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Just when we thought the industry was losing its luster

The Centre's Review team left to right: Lee Whittington, Gord Zello (Department Chair Pharmacy and Nutrition), , Rodger Campbell (CEO CRC Australia) and Harold Fast (Founder Fast Genetics)

Lee Whittington
B.Sc., MBA, P.Ag.
President/CEO
Prairie Swine Centre

In 1992 I was being interviewed for a position at the new Prairie Swine Centre, I remember vividly one of the questions following my presentation to an audience of producers and academics – "Do you think that there is any improvement left to discover in pork production". My answer probably wasn't as detailed as my questioner was seeking but contained words to the effect of "we've only begun" and "there is this window of opportunity where Canada can to take a larger place in a North American marketplace". What happened the next two decades has been nothing short of amazing, for example:
Pig performance 1990 vs today:

- National sow herd is 30% larger than in 1990 (in spite of the declines of past 5 years)
- Number of pigs/sow/year increased 30%
- Market weights increased 15-20%

(Just when we thought ... conti'd on page 7)

The overall response of piglets to phase one diets during the first two weeks in the nursery is not affected by creep feeding or weaning weight.


Denise Beaulieu, Ph.D. Janice Shea, BSA.
Prairie Swine Centre

Average litter size on swine farms in Canada has increased from approximately 12.3 to 13.7 piglets in the past 5 years. Further improvement is expected and is an important determinant of the competitiveness of the industry in Western Canada. However, research conducted at PSCI showed that as litter size increased from 8.4 to 15.4 pigs born alive, average birth weight decreased by approximately 250 grams, or almost 40 grams per additional pig. The number of pigs less than 850 grams increased from 0.2 per litter in the small (5 to 12 piglets) litters to almost 1 per litter in the largest (16 or more born alive) litters. It is apparent that as litter size continues to increase it is crucial that these small pigs survive and go to market or the benefits of larger litters will not be not realized.

The period immediately post-weaning is characterized by problems such as low feed consumption, poor growth rate, and increased incidence of diarrhea in the piglets. Reducing the interval between weaning and resumption of feed consumption can mitigate these issues, thus the piglet must be encouraged to begin consuming solid feed upon entering the nursery. Traditionally the feed offered immediately post-weaning is very high quality, containing animal by-products providing the piglet with "extra-nutritional" benefits including appetite stimulation. This feed however, is very expensive and producers are questioning if it is necessary for all piglets.

This experiment was designed to determine if the requirement for a complex dense feed immediately post-weaning is dependent on the weaning weight of the pig. We hypothesized that the light-weight pigs at weaning would show a greater response to the higher quality feed. We also studied the whether the provision of creep feed was beneficial. This creep feed data and the data pertaining specifically to weaning weight were described in the Fall 2011 issue of Centred on Swine.

> "The complex diet cost $906 per tonne or $400 more than the simple diet."

Fifteen nursery fills were studied. Each nursery (32 pens, 4-5 pigs per pen) was filled with the piglets from one weeks' farrowing. We used only 12 pens, 6 for the lightest, and 6 for the heaviest pigs from the weaning group. Within each body-weight grouping, these 6 pens were then assigned to one of 3 treatments (Table 1). Thus within each nursery we had 2 pens per treatment, per body-weight grouping. Pens were mixed gender, and contained at least 2 pigs of one gender. Farrowing groups 1 to 8, received creep

Table 1. Treatment regimes

Treatment	Feeding regime
A	Complex diet day 0 to 1, Simple diet day 2 to 14
B	Complex diet day 0 to 4, Simple diet day 5 to 14
C	Simple diet day 0 to 14

Table 2. Ingredient composition of experimental diets

Ingredient, %	Complex	Simple
Wheat	24.20	29.86
Corn	20.00	
Soybean meal	16.90	25.00
Peas	10.00	10.00
Canola meal	------	7.80
Corn DDGS	------	20.00
Fish meal	5.00	------
Spray dried whey	14.29	------
Spray dried plasma	2.50	------
Spray dried blood meal	2.50	------
Canola oil	1.75	2.80
Limestone	0.70	0.85
Dicalcium Phosphate	0.15	1.15
Salt	0.25	0.40
Vitamins	0.60	0.60
Minerals	0.60	0.60
DL methionine	0.130	0.090
L-Threonine	0.190	0.245
Lysine HCl	0.020	0.385
Copper sulphate	0.04	0.04
Choline chloride	0.08	0.08
LS20	0.10	0.10
Cost per tonne, August 2012	$ 906.00	$ 498.00

feed (a non-medicated phase 1 starter) for one week prior to weaning. Groups 9 to 15, received no creep feed. As described in our earlier report (Fall 2011) creep feeding in this experiment did not improve average litter weaning weights.

