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Can I Use Vomitoxin-Contaminated Barley to Feed my Pigs?

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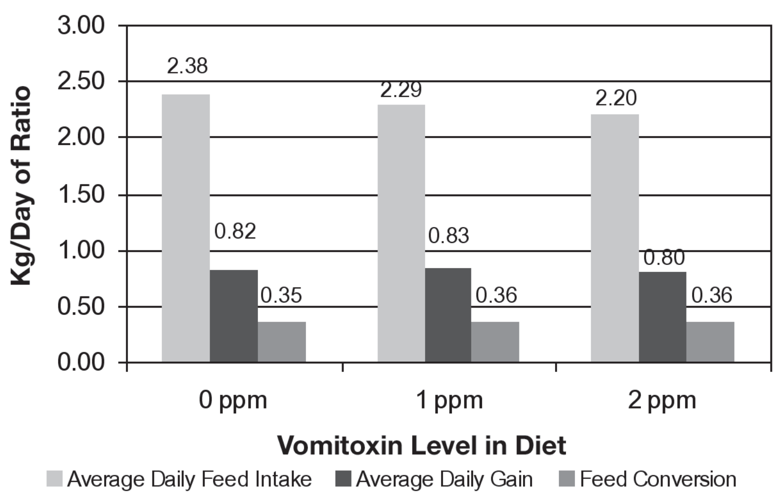
Over the last several years, the incidence of *Fusarium* infestation in cereal crops in Manitoba has been on the rise. While this fungal disease has direct implications for crop producers in terms of yield and quality losses for their grain, the impact on swine producers has also been substantial. When *Fusarium* infects grains such as barley, a toxic metabolite known as deoxynivalenol is produced. Deoxynivalenol is more commonly referred to as DON or vomitoxin. When vomitoxin is present in swine feeds, it can lead to significant reductions in feed intake, resulting in negative impacts on animal performance. Current guidelines recommend keeping vomitoxin levels in complete swine rations to less than 1 ppm. While this is desirable, maintaining vomitoxin levels to this level may not always be possible, given the amount of contaminated grain available in this province. For this reason, we undertook a study to examine the impact of low levels of vomitoxin, in barley-based diets, on feed consumption, weight gain, and carcass parameters of swine fed throughout the grow-finish period.

In this study, 144 Cotswold pigs (average starting weight of 23 kg) were fed a simple barley-based diet, containing either 0, 1 or 2 ppm vomitoxin. The different levels were achieved by diluting contaminated barley with clean, vomitoxin-free barley. Feed intake and pig weights were measured on a weekly basis. Pigs were fed through the grow-finish phase and marketed when they had reached 110 kg. Analysis of the data in Figure 1 revealed that, as expected, vomitoxin caused a depression in feed intake, equivalent to approximately 7 per cent at the 2 ppm level. However, average daily gain was only marginally affected and, in fact, feed conversion tended to be higher with the higher levels of vomitoxin in the diet.

An interesting finding of the current study related to the

Figure 1.
The Effect of Vomitoxin on Pig Performance



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Seepage Below a Straw-Based Housing System: Is Anything Moving?

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Introduction

A study was initiated in the spring of 2001 to examine whether seepage occurs beneath the straw/manure bedding materials in straw-based housing systems used for rearing hogs. It also examined the potential for impacts on underlying ground-water if seepage does occur.

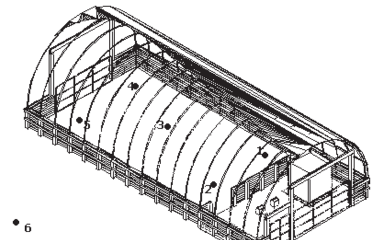
Since interest in this method of rearing pigs is increasing, it is important to know if there is movement of nutrients or other dissolved components of manure downward through the soil profile or whether the straw holds these nutrients.

A drilling protocol was set up according to Figure 1. Five sites were selected with two in lighter, sandier textured soils and three in heavier, clay textured soils. All site holes were drilled in the same sequence to allow a hole-by-hole, and site-by-site comparison.

Sampling Procedures and Site Selection

Six holes, nine feet (2.74 m) deep, were drilled at each site. Five holes were drilled inside the shelter, with a sixth hole located outside the shelter. The sixth hole was drilled to determine the background measurements at each site. Double samples were collected at 12-inch (30 cm) intervals.

Figure 1. Drilling Pattern



Sample material was removed from the drill probe and deposited into labeled plastic bags. Each hole's collection was then placed in a cooler with ice packs. At the end of the day, all samples were frozen until shipped for analysis. All holes were filled with bentonite chips to seal the hole.

