Performance of dairy cows facing suspected mycotoxin problems

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Mycotoxins are well known for their effects on monogastric animals. Ruminants, until recently, were considered 'protected' against this problem through the detoxification action of rumen flora. However, due to the possible aflatoxin M1 (metabolite of the aflatoxin B1), contamination of milk for human consumption, almost all countries worldwide have adopted registrations on this carcinogenic component. There are also more and more scientific publications highlighting the depressor effects of other types of mycotoxins on ruminant performance even at low dosage but over a long period or when rumen function is already not optimum (acidosis).

In this context, Neovia launched a research program in ruminants using their T5X mycotoxin binding product concept. On the one hand, it has proved the high potential of the product to prevent aflatoxin contamination in dairy milk (in vitro and in vivo trials) and on the other hand, it has evaluated its benefits when used in farms where contaminations of other types of mycotoxins are suspected to be one cause of zootechnical depressive effects.

For the trial nine French dairy herds (715 cows in lactation) were selected with:

- Breeding problems not explained by zootechnical performances and/or the health status of the animals (recurrent mastitis, high level of somatic cells in the milk, ingestion and/or milk production under expectation).
- Problems not due to an unbalanced ration or infectious disease.
- No grazing period, in order to keep the ration as stable as possible.

Samples of the TMR were taken for analysis at the exit of the mixer or in the feeding trough, to ensure a good representation of the real contamination ingested by the animals.

Some 43 different mycotoxins and metabolites were analysed by Gaz Chromatography coupled with Mass Detection. In each TMR sample analysed, between three and eight different mycotoxins were found, with variable levels (Table 1). These mycotoxins were all 'field mycotoxins'.

		No. of positive herds	Min. dose (ppb)	Max. dose (ppb)
Tricho type A	T-2 toxin	1	30	
	HT-2 toxin	4	25	100
	MAS	2	15	45
	T-2 tetraol	1	42	
Tricho type B	DON	9	130	3500
	DOM-1	1	115	
	3ac-DON	3	25	130
	15ac-DON	6	65	460
	Nivalenol	5	55	980
	Zearalenone	9	15	17
	Fumonisins	6	40	270

Table 1. Levels of mycotoxins found in the nine herds tested.

Periods of two months each were compared. The data for two months before T5X SD supplementation was compared to the two following months with T5X SD in the feed (Fig. 1).

There was no feed formulation variation during the whole trial period (control period + experimental period). If any, the biased period was not taken into account for the statistical analysis.

A dose of 100g/day/cow of T5X SD was mixed into the mixer or top fed into the feeding trough (dosage recommended for dairy cows when mycotoxin problems occur).

In order to compare each cow and each herd to the others, all data were statistically corrected by several factors (lactation rank, lactation stage, original herd). The protein content was also corrected by the seasonal factor.

Trial results

The results are based on the monthly individual cow measurement, and milk quality control test (three times/month/herd).

The data of the cows present during the four month trial was selected (the cows who calved or were dried during these four months were excluded from the analysis). Each cow included received the same quantity of T5X SD.

Milk production (Fig. 2) was very stable during both periods (control and experimental). After the beginning of T5X SD supplementation, milk production increased significantly (p=0.015) by about 2kg/cow/day, and stayed stable at this higher level during the second month of the trial.

During the control period the protein content decreased slightly (Fig. 3). This drop is linked to a moderate increase of milk production, which diluted the protein content into the milk. In contrast, T5X SD increased milk production, with a higher protein content of more than 0.6g/kg.

It induces a significant increase of the milk protein yield by 10%

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Fig. 1. Two month comparison with and without supplementation.

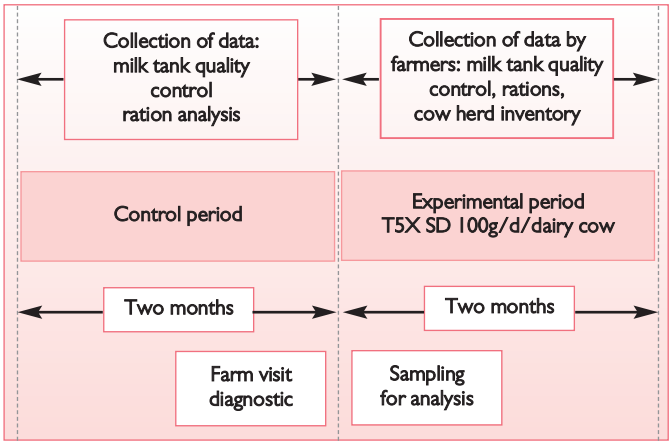
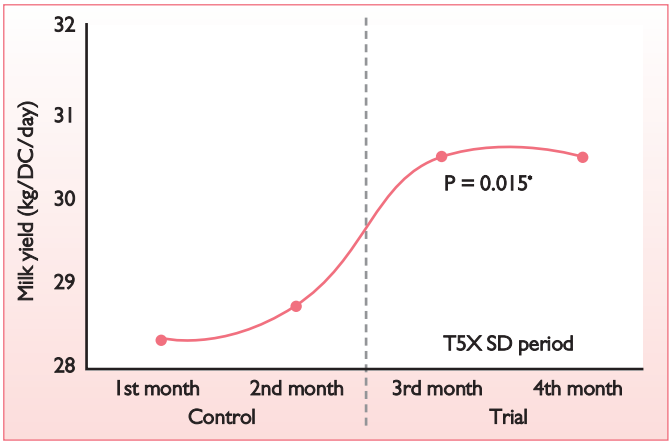


Fig. 2. Evolution of milk production during the trial period.



