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CHEMICAL EFFECTS

AFB1 Toxicity in Human Food and Animal Feed Consumption: A Review of Experimental Treatments and Preventive Measures

2024-05-13

Aims: The current review aims to outline and summarize the latest research on aflatoxin, with research studies describing natural, herbal and chemical compound applications in animal (pig) models and in vitro cellular studies. Aflatoxin, a carcinogenic toxin metabolite, is produced by Aspergillus flavus in humid environments, posing a threat to human health and crop production. The current treatment involves the prevention of exposure to aflatoxin and counteracting its harmful toxic effects, enabling survival and research studies on an antidote for aflatoxin.
Objectives: To summarize current research prospects and to outline the influence of aflatoxin on animal forage in farm production, food and crop processing. The research application of remedies to treat aflatoxin is undergoing development to pinpoint biochemical pathways responsible for aflatoxin effects transmission and actions of treatment.
Significance: To underline the environmental stress of aflatoxin on meat and dairy products; to describe clinical syndromes associated with aflatoxicosis on human health that are counteracted with proposed treatment and preventive interventions. To understand how to improve the health of farm animals with feed conditions.

Authors: Agnieszka Pożarska, Krzysztof Karpiesiuk, Wojciech Kozera, Urszula Czarnik, Michał Dąbrowski, Łukasz Zielonka

Full Source: International journal of molecular sciences 2024 May 13;25(10):5305. doi: 10.3390/ijms25105305.

Aims: The current review aims to outline and summarize the latest research on aflatoxin, with research studies describing natural, herbal and chemical compound applications in animal (pig) models and in vitro cellular studies.

Widespread 2013-2020 decreases and reduction challenges of organic aerosol in China

2024-05-25

High concentrations of organic aerosol (OA) occur in Asian countries, leading to great health burdens. Clean air actions have resulted in significant emission reductions of air pollutants in China. However, long-term nation-wide trends in OA and their causes remain unknown. Here, we present both observational and model evidence demonstrating widespread decreases with a greater reduction in primary OA than in secondary OA (SOA) in China during the period of 2013 to 2020. Most of the decline is attributed to reduced residential fuel burning while the

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interannual variability in SOA may have been driven by meteorological variations. We find contrasting effects of reducing NOx and SO2 on SOA production which may have led to slight overall increases in SOA. Our findings highlight the importance of clean energy replacements in multiple sectors on achieving air-quality targets because of high OA precursor emissions and fluctuating chemical and meteorological conditions.

Authors: Qi Chen, Ruqian Miao, Guannan Geng, Manish Shrivastava, Xu Dao, Bingye Xu, Jiaqi Sun, Xian Zhang, Mingyuan Liu, Guigang Tang, Qian Tang, Hanwen Hu, Ru-Jin Huang, Hao Wang, Yan Zheng, Yue Qin, Song Guo, Min Hu, Tong Zhu

Full Source: Nature communications 2024 May 25;15(1):4465. doi: 10.1038/s41467-024-48902-0.

A review on micro- and nanoplastics in humans: Implication for their translocation of barriers and potential health effects

2024-05-23

As emerging contaminants, micro- and nanoplastics (MNPs) can absorb and leach various toxic chemicals and ultimately endanger the health of the ecological environment and humans. With extensive research on MNPs, knowledge about MNPs in humans, especially their translocation of barriers and potential health effects, is of utmost importance. In this review, we collected literature published from 2000 to 2023, focusing on MNPs on their occurrence in humans, penetrating characteristics in the placental, blood-brain, and blood-testis barriers, and exposure effects on mammalian health. The characteristics and distributions of MNPs in human samples were analyzed, and the results demonstrated that MNPs were ubiquitous in most human samples, except for kidneys and cerebrospinal fluid. In addition, the phenomenon of MNPs crossing barriers and their underlying mechanisms were discussed. We also summarized the potential factors that may affect the barrier crossing and health effects of MNPs, including characteristics of MNPs, exposure doses, administration routes, exposure durations, co-exposure to other pollutants, and genetic predisposition. Exposure to MNPs may cause cytotoxicity, neurotoxicity, and developmental and reproductive toxicity in mammals. People are encouraged to reduce their exposure to MNPs to prevent these adverse health effects. Finally, we discussed the shortcomings of current research on MNPs in humans, providing a valuable reference for understanding

As emerging contaminants, micro- and nanoplastics (MNPs) can absorb and leach various toxic chemicals and ultimately endanger the health of the ecological environment and humans.

and evaluating the potential health risks from MNP exposure in mammals, including humans.
Authors: Cui-Lan Bai, Dan Wang, Yu-Ling Luan, Si-Nan Huang, Liang-Ying Liu, Ying Guo
Full Source: Chemosphere 2024 May 23:142424. doi: 10.1016/j.chemosphere.2024.142424.

