Selko®

Selko® TOXO® Range

Mycotoxin Mitigation

HEALTHYLIFE
SUSTAINABLE LIFETIME PERFORMANCE

trouw nutrition
a Nutreco company

New mycotoxins are emerging in dairy cattle

Dairy diets are easily contaminated by mycotoxins. They may be present at moderate levels, but feeding mycotoxins over an extended period can lead to chronic toxicity.

Traditionally Fusarium mycotoxins such as deoxynivalenol (DON), zearalenone (ZEA) and T-2 toxin are known to cause problems. More recently, new groups of mycotoxins, the so-called silage mycotoxins and other emerging mycotoxins, are gaining importance.[1,2,3] Lastly, there are the endophytes-produced ergot alkaloids which grow inside plants and can cause problems in dairy cows.

The impact of mycotoxins on rumen health

If a TMR consists of a mixture of concentrates and various forms of roughages, exposure of dairy cattle to multiple mycotoxins is a serious risk. Rumen microorganisms can partially degrade mycotoxins, but their detoxification capability may be compromised by factors like ruminal acidosis and antimicrobial silage moulds, potentially leading to reduced detoxification capacity.

Silage contamination with moulds can also promote bacterial contamination, exacerbating health risks from chronic exposure to moderate levels of various mycotoxins.

What are the symptoms in dairy cows eating contaminated feed?

The effects of the so-called "big 6" mycotoxins on performance, health and fertility of dairy cows have been well documented (see Table 1).

Mycotoxins generally induce poor feed intake, reduced milk production, immune depression, increased disease incidence and hormonal imbalances impacting fertility. Although, attributing farm issues solely to mycotoxin contamination can be challenging due to overlapping symptoms with other diseases or management factors.[4,5]

Mycotoxin/s	Source	Negative effects of chronic toxicity
Aflatoxins	Grains, protein sources, by-products, silages	Poor rumen fermentation, reduction of feed intake, milk yield, feed efficiency and reproduction capacity, poor response to vaccines, lowered disease resistance, liver toxicity, kidney toxicity, increased incidence of lameness and mastitis, increased somatic cell counts.
Zearalenone	Grains, protein sources, by-products, silages, hay	Reduced feed intake, reduced milk yield, abortions, abnormal oestrus cycle, vaginitis, sterility, increased number of services per conception, increased incidence of retained placenta.
DON	Grains, protein sources, by-products, silages, hay	Reduced milk yield, poor rumen fermentation, reduced microbial protein synthesis, increased somatic cell counts.
T-2 toxin	Grains, protein sources, by-products, silages, hay	Feed refusal, reduced milk yield, hemorrhagic gastroenteritis, diarrhoea, blood in the faeces, abomasal and ruminal ulcers, poor immunity, absence of oestrus.
Fumonisins	Corn, corn by-products, corn silage	Reduced feed intake, milk yield, feed efficiency and reproduction capacity, liver toxicity, kidney toxicity, poor immunity.
Ochratoxin A	Grains, protein sources, by-products, silages	Not a serious problem but when rumen health is compromised, it can cause performance and health issues.

Table 1. Feed sources of the 6 most important mycotoxins of dairy cows and their effect on health, performance and reproduction.

The risk of aflatoxin in dairy cows

Aflatoxin-contaminated feed can lead to the presence of aflatoxins in milk, particularly aflatoxin M1, a known carcinogen, which is excreted in the milk of cows consuming such feed. Global regulatory bodies have set limits for aflatoxin levels in both feed and food products to ensure dairy cow health and milk quality. Farmers should regularly monitor feed and milk for aflatoxin contamination, taking necessary measures if levels exceed permissible limits to prevent further exposure and contamination.

Silage mycotoxins

Next to the "big 6" mycotoxins, new groups of mycotoxins have been identified, the so-called silage mycotoxins.[1,2,3] They can cause symptoms similar to the "big 6" mycotoxins and hence understanding their presence and negative effects on dairy cows is very important (see Table 2).

