

THE VARIATION OF AFLATOXINE IN FEW FODDER AND FOOD PRODUCTS IN BRASOV COUNTY

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Abstract

*Aflatoxins are produced by certain strains of *Aspergillus flavus* and *Aspergillus parasiticus*. Four aflatoxins (B_1 , G_1 , B_2 , G_2), often occurring simultaneously, have been detected in foods and fodder. But the aflatoxin B_1 is the most commonly occurring type of aflatoxin and a potent cancer-causing agent. The present study's aim was to determine the aflatoxin's content variation- in the fodder and foodstuff from samples that have been harvested from farms, production units and food markets of Braşov County. The tests were developed in the Braşov D.S.V.S.A. laboratory. None of the samples presented values above the allowed present limits.*

Keywords: *aflatoxins, mycotoxins, fodder, food products.*

Introduction

Mycotoxins came to be considered a risk factor both for human and for animal health, having been proven their presence in both animal and vegetal byproducts in amounts dangerous for public health (Crivineanu, 1996).

They may be present in the fodder, as well as in foodstuff (eggs, meat, milk, grains and cereals) under certain conditions of temperature and moisture. The contamination of the alimentary products from animals or animal byproducts is usually consecutive to the animal digestive absorption of mycotoxins from the fodder (Won-Bo, 2004)

Aflatoxins are a group of highly toxic metabolites that include specific forms designated as B_1 , B_2 , G_1 , G_2 , M_1 and M_2 with little differences in chemical composition displayed in the figure 1 (FDA, 1995).

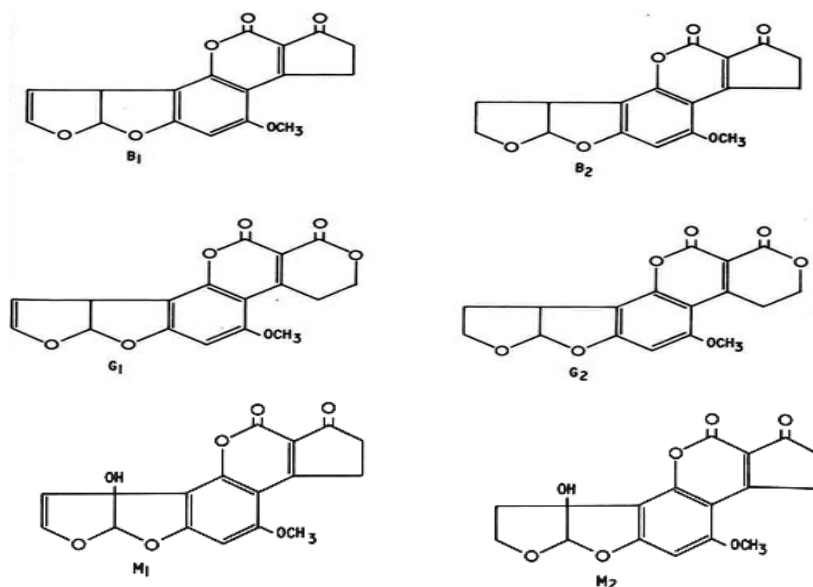


Figure 1. The structure of some aflatoxins and their metabolites

At least 13 different types of aflatoxins are produced in nature and four designed B₁, B₂, G₁ and G₂ are most common. These toxins are usually found together in various foods and feeds in various proportions: aflatoxin B₁ is usually predominant and is the most toxic, carcinogenic and is produced by both *Aspergillus flavus* and *Aspergillus parasiticus*. Aflatoxins G₁ and G₂ are produced exclusively by *Aspergillus parasiticus*. Aflatoxin M₁ - a major metabolic product of aflatoxin B₁ in animals and is usually excreted in milk and urine of dairy cattle and other mammalian species that have consumed aflatoxin – contaminated food or feed (Beasley, 1999).

The conversion in the liver of aflatoxin B₁ to aflatoxicol and other components is displayed in the figure 2.

Because of the carcinogenic properties of this mycotoxin and the concern for to human health and animals, there are EU regulations for: sampling methods; performance criteria for methods of analysis, according Directive 98/53/EC (Bauer, 2004). The maximum levels of mycotoxins in different types of products are indicating in table 1.