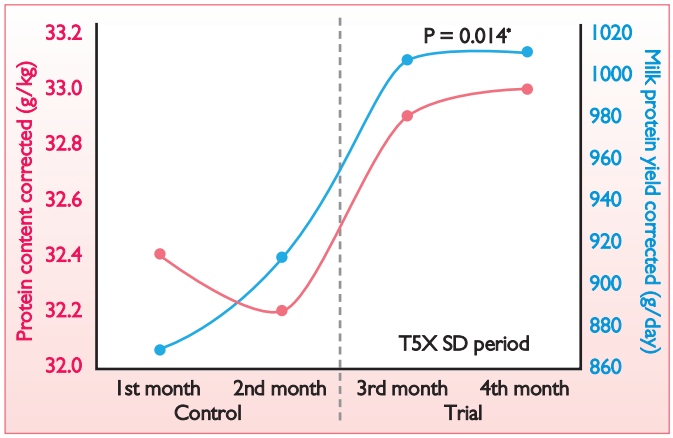


Fig. 3. Evolution of the protein content and the milk protein yield.

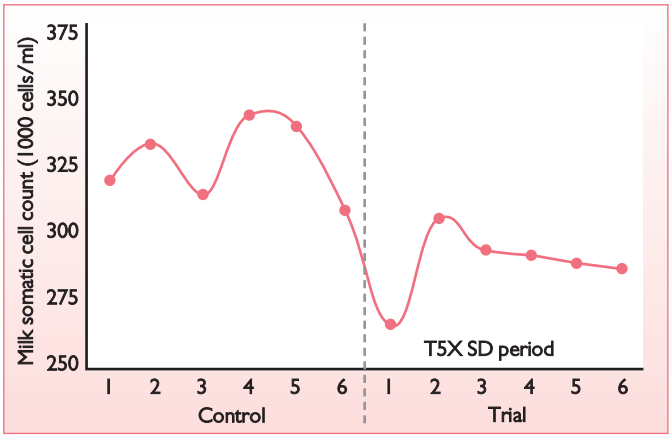


Fig. 5. Evolution of the somatic cell count of the milk.

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(p=0.014). This jump is higher than the increase of milk production (+7%) and confirms the positive progression.

Generally, the increase of both milk production and protein yield results in a better assimilation of the diet energy. It may be explained by two hypotheses – the addition of T5X SD either increases the consumption rate, or gives a better valorisation of the TMR by animals.

On a regular weekly basis, only one herd weighed out the total quantity of TMR distributed and the feed refusals, allowing the daily individual ingestion to be followed (Fig. 4).

Thus, after three weeks of experimentation, cows consumed about +5kg crude matter per day, which is about +2kg of dry matter (+12%).

The T5X SD effect was analysed through milk tank quality control tests (three times/month).

These values are an average for each herd (no individual data). The cows with clinical mastitis and under medical treatment were not taken into account in the somatic cell analysis.

During the control period, somatic cell counts were variable, but stayed at a high level (> 300,000 cells/ml).

Thanks to T5X SD, an average decrease of 50,000 cells/ml was observed (Fig. 5).

Among six herds with abnormal cell count before T5X SD supplements (> 350,000 for several months), five showed a reduction of cell count by about 100,000 cells/ml.

In farms where multi-contamination (trichothecenes/zearalenone/fumonisins) was encountered, the addition of 100g of T5X SD in the TMR for two months results in:

- + 2kg of milk/day/cow (p<0.05).
- + 100g of protein/day/cow (p<0.05).
- + 2kg of dry matter consumed.
- -50 000 to -150 000 cells/ml.

In France the economic gain was +€0.73 per cow per day. The return on investment index was over four.

These trials have shown that ruminants, and especially dairy cows, may be sensitive to other mycotoxins than aflatoxins. Thus, when mycotoxin contamination is suspected to be responsible for disorders at farm level or when aflatoxins M1 are found in milk, the T5X concept is able to offer a reliable solution to help farmers overcome this critical period.

Ruminants are more sensitive to mycotoxins than you would expect.

Rumen flora is a partial barrier that enables the toxins to be destroyed and eliminated, but only 20-30% of mycotoxins seem to be degraded at the rumen level. And still, some mycotoxins are not destroyed in the rumen. Rumen microflora can even transform them into more toxic components. ■

Fig. 4. Evolution of the feed consumption in one of the nine herds.