Aflatoxin binders – how to get the best value for money

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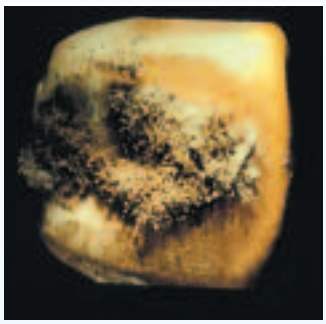
All around the world, mycotoxins, and aflatoxins in particular, threaten the feed and livestock sectors. In recent years, there has been an overflow of aflatoxin binders in the market.

Surprisingly, many products have little research to back up the effectiveness they claim. Many producers spend more money on influencing customer emotions than on research to improve the performance of their products.

In addition, many poultry companies buy such products out of fear of losses rather than out of knowledge about conquering aflatoxins. What can poultry producers do, to ensure they buy the best value for money?



Mould infected corn.

Mycotoxins are the toxic products of different types of fungi. These fungi are a serious threat to the quality of grains and other raw materials. They are found in all stages of the feed manufacturing process; from the cultivation of grains to the storage of complete feeds.

Of all known mycotoxins, the aflatoxins are most potent. At levels of even less than one part per million (ppm), they damage cells within the organism.

Aflatoxins are produced by the fungi species Aspergillus flavus and Aspergillus parasiticus. The optimal conditions for these fungi to grow are:

- Presence of nutrient substrates such as peanuts, corn (see picture), cottonseed, Brazil nuts, figs and copra.
- Availability of oxygen.
- Relative humidity >80%.
- Temperature >25°C.
- Neutral pH level.

Thus, particularly tropical and continental climates are very favourable places for the year-round production of aflatoxins. Temperate regions would be more sensitive during summer.

Aflatoxicosis

In the case of poultry production, the damage done by aflatoxins and the economic losses resulting from this has been very well documented.

The effects of aflatoxins on health and productivity of poultry varies with concentration of intake, length of exposure, species, breed, diet and nutritional status.

Yet, aflatoxicosis is known to have a cumulative effect. Hence, the exposure of small doses over lengthy periods is as dangerous as a single large exposure.

Furthermore, research showed that young chicks are more sensitive than adults. The damage to birds can be separated into four stages (see fig 2):

- Decreased liver functioning (decreased performance, slow growth).
- Suppression of immunity (high susceptibility to diseases through secondary infections).
- Clinical signs of damaged organs.
- Death.

The signs in stage 2 and 3 for ducklings, broilers, layers, turkeys and quail include anorexia, decreased weight gain, decreased egg production, haemorrhage, embryo toxicity and increased susceptibility to environmental and microbial stressors, fatty liver syndrome, necrosis and bile duct hyperplasia.

Detoxification strategies

There are numerous strategies for aflatoxin control. Proper harvesting and storage are among the best ways to prevent their presence. If these methods do not succeed, there are few methods that give satisfactory results.

Treatment with fungus inhibitors or other anti-mould products prevents further contamination, but does not decrease the level of toxins that is already present.

Methods to decrease toxin levels include dilution and chemical treatment but are mostly ineffective, expensive or negatively influence the nutritional value of the raw material.

The most commonly applied method to counteract aflatoxins in contaminated feedstuffs is to include a toxin binder in the feed.

Most toxin binders are mineral clays that prevent the aflatoxins from being absorbed by the intestine.

A good toxin binder can actually restore the nutritional values of aflatoxin contaminated feedstuffs.

The problem for users of such products is that there are numerous products available which makes it difficult to choose the best out of all alternatives.

The selection of any additive into our feed manufacturing process ultimately deals with its economic value. There must be a return on the investment. Proper choice and use of a toxin binder can benefit the poultry sector enormously.

Only how can you recognise a good toxin binder from a product that claims to bind toxins but has no proven effect?

To choose a toxin binder, one must know its efficacy. The quality of a toxin binder is expressed in four different parameters.

- Binding capacity.
- Absorption efficacy.
- Activation time.
- Inclusion rate.

Binding capacity

First, and most important, is the binding capacity. How many of the toxins are actually bound?

The process of aflatoxin binding is based on the principle of electric polarity.

As the negative electric polarity of the toxin is bound by the positive electric polarity of the binder, toxins are immobilised and then excreted by the animal.

This binding capacity is usually expressed in the amount of aflatoxins in milligram that is bound by 1g of toxin binder.

Absorption capacity is mainly influenced by the binding surface of the toxin binder as can be seen in the photograh on page 35.

