PRAIRIE SWINE CENTRE

2024 Results

Nutrition

» A study supplemented diets with 2% dietary fibre, including both soluble (inulin) and insoluble (lignocellulose) fibre sources, and with soluble dietary fibre:insoluble dietary fibre (SDF:IDF) ratios of 1:1, 1:3, 1:5, and 1:7, found that:

- Supplementing dietary fibre, regardless of the soluble dietary fibre:insoluble dietary fibre (SDF:IDF) ratio, resulted in improved fecal score in newly-weaned pigs, indicating a possible reduction of diarrhea severity with fibre addition.
- Regardless of SDF:IDF ratio, inclusion of dietary fibre resulted in reduced ammonia-nitrogen concentration in cecal and colonic digesta, indicating a positive impact on hindgut fermentation characteristics and reduced production of harmful metabolites
- In comparison to a basal diet, adding dietary fibre with an SDF:IDF ratio of 1:1 reduced concentration of the pro-inflammatory cytokine IL-6 whereas SDF:IDF ratios of 1:3, 1:5, and 1:7 reduced concentration of IL-1B, indicating improved inflammatory status.

» Overall, dietary fibre did not impact superoxide dismutase concentration, an indicator of antioxidant status, when compared to a basal diet, however, addition of dietary fibre with SDF:IDF ratio of 1:5 resulted in increased superoxide dismutase concentration compared to 1:1 and 1:3.

- In a study evaluating the effect of extrusion (E) of round (RPF) and wrinkled pea (WPF) flour, it was found that:
- Amylose content decreased and the starch content increased in RPF and RPF-E compared to WPF and WPF-E. RPF had a lower starch content but a higher proportion of amylose than WPF, regardless of extrusion.
- Ileal and total tract digestibility of starch was higher in RPF than WPF. Extrusion had no effect on ileal digestibility of starch but increased total tract digestibility in RPF. However, total tract digestibility was nearly 100% across pea flour type and extrusion.
- The Shannon index (indicative of microbial diversity) in ileal digesta was comparable between pigs regardless of pea flour type, however, extrusion resulted in a reduction in microbial diversity in WPF compared to RPF. There was no impact of pea type or extrusion on fecal microbial diversity.

Engineering

- Evaluating the application of selected nanomaterials to mitigate mycotoxin contamination in feed grain, showed treatment with magnetic graphene oxide (MGO) nanomaterial had the highest efficacy for reducing deoxynivalenol (DON) concentration in wheat.
- Group housed sows raised under their preferred environmental temperature (8 ˚C) led to lower natural gas usage (58%) and electricity consumption (28%) for heating and ventilation compared to typical temperature setpoints used in commercial sow barns (16.5 ˚C). During the trial, the Treatment room also exhibited lower CO2 levels compared to the Control room, indicating better air quality.
- Initial testing of the original test kit for rapid detection of Porcine Epidemic Diarrhea virus (PEDv) indicated that the test kit can indeed detect Canadian PEDv strains, but modifications are needed to eliminate potential ambiguity in the interpretation of test results, which is based on visual colorimetric changes of test reagents. Sampling and testing procedures when using the test kit were also revised to further enhance the accuracy and consistency of test results.
- Road test results of a mechanically ventilated trailer showed no significant change in blood cortisol levels, and rectal and body temperature of pigs measured at the start and end of each monitoring trip, indicating pigs were not under stress during transport. Microbial counts on trailer surfaces such as the wall, floor, gates, loading ramp and drinkers after standard washing and disinfection procedures ranged from 0 to 4 CFU, which is within the recommended 0 – 10 CFU counts set by Canadian Swine Health Board for clean trailers.
- Evaluation of an electro-nanospray system generating engineered water nanostructures (EWNS) in pilot-scale trials showed that the electro-nanospray system reduced the average reductions in airborne bacteria, dust, NH3, and CO2 were 31%, 42%, 40%, and 43%, respectively. No significant impact on animal performance was reported.
- Electro-nanospray units installed in a trailer assessing the efficacy of minimizing disease spread of pigs during transport showed the middle and end of the monitoring trips, average reductions in culturable bacteria were 40±2% and 16±6%, respectively. Additionally, a 24±2% reduction in dust was achieved during the trip. Reductions in the microbial population on the metal surfaces of the animal compartment were also observed, with 78±15% at the middle and 85±15% at the end of the trial.

