Pigs consume more water when stressed

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Two novel technologies consisting of an individual water consumption system (IWCS) and infrared thermography system (ITHS) were installed in a finishing room. The individual water consumption system (installed in each pen) was composed of a nipple drinker attached to a water flow meter, and an RFID reader (and antenna) to capture individual pig data. The infrared thermography system was composed of two types of infrared cameras, one to capture images of individual pigs drinking, a second to capture an image of all the pigs in the pen. To assess whether the novel technologies were capable of detecting pigs that may be stressed due to routine practices, two stressors were introduced during the trial: (1) moving pigs to the barn hallway and handling them through a pre-defined route for 10 minutes, and (2) mixing unfamiliar groups of pigs.

As part of a larger Swine Innovation Porc project (#1237) entitled 'Use of novel technologies to optimize pig performance, welfare and carcass value', various technologies were developed and pilot- tested in different universities and research centers throughout Canada (under CCSI coordination). After pilot studies were completed by the original developers of the technologies, the next step was to conduct commercial trials where selected developed technologies were applied in a production environment and evaluated under typical commercial practices. Commercial trials were a critical step after the research and development phase, providing the opportunity to make adjustments to the technologies, facilitating their adoption in commercial barns.

Two novel technologies (IWCS and ITHS) were installed in a grow-finish room with six pens containing 14 pigs per pen (Figure 1). The IWCS was comprised of a nipple drinker attached to a water flow meter, and RFID reader and antenna together with electronic ear tag transponders. ITHS was composed of two types of infrared cameras: C3 camera (FLIR C3 Compact Thermal Imaging Camera) and A325 IRT camera (FLIR A325sc Infrared Camera). The A325 IRT cameras were used to capture the image of all the pigs in the pen while the C3 cameras were installed on top of the drinker to capture the image of an individual pig while drinking. Pigs were transferred into the room at 20-25 kg and remained in the room for 10 weeks until reaching 105-110 kg.

RESULTS AND DISCUSSION

Water Consumption and Handling

Figure 2 shows the comparison of average water consumption before and after the moving activity. Regardless of stress induction, water consumption increased as the trial progressed. At the start of the trial, grower pigs had an average water consumption of about 4,014 mL/day; this increased to 5,876 mL/day towards the end of the trial when pigs were nearing market weight.

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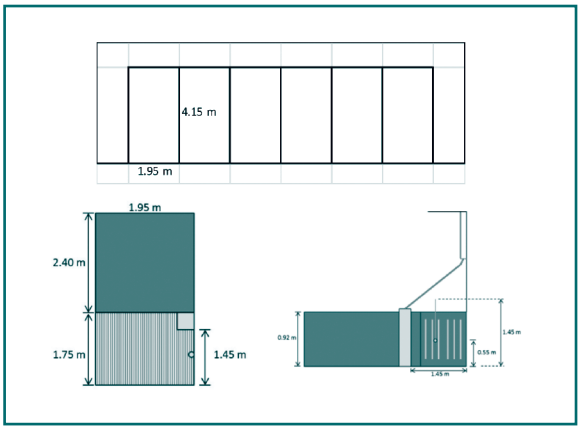

Figure 1. Floor layout (a) of the grow-finish room used in the study. Details of the pen showing the location of the feeder and drinker – top view (b) and side view (c).

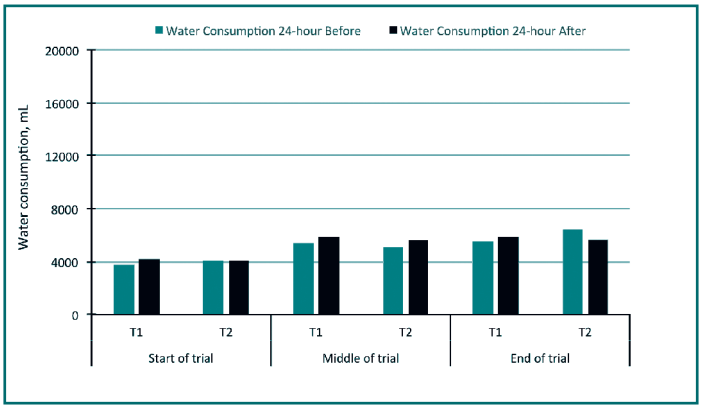

Figure 2. Average water consumption of pigs 24 hours before and 24 hours after the moving activity during the start (n=12), middle (n=12) and end (n=10) of the trial.

