Evaluating Novel Technologies

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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.

Data from the IWCS system showed that grower pigs tend to consume more water when stressed, and water consumption increased as the pig grew regardless of stress induction. 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. Additionally, installing the two novel technologies and inducing stress due to moving and mixing had no considerable negative impact on the pigs' production performance.

INTRODUCTION

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.

MATERIALS AND METHODS

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, 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.

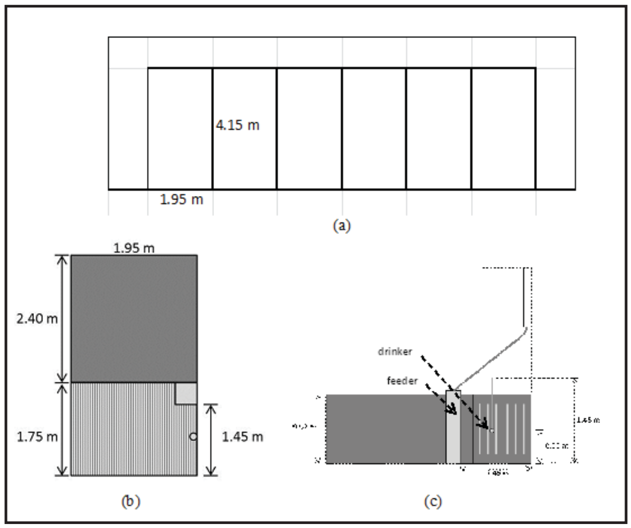

Figure 1. Floor layout (a) of the grow-finish room used in the study. Details of the pen showing the location of the feeder and drinker – top view (b) and side view (c).

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.

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.

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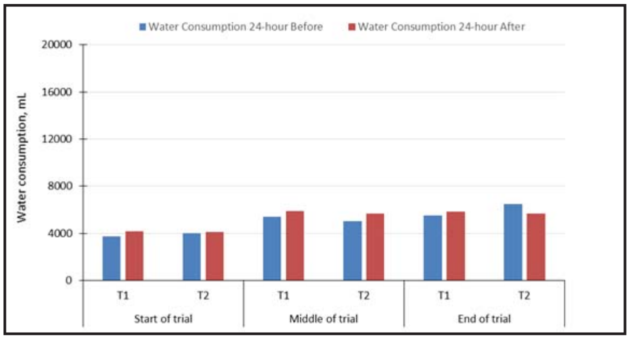

Figure 2. Average water consumption of pigs 24 hours before and 24 hours after the moving activity during the start (n=12), middle (n=12) and end (n=10) of the trial.

Water Consumption, 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.

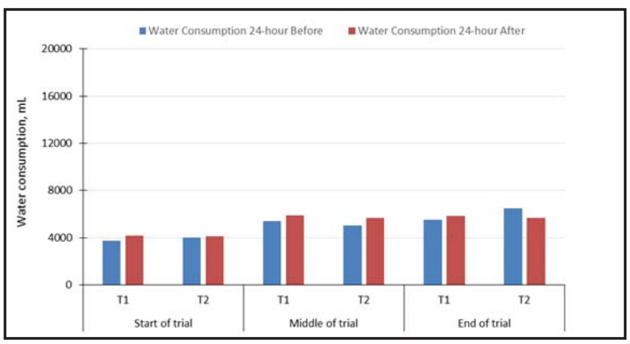

Figure 3. Average water consumption of pigs 24 hours before and 24 hours after unfamiliar pigs were introduced into the pen during the start (n=16), middle (n=16) and end (n=12) of the trial.

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.

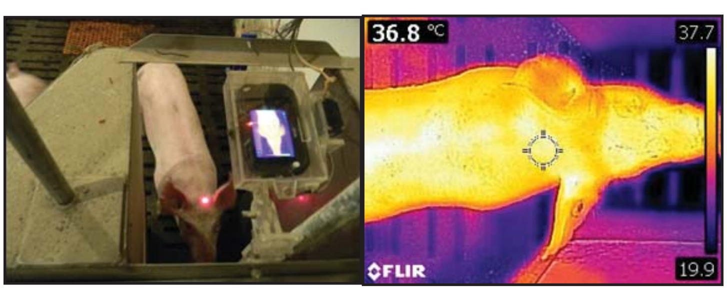

Figure 4. Photo of the C3 camera taking a snapshot of a pig while drinking (A). An IR image of the pig taken by the C3 camera (B).

Infrared Thermography - Mixing

Increase in body temperature after the mixing activity was observed at the middle and end of the trial. At the middle of the trial, the average body temperature was about 37.4°C; this increased to about 37.9°C after the introduction of new pigs into the pen. Similarly, the average body temperature increased from 35.6°C to 35.9°C after the mixing activity at the end of the trial. The increase in body temperature could be due to the level of aggression which seemed to have more impact on body temperature changes than on water consumption.

Table 1. Average daily gain and backfat depth of pigs during the trials.

Parameter	Trial 1	Trial 2	Average ± SD
Average daily gain, kg/day	1.20	1.13	1.17 ± 0.05
Average backfat depth, mm/day	0.09	0.11	0.10 ± 0.01

Pig Performance

Pigs had an average ADG of 1.17 ± 0.05 kg/day and an average backfat depth of 0.10 ± 0.01 mm/day. These values were comparable to the ADG and backfat depth of pigs in typical production barns. No considerable difference was observed in ADG and backfat depth of pigs between the two completed trials (Table 1).

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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