# BIOLEX® MB40


## NEUTRALIZING MYCOTOXINS - BIOLEX® MB40 WITH KEY FUNCTIONS INSIDE THE GUT

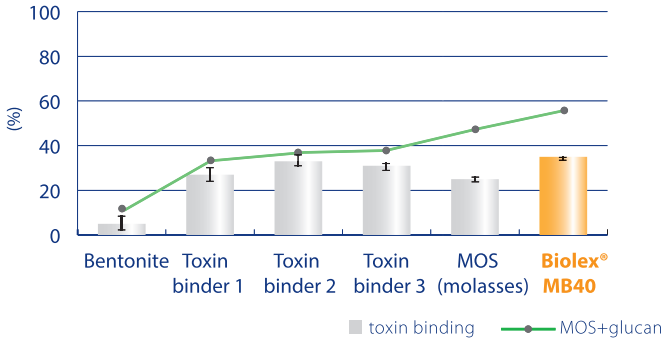
Environmental toxins may not only affect the health and performance of livestock to a substantial degree, but they also pose a risk to human health. Mycotoxins in particular can enter the food chain through animal feed and foodstuffs and have a high risk potential. All over the world these fungal toxins are ever-present in agricultural products depending on the respective crop type, weather conditions, producer region and the storage conditions. The negative impacts of the primary toxins Deoxynivalenol (DON), Zearalenone (ZEA), Aflatoxin B1 and Ochratoxin (OTA) are well researched and documented. However, it remains largely unknown to what extent the interactions between these mycotoxins and the numerous less well-researched environmental toxins pose a risk to animal health. Under these circumstances, one would expect to see increased susceptibility to infections, diminished immune system efficiency and an increased risk of autoimmune diseases even at very low concentrations. Especially breeder animals are at risk in the long term.

### Merely binding mycotoxins simply isn't enough

Neither heating nor preserving during the processing stages can render the accumulated fungal toxins harmless. Once the available measures in breeding, cultivation and harvesting leading up to the production of compound animal feed have been exhausted, there is a prevailing opinion that mycotoxin binders can protect the animal from damaging effects by binding the toxins. The proof of efficacy is usually documented using an in vitro adsorption test, meaning, in a test tube rather than in the animal itself. In doing so, it is asserted that fixation with a toxin binder alone is sufficient to render the respective mycotoxin harmless. However, the detoxification process is much more complex, and it doesn't happen in the feed but in the gut of the animal.

In an experiment conducted at the University of Vienna in Austria (Fruhauf et al., 2012), it was examined to what extent various commercial toxin binders and yeast cell wall products can absorb Zearalenone (ZEA). The experiments were conducted using synthetic buffer solution and porcine gastrointestinal juice.

Fig.1: Adsorption capacity of toxin binders and Biolex® MB40 in synthetic buffer solution for ZEA (%)




Initially, 10 mg of a toxin binder or **Biolex® MB40** and 0.2 mg ZEA were added to a standard citrate buffer (5 ml) with a pH value of 3. Figure 1 shows that the binding capacity after an incubation period of 24 hours in synthetic buffer is, on one hand, relatively low, and that, on the other hand, there is hardly any difference between the various toxin binders and yeast products.

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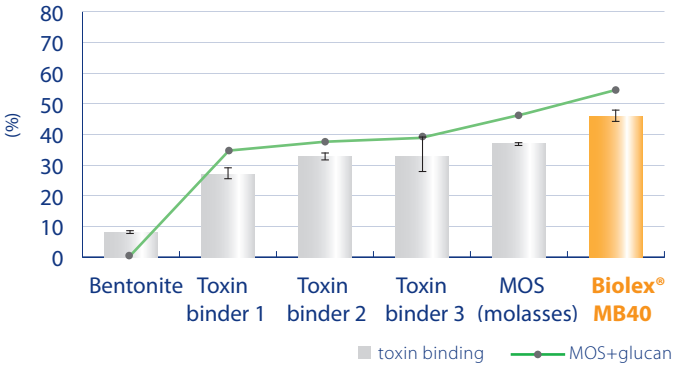
It was furthermore proven that anorganic substances (zeolite/bentonite) have a rather low ZEA adsorption capacity under these conditions.

*This type of testing therefore seems unsuitable to evaluate the performance of mycotoxin binders. Furthermore, it can be assumed that simple adsorbents also bind other essential nutrients without promoting the detoxification process in the gut.*

## Activating the gut and strengthening the intestinal barrier

**Biolex® MB40** is a cell wall product made from brewers' yeast *Saccharomyces cerevisiae* with a high content of mannans and β-glucans. For one, these two specific substances have a high adsorption capacity; on the other hand, many studies have proven the immunomodulating properties of 1.3-1.6-β-glucans. Prebiotic characteristics of these mannan oligosaccharides (MOS) can also promote the stabilization of the gut by supporting an intact microflora.

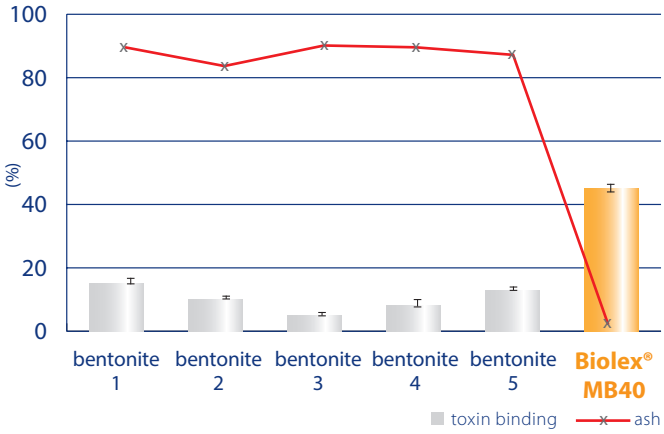
Fig.2: Adsorption of ZEA to toxin binders and **Biolex® MB40** in gastrointestinal juice of piglets depending on the mannan and glucan content (%)




In the 2nd phase of the trial, the University of Vienna has tested the adsorption capacity of various toxin binders and **Biolex® MB40** under conditions very similar to those present in the gastrointestinal tract of swine. To do so, **Biolex® MB40** was compared to mycotoxin binders established on the market in the gastrointestinal juice of swine.

