



Evaluating the impact of early life management of piglets on lifetime welfare and performance

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Introduction

It is widely known that getting newborn piglets off to a successful start in life is key for increasing the chances of lifelong health and productivity, and the early life management of the pig is focussed on ensuring good nutrition, accommodating temperature requirements to avoid chilling and maintaining good health. But how much consideration is given to how the physical and sensory environment

and experiences in the weeks of early life could impact the behavioural development of the pig, transition at weaning and their overall resilience to stressors and animal welfare?

The first 12 weeks of a pig's life is a period where rapid brain development occurs, with the greatest increase occurring from the period of birth to four weeks of life (Conrad et al. 2012).

This rapid growth suggests a critical period of development, and what a pig experiences during this period of time will shape how an individual responds to subsequent life events, leading to consequences for the overall health and resilience of the pig, welfare and productivity. Management strategies that provide targeted inputs during this sensitive period of development could lead to improvements in the behavioural development, affective state, and the subsequent response of the pig to stressors which could result in a more resilient animal, with better health and welfare outcomes.

Evaluating the effect of management strategies early in life to impact the long-term welfare and resilience of the pig in fully slatted systems is the objective of one of the four research goals that constitute the Natural Sciences and Engineering Research Council (NSERC) industrial research Chair research program in swine welfare. Led by Dr. Yolande Seddon and developed in

(Evaluating the impact of early life... cont'd on page 2)

Inside This Edition

Investigating novel biomarkers of welfare in swine..... 4

Can hybrid rye replace wheat in swine diets?..... 8

A new method for improving animal welfare oversight: routine monitoring of pig carcasses 10

Personal Profile 12

Program funding provided by



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Ministry of
Agriculture

(Evaluating the impact of early life... cont'd from page 1)

collaboration with 14 industry partners representing Canadian producers, processors and a swine genetics company, the program contains four overarching research goals which focus on emerging questions in swine welfare. Over a series of experiments, the research of Goal 1 is to determine the contribution of early life management to resilience, sociability and welfare outcomes in the growing pig. Broadly, this work will determine if there are beneficial and additive effects to targeted management of the pig within the first four to 12 weeks of life to shape the behavioural and stress resilience of the pig, and the consequences for lifetime pig welfare and performance. This work is important to uncover ways to optimize welfare and performance in the fully-slatted system, and could contribute to supporting other industry goals such as reducing antibiotic use, to which the fundamental resilience of the pig is important for success.

As part of our study design, we will follow the pigs from birth to slaughter. Provided that a marked improvement on the stress resilience, performance, or welfare of the pig is seen, the treatments implemented in the study could potentially serve as functional modifications to swine housing in production settings.

What we did:

One longitudinal trial has been run to evaluate the interactive effects of specific early life management strategies designed to target specific areas of pig development that will support improved welfare and productivity outcomes. Before implementing any enrichments and management strategies in production systems, it is imperative to know if these enrichments will make a worthwhile improvement to both yield and pig welfare. Trying to pinpoint the best period in development between the two critical windows in the pig's life is important so that the approach can be most effective. Thus, we aimed to determine if targeted management between birth to four weeks or four to twelve weeks will generate the most profound effects on the pigs' welfare and growth, or if both periods combined will create an additive effect. Following pigs from birth to slaughter, the long-term effects on the pig can be determined, also enabling a cost benefit analysis to be conducted to determine if there are worthwhile benefits for production.

Forty litters of pigs have been studied originating from four farrowing batches. In the farrowing room, 50% of pens were reared as standard, with no additional management inputs, and treatment litters receive three management changes. Three management changes that have been shown to improve welfare and decrease adverse behaviours are manipulable physical enrichments, provision of extra space pre-weaning, and positive human contact. An interactive approach of providing the combination of these adjustments was taken to determine if we can understand the maximum benefits to be had from this approach, which could lead to later questions on what could be the most pertinent management adjustments to make.

1) Chewable enrichments: in the form of cotton rope and burlap strips hung in several locations in the farrowing pen, serve to satisfy and develop their innate foraging motivation, support the development of chewing (mastication) ahead of solid food intake, and provide an outlet for expression of oral behaviours towards the enrichment, instead of towards the sow or littermates. Rope and burlap are also added to the creep feeders to entice the piglets and bring their attention to the



creep, a simple approach to add functional enrichment which has previously been shown to stimulate exploration at the creep feeder pre-weaning, increasing feed intake and weight gain post weaning (Middelkoop et al. 2019).

2) Extra space per pig: farrowing pen space increased from 4.32m² to 6m², increasing the room for the expression of social behaviours and play. Room to express these behaviours pre-weaning when they start to develop has been shown to reduce aggression post-weaning, and also helps to reduce overcrowding for large litters.

3) Neutral human contact: Specific handlers caring for the pigs took time on three occasions per week when checking pens and changing enrichment to enable piglets to sniff and interact with the human handler. This neutral human interaction is given to acclimate the pigs to human presence, reducing fear of humans and reduce the negative associations that may have arisen from previous handling and processing.

“early life experience of piglets before and around weaning can influence their behavioural adaptation and the development of positive or negative behavioural characteristics”

These manipulations can prepare the pig for close human contact during handling, shape the development of oral-nasal-facial behaviours, reducing negative behaviour to pen mates, and improve social behaviours.

