Advancing swine welfare practices to empower your industry: What the Chair in Swine Welfare is doing for you

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Martyna Lagoda, a post-doctoral fellow at the University of Saskatchewan working for the NSERC Industrial Research Chair in Swine Welfare under the supervision of Yolande Seddon, gave an update at the 2024 PSC Producer Meetings on the research results and tools developed by the Chair in Swine Welfare for the Canadian swine industry. Martyna started her presentation by explaining that the Chair program was put in place in 2018 as a strategic initiative to provide a proactive rather than reactive approach to swine welfare pressures, with total funds of $2 million provided by 14 industry partners, the Federal government, and the University of Saskatchewan. The Chair created a team of highly trained individuals with expertise in animal welfare and an understanding of the needs of the pork industry to develop practical solutions to welfare challenges. In addition to the Chair program, the team has tackled a breadth of research areas from sow management and grouping strategies, lifetime welfare of growing pigs, pain management, welfare assessment and biomarkers, environmental enrichment, to swine transport.

The Chair program was designed with two overarching objectives, which contained four major research goals:

1) Investigate beneficial pathways to support the pig in fully-slatted systems:
- Goal 1: understand how early-life management contributes to pig robustness, sociability, and welfare in the growing pig;
- Goal 2: identify if promotion of play behaviour can increase physiological and psychological robustness and confer benefits to resilience and productivity of pigs.

2) Develop tools to monitor and measure welfare:
- Goal 3: identify and validate biological markers for objective assessment of pig welfare;
- Goal 4: understand the value of carcass assessment to inform on animal welfare on-farm and during pre-slaughter handling.

Early-life development is critical to welfare and to how pigs cope with stress later in life. Goal 1 investigated optimization of welfare in fully-slatted systems by modifying early-life management in farrowing and nursery to support an improvement in lifelong welfare outcomes and productivity of pigs. Management modifications included provision of chewable materials to support chewing and rooting (natural behaviour expression and preparing for ingestion of feed), positive human contact to reduce fear, and extra space to develop social behaviours. Pigs receiving these modifications in both farrowing and nursery had improved average daily weight gain in the nursery and throughout life. They also had reduced skin lesions upon mixing suggesting improved social skills and improved handleability likely due to reduced fear of humans. There were fewer bitten tails in the nursery phase when pigs received early-life management modifications. Overall, results show improved welfare and suggest lower associated stress levels, resulting in improved weight gain and less damaging behaviour in pigs that received early-life management modifications.

Goal 2 is based on supporting positive welfare through the provision of play opportunities. Historically, producers were asked to reduce negative experiences in the pigs' lives such as castration and tail docking pain. Nowadays, it is increasingly recognised that caring for animals must also foster positive experiences: promoting positive human-animal relationships, supporting pigs to form social bonds, and providing play opportunities as a rewarding experience. To determine whether play can be supported in intensive production systems, and whether it confers benefits to resilience and productivity,

pigs were reared with daily play opportunities (enrichment and extra space) from birth, and every second day during a disease challenge (PRRSv infection) starting four weeks post-weaning. When mixed for transport and throughout the disease challenge, play pigs had reduced skin lesions suggesting reduced aggression. Play pigs were more active before and during the infection period demonstrating less sickness behaviour. Play pigs were less likely to experience respiratory distress (probability: 35% vs control pigs: 91%). Play pigs had higher daily weight gain in the second half of infection than control pigs (Figure 1). The results show that play behaviour can be promoted in intensive production systems and can offer a promising tool to support good welfare, resilience, productivity, and animal care practices that align with consumer values, supporting a positive image of pork production.
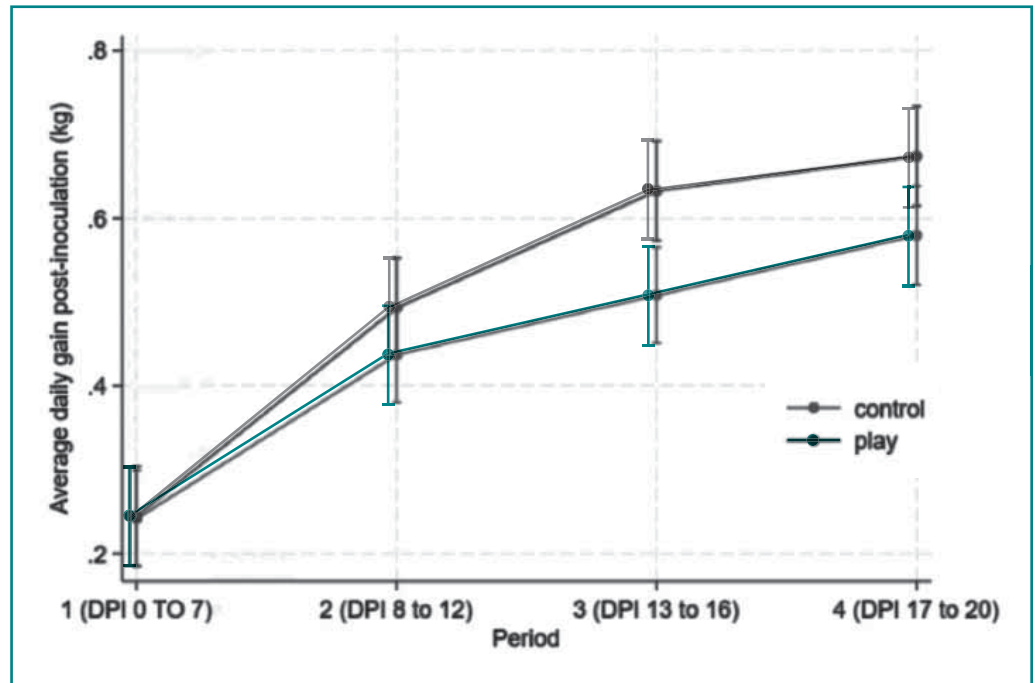

