

Maintain the same production levels by tackling mycotoxins!

Mycotoxins are produced by fungi as a natural defence mechanism. The presence of these mycotoxins can vary considerably since the development of fungi in the field (*Fusarium* spp.) or during storage (*Penicillium*, *Aspergillus*) depends on multiple factors. This makes it very difficult to estimate the exact extent of the damage which is caused. However, mycotoxins are considered to be a "global problem". This is confirmed by a study performed in the United States where it was stated that up to \$ 1.5 billion of loss was recorded due to loss of grain revenues and expenditures on research and monitoring. For the EU, where roughly twice as much grain is cultivated as in the USA, the mycotoxin problem leads to significant economic losses (Report: programma precisielandbouw, 2011).

It is impossible to prevent the development of fungi by 100%, although **preventive measures** can already limit the production of mycotoxins. Thereby it is important to prevent the growth of fungi during the growth of crops, harvest and storage. Weather conditions (warm and wet) can influence the growth of *Fusarium*. As well as any form of stress in the field (drought, insects, etc.). As a final preventive measure in the field, it is necessary to plough after harvesting as *Fusarium* survives on dead plant material. During storage an adjustable temperature along with a low humidity are the most important parameters in order to prevent fungus growth.

When contaminated feed is consumed by the animal it may manifest in acute symptoms. On the other hand mycotoxins in the feed are more often seen as a rather chronic problem in which characteristic symptoms are lacking which subsequently makes the diagnosis more difficult. A moderate result on-farm (reduced growth, reduced fertility) and increased susceptibility to infectious diseases (caused by the immunosuppressive properties of mycotoxins) are some examples of a mycotoxin contamination. Last but not least, also age and the overall health status of the animals influence the severity of the symptoms.



Mycotoxins enter the gastro intestinal tract through the feed where they will be absorbed in the small intestine. In this way they enter the bloodstream which has an immediate connection to various organs. Therefore the direct effect of mycotoxins will mainly be situated at the liver, kidney, gastrointestinal tract, brains, and the organs for reproduction. Organs such as liver and kidneys try to transform the toxic mycotoxins into a less harmful metabolite. However, this reaction can also lead to even more harmful metabolites (e.g. ZEA conversion to α -ZEA, the latter has a much stronger capacity of binding to the oestrogen receptor). In case of indirect effects the overall immunity is strongly suppressed. As a result, the animals are more sensitive to all kinds of infections which leads to the fact that mycotoxins are often missed as a causative factor.

In spite of all kinds of precautions, the risk of mycotoxins present in feed is considerable. In case of the slightest suspicion of mycotoxins or fungi action should be taken. This can be done by replacing the contaminated feed or by adding a toxin binder to the feed. In which extent the feed is contaminated by various mycotoxins can be confirmed by analysing a feed sample. This can be done by a qualitative ELISA assay, or by a quantitative HPLC assay. Still, attention should be paid to both the possibility of an underestimation of the result (e.g. the presence of masked toxins) as well as the problems associated with the interpretation of results. At the moment, European guidelines are often regarded as "truth." Although negative results (e.g. loss of production) are already noted under the limit of these guidelines.

In order to choose the appropriate mycotoxin binder, it is very important to understand the structure of the mycotoxins. A standard toxin binder (e.g. Aluminosilicate) can only bind polar mycotoxins (e.g.

Aflatoxin) effectively due to its layered structure and polarity. Therefore Nuscience selected an active aluminosilicate which has the possibility to bind also nonpolar structures (eg. Zearalenone).

On the other hand, DON is very difficult to capture through binding. This phenomenon is not necessary because of its polarity but rather attributed to its globular structure which is caused by the fixed and rigid epoxide ring. In other words, the molecule is too large to be bound in the layered structure of the aluminosilicate (Figure). In addition, the epoxide ring is responsible for a large part of the toxicity.

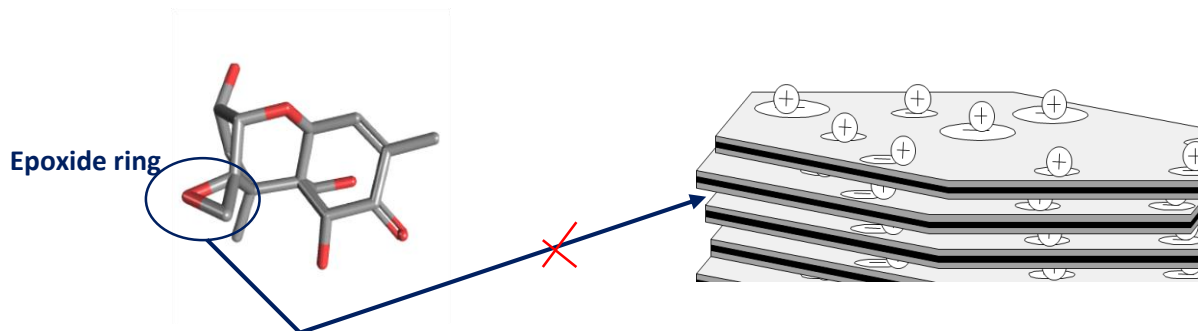


Figure 1: De globular structure of DON, caused by the epoxide ring, inhibits the aluminosilicate to bind DON

Since DON may occur in corn, wheat, barley and CCM in rather high levels it is important to transform the mycotoxin into a harmless metabolite. (BEMEFA, 2014). This can only be achieved by changing the chemical structure (**i.e. biotransformation**) whereby the epoxide ring is cut and DON loses its toxicity.

In addition to the preventive measures and binding / transforming mycotoxins, Nuscience is able to provide **additional support** to the affected organs. This gives the opportunity to the animal to cope even better in the detoxification process. Mycotoxins induce an increased production of free radicals and oxidative stress in various tissues, which has a negative effect on the life span of cells. Especially on tissues with a fast turn-over, such as the liver and the intestine. Nuscience created a specific blend of natural antioxidants based on plant polyphenols which were selected due to their antioxidant effect in the intestinal cells of animals.

Through the use of these natural antioxidants the present oxidative stress can be greatly reduced. This has a positive effect on the intestinal and liver health of the animals. In this way the negative effects of mycotoxins can be prevented.

In case of a suspicion of mycotoxins or the presence of fungi in the feed, action should be the next step. Contaminated feed should be removed and / or a toxin binder can be used. Usually, the animals respond positively after 7 days (sometimes several weeks) in case mycotoxins are the cause of the existing problems.

Nuscience has developed a wide range of toxin binders **Vitafix Select, Vitafix Plus and Ultra**. In this way an appropriate product can be used for each situation. This range binds both nonpolar and polar mycotoxins which will be excreted with the faeces. **Vitafix Plus / Ultra** is also able to transform DON into a harmless metabolite. In order to support the animal and restore affected organs betaine and natural antioxidants were added to **Vitafix Ultra**. All products in the Vitafix range show a low affinity for vitamins and minerals.