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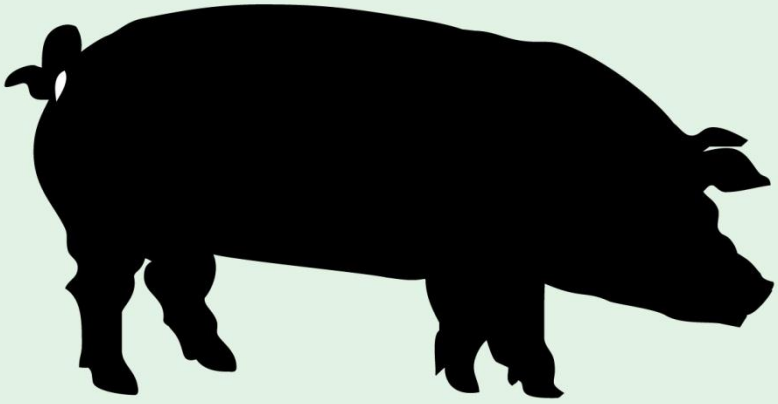

CENTRALIA SWINE RESEARCH UPDATE

January 28th 2015

CentraliaSwineResearch.ca

CENTRALIA SWINE RESEARCH UPDATE
Kirkton-Woodham Community Centre
January 28, 2015

9:15 a.m. Registration and Coffee
9:50 Opening Remarks

LUNCH

WRITTEN-ONLY TOPICS

ACKNOWLEDGMENT

Centralia Swine Research Update *wishes to* ***acknowledge*** *and* ***sincerely thank*** *the following Associations and Companies for their financial support as sponsors of this year's program:*

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Wed. January 27, 2016

Wed. January 25, 2017

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Centralia Swine Research Update
Box 37
Exeter, Ontario
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The Centralia Swine Research Update Planning Committee would like to acknowledge the logistical support from the Ontario Ministry of Agriculture, Food and Rural Affairs for the co-ordination, proceedings, and registration of this event.

An Investigation of Iron Deficiency and Anemia in Piglets

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Introduction and Objectives

Iron supplementation is a necessary farm management practice and is carried out in order to prevent suckling piglets from developing iron deficiency and anemia. There are four reasons why piglets require supplemental iron within the first week of life: 1) limited iron stores at birth, 2) low content of iron in sow milk/colostrum, 3) limited to no access to soil and 4) high iron demand due to rapid growth rate (1). A 200 mg dose of iron administered intramuscularly within the first week of life has been the accepted standard protocol for iron supplementation for many years. The objectives of this study were to investigate whether current iron supplementation protocols are adequate to meet the needs of today's piglets by determining the prevalence of anemia or iron deficiency in piglets at the time of weaning and to determine whether iron status at the time of weaning affects post-weaning performance.

Methods

Twenty commercial swine farms were visited across Ontario. All farms used injectable iron supplementation given in the first week of life. Farms used either iron dextran or gleptoferron. On each farm 3 piglets (small, medium and large) per litter were chosen for the study and approximately 60 pigs per farms were sampled. Pigs (n=1095) were sampled 1-2 days prior to weaning. Each piglet was individually weighed and had blood samples taken upon enrollment. Blood samples were submitted to the Animal Health Laboratory (AHL), University of Guelph for complete blood count (CBC) analysis. Three weeks later the same pigs were re-weighed and had a second blood sample taken which was analyzed for hemoglobin concentration. The hemoglobin concentration from each piglet was defined as follows: normal (>110g/L), iron deficient (>90g/L but < 110g/L), and anemic (< 90g/L) (2). Producers completed a short questionnaire about their husbandry practices along with their iron supplementation methods. Statistical analysis was designed to evaluate the association and to assess nursery performance between hemoglobin status at weaning and 3-wk post-weaning weight.

Results

At weaning, the between herd prevalence of iron deficiency and anemia were 28% and 6%, respectively. Anemic pigs at weaning had a 0.81 kg reduction in their 3-wk post-weaning body weight compared to piglets with normal hemoglobin values at weaning. Also, anemic pigs at weaning had a 0.68 kg reduction in their 3-wk post-weaning body weight when compared to iron deficient pigs at weaning. The largest piglets at weaning had lower hemoglobin values compared to small pigs. The fastest growing suckling pigs have the largest blood volume, therefore their hemoglobin is diluted, but in addition, these animals have the highest requirements for all nutrients. Thus, rapidly growing piglets at weaning have higher iron requirements compared to smaller piglets. The results from this study confirm that 200mg of injectable iron in the first week of life was often not sufficient to prevent anemia or iron deficiency for the larger, faster growing pigs. Anemia at weaning

was associated with reduced growth in the first 3 weeks post weaning. Surprisingly piglets generally remained anemic or iron deficient during the 3 weeks post-weaning although starter rations were well fortified with iron.

Take Home Message

Understanding the consequences of iron deficiency and anemia is important for the swine industry and producers in order to prevent economic losses. This project has demonstrated that large fast growing pigs are often iron deficient and possibly anemic at weaning and this is having an impact on post-weaning performance. However, more work is needed in order to determine if additional supplementation or different protocols are beneficial. Pork producers need to re-evaluate their iron supplementation program.

Acknowledgments

This work was supported by Ontario Pork and the University of Guelph-OMAFRA Research Partnership. We are grateful for the participation of pork producers and the assistance of AHL in analyzing blood samples.

References

1. Svoboda, M., and Drabek, J. (2005). Iron deficiency in suckling piglets: etiology, clinical aspects and diagnosis. *Folia Vet*, 49, 104-111.
2. Nielson, JP. *et al*. (2013). Herd diagnosis of iron deficiency in piglets. Proceedings European Symposium Porcine Health Management. p168.

The Use of Zinc in Swine Production and Its Link to Antimicrobial Resistance

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Zinc is a necessary component of a pig's diet. Feed containing 50-125 ppm of zinc is suitable for normal growth and development. However, zinc is also used therapeutically in swine production as a treatment for post-weaning diarrhea. The therapy involves the addition of high levels of zinc (2,000-3,000 ppm) to the feed for 2-3 weeks after weaning. Pigs are fairly resilient to high levels of zinc (up to ~3,000 ppm), but the gut bacteria are prone to the antimicrobial properties of zinc therapy; although the full mechanism of this therapy is still being researched.

Due to increasing pressure to reduce the use of traditional antibiotics in swine feed, zinc therapy has become a popular antibiotic alternative that is now widely used in Ontario swine production. Our recent survey of 22 nursery herds from 9 counties in southern Ontario showed that 68% of the farms were using a nursery feed with high levels of zinc (>2000 ppm). It was also found that some herds were using zinc at levels exceeding 3,000 ppm which can cause zinc toxicity in pigs.

However, despite being a popular antibiotic alternative, a high level of in-feed zinc may inadvertently be causing resistance to antibiotics. Some bacteria (*Staphylococcus* spp.) carry a zinc-resistance gene which is genetically linked to other antibiotic-resistance genes within a 'genetic cassette' (*1*). When these bacteria are exposed to high levels of zinc they will get this genetic cassette from other bacteria in order to acquire resistance to zinc. However, the genetic cassette contains other resistance genes and so the bacteria will acquire resistance to other antibiotics despite not being exposed to those antibiotics. That is, it is possible for bacteria to become resistant to antibiotics even under 'antibiotic-free' conditions.