Absorption efficacy

The second parameter that influences toxin binder quality is absorption efficacy. The particles of most toxin binders expand as soon as they come in contact with water.

Because of this expansion, small molecules (including aflatoxins) are absorbed into the particle. This temporarily immobilises the aflatoxins.

This mode of action, however,

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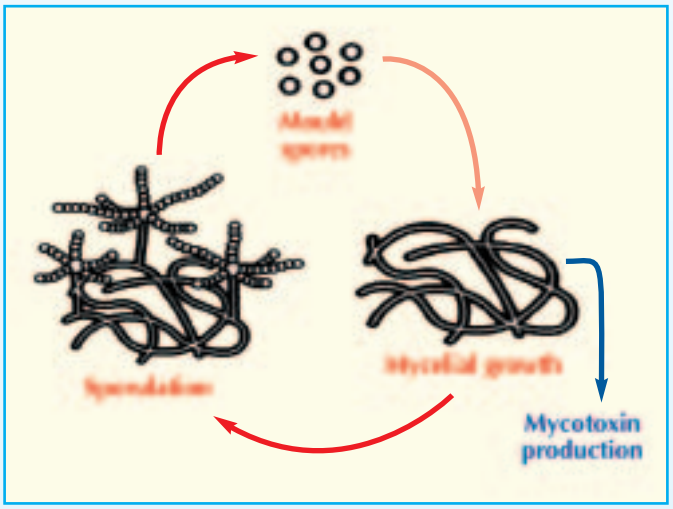
Fig. 1. Mould growth and mycotoxin production process.



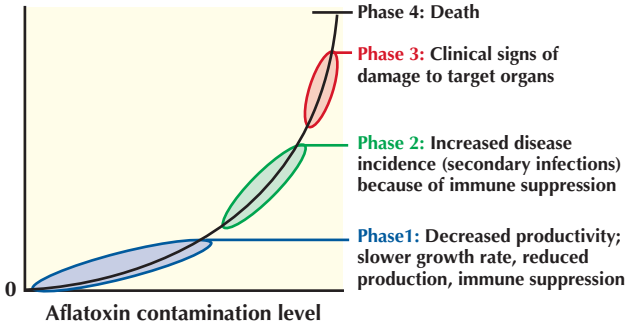


Fig. 2. The phases of mycotoxicosis.

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has two important disadvantages.

In first place, there are toxin binders that absorb more than toxins alone. There is plenty of research that shows that valuable nutrients are absorbed by toxin binders.

Although the damage of aflatoxicosis might be prevented, this still results in economic losses because the digestible levels of nutrients decrease drastically.

The second disadvantage of absorption is that the toxin molecules are absorbed like a sponge but are not actually bound to the particle. In practice this means that after some time, toxic molecules can return to the gastro-intestinal tract.

Activation time

Toxin binders are activated once they come in contact with water. The activation usually takes place in the gastro-intestinal tract.

The reaction time is the time between the first contact with water and the start of the binding or absorption process.

It is of no use if the activation time in poultry is more than two hours because absorption of nutrients and toxins by the animal is then already in full progress.

Inclusion rate

The last quality characteristic is the inclusion rate of a toxin binder. Although it is mainly an economic parameter it should not be neglected.

The price of a toxin binder is of no importance if it is not compared to its quality and to its inclusion rate.

What eventually matters is the efficacy per kilogram of final feed.

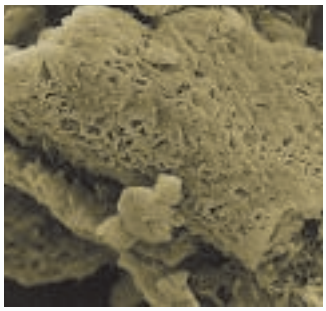
The pitfalls of choice

Any poultry farm or feed producer that considers the use of toxin binders faces the wide variety of products that are available.

The four quality parameters discussed above provide a handhold to the purchaser. Just notice two pitfalls:

- Absorption capacity is often mistaken for binding capacity. However, the efficacy of products that both binds and absorbs aflatoxins is much higher than that of products that only absorb.
- Not all mineral clays are toxin binders! Modern geology knows many subtypes. Only a few subtypes actually function as a toxin binder and these can be found in a limited number of mines.

The use of a wrong subtype will result in low efficacy rates or absolutely no effect at all.



Toxin binders such as NovaSil Plus show a large binding surface on microscopic pictures.

Therefore, one should always ask for independent 'in-vivo' trial results.

If suppliers have no research results available, this usually clarifies that an ineffective or unknown subtype has been used. Be investigative and vigilant to their claims.

Good feed deserves good afla-