

Aflatoxin B₁ Oral Administration to Laying Hens: Efficacy of Modified Mannanligosaccharide (MTB-100) to Prevent Mycotoxicosis

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Summary

The ability of dietary mannan oligosaccharides (MOS) to remove pathogenic bacteria from the intestinal lumen, to modulate the immune response system and to improve animal production has been highlighted in recent studies with several species. Some authors also describe a selective binding of these sugars with aflatoxins. To evaluate the effectiveness of a mannan oligosaccharide added to the diet to interact with an oral administration of aflatoxin B₁ to laying hens, forty-eight birds were administered a diet containing 2.5 ppm AFB₁ for 28 days. Twenty-four birds were assigned to a test group that was supplemented with 0.11% MTB-100. Eggs were collected daily during the experiment. At the end of the trial, the layers were euthanized and liver tissue collected. AFB₁ and AFM₁ levels were determined in egg and liver samples. No AFB₁ or AFM₁ was found in eggs produced by either experimental group. Significant differences (P<0.01) were observed between the levels of aflatoxin found in livers in the control group (4.13 ± 1.95 ppb) and the group given MTB-100 (2.21 ± 1.37 ppb). These data clearly demonstrate the efficacy of MTB-100 added to the diet to counteract aflatoxin either by its adsorption or degradation.

Introduction

Aflatoxin B₁ (AFB₁), a metabolite of certain strains of *Aspergillus Flavus* and *A. parasiticus*, is an extremely hepatotoxic compound that frequently contaminates animal feeds at low levels. Moreover, the stability of this toxin to chemical and thermal treatment increases its potential impact. Some authors describe the ability of various sorbent materials as hydroxyaluminosilicates (bentonite and zeolite) to prevent the gastrointestinal absorption of AFB₁ in different animal species (Scheidler, 1993; Harvey et al., 1994; Zaghini et al., 1996). While Devegowda et al. (1994) demonstrated the capacity of mannan oligosaccharides (MOS) to prevent aflatoxicosis, published data related to this effectiveness are lacking. To verify the usefulness of MOS in preventing the gastrointestinal absorption of AFB₁ the product was added to contaminated diets fed laying hens. The presence of the parent compound and the presence of its metabolite M₁ were determined in liver and egg samples.

Materials and methods

Forty-eight laying hens (ISA Brown Golden, 2.2 kg mean body weight) were given a diet containing 2.5 ppm AFB₁ for 28 days. Twenty-four birds were assigned to the test group B which was supplemented with 0.11% MTB-100, a mannan oligosaccharide (MOS) product. Feed and water were provided *ad libitum*. All birds were clinically examined and

the eggs were daily collected. At the end of the study, the laying hens were euthanized and livers were collected to determine aflatoxin B₁ and M₁ levels by enzyme immunoassay (EIA, Transia Plate Aflatoxin B₁; R-Biopharm, Ridascreen Aflatoxin M₁). After freeze-drying, yolks were checked to measure AFB₁ and AFM₁ concentrations by HPLC. Raw data and mean values were subjected to statistical analysis by means of variance analysis and Student's *t* test (unpaired data) respectively.

Results and discussion

Birds on both treatments were healthy during the experiment and there was no apparent effect of the mycotoxin on feed intake, weight gain or egg production. No macroscopic and microscopic lesions were observed at necropsy, regardless of treatment. No AFB₁ or AFM₁ was found in eggs produced by either experimental group. These results confirm published reports demonstrating little if any storage of AFB₁ and of some of its more polar metabolites (like AFM₁) in yolk and albumen (Trucksess et al., 1983; Micco et al., 1987). Nevertheless, Micco et al. (1987) administered 30 mg AFB₁ per kg for 7 days and found 1.70 ppb AFB₁ in eggs produced on the 2nd day, but this value decreased to 0.82 ppb in eggs produced on the 7th day.

Results of liver tissue analysis confirmed the hepatotoxic effect of aflatoxin B₁ (Richard et al., 1986; Beaver et al., 1990; Zaghini et al., 1996). Significant differences (P<0.01) were observed between the levels of aflatoxin in the control group (mean value: 4.13 ± 1.95 ppb) and the group given MTB-100 (mean value: 2.21 ± 1.37 ppb). These data clearly demonstrate the efficacy of MTB-100 added to the diet in counteracting aflatoxin either by adsorption or degradation. The results of this investigation confirm the ability of these oligosaccharides to prevent mycotoxicosis caused by the contamination of animal feed by AFB₁.

References

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