

## Editorial

# Mycotoxins in Animal Feed, Hazardous to Both Animals and Human Health

ZuhairBani Ismail\*, Ehab Abu Basha, Farah Al-Nabulsi

Jordan University of Science and Technology, Jordan

**\*Corresponding author**

ZuhairBani Ismail, Department of Veterinary Clinical Sciences, Faculty of Veterinary Medicine, Jordan University of Science and Technology, Irbid 22110, Jordan, Tel.: 00962796654331; E-Mail: zuhair72@just.edu.jo

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**Abstract**

Mycotoxins are toxic substances that are produced by several species of fungi when environmental conditions are favorable. Mycotoxins are associated with several ill health syndromes in both animals and humans. Prevention and control are difficult, but represent an indication of best management practices.

**Keywords**

- Mycotoxins
- Animal feed
- Milk
- Animal health
- Human health

**EDITORIAL**

Mycotoxins are toxic natural byproducts that are produced by many species of filamentous fungi belonging to the phylum Ascomycota [1]. There are over 300 different types of mycotoxins that were identified [1]. The most important fungus species that are responsible for most of the mycotoxins in nature are *Aspergillus*, *Fusarium*, and *Penicillium* [2]. *Aspergillus* and *Penicillium* grow and produce toxins in stored feed. Other fungi such as *Fusarium* species grow and propagate on growing plants such as wheat, barley and corn [3]. Table 1 shows the most important mycotoxins that are frequently associated with adverse health effects in both animals and humans. In general, aflatoxins (AF), ochratoxins (OT), fumonisins, patulin, zearalenone (ZEA), and trichothecenes including deoxynivalenol (DON) and T-2 toxin are most frequently found in animal feedstuff [4,5]. Many factors contribute to the production of these mycotoxins in feedstuffs including storage, environmental, and ecological conditions [6].

Despite many control strategies, contamination of human and animal food and feed with mycotoxins is still considered a global health threat [1]. Mycotoxins in food pose a significant health effects in both humans and animals, and may cause substantial economic losses due to trade restrictions and discarded food and feedstuffs [7,8].

Aflatoxin is considered one of the most potent mycotoxin that may result in huge annual economic losses [9-12]. In the USA, it is estimated that more than US \$52.1 million are lost annually due to aflatoxin contamination [11]. Aflatoxins are chemically classified as difurocoumarolactones. Aflatoxins are produced by *Aspergillus flavus*, *Aspergillus parasiticus*, *Aspergillus nomius* and *Aspergillus pseudotamarii* via polyketide pathway [13]. There are 4 main subtypes of aflatoxins found in feedstuffs: B1, B2, G1 and G2. In human beings, only aflatoxin and fumonisins are considered important health hazards because of their carcinogenic effects [14]. Aflatoxins have been associated with

hepatic cancer and immune suppression particularly in people with chronic hepatitis B virus infection [14]. In addition, acute aflatoxicosis has been associated with early life child growth retardation [14].

All ages of animals are susceptible to the effects of aflatoxins, however, clinical symptoms vary according to the age and species of the animal, dose, exposure period, and nutritional status [1]. Aflatoxins are known to produce hepatic damage, gastrointestinal disorders, inconsistent feed utilization and decreased feed efficiency, decreased production, efficiency, reproductive failure including embryonic death and teratogenicity, cancer formation and depressed immune system [1].

In dairy cattle, exposure to aflatoxins for prolonged periods in contaminated corn (120 ppb) was associated with severe herd health problems, premature birth of small and weak calves, diarrhea, acute mastitis, poor quality of milk, respiratory disorders, prolapsed rectum, hair loss and reduced feed consumption [15].

Ochratoxins are metabolites produced by *Aspergillus* and *Penicillium* species [16]. Ochratoxin A is the most toxic metabolite of this group. Ochratoxin A was found teratogenic in rats, hamsters and chick embryos [13]. It was also found to inhibit hepatic mitochondrial transport systems [13]. In addition, ochratoxin A is considered nephrotoxic and may cause hepatic, gastrointestinal, lymphoid tissue and renal tubular damage [16].

Zearalenone is a non-steroidal estrogenic mycotoxin produced by *Fusarium graminearum* [16,17]. It was reported to interfere with ovulation, conception, implantation and fetal development [16,17]. In cattle, zearalenone has been associated with infertility, reduced milk production and hyperestrogenism [16].

Trichothecenes are mycotoxins that are produced by several species of fungi of the genus *Fusarium* [16]. There are 2 subtypes

of trichothecenes: group A which include T-2 toxin, HT-2 toxin and diacetoxyscirpenol (DAS) [16]. Group B includes deoxynivalenol (DON or vomitoxin), nivalenol (NIV) and Fusarenon X [16]. T-2 toxins may cause severe gastrointestinal irritation leading to serous hemorrhagic inflammation, necrosis and ulceration [16]. It also may cause hepatic, renal heart, brain damage [8]. The T-2 toxin was reported to cause immunosuppression in cows by decreasing serum immunoglobulin concentrations including IgM, IgG and IgA, and impairing neutrophil and lymphocyte functions [16]. Abortion and infertility were also associated with feeding T2 contaminated feed [16]. Mucosal ulceration in the rumen and abomasum was found also in calves consuming T-2 contaminated feed [16].

Fumonisin are a group of compounds originally isolated from *Fusarium moniliforme* [16]. There are 6 different subtypes of fumonisins (FA1, FA2, FB1, FB2, FB3 and FB) [16]. Fumonisin toxicosis in humans has been associated with oesophageal cancer and in neural tube defects [14]. In most animals, fumonisin impairs immune function, causes liver and kidney damage, decreases weight gains and increases mortality rates.

Regardless of rigorous attempts to prevent and control mycotoxin occurrence in animal and human feed, mycotoxins still represent a serious economic and health hazard in both animals and humans worldwide. Effective control of mycotoxins in feedstuffs and animal products, therefore will improve human and animal health and increase animal productivity and hence the economic returns of animal industry.

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