Mycotoxin/s	Source	Negative effects of chronic toxicity
Ergot toxins	Small grains, grass, hay	Reduced feed intake, milk yield and reproduction, increased incidence of abortion and retained placenta, reduced prolactin levels, rough hair, necrosis of extremities like tail, ear and hooves.
Tremorgens (fumigaclavine A and B)	Cereals, nuts and fruits	Anorexia, diarrhoea, reduction of thriftiness, irritability.
Silage Penicillium mycotoxins (ochratoxins, penicillic acid, citrinin, roquefortine C, mycophenolic acid, patulin)	Corn silage, wheat silage, alfalfa silages	Reduced VFA synthesis, poor milk yield, poor rumen health, kidney toxicity, increased incidence of mastitis, ruminitis and laminitis, increased somatic cell counts.

Table 2. Symptoms that silage mycotoxins can cause in dairy cows.

Are dairy cows able to deal with mycotoxin toxicity?

Rumen protozoa, can help to lower mycotoxin toxicity,[6,7] particularly in case of a challenge with ochratoxin A (OTA). However, there are several factors that have an impact on the ability of the rumen flora to lower mycotoxin toxicity, presented in Figure 1.

The presence of mycotoxins in the diet can hinder rumen flora's ability to detoxify them; for instance, zearalenone can transform into a more potent compound, α-zearalenol, with estrogenic properties similar to estradiol, linking to specific cell receptors and leading to various reproductive issues.[8]

Moreover, modern dairy cows exhibit accelerated feed passage through the rumen, reducing microorganisms' detoxification time. Sub-acute ruminal acidosis (SARA) further diminishes protozoa in the rumen, impairing mycotoxin detoxification. Consequently, awareness among farmers, nutritionists and veterinarians regarding the significant challenge of mycotoxins to dairy cows is rising.

Figure 1. Factors with a negative impact on detoxification of mycotoxins in the rumen.

Selko TOXO range

Selko TOXO-MX is part of our Selko Mycotoxin Risk Management Programme and consists of smectite clays, which have shown to have a high binding capacity for aflatoxin B1. With the bioavailability of aflatoxin B1 reduced, the production of aflatoxin M1 is diminished, meaning lower levels are excreted into the milk.

Selko TOXO contains bentonite, a mycotoxin binder with at least 50% smectite, which has strong binding capacity for aflatoxins, ergot toxins and LPS, in combination with glucose biopolymers, which maintain gut tight junctions to reduce the translocation of mycotoxins into the blood stream of cattle.

Selko TOXO-XL contains bentonite with at least 50% smectite, which has strong binding capacity for aflatoxins, ergot toxins and LPS, glucose biopolymers, which improve gut barrier function reducing uptake of mycotoxins, in combination with purified β-glucans that improve the immune function of cattle.

Recommended feeding rate

The recommended dose is based on the level of mycotoxins in the dairy ration.

Product	Bentonite	Glucose biopolymers	Exposed β-glucans
Selko® TOXO®-MX	✓		
Selko® TOXO®	✓	✓	
Selko® TOXO®-XL	✓	✓	✓

Adsorption ability

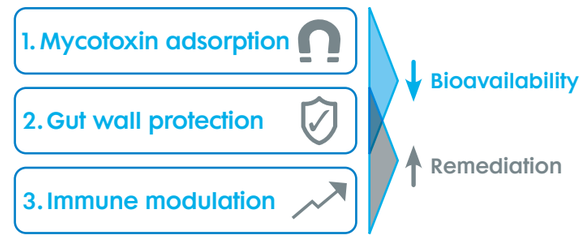
Extensive in vitro and in vivo validation results assure the efficacy of bentonite in its affinity and capacity towards mycotoxin adsorption. TOXO products contain (smectite-based) bentonite that is carefully selected and rigorously controlled in accordance with the (EU) No 1060/2013 category of technological additives. The bentonite in the TOXO portfolio has proven to show consistent and outstanding performance in various certified laboratories. Recent data by scientific institutes has proven its efficacy in animal performance.

