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Building Innovation Into What We Do - Everyday!

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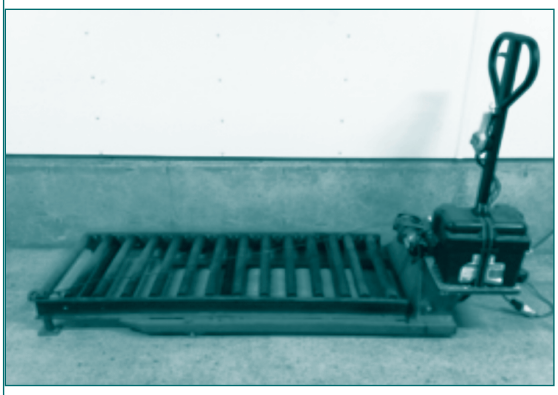
Highlight Safety and Innovation:

At Prairie Swine Centre we start every meeting with a safety tip. Today's safety tip is also an innovation – the deadstock mover. According to workplace research we should be careful when lifting anything greater than 15% of our body weight (source: Kansas State University), and the fewer steps we take carrying heavy objects the better. Sows die, sometimes in awkward places, and they are heavy. The photo of the deadstock mover is an innovation developed by the production and maintenance staff at Prairie Swine Centre, instigated by Brian Andries our Operations Manager. Here is their low cost innovation to make light work of a job that needs to be done on all farms. The solution is in a word 'elegant' from its dependable components to its low cost manufacture, and it removes a health and safety risk associated with the job.

What can we take from this simple example about the role of innovation on our farms?

What Does it Mean to be Innovative?

The word has become so overused in business press that it ceases to hold real meaning or excitement. For example, last year the word 'Innovation' appeared 33,528 times in quarterly and annual US corporate reports. In one 90 day period there were 225 books published with the word 'innovation' in the title; in addition a survey of 260 companies, 43% indicated they had a 'chief innovation officer' or equivalent position*. Given the focus on innovation it should be all around us and contributing to improved businesses, better personal wellbeing and be part of virtually everything we touch. Yet many of our successful businesses,



The low-cost deadstock mover is an innovation using a pallet jack, rollers and an electric winch

especially in manufacturing, have developed systems that engage the power of Standard Operating Procedures (SOP's) and volume to drive down costs as a way to achieve profitability. Our farming model has also demonstrated that there are advantages to size. Our systems leverage their expertise by managing thousands (for example, acres or sows) in pursuit of a more efficient farm that meets family or shareholder needs for net income. Are 'innovation' and standardization opposites and in conflict?

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Piglet Health and Welfare in the Nursery

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Piglets experience acute stress at weaning, as they must suddenly adapt to abrupt changes to their physical environment, social group, and diet. Weaning under typical farm conditions results in weight loss, aggression, belly nosing and increased susceptibility to diarrhoea and disease. The problem appears to be largely psychological, as young pigs are not prepared to cope with so many changes at once. Many studies have now identified ways to adapt the farrowing and nursery environments to facilitate the weaning transition by increasing early consumption of solid food and reducing stress. Some of these practices require more inputs and labour, however, many can be accommodated at little cost to producers.

What is the problem?

To understand the problem it is helpful to consider how pigs behave in wild or semi-natural settings. In wild pigs, weaning is a gradual process that is completed at 3 or 4 months of age. During this time, the sow interacts with her pigs, they explore a spacious and complex environment, learn to consume a variety of solid foods and socialize with other herd members.

Successful strategies to reduce weaning stress consider these factors and try to introduce them into the production environment. Changes which promote the early intake of solid food and reduce the abrupt impact of weaning have been found to aid greatly with piglets' adaptation to the nursery environment.

Stimulating early food intake

Often pigs will fail to consume feed for up to 48 hours after weaning, and this results in weight loss, damage to the intestine and increased susceptibility to diarrhoea. Over the past decade, weaning age on commercial farms has increased from 2 weeks to 3 or 4 weeks, and creep feeding in the farrowing room is a common practice. These practices result in piglets becoming familiar with solid feed before weaning occurs. Many studies have shown that piglets that eat feed preweaning will also consume more feed and have better growth postweaning. Unfortunately, the consumption of creep feed is highly variable, with some piglets benefitting from this practice much more than others. Studies at the Prairie Swine Centre show that smaller pigs were more likely to consume and benefit from creep feed, while larger piglets were less interested in creep (Bandara et al, 2011).

Providing feed in a way that stimulates exploration and social interaction, either before or after weaning, can increase feed intake. The new Canadian Code of Practice (NFACC, 2014) recommends the use of feeding trays or floor feeding for weaned pigs until they are eating readily (3-4 days). The tray encourages feed consumption by allowing piglets to explore the feed together. Providing creep feed in an open tray feeder in farrowing also resulted in more feed consumption and social interaction at the feeder, and reduced weight loss at weaning (Brown and Seddon, 2014). Another option is to provide moistened feed as this is more attractive to pigs than dry feed (Reiners et al, 2008).

Drinkers can also improve piglet welfare. Torrey et al (2008) found that push lever bowl drinkers reduce water wastage and belly nosing compared to nipple drinkers. They hypothesized that bowl drinkers satisfy nursing impulses in newly weaned pigs, as the pigs must create negative pressure to drink from a bowl. This requires the same tongue motion as suckling, which does not occur when the pig drinks from a nipple drinker. As well, pigs will push their noses against the metal rim providing additional tactile stimulus. Excessive drinking and water wastage can occur during the first 48 hours post-weaning, and results in less time spent eating by the pigs, so bowl drinkers can reduce help reduce this behaviour.

Another strategy for stimulating early feed intake is intermittent suckling, where the sow is segregated from her pigs for 6 to 12 hours per day, usually in week 3 or 4. In semi-natural conditions, sows often leave the litter for several hours each day, and during this time piglets will explore their environment and learn to consume solid feed. This procedure also reduces weaning stress by preparing piglets for separation from the sow.