Diets (Table 2) were formulated to meet or exceed amino acid, energy, vitamin and mineral requirements for pigs of this age and body weight (NRC 1998). The "complex" diet used corn instead of corn DDGS and contained whey, plasma, blood meal and fish meal while the "simple" diet met requirements using wheat, soybean meal, canola meal and corn DDGS. The simple diet would thus be much "cheaper" to manufacture. While both diets met all the nutrient requirements for piglets of this age and weight ingredients in the complex diet should supply additional benefits such as improved palatability and aiding the immune system. We hypothesized that the complex diet would be especially beneficial for lightweight piglets and those who had not received creep in the farrowing room. As shown in Table 2, based on August 2012 ingredient prices, the complex diet cost $906 per tonne or $400 more than the simple diet.

The three treatments were A: the complex diet only on day 1, B: the complex diet on the first 4 days, followed by the simple diet, and piglets on treatment C only received the simple diet.

Surprisingly dietary regime had no effect on piglet performance during the first 14 days in the nursery (Table 3, BW d 14, ADG, ADFI and FCE day 0 to 14 all $P > 0.05$). The provision of the complex feed improved feed intake and prevented some body weight loss during the first 24 hours post-weaning, however this benefit was not maintained.

There was an interaction between diet and body weight category on growth rate immediately post-weaning (Figure 1). Piglets which were heavier at weaning, lost weight during the first day post-weaning regardless of diet complexity. In contrast, piglets which were lighter, and receiving a complex diet maintained their BW (BW group by diet, day 0 to 1; $P = 0.01$). Our hypothesis, that light-weight pigs would respond more to a higher quality diet was proven correct for the first 24 hours post-weaning. However, overall this response appears to be of little importance as there were no interactions of birth weight and feeding regime after this time (data not shown).

In this experiment feeding a simple diet, formulated to meet all nutrient requirements, did not reduce growth of piglets when compared to a complex diet fed for 1 or 4 days post-weaning.

(The overall response of piglets ... cont'd on page 5)

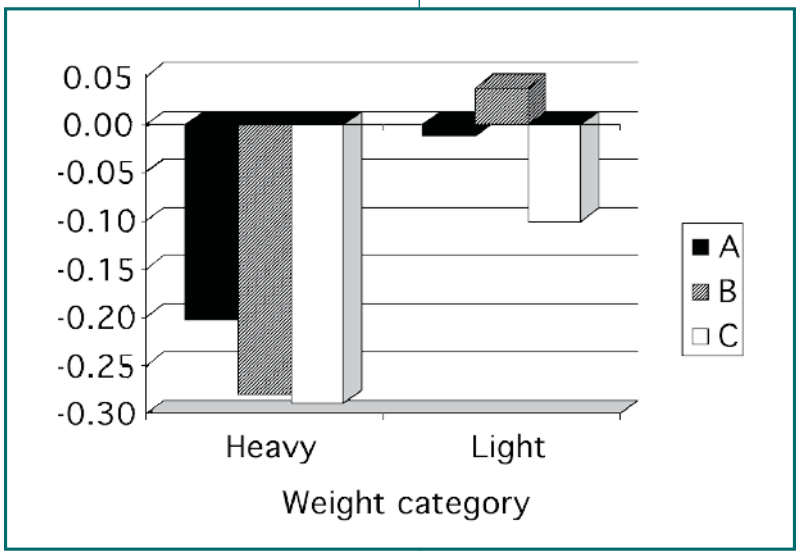

Figure 1. The interaction between body weight and feeding regime on the growth of piglets day 0 to 1 post-weaning. Treatment A and B piglets were receiving the complex diet and treatment C piglets the simple diet during this period.

Top 10 developments in swine nutrition, 1991 to 2012

Dr. John Patience
Professor of Animal Science
Iowa State University

In 1975, one sow in the USA produced 720 kg of pork per year, but by 2009 it was 1816 kg per sow, points out Dr. John Patience, from the Department of Animal Science at Iowa State University. In 2009, the US produced 10.4 billion kilos of pork from about 5.8 million sows. "Using 1975 productivity , it would require 14.5 million sows, an increase of 8.7 million, to produce 2009 quantities of pork," he says. "At an average sow feed cost of $336/sow/year, the added cost of these sows, just for feed would be $2.95 billion per year, adding $26 to the cost of each pig sold." The industry has been very focussed on doing its job well. Technology has changed our world. Improvements in nutrition have made a major contribution to higher output per sow and improved efficiency in the nursery and grow-finish phase. Dr. Patience lists the 10 top developments that have had the biggest impact over the last 20 years.

