Aflatoxins are a serious problem in poultry production. They reduce growth and feed efficiency, impair the health of the birds, and cause carcass bruising and liver and kidney damage. These effects can have serious economic implications for poultry producers, especially duck farmers, because ducks are far more sensitive to aflatoxins than other poultry. Acute symptoms of aflatoxicosis include hepatitis with diffuse degeneration in parenchymal cells, enlarged cell nuclei, and extensive bile duct proliferation. Aflatoxicosis substantially depresses animal performance. Aflatoxins can also cause liver cancer in several animal species, including humans.

The liver metabolises and detoxifies much of the aflatoxin after it has been absorbed from the animal’s digestive tract. For example, the liver converts aflatoxin B1 to less toxic aflatoxin M1, P1, Q1, B2a, and aflatoxicol. However, in livestock and poultry, these metabolites can be deposited in meat, milk, and eggs and could subsequently create health problems in humans.

Neutralising aflatoxin
Livestock and poultry producers must neutralise aflatoxin in feed to decrease the risk to both animals and humans. One strategy is to bind the aflatoxin molecule to a compound that cannot be absorbed from the animal’s digestive tract. The bound aflatoxins are then excreted in the faeces.

Glucomannan (Mycosorb), a functional carbohydrate extracted from the yeast cell wall, adsorbs aflatoxin, as well as other types of mycotoxins. The structure of glucomannans consists of a large surface area containing pores of many different sizes that physically trap or adsorb the mycotoxins.

Recently, Dr. J. Khajarern and Dr. S. Khajarern of Khon Kaen University in Thailand completed trials to measure the impact of Mycosorb on ducks fed aflatoxin-contaminated feed. The researchers used two concentrations of aflatoxin (60 and 120 ppb) and two concentrations of Mycosorb (0.05 and 0.10%). They found that an aflatoxin concentration above 60 ppb depressed growth of the ducks during 0-21 days of age (Table 1). At 120 ppb aflatoxin, body weight gain was only 52.9% of the control. However, when the binder was added, the growth rate recovered to 67.4% of the control.

Likewise, aflatoxin substantially reduced feed efficiency in the ducks. The glucomannan-based adsorbent partially reversed this effect as well. Feeding increasing concentrations of aflatoxin, without the addition of the adsorbent, also had a significant adverse impact on feather score, incidence of leg deformity, and web toe haemorrhage scores. Further analysis of the bone revealed that aflatoxin significantly reduced bone ash and bone calcium concentrations. These effects were partially reversed by the addition of the adsorbent into the diet.
A new insight into aflatoxins

Bintvihok et al. conducted a study to look at the metabolic effects of aflatoxicosis in ducks. The study was also designed to evaluate the ability of the adsorbent to control aflatoxin B1 in ducklings and reverse some of the adverse effects of aflatoxin.

We cultured a local strain of *Aspergillus flavus* on potato dextrose agar to create the aflatoxin B1 used in this study. The aflatoxin concentration in the final material was determined by chemical analysis. A total of 180 day-old commercial strain ducklings of both sexes were fed a standard, mycotoxin-free ration for five days. Ducklings were then divided by weight into the following five dietary treatments:

- Control (aflatoxin-free)
- Control + 0.05% Mycosorb
- Control + 100 ppb aflatoxin B1
- Control + 100 ppb aflatoxin B1 + 0.05% Mycosorb
- Control + 100 ppb aflatoxin B1 + 0.10% Mycosorb

The experimental rations were fed for 30 days. An aflatoxin-free feed was then fed for 20 days. Six ducks from each group were killed on days 30, 35, 40, 45, and 50 for blood, liver enzyme and histopathology.

Reduced enzyme activity

Aflatoxin had a marked effect on liver and serum enzyme activities in ducklings at 55 days of age. Aflatoxin elevated the activities of the enzymes. However, Mycosorb was able to reverse these trends. These observations agree with those from similar studies with chickens.

From the liver histopathology data, it could be concluded that aflatoxin increased the accumulation of fat in the liver and proliferation of the bile duct (both undesirable conditions). It also caused the liver cells to swell and bile to accumulate in the liver (two more bad symptoms). However, the adsorbent was able to defend the liver from the adverse effects of aflatoxin.

*Figures 1 and 2* show residues of aflatoxin M measured in the muscle and liver respectively. From day 30 of the experiment, residual levels of AFM1 were markedly higher in liver than in muscle, whereas AFB1 residues were not found in the muscle. Residue levels in liver and muscle were highest in the AFB1 group, and residue levels decreased over the experimental period.

According to the results of the study, we commented that “Mycosorb seems to protect the liver of ducklings from the ravages of aflatoxicosis. With improved liver function, the ducks are able to achieve optimum performance. From a food safety perspective, the adsorbent reduced tissue residues of aflatoxin.”

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**Table 1 - Effect of Glucomannan (Mycosorb) in controlling effects of aflatoxin in ducks (0-21 days)**

<table>
<thead>
<tr>
<th>Aflatoxin (ppb)</th>
<th>GM</th>
<th>Weight gain (g)</th>
<th>Feed: gain</th>
<th>Feather score</th>
<th>Leg deformity score</th>
<th>Web toe haemorrhage score</th>
<th>Liver weight (g/100g BW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFM1 60 None</td>
<td>602</td>
<td>1.75</td>
<td>1.67</td>
<td>1.73</td>
<td>1.33</td>
<td>5.72</td>
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<tr>
<td>120 None</td>
<td>417</td>
<td>1.96</td>
<td>1.59</td>
<td>2.21</td>
<td>2.47</td>
<td>7.81</td>
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<tr>
<td>60 0.05</td>
<td>642</td>
<td>1.80</td>
<td>1.95</td>
<td>1.23</td>
<td>1.50</td>
<td>5.35</td>
<td></td>
</tr>
<tr>
<td>120 0.05</td>
<td>597</td>
<td>1.79</td>
<td>1.76</td>
<td>1.56</td>
<td>1.79</td>
<td>5.32</td>
<td></td>
</tr>
</tbody>
</table>

*Means within a column with different superscripts are significantly different.

1 GM=Mycosorb from Alltech.

2 Feather score: 1=Poor; 2=Moderate; 3=Good.

3 Leg deformity score: 0=Normal; 1=One leg slightly deformed; 2=Both legs slightly deformed; 3=One leg severely deformed; 4=Both legs severely deformed.

4 Web toe haemorrhage score: 0=Normal; 1=slight haemorrhage; 2=Moderate haemorrhage; 3=Severe haemorrhage.