Technical Bulletin

Biomonitoring mycotoxins : A new avenue to measure the impact of toxins on animals

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At Innovad®, we want to ensure that we have the means to do what we promise by continually upgrading our resources and skills to support our years of experience in the food/feed industry. As part of this commitment, we are collaborating with the University of Ghent to fund research on **a unique new way of looking at diagnosing toxins impact on animals**.

The biggest challenge in the mitigation of toxins contamination is the ability to properly detect the risk we are confronted with....

The presence of mycotoxins in feed impairs animal health and performance leading to economic losses.. Monitoring mycotoxin exposure is important to diminish associated losses.

Up till now, mycotoxins are mostly determined **in feed**. Feed analysis gives a good indication of the risk, especially the amount to which the animals are exposed. A **risk assessment** is hereby a useful tool, it combines characterization of possible health hazards with the amount to which the animals are exposed. However, this information is general and no information is given about the impact on the animals itself. Analyzing such feed samples could sometimes lead to misleading information due to the presence of hotspots and the difficulty of determining masked mycotoxins, both leading to underestimation of the risk.

Our latest research focus on the **exposure** assessment identifying **biomarkers** and developing the appropriate analytical method to determine toxic metabolites in animal biofluids. Such Biomonitoring could give more reliable results providing an indication of the real animal intoxication level and its economic impact. **A link** can also be made between concentrations in the feed and in the boological fluids.

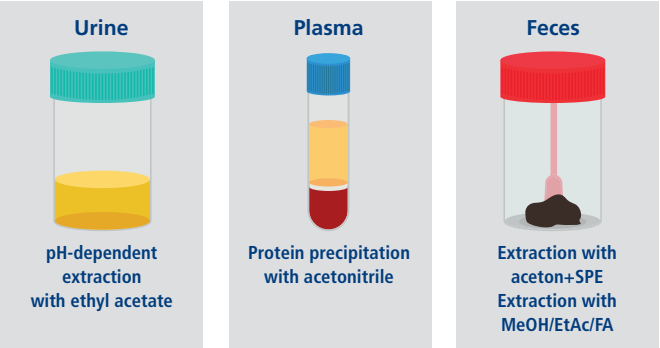
Biomarkers for Biomonitoring

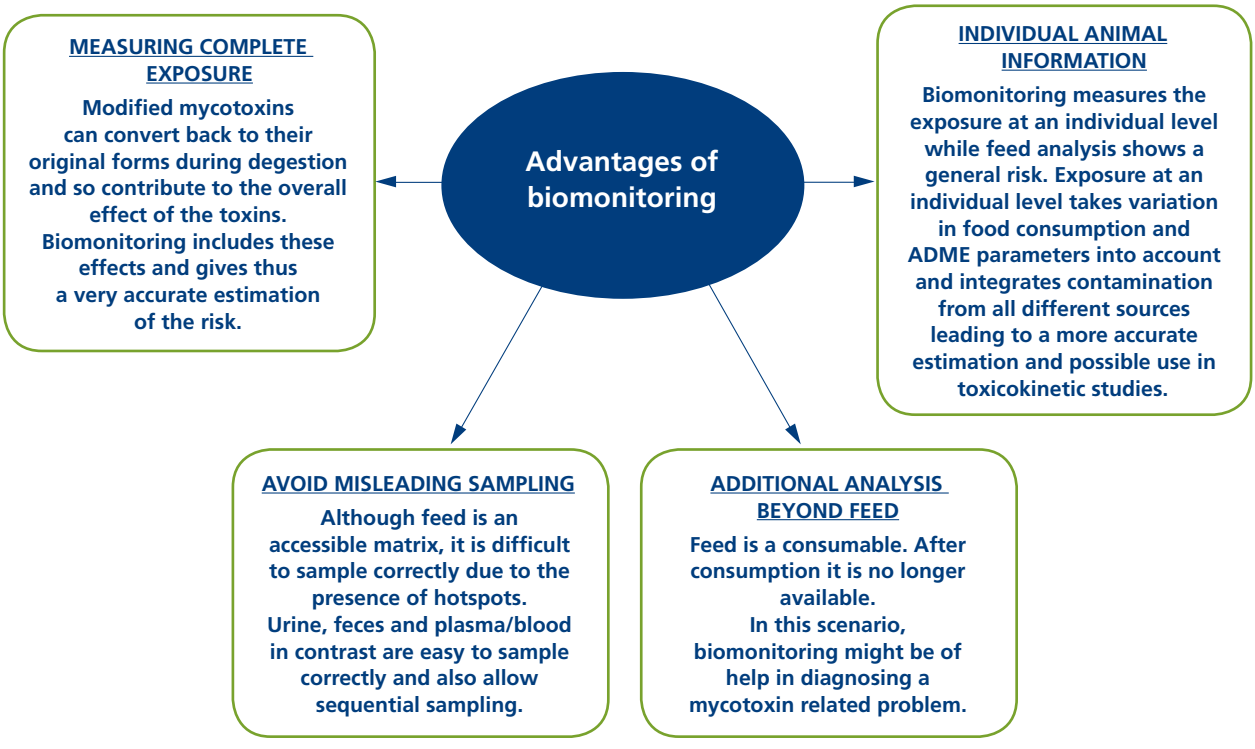
Biomonitoring is determining the exposure of animals to mycotoxins with the use of so-called biomarkers. Biomarkers are the molecules that are related to the exposure and that can be found in the biological matrices of the animals. Two types of biomarkers can be distinguished: **direct** (exposure) and **indirect** (mechanism/effect) biomarkers. The latter are non-specific and associated with either the effect or mechanism of the toxins. (I.e: change in So/Sa-ratio after fumonisin exposure or the change in liver/serum enzymes after the administration of aflatoxin B1) The effect-based biomarkers are even less specific than the mechanism-based. A typical example is the alteration in feed intake after administration of deoxynivalenol. The direct biomarkers are specific and directly linked to the exposure. This type of biomarker is often the mycotoxin itself or their **phase I and II metabolites**. For biomonitoring, the direct biomarkers are the most interesting.