Gut integrity

Specific glucose biopolymers reinforce the tight junctions of enterocytes as well as the ratio of villi height to crypt depth, both of which can be negatively impacted by mycotoxins. This mechanism is crucial to cope with mycotoxins that are difficult to adsorb and, therefore, plays a complementary role to adsorbents. Well-maintained gut integrity contributes to improved animal performance under mycotoxin exposure, as shown in various in vivo studies.

Immune modulation

Mycotoxins suppress the immune system's ability to respond to invaders. TOXO products contain highly exposed ß-glucans that act as immune modulating agents to mitigate the mycotoxin-induced immunosuppression. The source of the ß-glucans we use is unique, due to our patented production technique. This technique also ensures a superior efficacy over other best alternatives, with in vitro and in vivo proof.



Selko® TOXO®-XL

TOXO-XL Farm Pack

25% TOXO-XL and a limestone carrier suitable for dairy, beef and sheep.

Recommended feeding rate: 80-180g/h/d

TOXO-XL Farm Pack Plus

45% TOXO-XL on a maize gluten carrier suitable for dry cows.

Recommended feeding rate: 45-100g/h/d

Trial reports

Trial 1:

Selko TOXO-MX effects of AFB1 on AFM1 concentrations in milk, dairy performance and health in multiparous lactating Holstein dairy cows

A trial was carried out at the CERZOO research and experimental centre of the University of Piacenza, Italy. The objective of the study was to determine the efficacy of Selko TOXO-MX in mitigating the adverse effects of AFB1 on AFM1 concentrations in milk, dairy performance and health in multiparous lactating Holstein dairy cows.

The study clearly indicated that by effectively binding AFB1 at the intestinal level, TOXO-MX allowed less AFB1 to pass through into the blood, ultimately reducing the amount of AFM1 excreted in the milk by 64.8% ($p<0.05$). Such affect was achieved at very low concentrations of AFB1 in TMR indicating products high affinity for AFB1 (Figure 2).

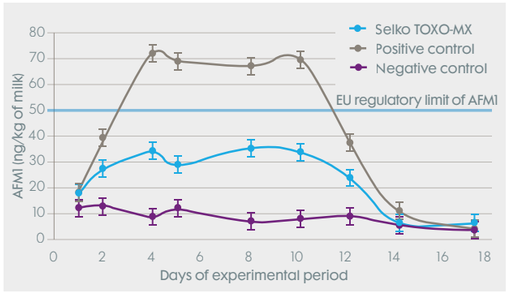


Figure 2. Aflatoxin M1 (AFM1) levels measured in milk of cows receiving aflatoxin contaminated feed with and without Selko TOXO-MX and cows receiving clean feed.

Trial 2:

Selko TOXO reduces the negative impact of mycotoxin contaminated TMR in dairy cows

The objective of the study was to determine the efficacy of Selko TOXO in reducing the negative impact of feeding TMR contaminated with mycotoxins to dairy cows. The addition of Selko TOXO to the TMR of high performing dairy cattle resulted in improved fertility. This was observed by the farmer, but also reflected in the cow management data, with a significantly ($P=0.04$) reduced number of inseminations per cow (see Figure 3).

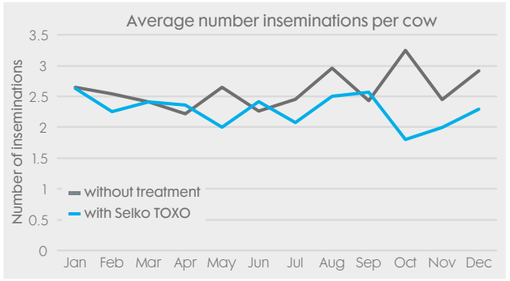


Figure 3. Average number of inseminations per cow during a period of treatment with Selko TOXO compared to a period without treatment with Selko TOXO.