Our research has shown that this event can occur on commercial swine farms. We conducted a randomized-controlled trial with 110 pigs under antibiotic-free conditions; half were given a minimal zinc diet (100 ppm) and half were given a high zinc diet (3,000 ppm). It was found that pigs on the high zinc diet were significantly more likely to carry the 'superbug' named methicillin-resistant *Staphylococcus aureus* (MRSA) than pigs fed the minimal zinc diet (*2*). Additionally, our study of 22 nursery herds in southern Ontario showed that farms using a high zinc diet were more likely to carry MRSA, and these bacteria commonly carried the genetic cassette which contains resistance genes for both zinc and antibiotics.

This research highlights the complexity of antimicrobial resistance. There are multiple factors which contribute to antimicrobial resistance and this is one scenario which demonstrates that an antibiotic alternative can still cause antibiotic-resistance in bacteria. Conserving the therapeutic activity of antibiotics is important for both human and animal health, but antibiotic alternatives should always be validated with research, otherwise these alternatives may just be contributing to the problem.

References

1. Cavaco et al., 2010. Antimicrob Agents Chemother. 54(9):3605-8.
2. Slifierz et al., 2014. Zoonoses and Public Health. doi:10.1111/zph.12150.

Feeding of Fermented DDGS in a Liquid Feed System to Weanling Pigs: Improving Growth Performance using Fiber Manipulation with Enzymes and Microbial Inoculants

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Introduction

Feeding diets with a high insoluble:soluble fiber ratio has been suggested as a strategy to improve gut function in newly weaned piglets (Molist et al., 2014). Fermentation of DDGS, via soaking in water for an extended period with added fiber-degrading enzymes and microbial inoculants, can be used to target the soluble fiber portion, increasing the insoluble:soluble fiber ratio. The resulting product is a more valuable feed ingredient for young pigs. Fermentation would also convert energy present in soluble fiber to short chain and organic fatty acids, improving energy availability and thus feed efficiency (Gain:Feed). Control and stability of the fermentation is crucial for generating a consistent product. A preliminary study was conducted to identify microbial inoculants capable of controlling the fermentation of DDGS when combined with fiber-degrading enzymes and to determine the optimal feeding window. A growth trial was then carried out using piglets weaned at 20 days of age and fed liquid corn and soybean meal based diets combined with DDGS to determine the impact of fermenting DDGS on growth performance of weanling piglets. Liquid feeding unfermented DDGS supplemented with the microbial inoculants and fiber-degrading enzymes served as the control.

Materials and Methods

DDGS containing diets were fed to newly weaned pigs (8 pens/diet, 14 pigs/pen). The two treatments, fermented DDGS (**ferDDGS**) and unfermented DDGS (**uferDDGS**) were formulated as identical corn and soybean meal based diets to meet or exceed NRC (2012) requirements for three phases; Phase I (7.5% DDGS, week 1 postweaning), Phase II (16.25% DDGS, week 2-3 postweaning), and Phase III (25% DDGS, week 4-6 postweaning). **ferDDGS** consisted of DDGS (Greenfield Ethanol), which was fermented in 39±3°C water (14% DM) with β-glucanase and Xylanase; (67.2 and 51.4 IU/g DDGS resp., AB Vista) and the silage inoculant Biotal Plus (360, 000 CFU *Pediocoocus pentosaceus* 12455 and *Propionibacterium jensenii* 30081/g DDGS with 0.04 IU β-glucanase, 0.02 IU Galactomannanase, and 0.03 IU Xylanase/g DDGS; Lallemand). **ferDDGS** was fed between 1 and 7 days after the start of fermentation and mixed with the remaining dry diet components and water (25-26% DM) just prior to liquid feeding. **uferDDGS** consisted of the complete dry diet, enzymes, and inoculant (identical inclusion levels as ferDDGS) added to water immediately prior to liquid feeding (25-26% DM). As initial BW (**BW_i**) was variable (Table 1) pigs were separated into two rooms according to a heavy BW_i (**HBW_i**, 7.6±0.8 kg) or light BW_i (**LBW_i**, 5.8±0.6 kg) (n=4 per room). Per pen dry matter intake (**DMI**) and individual pig BW's were determined each week for calculating daily BW gain (**ADG**) and Gain:Feed (G:F). To ensure all pigs ended the trial at a similar BW, **LBW_i** pigs were fed Phase III diets an additional week, subsequently included in Phase III growth analysis for **LBW_i** pigs.

Results

Despite efforts towards stabilizing fermentations, **ferDDGS** quality was found to be variable between batches with occasional high acetic acid levels (ferDDGS [n=9]: 42.6±17.4 mM lactic acid; 55.3±37.1 mM acetic acid, pH 4.8±0.4; u**ferDDGS [**n=3]: 17.6±1.4 mM lactic acid; 3.9±0.7 mM acetic acid pH 5.6±0.3). As there was a significant ($P<0.05$) interaction between BW_i and treatment, growth data was separated according to **HBW_i** and **LBW_i**. Within the **HBW_i** pigs, ADG and BW were higher ($P<0.05$) in pigs fed **uferDDGS** in Phase II but not I or III ($P>0.10$) while DMI was not impacted, resulting in greater G:F ($P<0.05$) in Phase II (Table 1). Within **LBW_i** pigs, ADG and DMI were improved ($P<0.05$) in pigs fed **ferDDGS** in Phase III without impacting G:F ($P>0.10$). BW's were higher in usDDGS pigs in Phase II ($P<0.05$) but no other parameter was impacted ($P>0.10$) (Table 1).

Table 1: Growth performance for nursery pigs fed liquid diets containing DDGS fermented (ferDDGS) or unfermented (uferDDGS).

	Heavy initial body weight			**Light initial body weight**		
	Diet		**P-value**	**Diet**		**P-value**
	ferDDGS	**uferDDGS**		**ferDDGS**	**uferDDGS**	
Body Weight (kg)						
day 0, weaning	7.5±0.03	7.6±0.03	0.58	5.8±0.02	5.8±0.02	0.10
day 7, end of Phase I	7.9±0.1	7.8±0.1	0.89	6.3±0.1	6.4±0.1	0.43
day 21, end of Phase II	**11.6±0.1**	**12.4±0.1**	**<0.01**	**9.2±0.1**	**9.7±0.1**	**0.04**
day 42, end of Phase III[1]	25.3±0.4	25.5±0.5	0.82	25.7±0.5	24.6±0.4	0.15
Average Daily Gain (g/d)						
Phase I	526±16	392±14	0.55	74±14.5	83±15	0.67
Phase II	**263±14**	**324±14**	**0.01**	210±14.5	234±15	0.27
Phase III	647±14	623 ±14	0.24	**611±16.8**	**550±15**	**0.02**
Dry Matter Intake (g/d)						
Phase I	201±11.0	196±11	0.75	180±9	178±9	0.86
Phase II	369±9.2	372±9	0.85	286±10	305±10	0.17
Phase III	984±34	947±34	0.46	**897±32**	**775±28**	**0.02**
Gain:Feed (g/g)						
Phase I	0.16±0.08	0.19±0.08	0.73	0.42±0.08	0.48±0.08	0.54
Phase II	**0.72±0.02**	**0.87±0.02**	**<0.01**	0.74±0.03	0.78±0.03	0.43
Phase III	0.66±0.02	0.66±0.02	0.96	0.68±0.01	0.71±0.01	0.13