- Transitioning from ingredient-based formulation to nutrient and energy-based formulation. "We are supplying nutrients to the pig, not corn or soybean meal," notes Dr. Patience. "This has made a huge difference to the industry!"
- Transitioning from empirical definition of requirements to factorial definition of requirements, leading to growth modelling. "The factorial approach says that the pig requires lysine for maintenance and lean growth, and calculates requirements based on assumptions about genetic capability, feed intake etc.," explains Dr. Patience. "The new NRC model takes into account many variables when making recommendations.
- Formulating diets on the basis of amino acids rather than protein, then later on the basis of Apparent Ileal Digestibility (AID) and now Standard Ileal Digestible (SID) lysine. This has made a huge difference as it is much more accurate. "For example, if we take the value for protein, total lysine and SID lysine in wheat as a baseline with the value 100, the comparative value of crude protein in corn would be 61, but the value for SID lysine would be 71. This illustrates how much the value is underestimated by using crude protein," says Dr. Patience. "Similarly, for protein sources, if we take soybean meal as having values of 100, canola meal has a value of 75 for crude protein, but only a value of 60 for SID lysine, indicating that formulating on the basis of crude protein significantly overestimates its value to the pig."
- The adoption of more sophisticated energy systems, which is currently Net Energy (NE). Traditionally, Digestible Energy (DE) or Metabolizable Energy (ME) has been used in formulation. DE is the gross energy in the ingredient less the energy in the faeces and is about 85% of the GE. ME is the DE less the energy lost in the urine or gases emitted from the pig, which means we have about 82% of GE. NE accounts for the energy lost by the pig as heat resulting in only 56% of GE. "As we move towards NE we are removing most of the variation related to the ingredient and the variations after that are related to the pig and how it uses that energy," comments Dr. Patience. "Ideally we need to know how much energy goes for lean growth and how much goes into fat deposition, but often we don't know that."
- Adoption of the phytase enzyme and formulation of diets on the basis of available phosphorus.
- The release of the 2012 NRC requirements, with a stronger emphasis on factorial as opposed to empirical approach to defining nutrient requirements. "This publication is now 400+ pages and has grown hugely, with

a greatly expanded database of ingredient information," points out Dr. Patience. "It attempts to make ingredient nutrient content more robust and places a greater emphasis on net energy and effective NE. Also, it tells you how many sources of data there are for each ingredient, so you can see how much validity to put on the data." In addition, he notes, it has an expanded emphasis on modelling to define nutrient requirements. A greatly expanded explanation of the scientific and philosophical basis of the recommendations presented in the book, helps you determine whether the approach is right for your farm.

- The widespread availability of synthetic amino acids: lysine, methionine, threonine and tryptophan. "The use of synthetic amino acids reduces the quantity of soybean meal and other protein sources in the diet," explains Dr. Patience. "It has been estimated that the widespread adoption of synthetic amino acids has reduced the quantity of land required to feed the US pig herd by 14 - 15%."
- Marker-assisted technology and hyper-prolific lines. "This has led to advances in productivity that could only have occurred if nutritional management was up to the task," believes Dr. Patience. "Nutrition has kept up with genetics, and we have been able to feed a sow that is producing 30 PSY and also feed for the pig's better growth potential."
- Adoption of increasingly sophisticated record keeping systems, which have driven the decision making process. "This has had a profound influence on the industry. Producers ask a lot more questions when they have better data," says Dr. Patience. "They ask: If I'm below average or below target, what is going on nutritionally?"
- The increasingly rapid change in emphasis from maximizing productivity to maximizing financial returns. A good example is a big focus on barn throughput while meeting weight targets.

"How did we ever operate without using these developments?" asked DR. Patience. "Producers have adopted most of these, although the NE system is not being used as much as it should. Least cost formulation is only one step along the way, we need to know the pig's response so we can optimise its nutrient intake based on performance."

(The overall response of piglets ... cont'd from page 3)

Table 3. The effect of feeding regime on performance of weanling pigs. Average of 60 pens per treatment, 4 pigs per pen.

		Dietary Treatment				
Parameter		A	B	C	SEM	P value
Body wt, kg	Day 0	8.43	8.43	8.42	0.07	0.92
	Day 1	8.33	8.32	8.22	0.08	0.07
	Day 4	8.47	8.89	8.44	0.08	<0.0001
	Day 7	8.79	9.19	8.79	0.10	<0.0001
	Day 14	10.95	11.25	11.11	0.17	0.14
ADG, kg/day	Day 0-1	-0.11	-0.12	-0.20	0.02	0.002
	Day 2-4	0.03	0.14	0.06	0.01	<0.0001
	Day 5-7	0.14	0.12	0.14	0.01	0.21
	Day 5-14	0.27	0.25	0.28	0.01	0.04
	Day 0-14	0.17	0.20	0.19	0.01	0.14
ADFI, kg/day	Day 0-1	0.12	0.12	0.08	0.01	0.002
	Day 2-4	0.10	0.17	0.12	0.01	0.0001
	Day 5-7	0.20	0.25	0.20	0.01	0.001
	Day 0-14	0.24	0.27	0.25	0.01	0.002
	Day 5-14	0.31	0.33	0.31	0.01	0.16
FCE, as G/F	Day 0-14	0.71	0.70	0.73	0.04	0.31
	Day 5-14	0.86	0.75	0.89	0.02	0.0001

Switching from a complex to a simple diet after one day reduced feed intake to a greater extent than switching after 4 days post-weaning.