Other strategies for increasing feed intake include multi-suckling and get-away systems (Oostindjer et al, 2014). In multi-suckling, piglets from more than one litter are allowed to mix before weaning. This simulates the early socialisation observed in wild pigs, which join the dam's group

(Piglet Health ...Continued on page 9)

(Building Innovation...Continued from page 1)

Pork producers, transporters and packers want reliable, predictable processes that produce a well-defined product. For example; the pork chop of exactly 1inch thick with colour scores of 4, a marbling score of 3, and drip loss of less than 7%. These specifications are expected to be the end result of; a genetics program that met reproductive goals; a herdsperson who weaned the target number of pigs that week; a feeding program that met budget; and lastly pre-market in-barn and transport handling care that resulted in low animal stress, with no bruising or demerits. Now repeat these actions exactly the same for 52 weeks of the year and you have defined the successful system for this particular end product. Throughout this description of a successful system the word innovation didn't appear once, and yet where did the standardized systems come from? They were a product of trial and error, of research, of close observation and measurement – in short, a series of 'innovations' built upon each other to develop our current 'Best Practices' and we then embraced these and made them our SOP across all barns and people engaged in producing our pig. Thus innovation and standardization are related but the timeline between them is often long and the cause and effect often distant from each other.

Where Does Innovation Occur?

I have identified processes and products that lead to some tangible item – like our perfect pork chop. What about innovation beyond product research and development? Is it possible to have innovation elsewhere in the company, perhaps in human resources, staff meetings, or even accounting? Yes of course it is. Any area of business activity can identify best practices (the result of little innovations along the way) that result in improved processes and measurable results that move the business closer to its goals. Innovation is not limited to things (like iPhones, or tablets) but can exist at the Enterprise level within the organization. For example, this spring PSC was presented with the Low Demerit Score award by achieving 96.57% demerit free market hogs. How we got there started a few years ago with reconfiguring a room for holding market animals, changes to flooring in the shipping room, and a focus on animal handling techniques. A series of innovations that resulted in excellent results for the end product, not to mention reduced frustration for staff, carcass quality premiums and reduced transit insurance costs. These are all good end products achieved by recognizing a need for change.
In spite of having some success with various production innovations we are left with the question "How do we 'turn on' and capture innovation on our farm?"

The Hycare sow management system at a tradeshow in Germany, October 2014. The focus on sanitation and bringing the sow to the herdsperson provides a radical innovation in barn design and demonstrates significant improvements in piglet growth according to MS Schippers personnel.

The issue is not that people are not creative; certainly they are, especially if encouraged and rewarded. The issue is not that we don't appreciate the benefit of innovation; we have all seen opportunities to improve what we do (such as moving deadstock) and had at that moment a flash of insight to innovate the practice. The real issue is how do we harness this innovative insight and make it serve the betterment of our farm business.

How to Turn on Innovation

The experts in this field give us a few tips for being able to switch innovation 'ON' in our business, and then more importantly taking action to follow through with the idea.

Step #1. Do your own internal check by asking yourself and some of your staff and family:

- In your experience does innovation in your company improve net income?
- On a scale of 0-100 do you consider yourself innovative? (0 is not innovative at all, 100 is completely innovative in everything you do)
- Using the scale of 0-100 rate your business as innovative.

The InnovationOne group who pioneered this concept suggests their findings show (using a more detailed questionnaire than the three questions above) that businesses scoring below 70 have a random and incremental approach to innovation. What is interesting is that these same businesses score lower in net income and ability to differentiate their product in the marketplace, two very important metrics in business. These businesses are missing the rewards experienced by businesses that take a planned approach and embrace trying more radical innovations. The authors suggest having a planned approach and dedicating time for innovation activity and discussions.

Alas, this potent symbol of innovation, used for decades to illustrate 'bright ideas' is itself being innovated out of existence. Replaced by a brighter idea that costs less to operate and has greater life expectancy, the LED light. Innovation is an ongoing and never ending process.

Looking for more motivation?

If you are intrigued and want to think further about innovations in the pork industry go to the Prairie Swine Centre website (www.prairieswine.com) and see the top 10 innovations I saw at the 2014 Eurotier tradeshow in Germany. Some of these are ready for innovative Canadian farms to try. To really stretch your imagination the Hycare system from MS Schippers of the Netherlands seeks to use robotic warehouse technology to rethink managing the farrowing room. This short video on You Tube is a must see that will put innovation in pork production in a whole new light. (https://www.youtube.com/watch?v=0RzAOOotHv0).

Prairie Swine Centre Testing Nanotechnology Applications In Pig Industry

Prairie Swine Centre Inc.

Nanotechnology – it's a word most people come across while watching science fiction movies, but it's become a modern reality. But what exactly is it? And how can it help push the pork industry forward into a new future? That's precisely what the Prairie Swine Centre wanted to discover with a recent research project.

But first, what is nanotechnology? Nano basically means small... really, really small. A nanometer is one millionth of a millimetre. To illustrate just how small, consider that a normal, healthy fingernail is just one millimetre thick. Nanotechnology is all about harnessing the power of individual atoms and molecules at a very small scale to make a really big difference. For example, zinc oxide nanoparticles, (which are between one and 100 nanometres in size) are used in transparent sunscreens to block out the damaging rays of the sun.

> If proven effective, with a single treatment application, we could simultaneously address concerns with hazardous gas emissions as well as the spread of disease

So, what does all that have to do with raising pigs? As it turns out, potentially quite a bit.

"We wanted to see if we could control the growth and transmission of disease-causing microorganisms in swine barns through the use of nanotechnology," said Dr. Bernardo Predicala, Engineering Research Scientist at the Prairie Swine Centre, and the project's lead.