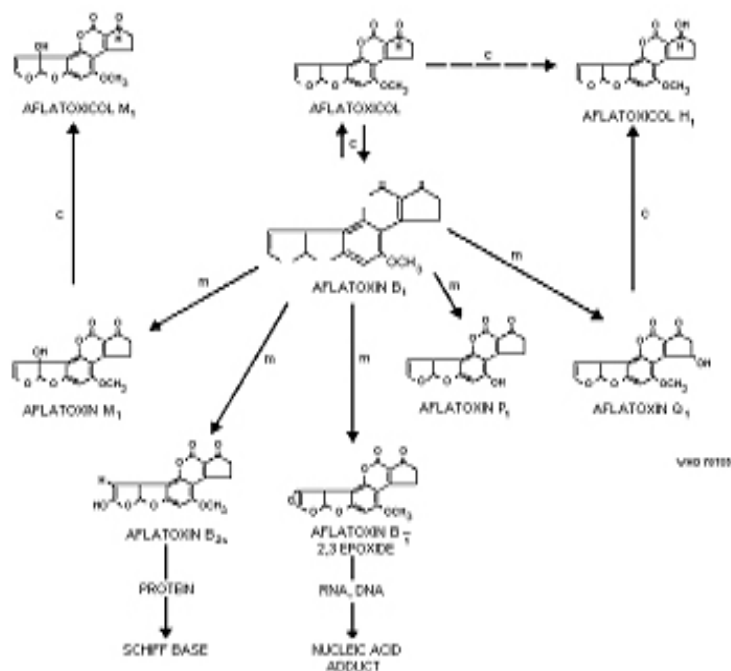


Figure 2. Aflatoxin B₁ metabolism in the liver

Table 1. The maximum level of mycotoxins in different types of products

Mycotoxin type	Level	Products	Directive EU
Aflatoxin B ₁	2.0 – 8.0 (ppb)	Cereals, ingredients in foods, ground nuts, nuts, dry fruits	466 / 2001 257 / 2002 2174 / 2003
	0.10 (ppb)	Baby foods	683 / 2004
	5 – 20 (ppb)	Types of fodders	32 / 2002 100 / 2003
Aflatoxin B ₁ +B ₂ +G ₁ +G ₂	4.0 – 15.0 (ppb)	Cereals, ingredients in foods, ground nuts, nuts, dry fruits	466 / 2001 257 / 2002 2174 / 2003
	-	Baby foods	683 / 2004

Experimental

The present report refers to the determinations made between 2005 – 2006 on samples from farms, processing units markets designated booth for animal feed and human food (meat, organs, whole milk, powder milk, cereals). We have used quantitative tests, which are based on an enzyme linked immunosorbent assay principle .The measurements have been made by photometric method an ELISA reader being used from Sanitary- Veterinary and Food Safety Direction of Brasov - Laboratory. The reading of the samples was made at 450 nm for aflatoxin B₁ and M₁ (using Immunolab GmbH or Ridascreen Aflatoxin B₁ kit), at 650 nm for aflatoxin HS (using Veratox HS kit) after the introduction in the device memory of the standard curve resulted from the aflatoxin standards. Standard values used according to the type of aflatoxin that have been used shown in table nr.2.

Table 2 . Standard values of aflatoxin

AFLATOXINE STANDARDS, ppb			
Aflatoxin B ₁		Aflatoxin HS	Aflatoxin M ₁
0	0	0	0
1	0.01	1	5
5	0.04	2	10
10	0.1	4	20
20	0.4	8	40
50	1	-	80

All reagents required for determinations had adequate quality according.

Torte accomplishment of the tests we have used up-to-date methods of investigation. Weighing of the probes has been done by means of electronic scales with a measurement accuracy of 10⁻⁴g. We have also used for the determinations class A glassware and high purity reagents similar to those for chromatography, as prescribed by the working protocol of the kit.

Results and Discussions

The study was made in the period 2005 – 2006. In 2005 the alimentary stuff represented 95 % of the tested products, while the animal feed represented only 5 %. In 2006 the alimentary stuff represented 76.67 % of the tested products, while the animal feed represented only 33.33 %.

According to the nature of sample and to the basic matrix of the kit measurements have been made for:

- aflatoxin HS in grain , peanuts and spices .
- aflatoxin B₁ in grain , fodder , alimentary products .
- aflatoxin M₁ in milk and diary products

The values for the 2005 measurements are shown in table 3.