Matrices of Biomonitoring

Detection of biomarkers occurs in easily accessible matrices such as **blood**, **urine** and **feces**.

- Direct biomarkers or biomarkers for exposure, for example the rapidly absorbed mycotoxins can be detected in blood. Peak concentrations can be seen after few hours. The concentration in blood is directly related with the exposure. **Plasma** is thus a good matrix to measure mycotoxins a few hours after exposure.
- **In urine** the rapidly absorbed mycotoxins and their metabolites are also found. The relation with exposure is more difficult than in blood because the concentration depends on the amount of urine produced. Therefore, it is necessary to include creatinine as a non-food related marker to correct for the variation in production.
- **Feces** is a useful matrix for the mycotoxins whose absorption in the gastro-intestinal tract is low. They are directly excreted in feces. The concentration found can slightly deviate from the exposure due to detoxification by the intestinal microflora.





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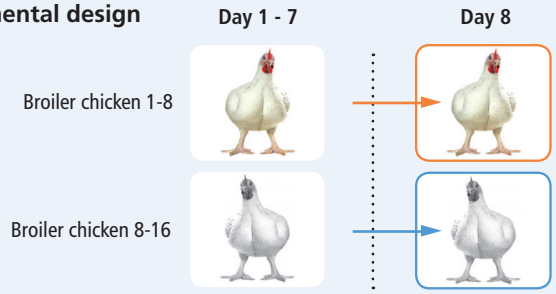
Biomonitoring analysis as a *new* tool to evaluate mycotoxin detoxifyers

Mycotoxin detoxifiers like **Escent® S** are products that diminish the effects associated with toxins. A possible way to prove the efficacy of these products is doing in vivo absorption tests. In these trials the concentration of mycotoxins in animal matrices is detected and the difference in concentration with and without detoxifier is determined. This difference is a measure for the efficacy of the product. This type of test gives accurate results and should in the future replace in vitro tests or in vivo test based on non specific parameters such as growth performance and feed conversion.

Experimental design



16 broiler chickens were acclimatized during one week.

After one week 8 chickens received mycotoxins and the 8 other chickens received mycotoxins plus **Escent® S** (2.4 kg/ton feed). The selected mycotoxins were aflatoxin B1 (20 ppm in feed) and deoxynivalenol (5 ppm in feed).

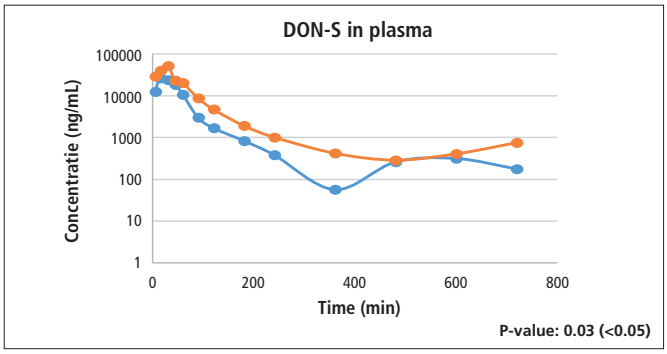
Escent® S and the mycotoxins were administered using an intra-crop bolus. Plasma was collected.

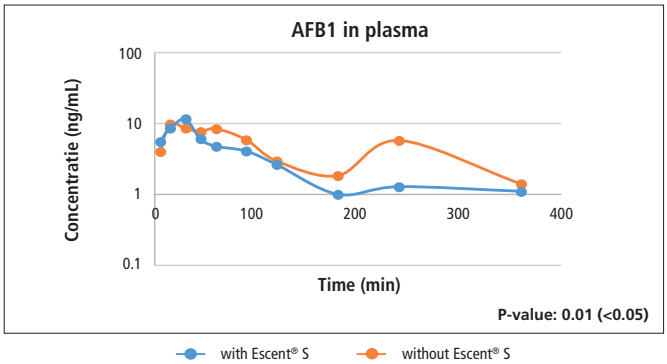
Results

After administration of DON, the best biomarker for exposure was DON-sulphate. DON-sulphate has a higher area than DON itself. After administration of AFB1, AFB1 remained the best biomarker for exposure.

Escent® S significantly decreased the concentration of mycotoxins (deoxynivalenol and aflatoxin B1) in plasma of broiler chickens. Therefore, this research is an additional way of proving the efficacy of **Escent® S**.

Results of the trial in plasma





with Escent® S without Escent® S

Reference:

Related to biomarkers: general

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Related to the advantages of biomonitoring

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Related to new tool to evaluate mycotoxin detoxifiers

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