

# Survey into mycotoxin contamination of pig complete feed

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Neovia is known for its permanent innovation to provide natural and sustainable solutions to improve animal performance. Today, Neovia's innovations have been extended to mycotoxins analyses and the company has published its first complete mycotoxin survey on pig complete feed.

Mycotoxins have been known for more than 50 years, but only the major ones are well studied, and we often forget to talk about synergies between toxins. These can cause very deleterious effects on animals, sometimes more than the simple addition of several mycotoxins.

This article looks at which mycotoxin contamination frequently occurs in pig feed as well as co-contaminations.

## Materials and methods

To realise this survey 331 samples of pig complete feed, from France, have been analysed using liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS).

Forty three mycotoxins were tested, from 10 different families: field mycotoxins like trichothecenes, zearalenone and fumonisins; storage mycotoxins like aflatoxins and ochratoxins; and both in field and storage mycotoxins as ergot alkaloids. In total, Neovia processed more than 14,000 analyses.

## Main trends

Four main results emerge from the Neovia analysis: pig complete feed is principally contaminated by four mycotoxin families: trichothecenes (mainly type B), fumonisin, zearalenone and tenuazonic acid.

Deoxynivalenol (DON) (from trichothecenes B family) was found in 43.8% of the sample, at an average concentration of 942ppb (µg/kg).

Fumonisin B1, with an average concentration of 5,557ppb, was found in 30.1% of the

samples. Zearalenone and tenuazonic acid were also dosed in respectively 26.4% (average concentration of 603ppb) and 23.1% (average concentration of 159ppb).

Other mycotoxins like T-2 toxin and its metabolite HT-2 toxin were also often found in the samples, as well as ergot alkaloids and ochratoxin A.

The most well known mycotoxins are not necessarily the most found in samples, for example, nivalenol, type B trichothecene, twice as much toxic as DON, found in almost 25% of the samples, is really less studied than aflatoxins, which are only found in less than 2% of the cases!

## Effects on pigs

Intoxication of pigs by DON is associated with digestive troubles (feed refusal, vomiting and lesions of the gastrointestinal tract), and zootechnical problems (proven decrease of ADG).

Alteration of immune response has also been observed. In addition, tenuazonic acid has the same effects as trichothecenes and increases DON's effects.

ADG can also be downgraded by fumonisin B1, and consumption of this mycotoxin by gestating sows resulted in considerable damage to foetuses in utero.

Zearalenone is also well known for its impact on reproduction parameters, especially in sows. Growing pigs can suffer sexual development disease too, and boar semen can be downgraded.

Ochratoxin A, also present in samples, can provoke digestive troubles as well as hepatic intoxication and renal lesions. Digestive troubles and gangrene of external members are also associated with ergot alkaloids consumption.

## Co-contaminations

As previously said, the presence of two different mycotoxins in a sample does not mean their effects will be just additional;

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**Table 1. Right, the occurrence of mycotoxins in pig complete feed samples.**

Mycotoxins	%	ppb
Zearalenone	26.4	603
Zea metabolites	0	
Fumonisin B1	30.1	5557
Fumonisin B2	21.9	3803
Fumonisin B3	10.0	84
Monoliformin	5.5	219
Tenuazonic acid	23.1	159
Aflatoxin B1	1.8	17
Aflatoxin B2	0.6	8
Aflatoxin G1	0.9	2
Aflatoxin G2	0	
Ochratoxin A	13.7	3
Ochratoxin B	1.5	1
Ochratoxin α	0.6	86
Cyclopiazonic acid	0	
Citrinin	0.3	205
Patulin	0	
Sterigmatocystin	0.3	10
<b>Type A Trichothecenes</b>		
DAS	0.3	15
MAS	0.6	10
T-2 toxin	5.5	21
HT-2 toxin	17.0	20
T-2 tetraol	6.4	44
T-2 Triol	0	
Verrucarol	0	
<b>Type B Trichothecenes</b>		
DON	43.8	942
DOM-I	0	
15-ac DON	18.5	1098
3-ac DON	0.9	6673
Fusarenone X	0.3	10
Nivalenol	24.9	642
<b>Ergot alkaloids</b>		
Ergocornin	7.6	33
Ergocristin	10.6	62
Ergocryptin	8.5	37
Ergometrin	1.8	15
Ergosin	12.8	71
Ergotamin	11.9	3998

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synergies can also be created and deleterious effects on animals will be considerably increased.

Three main couples of mycotoxins appear to contaminate pig complete feed. Within the 331 samples tested, 63% were contaminated by DON and fumonisin B1, 53% by DON and zearalenone and 36% by fumonisin B1 and zearalenone (see Table 2).

## Effects on pigs

Even if the literature does not contain many studies about the possible effects of zearalenone associated with fumonisin B1, this combination seems to be additive. That means that the effects of the first toxin will be added to the effects of the second toxin. But other synergistic associations have been observed.

The association of DON and zearalenone is a good example of mycotoxin synergy. This association can lead to decreases in average daily gain and feed consumption, as well as an important decrease in immune response.

Reproduction troubles can also appear and internal necrosis has also been seen. Concerning the effect of dietary fumonisin associated with DON, the effects seem to be additive, but can sometimes lead to synergies.

## Conclusion

Mycotoxins in pig complete feed are a major threat to pig health at all stages.

Neovia's survey has highlighted the threat of mycotoxin contamination in pig complete feed and demonstrated the synergies that are present.

In total, 43 mycotoxins were studied, representing the main ones found in animal nutrition, but it is possible to find more than 400 different mycotoxins in nature!

More studies have to be done to go further and get a better understanding of the

effects either of the less well known mycotoxins and of co-contamination. This study also shows that mycotoxin issues cannot be resolved with the six main toxins that people are usually looking at, but are much more complex.

A global approach has to be built up in order to reduce as much as possible the depressor effects of all mycotoxins on animals. ■

References are available from the author on request

**Table 2. Co-occurrence of mycotoxins in pig complete feed samples.**