Disease spread during swine production is usually controlled through two distinct methods – biosecurity and sanitation. Biosecurity involves protocol, policies and procedures that reduce the risk of initial contamination and subsequent spread of a pathogen within an operation. This can include practices such as showering in and out, Danish entries, and ensuring staff, guests and visitors don't pose a health risk to the herd.

Battling disease on the sanitation front means treating the environment to reduce the level of possible pathogens that could make animals or people sick. This can include the proper cleaning and drying of barns and trucks, and applying the correct disinfectants in the correct volumes to reduce the risk of illness. In other words, biosecurity is about preventing infectious agents from entering the barn, and sanitation is about controlling and reducing infectious agents that may already be present in the barn.

While biosecurity and sanitation efforts are always improving and evolving, so are the pathogens they seek to contain. The industry has changed too, and sometimes, with greater efficiency comes greater risk.

"The swine industry has shifted toward production systems where more animals are raised in larger facilities. These changes have increased efficiency, productivity and profitability, but it's also increased the risk and prevalence of animal diseases," said Predicala.

That's why scientists are constantly looking for new ways to manage and mitigate health risks. Not only is a healthier herd better for productivity and profitability, but it's much better for the pig – and animal welfare is an increasing priority to the public and to producers alike.

"Nanoparticles are known to have antimicrobial properties," said Predicala. "They've been used in water treatment and purification, as well as in air filtration systems in hospitals to provide a clean environment for patients, especially during surgery."

Predicala, along with Prairie Swine Centre engineering research assistant Alvin Alvarado, wanted to investigate how nanoparticles could supplement the safeguards already provided by biosecurity and sanitation measures. But that's not all – the research could also determine whether the novel nanotechnology application could also help manage gas emissions – an inevitable byproduct of swine production.

"If proven effective, with a single treatment application, we could simultaneously address concerns with hazardous gas emissions as well as the spread of disease – both which greatly affect the profitability and sustainability of livestock operations," explained Predicala.

Predicala and Alvarado designed a research project conducted right on site at the Prairie Swine Centre. But first, the effectiveness of a variety of commercially available nanoparticles in controlling the growth of certain pathogens had to be selected. In order to do that, laboratory scale experiments were conducted at the University of Saskatchewan to determine which nanoparticle would be most effective. The results showed that zinc oxide (ZnO) was the clear winner.

The next step was to bring the ZnO nanoparticles to the Prairie Swine Centre facility to assess whether the nanoparticles could really pack the punch the researchers were looking for. Two identical controlled-environment chambers, each 4.2m x 3.6m x 2.7m, were used to conduct the first portion of the research. Each chamber was fully instrumented and had identical environmental conditions, and each housed a pen of the same size. The chambers were operated with a negative pressure ventilation system.

Next, a filter was installed into each of the

(Nanothechnology...Continued on page 11)

Effectively Assessing Barn Renovations

Lee Whittington, President/CEO, Prairie Swine Centre

Murray Elliott, FGC Inc.

On the third week of March 2014 pork producers saw something they had never seen before – individual pigs sold for more than $300 each. The fact that this coincided with moderating grain prices meant that margins had never been better in recent memory (last 7 years). Now what? Although there is plenty of debt to soak up these margins, there is a noticeable change in perceptions on the future of the pork industry. A new future could be imagined that included facility and equipment renewal. Over the next 2 years there will be plans and purchase decisions made to address pent up demand by facilities and their managers to address the repair and maintenance concerns of pig barns. Nationally we have an aging 'fleet' of barns, with the last big building effort concentrated between 1991 and 1998; these barns have seen more than half their productive life, even with good maintenance. This is complicated by the fact the maintenance and repairs over the past 7 years have been well below the level required to keep the 'fleet' in tip top shape. Some barns have passed their 'best before date', but for those barns we want to remain operational for the next 20 years we need to consider reinvestment. The challenge, there are many demands and few resources so how do you decide where the first dollar should be spent?

It would be nice to "have an app for that" but the complex considerations of capital vs operational investments, people vs infrastructure, and short-term vs long-term return on investment make analysis of this 'apples and oranges' comparison very challenging. We challenged ourselves to consider what kind of a tool might assist in making these decisions logical and a good contributor to profitability. We also saw this challenge of barn reinvestment choices being influenced by personal preference, and rather than money spent being a positive influence on future cash flow and profitability, they could be simply expenditures on 'my favourite things'.

Here is a checklist approach to making objective barn investment decisions. We considered a simple approach using a combination of perceived risk of not making a change in each area, and the impact of a worst case scenario if catastrophic failure of that overlooked area was to occur. Our suggestion is you take a walk around and through the entire barn; you may want to have someone accompany you since perception of risk and impact is subjective and the exercise could benefit from a second opinion. You will also want to take a few tools with you to poke and prod and assess equipment and structure. This is where the title of this article comes in, "Shining a light..." is a direct reference to your need to have a high intensity flashlight with you to inspect below slats, in attics and behind pillars and equipment. We recommend at least 200 ft candle power (as little as $50) and better yet 800 ft candle lights, an inexpensive investment that will bolster your judgment with greater clarity in important areas such as assessing concrete cracks and rafter strength. The other tools you will need include a ladder tall enough to allow you to get on the roof, a small ladder in the barn for accessing attic hatches, and in the tool belt a screwdriver and knife for scrapping and digging, perhaps a can of fluorescent paint to mark areas for re-inspection in the future.

The following Risk Assessment Checklist looks at four areas of consideration (Biosecurity, Structural, Utilities and Operational). Certainly more could have been added but in balancing the need for brevity and ease of use against being all encompassing, we opted for a quick tool that will reveal the areas of greatest need and allow you to pursue an action plan or seek professional structural or other engineering and construction advice. A special note regarding safety for people working in barns; the structural and utility sections of the checklist identify safety considerations. For example, marked exits, emergency egress exits and fire separation — to increase time to exit the building, these may not have been part of the original barn plan but should be considered essential upgrades as we evaluate our barn structures.