[1]Phase III ended on day 42 for heavy initial body weight pigs and day 49 for light initial body weight pigs

Discussion

Particularly low lactic acid and high acetic acid levels in a particular batch of fermented DDGS are most likely the cause of poor comparative performance during Phase II for **HBW_i** pigs fed **ferDDGS**. The lesser impact on **LBW_i** pigs fed **ferDDGS** is of interest, and is perhaps due to lower overall intake of both diets by **LBW_i** pigs during this time and poorer ADG compared to **HBW_i** pigs. In spite of unforeseen variability in quality of fermented DDGS batches, **ferDDGS** was found to improve growth performance late in the

nursery period, when DMI begins to increase dramatically, with a distinct benefit to **LBW_i** pigs. This observation may be due to a lesser ability of **LBW_i** pigs to utilize soluble fiber components of DDGS and thus benefiting more from fermenting **ferDDGS**. In addition pig potentially compromised by light BW at weaning may benefit more from dietary strategies which affect gut development. Future work will focus on analyzing the impact of the diets on gut development parameters using data collected during the trial to determine mode of action.

Acknowledgments
Funding was provided by OMAFRA, NSERC, Swine Innovation Pork and industrial partners of the swine liquid feeding association (www.slfa.ca).

References

Molist, F.; van Oostrum, M.; Pérez, J. F.; Mateos, G. G.; Nyachoti, C. M.; van der Aar, P. J., 2014: Relevance of functional properties of dietary fibre in diets for weanling pigs. *Animal Feed Science and Technology*., **189**, 1–10.

Improving Sow Productivity through Genetics and Genomics

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Background

Sow productivity is a complex concept involving several characteristics such as fertility, prolificacy and maternal abilities, which all contribute to the number of piglets weaned per sow per year. Litter size has been improved genetically in many pig populations around the world, as it is the most economically important sow productivity trait. Nowadays, all breeding programs include litter size as the main sow productivity trait in dam lines but its definition varies between countries and/or breeding programs. The total number of piglets born (including born alive and stillborn, excluding mummies) in combination with perinatal piglet survival as a second trait are used in the Canadian Swine Improvement Program, whereas the number of piglets born alive or alive at a standard time after birth or at weaning has been adopted in other countries such as Denmark, France and The Netherlands. Most sow productivity traits have a low heritability, which makes selection based on individual sow performance ineffective; yet remarkable progress has been made using statistical methods to combine records on all relatives and large amounts of data. CCSI manages a huge database of pedigrees and performance records and carries out national genetic evaluations for more than 20 different traits. In the area of sow productivity, national evaluations are based on more than 1.5 million litter records collected on purebred sows between 1978 and 2014. Figure 1 shows genetic trends on litter size in Canadian maternal breeds since 2000 and piglet survival since 2004. In the last 15 years, annual genetic gains of about 0.2 piglets/litter have been achieved in Yorkshire and Landrace. At the same time, progress in management, feeding and reproductive technology has also contributed to improve sow productivity.

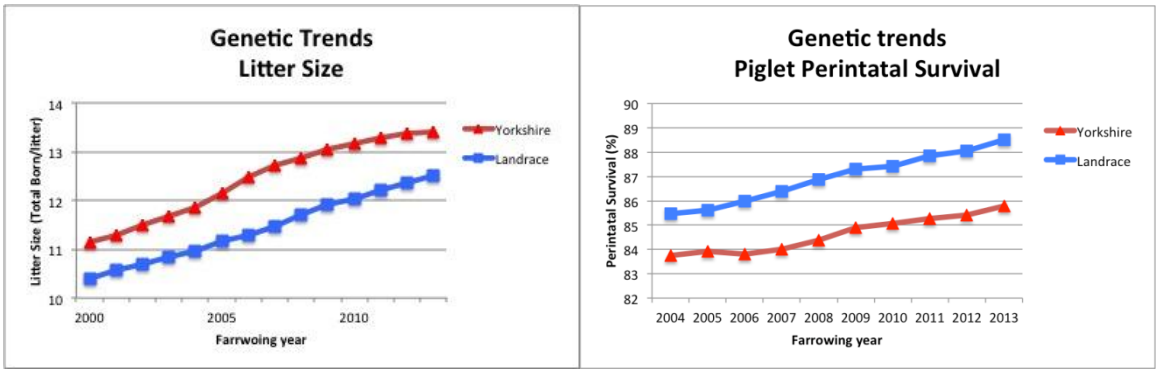

Figure 1. Genetic trends on litter size and piglet survival in the Canadian Swine Improvement Program.

New sow productivity traits

Following several years of successful selection on litter size, there has been a tendency in the last few years to add new sow productivity traits to swine breeding programs, mainly to limit piglet mortality and heterogeneity resulting from large litters. New traits include

piglet survival, number of teats, uniformity of piglets at birth, litter weight at birth and weaning, weaning capacity, weaning to conception interval, etc. In collaboration with researchers from the University of Guelph, CCSI has developed breeding values for several new traits in the past years and made them available to breeding stock suppliers to allow for selection on new traits in addition to litter size. Among the new traits evaluated, piglet perinatal survival, farrowing interval and number of functional teats are now included in the national dam line index (DLI) used to select purebred breeding stock.

Use of commercial data

CCSI's national genetic evaluations currently include litter records available on purebred sows (producing purebred or crossbred litters), but there is work underway to implement genetic evaluations including records centralized in the CCSI database on commercial sows. This will considerably increase the accuracy of breeding values for sow productivity traits and provide opportunities to further increase genetic gains on litter traits.

Screening for hypoprolific boars

Many chromosomal abnormalities cause hypoprolificacy in swine. New abnormalities have been described on a regular basis and they are not rare in swine populations. The effect of these different abnormalities was found to reduce litter sizes from 22 to 68%. There is a need to detect potential carriers of these anomalies to prevent their spread in swine populations, which could lead to high costs for commercial producers. CCSI's database is used to compute 'Direct Boar Effects' (DBEs), which is an estimate of the average direct effect of each boar on the litter size of its mate. DBEs are used to detect potential carriers of chromosomal abnormalities that can now be tested at the University of Guelph through karyotyping analysis.