Ethology

- Burlap and rope as point-source enrichment attracted the highest frequency and duration of piglet interaction; however, needs to be replaced most frequently, resulting in higher labour and material costs. Scented newsprint also attracted a high level of activity, especially considering it was available for a shorter period as it was used up quickly. The low material cost, lack of issues with the liquid manure system and ability to retain novelty over time made it an effective enrichment.
- When pigs received periodic enrichment (crumpled newsprint on three days per week sprayed with a diluted solution of Phytozen® in water) at 18-21 weeks of age, they had significantly higher average daily gain compared to control pigs that only had a branched chain.
- Pigs that received enrichment in early life had significantly higher carcass weight and lean % compared to control pigs. The 3.8% improvement in carcass lean for pigs given enrichment in early life resulted in an additional $0.89 per carcass.
- Effect of periodic enrichment on ease of handling, behaviour and skin lesions.
  - Enriched pigs took less time to move from the grower to the finisher compared to control pigs who only had a branched chain.
  - Enriched pigs fought more at mixing during weaning, but with less severe skin lesions compared to control pigs. In later life, enriched pigs fought less than control pigs and spent more time interacting with enrichment and at the feeder, in addition to less severe ear and tail lesions.
  - In terms of aggression, enriched pigs performed more enrichment-related aggression than control pigs, but control pigs performed more overall aggression and pen mate-directed manipulation both in the early and late stage.
  - Overall, enriched pigs had less severe lesions with the effect most apparent when they received enrichment both in early and later life stages. Pigs enriched during later life had significantly reduced tail bite damage compared to those who did not receive enrichment during later life.
- Rearing piglets with modified management in the early life environment (farrowing and nursery) by providing chewable materials, extra space, and calm human contact resulted in improved average daily gain, fewer tail bitten pigs (end of the nursery) and were calmer with human handling.
- Manipulating the early life environment by giving chewing materials, extra space, and calm human contact supports better adaptability in the pigs and can help to shape behaviour away from damaging behaviours. However, the treatment, especially of chewable materials, should continue to be given into later life, thus meeting the Code of Practice, to sustain a reduction in tail biting.
- Play behaviour can be successfully promoted in grow-finish pigs through intermittent timed events delivering novel enrichment (3x/week). Play could be sustained over 10 weeks suggests it is a rewarding and motivating experience.
- Play occurred with the expression of behavioural indicators (ear and tail postures, vocalization), associated with a positive affective state, providing further evidence play is positive for pigs.
- Rearing pigs with regular intermittent play opportunities showed improved PRRSV resilience with less sickness behaviour, reduced clinical symptoms, a lower monocyte response and improved growth rate and feed efficiency throughout the challenge.
- The main variation in on-farm animal-based welfare indicators arose from the barn, batch, pen, seasonal affects, observer, floor, pig age and the number of pigs per pen. Preliminary analyses of the relationship between on-farm indicators and carcass welfare indicators in tail bite and skin lesions show logical associations between the prevalence of scores recorded on-farm and at slaughter. For example, every count of severe tail lesions (score 3) on carcasses is associated with a 4% increase in severe tail bites on farm and a 24% increase in moderate tail bites on farm, and a decrease in mild tail lesions (score 1). Similar patterns are emerging in the analysis of skin lesions, showing value from this data as a herd diagnostic tool for welfare assessments.
- A computer vision model has been developed that can detect, ID and track and extract images of the lateral and dorsal sides from the same carcass and detect and extract anatomical regions of the carcass: rump (including the tail), mid-section and head area (including ears and shoulder). The model operates in real-time on north American line speeds with high accuracy, precision and recall results (>90% for all).

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