



Insights into mycotoxins in swine diets



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Mycotoxins are regularly found in ingredients used in swine diets and the issue seems to be getting worse. That's why Dan Columbus, nutrition researcher at Prairie Swine Centre, presented some insights into mycotoxins in swine diets at the 2024 PSC Producer Meetings.

Mycotoxins are secondary metabolites produced by moulds and fungi. While there are over 400 mycotoxins identified, only a few are of concern in livestock, including

aflatoxins, zearalenone, fumonisins, ochratoxin, ergot and deoxynivalenol (DON, also called vomitoxin). In North America, DON is the most prevalent mycotoxin (showing up in 94% of tested finisher swine diet samples), followed by zearalenone and fumonisin. Co-contamination with several different mycotoxins is common, with about a quarter of samples testing positive for over 60 mycotoxin metabolites. The incidence of mycotoxins in grains increased in 2023 vs. 2022 and there is some thought that the prevalence will continue to increase due to climate change. The FAO has estimated that the cost of mycotoxins in Canada and the USA is \$5 billion each year due to crop losses, reduced animal performance, costs associated with mycotoxin analysis, and use of feed additives.

Grains contaminated with mycotoxins are often downgraded to be used in animal feed as they will not be used for human consumption, which is why we often see mycotoxin issues in swine diets. Mycotoxins exert toxic effects and have adverse physiological effects when ingested by animals, resulting in reduced feed intake in most cases. At high inclusion levels, we'll see vomiting and reduced growth, and in some cases

skin lesions, gut health problems, kidney and liver issues, and reproductive problems.

Pigs are more susceptible to mycotoxin intake compared to chickens and cattle, likely because pigs don't have a large microbial population that can detoxify the mycotoxins before digestion happens, as is the case for cattle (rumen) and to some extent chickens. The general thought is that older animals are better capable of handling mycotoxins than young animals, but Dan's research suggests this might not be entirely the case.

“Research indicates that older animals are more susceptible to DON.”

The CFIA and other regulatory bodies internationally have developed regulations and guidelines regarding the acceptable level of mycotoxins in complete feed and ingredients. The new CFIA regulations for mycotoxin levels are shown in Table 1. The CFIA does not allow blending of contaminated grain with non-contaminated grain. They do allow the inclusion of mitigants, and products are now able to be registered as mitigants in Canada, but they can only be used in diets with mycotoxin levels below the regulated levels.

Getting a good feed sample to test for mycotoxins is not easy, as mycotoxins are concentrated in pockets in the feed and, depending on where you take your sample, you may get very

Table 1. CFIA regulations regarding acceptable mycotoxin levels in complete feed and feedstuffs.

Mycotoxin	New Action Level	
	Complete Feed	Feedstuff
Aflatoxins	20 ppb	20 ppb
Deoxynivalenol	1 ppm	5 ppm
Fumonisin	10 ppm	20 ppm
Ergot – weaned piglets	1 ppm	3 ppm
Ergot – GF pigs	2 ppm	6 ppm

different results. Different labs will also provide different results. It is recommended to take multiple samples from different locations of the feed, mix those together to get a composite sample and to get a final sample from three to five different composite samples. An alternative to sampling the diet is to sample blood or urine from pigs several hours after a meal, as Dan's research showed a strong correlation between the level of mycotoxin (DON) in the diet and that in the blood and urine of pigs fed those diets.

With the high prevalence of mycotoxins in swine diets, the question begs what we can do about it? The best strategy is to avoid feeding mycotoxins or reduce the level of mycotoxins consumed. Definitely keep mycotoxins out of your breeding herd and nursery pigs. Other options include physical separation or the use of feed additives such as mycotoxin binders, yeast products, preservative blends or spray dried porcine plasma. Adsorbents and binders are non-nutritive feed additives such as bentonite/silicate clays and activated charcoal meant to deactivate or reduce absorption of mycotoxins. They are generally only effective against aflatoxins and may absorb useful nutrients as well. They do not adsorb DON at all. Another option is detoxification of mycotoxins by converting them into non-toxic metabolites. This can be done using certain enzymes, a probiotic or microbial blend, or antimicrobial agent such as sodium metabisulfite. More research is starting to come out with this class of mitigants. Physical removal of mycotoxins from the grain and grain sorting are possible but may not be economically viable. Research with porcine spray-dried plasma showed improved feed intake and growth performance in DON-contaminated nursery diets, but bovine spray-dried plasma did not have the same effect. Yeast products and blend products that contain one or more components such as antioxidants, amino acids, yeast products, plant extracts, etc. are the most promising products thanks to their multi-pronged approach to mycotoxin mitigation, including deactivation, biotransformation, protection of the animal and physiological support.

Previous research showed that while feed intake was initially reduced when grow-finish pigs were fed DON-contaminated diets (3 ppm) for 7 days, feed intake recovered near the end of the 7-day period. In a more recent study, Dan investigated whether 1 ppm is an appropriate maximum inclusion for DON.

He set up two trials, one in finisher pigs (75 kg) for 6 weeks and one in grower-finisher pigs (35 kg) for 11 weeks feeding 0, 1, 3 or 5 ppm DON. Both trials showed no effect on general health indicators in blood samples, and no effect on nutrient utilization. In the finisher study, pigs fed DON had reduced feed intake and growth performance, but they recovered after 4 weeks. Body weight was not affected in pigs fed 1 ppm DON but was lower from day 7 onwards for pigs fed 3 and 5 ppm DON. In the grower-finisher trial, there was again no effect of 1 ppm DON, but the negative effects on performance of pigs fed 3 or 5 ppm DON was much more variable than in the finisher trial. In the grower period, the effects of 3 and 5 ppm DON on body weight were not clear cut. The effects did not become consistent until the finisher period.

Average daily weight gain was reduced in the grower phase but not the finisher phase whereas feed intake was reduced in the finisher phase but not the grower phase when feeding 3 or 5 ppm DON. Overall, these results suggest that if you must use diets with mycotoxins (DON), it is best to feed them to grower pigs rather than finisher pigs. These trials also show that 1 ppm DON is a good cutoff level.



Dan Columbus presenting at the Manitoba producer meeting in Niverville, Manitoba.

In summary, mycotoxins will continue to be an issue for the livestock industry. Mitigation strategies are available, but efficacy depends on the mycotoxin present. The research trials suggest that older animals are more susceptible to DON and that there is some evidence of adaptation. Lastly, effects of DON are mostly due to feed intake rather than an animal health or nutrient utilization issue.