Genomic selection

Researchers at CCSI and the University of Guelph are also working on new genomic tools for genetic evaluation and selection of pigs. A high-density panel of genetic markers with approximately 60,000 single nucleotide polymorphisms or SNPs has been commercially available to pig breeders since late 2009. This panel has been used to genotype several thousand animals in the Canadian Swine Improvement Program. Sow productivity traits are ideal traits for genomic selection, since they have a low heritability, are expressed only in one sex, are only measured on mature animals and in the case of some traits are difficult to measure (i.e. ovulation rate, fertility, uterine capacity, longevity, etc). In this context, the large database managed by CCSI is a valuable resource since it provides opportunity to target specific animals that are influential to each breed and contains many performance records or progeny with performance data. Recent developments in dairy cattle have shown the potential of genomic selection; there is a need, however, to develop optimal strategies for the Canadian swine breeding industry so that genomic selection is adopted in a quick and cost-efficient way. Pilot genomic evaluations are being tested for traditional traits and will be extended to many other traits in the next few years.

Animal Health Laboratory Update

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The AHL is a full-service, fully computerized veterinary diagnostic lab that boasts an extensive cadre of laboratorians with post-graduate training and specialty board certification. This expertise provides a single source of laboratory services in the field of animal health, including swine diagnostics.

Our Personnel
Personnel at AHL-Guelph provide a wide range of veterinary laboratory tests for swine in our specialty areas of: anatomic pathology, histotechnology and immunohistochemistry, bacteriology, clinical pathology, immunology/serology, molecular biology, mycoplasmology, parasitology, toxicology, and virology. Personnel at AHL-Kemptville provide anatomic pathology services and case coordination, and forward specimens to AHL-Guelph for additional testing as required. AHL personnel continuously strive to develop improved tests and to optimize our testing spectrum. The AHL provides reports and consultations to support veterinary practitioners, our primary client group. We keep our Vet-clients apprised of AHL current activities, lab-based animal disease events and disease trends, by way of the quarterly AHL Newsletter.
http://www.guelphlabservices.com/AHL/Newsletters.aspx

Disease Trends
We also serve as the central source of provincial animal disease trend information. Changes in the patterns of existing disease, or the appearance of a new disease, are communicated to OMAFRA, veterinarians, producers and industry groups. Laboratorians at the AHL are vigilant regarding surveillance for foreign animal diseases and zoonotic diseases. As a partner with the Ontario Ministry of Agriculture and Food and Rural Affairs (OMAFRA) in the Ontario Animal Health Network (OAHN), the AHL contributes to maintaining healthy animals and safe food in Ontario.

Accreditation
The Animal Health Laboratory (AHL), a unit of the Laboratory Services Division of the University of Guelph, employs a comprehensive quality program.

The AHL is accredited by:

- American Association of Veterinary Laboratory Diagnosticians (AAVLD) – full accreditation, all species
- Standards Council of Canada (SCC) to ISO/IEC 17025:2005 standard for specific tests listed on our scope of accreditation
- Canadian Association for Laboratory Accreditation (CALA) to ISO/IEC 17025:2005 standard for specific tests on our scope of accreditation
- Canadian Food Inspection Agency (CFIA) – EIA

We continually strive to meet the needs of the swine industry in areas of diagnostics, export certification and emerging disease investigation.

Dynamics of Nitrogen Retention in Gestating Sows – Implications for Feeding Programs

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Introduction

Body protein deposition (**Pd**) is a main determinant of amino acid and energy requirements of gestating sows. However, based on the most recent review, empirical data on the dynamics of Pd in gestating sows is limited (NRC, 2012), especially as it relates to the gradual transition of maternal Pd in early gestation to fetal Pd in late gestation. Particularly for parity 1 and 2 sows, where maternal Pd is relatively large and affected by energy intake, more data is needed.

Objectives

To assess the dynamics of Pd (nitrogen [N] retention × 6.25) in gestating gilts and investigate the effect of energy intake on maternal protein deposition.

Methodology

Fifty two gestating purebred Yorkshire gilts (initial BW and P2 back fat [**BF**] at 25d of gestation 168.1±2.2 kg and 17.1±0.8 mm) from the Arkell Swine Research Station were used for this trial, distributed over 4 groups. Based on average BW and BF at breeding and the NRC (2012) swine nutrient requirements modelling program, high and low feeding levels corresponding to 15% above and 15% below estimated energy requirements for gestating gilts were determined (2.59 and 1.87 kg/day, respectively). A corn and soybean meal diet was used for both feeding levels (3.30Mcal ME/kg, 17.8% CP, 0.82% SID Lys) and fed from 30-110 days of gestation. Throughout gestation there were 5 N-balance periods of 4 days in length, starting at 35, 49, 63, 85, and 106d of gestation. Urinary N was collected quantitatively via urinary catheters and fecal N was calculated from N intake and fecal digestibility; the latter was determined using an indigestible marker. Bi-weekly BW and BF was measured throughout gestation. To correct for systematic differences between N-balance observations and Pd, the NRC (2012) modelling program was forced to be consistent with observed changes in BW and BF between 39 and 110 d of gestation. The mean ratio between modelled Pd and observed N-balance was used to adjust N-balance observations. Pregnancy-associated Pd (fetus, mammary gland, uterus, and placenta) was calculated using actual litter size and average piglet birth weight using NRC (2012). Maternal Pd was calculated as the difference between total Pd and pregnancy-associated Pd.

Results

At 25d of gestation, BW and BF did not differ between feeding levels ($P=1.00$), but at 110d of gestation, feeding level had an effect on BW ($P<0.0001$) and tended to affect BF ($P=0.059$) (Table 1). Feeding level and day of gestation affected whole body Pd (Table 1) and maternal Pd (Figure 1) ($P<0.01$), but there was no interaction ($P>0.67$). Whole body Pd showed both linear and quadratic relationships with day of gestation ($P<0.05$). Maternal Pd declined linearly ($P<0.001$) with day of gestation (Figure 1). Across the five N-balance periods, whole body and maternal Pd increased by 33.0±1.6g/d as a result of the increased feed intake.

Table 1. Effect of gestation feeding level (High vs. Low) on total BW gain, changes in BF and whole body Pd (maternal plus pregnancy associated Pd; mean ± SE)**.**

Parameter	High	Low	P-value
Initial BW (kg, 25d)	167.8±2.7	168.4±2.7	1.000
Initial BF (mm, 25d)	17.0±0.9	17.3±0.9	1.000
BW gain, day 35 to 110, kg	59.7±1.4	37.9±1.3	<0.0001
BF gain, day 35 to 110, mm	2.4±0.5	0.5±0.5	0.059
Whole body protein deposition (Pd; g/d)			
Day 35-39	103.50±8.0	70.66±7.9	0.0008
Day 49-53	89.63±8.0	58.79±7.9	0.0023
Day 63-67	107.78±8.0	73.28±8.0	0.0004
Day 85-89	114.42±8.1	79.69±8.1	0.0005
Day 106-110	119.93±8.1	95.85±8.2	0.0735