(Effectively Assessing...Continued on page 6)

(Effectively Assessing...Continued from page 5)

Risk Assessment Checklist

Area	Description of area observed	Risk scale 1-5	Impact of failure on farm net income 1-5	Avoidance of risk, best return score
BIOSECURITY				
STRUCTURAL				
OUTSIDE	Cracks in foundation wall			
	Insulation, studs, vapour barrier			
	Pit walls			
	Eaves, soffit, facia			
	Roof steel, seams, screws			
INSIDE	Floors, cracking and heaving			
	Slats, cracks (along length or across slat)			
	Under the slat in high use areas			
	Farrowing and nursery floors			
	Suspended floor supports			
	Ceilings plywood, PVC liners			
	Interior perimeters moisture migration			
UTILITIES				
OUTSIDE	Electrical service connection to barn			
	Emergency generator exhaust vent			
	Fire department access road around structure			
	Water supply for fire fighting			
	Exit doors and emergency egress openings clear of obstacles and functional			
	Gas lines painted yellow, and other utilities clearly marked			
INSIDE	Fire detection/alarm system (tested)			
	Fire extinguishers in all passageways that lead to exits (tested annually)			
OPERATIONAL				
OUTSIDE	Gravel building perimeter; control of weeds, placement of rodent control			
	Sewer vent pipes clear of debris			
	Manure pump out access covers solid and secured			
	Feed bins stable and secure, boot bottoms			
	Feed bins stable and secure, boot bottoms			
INSIDE	Equipment tied to the floor			
	Sow stalls, feeders			
Other				

Perimeter (walk the barn)

- check for cracks in foundation wall, hairline cracks are expected, larger cracks need further investigation
- stud walls can be inspected by removing fasteners and looking at the condition of insulation, studs and vapour barrier
- check the manure pit access, this is will give the best view of visible pit walls, do not enter pit
- check eaves, this is where ventilation air enters barn, eave doors should be intact, soffit and facia can be checked

Check roof

- climb on roof and check steel condition, watch for rust at seams, popped screws and pay special attention to valleys and any chimney or pipes that penetrate roof steel, note placement on roof so that when inspecting attic these areas can be targeted from the inside

Enter barn and check floors and slats

- when checking slats look for surface cracking, cracks or pops along the length of the slat mean rebar has been exposed to manure and is rusting, cracks across the slat is of more immediately danger and slat could collapse with warning
- check the bottom of the slats in 10 high use areas, slats will often show wear under slat first. This will show as concrete blown off the bottom side of slat, if this occurs slats are of no value
- check solid hallways for cracking, minor cracking in these areas is expected, look for unusual amounts of cracking that could be caused by frost penetration

Preparing for a Barn Inspection

- a tall ladder for roof access
- a small ladder for accessing attic hatches
- screwdriver and knife for scrapping and digging
- fluorescent paint for areas of re-inspection

Check equipment tied to floors

- areas where equipment such as dry sow stalls, feeders, farrowing floors are attached to floors are high wear areas
- use screw driver and scrape until metal is uncovered, this will give some indication of required maintenance.
- farrowing and nursery floors are self supporting, check beams or framework to insure stability
- any plastic coated expanded metals should be inspected for cracking, even hairline cracks means life of product is greatly diminished

Ceilings

a variety of products are possible on ceilings, the most common are plywood and PVC liners

- pay particular attention around the interior perimeter, moisture entering from eaves will cause deterioration around perimeter first
- check integrity of plywood ceiling with a knife, wood should not be punky and should be difficult to penetrate with a knife
- PVC ceilings will not show this wear but check to make sure strapping above this product is sound, again in a few suspect locations pierce the PVC and check for soundness of strapping

