PRAIRIE SWINE CENTRE

2025 Results

# Engineering

- Magnetic graphene oxide (MGO) nanoparticles demonstrated to be the most promising DON-binding agent for reducing mycotoxin contamination in feed grains in swine diets. The application of MGO nanoparticles is similar to conventional DON binders, which is convenient for pig producers.
- Nursery pig trials showed the addition of MGO in diets had no adverse impact on their average daily gain, feed intake and gain-to-feed ratios.
- The use of MGO nanotechnology to reduce DON contamination is currently not cost-effective due to the high cost of commercially available MGO nanoparticles.
- Assessment of productivity and performance of sows raised under their preferred environmental temperature (8 ˚C) showed that group housed sows did not show any adverse impact on sow physiology and overall performance.
- Raising gestating sows at their preferred environmental temperature led to lower CO2 levels, natural gas usage (53%) electricity consumption (39%) for heating and ventilation compared to typical temperature setpoints.
- Results from chamber trials with grower finisher pigs indicate that grower-finisher pigs can tolerate temperatures as low as 10.5°C.
- A rapid test kit for Porcine Epidemic Diarrhea virus (PEDv) has been confirmed to be able to detect the North American PEDv strains. The rapid test kit should yield results in about 30-45 minutes and would cost about CAD$10 per test, with results subject to confirmation through PCR testing. Additional refinements are needed to finalize the version of the modified test kit that would be ready for commercialization.
- A comprehensive guide for users of the modified kit has been developed, incorporating guidelines from PEDv surveillance programs in various Canadian provinces to ensure adherence to government requirements. The developed test kit is intended to be a cost-effective biosecurity tool that will allow the target users (i.e., pig farmers, swine veterinarians) to conduct wider screening of suspected sites and animals prior to outbreak of the disease, as well as for testing critical sites and surfaces to confirm the effectiveness of clean-up and control measures implemented to eradicate PED from a barn after disease outbreak.

- A pilot-scale study involved feeding pigs with increasing levels of dried Saskatoon berry pomace was conducted; a) Diet A (control, fed a basal diet), b) Diet B (basal diet plus 5% pomace), and c) Diet C (basal diet plus 10% pomace). Diet C had an improved ($p < 0.05$) total dietary fiber and insoluble dietary fiber digestibility while Diet B had higher ($p < 0.05$) total nitrogen loss compared to Diet A. Both Diets B and C had higher ($p < 0.05$) fecal nitrogen loss compared to Diet A. Overall, a basal diet with 10% pomace (Diet C) improved total fiber and insoluble fiber digestibility and repartitioned nitrogen losses.
- A study focused on the development an advanced artificial intelligence (AI) technology with machine learning. Initial work focused on individual pig identification. Using the publicly-available JD dataset, the model successfully identified 30 different pigs with an accuracy of 99.80%. The confusion matrix revealed minimal misclassifications, while heatmap visualizations showed the model correctly focused on key facial features during prediction. This system can accurately and efficiently recognize pigs under actual barn conditions.
- Additional project activities focused on monitoring and detecting pig behaviors through object detection and pose estimation techniques. The YOLOv5 model achieved 93.8% accuracy in detecting posture and locomotion behaviors, and 92.5% accuracy in detecting feeding and drinking behaviors. Meanwhile, HRNet model applied to the AP-10K dataset demonstrated significant accuracy in locating key points on pig body parts, highlighting the strength of pose estimation for behavior analysis.

# Ethology

- Selecting pigs at 8 weeks of age based on a Thermal Efficiency Index (TEI) into high and low TEI groups showed high TEI pigs exhibited a slower growth rate compared to low TEI. No significant differences were observed between TEI groups in terms of average daily feed intake (ADFI) or feed efficiency (gain-to-feed ratio, G:F).
- A correlation analysis between TEI and feed efficiency (G:F) from 12 to 20 weeks revealed a decreasing relationship over time. Low TEI pigs had greater weight and fat content at slaughter, however, there was no effect of TEI on loin depth. The lean yield percentage tended to be lower in Low TEI pigs than in high TEI pigs.
- Pigs subjected to a handling stressor at 12 weeks of age receiving a 3% electrolyte solution (DSS 500) exhibited greater changes in TEI compared to the control group (no electrolyte). However, neither the TEI category nor DSS treatment had a significant effect on pig behaviour during handling.
- Pigs subjected to a mixing stressor at 16 weeks of age (mixed with unfamiliar pigs for two hours) receiving the DSS 500 electrolyte solution exhibited greater changes in TEI compared to control pigs. Control pigs had significantly more head lesions and tended to have more mid-body lesions compared to DSS-treated pigs. TEI category also tended to influence hind-end lesions, with low TEI pigs exhibiting less change in lesion scores than high TEI pigs.
- TEI can be used to identify pigs with better performance in terms of weight gain and carcass yield.
- Piglets show preference for a large pellet creep (4cm pellet, off-the-shelf high-fibre pellet feed) and crumble meal starter diet, but the preferred creep feed did not improve piglet pre-weaning or post-weaning growth or blood parameters at weaning.
- There was a slightly higher likelihood for reduced creep wastage by the piglets who received mixed creep of large pellet and standard creep.
- Piglets receiving only large pellet creep had higher red cell distribution width and piglets who were provided with mixed creep tended to have higher total iron binding capacity compared to those with standard creep or no creep.
- The blood profiles of large piglets showed a clear sign of anaemia and iron deficiency despite receiving iron supplementation after birth. Large pigs receiving pellet creep had lower hemoglobin and hematocrit, and higher red cell distribution width at weaning.
- Comparing commercial farm data from 2021 to 2023 (6 group housing vs 6 stall housing), indicated that group housed barns had worse conception rate and repeats than stall housed barns, especially among lower parity sows.
- Group housed sows recorded lower stillborns as seen in previous studies.
- Providing modified management (farrowing, nursery) through chewable materials, extra space, and calm human contact resulted in improved average daily gain, and fewer tail bitten pigs. Pigs given modified management performed fewer oral manipulations of the ears, tail and face of pen mates in the grow-finish.
- Testing the response of pigs to feed reintroduction after a 16 hour out-of-feed event at 20 weeks of age, skin lesions to the front of the body and tail lesions were lower in control pigs than in pigs that had received early life management changes in either the farrowing room, nursery or both.
- Rearing pigs with regular intermittent play opportunities showed improved resilience to PRRSV with less sickness behaviour, reduced clinical symptoms, a lower monocyte response and improved growth rate and feed efficiency throughout the challenge.
- There was a higher hair cortisol:DHEA ratio in pigs with lameness pre-weaning in hair reflecting the farrowing period, but not in hair collected thereafter. There were no differences seen in hair hormone concentrations in pigs raised in different rearing environments (enhanced: containing manipulable materials, extra space, and positive human contact vs standard environments), suggesting these treatments may not drastically alter stress, and also that the environments tested were not resulting in significant changes in hormones over the populations.
- A computer vision model developed 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). Training the model to identify and quantify welfare lesions (skin lesions, tail length, tail lesions, hernia) is completed, and a second patent application is being applied for to cover the lesion detection algorithms.

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For more Information, please contact
**Prairie Swine Centre**
Box 21057, 2105 8th Street East
Saskatoon, Saskatchewan CANADA S7H 5N9
Phone: (306) 373-9922
www.prairieswine.com

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