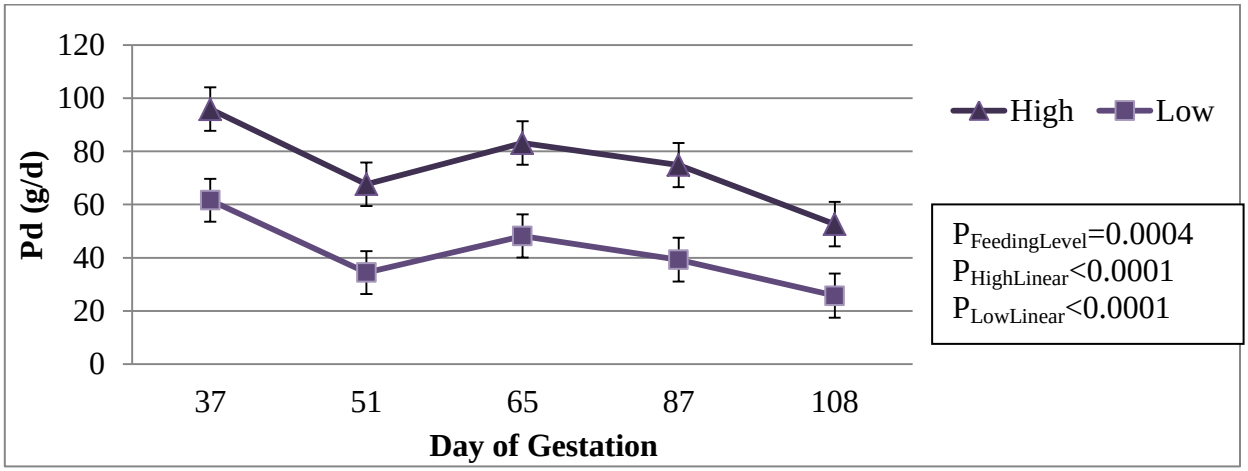

Figure 1. Effect of gestation feeding level (High vs Low) on maternal Pd in gestating gilts.

Conclusion and implications

Increasing feed intake during gestation of parity 1 sows (gilts) leads to a substantial increase in whole body Pd, which is constant throughout gestation and consistent with NRC (2012). However, the gradual decline in maternal Pd with day of gestation is in contrast to NRC (2012) and has important implications for the factorial estimation of amino acid requirements of gestating gilts. Determining the pattern of whole body Pd in gestating sows allows nutritionists to more closely estimate the changing nutrient requirements during gestation and formulate rations accordingly. Further investigation into the physiological control of the dynamic changes in maternal Pd throughout gestation is warranted.

Acknowledgments

Thanks to lab mates and technical staff. Financial support provided by Ontario Pork, Ontario Ministry of Agriculture and Food, de Heus, and Ajinomoto.

References

NRC (National Research Council) 2012. Nutrient requirements of swine. National Academy Press, Washington, DC

Preparing For the Next Emerging Disease – Lessons Learned From PED

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National Pork Board (USA)

The diagnosis of Porcine Epidemic Diarrhea virus (PEDV) in the United States in May of 2013 sparked intense discussions by all sectors of the swine industry centered on how best to identify and protect producers from another disease threat. Other diseases such as high pathogenicity Porcine Reproductive and Respiratory Virus (PRRS), Porcine Circovirus (PCV), and Porcine Kubovirus have been identified within the last few years as important emerging pathogens of swine. The presentation will review the rationale, participants involved, infrastructure needs and immediate and future actions to be taken to better prepare producers, veterinarians and other stakeholders against potential swine health threats.

Environmental Enrichment for Growing Swine

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Environmental enrichment is a component of swine welfare. Enrichment devices are necessary according to the 2014 Canadian Code of Practice for the Care and Handling of Pigs. Some Ontario swine producers incorporate enrichment devices such as tires, bowling balls, and hanging chains for growing pigs. These items tend not to sustain pig interest over time. A field study was designed to compare two environmental enrichment devices on eleven commercial swine farms with respect to durability, maintenance requirements, and ability to sustain pig interest.

One enrichment device utilized a teeter totter style design (TT). This device is attached to a pen dividing wall and has attachments that hang off the arms of the teeter totter into the adjoining pig pens. The second device (TS) hangs from the ceiling of a pen and has 3 plastic arms extending from the center of the apparatus. Half of the devices had a bell attached to test whether noise increases pig interaction with the toys. Consequently, two variations on each of the two distinct toys were tested in this trial: TS and TS with bell, TT and TT with bell. Each of the 11 cooperating farms received two of each type of toy (total of 8 toys per farm) installed in either nursery, wean to finish and/or grower/finisher pens. Farmers recorded the number of pigs playing with each toy during a point-in-time observation period, approximately one minute in length, every morning and afternoon for a four month period.

This study revealed that while both toy designs sustained pig interest for the duration of the study, the TS had a greater percentage of pigs interacting with it, but required more maintenance than the TT. It is hypothesized that more pigs played with the TS because it could be accessed from all sides allowing a larger number of pigs to play at one time, compared to the TT which required mounting on the pen wall. While the TS was a more popular toy, it also required more maintenance as the plastic arms were completely chewed off when placed in finisher pens. Nevertheless, pigs continued to play with the TS even when all arms were removed. The ability to produce noise did not influence the proportion of pigs that played with either toy. Pig interest in the toys increased whenever changes were made. For example, replacing the plastic arms of the TS resulted in an immediate increase in pig interaction. A marking trial performed on four farms showed that all the pigs in a pen will take turns playing with the toys over time. Producer feedback on a survey following the completion of the trial indicated that nine of the ten responding producers would incorporate these devices into their pig pens to meet the Code of Practice requirements for environmental enrichment.
The results of this study may be useful to swine practitioners as a reference for the designs and materials that function well as swine environmental enrichment devices. The requirement of providing environmental enrichment in all swine pens can be frustrating for producers to fulfill. This study identified two enrichment devices that sustain pig interest while remaining inexpensive and durable.

Access a video on this project: http://bit.ly/1CgdzN0

PED Research Update 2013-2014

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Porcine Epidemic Diarrhea virus (PEDV) was first identified in the United States in May of 2013. A critical part of a response plan is the ability to be able to provide recommendations on how best to manage and control the spread of the disease. For PED, basic information about the virus was extremely limited. In order to address this research gap, the Board appropriated supplemental funding in order to initiate an aggressive research process for PEDV. The presentation will provide a brief review of the research that has been completed from 2013-2014 and also cover research priorities and focus for 2015.

Swine Influenza – The Pattern of Infection in a Nursery, Not What You Would Expect

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Introduction

Typical outbreaks of influenza in swine herds are characterized by abrupt onset of respiratory illness and quick resolution of clinical signs. Recent field studies, however, indicate that circulation of influenza virus in individual animals may not be as simple as previously thought. The epidemiology of influenza in large multi-site and multi-source herds is not well described. Therefore, the purpose of this study is to describe the dynamics of influenza virus circulation in a nursery herd with multiple sow sources under commercial conditions.

Material and Methods

The nursery barn included in the study was a ~2000 head nursery operated as all-in/all-out by barn facility. Pigs were sourced from 5 different sow herds, each with a different health status, and were mixed in 4 rooms (each with 20 pens). Within 2h of arriving at the nursery barn, 400 pigs were selected for the initial virological testing. In addition, 81 pigs were included in the longitudinal study for ongoing weekly testing for influenza virus. Pigs were followed from November 18th, 2013 to January 9th, 2014. Growing and isolation of the virus was done using Madin-Darby canine kidney (MDCK) cells. Temperature and relative humidity were measured every 5 min using HOBO data loggers. The mean temperatures in all 3 rooms were similar (23^{o} C - 24^{o} C), whereas the mean relative humidity ranged between 70% and 77%.

