

A new method for improving animal welfare oversight: routine monitoring of pig carcasses

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Introduction

In an age of increasing consumer concern over the welfare of animals raised for consumption, collecting data that can provide insight on the welfare of animals raised in production systems is valuable for an industry to demonstrate and assure customers that specific standards are maintained, and to monitor progress in animal care for continual improvement of practices. Animal care verification requires the accurate

evaluation and quantification of animal welfare. Assurance schemes typically rely on farm audits for animal care verification, which are time consuming, incur cost for the producer and can pose a biosecurity risk. Consequently, animal care audits are performed infrequently and commonly by the herd veterinarian, which can make the audit less credible if there is a conflict of interest. A strong, credible system for animal care evaluation is important to support transparency and public trust in practices. One approach to increase the consistency and accuracy of monitoring animal welfare standards could be the monitoring of pig carcasses at slaughter for indicators of importance to animal welfare.

animals, regardless of the production system (Whay et al. 2003). The evaluation of animal welfare indicators on swine carcasses at slaughter could offer a cost-effective method for the routine evaluation of swine welfare on farms supplying pigs to abattoirs within Canada.

The NSERC Industrial Research Chair program in swine welfare, led by Dr. Yolande Seddon and developed in collaboration with 14 industry partners representing Canadian producers, processors and swine genetics company contains four overarching research goals which focus on emerging questions in swine welfare. The broad objective of Goal 4 is to evaluate the value of measuring animal-based indicators of welfare at slaughter to determine if this could be a viable method for a routine animal welfare monitoring system (Fig. 1). Specific objectives of this research are to determine:

- Whether measuring animal-based indicators of welfare on swine carcasses can accurately inform about the welfare of swine on-farm and during pre-slaughter handling.
- The relationship between animal-based indicators on carcasses and economic loss to understand the economic consequence of these lesions to the producer and meat packing industry.

Animal-based indicators of welfare are quantifiable characteristics directly measured on the animals, such as behaviour, body condition, health (EFSA, 2012), and are reflective of what the animal has experienced. Animal-based indicators are scientifically validated to provide meaningful information on animal welfare (EFSA, 2012) and provide a powerful and consistent method of evaluating the wellbeing of groups and individual

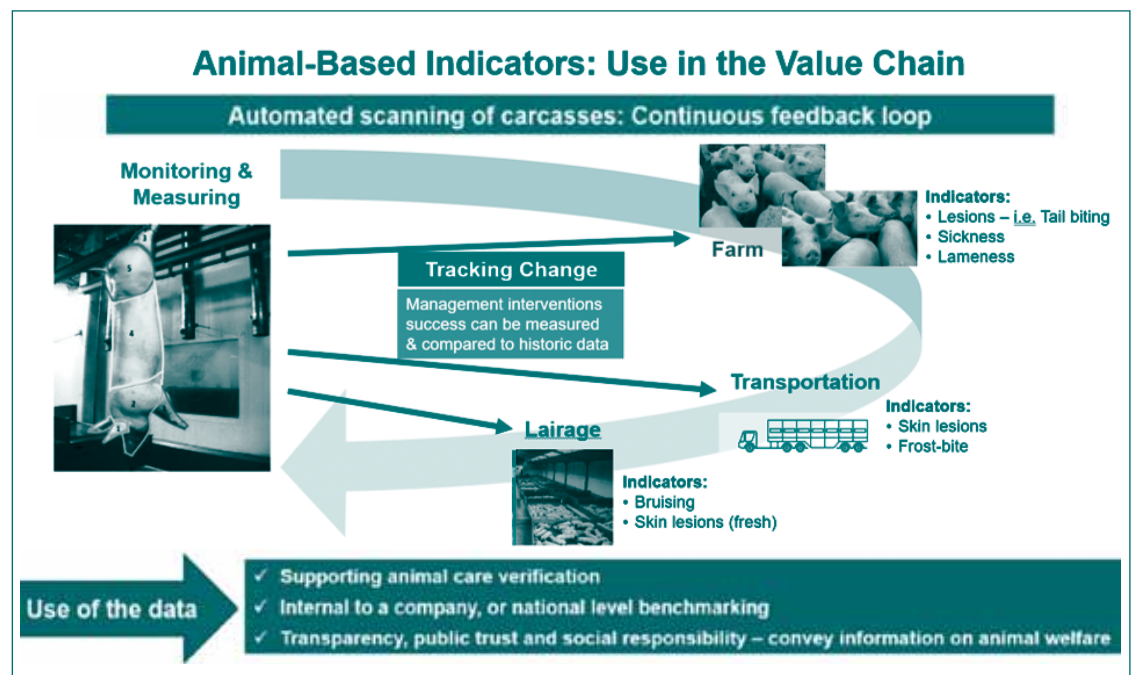


Figure 1. Overview of monitoring animal-based indicators of welfare on carcasses at slaughter, linking measures to stages of production to support routine monitoring. Schematic author: G. Miguel-Pacheco.

