

Mycotoxins: a serious threat to the dairy industry

by Radka Borutova, product manager Mycofix product line, Biomin Holding GmbH, Industriestras 21, 3130 Herzogenburg, Austria.

The contamination of animal feed with mycotoxins is a worldwide problem in animal production. The complex diet of ruminants, consisting of forages, concentrates, and silages, can be a source of diverse mixtures of mycotoxins that contaminate individual feed components.

Concomitantly, there has been an increase in feed intake to meet the greater nutrient demand, which often exposes cows to mycotoxin contaminated feeds.

Limited protection

Dairy cows, like other ruminants, have some capacity to protect themselves against the harmful effects of mycotoxins due to the detoxifying action of certain ruminal micro-organisms.

However, modern dairy cows have a much faster passage of feed through the rumen, thus less time for rumen microbes to detoxify mycotoxins. The combined factors of high production, incompetent rumen microflora action, unbalanced

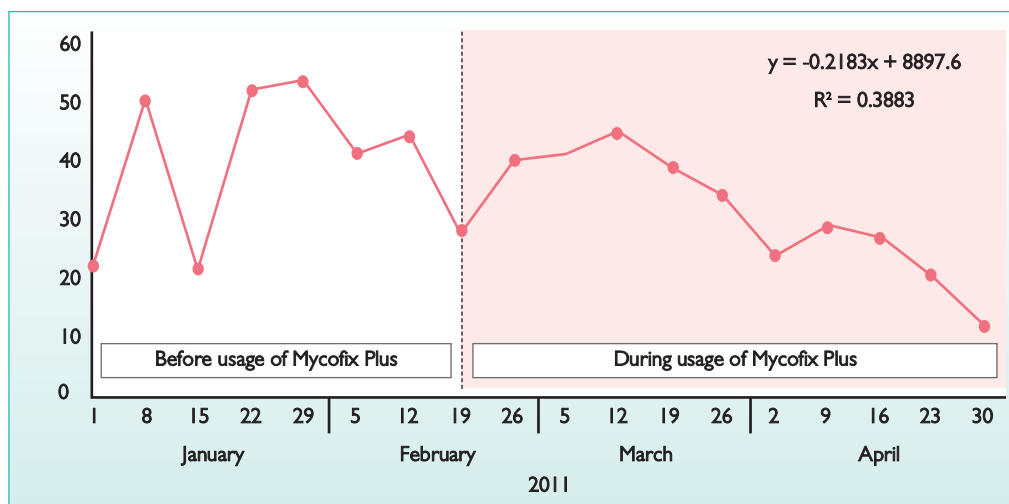


Fig. 2. Incidence (number of events) of total metritis registered during 151 days.

nutrition (for example subclinical acidosis) and mycotoxins in the feed are key factors allowing mycotoxins to escape detoxification and be absorbed by the intestine as in monogastrics.

Mycotoxicosis symptoms

Symptoms of mycotoxicosis in a dairy herd may be non-specific, wide ranging and sub-clinical depending on the mycotoxins involved and

their interaction with other stress factors as farm management, presence of infectious diseases and welfare of the animals.

Recognising when mycotoxins are causing poor health and performance is extremely difficult. Some mycotoxins, such as zearalenone, predominantly affect reproduction and are relatively easy to identify.

Also, high levels of mycotoxins that can cause acute intoxications and dramatic changes in milk production and animal health status can

be determined much more easily.

Unfortunately, the most common and most difficult challenges to identify occur when rations contain low levels of mycotoxins and the health effects are subclinical.

Presence of mycotoxins in feed is very often connected with increased incidence of metabolic disorders as ketosis, retained placentas, displaced abomasums, mastitis, metritis, lameness, elevated somatic cell counts and consequently slightly decreased milk production. Subclinical mycotoxicoses decrease profitability by lowering milk production and quality and finally increasing expenses from inappropriate veterinary therapies.

Mode of action

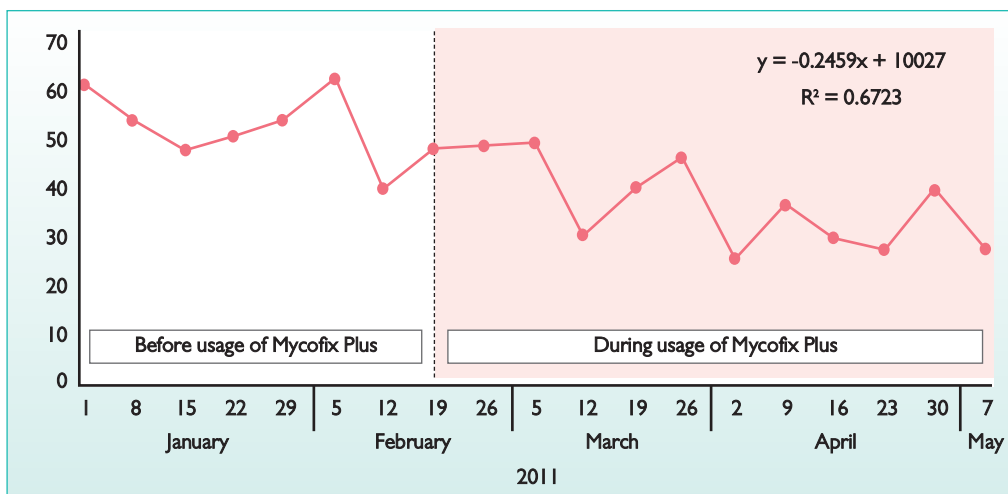
Mycotoxins can be the primary agent causing acute health or production problems in a dairy herd, but more likely, mycotoxins are a factor contributing to chronic problems including a higher incidence of diseases, poor reproductive performance or suboptimal milk production.

