such environmentally-driven alterations in EV ncRNA might affect the complex crosstalk between malignant cells and the

tumor microenvironment, thus modulating the risk of cancer initiation and progression. In this review, we summarize the current knowledge about EV ncRNAs at the interface between environmental and lifestyle determinants and cancer. In particular, we focus on the effect of smoking, air and water pollution, diet, exercise, and electromagnetic radiation. In addition, we have conducted a bioinformatic analysis to investigate the biological functions of the genes targeted by environmentally-regulated EV microRNAs. Overall, we draw a comprehensive picture of the role of EV ncRNA at the interface between external factors and cancer, which could be of great interest to the development of novel strategies for cancer prevention, diagnosis, and therapy.

Authors: Paola Monti, Giulia Solazzo, Valentina Bollati

Full Source: Environment international 2023 Oct 10:181:108255. doi: 10.1016/j.envint.2023.108255.

OCCUPATIONAL

Endocrine disruptors: Unravelling the link between chemical exposure and Women's reproductive health

2023-10-12

An Endocrine Disrupting Chemical (EDC) is any compound that disrupts the function of the endocrine system in humans and is ubiquitous in the environment either as a result of natural events or through anthropogenic activities. Bisphenol A, phthalates, parabens, pesticides, triclosan, polychlorinated biphenyls, and heavy metals, which are frequently found in the pharmaceutical, cosmetic, and packaging sectors, are some of the major sources of EDC pollutants. EDCs have been identified to have a deteriorating effect on the female reproductive system, as evidenced by the increasing number of reproductive disorders such as endometriosis, uterine fibroids, polycystic ovary syndrome, premature ovarian failure, menstrual irregularity, menarche, and infertility. Studying EDCs in relation to women's health is essential for understanding the complex interactions between environmental factors and health outcomes. It enables the development of strategies to mitigate risks, protect reproductive and overall health, and inform public policy decisions to safeguard women's well-being. Healthcare professionals must know the possible dangers of EDC exposure and ask about environmental exposures while evaluating patients. This may result in more precise diagnosis and personalized treatment regimens. This review summarises the existing understanding of prevalent EDCs that impact women's health and involvement in female reproductive dysfunction and underscores the need for more research.

An Endocrine Disrupting Chemical (EDC) is any compound that disrupts the function of the endocrine system in humans and is ubiquitous in the environment either as a result of natural events or through anthropogenic activities.

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Further insights on potential mechanisms of action of EDCs on female has been emphasized in the article. We also discuss the role of nutritional intervention in reducing the effect of EDCs on women's reproductive health. EDC pollution can be further reduced by adhering to strict regulations prohibiting the release of estrogenic substances into the environment.

Authors: Saqib Hassan, Aswin Thacharodi, Anshu Priya, R Meenatchi, Thanushree A Hegde, Thangamani R, H T Nguyen, Arivalagan Pugazhendhi

Full Source: Environmental research 2023 Oct 12:117385. doi: 10.1016/j.envres.2023.117385.

Consumption of bivalve shellfish in French coastal populations: data for acute and chronic exposure assessment

2023-10-13

Shellfish are a source of nutrients but are also a matter of concern in terms of food safety due to natural contaminants such as phycotoxins or anthropogenic contaminants including microbial agents and heavy metals. However, data related to consumption for each mollusk species are scarce and missing for appropriate exposure calculation. The objective of the study was to generate shellfish consumption data in the adult coastal population in France to assess exposure to health risks, the effects of determinants on the frequency of consumption and usual intake, and shellfish food risk perception. Our study, named the CONSOMER study, was carried out using an online survey in 2016 and 2017 and included a food frequency questionnaire. After validation, 2,479 individual questionnaires were available for statistical analysis. Our findings provide estimates of shellfish consumption frequency, portion sizes, weekly intake in g/week and g/week/body weight that can be used for acute and chronic exposure calculations. For the acute risk, the 97.5th percentile of the portion size was found to be around 290 g for the adult coastal population. For chronic exposure, recreational shellfish harvesting activities were associated with higher weekly intakes. A non-negligible part of this subpopulation is not aware of food safety recommendations concerning harvesting areas. Results for shellfish harvester consumption in particular are consistent with other available data. Exposure calculations and safety recommendations should target shellfish harvesters.

Authors: Mathias Lunghi, Nathalie Arnich, Franck Lehuédé, Carine Dubuisson, Anne Thebault

Full Source: Journal of food protection 2023 Oct 13:100180. doi: 10.1016/j.jfp.2023.100180.

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