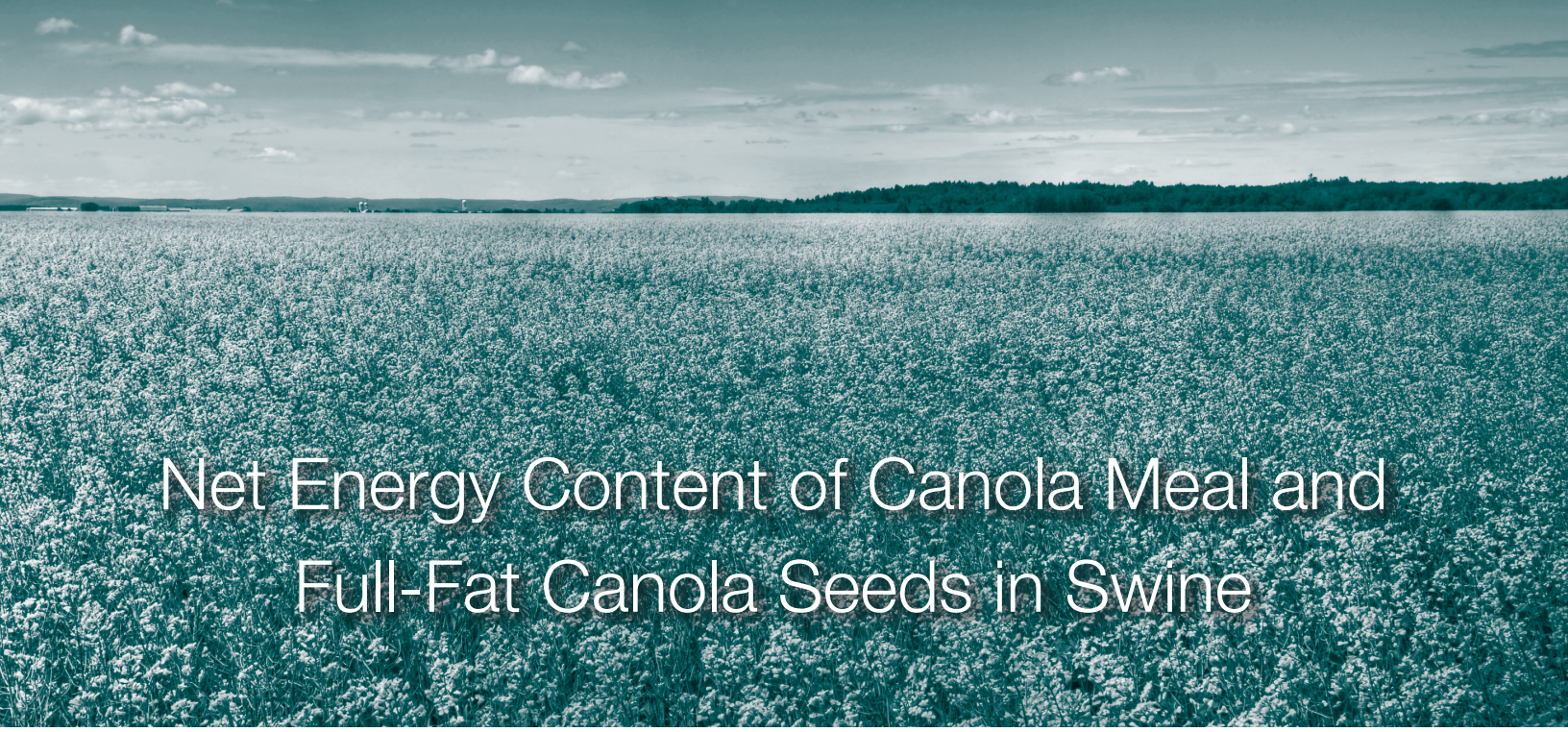
Load bearing walls

- not all barns have load bearing walls but any structure over 80' will almost always have trusses supported in the interior of the barn. These may be steel posts, concrete walls or stud walls usually on a concrete curb and these supports hold up a split truss and are extremely important
- if the structure has steel posts look for rusting especially at the base. Scrape away any surface rust until good steel is found, there should be very little deterioration or an engineer should be consulted
- if concrete look for cracking, hairline cracks are expected
- if wood, expose some of the stud wall and inspected for damage

Attics

- this area tends to be the most neglected area of a structure so pay special attention
- trusses are normally spaced at 48" centers. You cannot step on any area except the bottom cord of a truss or you may fall through the ceiling
- any roof leaks will be obvious from the condition of the insulation. Blown insulation should appear fluffy and evenly spread. Every discolouration or sagging is a roof leak. Every steel roof will have a few leaks (these should be repaired) but the important points are how much and how long, any leaks will have caused some deterioration to ceiling, bottom cords and truss plates, the amount and duration of these leaks will be directly related to the amount of damage. Minor damage is not significant but if the bottom cord is punky or the truss plates corroded an engineer should do further assessment, again scraping rust looking for good metal in plates and penetrating wood trusses with a screwdriver will give some indication of the amount of damage
- pay special attention around the perimeter of the roof as this is where snow has most likely entered the attic
- truss plates should be closely looked at. They should appear shiny and basically look like new, any rusting on truss plates is an issue that can cause roof collapse
- if there is no cladding under the roof steel such as tentest or vinyl back insulation holes in the attic will be obvious when you shut off the flashlight
- if the roof steel has under cladding of tentest this product sags easily if wet so roof leaks are again fairly obvious
- if the roof has vinyl back insulation this is more difficult. Water will run down the vinyl until it finds an exit so where you see insulation damage the leak may be higher up the roof

"You may want to have someone accompany you since perception of risk and impact is subjective and the exercise could benefit from a second opinion. "



Net Energy Content of Canola Meal and Full-Fat Canola Seeds in Swine

Carlos A. Montoya, Kathryn Neufeld, Pam Kish & Pascal Leterme

Introduction

Canola meal (CM) is used in animal nutrition but has to compete with other protein sources such as soybean meal and peas. Currently, CM is not used to its full potential in swine nutrition, due in part to a lack of confidence in its nutritional quality. Because of its low starch and oil content and high protein and fibre content it is perceived as a poor energy source.

Thanks to their high oil content, full-fat canola seeds (FFCS) could partly contribute to correct the low energy content of CM. However, the seeds must be crushed to liberate the drops of oil entrapped within the cell walls and little information is available on the efficiency of the process.

The NE system is the best estimate to predict pig growth and the pigs ability to convert feed into lean meat. However, it is often estimated by means of prediction equations because the direct determination is time-consuming and expensive. It is possible to confirm the validity of the NE content of CM or FFCS by measuring the feed conversion ratio of pigs fed with canola-based-diets. If the growth rate does not correspond to the predicted value, it means that the current values of NE over- or underestimate the real energy potential of these canola products.

Material & Methods

A total of 18 growing pigs (36 kg on average) were used for the digestibility study. Three experimental diets were prepared: a control diet (composed of barley, soybean meal and a mineral/vitamin premix) and two diets composed of 2/3 of the control diet and 1/3 of CM or FFCS. Each diet was tested on 6 growing pigs. After an adaptation period to the diet of 10 days, the faeces were quantitatively collected for 10 days. The samples were then pooled per animal, freeze-dried and analysed at the University of Saskatchewan. The digestible and net energy (DE and NE) content of the diets were calculated. The same parameters were calculated for the CM or FFCS alone (Table 1).

Based on the results of the NE content of CM and FFCS, two separate growth studies were conducted with graded levels of CM or FFCS. In each study, 72 growing pigs were used and four diets containing graded levels of FFCS (0, 5, 10 and 15 %) or CM (0, 7.5, 15 and 22.5 %) were formulated in order to meet the pig's nutritional requirements. Each diet was tested on 18 growing pigs (9 females and 9 males) for 35 d.

