Featured expert of the month...

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Understanding Mycotoxins

Mycotoxins are a large group of toxins produced by moulds and they can be very toxic for animals, plants and humans. To date we know of approximately 300 different mycotoxins and data from the UN has shown that mycotoxins are present in more than 30% of the cereals produced worldwide.

The challenge with mycotoxicosis is that it is very difficult for the producer to clearly diagnose. However, every poultry producer knows that mycotoxins play some role in poor animal performance. In making a diagnosis of mycotoxicosis it is important to examine the clinical history and clinical signs as well as looking for liver lesions, as the liver is the organ most damaged by mycotoxins.

Inadequate or inaccurate sampling techniques are the most common error when analysing for mycotoxins. Mycotoxins are never evenly or uniformly distributed in the stored cereal or feed. They are more concentrated in areas with higher humidity and/or with higher oxygen levels. In the majority of cases the sampling is carried out in small areas of the storage container. These unrepresentative samples once analysed do not give a true picture of the mycotoxins present in the feed. On the farm once mycotoxins are suspected the animal may have eaten all the feed and so no samples will be left to analyze. In addition, under field conditions, more than one mycotoxin will be present in the feed simultaneously, and even if the mycotoxin analysis shows lower levels of certain mycotoxin(s), other untested mycotoxins may also be present. Multiple mycotoxins can act synergistically making the feed more toxic.

From the epidemiological point of view, fungi growth could happen at different phases of plant development. They could invade the seeds before harvest while the crop is still in the field, or grow during storage at the feed mill as well as on the farm. Moulds can also grow during feed processing, once the mixer increases the temperature and humidity in the feed. Finally, the fungi growth and mycotoxin production could occur in the feeders when they have not been adequately cleaned.

It is evident from the text above that to fully understand the impact of mycotoxicosis on poultry production it is necessary to better understand the epidemiology of fungi growth and mycotoxin production. Based on this knowledge the producer will then be able to establish the correct practises in order to prevent or minimise the risk of mycotoxicosis in animals. It is also important to learn how to determine the cost of mycotoxicosis.

Cost of Mycotoxins on poultry production and mycotoxins versus other factors

It is essential to know how to determine the cost of mycotoxicosis by highlighting the cost/gain of preventing the problem. However the cost of mycotoxicosis can be very difficult to ascertain as the reduction in performance or occurrence of disease will vary under different environmental and management conditions. The financial impact of mycotoxins on a parent broiler breeding enterprise can be calculated by quantifying the effect on liveability, egg production, hatchability and loss in future chick production as a result of mortality. The cost of adversely affected carcass quality due to mycotoxins should be considered. Mycotoxins can induce bruising, elevate mortality during transport and contribute to septicaemia following immune suppression. When the immune system is impaired increased medication will be required for the flock.

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How can we connect all theses losses of animal health and performance to mycotoxins?

There are many other factors that could interfere with the severity of mycotoxicosis in animals. The most important are poor management and hygiene conditions. There is much practical evidence showing that the management conditions will affect the response of poultry to the mycotoxin challenge. Normally, the association of mycotoxicosis with poor management conditions and hygiene could increase the stress on animal and the exposition of the pathogens resulting in increased incidence of mycotoxicosis with higher losses in performance. On the other hand under good management and hygiene conditions, the cost of mycotoxicosis on animal health and performance would be lower. This can be seen when you look at two producers who buy the same feed from the same feedmill. One might have a greater mycotoxin challenge than the other simply due to farm management and hygiene conditions. The challenge is to identify the key factors that lead to the greater mycotoxin challenge.

Unfortunately, in poultry production it is almost impossible to isolate one cause when health problems appear. The complex poultry production system promotes stress conditions, pathogen exposition, nutrition problems, management mistakes all of which will affect poultry development. The different combination of all factors will induce different levels of severity of diseases. As this issue is extremely complex, a practical way to recognise and measure the various factors should be applied in any monitoring programme.

