

# Three ways to reduce the impact of DON on milk profits

Due to their high feed intakes and high concentrate: forage ratios in diets, high producing dairy cows are at risk for negative impacts of the mycotoxin deoxynivalenol (DON) on milk quality and component yields.

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The extent of the negative response can be managed by nutritional means, through the use of certain phytochemical substances for more consistent milk component yields.



## Variation in milk component yields

Increasingly, the levels of protein and fat in milk are being recognised as major determinants of milk price. As a result, milk component levels are important factors in herd management and directly impact farm income.

Production of milk fat and protein can vary a lot from one herd to another. US studies showed that herd average milk protein ranged from 1.57-4.66%, with an average of 3.05%. Milk fat ranged from 1.77-5.98%, with an average of 3.76%. This indicates that many herds are producing components below average for their market and their breed, which presents an opportunity to improve component production and income from milk sales.

Principally, the yield and the content of milk fat are influenced by the digestion of feed in the rumen. Provided the ration contains adequate levels of digestible fibre and the cow efficiently digests that fibre, the acids produced in the rumen will support efficient milk fat synthesis, bringing responses in both fat yield and content.

But in many cows the rumen may be less efficient than we believe. DON, the most prevalent mycotoxin in animal feedstuffs globally, has been shown to have a negative impact on rumen efficiency. Scientific studies reported that DON negatively impacted certain aspects of rumen fermentative capacity, especially reduced acetate and propionate production.

## Impact of DON on milk parameters

Ruminants are regarded as quite resistant to Fusarium toxins such as deoxynivalenol (DON) because of the detoxifying potential of rumen microbes. However, the detoxification capacity of rumen microbes depends on a functional rumen. High producing dairy cows with high feed intakes and high levels of concentrates in their ration are more susceptible to the negative effects of DON.

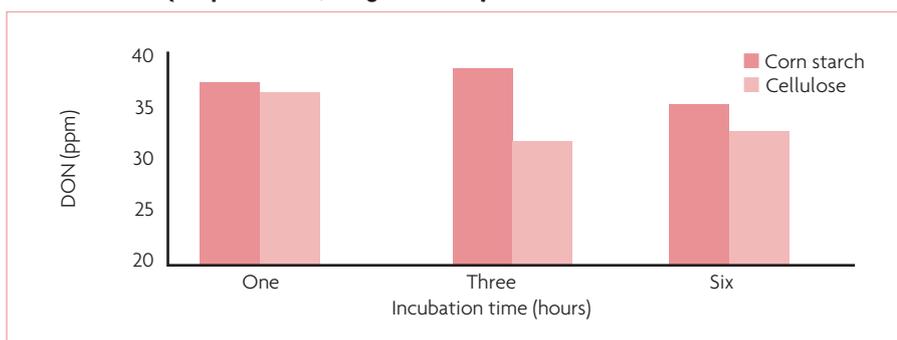
This is because on the one hand it increases the passage rate in the rumen, giving the microbes less time to degrade mycotoxins and on the other hand reduces rumen pH, which has a negative effect on DON degradation in the rumen. The data in Fig. 1 shows that DON is degraded at a slower pace in the rumen with high starch levels in the diet, compared to diets with high levels of cellulose.

Scientific literature reveals, that unlike aflatoxin, there is very little carry-over from DON in dairy rations into milk. However, DON in rations for dairy cows, has been shown to decrease milk fat and increase somatic cell counts (SCC). DON is known to increase oxidative stress, which in dairy cows has been related to oxidative mammary tissue damage and increased SCC.

There is further evidence that DON affects rumen fermentation and microbial

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**Fig. 1. Difference in DON degradation rate in the rumen in response to two different carbon sources (adapted from Jeong 2010 et al).**



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protein yield, which can again affect feed efficiency and milk component yields.

### Managing the response to DON

Traditionally, feed additives have been developed to attack mycotoxins in the animal's digestive tract directly to counteract harmful effects from mycotoxins in the animal. However, both mycotoxin binders and mycotoxin deactivators have their limitations.

It is well known that adsorption is not an effective strategy for most mycotoxins. Only certain bentonites work well with

Stress reaction to DON	Impact on milk quality and component yield	Mode of action plant extracts
Reduced feed intake	Decreased milk component yield	Plant extracts known to attenuate the negative impact of DON on appetite regulation, can help to maintain high feed intakes
Impaired rumen fermentation and microbial protein synthesis	Decrease in milk fat and milk protein	Certain plant extracts are proven to support efficient rumen fermentation
Increased production of Reactive Oxygen Species (ROS) – oxidative stress	Leads to inflammatory responses in the mammary gland and increased SCC	Plant extracts from herbs or spices with high antioxidative capacity can reduce ROS

**Table 1. Three ways to disarm DON with plant extracts fed to dairy cows.**

aflatoxins and some yeast cell wall components have been proven to bind zearalenone, based on specific structural fits. For other types of mycotoxins, particularly DON, binding strategies do not work effectively.

Biotransformation of mycotoxins is another strategy that directly attacks mycotoxins to transform their structure into non-toxic metabolites. Again, this strategy is very specific to certain target mycotoxins. On top of that, it takes time to complete the biotransformation of mycotoxins and time to do so in the digestive tract is limited, particularly when feed passage rate is high. The question is, how does the animal deal with the mycotoxins left untouched by the highly specific feed solutions mentioned above?

A third and more cost effective strategy to counteract mycotoxins focuses on disarming mycotoxins by supporting the animal's resistance to the harmful effects of mycotoxins.

This strategy empowers animals to adapt to difficult mycotoxins such as DON and reduces the extent of the stress reactions generally seen in response to them. There are ways to increase the resistance in cows to DON by nutritional means (Table 1). For instance, adding plant extracts with high anti-oxidative capacity to the diet that either scavenge Reactive Oxygen Species (ROS) or upregulate and protect endogenous antioxidant defences have shown to enhance ROS detoxifying capacity in animals, thus reducing oxidative stress in response to DON.

Several bioactive substances derived from herbs and spices have also been shown to have high anti-inflammatory properties.

Others are known for their ability to help maintain efficient rumen fermentation and high feed intakes.

So, there is scope for nutritional means to optimise the response of cows to mycotoxins such as DON in favour of consistent milk component yields with an optimal combination of plant extracts suited to the cow and the challenges presented by DON. ■