Feeding the complex diet for the initial 4 days in the nursery would costs about $0.50 more per pig than feeding the simpler, cheaper diet throughout. Our results indicate that these savings would accrue regardless of piglet birth weight.

It is important to note that these studies were designed specifically to investigate the response to the diets and these pigs were raised under ideal, non-stressful conditions. We are presently conducting experiments to determine if these results will be maintained when pigs are raised under more commercial conditions. In a similar experiment, however, Levesque and co-workers (2012) at the University of Guelph showed that although pigs fed a simple diet post weaning did have decreased growth and feed intake relative to their cohorts receiving a complex diet they compensated for this reduction during the grow-finish stage and thus there was no overall effect on performance but overall a decrease in lifetime diet cost.

The Bottom Line:

Producers may be able to save money by feeding simpler stage 1 diets. However, our study and that conducted at the University of Guelph indicates that further research is required to determine if these simple, cheaper diets affect the ability of the young pig to respond to disease and/or environmental stressors.

Acknowledgments

Strategic funding was provided by Sask. Pork, Alberta Pork, Manitoba Pork Council, and the Saskatchewan Ministry of Agriculture - Agriculture Development Fund.

Using 'translactational analgesia' to reduce piglet pain at castration

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Background

Public concern regarding painful livestock procedures such as castration is increasing. Piglet castration has been criticized, largely because pain medication is not commonly used. The cost and labour required to administer analgesics to individual piglets are the main deterrents to producers adopting this practice. Having an affordable and practical method of delivering pain medication would likely increase the acceptance of this procedure and use of pain medication by producers. Previous studies with cattle have shown that analgesics can be transferred through milk at lactation. However, there is a lack of research on swine and the degree of passive transfer of these drugs to offspring. The objective of this study is to determine if the analgesic, Meloxicam©, can be delivered to the piglets via the sow. The study is being conducted in three parts, with the first objective being to determine if a) pain medication can be passed via the milk, and b) the drug concentration found in milk. The second objective is to determine the most effective time period that will provide the maximum transfer of drug to piglets, and the third objective is to determine whether this method is effective at reducing pain responses during or after castration.

Translactational Analgesia

Our first experiment studies the transfer and excretion of analgesic in milk. Twelve sows were injected with Meloxicam© at seven days post-farrowing, with each sow receiving one of three dosages. After the injection, multiple blood and milk samples were collected over a 5 hour period. The samples are currently being tested for drug concentration, and will indicate the amount of drug transferred through milk and how drug levels change over time. Based on these results we will determine an 'optimum' drug dosage and timing that may be effective at reducing pain at castration.

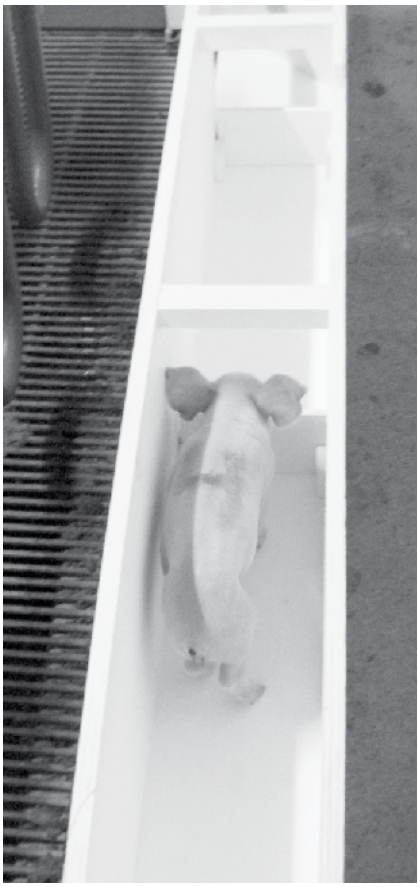

Figure 1. Piglet chute, used for behavioural observations after castration. The behaviour of pigs in the chute and time taken to return to the sow will be used to measure pain relief.

> "Having an affordable and practical method of delivering pain medication would likely increase the acceptance of this procedure."

In the second experiment, we will inject sows and collect blood samples from piglets to see if appropriate levels of analgesic are transferred to piglets. A third and final experiment will involve 24 sows and 144 piglets, and will assess whether translactational analgesia is effective at reducing pain. Some sows will receive the analgesic, and some a saline injection as a 'control' treatment. Piglets will be castrated one or two hours after sow injection, and using a variety of measures piglet pain will be assessed at the time of castration and for up to 24 hours following castration. Some piglets will not be castrated, but will receive a 'sham' treatment involving handling similar to that used for castration. This will help us to determine the difference between the actual pain of castration, and the piglet's reaction to handling.