Table 3. The values of aflatoxin obtained in alimentary products in 2005

PROUDCT NAME	MEASUREMENTS VALUES, ppb		
	Aflatoxin B ₁	Aflatoxin HS (B ₁ , B ₂ , G ₁ , G ₂)	Aflatoxin M ₁
Meat (pork, beef , mutton , poultry)	0.00 – 0.04	-	-
Organs (pork, beef , mutton , poultry)	0.00 – 0.08	-	-
Byproducts (pork , beef , poultry)	Absent	-	-
Fish (row, froze)	0.00 – 0.066	-	-
Preserves (meat, fish)	0.00 – 0.05	-	-
Honey	0.00 – 0.24	-	-
Fodder	0.00 – 0.62	0.00 – 0.86	-
Mix fodder	-	-	-
Eggs	Absent	-	-
Fresh cheese	-	-	0.00 – 0.0045
Cedar	-	-	0.00 – 0.0022
Lactic cultures	-	-	-
Row milk	-	-	0.00 - 0.0011
Powder milk	-	-	-
Spices	-	-	-
Coffee	-	-	-
Peanuts, raisins, nuts, coconut	-	Absent	-
Cereals	-	-	-

The values for the 2006 measurements are shown in table 4.

Table 4. The values of aflatoxin obtained in alimentary products in 2006

PROUDCT NAME	MEASUREMENTS VALUES, ppb		
	Aflatoxin B ₁	Aflatoxin HS (B ₁ , B ₂ , G ₁ , G ₂)	Aflatoxin M ₁
Meat (pork, beef , mutton , poultry)	0.00 – 0.03	-	-
Organs (pork, beef ,mutton , poultry)	0.00 – 0.05	-	-
Byproducts (pork, beef , poultry)	Absent	-	-
Fish (row, froze)	-	-	-
Preserves (meat, fish)	-	-	-
Honey	0.00 – 0.19	-	-
Fodder	0.00 – 0.0199	-	-
Mix fodder	0.00 – 0.0062	-	-
Eggs	Absent	-	-
Fresh cheese	-	-	0.00 – 0.003
Cedar	-	-	0.00 – 0.001
Lactic cultures	-	-	Absent
Row milk	-	-	0.00 - 0.0010
Powder milk	-	-	0.00 – 0.0020
Spices	0.00 – 2.9	-	
Coffee	0.00 – 3.1	-	
Peanuts, raisins, nuts, coconut	0.00 – 0.280	-	
Cereals	0.00 – 1.0	0.00 – 1.9	

The results following measurements show that values obtained on aflatoxin B₁ in meat, organs and meat byproducts from pork, beef, mutton and poultry are variable between 0.00 – 0.08 ppb, the highest value having been found in swine kidney in 2005. In the honey samples to be tested, the highest values of aflatoxin B₁ determined in 2005 also, was 0.24 ppb.

A remarkable fact is that in lactic cultures the aflatoxin M₁ is absent, proving that lactic cultures have been obtained under maximum - security conditions by using specific strains which then will be used in the production of fermented stuff (food). Diary products have a relative low level of aflatoxin, the highest level having been as low as 0.0045 ppb in 2005. Likewise, concerning the fodder and cereals the

measurements have shown values varying between 1 ppb for aflatoxin B₁ in 2006 and between 0.06 for aflatoxin HS in 2005.

In all those cases the obtained values range are in the maximum allowed limits of the present legislation:

- ANSVSA Ordinance 97 / 2005 for alimentary products
- MAAPA and MS Ordinance 249 / 2003 for fodder

Conclusions

The present study reveals the fact following a well-established supervision and control program; none of the samples that have been tested (fodder and alimentary products) had been above the maximum allowed level. Observing the impact of micotoxins over the human and animal health, the obtained values in the present study proved that the above products are not a hazard for human and animal health. The best protection against mycotoxins is monitoring for their presence in feed and foods, testing all along the pathway from initial harvest of grains to the finished product.

Acknowledgements

We would like to thank very much for the financial support from Excellence Research Project for Young Researchers cod 163, no. 5898/2006 *Detection of some toxic compounds from water, food and biological samples, using enzymatic, chromatographic and spectral methods.*

References

- Bauer, J. (2004). Are mycotoxins in food a health hazard? *Dtsch Tierarztl Wochenschr*, 111(8), 307-12.
- Beasley, V. (1999). *Veterinary Toxicology. Mycotoxins that affect the liver*, International Veterinary Information Service, Ithaca NY, A 2628.0899.
- Crivineanu, V., Rapeanu, C.M., Crivineanu, M. (1996). *Toxicologie Sanitar Veterinara*, Ed. Coral Sanivet Bucuresti

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Food and Drug Administration, (1995). Sec. 555.400 *Foods—adulteration with aflatoxin*. http://www.fda.gov/ora/Compliance_ref/cpg/cpgfod/cpg555-400.htm

Shim, W.B., Yu, A., Yoon-Jung, K., Zheng-You, Y., Seon-Ja, P., Sergei, A. (2004). Fluorescence polarization immunoassay based on a monoclonal antibody for the detection of ochratoxin A. *International Journal of Food Science and Technology*, 39, 829-837.