Results

The DE content was 3.51 and 4.99 Mcal/kg DM and the NE 2.41 and 3.53 Mcal/kg DM for CM and FFCS, respectively. The DM and nitrogen digestibility for CM was 74 and 79 % and for FFCS 75 and 74 %, respectively (Table 1). The results of growth performance are detailed in Table 2 and Figure 1. No difference in average daily gain (ADG) and feed conversion ratio (FCR) was observed when CM (ADG,

CM (ADG, 1.07 ± 0.29 kg/d and FCR, 1.99 ± 0.56) or FFCS (0.97 ± 0.24 kg/d and 2.27 ± 0.56) were included at different levels in the diets (P > 0.05).

Table 1. Digestibility values and energy content of canola meal(CM) and full-fat canola seeds (FFCS) in growing pigs.

	Canola Meal	*Full-Fat Canola Seeds*
Digestibility (%)		
Dry Matter	*74.0*	*75.0*
Nitrogen	*79.0*	*74.0*
Energy	*74.0*	*73.0*
Digestible Energy (Mcal/kg DM)	*3.51*	*4.99*
Net Energy (Mcal/kg)	*2.41*	*3.53*

The Bottom Line

The project aimed to estimate the net energy (NE) content of canola meal (CM) and full-fat canola seeds (FFCS) in swine and to validate these values, through growth studies using diets containing graded levels of CM or FFCS. No difference in average daily gain and feed conversion ratio was observed between the treatments. This confirms that the estimation of the NE content (CM 2.41 and FFCS 3.53 Mcal/kg DM) was correct and that it is possible to formulate balanced diets for growing pigs that contain up to 15% FFCS and 22.5% CM.

Table 2. Feed intake and growth in growing pigs fed with different levels of canola meal(CM) or full-fat canola seeds(FFCS) in the diets

	Inclusion level (%)				*RSD*[1]	*P*			
CM	0	7.5	15	22.5		Diet	Time	D x T	Gender
FFCS	0	5	10	15					
Average Daily Gain (kg)									
CM	2.03	2.02	2.01	2.09	0.55	0.664	0.001	0.122	0.023
FFCS	1.97[a]	1.99[a]	1.84[ab]	1.75[b]	0.45	0.001	0.001	0.651	0.002
Average Daily Gain (kg)									
CM	1.08	1.09	1.03	1.08	0.25	0.483	0.001	0.925	0.360
FFCS	0.98	1.00	0.94	0.95	0.24	0.070	0.001	0.437	0.018
Feed Conversion									
CM	1.94	1.95	2.06	2.00	0.63	0.190	0.001	0.694	0.814
FFCS	2.07	2.05	2.03	1.92	0.66	0.068	0.002	0.056	0.245

[1] *RSD: residual feed deviation*

[a, b] *Values with different letters in the same row differ significantly at P<0.05.*

(Piglet Health..Continued from page 2)

approximately 10 days after birth. In get-away systems, the sow is allowed to leave her litter, and may do so for up to 14 hours per day in the fourth week (Johnson and Marchant-Forde, 2009). The benefits of multi-suckling are due to reduced aggression and mixing stress at weaning, not just increased feed intake. Because multi-suckling allows piglets to mix and socialise at an earlier age, later mixing results in less stress. It can be easily implemented on-farm by creating a small door between 2 adjacent farrowing crates, and opening this when pigs are 2 weeks old to allow piglets from the two litters to mix.

Social learning and enrichment

Young pigs learn about their environment and what foods to eat from observing and imitating their litter mates and the sow. Without this experience, they are naturally neophobic and will avoid new foods or objects. Neophobia serves to protect young animals from ingesting toxic foods, but in weaned piglets this can make them more reluctant to consume feed. Seeing another pig eat increases the motivation to eat, and being able to participate may be even more important than just observing the behaviour. Learning from the sow is especially important. Unfortunately the sow's ability to interact with piglets is restricted in most farrowing pens, so there is little opportunity for them to learn from her behaviour. For this reason new farrowing systems have been developed which allow greater opportunities for interaction between the sow and her piglets, including a common feeding area (ProDromi, 2014). European studies have also shown that providing flavoured foods to the sow prenatally or postnatally results in positive effects on piglet performance after weaning (Oostindjer et al, 2014), as they recognise and are attracted to the familiar flavour.

Neophobia in piglets is also increased by the lack of exposure to different objects, foods and situations in both the farrowing and nursery environment. Typically these environments are barren and do not encourage activities such as exploration or foraging. The new Code of Practice (NFACC, 2014) recommends that pigs be provided with a variety of enrichments, including objects such as suspended toys, cloth strips or rubber, or rootable materials such as straw, hay, wood, or peat. Providing enrichment has been shown to reduce stress and fear responses in a variety of species. In piglets, providing enrichment in the farrowing pen resulted in reduced belly nosing and better growth and feed intake postweaning. Providing enrichment postweaning was even more effective, and resulted in improved growth and feed efficiency, and reduced incidence of diarrhoea in the two weeks following weaning (Oostindjer et al, 2014). Less aggression and more exploration and play behaviours were also found, further indicating that weaning stress was reduced, probably due to the distraction provided by enrichment. The ingestion of straw and other fibres may also increase saliva production and maturation of the intestine, resulting in improved gut health.

Enrichment studies clearly show that providing enrichment only in farrowing and not in nursery has a negative effect. So if enrichments are provided in farrowing they should definitely be included in the nursery, otherwise the negative impact of weaning will be increased.

