



International 58th Meat Industry Conference “Meat Safety and Quality: Where it goes?”

## Mycotoxin contamination of the food supply chain - Implications for One Health programme

Dragan Milicevic<sup>a,\*</sup>, Ksenija Nesic<sup>b</sup>, Sandra Jaksic<sup>c</sup>

<sup>a</sup>*Institute of Meat Hygiene and Technology, Kacanskog 13, 11040 Belgrade, Serbia*

<sup>b</sup>*Institute of Veterinary Medicine of Serbia, Auto put bb, 11070 Belgrade, Serbia*

<sup>c</sup>*Scientific Veterinary Institute Novi Sad, Rumenicki put 20, 21000 Novi Sad, Serbia*

---

### Abstract

Mycotoxins are a group of naturally occurring toxic chemical substances, produced by different fungal species, which can cause illness or even death due to their toxigenic, carcinogenic, mutagenic and teratogenic effects. Though more than 400 mycotoxins are known to have toxic effects on human when ingested along with contaminated food, mycotoxins like aflatoxins, ochratoxins, zeralenone, trichothecenes and fumonisins are the major mycotoxins influencing the public health and agriculture. Due to the global nature of the food supply and advances in analytical capabilities, mycotoxin contamination will continue to be an area of concern for regulatory agencies, the food industry, and consumers.

© 2015 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of scientific committee of The 58th International Meat Industry Conference (MeatCon2015)

*Keywords:* Mycotoxins; food supply chain; Public health

---

### 1. Mycotoxins in general

Mycotoxins are natural contaminants produced by a range of fungal species. Their common occurrence in food and feed poses a threat to the health of humans and animals. This threat is caused either by the direct contamination of agricultural commodities or by a “carry-over” of mycotoxins and their metabolites into animal tissues, milk, and

---

\* Corresponding author. Tel.: +381-11-2650-655; fax: +381-11-2651-825  
E-mail address: [dragan@inmesbgd.com](mailto:dragan@inmesbgd.com)

eggs after feeding of contaminated feedingstuffs<sup>1</sup>. The most important agro-economic and public health classes of mycotoxins are aflatoxins (AFT), ochratoxins (OTA), zeralenone (ZEA), trichothecenes, and fumonisins (FUMs) produced by species of *Fusarium*, *Penicillium* and *Aspergillus*. If these mycotoxins occur at a considerably high level in foods, they can cause toxic effects ranging from acute to chronic (mutagenic, teratogenic, carcinogenic) manifestations in humans and animals<sup>2</sup>. The economic impact of mycotoxins include loss of human and animal life, increased health care and veterinary care costs, reduced livestock production, disposal of contaminated foods and feeds, and investment in research and applications to reduce severity of the mycotoxin problem<sup>3</sup>. Due to their deleterious effects on humans and farm animals, several countries have implemented regulations prescribing mycotoxin limits in several food commodities intended for consumption. In 1993, the WHO-International Agency for Research on Cancer<sup>4,5</sup> evaluated the carcinogenic potential of AFT, OTA, TCT, ZEA, and FUMs.

### 1.1. Factor affecting production, contamination of foods and feeds by mycotoxins

Various factors operate interdependently to affect fungal colonization and/or production of the mycotoxins. D'Mello and MacDonald<sup>6</sup> categorized the factors as physical factors (moisture, relative humidity, temperature and mechanical damage), chemical factors (carbon dioxide, oxygen, composition of substrate, pesticide and fungicides), and biological factors (plant variety, stress, insects, spore load). The biological factors have been further sub-categorized into intrinsic factors, including fungal species, strain specificity, strain variation, and instability of toxigenic properties. This is in part due to the multidisciplinary nature of mycotoxin research, which involves analytical chemistry, toxicology, taxonomic mycology, hygienic measures, microbial physiology, epidemiology, and increasingly weaponry. Some molds are capable of producing more than one mycotoxin and some mycotoxins are produced by more than one fungal species. Often more than one mycotoxin is found on a contaminated substrate. Therefore, the presence of potentially toxigenic fungi does not imply the presence of mycotoxins and vice versa<sup>8</sup>.

### 1.2. Occurrence and significance of mycotoxins in foods and feeds

Mycotoxicoses in humans or animals are characterized as food or feed related, non-contagious, non-transferable, non-infectious, and non-traceable to microorganisms other than fungi. Clinical symptoms usually subside upon removal of contaminated food or feed. Mycotoxin contamination is encountered in various environments. For instance, mycotoxins have been frequently identified in grain products, coffee beans, spices and nuts. In agriculture, mycotoxins can be present mainly in livestock feed. A wide range of commodities can be contaminated with mycotoxins both pre- and post-harvest. Serbia is largely a developing agriculture-based economy, so therefore, surveillance for mycotoxins and mycotoxigenic fungi is critical for maintaining high quality of feed (Table 1) and food (Table 2)<sup>9,10,11</sup>.

#### 1.2.1. Aflatoxins

AFs are difuranocoumarin derivatives produced by a polyketide pathway by many strains of *Aspergillus flavus*, *Aspergillus parasiticus* and the rare *Aspergillus nomius*, which contaminate agricultural commodities. They have toxic, carcinogenic, mutagenic and teratogenic effects in laboratory animals. The liver is the main target organ for AF toxicity and carcinogenicity. The rate of metabolism and products formed determine differences in species susceptibility to AF. In this instance, the presumed intermediate metabolite, AFTB1 8,9-epoxide forms an adduct with DNA and consequentially disrupts the transcriptional and translational processes. Approximately 95% of AFB<sub>1</sub> metabolites excreted in milk are in the form of AFM<sub>1</sub>, though AFM<sub>2</sub>, AFG<sub>1</sub> and AFB are also reported.

#### 1.2.2. Ochratoxin

OTA is produced by fungi of the genera *Aspergillus* and *Penicillium*. The target organ for OTA is the kidneys and initial interest in this group of toxins was as a cause of porcine nephropathy. OTA has subsequently, been

Download English Version:

<https://daneshyari.com/en/article/1266317>

Download Persian Version:

<https://daneshyari.com/article/1266317>

[Daneshyari.com](https://daneshyari.com)