Results

No pigs tested positive for influenza virus at the first sampling, but all pigs included in the longitudinal study were virus-positive at some point in time, with some animals being positive more than once (Figure 1). A difference could be observed in positivity of pigs among the 5 sources of pigs (Figure 2). Pigs from Source 1 had more virus-positive tests when compared to pigs from Source 5. In contrast, pigs from Source 2 and 4 were less likely of having virus-positive tests when compared to pigs from Source 5. Pigs from Source 3 were not different than pigs from Source 5.

Discussion

The level of virus shedding was dependent on the source of pigs supplied to the nursery. Since all pigs were negative at first sampling it is impossible to determine where the virus came from. This case did not follow a regular outbreak pattern. We expected a rapid spread to all pigs and then all the pigs recovering at about the same time, not several separate waves of illness. Possible explanations include the presence of two or more different influenza strains, or the disappearance of passive immunity occurring at different rates, or a combination of factors. We are currently investigating possible causes of the unexpected pattern of disease. The findings will be useful in developing control strategies.

Acknowledgements
OMAFRA, Ontario Pork, Swine Innovation Porc and Agriculture and Agri-Food Canada through Swine Cluster II program. We appreciate the help of participating producers.

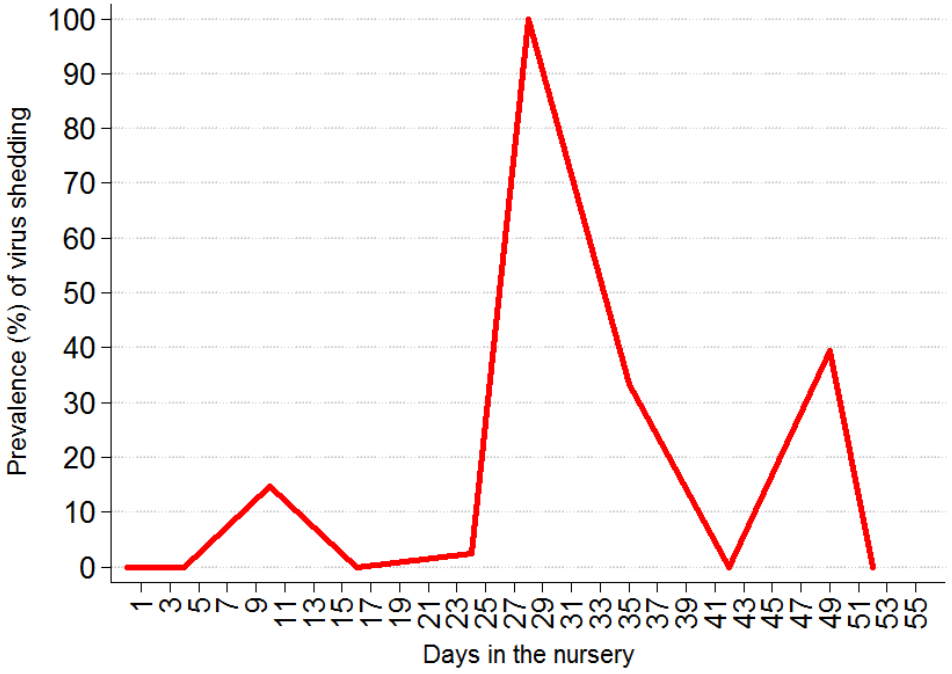

Figure 1. Swine influenza virus shedding among pigs while in nursery.

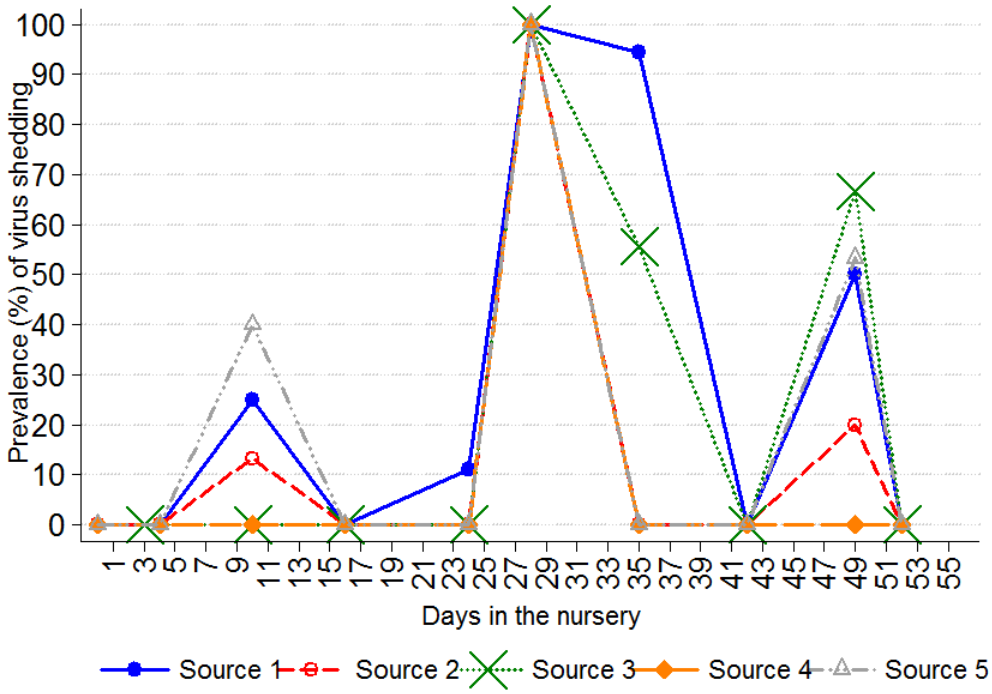

Figure 2. Swine influenza virus shedding among pigs while in nursery according to sow source.

Challenges of Designing a Diet Using Local Feedstuffs for Ugandan Subsistence Farmers

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Introduction

Small-scale pig production in East Africa can improve the welfare of smallholder farm families (Kristjanson et al 2004;Randolph et al 2007). Smallholder farmers keep 1 to 4 growing pigs and sell them to pay for food, school fees, and medicine (Dewey et al 2011; Kagira et al 2010). However pigs grow slowly, gaining on average 130 $\pm$ 20 grams per day (Carter et al 2013). Poor genetics, free-range management, parasites, and nutritional deficiencies may contribute to their slow growth (Kagira et al 2012; Katongole et al 2012; MAAIF 2005; Muhanguzi 2012; Mutua et al 2012; Ouma et al 2014 report; Thomas et al 2013). In Uganda, smallholder pig farmers report that feeding is a key production constraint. Feeds are expensive and scarce, particularly in dry seasons and in the "hungry months" that occur several months after harvest when feed and food stocks run low. Food/feed competition between people and pigs, and lack of knowledge to formulate low-cost nutritionally balanced rations are further challenges (Katongole et al 2012, MAAIF 2005; Mutua et al 2012; Ouma et al 2014 report; Muhanguzi et al 2012). Poor roads, limited transportation means, and a lack of money with which to buy feeds further inhibit farmers' ability to provide pigs balanced diets.

