



DETOXIFYING DON

Strategies for detoxifying vomitoxin (DON) using innovative chemical and biological approaches in post-weaning piglets

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Why is this project important?

The mycotoxin deoxynivalenol (DON) occurs on many commonly used cereal grains such as corn, wheat and barley, and the incidence of DON contamination of grains has been increasing in recent years. It has been estimated that direct and secondary losses due to DON may range between \$50 million and \$300 million each year in Canada.

Typical negative effects of mycotoxin consumption by pigs include reduced feed intake, digestive dysfunction, immune suppression and reduced growth performance. In addition, consuming DON-contaminated feed results in damage to the intestinal tract epithelial cells, which causes alteration of intestinal growth and barrier function, as well as increased susceptibility to pathogens. Damage to the intestine also results in a reduction in nutrient absorption. Once absorbed, DON inhibits protein synthesis, causes kidney and liver damage, and can suppress immune function, resulting in a decreased ability to resist disease challenges.

In general, the negative effects of mycotoxins are greater in younger animals. While strategies have been developed to reduce the effects of some mycotoxins, such as toxin binders, these have limited effect for mitigating the negative effects of DON. There is a need for effective and economical methods to reduce the impact of DON in feed and feed ingredients.

What did researchers do?

Scientists tested the effectiveness of sodium metabisulfite (SMBS), when added to feed, to detoxify DON in the piglet's gut.

As a means of protecting SMBS, researchers used different fats to create technologies that encapsulate the compound and produce microparticles that can be mixed with feed for consumption by the animals.

To gauge how effectively SMBS neutralizes the impact of vomitoxin, they combined the chemical with DON-contaminated feed, fed it to post weaning piglets, and monitored the results. Whereas such feed normally impairs or halts pig growth, the coated SMBS managed to reverse the negative effects on growth performance.

As part of the team’s work to craft an encapsulating technology for SMBS, they used common granulation technology. The granulation process transforms fine powders into free-flowing, dust-free granules that are easy to compress.

The encapsulation process also involved electrospinning, a method that produces ultrafine fibres using a spinneret (a small metal cap or thimble with fine holes) under a high-voltage electric field.

What will be the benefit of this research?

The research team has proven the viability of their concept, with results showing that it is feasible to use encapsulation technology to effectively deliver SMBS as a detoxifying agent for swine production. This is an encouraging sign for producers and the industry, as vomitoxin is both a financial burden and a safety hazard.

Developing and optimizing cost-effective post-weaning feeding strategies will enhance efficiency at the production level. Utilizing nutritional strategies to augment gut health and function in weaned pigs will eliminate the need for in-feed antibiotics. In turn, this will allow for more efficient marketing strategies for Canadian pork and pork products. Of note, high levels of SMBS in the diet can decrease the bioavailability of thiamin; therefore, thiamin is usually supplemented at greater concentrations or with a protected form in diets that include SMBS.

In addition, immune challenges can have a negative effect on the pig's gastrointestinal tract, which in turn impacts performance and profit. Previous studies have estimated a 20-35% reduction in lean growth and a 10-20% reduction in feed efficiency for growing pigs at sub-clinical levels of disease. This decrease in performance can have a substantial impact on producer profitability, which could be mitigated through optimizing nutrition programs during times of immune challenge.

Collaborators

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Project status

Completed in 2023.

Additional resources and information about this project

R&D Featured Articles by Swine Innovation Porc

- [Science Steps In to Keep Toxin Out](#)
July 25, 2023

Farmscape interviews

- [Management Key to Improved Profitability, Animal Welfare, Sustainability](#)
April 26, 2019

Related subprojects

The work presented in this fact sheet is one of three subprojects that make up a larger, nation-wide and multi-institutional Swine Cluster 3 project titled: *Development of innovative strategies to reduce feed costs in the post-weaning period while maintaining optimal performance and health*. The three subprojects are as follows:

- [Examination of the effectiveness of provision of functional amino acids to enhance pig robustness](#)
- [Strategies for detoxifying vomitoxin \(DON\) using innovative chemical and biological approaches in post-weaning piglets](#) (*this fact sheet*)
- [Pulse grains and organic acids to control growth performance and health of young pigs](#)

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