DETECTION OF AFLATOXIN M1 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 Sinal Governorate, Egypt. The collected samples were analyzed for detection of aflatoxin M1 (AFM1). The obtained data revealed that AFM1 was detected in (16%) of examined camel's milk samples with a mean value of 0.65 ±0.008 mg/L. AFM1 in positive samples ranging from 0.40 to 0.90 mg/L. The public health importance of aflatoxin M1 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 B1 (AFB1) contaminated diets eliminate into milk amounts of the principal 4-hydroxylated metabolite known as “milk toxin” or aflatoxin M1 (AFM1). AFB1 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). AFM1 is secreted in milk of ruminants and other lactating animals within 2 days after ingestion of feed contaminated with aflatoxin B1 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 AFM1 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 AFM1 in milk and milk products. Aflatoxin M1 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 M1 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 $M_1$(mg/L) in examined she-camel's milk samples.

<table>
<thead>
<tr>
<th>Number of examined samples</th>
<th>Positive samples</th>
<th>Min.</th>
<th>Max.</th>
<th>$\bar{X} \pm S.E.$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>8</td>
<td>16</td>
<td>0.4</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Min. : Minimum value.
Max. : Maximum value.
$\bar{X}$ : Mean value.
$\pm$ S. E.: Standard Error.
Table 2. Frequency distribution of aflatoxin M1 contamination in examined she-camel’s milk.

<table>
<thead>
<tr>
<th>Range µg /L</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
</tr>
<tr>
<td>0.40 – 0.60</td>
<td>4</td>
</tr>
<tr>
<td>0.60 – 0.80</td>
<td>2</td>
</tr>
<tr>
<td>0.80 – 0.90</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Country</th>
<th>Permissible limits(µg /L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>0.05</td>
</tr>
<tr>
<td>Italy</td>
<td>0.05</td>
</tr>
<tr>
<td>Switzerland</td>
<td>0.05</td>
</tr>
<tr>
<td>France</td>
<td>0.2</td>
</tr>
<tr>
<td>FDA</td>
<td>0.5</td>
</tr>
</tbody>
</table>

(Galvano et al., 1996)

DISCUSSION

Data presented in table 1 showed that, 16% of milk samples contained aflatoxin M1 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 M1 at levels ranging from 0.25 to 0.80µg /L: Balata and Bahout (1996) reported that, 26% of examined camel milk samples contained aflatoxin M1 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 M1 detected in examined milk samples could be attributed to the feeding of hay and concentrates containing aflatoxin B1.
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 M₁ content and that the higher the temperature used, the smaller was the amount of residual aflatoxin (Appelbaum 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 M₁ was not only secreted in milk, but also excreted in the urine and feces of animal. Therefore, aflatoxin M₁ 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 M₁ and milk (Abdel Fattah, 1999). Generally, the real hazards of aflatoxin M₁ may be due to cumulative effect of repeated exposure to very small or even undetectable doses of aflatoxin M₁ for comparatively long periods (Handrickse, 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 B₁ 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.
REFERENCES


تقدير الآفلاتوكسين M في ألبان الجمال في سيناء

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أجريت هذه الدراسة على خمسين عينة من مشتقات ألبان الجمال المتواجدة في محافظة سيناء، وقد تم تحليل هذه العينات لتقدير كمية الآفلاتوكسين M. أظهرت النتائج أن 11% من هذه العينات تحتوي على الآفلاتوكسين M بمعدل قدره 0.08 - 0.02 ميكروجم/لتر. وقد تراوحت كمية الآفلاتوكسين M في العينات المتبادلة مابين 0.01 - 0.02 ميكروجم/لتر. وقد تم إلتقاء الأمليات الصحية والإجراءات الواجب اتخاذها لمساندة المستهلكين من آثار الآفلاتوكسين M في ألبان إثنان الجمال.