ENVIRONMENTAL RESEARCH

Evaluation of Germicidal Ultraviolet-C disinfection in a Real-World Outpatient Healthcare Environment

2024-05-23
Background: The COVID-19 pandemic has highlighted the need for effective infection control in outpatient healthcare settings. Germicidal Ultraviolet-C (GUV) light, known for inactivating microorganisms by damaging their DNA or RNA, offers a potential solution. This study examines the efficacy of GUV air disinfection systems in real-world outpatient environments.
Methods: We deployed upper-room and far-UV GUV fixtures in three outpatient facilities, assessing their impact on bacterial loads through air and surface sampling and bioindicator tests. Occupancy was also monitored.
Results: While manual air and surface sampling did not show a significant difference in bacterial loads between control and UV-C-treated groups, bioindicator tests demonstrated a high level of spore inactivation (up to 99.7% for upper-room GUV and 96.26% for far-UV). Occupancy levels did not significantly influence these outcomes.
Discussion: The discrepancy between bioindicator efficacy and environmental sampling results suggests limitations in the latter's ability to accurately capture environmental bioburden. Bioindicators proved to be reliable for in-situ validation of UV-C surface disinfection.
Conclusions: Bioindicators are effective for validating GUV surface disinfection efficacy in healthcare settings, though further research is needed to optimize environmental sampling methods for assessing GUV's impact on real-world bacterial loads.

Background: The COVID-19 pandemic has highlighted the need for effective infection control in outpatient healthcare settings.

Authors: Douglas W Challener, Aaron J Tande, Carolina Koutras, Richard L Wade, Maggie A McIntee, David M Strauss, Xiaoxi Yao, Yu-Hui Chang, Elie Berbari
Full Source: American journal of infection control 2024 May 23:S0196-6553(24)00528-5. doi: 10.1016/j.ajic.2024.05.014.

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Bioaccumulation of polycyclic aromatic hydrocarbons and their human health risks depend on the characteristics of microplastics in marine organisms of Sanggou Bay, China

2024-05-14
Microplastics pose a threat to marine environments through their physical presence and as vectors of chemical pollutants. However, the impact of microplastics on the accumulation and human health risk of chemical pollutants in marine organisms remains largely unknown. In this study, we investigated the microplastics and polycyclic aromatic hydrocarbons (PAHs) pollution in marine organisms from Sanggou Bay and analyzed their correlations. Results showed that microplastic and PAHs concentration ranged from 1.23 ± 0.23 to 5.77 ± 1.10 items/g, from 6.98 ± 0.45 to 15.07 ± 1.25 μg/kg, respectively. The microplastic abundance, particularly of fibers, transparent and color plastic debris, correlates strongly with PAH contents, indicating that microplastics increase the bioaccumulation of PAHs and microplastics with these characteristics have a significant vector effect on PAHs. Although consuming seafood from Sanggou Bay induce no carcinogenic risk from PAHs, the presence of microplastics in organisms can significantly increases incremental lifetime cancer risk of PAHs. Thus, microplastics can serve as transport vectors for PAHs with implications for the potential health risks to human through consumption. This study provides new insight into the risks of microplastics in marine environments.

Microplastics pose a threat to marine environments through their physical presence and as vectors of chemical pollutants.

Authors: Qi Sui, Xiaobin Yang, Xuemei Sun, Lin Zhu, Xinguo Zhao, Zhihua Feng, Bin Xia, Keming Qu
Full Source: Journal of hazardous materials 2024 May 14:473:134622. doi: 10.1016/j.jhazmat.2024.134622.

PHARMACEUTICAL/TOXICOLOGY

Sensitization to Food and Aero-Allergens in Children with Coeliac Disease Assessed with the Use of a Multiplex Molecular Diagnostic Technique

