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The mycotoxins in foods from livestock origin and consumption risks

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Abstract

During daily life, foodstuffs destined for animal are contaminated at different scales, by their mold, spores and their mycotoxins. The dangerous mycotoxins are; aflatoxin, okra toxins, zearalenons, T-2 toxin, fumonisins. These mycotoxins passing from livestock, through their products like milk and milk products. When the food of livestock has not airing humidity, begins mold to grow and they emit mycotoxins. Aim of study: Identification of aflatoxin in the products from animal origin. The damages they cause and awareness of local institutions and consumers. Sampling the unpasteurized milk and their products like cheese, yogurt, butter were taken and were treated with immunological methods like ELISA test. Where is defined the amount of aflatoxin. Are also obtained samples of livestock food for aflatoxin identification. Identification of aflatoxin in animal feeding is done in two periods, from February to April and in the second phase from September to October 2013. According to the results in some food samples we foundaflatoxin 25.30 µg/kg, which is higher than the rate that is allowed 20µg/kg. While the the average contaminated concetrate is 6 times over average. Whereas at samples taken in maize contamination by mycotoxins is 7 times higher than permissible norms.

Keywords. Food, aflatoxins, livestock, milk

Introduction

Food for animal purpose frequently is contaminated with *Aspergillus flavus* or *Aspergillus parasiticus* during storage [3, 6], but there is evidence that infestation of grain may also occur prior to harvest. Environmental conditions conducive to *Aspergillus* moulds are presented at daytime temperatures of about 25°C - 40°C, while toxin production is enforced at temperatures ranging from 20°C to 30°C. That is why aflatoxins usually are declared *imported toxins* within Central European countries faced to moderate climatic conditions. According to their growing regions, mainly pistachios, peanuts, hazelnuts, Brazil nuts, almonds, rice, sorghum, dried fruit and spices are agricultural commodities high at risk [7]. The frequent occurrence of aflatoxins in oil seeds and grain, especially in maize, not only poses a direct hazard to human consumption, but is also closely connected to the occurrence of aflatoxins in milk and edible animal tissues (See Figure 1) [9]. The aflatoxin has been derived from *Aspergillus flavus*, the fungi species it was first detected [1]. Afla toxin variants are named according to their blue or green fluorescence behaviour in thin layer chromatography and their natural occurrence in milk (B1, B2, G1, G2, M1, M2) [10]. Toxic health effects might either be acute or chronic, predominantly influenced by the dose of exposure. Apart from aflatoxicosis in humans, cattle, are the farm animals that are primarily affected. AFB1 causes severe liver damages including hemorrhagic necrosis, fatty infiltration and bile duct proliferation [8]. Although a 10-fold variation in species`susceptibility to the acute effects of AFB1 is documented, any species can be considered as totally resistant [10]. Apart from carcinogenic properties, aflatoxins are both mutagenic and teratogenic. Tumours due to aflatoxins can mainly be found in the liver, forming hepatocellular carcinoma, but may also occur in other organs [9]. Epidemiological data support the hypothesis that, besides Hepatitis A viral infection, dietary AFB poses an important risk co-factor for human hepatocellular carcinoma. According to European legislation, it is illegal action, production and sale of grass or concentrates with high levels of more than 20 ppb of aflatoxin, for the milk cows, grass, etc. Apart from non-developed countries, serious contamination occurred in North America, where concentrations up to 2900 mg·kg–1 grains were reported in 1999. Due to its fungal sources, ZEA is often combined with trichothecenes [11]. Contaminated foodstuffs involve grapes, wine, wine fruits, cereals, coffee, cocoa, edible nuts, pulses, beer and spices. Secretion toxicokinetics are linearly dependent on the toxin intake while the toxin clearance is usually finished three days after withdrawal of the contaminated diet. Differences in

species' susceptibility are due to variations in number and affinity of oestrogen receptors. Pigs and sheep are considered to be high susceptible species.

