SUMMARY

Studies on Aflatoxins in Milk and Milk Products
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1) One hundred and forty eight raw milk samples were examined for the presence of aflatoxin. Only one milk sample from an individual animal contained aflatoxin $M_1$ at a concentration of 0.5 µg/liter.

2) Among the milk products examined in this study, condensed milk (3), dried milk (10), khoa from the Institute Dairy (18) and market dahi (10), were found to be free from aflatoxin.

3) Eight out of 29 market khoa samples contained the four types of aflatoxins in the following ranges: aflatoxin $B_1$ (20 to 240 µg/kg), aflatoxin $B_2$ (0 to 8 µg/kg), aflatoxin $G_1$ (10 to 140 µg/kg) and aflatoxin $G_2$ (0 to 4 µg/kg).

4) Among 17 samples of cheese that were examined, only 4 samples contained the four types of aflatoxins in the following ranges: aflatoxin $B_1$ (28 to 128 µg/kg), aflatoxin $B_2$ (0 to 3 µg/kg), aflatoxin $G_1$ (20 to 115 µg/kg) and aflatoxin $G_2$ (0 to 2 µg/kg).

5) None of the milk products, examined in the present study, contained aflatoxins $M_1$ and $M_2$.

6) Out of a total number of 114 isolates of aspergilli screened for aflatoxin production, 28 were capable of
elaborating the toxin. Among 77 *Aspergillus* isolates that were identified only the strains of *Aspergillus flavus* (14.28%) and *Aspergillus parasiticus* (2.59%) produced aflatoxin. Molds other than *aspergillus* did not produce aflatoxin.

7) One standard aflatoxin producing strain, *Aspergillus parasiticus* MTCC 2999 and another laboratory isolate *Aspergillus flavus* K3 were examined for aflatoxin production in *khoa*. The inoculated *khoa* samples were examined after incubation for 2 weeks at three temperatures namely, 5°, 28° and 37°C. No aflatoxin was produced by both the cultures in *khoa* samples incubated at 5°C. Production of aflatoxins B1 + G1 by *Aspergillus parasiticus* in the top most one cm layer of *khoa* at the inoculation temperatures of 28° and 37°C was 91.90 mg/kg and 11.0 mg/kg respectively. The corresponding values for aflatoxin production by *Aspergillus flavus* in *khoa* under similar experimental conditions were 81.0 mg/kg and 7.0 mg/kg. The penetration of aflatoxin was, however, observed up to fourth one cm layer in the inoculated *khoa* samples.

8) Partitioning studies of added aflatoxin M1 in milk showed that, when lactic cultures were used as curdling agents, more than 60% of the added aflatoxin M1 could be recovered from whey, while the curd fraction retained only 20% of the toxin.
Partitioning studies during preparation of paneer from milk containing aflatoxin B₁ showed that irrespective of whether lactic or citric acid was used as the coagulating agent, the protein fraction retained 35 - 40%, while whey and washings contained 50 and 10 - 15% respectively, of the added toxin.

No significant differences were observed during partitioning of added aflatoxin B₁ in milk irrespective of whether animal or microbial rennet was used for coagulation of milk. Maximum retention of aflatoxin (50 - 55%) was noted in the protein fraction, while whey and washings contained 40 and 5 - 10% of the added toxin in the above experiment.

9) Autoclaving or boiling of milk reduced the added aflatoxin B₁ content by 20 and 10% respectively. Exposure of milk to temperatures such as 63⁰, 80⁰ and 90⁰C had no significant effect on the aflatoxin level in milk.

10) Studies on the effect of aflatoxin B₁ on selected lactic cultures showed that only Lactobacillus bulgaricus-1373 exhibited marked growth inhibition.

11) Addition of aflatoxin B₁ up to 50 μg/ml in the growth medium did not induce any aberrant forms in all the 7 lactic cultures.
12) Maximum binding of aflatoxin B<sub>1</sub> was found in the case of *Lactobacillus bulgaricus* 1373 (44%) cells, while binding of the toxin was minimum with the cells of *Streptococcus cremoris* G<sub>1</sub> (14%). None of the lactic cultures metabolized aflatoxin B<sub>1</sub>.

13) There was neither stimulatory nor inhibitory effect of aflatoxin B<sub>1</sub> on the acid producing ability of the lactic cultures. In the presence of aflatoxin B<sub>1</sub>, acid production was initially retarded in *Lactobacillus bulgaricus* upto 12 hours and thereafter, there was no significant difference in acid production between the treated and control cultures.