Conclusions

Since weaning occurs more abruptly and at an earlier age than is natural, it is important to prepare piglets for this transition. This includes encouraging piglets to feed preweaning by using tray feeders, providing mash feed, and use of enrichment (hay, straw, rope, objects) to encourage exploration and rooting. Other measures that allow more social interaction should also be considered, including providing feed where both the sow and piglets can access it, and systems that allow early mixing of piglets such as the multi-suckling system described. Enrichment is most important in the nursery, where it can distract piglets from negative behaviours and encourage exploration activity and feeding. Further research is needed on the use of flavoured feeds, the design of farrowing pens and use of enrichment to reduce weaning stress and promote health in weaned piglets.

Injury Prevention is Loss Prevention: Applying Health and Safety Research Helps the Bottom Line

Catherine Trask
Canadian Centre for Health and Safety in Agriculture (CCHSA)

Injury as a source of loss

Injury is a big problem in pork production, from a business perspective, a regulatory compliance perspective, and for workers' quality of life. In agriculture, musculoskeletal disorders like back or shoulder pain are the most common cause of work absence, and farm income is lower when operators have disability related to these disorders. In heavy industries like construction, productivity is lower among workers who have pain even when workers do not take time off or make a claim. A survey of Saskatchewan pig barn workers conducted in 2012 found that 92% have pain somewhere in their body, and 58% say their work is affected by pain. Clearly there are opportunities for improving profitability by addressing workplace injury and musculoskeletal symptoms.

Injury prevention is fundamentally linked to sound business practice. Consider the simplest calculation for assessing the viability of a business: **Profit = Revenue – Loss**

The swine industry invests a lot of effort and attention in tracking production performance. But at the end of the day, profit increases the most when there is focus on both production and loss prevention. Loss can come from elevated workers' compensation rates, sick leave and absenteeism, worker turnover (along with the recruitment and training costs this entails), and 'presenteeism' (i.e. workers that have pain but still come to work with lower productivity). Musculoskeletal injury will increase all of these types of loss.

Solving the problem

Knowing about this source of loss is one thing, but how can it be prevented? Researchers at the Prairie Swine Centre and Canadian Centre for Health and Safety in Agriculture are working on a set of research studies to tackle the issue of injuries in pork production. This research will span 3 main areas: 1) analyzing injury rates to look for trends and target areas; 2) developing a 'toolbox' approach to evaluate the impact of new technologies, and 3) looking for new technologies to test and barns in which to test them.

Analyzing injury statistics

One of the ways to improve performance is to track quantify where you are and set goals for where you'd like to be. Analyzing injury rates will help to do this by setting the current benchmark and then identifying and prioritizing the areas to improve. This type of analysis will also help identify the high risk areas, activities, and job titles. There is already some valuable information from existing reports, since previous ergonomic studies have identified several challenging tasks in pig barns. One article cites catching and lifting piglets as the hardest job, while another reports cleaning, piglet processing, and sorting piglets as having the highest exertion levels. Danish researchers measured duration of back bending and found that in most tasks workers had their backs bent more than >20 degrees for about 40% of the time. In a recent survey of Saskatchewan pig barn workers, the tasks identified by workers as difficult were: moving pig, getting in and out of pens, handling dead pigs, processing piglets, veterinary treatments, cleaning and maintenance. We plan to study modern Saskatchewan injury reports in order to find the biggest opportunities for improvement.

Testing the solutions

After we determine what areas need to be addressed, we'll want to make sure that our proposed solutions are effective. These solutions need to be not only effective in preventing injury, but also acceptable to workers (so that they are used). They also need to provide a good return on investment (so that they get purchased in the first place). In order to make sure these requirements are met within the context of pork production, we need a set of tests or evaluations for new solutions. This 'toolbox' approach will develop a suite of evaluation tools that can be applied to any type of safety solution. The toolbox will assess: the baseline effectiveness of the solution

in preventing industry; the cost of implementation including training and maintenance; acceptability to workers and worker recommendations for improvement; local barn or company characteristics that help or hinder effective implementation; and overall return on investment relative to any changes in injury or productivity.

With good benchmarking and adoption of proven prevention strategies, injury losses can be prevented to strengthen the bottom line

On the lookout for new solutions and test facilities

Lab tests are fine for some things, but to make sure these solutions can be applied successfully in industry we need to assess them in a real-world setting. This means we'll be on the lookout for appropriate solutions to the problems we identify, and also the right environments in which to test them. For example, our first solution to assess will be needle-less injectors.

Needle-less injectors have been gaining popularity on pig farms for productivity reasons. They eliminate risk of needle-stick injury, but may increase musculoskeletal exposures and lead to injury. It is unclear whether needle-less injectors have a net health and safety benefit. This project aims to address that gap with a comprehensive evaluation, including investigation of: Injury rates, Worker preferences, Measured musculoskeletal exposures like grip force and repetition, Productivity, and Overall cost-benefit and return on investment. This means we'll be implementing the needle-less injectors in a few barns and observing the effect on worker symptoms and productivity. We'll also meet with workers and barn managers to identify challenges and find the best ways to make the transition smooth. Lastly, we'll track the costs and weigh them with the potential benefits so that producers can make an informed choice about when to adopt a new method or technology.

We know from previous research that there are some things that can be done to maximize the chance for success when introducing a new method. New controls are generally more successful when they have:

1. Organizational support and involvement at the top, where management not only says safety is important, but shows it by ensuring the time, funding, and resources are available to make the control successful.
2. Safety included as a business priority, demonstrated by incident tracking and OH&S systems, including safety in performance evaluations, and preventing loss by helping low performers
3. A local champion — perhaps a worker representative or manager who is already engaged in Occupational Health and Safety issues.
4. Engaging workers throughout the process to address constraints and motivate buy-in.
5. Adequate communication of the project's goal, what will be done, timeline, and ways to give feedback.
6. Some pilot testing. Trial small before you go big, trial cheap (i.e. get feedback on the paper version) before you go expensive, and evaluate any new initiative before expanding the implementation.
7. Training reinforcement to encourage peer and supervisor modeling.