Measures used to evaluate pain relief will include piglet vocalizations at the time of castration, and behaviour over a 24 hour period following castration (lying, standing, time spent suckling). Meloxicam© is a non-steroidal anti-inflammatory (NSAID) drug, similar to aspirin, and is expected to reduce pain and inflammation following castration but is not likely to have a noticeable effect on pain at the time of castration.

Previous studies have shown there is little difference in the behaviour of castrated and non-castrated piglets within the farrowing crate; piglets generally continue to feed and rest with their littermates following the procedure, with only minor changes in posture and movement. Therefore, as a method to identify pain, piglets will be observed manoeuvring a chute with hurdles (Figure 1) for indications of pain or discomfort approximately 20 minutes after castration. The piglet must raise its hind legs high in order to cross the hurdle, and therefore it is expected there will be differences in the length of time it takes a piglet to manoeuvre along the chute and over the hurdles if experiencing discomfort from castration. The piglet is placed in a wooden chute at the back of the farrowing crate, and must walk down the chute to return to the sow. To ensure that the piglets are familiar with the chute they will be trained on the day before by placing them in the chute and letting them learn how to find the exit.

The Bottom Line

With the growing awareness of animal welfare issues in the public, there in an increasing need for alternatives to painful procedures such as castration. Finding a practical and economic way of providing pain relief would enable producers to address this problem effectively, while also improving piglet welfare. Using translactational medication for pain relief would be much easier to implement compared to injecting individual piglets, and if it is shown to be effective could offer producers a way forward.

Acknowledgements

Project funding was provided by the National Pork Board, USA. Strategic funding to the Prairie Swine Centre is provided by Sask. Pork, Alberta Pork, and the Manitoba Pork Council.

(Just when we thought ..... cont'd from page 1)

- ADG in grow-finish pigs increased 33%
- Infrastructure for both production and processing has been largely replaced or renewed (especially in western Canada)

The next 20 years we can anticipate might be somewhat muted compared to the past 20, with fewer new barn openings perhaps, but just when you think you can predict the future something shifts and new possibilities emerge. Few if any of us could have predicted the 30 pig/sow/year barrier would be exceeded; so we are better off not predicting but developing a system that can respond as need and opportunity arises. That in essence is what swine research must never lose sight of. We must build, maintain and fund the scientific intellectual capability and facility capacity to ask the next questions which give us the next generation of answers to develop the questions that will be asked in 20 or 30 years.

At the time of writing this article I have recently had the opportunity to meet with several of the pork boards across Canada, most of the processors in Canada, participated in workshops on how we are to implement group housing for gestating sows, met with researchers, university and industry to work on creating a new business model for the future of swine research in North America, and witnessed the culmination of 4 years of health advances at the Canadian Swine Health Forum. Yes there is much angst concerning current profitability but there is still no question that there will be a future for pork production in Canada.

The Centre just completed an independent third-party review of its operations, stakeholders expectations, past deliverables and assessment of future role. The external review process was in-depth and in addition to an internal review and development of a report on the Centre's past accomplishments it included a two day site visit, personal interviews with staff & stakeholders, and communication with funding agencies and collaborators. A final report is expected in November and will be a public document of the University of Saskatchewan (available also at www.prairieswine.com).

We are sandwiched into this period in history where poor returns cast a shadow over everything we do. It is easy to fall into a malaise, and there is something we can do about it. No 'ifs and ands or buts' we at Prairie Swine Centre are given this time and we will make the most of it. A perfect example is the new 2011 Research Results you will find at www.prairieswine.com. There are 28 new scientifically sound conclusions we can make this year that did not exist prior to this time. Many of these have been analyzed for their impact on net income ranging from $0.50 to over $2.00 per pig. These can also be found on our website www.prairieswine.com

Thank you to all the pork producer, government and industry supporters who make our research possible.

> "swine research must never lose sight of what is needed to build, maintain and fund the scientific capacity to address the questions that will be asked in 20 or 30 years."

Early detection and interventions for reducing lameness in gestating sows

Jennifer Brown, Ph.D.;
Yolande Seddon, Ph.D.; Fiona Lang, Ph. D.;
Nika Zillman BSA.; Megan Bouvier, BSA.

Background

Sow lameness is the second most common cause of culling after reproductive failure. While good conformation and genetics contribute substantially to reducing lameness in sow herds, hoof problems commonly arise in fully slatted concrete systems. Pressure exerted from the concrete flooring generates a response in the hoof to increase horn growth. Combined with unbalanced weight distribution this can lead to malformations of the foot such as claw overgrowth and heel erosion (Figs 1 – 3).

Hoof abnormalities are perhaps overlooked, but contribute to the development of lameness in sows. Heel and wall cracks provide a route of entry for infection, while overgrown claws increase the risk of injury on slats and can impede sow movement. Hoof abnormalities do not take long to develop, and on visits to commercial herds a surprising number of low parity sows have been observed with hoof abnormalities.