One set of samples was used for texture analysis for each site, while the other set of samples was analyzed for nitrate (N) and chlorides at all depths and for phosphorus (P) to a depth of two feet (60 cm).

Sites were selected in an attempt to cover a range of soil geology. At Site 1 the geology consisted of a mixed silty clay, silt, and glacial till with the till more common in the lower parts of the holes. Sites 2 and 4 were sand. The sand at Site 4 was somewhat cleaner and coarser than the sand at Site 2. Sites 3 and 5 were oxidized silty clays with some silt inclusions and layering.

Results and Discussion

The chloride information indicated a downward fluid flux occurred beneath all barns. This was a bit surprising in a straw-based system where precipitation is excluded from the straw. Nonetheless, there were elevated chlorides extending to the full depth of exploration in at least some of the barn holes at all five sites. Looking at the nitrate data, there was little in the way of nitrate leakage beneath most barns. One hole, at Site 4, indicated significant nitrate leakage to a depth of six feet (1.83 m). Nitrate levels returned to background levels below this depth.

Phosphorus was present in the top foot (30 cm) in amounts higher than background levels. However, P levels drop rapidly in the second foot (30-60 cm). Only seven of the 25 holes drilled in the shelters were at or above background levels of P at the two-foot (60 cm) depth. This indicated P was being tied up in the soil profile. While seepage occurred, only salts are moving significantly through the soil profile.

In terms of the potential environmental impacts, although little nitrate leaching occurred, there was downward movement of chloride. Should the dissolved compounds reach the water table, they will cause a local degradation of water quality. The challenge now is to work to reduce or eliminate this downward movement of fluid to improve the sustainability of this structure for rearing pigs.

Minimum Space Allowances for Transportation of Swine by Road

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NOTE: The complete text of this article can be found in the Canadian Veterinary Journal (2002) 43:207-212. "This material is posted, and the values converted from SI to Imperial Units, with permission from the Canadian Veterinary Medical Association."

Abstract

Space allowance for animals in transit is a consistent concern in many countries that are developing codes of practice and regulations to assure humane treatment of food-producing animals. The minimum space allowance requirements for a broad range of swine in transit has not been well described or scientifically substantiated. A maximal loading pressure recommendation for pigs weighing from 5 to 250 kg was derived by a consultative process involving the swine transportation industry, animal welfare groups, and a literature review. The recommended maximal loading pressure under ideal conditions for swine loaded in groups can be described as a Hoerl Model $y = (37.53)(0.9969)^{W}(W^{0.5008})$, where y = loading pressure in kg body weight/m^2 and W = average animal body weight in kilograms.

We consider these recommendations of loading pressure to be usable maximums in purpose built equipment with no concurrent risk of heat stress in the pigs. Multi-deck aluminum punch-out trailers, designed for swine and used in western Canada, have large ventilation holes positioned to assure equal ventilation of all decks. Some "cattle" trailers produced by the same manufacturer have removable decks to allow for triple decking of swine and double decking of cattle. The pattern of ventilation ports in dual purpose cattle trailers is primarily placed to prevent cattle from getting their feet entrapped in the ports. This ventilation hole pattern may not allow equal ventilation of all decks when hauling swine.

At all weights, thin pigs require more space than a well-finished pig of the same weight. Allow 25 per cent more space per pig when temperature exceeds 75°F (25°C). Where possible, avoid transporting pigs in hot, humid weather.

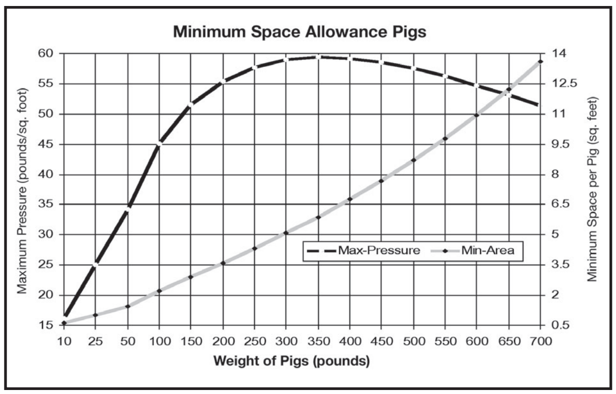

FIGURE 1
Minimum space allowance for swine in transit, based on average individual body weight (imperial). The top thick line describes the maximal floor pressure in the trailer in pounds per square foot, left hand Y-axis. The bottom grey line is the minimum space per pig in square feet measured on the right Y-axis. A standard 102-inch wide possum belly (8.3-ft. internal width) carrying 250-pound pigs at 57 lbs/ft^2 would be carrying 475 pounds per running foot of deck.

