**Title:**

*Adverse Health Effects Associated with Aflatoxin Hazard*

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**Abstract**

This article observes the adverse health effects associated with aflatoxin hazards, focusing on their impact on human health. Aflatoxins are toxic metabolites produced by certain molds that commonly contaminate food crops, particularly in warm and humid regions. The article highlights the numerous adverse health effects caused by aflatoxin exposure, including hepatotoxicity, carcinogenicity, immunosuppression, and growth impairment. Additionally, precautionary measures and strategies to alleviate aflatoxin contamination are discussed.

**Introduction**

According to (Saha Turna et al., 2023), “Aflatoxins are mycotoxins, or fungal toxins, produced primarily by the fungi *Aspergillus flavus* and *A. parasiticus*”(p. 1).

Aflatoxins are highly potent mycotoxins produced by Aspergillus species, primarily Aspergillus flavus and Aspergillus parasiticus. These molds frequently contaminate various agricultural commodities, including grains, nuts, and spices, under specific conditions of temperature and humidity. Aflatoxin exposure poses significant health risks to both humans and animals, with the liver being the primary target organ (Saha Turna et al., 2023).

Four major types of aflatoxins are found in a variety of food crops: aflatoxin B1 (AFB1), aflatoxin B2 (AFB2), aflatoxin G1 (AFG1) and afla­toxin G2 (AFG2) (Saha Turna et al., 2023). AFB1 is the most lethal derivative, and the form usually found in food. Its hydroxylated metab­olite aflatoxin M1 (AFM1) can be found in milk and other dairy products from dairy animals that have consumed AFB1-contaminated feed. Therefore, the spread of aflatoxin from mothers to newborns can happen throughbreast milk, as well as dairy goods (Saha Turna and Wu, 2023).

**Hepatotoxicity**: Aflatoxins are well-known for their strong hepatotoxic effects. Upon absorption, these contaminants are metabolized by the liver, leading to the development of reactive intermediates that can bind to cellular macromolecules and disrupt normal cellular function. Chronic exposure to aflatoxins has been linked to liver damage, including hepatocyte necrosis, fibrosis, and cirrhosis. Hepatocellular carcinoma (HCC), one of the most common types of liver cancer, is strongly associated with long-term aflatoxin exposure.

Aflatoxin toxicity may result in nausea, vomiting, abdominal pain, convulsions, and other signs of acute liver injury. Long-term exposure also leads to various complications like growth retardation, cirrhosis, and hepatocellular carcinoma (McMillan et al., 2018).

**Carcinogenicity**: Aflatoxins are classified as Group 1 carcinogens by the International Agency for Research on Cancer (IARC), indicating that they are carcinogenic to humans.

(Adler et al. 2008a) says “Substances are defined as carcinogenic if after inhalation, ingestion, dermal application or injection they induce (malignant) tumours, increase their incidence or malignancy, or shorten the time of tumour occurrence”.

“As aflatoxin is a genotoxic carcinogen, and regulations concerning its pres­ence in food have largely focused on its carcinogenic effects” (Saha Turna et al., 2023).

The formation of DNA adducts through aflatoxin metabolism is a key mechanism behind their carcinogenicity. These adducts can lead to mutations and genetic alterations, contributing to the initiation and progression of various cancers, including liver, lung, and gastrointestinal cancers (Adler et al., 2008a).

**Immunosuppression**:

By definition, “Immunosuppression is a state of temporary or permanent dysfunction of the immune response resulting from insults to the immune system and leading to increased susceptibility to disease” (Dohms and Saif, 1984).

Aflatoxin exposure can impair the immune system's function, rendering individuals more vulnerable to infections. The toxins can suppress immune responses by affecting lymphocyte proliferation, antibody production, and cytokine regulation (Dohms and Saif, 1984). As a result, aflatoxin-exposed individuals may experience increased vulnerability to infectious diseases and reduced efficacy of vaccinations.

**Growth Impairment:** Aflatoxin exposure is particularly unfavorable to children's growth and development. Chronic ingestion of contaminated foods can lead to stunted growth, malnutrition, and cognitive impairments (Mapunga et al., 2017). Aflatoxins interfere with nutrient absorption and utilization, exacerbating the negative impact on overall health and well-being.

**Preventive Measures and Mitigation Strategies:** Several strategies can be employed to reduce aflatoxin contamination in food and feed. These include proper agricultural practices, such as crop rotation, adequate drying, and storage facilities, as well as the use of biological control agents to suppress mold growth. Post-harvest interventions, such as sorting and aflatoxin testing, can help identify and discard contaminated products. Additionally, advancements in biotechnology hold promise for developing aflatoxin-resistant crop varieties (Joutsjoki and Korhonen, 2021).

**Conclusion**: Aflatoxins pose weighty adverse health effects, ranging from hepatotoxicity and carcinogenicity to immunosuppression and growth impairment. These mycotoxins remain a global concern, particularly in regions where climatic conditions are conducive to mold growth. Implementing preventive measures and effective mitigation strategies is crucial to reducing the impact of aflatoxin hazards on human health. Continued research, education, and collaboration are essential to safeguarding public health and ensuring the safety of the food supply chain.

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