The discomfort of lameness can cause sows to reduce feed intake, which can result in decreased reproductive and lactation performance. Sows with less stability on their feet (Fig. 4) are also at a greater risk of crushing piglets from lack of control while lying down.

Little research has been conducted on the impact of early intervention and prevention of sow lameness during gestation. Historically, there was little option to treat sows with hoof problems due to the unwillingness of sows to have their feet held. The Zinpro Corporation, Minnesota, USA have now developed the first chute (Fig. 5) to restrain sows allowing hoof trimming to take place, and a range of corrective trimming protocols to prevent and restore correct hoof conformation in sows. The use of corrective claw trimming can be used as a preventative or early treatment option for lame sows, and could significantly increase sow productivity and longevity.

A study being conducted by the Prairie Swine Centre is using the FeetFirst® chute to evaluate

Figure 3. Heel erosion in a low parity sow

Figure 1. Overgrown hind toe and dew claws

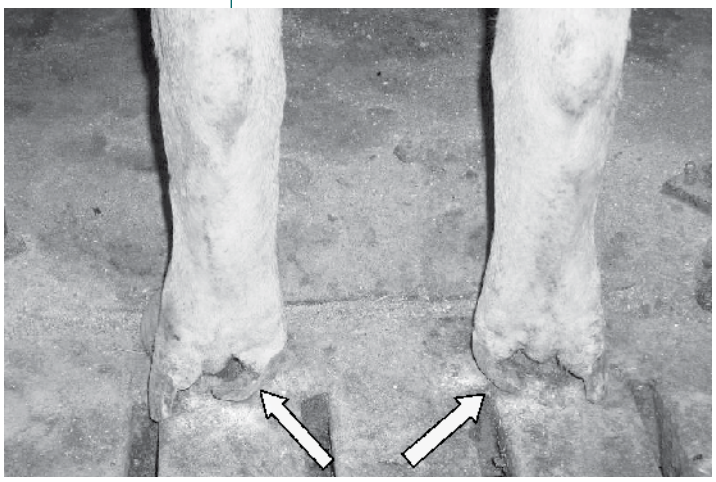

Figure 2. Overgrown and bent over dew claws – risk of injury

the effectiveness of using hoof trimming on non-lame sows to prevent lameness, and as an intervention treatment in lame sows. This the first time the FeetFirst® chute has been used in Canada.

Study design

The project is being carried out at a large commercial sow herd in southern Saskatchewan. Performing the study on a large sow herd will give us the opportunity to evaluate a large number of sows. The project has three objectives which form three stages to the study:

Objective 1 will determine the occurrence and severity of lameness in the sow herd: A detailed survey on the occurrence and severity of sow lameness is being conducted, and will include 50% of the sow herd (approximately 2,500 sows).

Figure 4. Overgrown dew claw and excessive heel overgrowth can be improved with hoof trimming

Objective 2 will determine the effectiveness of preventative hoof trimming on non-lame sows at preventing lameness and increasing sow performance. Two hundred non-lame sows will be evaluated for lameness using locomotion scoring as they exit the breeding unit. At 8 weeks post breeding, 100 sows will receive a preventative hoof trim, and 100 sows will be studied for hoof abnormalities but will not be treated (control group).

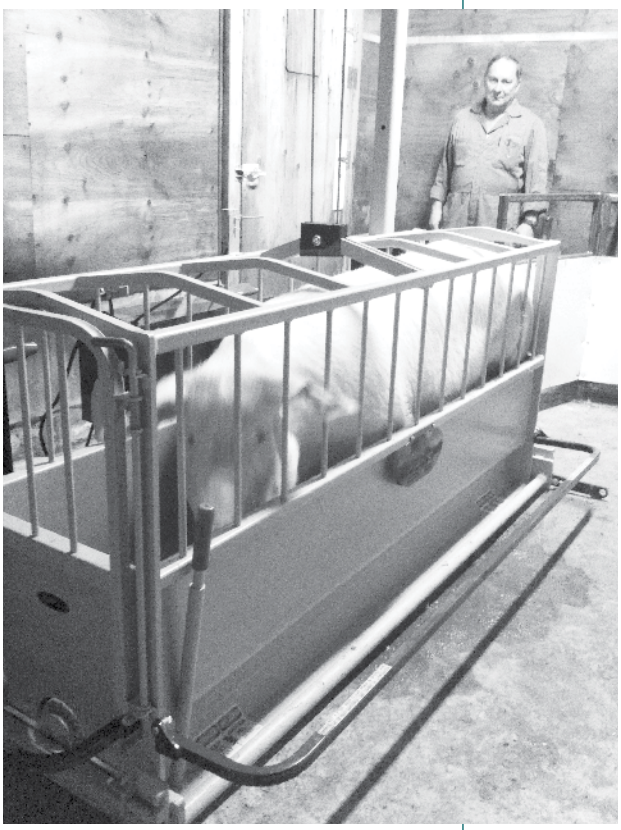

Figure 5. Sow Feet First chute by Zinpro® Corporation

Objective 3 will evaluate a comprehensive early treatment protocol for lame sows, and will study lameness progression and sow productivity. Three hundred lame sows will be identified upon leaving the breeding unit, and of these 150 will be assigned to treatment group and the remaining 150 sows will act as controls.