Fruits, opportunistic legumes (weeds), crop residues, and concentrates that are low-to-no cost are available seasonally (Katongole et al 2012; MAAIF 2005; Mutua et al 2012; Ouma et al 2014 report; Muhanguzi et al 2012). These could be used to formulate balanced least-cost rations to meet pigs' nutrient requirements, to improve pig growth performance while minimizing feed costs.

In Uganda, empirical studies describing the nutrient value and seasonal availability of local pig feedstuffs have not been done, nor have the nutrient requirements of local and crossbreed pigs been determined. This information is needed as a basis for development of low-cost seasonal diets for pigs.

Objectives

The objectives of this study were 1) to estimate the nutrient value, seasonal availability, and relative importance of locally available pig feedstuffs in Central Region, Uganda; 2) determine the nutrient requirements of local and crossbreed starting and growing pigs; 3) develop low-cost balanced diets; 4) conduct a feed trial to determine the average daily gain and feed conversion of starting and growing pigs fed one of two diets based on local feedstuffs; and 5) conduct farmer training and feedback workshops to share the diets with farmers and understand the associated benefits and challenges of feeding the new diets to their pigs.

Methods

Throughout the implementation of this research to accomplish the objectives above, the limited resources of smallholder farmers and their lack of access to purchased feeds, seasonal availability of feed stuffs, human/pig food/feed competition, management

practices (presence or lack of deworming protocol, free-range versus tethered/housed) were considered. Spending approximately 3 years in East Africa helped the author gain a thorough understanding of the challenges experienced and the opportunities available to smallholder farmers there. Following diet development and validation through a controlled feed trial, trial results and diet formulation were shared with farmers and their feedback was requested.

Conclusions

Pig feedstuffs of adequate nutritional value are locally available in Uganda. Low-cost balanced diets can be developed that not only meet the nutrient requirements of local pigs on smallholder farms but that include low-to-no-cost feedstuffs to which smallholder farmers have access. These diets also minimize the inclusion of purchased pig feedstuffs and feedstuffs that people consume as food. Farmer feedback revealed that they are willing and able to feed these diets to their pigs.

Acknowledgments

These studies have been sponsored by the Smallholder Pig Value Chain Development Project, Livestock and Fish by and for the Poor CGIAR Research Program (CRP 3.7), IFAD, European Union, Ontario Veterinary College and the Ontario Agricultural College at University of Guelph.

References

Carter, N., Dewey, C., Mutua, F.K., de Lange, C., Grace, D. (2013): Average daily gain of local pigs on rural and peri-urban smallholder farms in two districts of western Kenya. Trop. Anim. Health Prod. 45:1533-1538.

Dewey, C.E., Wohlegemut, J.M., Levy, M., and Mutua, F.K. (2011). The impact of political crisis on smallholder pig farmers in Western Kenya, 2006–2008, Journal of Modern African Studies, 49,3, 455-473.

Kagira, J.M., Kanyari, N., Maingi, N., Githigia, S.M., Ng'ang'a, J.C. and Karuga, J.W. (2010). Characteristics of the smallholder free-range pig production system in Western Kenya, Tropical Animal Health Production, 42, 865-873.

Kagira J.M., Kanyari, P.N., Githigia, S.M., Maingi, N., Ng'ang'a, J.C. (2012): Risk factors associated with occurrence of nematodes in free range pigs in Busia District, Kenya. Trop. Anim. Health Prod. 44:657-664.

Katongole, C.B., Nambi-Kasozi, J., Lumu, R., Bareeba, F., Presto, M., Ivarsson, E., Lindberg, J.E. (2012): Strategies for coping with feed scarcity among urban and peri-urban livestock farmers in Kampala, Uganda. Journal of Agriculture and Rural Development in the Tropics and Subtropics. 113 (2):165-174.

Kristjanson, P., Krishna, A., Radeny, M. and Nindo, W. (2004). Pathways out of poverty in Western Kenya and the role of livestock. Working paper for the FAO/Pro-Poor Livestock Policy Initiative.

(MAAIF) Ministry of Agriculture, Animal Industry and Fisheries. The Republic of Uganda (2005): National Animal Feeds Policy. Entebbe, Uganda.

Muhanguzi, D., Lutwama, V., Mwiine, F.V. (2012): Factors that influence pig production in Central Uganda -Case study of Nangabo Sub-County, Wakiso district. Vet World. 5 (6):346-351.

Mutua, F.K., Dewey, C., Arimi, S., Ogara, W., Levy, M. and Schelling, E. (2012). A description of local pig feeding systems in village smallholder farms of Western Kenya. Tropical Animal Health and Production, 44, 6, 1157-1162.

Ouma, E., Dione, M., Lule, P., Pezo, D., Marshall, K., Roesel, K., Mayega, L., Kiryabwire, D., Nadiope, G., Jagwe, J. (2014): Smallholder pig value chain assessment in Uganda: results from producer focus group discussions and key informant interviews. Unpublished ILRI Research Report, Nairobi, Kenya.

Randolph, T., Schelling, E., Grace, D., Nicholson, C., Leroy, J., Cole, D., Demment, M., Omore, A., Zinsstag, J. and Ruel, M. (2007). Invited Review: Role of livestock in human nutrition and health for poverty reduction in developing countries, Journal of Animal Science, 85, 2788--2800.

Thomas, L.F., de Glanville, W.A., Cook, A., Fevre, E.M. (2013): The spatial ecology of free-ranging domestic pigs (*Sus scrofa*) in western Kenya. BMC Vet. Res. doi:10.1186/1746-6148-9-46.

Economic Impact of PRRS: The Difference Between All-In/All-Out vs Continuous Flow Nursery Management

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Introduction

Porcine reproductive and respiratory syndrome (PRRS) is the most economically significant swine disease in Canada and yet there are few studies documenting the cost of outbreaks of the disease. There is one American study (Neumann et al., 2005) that is frequently quoted that suggests PRRS results in more that $500 million in losses per year in the U.S. The study also attributes over 80% of the economic losses to the post-weaning period (nursery and grower production). The objective of our study was to examine production records from Ontario nurseries before and after a PRRS outbreak to calculate the effect of PRRS on post-weaning performance. We also used the information from this study to examine the possible cost-benefit of performing a nursery depopulation once the PRRS immunity status of the sow herd stabilized at about 6-months post-outbreak.

Materials and Methods

Six large production systems with accurate production records and a clearly defined PRRS outbreak were chosen for the study. Nursery production records related to the 6-months before a PRRS outbreak and for the year following the PRRS outbreak were used in the study. Approximately 750,000 pigs were included in the study; however, data were analyzed on the basis of the performance of weekly batches. The impact of the disease was examined for the first 6 months and the second 6 months after the outbreak, as well as by type of pig flow. Some of the nurseries operated as continuous flow (CF), which typically involved emptying individual rooms and cleaning between batches, and some nurseries operated as all-in/all-out by site (AIAO). All nurseries were off-site from the sow units.

In order to conduct the cost-benefit analysis we assumed a pig that died in the nursery was a loss of $40. We assumed the price for feeder pigs as $2.50/kg and that reduced growth rate was calculated as the cost of selling lighter weight pigs. Feed cost was assumed to be $450 per tonne.