Figure 1 Comparison of average daily gain during the infection period (DPI: days post infection) in control and play pigs. Data are presented as predicted mean and 95% confidence intervals. Star indicates a significant difference between treatments.

Biomarkers of stress and welfare in pigs are currently lacking but are needed to support objective comparisons of welfare in different production systems and in individual animals. Cortisol and DHEA found in hair, as well as their ratio were validated as a measure of chronic stress from which to evaluate welfare in Goal 3. These hormones are deposited from the blood stream into the hair shaft as it grows, and their levels are analyzed in shaved hair to inform on stress levels experienced by an animal retrospectively, over the period of time represented in the hair growth. Results from a collaboration with Iowa State University show that cortisol and DHEA-S levels in hair are a heritable trait, and good potential biomarker candidates to select pigs that are better able to cope with stress. Using the ratio of cortisol to DHEA, the team identified lame piglets had a higher cortisol:DHEA ratio, indicating a major physiological stress and potentially a lower stress coping ability, and evidence that the ratio of cortisol to DHEA shows value as a tool for individual pig welfare assessment.

Goal 4 evaluated the value of carcass assessment to measure welfare on-farm and during pre-slaughter handling. This project was conducted in response to the industry's need to collect high-quality welfare data that is quantifiable and objective, in a practical way that can complement data from on-farm welfare assessments. Welfare data allows the industry to improve transparency in reporting and support public trust in the quality of Canadian pork. It also helps to benchmark on a national level and to track the success of on-farm management practices in supporting continuous improvement. The project investigated whether animal-based welfare indicators on carcasses are related to animal- and resource-based welfare measures on-farm and in pre-slaughter handling, to provide a herd diagnostic tool. The second objective was to automate the scoring of carcass lesions using computer vision (artificial intelligence). A camera

was installed in an abattoir at a turn on the line, post scalding and dehairing, to permit viewing of lateral and dorsal sides of the carcass. Footage was analyzed by two observers and scored for skin lesions (fresh: measure of recent aggression, i.e.: during transport, and old: aggression on-farm), tail length (reflective of on-farm docking practices), tail and ear lesions, hernias, frostbite, human handling lesions, loin bruises and bursitis. Data showed that 64% of tails are docked very short, likely as a measure to curb tail biting. However, mild tail biting lesions were still recorded on ~40% of pigs, providing feedback on the effectiveness of current management practices to curb the risk of tail biting. Data also support the predictive value of carcass indicators as a herd diagnostic tool for welfare on-farm and during pre-slaughter handling. The automated scoring system can identify and track carcasses, extract lateral and dorsal sides, and carcass sections such as ears, tail, shoulder, mid-section, and rump with high accuracy. The system is currently being trained to identify and quantify lesions of importance to welfare. Overall, the automation process has been successful allowing for commercial level uptake.

In conclusion, the NSERC Chair in Swine Welfare provided information and tools that the industry can employ to promote Canada as a leader in pork production and quality, and to elevate Canada's options and conversations on animal care. The Chair is currently up for renewal and conversations are now taking place regarding future directions. Moving forward, the team is now looking to support industry implementation of goals 1, 2 and 4 in commercial production systems this summer. Starting this fall, the team will begin work on addressing sow mortality by identifying risk factors and providing advice on mitigation. Please get in touch with Martyna (martyna.lagoda@ usask.ca) if you wish to participate in any of these commercial trials.