Monitoring programme to evaluate the influence and cost of mycotoxicosis on poultry performance and health

In order to establish an effective monitoring program to measure the impact of mycotoxicosis on animal health it is necessary to understand the impact of mycotoxins on animal health (immune suppression, lesions, etc.) and to know when mycotoxins will be present in feed.

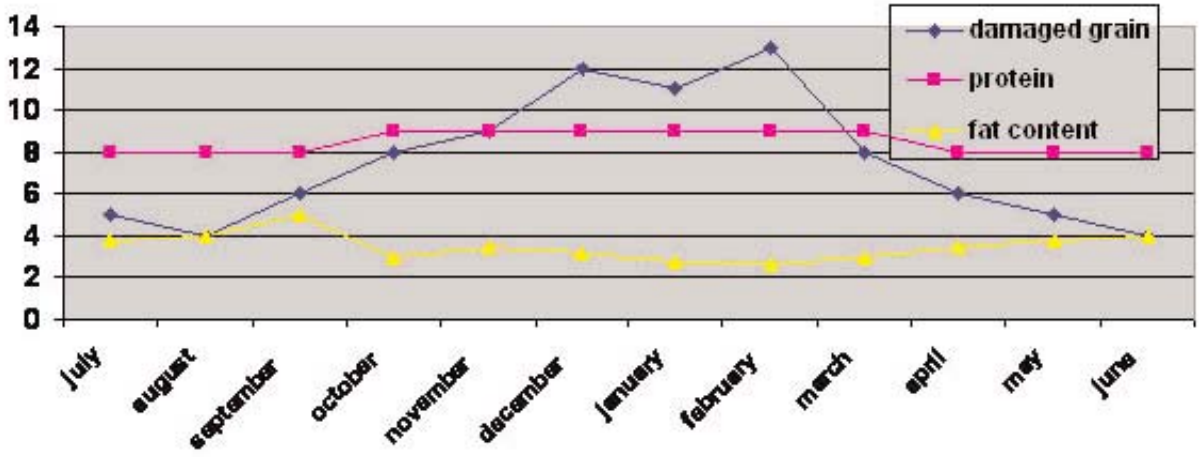
"The higher the percentage of damaged grains, the higher the probability of elevated levels of mycotoxins and lower nutritional levels."

As discussed, it is difficult to evaluate mycotoxin levels present in cereals in the field. However, there is a high correlation between damaged grains, reduced nutritional value in the grain and mycotoxins levels. The higher the percentage of damaged grains, the higher the probability of elevated levels of mycotoxins and lower nutritional value of the grain. Therefore, applying a constant monitoring methodology using, for example, percentage of grains that are broken, have some physical damage or have mould, recorded in a graph makes it easier to identify over a long period of time when the highest probability will occur for mycotoxin contamination. If we follow the example in graph 1 it is possible to see an increase in the number of damaged grains and a reduction of fat content in grains from the months from December to February, which classify this period as being higher risk for mycotoxin problems.

To relate these grain quality results to animal health problems it is necessary to have an on-field constant monitoring programme in place to evaluate potential mycotoxin problems in animals. It is recommended that animal performance index (feed intake, weight gain, egg production, feed conversion rate, etc.), evaluation of vaccinal titer (average and coefficient of variation of vaccinal antibody response), mortality, use of medication (for secondary infections), and slaughterhouse discarding index are monitored in addition to carrying out a representative necropsy of birds. All data recorded should be presented in graph format to be compared with the grain quality results.

In the example in graph 2, if you compare the critical period where there is a high percentage of lesions identified in the necropsy with the data in graph 1 (grain quality) it is possible to see that the period with the higher percentage of lesions correlates to the period with a higher percentage of damaged grains. From this it is possible to conclude that the increase in lesion problems in the field is highly influenced by mycotoxins and fungi growth on cereals. Using the information regarding the cost for the poultry producer (reduction of poultry performance, increase cost of medication, increase meat discarding) it will be possible to define the approximate cost of the mycotoxin contamination on your bottom line.

Graph 1- Percentage of damaged grains, crude proteins and fat content in grains used in diet.



Graph 2 – Results of field autopsy in broilers.