Growth performance, mortality, carcass revenue and cost differences in a commercial production system positive to swine dysentery: A case study

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Swine dysentery (SD) is a severe muco-hemorrhagic colitis that mainly affects pigs in the grower/finisher phase. The causative agents of SD are two species of *Brachyspira* that colonizes the large intestine, *B. hyodysenteriae* and *B. hampsonii*. The increase in costs associated with raising pigs with SD is usually related with slower and uneven growth, higher death loss, reduced feed efficiency and higher in-feed and in-water medications costs. In the present case study, 4,111 crossbred pigs (initial body weight = 35 kg) housed in four straw-based commercial grower-finisher barns were used to quantify the cost of SD. Pigs in two barns were fed non-medicated feed whereas pigs in the other two barns were fed medicated feed throughout the grower-finisher period. Results from the present case study indicate a biological and economic performance difference to feed medication. The economic benefit to feed medication in a flow positive for *Brachyspira* in this case study was estimated to be approximately $11/pig.

Introduction

Swine dysentery (SD) is an enteric disease of economic importance for pork producers. Swine dysentery is clinically manifested by mucoid or bloody scours, reduced growth rate and increased feed conversion, therefore causing major economic losses during the grower-finisher period. The higher mortality may also be observed in pigs with SD and the associated cost for the treatment of this disease with antibiotics also increases the economic losses. If production losses, feed and water medications, mortality and non-marketable pigs are considered, the cost of classic SD is likely in the range from $9.5 to 17.5/pig. Therefore, having strategies to reduce the production and economic losses of a farm are economically important. *Brachyspira* species are very susceptible to tiamulin but less susceptible to gentamycin and lincomycin (Duhamel et al., 1998). Tylosin used to be the drug of choice for treatment of SD but most isolates are now resistant to this drug (Duncanson, 2013). *Brachyspira hyodysentariae* appears to become resistant to antibiotics over time and producers should therefore use them judiciously.

The present case study was designed to quantify the cost of novel emerging *Brachyspira* species in a commercial straw-based grower-finisher barn with multisite production and identify a cost effective medication strategy to control *Brachyspira*.

The case study

The case study was conducted at a commercial grow-finish barn between May and October, 2014. This facility has four straw-based barns with each barn joined by a hallway. These four barns had previously tested positive for the novel species "*Brachyspira hampsonii*" clades I and II (strains 30599 and 30446 respectively). Each barn has wet/dry feeders (Crystal Springs™) at the center of the pen divider, serving two pens with one feed line. Each pen contained approximately 250 pigs. Feeders sit on a raised concrete area while pen is totally opened. Straw is added prior to pig arrival and biweekly thereafter throughout the grow-finish period.

A total of 4111 crossbred pigs (initial body weight = 35 kg) originating from a pig flow PRRS and mycoplasma negative and vaccinated for circovirus at weaning, erysipelas, ileitis,

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and blackleg in the nursery were conveniently distributed in the four barns. Pigs in barns one and four were fed *ad libitum* a control (non-medicated) diet whereas pigs in barns two and three were fed the same diet but medicated with tiamulin (Denagard, Novartis Animal Health Canada Inc.) at 90, 60 and 40 ppm to control SD during Grower 1 (35-50 kg BW), Grower 2 (50-70 kg BW) and Grower 3 (70-95 kg BW), respectively. Lincomycin (Lincomix, Zoetis Canada Inc.) at 44 ppm was used in the medicated diets during the Finisher phase (95 kg BW to market weight). Pigs were weighed prior to entry and at slaughter to calculate average daily gain (ADG). Total feed added per barn was recorded to calculate average daily feed intake (ADFI), total feed cost per pig and per kg of gain. The ADFI and ADG were used to calculate feed conversion (feed:gain; F:G). Dead and euthanized pigs were also recorded and accounted for the growth performance calculations.

Pigs were marketed at ~128 kg live weight and carcass data were captured by treatment on all pigs marketed which were identified with a tattoo number. Carcass weight, backfat and loin depth (mm) were electronically measured, collected and recorded to see if there was any effect of the medication on carcass characteristics.

The health status of the pigs and the availability of feed and water in each pen was monitored daily. During daily health checks, a fecal sample from pigs with observed loose stool was taken using a disposable spoon. Fecal samples were frozen at -20 °C until their analysis in the laboratory for *Brachyspira* spp. presence. Pigs appearing ill were treated and if deemed necessary removed from the study and reallocated to recovery pens.

