Mycotoxins and its impact on human populations

Introduction

Food spoilage due to microorganism’s especially fungal contamination can be accompanied by the production of toxic secondary metabolites which may result in medical problems. Mycotoxins are secondary metabolites and structurally diverse group of mostly small molecular weight compounds produced by different molds or fungi that have shown serious effects on humans, animals, and crops. Not all toxins produced by molds are called Mycotoxins. The contamination of food materials with molds and mycotoxins is a major concern worldwide. Mycotoxins are toxic to human beings and other animals even in very low concentrations. Mostly, mycotoxins occur more frequently in areas with a hot and humid climate that favors the growth of molds in the substrate. But they can also be found in temperate as well as other climatic conditions. Many molds are capable of producing more than one type of mycotoxin. Some mycotoxins are produced by more than one species. Generally, more than one mycotoxin is found on a contaminated food substrate.

Exposure to mycotoxins is mostly by ingestion, but also may occur through dermal and inhalation routes (fungal bioaerosols). Some fungal species produce mycotoxins in their spores or in mycelium. The diseases caused by exposure to mycotoxins are known as mycotoxicoses. However, mycotoxics often remain unrecognized by medical professionals. Mycotoxins such as Aflatoxin B₁ (AFB₁), fumonisin B₁, B₂ (FB₁) & ochratoxin A (OTA) which are toxic to mammals causing one of the most toxic effects on them leading to hepatotoxicity, mutagenicity, teratogenicity resulting in diseases like hepatitis, oedema, haemorrhage, oesophageal cancer & kidney failure. The presence of fungal propagules, volatiles and mycotoxins in the air can cause a health hazard in all segments of the population. The diseases caused by exposure to mycotoxins are known as mycotoxicoses. However, mycotoxics often remain unrecognized by medical professionals. Mycotoxins such as Aflatoxin B₁ (AFB₁), fumonisin B₁, B₂ (FB₁) & ochratoxin A (OTA) which are toxic to mammals causing one of the most toxic effects on them leading to hepatotoxicity, mutagenicity, teratogenicity resulting in diseases like hepatitis, oedema, haemorrhage, oesophageal cancer & kidney failure. The presence of fungal propagules, volatiles and mycotoxins in the air can cause a health hazard in all segments of the population.

The reason for the production of mycotoxins is still unknown but studies have said that they are not necessary for the growth. As mycotoxins weaken the receiving host, the fungus uses them as a source to better the environment for further fungal proliferation. Mycotoxin enhances the production of oxygen free–radicals & inhibits protein synthesis by competition with phenylalanine its structural analogue. Aspergillus, Penicillium & Fusarium are common fungal species producing mycotoxin which are frequently occurred in major food crops in agricultural field & contaminate during transportation and storage. Study reports of outbreaks mycotoxicoses disease in animals, causing gastrointestinal lesions, distension and haemorrhage in the stomach and small intestine.

All these compounds cause some degree of acute toxicity when given in high amounts. Over 40 species of Aspergillus have been listed as capable of producing toxic metabolites. Aspergillus mycotoxins of greatest significance in foods and feeds are aflatoxins which were known to produce by Aspergillus flavus, Aspergillus parasiticus A. fumigatus. The reasons for the lack of action to handle the problem of mycotoxins have different angles in the developing countries like India. However, a number of factors can be identified viz. lack of knowledge, severity of the mycotoxin problems and health effects, hygienic storage and handling of the food materials etc. Because of its widespread human exposure to high levels and its carcinogenic properties the World Health Organization has started to respond and highlight the need for action.

In many developing and underdeveloped countries mycotoxins affect staple foods, including groundnuts (peanuts), maize (corn), other...
cereals and nuts, such that exposure is continuous and often at high levels. Surveillance studies showed that worldwide contamination of cereal grains and other feeds with Fusarium mycotoxins. Mycotoxins contaminate the diet of a large proportion of the world’s population due to lack of proper handling and storage facilities and hot and humid conditions which favors the growth of fungi in food materials. Mostly the problems of mycotoxicoses described are a consequence of the ingestion of food contaminated with mycotoxins. The strict control of food quality, modern processing and storage facilities, legislation in both industrialized, developing and underdeveloped countries, is therefore necessary to avoid such outbreaks.

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**Conflict of interest**

The author declares no conflict of interest.

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