Trial 3:

Selko TOXO improves reproductive performance of dairy cows fed mycotoxin contaminated TMR

The objective of this study is to determine the efficacy of Selko TOXO in alleviating the negative effects of feeding mycotoxin contaminated TMR on the reproductive performance of dairy cows. During a 10 month trial period, 5 months of treatment with Selko TOXO was compared to 5 months of treatment with a competitor product. The addition of Selko TOXO to the ration contaminated with mycotoxins resulted in a positive effect on heat detection, fertility, pregnancy rate and abortions of dairy cattle (see Figure 4).

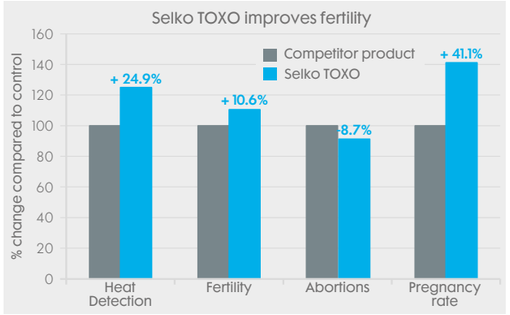
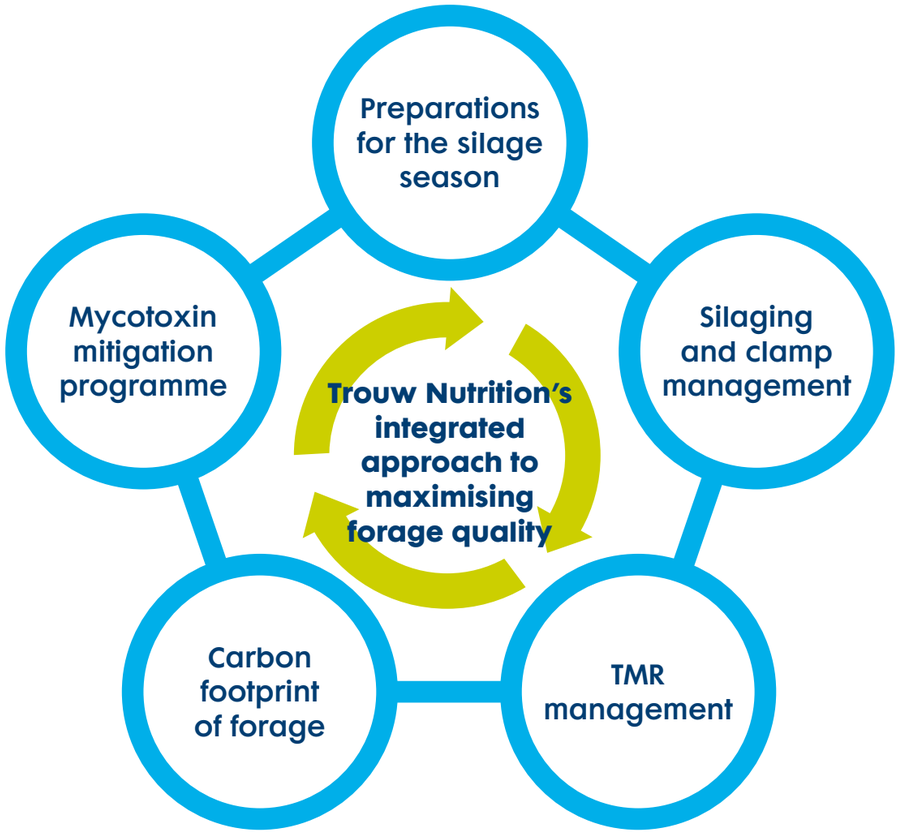


Figure 4. Compared to a competitor product, feeding Selko TOXO to dairy cows challenged with mycotoxins resulted in an improvement to heat detection, fertility and pregnancy rate and the reduction of the percentage of abortions.

Maximising forage quality for performance, profitability and sustainability



Talk to us about how we can help you to optimise animal health and performance, increase farm profitability and reduce carbon footprint.

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Trouw Nutrition is a global leader in innovative feed specialities, premixes and technical services for animal nutrition. Quality, innovation and sustainability are the guiding principles behind everything we do – from research and raw material procurement, to the delivery of cutting-edge products and services for agriculture.

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