2024-05-19
(1) Background. Coeliac disease (CD) often co-occurs with autoimmune conditions or genetic syndromes, but there are few studies on the co-existence of CD and immunoglobulin E (IgE)-mediated allergies. The purpose of this study was to assess sensitization to food and aero-allergens in pediatric patients with CD. (2) Methods. A multiplex ALEX®2 test was used to determine specific IgEs (sIgEs). (3) Results. The study

included 108 children newly diagnosed with CD. Allergen extract- and/or allergen molecule-sIgEs were detected in 49.1% of children. Most children (41.5%) were sensitized to both inhalant and food allergens. The three most common aero-allergens (timothy pollen, ryegrass, silver birch) were molecules Phl p 1, Lol p 1, and Bet v 1. The most common food allergens (hazelnut, apple, and peanut) were Cor a 1, Mal d 1, and Ara h 8 molecules of the PR-10 subfamily. Patients were not sensitized to cereal allergens containing gluten. Spearman's rank correlation analysis of sensitized patients showed a significant positive relationship (r = 0.31) between the patients' age and the occurrence of positive sIgEs (≥0.3 kUA/L) for inhalant allergen molecules (p = 0.045). In sensitized patients, mainly symptoms of inhalant allergy were observed, such as hay fever, conjunctivitis, and bronchial asthma. (4) Conclusions. The current study indicates the co-occurrence of IgE sensitization to food and inhalant allergens in children with CD. The study highlights the need to take a closer look at the diagnosis of IgE-mediated allergy in patients with CD, which may help in their care and lead to a better understanding of the relationship between CD and IgE-mediated allergy.

Authors: Izabela Knyziak-Mędrzycka, Bożena Cukrowska, Wojciech Nazar, Joanna Beata Bierła, Kamil Janeczek, Paulina Krawiec, Weronika Gromek, Mariusz Wysokiński, Ewa Konopka, Ilona Trojanowska, Sylwia Smolińska, Emilia Majsiak

Full Source: Journal of clinical medicine 2024 May 19;13(10):2992. doi: 10.3390/jcm13102992.

Development and Evaluation of a Novel Antibacterial Wound Dressing: A Powder Preparation Based on Cross-Linked Pullulan with Polyhexamethylene Biguanide for Hydrogel-Transition in Advanced Wound Management and Infection Control

2024-05-10

As antibiotic resistance increasingly undermines traditional infection management strategies, there is a critical demand for innovative wound care solutions that address these emerging challenges. This study introduces a novel antibacterial wound dressing based on Cross-Linked Pullulan (Pul) and Polyhexamethylene Biguanide (PHMB) for enhanced wound management and infection control. The dressing's adsorption rate reached 200% of its original weight within 30 min, exceeded 300% after 5 h, and exhibited significant non-Newtonian fluid properties. The dressings were able to release the loaded medication completely within

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20 min; additionally, the dressing demonstrated significant antibacterial activity against a broad spectrum of bacteria. Significantly, the therapeutic effects of the Pul-PHMB/GP dressing were evaluated in a mouse model. Compared to untreated wounds, wounds treated with Pul-PHMB/GP exhibited a significant gelation process within 5 min post-treatment and showed a significant increase in wound healing rate within 12 days. This powder preparation overcomes the limitations associated with liquid and gel dressings, notably in storage and precise application, preventing the premature expansion or dissolution often caused by PHMB in high-humidity environments. The powder form can transform into a gel upon contact with wound exudate, ensuring accurate coverage of irregular wounds, such as those from burns or pressure sores, and offers excellent chemical and physical stability in a dry state, which facilitates storage and transport. This makes the dressing particularly suitable for emergency medical care and precision therapy, significantly improving the efficiency and adaptability of wound treatment and providing robust support for clinical treatments and emergency responses.

Authors: Jiangtao Su, Wantao Yu, Xiaoxia Guo, Chaofan Wang, Qianqiu Wang, Ban Chen, Yuchen Hu, Heshuang Dai

Full Source: Polymers 2024 May 10;16(10):1352. doi: 10.3390/polym16101352.

Bloodstream Infection Caused by Erysipelothrix rhusiopathiae in an Immunocompetent Patient

2024-05-07

Erysipelothrix rhusiopathiae is a facultative anaerobe Gram-positive bacillus, which is considered a zoonotic pathogen. E. rhusiopathiae causes erysipeloid, mainly in occupational groups such as veterinarians, slaughterhouse workers, farmers, and fishermen. Two cutaneous forms (localised and generalised) and a septicaemic form have been described. Here, we report the isolation of a strain of E. rhusiopathiae from a 56-year-old immunocompetent obese male admitted to Fondazione IRCCS Policlinico San Matteo Pavia (Italy). Blood cultures were collected and Gram-positive bacilli were observed. E. rhusiopathiae grew and was identified. Antimicrobial susceptibility tests were performed and interpreted with EUCAST breakpoints (PK-PD). The strain was susceptible to all the antibiotics tested, while it was intrinsically resistant to vancomycin. The clinical diagnosis of E. rhusiopathiae can be challenging, due to the broad spectrum of symptoms and potential side effects, including serious systemic infections such as heart diseases. In the case described, bacteraemia caused by E. rhusiopathiae was detected in a