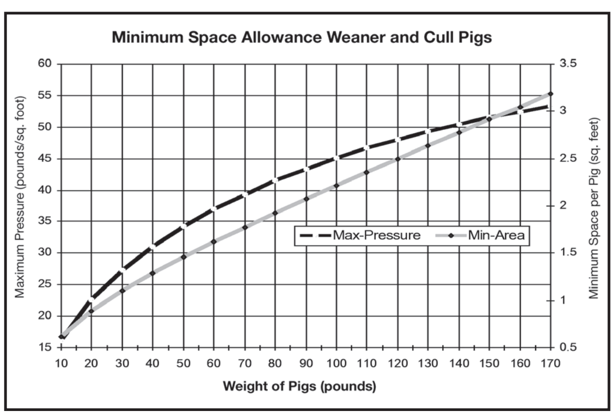

FIGURE 2
Minimum space for weaners and cull and under market weight swine, based on average body weight (imperial). The top thick line describes the maximal floor pressure in the trailer in pounds per square foot, left hand Y-axis. The bottom grey line is the minimum space per pig in square feet measured on the right Y-axis. A standard 102-inch wide possum belly (8.3-ft. internal width) carrying 50-pound pigs at 33 lbs/ft^2 would be carrying 275 pounds per running foot of deck.

Vomitoxin-Contaminated Barley

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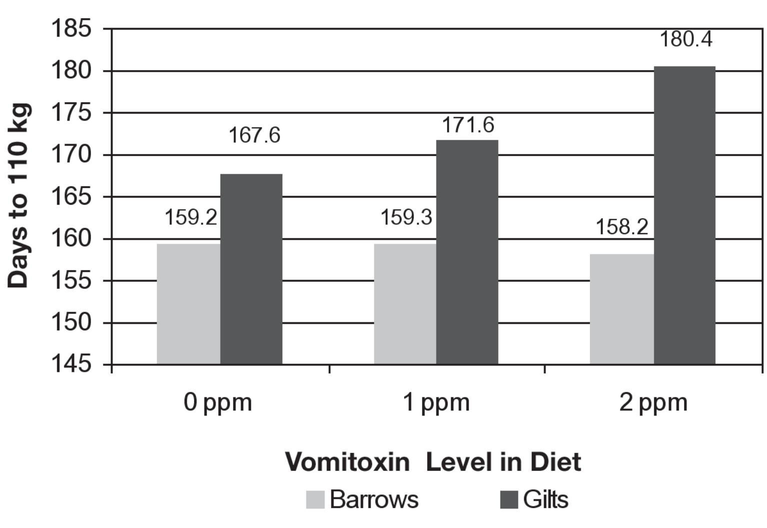
effect of diet on the age at which pigs reached 110 kg. The data in Figure 2 clearly show that, for barrows, the inclusion of vomitoxin up to 2 ppm was well tolerated and did not impact on the total days to market. The situation for gilts, however, was quite different. Higher levels of vomitoxin in the diet led to delays in the time required to reach 110 kg. Furthermore, there was a much greater spread in marketing times for gilts receiving the higher vomitoxin levels, making it difficult to market large groups of uniform gilts. Clearly these suspected sex effects of vomitoxin need to be further explored, and we are in the process of doing just that.

Figure 2.
The Effect of Vomitoxin on Days to 110 kg for Barrows and Gilts



In terms of the quality of the carcasses attained in this study, we found that when pigs were marketed at as close to 110 kg as possible, there was no effect of vomitoxin on carcass weight, index or backfat thickness. However, we did observe that, for both barrows and gilts, the loin premiums that were obtained tended to be higher for pigs receiving the diets containing 1 and 2 ppm vomitoxin. Barrows on the 2 ppm vomitoxin diet returned, on average, $0.57 more per pig than barrows receiving 0 ppm vomitoxin diets. Gilts on the 2 ppm vomitoxin diet returned, on average, $0.73 more per pig than gilts receiving 0 ppm vomitoxin. Further research is needed to gain additional insight into the mechanisms whereby vomitoxin promotes these effects on carcass quality.

In summary, our data show that vomitoxin can be included in diets up to a level of 2 ppm with no negative complications for barrows, with the potential for higher returns to be realized due to increased loin premiums. Caution must be used when using vomitoxin-contaminated diets for gilts, due to an increase in the days to market observed. Further refinements to feeding programs may yield effective strategies for the use of vomitoxin contaminated grains for gilts. The use of split-sex feeding may allow producers to take advantage of using locally produced, vomitoxin-contaminated grains in their feeding programs. Further research investigating the impact of vomitoxin on feed intake, performance and carcass characteristics, coupled with initiatives to decontaminate vomitoxin-containing barley, will help to ensure that producers can take advantage of local, cheaper sources of feed grains for use in their operations.

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