Results

Overall, pigs fed the non-medicated or medicated feed consumed the same amount of feed during the study (2.65 vs. 2.62 kg/d, respectively; Figure 1). However, pigs fed the non-medicated feed gained 35 g/d less BW (~4% lower ADG; 776 vs 811 g/d) than pigs fed the medicated feed. The overall feed conversion (F:G) was approximately five per cent higher in pigs fed non-medicated feed than in pigs fed medicated feed (3.41 vs 3.23, respectively).

Clinical signs of SD such as mucoid and/or bloody diarrhea that are usually correlated to performance losses, were scarcely detected likely due to the conditions used in the present study.

Table 1. Differences in BW, days to market and mortality in pigs fed non-medicated vs. medicated feed.

	Non-medicated	Medicated
Initial BW, kg	36.1	34.6
Final BW, kg	127.7	129.1
Total days to reach market weight	110.6	105.8
Cost of finishing space/pig[1]	$18.83	$18.00
Mortality		
Number of pigs used in the study	2017	2094
Number of pigs dead/destroyed	98	52
Average weight when pigs were dead/ destroyed, kg	58	63
Mortality rate, %	4.86	2.48
Cost of mortality/pig[2]	$6.03	$3.29
Feed costs		
Feed cost, $/tonne feed	234.1	241.0
Feed cost, $/pig	72.12	74.62
Feed cost, $/kg weight gain	0.798	0.779
Feed cost per pig assuming 100 kg of BW gain	$79.8	$77.9

[1] Calculated assuming that cost of finishing space for 105.6 days is $18. The 4.8 extra days that pigs fed non-medicated feed was translated into an extra cost of $0.83 [$18.0 + (105.6/$18) * 4.8].

[2] Calculated as follows: [(#Pigs used * mortality rate %) * (weight when pigs were dead – initial BW) * (79/100) * $2 * (108.5/100) + (#pigs dead/destroyed * $80)]/(#pigs used - #pigs dead/destroyed), where 79 is the assumed dressing percentage, $2 is the price of kg dressed pig, 108.5 is the assumed index, and $80 is the price per pig if sold at the beginning of the study.

The fact that barns were straw-based increased the likelihood of pigs to become exposed and infected with *Brachyspira* by fecal oral intake, but these conditions also decreased the possibility of observing clinical signs of SD in feces such as loose, mucoid or bloody stool that can be hidden in the straw. The use of large pens also made it difficult to see loose feces after a few minutes. Laboratory results confirmed that *B. hampsonii* strain clade II (strain 30446) was presented in the herd as this was identified by analysis of a fecal sample by PCR.

Pigs fed the non-medicated feed required ~4.8 more days to reach market weight than pigs fed the medicated feed (110.6 vs. 105.8 days, respectively; Table 1). The extra cost for finishing space of pigs fed the non-medicated feed was calculated to be $0.83 per pig.

Mortality rate was double in pigs fed non-medicated feed than in pigs fed the medicated feed (4.86 vs. 2.48%, respectively). Considering the number of pigs entered and their cost, number of pigs dead/euthanized, initial BW and average BW of dead/euthanized pigs, it is estimated that the cost of mortality per pig was $6.03 for pigs fed non-medicated feed, but only $3.29 for pigs fed medicated feed, so $2.74 difference per pig (Table 1). It is important to mention that this farm has had challenges with *Streptococcus suis* serotype 2 in the past, so *S. suis* serotype 2 could have contributed to the differences in mortality as well.

Figure 1. Overall growth performance of pigs fed non-medicated vs. medicated feed