Erysipelothrix rhusiopathiae is a facultative anaerobe Gram-positive bacillus, which is considered a zoonotic pathogen.

immunocompetent patient. Bacteraemia caused by E. rhusiopathiae is rare in immunocompetent people and blood cultures were proven to be essential for the diagnosis and underdiagnosis of this pathogen, which is possible due to its resemblance to other clinical manifestations.
Authors: Irene Mileto, Cristina Merla, Marta Corbella, Stefano Gaiarsa, Angela Kuka, Stefania Ghilotti, Pasquale De Cata, Fausto Baldanti, Patrizia Cambieri
Full Source: Microorganisms 2024 May 7;12(5):942. doi: 10.3390/microorganisms12050942.

OCCUPATIONAL

Glyphosate contamination of drinking water and the occurrence of oxidative stress: exposure assessment to rural Brazilian populations

2024-05-23
Studies reported that continuous application of glyphosate can cause disturbance in aquatic/terrestrial environments. As such, the objective of this study is to discuss the risk of exposure to the herbicide in drinking water and to assess the oxidative stress in the consumers rural populations of Casimiro de Abreu/ RJ and Paraguaçu/ MG, Brazil. For this, water samples (n=69) were analysed from the home of volunteers, by FMOC derivatizing- LC-FLD method. The oxidative stress was analysed determining lipid peroxidation (MAD) and defense enzymes (SOD and CAT) in serum samples from rural population (n=42) compared to urban residents (n= 42). Results of the analysis from drinking water, despite the low and moderate risk, by the hazard quotient (HQ), revealed that the population is environmentally exposed to the glyphosate. The relevant findings showed that is important to implement monitoring/ biomonitoring programs to prevent pollution and toxic effects in rural populations.
Authors: Rafaella Ferreira Nascimento Nunes, Luiz Paulo De Aguiar Marciano, Geovana Sousa Oliveira, Naiane Silva Cardoso, Fernanda Borges De Araújo Paula, Marcia Sarpa De Campos Melo, Isarita Martins
Full Source: Environmental toxicology and pharmacology 2024 May 23:104476. doi: 10.1016/j.etap.2024.104476.

Studies reported that continuous application of glyphosate can cause disturbance in aquatic/terrestrial environments.

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Occupational exposure, carcinogenic and non-carcinogenic risk assessment of formaldehyde in the pathology labs of hospitals in Iran

2024-05-25
Formaldehyde, a known carcinogenic compound, is commonly used in various medical settings. The objective of this study was to assess the carcinogenic and non-carcinogenic risks associated with occupational exposure to formaldehyde. This study was conducted in the pathology labs of four hospitals in Tehran. Cancer and non-cancer risks were evaluated using the quantitative risk assessment method proposed by the United States environmental protection agency (USEPA), along with its provided database known as the integrated risk information system (IRIS). Respiratory symptoms were assessed using the American thoracic society (ATS) questionnaire. The results indicated that 91.23% of exposure levels in occupational groups exceed the NIOSH standard of 0.016 ppm. Regarding carcinogenic risk, 41.03% of all the studied subjects were in the definite carcinogenic risk range (LCR > 10-4), 23.08% were in the possible carcinogenic risk range (10-5 < LCR < 10-4), and 35.90% were in the negligible risk range (LCR < 10-6). The highest index of occupational carcinogenesis was observed in the group of lab technicians with a risk number of 3.7 × 10-4, followed by pathologists with a risk number of 1.7 × 10-4. Furthermore, 23.08% of the studied subjects were within the permitted health risk range (HQ < 1.0), while 76.92% were within the unhealthy risk range (HQ > 1.0). Overall, the findings revealed significantly higher carcinogenic and non-carcinogenic risks among lab technicians and pathologists. Therefore, it is imperative to implement control measures across various hospital departments to mitigate occupational formaldehyde exposure levels proactively. These findings can be valuable for policymakers in the health sector, aiding in the elimination or reduction of airborne formaldehyde exposure in work environments.
Authors: Parvin Foroughi, Farideh Golbabaei, Mohsen Sadeghi-Yarandi, Mehdi Yaseri, Mahta Fooladi, Saba Kalantary
Full Source: Scientific reports 2024 May 25;14(1):12006. doi: 10.1038/s41598-024-62133-9.

Formaldehyde, a known carcinogenic compound, is commonly used in various medical settings.