The treatment protocol for lame sows takes a novel approach to maximise healing by addressing a number of the problems created by lameness. Sows will be given:

- two courses of an anti-inflammatory drug to reduce inflammation and initiate healing
- a corrective hoof trim to improve foot comfort and treat abnormalities that may be contributing to lameness
- a rubber stall mat to alleviate pressure on joints and feet from the concrete.

The Bottom Line

The results of this study will provide producers with a greater understanding of the prevalence and severity of hoof lesions encountered in commercial sow herds, the impact of lameness on sow productivity and the effectiveness of prevention and treatment regimes that are able to target hoof abnormalities. The experience of operating the FeetFirst® chute in a commercial sow barn will help to evaluate the validity of trimming and determine whether this practice is viable option for producers.

Acknowledgements

Funding for this project was provided in part by Agriculture and Agri-Food Canada's Canadian Agricultural Adaptation Program (CAAP), which is managed in Alberta by the Agriculture and Food Council of Alberta. Strategic funding was provided by Sask. Pork, Alberta Pork, and Manitoba Pork Council. We acknowledge Zinpro® Corporation for their training and support in implementing the FeetFirst® system.

Swine Innovation Porc

A revolution in feed management is coming to your operations!

Candido Pomar, a researcher for Agriculture and Agri-Food Canada in Sherbrooke, Quebec, together with his brother, Jesus Pomar at the University of Lleida, Spain (and several teams of researchers from other universities and five countries) are behind what promises to be the next opportunity in swine feeding; one that has the potential to transform how we feed pigs within the next five years. This team of researchers is striving to develop technology for feeding pigs individually, on a daily basis, rather than using a phase feeding program targeting the average pig in a pen.

Innovation in pig feeding

Precision feeding techniques is an innovative approach to the feeding of growing pigs, enabling pigs to be fed daily on an individual basis, maximizing the growth potential of each pig. Current phase feeding programs are least-cost formulated and typically target average growth potential in a group or barn. The drawback with this approach is lost opportunity, with faster pigs being under fed and slow-growing pigs being overfed.

In a given population, nutritional needs vary considerably from one pig to another and similarly, for each pig their needs change over time and according to their individual growth patterns. Estimation of nutritional needs should no longer be seen as a static characteristic of a population, but rather as an independently evolving dynamic process for each pig in the barn.

Results

Preliminary results of trials conducted at the research center of Agriculture and Agri-Food Canada in Sherbrooke indicate pigs (25 to 105 kg) fed with rations adjusted to their daily needs, showed that nitrogen and phosphorus intake was reduced by 25% and 29% respectively, while excretion of these same nutrients was reduced by nearly 40%.

What is the potential cost - benefit of this system? Transitioning from a standard phase-feeding program to an individualized daily feeding system is expected to reduce feed costs by $8 per pig. Additional savings can be realized for those farms with on-farm feed mills, as the precision feeding program would utilize two (blended) diets throughout the grower-finisher increasing the milling capacity of the feed system. Cost savings would also be realized through more efficient use of phosphorus and amino acids, in

> Individually feeding pigs with diets adjusted for their daily requirements has demonstrated 40% reduction in nitrogen and phosphorus excretion while at the same time reducing feed cost by $8/pig.

turn reducing the nitrogen and phosphorus content in manure – resulting in lower application costs.

Looking at a whole farm analysis the potential of the precision feeding system could save producers up to to $14/pig, based on 2012 prices.

Development and technology transfer

Implementation of a precision feeding system creates significant challenges with regard to the complexity (e.g. estimation of individual nutritional needs), reliability (e.g. on-farm use of electronic devices) and profitability, requiring new designs for equipment and software. Developing and testing the precision feeding system has been conducted by Dr. Candido Pomar at the Sherbrooke research centre, in addition with funding from Canadian Agricultural Adaptation Council (Agriculture Council of Saskatchewan) two demonstration sites (Quebec, Saskatchewan) will be established for producers to view the technology first hand.

Participating research centers and universities

Dairy and Swine Research and Development Centre (AAFC), Quebec; Université de Sherbrooke, Quebec; Université Laval, Quebec; Centre de développement du porc du Québec inc.; Prairie Swine Centre, Saskatchewan; Universidat Lleida, Spain; Institute i Tecnologia de Recerca Agroalimentéries (IRTA), Spain; Institut National de la Recherche Agronomique, France; Universidade Federal de Santa Maria, Brazil; University of Wisconsin-Madison, U.S.A.;and others.

