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DETECTION OF AFLATOXIN M_1 IN SHE-CAMEL'S MILK IN SINAI

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Abstract

This study was carried out on 50 samples of raw camel's milk. They were randomly collected from she - camels in Sinai Governorate, Egypt. The collected samples were analyzed for detection of aflatoxin M_1. (AFM_1). The obtained data revealed that AFM_1 was detected in (16%) of examined camel's milk samples with a mean value of 0.65 ±0.008 mg/L.AFM_1 in positive samples ranging from 0.40 to 0.90 mg/L. The public health importance of aflatoxin M_1 and the control measures to safeguard the consumers from exposure to aflatoxins were discussed.

INTRODUCTION

Aflatoxins (AF) are a group of highly toxic secondary metabolic products of some *Aspergillus* spp.; they easily occur on foods during growth, harvesting or storage. Aflatoxins are carcinogenic, teratogenic and mutagenic to animals and humans. Contamination of food is a current problem (Kisza and Domagala, 1994, Piva *et al.*,1995 and Galvano *et al.*, 1996).

Mammals who ingest aflatoxin B_1(AFB_1) contaminated diets eliminate into milk amounts of the principal 4-hydroxylated metabolite known as "milk toxin" or aflatoxin M_1 (AFM_1). AFB_1 is metabolized by the hepatic microsomal mixed function oxidase system, but, it also can undergo several metabolic conversions depending on species (Masri *et al.*,1974). AFM_1 is secreted in milk of ruminants and other lactating animals within 2 days after ingestion of feed contaminated with aflatoxin B_1 with percentages varying from less than 1% to 3%, and then, disappears from milk within 3 to 4 days (Balata and Bahout, 1996). The permissible limits of AFM_1 are highly variable, depending on the degree of development and economic involvement of the countries in setting regulatory limits. So, most of the developed countries have regulated the maximum permissible limits of AFM_1 in milk and milk products . Aflatoxin M_1 appears to be associated with the protein fraction of milk and, hence, the aflatoxin is present not only in fluid milk but also in product made from contaminated milk (Applebaum *et al.*, 1982).

This study was carried out to detect the level of aflatoxin M_1 in she - camels milk collected from Sinai Governorate, Egypt because people who live in this area consume raw camel's milk without any heat treatment.

MATERIALS AND METHODS

Collection of milk samples

Fifty samples of raw she -camel's milk were collected from Sinai Governorates. They were taken in sterile bottles and transferred to the laboratory in icebox and examined as soon as possible.

Extraction and analysis of milk samples

The collected samples were extracted and analyzed for detection of aflatoxin M_1 by using Thin Layer Chromatography (TLC) according to the method recommended by A. O. A. C. (1984).

Statistical analysis

The obtained data of the examined milk samples were statistically analyzed according to Berly and Lindgren (1990).

RESULTS

Incidence and quantitative estimation of aflatoxin M_1 in examined raw camel's milk were summarized in Table 1, while, the frequency distribution of aflatoxin M_1 in contaminated she -camels milk was illustrated in Table 2. The permissible limits of aflatoxin M_1 in some countries were mentioned in table 3.

Table 1. Incidence and quantitative estimation of aflatoxin M1(mg/L) in examined she-camel's milk samples.

Number of examined samples	Positive samples		Min.	Max.	$\bar{X} \pm$ S.E
	No.	%			
50	8	16	0.4	0.9	0.65± 0.008

Min. : Minimum value.
Max. : Maximum value.
$\bar{X}$: Mean value.
± S. E.: Standard Error.

Table 2. Frequency distribution of aflatoxin M1 contamination in examined she-camel's milk.

Range µg /L	Frequency	
	No.	%
0.40 – 0.60	4	50
0.60 – 0.80	2	25
0.80 – 0.90	2	25
Total	8	100

Table 3. Permissible limits of aflatoxin M1 in milk in some countries.

Country	Permissible limits(µg /L)
Germany	0.05
Italy	0.05
Switzerland	0.05
France	0.2
FDA	0.5

(Galvano *et al.*, 1996)

DISCUSSION

Data presented in table 1 showed that, 16% of milk samples contained aflatoxin M_1 with a mean value of 0.65 ± 0.008 mg /L. The obtained results in Table 2 revealed that, 4 (50%) of positive samples ranged from 0.40 – 0.60mg /L, 2 (25%) ranged from 0.60 – 0.80mg /L and 2(25%) ranged from 0.80 to 0.90mg /L. Nearly similar findings were recorded by Saad *et al.* (1989) who found that 30% of examined camel milk samples from several sources in Abu Dhabi, United Arab Emirates (UAE) contained aflatoxin M_1 at levels ranging from 0.25 to 0.80µg /L: Balata and Bahout (1996) reported that, 25% of examined camel milk samples contained aflatoxin M_1 and ranged from 0.3 to 0.85mg /L. The obtained data in Table 2 were higher than the limits of some countries in Table 3 which were intended by Galvano *et al.* (1996), but 50% of positive examined milk samples were within the permissible limits intended by Food and Drug Administration. Variable values of aflatoxin M_1 detected in examined milk samples could be attributed to the feeding of hay and concentrates contamining aflatoxin B_1

above 10 ppb as reported by Piva *et al.* (1995). Metabolism and transmission of aflatoxin in food producing animals is a major route through which humans are exposed to aflatoxin residues (Hsieh,1983). Heat treatment of milk reduced its aflatoxin M_1 content and that the higher the temperature used, the smaller was the amount of residual aflatoxin (Applebaum *et al.*, 1982 and Aman, 1995). Human exposure to aflatoxin could occur indirectly by consumption of animal products containing aflatoxin, as aflatoxin could withstand gastric acidity (Campbell, 1990 and Abarcae *et al.*, 1994). Aflatoxin M_1 was not only secreted in milk, but also excreted in the urine and feces of animal. Therefore, aflatoxin M_1 concentration in milk depends on the effectiveness of the urinary and fecal excretion routes and the degree of activity of the dual functioning of the mammary gland as an excretory organ for both aflatoxin M_1 and milk (Abdel Fattah,1999). Generally, the real hazards of aflatoxin M_1 may be due to cumulative effect of repeated exposure to very small or even undetectable doses of aflatoxin M_1 for comparatively long periods (Hendrickse, 1991).

Finally educational programs and informations have to be directed specially to owners to learn how to keep their animal feedstuffs in a hygienic manner to avoid production of aflatoxin B_1 by toxigenic molds. More over, the bad habit that grains which are no longer suitable for human consumption and used as animal feedstuffs should be prohibited.

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تقدير الآفلاتوكسين م١ فى ألبان الجمال فى سيناء

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أجريت هذه الدراسة على خمسين عينة لبن عشوائية من ألبان الجمال المتواجدة في محافظة سيناء وقد تم تحليل هذه العينات لتقدير كمية الآفلاتوكسين م١. أظهرت النتائج أن ١٦ ٪ من هذه العينات المختبرة تحتوى على الآفلاتوكسين م١بمتوسط قدره ٠.٦٥و. ٠.٨و. ميكروجرام/لتر وقد تراوحت كمية الآفلاتوكسين م١ في العينات الإيجابية ما بين ٠.٤٠و. و ٠.٩٠و. ميكروجرام/لتر. وقد تم مناقشة الأهمية الصحية والإجراءات الواجب اتباعها لحماية المستهلك من أخطار الآفلاتوكسين م١ في ألبان إناث الجمال .