Aim of study; During the first part of year 2013, in Kosovo was imported a lot of corn from Serbia dedicated for food of livestock. Most of them was suspected to be contaminated with *Aflatoxin*

Having in mind that *aflatoxin* is cancerogen, was taken some steps on monitoring the food for livestock feeding and monitoring of milk and products of milk, like cheese, yogurt, etc.

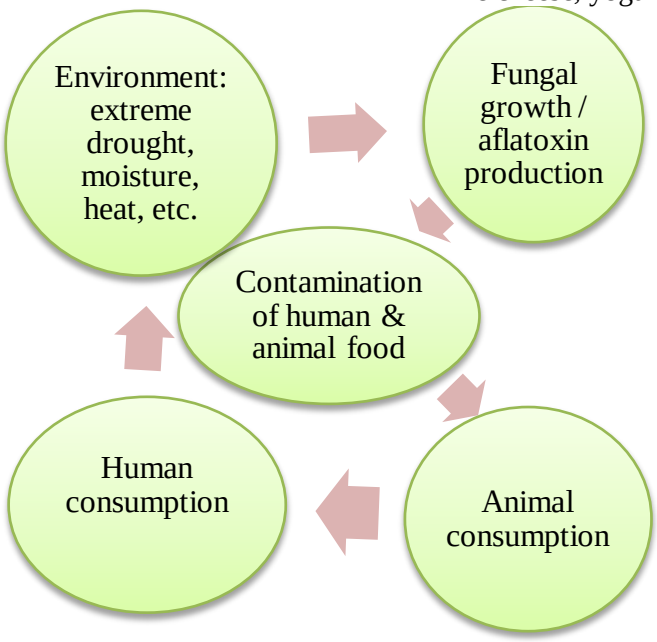

Figure 1 Aflatoxin; human, animal and environment interaction

Material and Methods

In two periods we collected samples from contaminated foodstuf and from row milk (Fig. 2) before thermic preparation. The first period was 20 February - 20 April 2013 and the second period was 10 October -10 November 2013.

We got samples from different milk processing factory.

- 10 samples of raw milk;
- 10 samples of fresh milk
- 10 samples from milk products
- 10 samples of milk and their products from import, and
- 50 samples of livestock food

Figure 2. The sampling of milk on milkweeds.

The method for detection of aflatoxin on animal products or on food of animals was used the ELISA test. The test was done in the labratory of Food and Veterinary Agency of Kosovo.

Results and Discussion

After sampling of food for animal we perform Elisa test and we compare with allowed amounts of

aflatoxin based from European Regulation, which is 20 µg/kg. Based on that we got the results shown in the table 1. We saw that the concentrate sampled on first period has high amount of aflatoxin M_1 54.2 µg/kg which is 2,5 more than is allowed (Table1). The same results we got also on corn, where the level of aflatoxin is 3 time more as is allowed byEC regulation. Afte analysis we stress the question why was on corn and concentrat so high. Except the not proper storage of corn under high humidity and other enviromental factors, the corn was imported fro Serbia. And most of the corn was contaminated with mycotoxins.

Table 1. Results of analysis for aflatoxin on livestock food.

Qty	*Type of Samples*	*Type of aflatoxin*	*Mean of Results*	*Methods*	*Allowed*
10	Concentrate	AF-M_1	**54.2 µg/kg**	Elisa	20,00 µg/kg
10	Corn	AF-M_1	**67.6 µg/kg**	Elisa	20,00 µg/kg
10	Soybean	AF-M_1	1,95 µg/kg	Elisa	20,00 µg/kg
10	Cornflower	AF-M_1	1.95 µg/kg	Elisa	20,00 µg/kg
10	Hime	AF-M_1	4.52 µg/kg	Elisa	20,00 µg/kg

The after analysis of food for animals we wanted to see the transmission on milk and their products. We got the level of aflatoxin higher as is allowed (Table 2). It was double 0.107 µg/kg more than normal level which is 0.05 µg/kg. After thermic preperation of milk we did not found so high level of aflatoxin. The same case os also for UHT milk, where we got very low amount of aflatoxin. As we know after thermic preparation of milk and storage on cooled space the level of aflatoxin can be lower comparing with raw milk.