Precision feeding test with prototype feeding station.

Canadian financial partners

We also thank the Canadian financial partners in this project, without whose aid, could not be successfully carried out.
Swine Innovation Porc, its private partners and Agriculture and Agri-Food Canada.

Personal Profile

Yolande Seddon, Ph.D.

Yolande joined the Prairie Swine Centre as a post-doctoral research associate with the ethology and welfare department in January 2012. Yolande has had a lifelong interest in animal behaviour, how animals perceive their environment and their interaction with humans. She is an enthusiastic individual with research interests surround developing practical improvements for the management of pigs that improve their welfare and productivity.

Yolande grew up in a small village near rural Staffordshire, UK, surrounded by a menagerie of animals. She took a keen interest in animals from a young age and spent many years caring for her family's flock of Soay sheep and helping at local stables. Her keen interest in animals led her to obtain a BSc (Hons) in Animal Behaviour and Welfare at Myerscough Agricultural college, UK and an MSc in Animal Biology and Welfare, Writtle Agricultural College, UK. She undertook part of her MSc at HAS Den Bosch University of applied sciences in the Netherlands, obtaining a wider, international perspective on animal welfare issues. During her MSc Yolande had several opportunities in which she studied the behaviour of pigs. Interested by the challenges presented in pig production, and she subsequently turned her focus to developing a career in applied pig science. Yolande took a year away from studies and worked on indoor and out door pig units to develop her practical knowledge of pig production before returning to academia to complete a British Pig Executive funded PhD at Newcastle University, UK. Her PhD research focused on the development of improved management strategies for the promotion of health in finishing pigs, and included work on sub-clinical disease detection.

Personal Profile

Garrett Rozeboom, M.Sc. Candidate

Garrett grew up on a small farm near Mason Michigan. He received his Bachelor of Science Degree, majoring in Animal Science, in December 2011 from the University of Minnesota. While attending school he was also the student manager of the university hog barn.

Garrett arrived in Saskatoon in January of 2012. He is currently completing an industry-focused Master of Science degree under the supervision of both the Prairie Swine Centre (PSC) and Gowans Feed Consulting (GFC). This is the first time Prairie Swine Centre has joined together with an industry partner to create an industry-based graduate student position. The goal of this program is to train Garrett in the field of nutrition so that he may quickly and effectively fill the need of the swine industry for qualified nutritionists. This position is unique in the fact that it combines both academic and industry experiences simultaneously; allowing Garrett the opportunity to learn from classes at the University of Saskatchewan, from research at the PSC, and from time spent working in commercial swine production, nutrition, and feed manufacturing.

The industry-focused program requires PSC and GFC to collaborate in making sure that Garrett is equipped to work in the industry after graduation. Garrett's unique program is under the direction of Dr. Denise Beaulieu (PSC) and Dr. Malachy Young (GFC). His research project is focused on the interaction between dietary energy (NE) and pig stocking density on late-finishing growth performance. In addition to growth, he plans to evaluate the impact of diet and pen density on farm potential for profitability and production efficiency. Lastly, he also plans to study the influence of diet and pen density on pig behavior and well-being. The overall goal of this research is to create a sustainable model that will provide producers with the tools to help them reduce feed costs while maintaining optimal outcomes.

When not in class or conducting research, Garrett will work alongside GFC nutrition consultants and on-farm researchers for approximately two months out each year. This on-the-job training began this past summer. Garrett worked on a commercial birth-to-feeder on-farm swine research trial, at the feed mill, and consulting with nutritionists from GFC. The applied research study and the feed mill operations were both hosted by the Alberta Pig Company (APC). The research was conducted at Lewisville Pork Farm; a sow farm within the APC system. In addition to the research work, he learned and experienced different approaches to production. After completing the trial portion Garrett had the opportunity to work at Sunhaven Farms Milling and learned about feed manufacturing. While there, Garrett learned about the feedstuff and feed production flow and quality control in a commercial swine feed mill.

Garrett is very excited to be in such a unique program, stating "This one of two programs that I know of in North America that has a university joined together with a swine industry partner. I feel like this position will equip me with the tools to benefit the swine industry". The Prairie Swine Centre hopes that he will be the first of many graduate students who will learn from this new industry-focused M.Sc. degree program.

Coming Events

Banff Pork Seminar
January 15-17, 2013
Banff, Alberta

Centralia Swine Research Update
January 30, 2013
Kirkton, Ontario

Manitoba Swine Seminar
January 30-31, 2013
Winnipeg, Manitoba

Alberta Pork Congress
March 20-21, 2013
Red Deer, Alberta

World Pork Expo
June 5-7, 2013
Des Moines, Iowa

PRAIRIE SWINE CENTRE

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