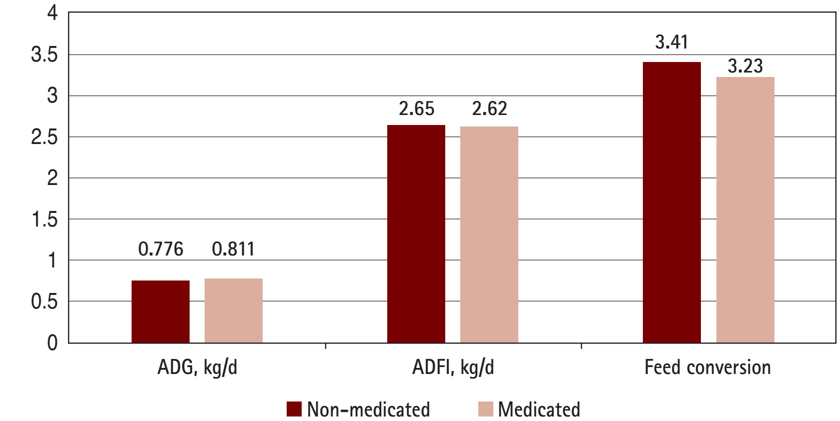
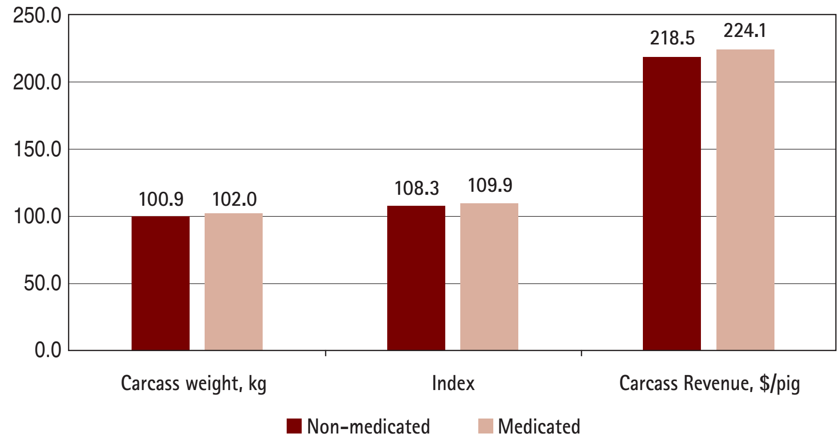


Figure 2. Carcass weight, index and carcass revenue in pigs fed non-medicated vs. medicated feed. Carcass revenue was calculated by multiplying carcass weight by index and price ($2) of kg dressed pig.



Because the medicated feed was more expensive than non-medicated feed, the feed cost per pig was less for pigs fed non-medicated feed than for pigs fed medicated feed ($72.1 vs. $74.6, respectively). However, when considering total kilograms of weight gain during the grower-finisher period, feed cost per kg of gain was $0.019 higher for pigs fed the non-medicated feed than for pigs fed the medicated feed ($0.798 vs. $0.779, respectively). Feed costs per pig are therefore $1.90 more expensive for pigs fed non-medicated feed than for pigs fed medicated feed if 100-kg of weight gain per pig is considered during the grower-finisher period (25 to 125 kg).

Pigs fed the non-medicated feed had one kilogram lower carcass weight than pigs fed the medicated feed (100.9

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vs. 101.9 kg respectively; Figure 2). Based on pigs that hit the desired core of dressed carcass weight and estimated percentage yield in the grading grid, pigs fed the non-medicated feed had also a lower index than pigs fed the medicated feed (108.3 vs. 109.9 respectively). The higher carcass weight and the higher index that resulted from feeding medicated feed to pigs resulted in higher carcass revenue for the pork producer. The carcass revenue per pig was $218.5 for pigs fed non-medicated feed but $224.1 for pigs fed medicated feed. These calculations considering an average price (August-October 2014) of $2 per kilogram of dressed carcass.

Antibiotics per se can have growth-promoting effects by controlling clinical and subclinical infections and reduce the microbial use of nutrients (Lawrence and Fowler, 2002). However, it seems to be that the growth promoting effects of antibiotics are only observed during the nursery phase but not during the grower-finisher period (Dritzz et al., 2002; Holt et al., 2011). .Pigs used in this case study were coming from a flow PRRS and mycoplasma negative and vaccinated for circovirus, erysipelas, ileitis, and blackleg, so the negative biological impact observed in the present study was likely related to the presence of *Brachyspira*. According to the calculations, it was estimated that the return to feed medication in this grower-finisher case study in a pig flow positive for SD was approximately $11/pig which is coming from $0.83 of extra costs for finishing space, $2.74 for higher mortality, $5.61 difference in carcass revenue and $1.90 difference in feed cost per pig.

Conclusion

Although the clinical signs of SD were sparsely observed, the negative biological impact in mortality and suboptimal performance that pigs challenged with *Brachyspira* usually present was shown in the current study. The medication of feed with Denagard during the grower feeding phases and Lincomix during the finisher phase represented a cost effective medication strategy to reduce mortality, number of days to market and feed cost per kilogram of gain, and increasing ADG during the grower-finisher pigs and carcass revenue per pig. The economic benefit to feed medication in a flow positive for *Brachyspira* in this case study was estimated to be approximately $11/pig.

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