They exert their effects through four primary mechanisms:

- Intake reduction or feed refusal.
- Reduced nutrient absorption and impaired metabolism.

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Fig. 1. Incidence (number of events) of total mastitis registered during 158 days.



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● Alterations in the endocrine and exocrine systems.

● Suppression of the immune system.

Recognition of the impact of mycotoxins on animal production has been limited by the difficulty of diagnosis. Symptoms are often non-specific and the result of a progression of effects, making a diagnosis difficult or impossible because of the complex clinical results with a wide diversity of symptoms.

Mastitis and metritis

Mastitis is defined as an inflammation of the mammary gland. Mastitis usually occurs primarily in response to intramammary bacterial infection, but also to intramammary mycoplasma, fungal, or algal infections.

Mechanical trauma, thermal trauma, and chemical insult predispose the gland to intramammary infection. Occurrence of mastitis depends on the interaction of host, agent, and environmental factors. Metritis is defined as inflammation of both the endometrial and muscular layers of the uterus.

Risk factors for developing post-partum metritis are: retained placenta, dystocia, stillbirth, twinning, uterine prolapsed, milk fever, poor hygiene during calving and ketosis.

Aflatoxin	Correlations					
	M1	B1	B2	G1	G2	Total
Herd A (13.01ppb Afla)	0.022	0.112	nd	-0.011	-0.011	-0.112
Herd B (110.63ppb Afla)	0.432*	0.425	0.323	0.389	nd	0.425

*Significant at $p \leq 0.05$; nd = not detected

Table 1. The rank correlation between aflatoxin and lameness in dairy farms.

Results from the dairy farm with 3,200 dairy cows, 3,000 heifers and 400 calves show that the average decrease in mastitis and metritis incidence after usage of Mycofix Plus (15-30g/cow/day) was -30.3% and -32.5%, respectively (Figs. 1 and 2).

Mycotoxin contamination of TMR was 800ppb of deoxynivalenol and 38ppb of zearalenone.

Lameness incidence

Another aspect that should be taken into account is the higher incidence of lameness on dairy farms feeding rations contaminated with mycotoxins. Lameness alone in dairy farms already causes large financial losses due to decreased milk production, impaired reproductive performance and higher culling and veterinary costs.

In a study conducted in 2010 by Pirestani and Toghyani it is proved

that an increase in the levels of aflatoxin (from 13.01 to 110.63ppb) concentration in the feedstuff was responsible for the increase in aflatoxin M1 in milk samples.

Also, levels of aflatoxin in diet and milk caused retained placenta which is a reproduction problem (delayed conception). Prevalence of lameness was significantly affected by milk aflatoxin level ($P \leq 0.05$).

It was concluded that there was a significant relationship between aflatoxin levels with lameness and retained placenta.

There was a significant relationship between aflatoxin and lameness (Table 1). This might be due to the aflatoxin and its effect on the sensitive lamina hoof, unsuitably placed straw yards, nutrition and poor management.

In addition, comparisons between normal cattle and lame cattle showed a slightly longer interval between calving to first insemination

and conception in lame cattle. This difference may be related to the pain caused by lameness associated with aflatoxins, which results in reduced feed intake and thus lower energy intake, hormonal and nutrition imbalance.

Korosteleva et al. (2009) observed that 500ppb of deoxynivalenol may also reduce phagocytic and neutrophilic activity and consequently determine serious symptoms when mastitis and lameness occurs.

Lameness is one of the most predominant clinical signs of ergot alkaloid poisoning together with reduced weight gain and agalactia.

Conclusion

It is well known that almost all mycotoxins suppress the immune system and impair a proper rumen function, even at levels that may not cause metabolic or physiological problems. It is essential to realise that mycotoxins decrease the feed intake which is consequently leading to decreased milk production.

Accurate feeding of dairy cows in combination with continuous mycotoxin risk management is the key in managing the optimal performance of the livestock business. ■

References are available from the author on request