Piglets were weaning at 26-28 days of age and new pen groups formed with litters mixed within treatment. In the nursery both treatment pigs and the control pigs were further divided into two more groups with 50% of pens received a management switch (Fig. 1). This resulted in 50% of treatment pens receiving no further interventions post weaning, and 50% receiving continued management interventions until 12 weeks of age. Simultaneously, 50% of control pens remained as control post weaning, and 50% of control pens started to receive the

management interventions from weaning until 12 weeks of age. This experimental design enables the effect of delivering management interventions separately at each of the sensitive periods of development (birth to four weeks, and four to 12 weeks), or to explore an consistent management across both periods. After week 12 of age, all enrichment management interventions were stopped, and pigs were reared to slaughter in standard husbandry conditions, with the provision of standard enrichment of rope changed once weekly. Pigs remained in the same pen groups after weaning until slaughter.

This longitudinal study is being purposefully used to answer several key research questions by layering measures across the pigs, building up a solid body of information that can support greater understanding of the separate and interactive effects, and the development of common welfare challenges:

A first research question is how the early life management influences the behaviour development, and subsequent indicators of welfare outcomes and performance.

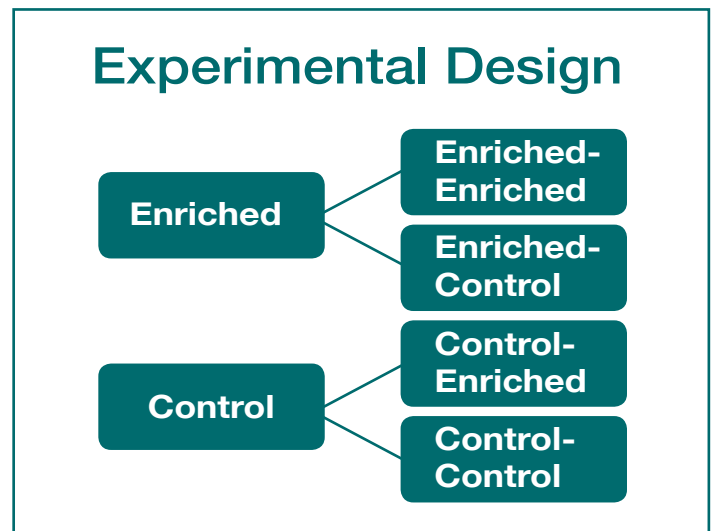
For this, repeated measurements are taken from the pigs throughout their life from birth to slaughter at each stage of growth to provide information on how the early life management has influenced various aspects of pig development of important to welfare and performance. Specific measures include: the development of oral-nasal-facial behaviour and its relationship to tail-biting in the pigs later in life; skin lesions as a measure of acute and chronic social aggression; fear of humans and handleability during moving and a weigh crate handleability test. Productivity measures include growth rate, feed conversion efficiency, carcass composition data from slaughter records. The repeated nature of these measures will provide a timeline of the magnitude and length of effects, if any, throughout the pigs' life in the production system.

A second research question is how the early life management has influenced the resilience of pigs to production relevant stressors. For this the transition of piglets at weaning has been studied, utilising specialised IVOG feeders (Hoko Farm Group, NL), the individual feed intake of piglets at weaning has been recorded and is used as a measure of the speed of transition onto solid food at weaning. At 17 weeks of age, pigs underwent an out of feed event stress test, designed to induce both acute and chronic forms of stress (O'Driscoll et al. 2013) and potentially stimulate a tail biting outbreak. Pigs were observed for behaviour before, during and after the out of feed event at refeeding, created by removing feed from feeders for a period of 18 hours. Saliva was also collected from pigs to measure physiological responses to the stressor, and the recovery. Oral behaviours and early life stress are also intimately tied with gut health and the gut-brain access. Studies have shown a possible link between abnormal gut development and behaviours like tail biting. Promoting early feed intake, such as from creep in the farrowing phase to help the transition onto solid feed is important. A third objective is to determine the relationship between the early-life environment, creep-feed intake pre-weaning, gut inflammation at weaning, and subsequent development of oral-nasal facial behaviour and tail biting later in life. A sub-sample of litters had blue dye added to the creep feed pre-weaning and were but swabbed to identify the number of piglets in the litter that have and have not eaten creep pre-weaning. The individual animals are tracked post-weaning, with fecal samples collected in the days

following weaning for measures of gut inflammation, and the animals followed to slaughter with regular observations for the development of tail biting; being both a bitten victim and becoming a biter.

Implications:

The early life experience of piglets before and around weaning can influence their behavioural adaptation and the development of positive or negative behavioural characteristics that have significant, and likely lasting, implications for welfare, stress resilience and production performance. This research will determine whether providing targeted adjustments to management at specific sensitive periods in the piglets' development, could offer a simple and effective method of benefitting the welfare, health and productivity of pigs. Working within the context of the pig's development and physiology could potentially provide an avenue for optimizing cost effectiveness and benefits of enrichments and can identify management strategies to help optimize welfare within modern fully-slatted systems of production. Supporting the overall resilience of the pig will simultaneously help to support goals to help reduce antibiotic use and support production in the face of common stressors experienced in the production system. The longitudinal approach offered by this work will also contribute knowledge towards uncovering the cost benefit of such approaches and also contribute knowledge towards understanding the development of complex welfare challenges, such as tail biting.



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