Due to the large number of pigs slaughtered within Canada, the routine monitoring of indicators on carcasses would need to be automated to be a viable tool for the industry. Researchers Giuliana Miguel-Pacheco, Yunayue Wang and Yolande Seddon from the Western College of Veterinary Medicine have collaborated with Prof. Seokbum Ko and Postdoctoral research assistant Juan Yeppez from the Department of Electrical and Computer Engineering to determine:

- iii) The ability to automate the evaluation of swine carcasses through training computer-based models to detect, identify and quantify animal-based indicators of welfare on carcasses.

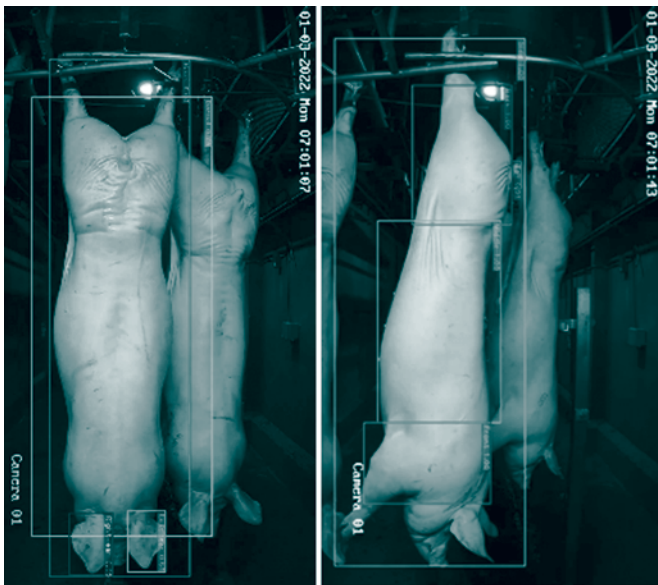


Figure 2. Computer-based system identifying different body regions on pig carcasses passing by a camera in the abattoir. Body regions of interest for animal welfare assessment: Dorsal side: ears and back; lateral side: shoulder, side, hindquarters, tail.

Research progress

Over a period of five months five maternity, 10 nursery and 10 finisher barns in Western Canada were each visited three times to perform repeat animal care assessments. At each visit a defined number of animals at each stage of production were randomly sampled and assessed for 43 animal-based indicators (i.e. tail-biting, skin lesions, hernias), and farms were assessed for five environmental (i.e. ventilation, dust level), and six resource-based indicators (i.e. floor type, enrichment). On-farm data collection utilised a sample size designed to pick up indicators if they were present in the population at 1% prevalence. Per finisher barn, at least one transport load of pigs originating from a batch of pigs assessed on farm, was followed to slaughter. At each finisher barn, the loading of the pigs onto the transport trailer was observed for animal-based and human-animal interaction indicators (i.e. prod use, the pig's reaction to handling). Each load of pigs followed from the finisher barn was tracked to slaughter where the assessment continued through the unloading, lairage and pre-slaughter management, utilising the abattoir video footage for observations. A video camera located on the slaughter line collected footage of the pig carcasses as they pass the camera after scalding and dehairing. Images of the carcasses

are assessed for 10 animal-based indicators of welfare that relate to animal-based injury (i.e. tail biting), environmental (i.e. injury, frostbite) and human-handler (i.e. bruising from tool use). Carcass data per load sent to slaughter, including cut outs is being collected.

Training computer models for automated assessment of indicators

A camera was set up in one Western and one Eastern abattoir to collect images of pig carcasses on the slaughter line after the process of scalding and dehairing. Images of pigs passing by the camera during abattoir hours of operation are sent to the University of Saskatchewan every six weeks, allowing the collection of a bank of images spanning all four seasons. Images of the pigs are reviewed through a collaborative effort by researchers at the Western College of Veterinary Medicine and the Department of Computer Engineering and the images marked up to identify specific criteria: one lateral and the dorsal side of each pig, different body parts of the pig (Fig. 2) and then to identify specific lesions of interest.

On-farm data collection concluded in summer 2022, and data processing continues into fall and winter 2022/2023. Results will be available in early to mid 2023.

Industry implications

The scientific knowledge delivered from this research project will enable the Canadian swine industry to determine whether the assessment of animal-based indicators of welfare on swine carcasses at slaughter can be a tool to monitor pig welfare at different parts of the production chain. Evaluating the ability to conduct camera-based assessment of animals at slaughter, paves the way for the development of automated animal welfare monitoring as a tool for the Canadian swine industry. Regular and automated assessment of animal welfare at slaughter from reviewing carcasses will help to improve the robustness and reliability of the Canadian swine industry's animal care program, may help to reduce the number of on farm audits and can also provide a mechanism routine data collection and feedback on findings at different levels of the production chain for continual improvement.

References

- EFSA Panel on Health and Welfare (AHAW) (2012) Scientific Opinion. Statement on the use of animal-based measures to assess the welfare of animals. EFSA Journal. 10 (6): 2767.
- Whay, H.R., Main, D.C.J., Green, L.E. and Webster, A.J.F. (2003) Assessment of the welfare of dairy cattle using animal-based measurements: direct observations and investigation of farm records. Veterinary Record. 153, 197-202.

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