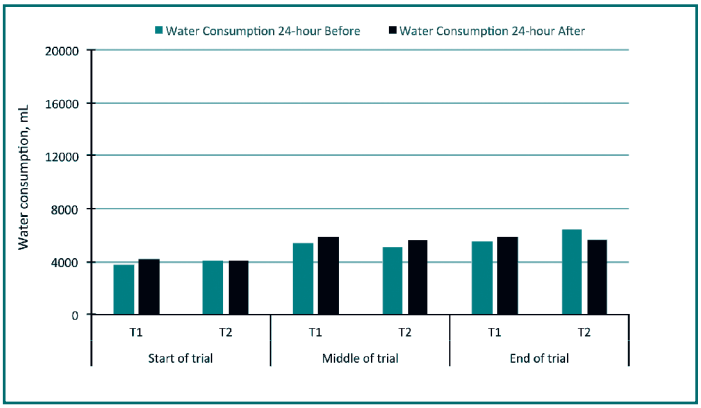

Figure 3. Average water consumption of pigs 24 hours before and 24 hours after unfamiliar pigs were introduced into the pen during the start (n=16), middle (n=16) and end (n=12) of the trial.

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At the start and middle of the trial, pigs tend to consume more water after the moving activity. On average, pigs consumed about 3,890 and 5,226 mL 24 hours before stress was induced at the start of the trial and middle of the trial respectively, increasing to 4,138 and 5,878 mL after the stress was induced. These results may imply that grower pigs consumed more water when stressed. No apparent trend was observed for water consumption towards the end of the trial.

Water Consumption and Mixing

A comparison of average water consumption of pigs 24 hours before and 24 hours after unfamiliar pigs were introduced into the pen is shown in Figure 3. In contrast to the moving activity, water consumption generally decreased 24 hours after mixing unfamiliar pigs into the pen. Pigs consumed an average of about 5,387 mL/day of water prior to the mixing activity; this decreased to 4,738 mL/day 24 hours after mixing occurred. The decrease in water consumption might be due to aggression that occurred after mixing, which subsequently prevented some of the pigs from drinking. This observation may have also caused the no apparent increase in water consumption from the start to the end of each trial.

Infrared Thermography - Handling

During the start and middle of the trial, no considerable change in body temperatures was observed. Towards the end of the trial when pigs were close to market weight, a slight increase in body temperature was observed after the moving activity. Pig average body temperature was 36.5°C before the moving exercise; this increased to 36.8°C after the mixing activity. This minimal change in body temperature could indicate that the moving activity was not strenuous enough to cause a marked change in body temperature of pigs.

CONCLUSION

1. Using the individual water consumption system, it was observed that grower pigs tend to consume more water when stressed. The system also confirmed that water consumption increased as the pig grew regardless of stress induction.
2. As captured by the infrared thermography system, aggression as a result of mixing unfamiliar pigs to the pen caused an increase in the recorded body temperature of pigs. The system also showed that the pigs' body temperature was affected by changes in room temperatures.
3. In this study, installation of the individual water consumption system and infrared thermography system and inducing stress due to moving and mixing had no considerable negative impact on pig production performance.

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(Functional amino acids ... continued from pg.3)
in the gut, reducing the inflammatory response. Therefore, it was hypothesized that the severity and incidence of diarrhea in Salmonella-challenged pigs would be aggravated by high protein diets. However, there was no effect of dietary protein content on fecal score. On the other hand, Salmonella counts in cecal digesta were increased in HP pigs compared to LP pigs. Thus, lowering dietary protein levels may be useful to suppress proliferation of microbial metabolites and consequently minimize intestinal disturbances in commercial settings with enteric problems.

During an immune response amino acids which are utilized for growth in healthy animals, are redirected towards immune support in diseased animals, decreasing their availability for protein deposition. Thus, supplementing functional AA may be necessary to support both the immune response and growth performance, reducing the negative effects of disease on performance.

As expected, inoculation with ST resulted in reduced average daily gain and average daily feed intake in the post-inoculation period compared to CT pigs regardless of dietary treatment (Table 2). However, ST pigs fed the AA+ diet had increased ADG and a tendency for improved feed efficiency (gain:feed) in the post-inoculation period, regardless of dietary protein level. While this performance was still reduced compared to healthy pigs, this shows that functional AA supplementation may provide an additional strategy for reducing the negative impact of disease challenge on animal performance.

In addition to the impact on performance, the supplemental AA profile attenuated the immune response through modulation of acute-phase protein levels in Salmonella-challenged animals. Disease-challenged animals showed increased serum concentration of haptoglobin and decreased concentration of albumin, respectively. However, when fed the AA+ profile, challenged pigs showed reduced overall levels of haptoglobin and increased levels of albumin compared to those fed the AA- profile. These findings corroborate the role of functional AA as regulators of metabolic pathways during inflammation, particularly through regulation of immune response.

Functional AA supplementation also decreased overall shedding of Salmonella compared to pigs fed AA- diets and Salmonella counts in colon were reduced in AA+ pigs compared to AA- pigs. Pathogen shedding is important as infected feces are a major source for cross infection between individual pigs and in a commercial setting reduced shedding could reflect in decreased incidence of natural exposure.

Overall, supplementation of key functional amino acids (methionine, threonine, tryptophan) above requirements appears to be a potential strategy for improving growth performance and health status of pigs exposed to an enteric pathogen.

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