Moving forward

Injuries can take a bite out of profits, but they don't have to. With good benchmarking and adoption of proven prevention strategies, injury losses can be prevented to strengthen the bottom line and secure long-term viability. The number of options in potential solutions can be overwhelming, but a systematic and collaborative effort will help identify the good ones. Ongoing research is being conducted to test potential strategies, and will be communicated to producers via the Prairie Swine Centre.

Collaboration and participation from producers is vital to developing solutions that are going to work in the long-term, so we'd love to hear from you. Please feel free to contact us if you have an idea for a new safety solution, or if you are interested in participating in a barn trial.

(Nanotechnologoy)..Continued from page 4)

chambers' ventilation air recirculation systems – one loaded with nanoparticles and the other without. The trials were 15 days long, and the scientists monitored microbial loads both in the air and on surfaces, as well as greenhouse gases, manure characteristics and pig performance.

To measure whether the nanoparticles could help with sanitation, two levels of ZnO nanoparticles were sprayed on concrete surfaces and compared to the control, which was treated with the standard chemical treatment ordinarily applied.

The results from both phases of the experiment were encouraging.

"Partial filtration of the air in the chamber with the ZnO nanoparticles did achieve a reduction in bioaerosol levels in both the human and the animal-occupied zones," said Predicala, adding it was important to note that the nanoparticles didn't appear to negatively affect any other measured aspects of swine production. "There was no significant impact on carbon dioxide and methane emissions, manure characteristics, or pig productivity."

The ZnO particles were shown to be effective in controlling the growth of certain commonly encountered pathogens such as Salmonella and S. suis. Also, the filtration system could be improved, further reducing bioaerosol pathogens with better air capture, and forcing more air to pass through the treated filter.

The sanitation experiment showed that the nanoparticles can indeed make a big difference by inhibiting the growth of microorganisms and in fact, could be a better option than conventional disinfectants. Of course, new technologies not only have to work, they have to be reasonably priced in order for any potential implementation to make sense. In that regard, the sanitation nanotechnology was ahead of the filter application.

"Currently, the use of the nanoparticle solution during sanitation was only about 12 cents higher than the use of conventional disinfectant," explained Predicala. "The cost of filtration treatment with ZnO nanoparticles has to come down significantly before it can be a practical barn application.

Predicala and Alvarado recommend pilot-scale testing in other parts of the barn such as the nursery, breeding, gestation, and farrowing areas to further determine the feasibility of both the sanitation and the filter nanoparticle applications.

"It would also be useful to conduct trials at higher recirculation rates, which would likely have a better impact on reducing bioaerosol levels," said Alvarado.

The full version of the study report can be found at prairieswine.com.

Personal Profiles

Danilo Sotto

Danilo Sotto is from Quezon City, Philippines and has started his Ph.D. program at the University of Saskatchewan in January 2015. He joined Prairie Swine Centre, Inc. as a graduate student for nutrition under the supervision of Dr. Denise Beaulieu. He is the recipient of the Gowan's Feed Consulting and Prairie Swine Center, Inc. Student in Animal Nutrition Award.

Dan earned his M. Sc. in Animal Science from the University of the Philippines Los Banos and has worked with the local feed manufacturing industry for 16 years before deciding to pursue Ph. D. He specialized in non-ruminant (swine and poultry) nutrition, doing feed formulations and research. He also held responsibilities related to purchasing and sales.

His study will focus on the effects of particle size and fibrous diets to improve pig performance and health. Particle size studies are mostly done using corn-soybean meal based diets and this may not be applicable to Western Canadian-type diets which are barley and wheat-based due to the type and amount of fiber present.

He aims to determine the variability in particle size in on-farm mills and will look at the impact of particle size, grinder type, fiber source, and feed form on pig performance, nutrient digestibility, feed manufacturing cost, and feed handling characteristics. He is also looking to improve the weanling pig's overall gut health with the appropriate diet particle size and fiber source in anticipation of the ban on in-feed antibiotics as growth promotants in Canada in 2017.

Coming Events

Swine Technology workshop
October 21, 2015
Red Deer, Alberta

Saskatchewan Pork Symposium
November 17-18
Saskatoon, Saskatchewan

Hog Days
December 2, 2015
Brandon, Manitoba

Banff Pork Seminar
January 12-14, 2016
Banff, Alberta

OMFRA News Release

I'm pleased to announce that Laura Eastwood will be joining the Agricultural Development Branch as a Swine Specialist on a permanent basis working from the OMAFRA Stratford Office.

Laura grew up in Burlington, Ontario and completed her undergraduate degree from the University of Guelph with a major in Animal Biology in 2006. She then moved to Saskatoon where she continued her studies at the University of Saskatchewan in conjunction with the Prairie Swine Centre, focusing on swine nutrition. In 2008, Laura completed her Master's thesis, where her research focused on determining nutrient digestibility of a novel ingredient and its effects on growth performance and carcass composition. Shortly after completing her M.Sc. program, Laura began her doctoral studies, completing her Ph.D. in 2013. Her research focused on improving sow performance and piglet health through dietary inclusion of omega-3 fatty acids.

After completing her graduate training, Laura continued with her research program at the Prairie Swine Centre, in the role of Research Associate – Nutrition. Laura's program focused mainly on improving piglet health through nutrition, and determining strategies to mitigate the post-weaning growth lag. Laura has also focused on determining optimal strategies to feed mycotoxin contaminated grain to swine.

After almost 9 years in Saskatoon working at the Prairie Swine Centre, Laura is excited to be moving back to Ontario in her new role as Swine Specialist with OMAFRA.

She will be starting her new position July 13, 2015.

All the staff at Prairie Swine Centre would like to take this opportunity to thank Laura for her time and commitment to the Centre as look forward to working with her in the future.

PRAIRIE SWINE CENTRE

Centred on Swine is a semi-annual newsletter produced by Prairie Swine Centre Inc. (PSCI).

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