*Under these more realistic conditions, a clear correlation between the mannan and glucan content of the products and their efficacy was confirmed.* **Biolex® MB40** – containing approx. 50 % mannans and glucans – has shown very good adsorption capacity compared to the toxin binders and also the MOS-product made from molasses (Fig. 2). Furthermore, the low efficacy of Bentonite/Zeolite against ZEA was proven again even under these test conditions (Fig. 3).

Fig.3: Binding capacity of **Biolex® MB40** for ZEA compared to anorganic toxin binders (%)




However, the sole fixation of the toxins in the gut will not be sufficient to eliminate their harmful health effects. It is therefore rather necessary to protect the animal from their damaging attack. In the gut, this can be achieved by improving the barrier function of the intestine. Yeast cell walls in **Biolex® MB40** create, on one hand, a protective biofilm on the intestinal mucosa. On the other hand, the so-called "tight junctions", which function as "door openers" between epithelial cells and regulate the transfer of nutrients and fluids from the bowel into the bloodstream, are strengthened. Due to this barrier created by **Biolex® MB40**, it is much more difficult for the mycotoxins to get into the bloodstream.

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## The key function inside the gut - neutralizing mycotoxins

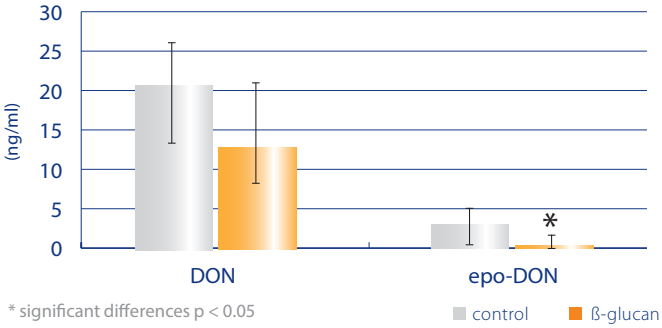
The detoxification of mycotoxins is a complex multifactorial process. The important factor is not the adsorption, but the neutralization of the detrimental effect of the mycotoxins in the gut. The β-glucans of the yeast cell play an important role in this process. Together with the mannans, their prebiotic action initially activates a specialized microflora, which is then enabled to hydrolyze the mycotoxins, thereby converting or breaking them down into other harmless products. It was furthermore shown, that characteristic receptors of the β-glucan molecule not only trigger an immune response, but that they are also able to recognize corresponding mycotoxin structures and to fixate them. One immediate result, for example, is that dangerous Deoxynivalenol (DON) is prevented from entering the bloodstream, and yet another is that the immune system can attack and break it down more efficiently just like a pathogen.

This multi-biotic neutralization process has also been confirmed in a study conducted by the Institute of Animal Nutrition of the Federal Agricultural Research Center in Braunschweig (in 2007): weaner piglets weighing 8 – 21 kg were fed standard rearing feed with DON-contaminated triticale (35 mg DON/kg), resulting in a DON concentration of 5.25 mg per kg feed in the final feed ration. Subsequently, the blood serum levels of the intact, aggressive DON and the concentration of the less harmful break-down product DE-epoxy-DON were determined. Figure 4 impressively illustrates that the "carry-over" of DON in the feed into the bloodstream via the intestine is reduced by almost 50 %. This can certainly be explained with the adsorptive capacity and epithelium-protective properties of **Biolex® MB40**. Of much greater importance to the evaluation, however, is the prevention of epoxy-DON entering the blood serum of piglets. β-glucan from cell walls of brewers' yeast did not only strengthening the mycotoxin barrier of the intestinal epithelium in this experiment, but also the break-down and detoxification of DON and epoxy-DON by up to 100 %.

The marked increase in the growth of lymphocytes and monocytes in the same experiment could be interpreted as an indication of the mycotoxin being eliminated by an immunological process.

*Biolex® MB40 can efficiently contribute to minimizing the cellular toxicity – for the health and strength of our livestock.*

Fig. 4: Effect of β-glucan from yeast cell walls on DON and De-epoxy-DON content in the blood serum of piglets (n=16)




* significant differences $p < 0.05$

## Conclusion Biolex® MB40:

- Biolex® MB40 **binds mycotoxins** effectively.
- Biolex® MB40 **prevents damage to the intestinal barrier** by mycotoxins.
- Prebiotic components of Biolex® MB40 support the microbial **break-down of mycotoxins** in the gut.
- β-glucans of the yeast cell wall in Biolex® MB40 stimulate the **deactivation of mycotoxins** in the gut.

**Leiber** GmbH · Hafenstrasse 24 · 49565 Bramsche · Germany
Tel +49 (0) 5461 9303-0 · Fax +49 (0) 5461 9303-28
E-Mail info@leibergmbh.de · www.leibergmbh.de

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**Australian Distributor:**
Prime Animal Health - (03) 9809 4334
Email: sales@primeanimalhealth.com.au

**Leiber** GmbH · Hafenstrasse 24 · 49565 Bramsche · Germany
Tel +49 (0) 5461 9303-0 · Fax +49 (0) 5461 9303-28
E-Mail info@leibergmbh.de · www.leibergmbh.de

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