Table 2. Analysis of level of aflatoxin on raw milk, fresh milk and UHT milk.

Qty	*Type of samples*	*Type of aflatoxin*	*Mean Results*	*Allowed level*	*Method*
10	Raw milk	AF-M_1	**0,107**	0.05 µg/kg	Elisa
10	Fresh Milk	AF-M_1	**0,059**	0.05 µg/kg	Elisa
10	UHT Milk	AF-M_1	0,009	0.05 µg/kg	Elisa

We also we perform analysis on products of milk like cheese, yogurt and cream, too see how much is the level of aflatoxin transmitted on this products. The test was done the same as per others and in two periods early spring and autumn. We found in our analysis that the samples taken on spring has higher level of aflatoxin as is allowed (0.05 µg/kg). On cheese we found 0.097 µg/kg aflatoxin, whereas on yogurt we found 0.72 µg/kg and on cream we found 0.099 µg/kg aflatoxin. It was expected to found some amount of aflatoxin on milk and their products, because the level of aflatoxin on livestock food was too high. Even after thermic preparation and cooled storage we found over alowed aflatoxinon products.

Table 3. Results of analysis for aflatoxin on milk products

Qty	*Samples*	*Aflatoxin*	*Mean Results µg/kg*	*Allowed level of aflatoxin*	*Methods*
10	Cheese	AF-M_1	0.097	0.05 µg/kg	Elisa
10	Yogurt	AF-M_1	0,072	0.05 µg/kg	Elisa
10	Cream	AF-M_1	0,099	0.05 µg/kg	Elisa

In the end we analyse all products on the second period on autumn. We found lower amount of aflatoxin compare with spring (Table 4). We got lower level of aflatoxin on milk and milk products because of awareness of farmers on high level of aflatoxin on imported corn and concentrate. And also during the spring and summer the farmers has fresh food for animals and not contaminated with mycotoxins. The only raw milk shows a slightly amount of aflatoxin more as is allowed. Where for other products we did not found higher level of afatoxin.

Table 4. Results of analysis for aflatoxin on milk and its product during the October 2013.

Qty	*Samples*	*Aflatoxin*	*Mean Results*	*Allowed level*	*Method*
10	Raw milk	AF-M_1	0,056 µg/kg	0.05 µg/kg	Elisa
10	Fresh Milk	AF-M_1	0,049 µg/kg	0.05 µg/kg	Elisa
10	UHT Milk	AF-M_1	0,042 µg/kg	0.05 µg/kg	Elisa
10	Cheese	AF-M_1	0,032 µg/kg	0.05 µg/kg	Elisa
10	Yogurt	AF-M_1	0,029 µg/kg	0.05 µg/kg	Elisa
10	Cream	AF-M_1	0,032 µg/kg	0.05 µg/kg	Elisa

Conlusions

Conclusion: Based on data found, livestock nutrition is a critical factor, affecting the aflatoxins residues in fresh milk and its products. And the samples taken in February-April have resulted in higher residues of aflatoxin. Based on our results the food for feeding livestock is very important, and if food is contaminated with aflatoxin, than also the products from livestock are contaminated. Mostly all animal products were contaminated, and the level of aflatoxin was over allowed level from 3 to 7 times. Etiology of aflatoxin, is mostly in imported food for livestock. The milk from animals feeder with not imported food, was not contaminated with aflatoxin. The samples analyzed on October, were not contaminated. Contamination was high on February - April, because the animals were feeded with food saved long time on Storehouse.

Recommendation; We should make a strategy and action plan based on good and well known practices and HACCP for storage of food for livestock, to reduce the level of mycotoxins on food. Implementation of all regulations, directives and other measures that can ensure safe food for people and animals. The application of good agricultural practices to reduce contamination of cereal grain in the field and warehouses. To create an comprehensive basis for mycotoxins considering the ecology of fungi, which shows the basis for the possibility of the occurrence and extent of distribution of aflatoxins.

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