We calculated the cost of the increased losses in nursery performance for a hypothetical 1000-sow operation producing 25 pigs per sow per year, comparing AIAO vs CF nursery scenarios in the second 6-month period after a PRRS outbreak.

Results and Discussion

Mortality increased in the first 6-month period following a PRRS outbreak and growth was reduced for CF and AIAO nurseries (see Table 1). In the second 6-month period after the outbreak, for the AIAO nurseries performance returned to normal, but for the CF nurseries mortality and growth were even worse than in the first 6-month period after the outbreak. Feed efficiency was not affected in either pig flow.

The most likely explanation for the difference between the pig flows is that in the AIAO nurseries, after 6 months following the outbreak the sow herd has stabilized and piglets are entering the nursery free of PRRS virus and remaining free of disease. Whereas in the CF nurseries the piglets are also entering the nursery free of PRRS virus but there are rooms of pigs in the nursery that have PRRS-positive pigs that infect the incoming pigs and the

disease continues to cycle in the nursery. These data suggest that the common strategy for controlling PRRS by depopulating the nursery once the sow herd is stable is warranted.

The cost-benefit analysis comparing 12,500 pigs entering AIAO nurseries vs CF in the second 6-month period folowing a PRRS outbreak is as follows:

- Mortality (a difference of 8.5%) =1,062 pigs x$40 per pig = $42,480
- Slower growth (360g/d vs 430g/d) results in pigs being 3.5 kg lighter after 50 days in the nursery and therefore would cost 3.5 kg x 12,500 pigs x $2.50 per kg = $109,357
- The feed efficiency remains essentially unchanged so there are some savings (3.5 kg lighter pigs x 1.6 feed conversion rate x $.45/kg feed cost x 12,500 pigs = -$31,500

Therefore in the 6-month period after a PRRS outbreak a 1000-sow herd would possibly lose about $120,000 by operating a CF nursery compared to performing a nursery depopulation or operating AIAO.

Table 1. Nursery performance parameters before and after an outbreak of PRRS, based on 6 large production systems in Ontario

	All-in/All-out by site			**Continuous flow by site**		
Time	**6 months Pre-PRRS**	**6 months post-PRRS**	**7-12 months post-PRRS**	**6 months Pre-PRRS**	**6 months post-PRRS**	**7-12 months post-PRRS**
Mortality (%)	2.39	3.38	1.95	2.01	5.97	10.49
ADG (g/d)	436	399	443	430	394	360
FCR	1.64	1.60	1.61	1.66	1.69	1.67

Conclusion

Although a great deal of attention is paid to the losses in the breeding herd that occur during a PRRS outbreak, there is a considerable economic loss experienced in the nursery from both mortality and slow growth. The findings of this study demonstrate a great difference in performance in the second half of the year following a PRRS outbreak between nurseries that operate as all-in/all-out by site and those that empty and clean rooms of a continuous flow nursery. These data support the strategy of performing a nursery depopulation once the sow herd becomes stable and negative piglets are being weaned.

References

Neumann E, Kliebenstein J, Johnnson C, Mabry J, Bush E, Seitzinger A, Green A, Zimmerman J. Assessment of the economic impact of porcine reproductive and respiratory syndrome on swine production in the United States. 2005. J Amer Vet Med Assoc. 227: 385-392.

Pain Control in Pigs

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Introduction

It is generally agreed that all mammals experience pain in a similar manner to humans. Some species such as pigs attempt to hide the effects of pain. Possibly in the wild this behaviour was protective, because a pig showing signs of pain might attract the attention of a predator. Therefore, one problem in minimizing pain in pork production has been the difficulty in detecting pain and assessing the severity of the pain. A second challenge has been the scarcity of products licensed for use in food-producing animals that are effective in treating pain. This area of medicine has expanded greatly over the past decade but the pharmacological options approved for use in swine are still very limited. There are other potential reasons that have limited the advancement of pain control in the pork industry including economics and labour requirements. On the other hand there are important reasons why we need to carefully examine this issue and determine where there are opportunities to improve pain control. There are circumstances on every farm where pain management will improve productivity, but in addition, as effective products become available pain control will be considered an essential part of good animal husbandry and expected by customers of the pork industry.

There are several categories of drugs that can be of use in reducing pain and stress. In general there are drugs that tend to block all pain sensation, the anesthetics (general and local), and there are drugs which suppress pain, often referred to as analgesics or pain killers. Under this latter general category there are relatively new products available for swine that are classified as non-steroidal anti-inflammatory drugs (NSAIDs). They tend to be relatively long acting and effective in reducing pain and inflammation. They include products such as Metacam (meloxicam), Anafen (ketoprofen), and Banamine (flunixin). There are also drugs which primarily reduce inflammation which is a major source of discomfort, for example corticosteroid drugs.

A summary of recent pain control research at the University of Guelph

We have used NSAIDs including meloxicam and ketprofen at the time of castration and tail docking to show that these products do appear to reduce pain during the 24 hour period following piglet processing. Results are described in the following publications:

Tenbergen R, Friendship R, Cassar G, Haley D. Investigation of the use of meloxicam for reducing pain associated with castration and tail-docking and improving performance in piglets. J Swine Health Prod. 2014, 22:64-70.

Cassar G, Amezcua R, Tenbergen R, Friendship RM. Preoperative ketoprofen administration to piglets undergoing castration does not affect subsequent growth performance. Can Vet J. 2014: 55: 1250-1252.

The analgesics used in these studies were useful in reducing the post-operative pain but not the acute pain associated with the pull of the spermatic cord at the time of castration. A study was performed to determine whether the use of a local anesthetic (lidocaine) injected into the testicle 3 minutes prior to castration would block the acute pain at the time of

castration. The results were inconsistent possibly because in some pigs the "freezing" didn't penetrate far enough along the cord. Our conclusion from this study was that the extra handling and the injection of the lidocaine caused pain and stress that offset the advantage of using anesthesia. It was also concluded that compliance by producers would be a problem because the procedure effectively doubled the time of processing. Some of our current work involves trying to find techniques that will minimize the labour and costs associated with using analgesia at the time of processing. For example we are looking at whether mixing NSAIDs with iron is an effective approach.

Although there has been a great deal of attention paid to providing pain control at castration, there are many other areas in production where analgesics may play an important role. Many of the pigs that are placed in a hospital pen are there because of painful conditions such as lameness, bitten tails, and other trauma. Recovery may be greatly improved if analgesics and anti-inflammatory drugs are incorporated into the treatment protocols. We have examined the use of analgesia given to sows after farrowing. In a study where we randomly assigned sows to treatment with meloxicam or to a control group, we found no difference in sow or piglet performance between the 2 groups. Details can be found in the following publication:

Tenbergen R, Friendship R, Cassar G, Amezcua MR, Haley D. Investigation of the use of meloxicam post farrowing for improving sow performance and reducing pain. J Swine Health Prod. 2014, 22:10-15.

This trial was repeated, treating only sows that had a difficult farrowing. In the second study, sows that received an analgesic recovered more quickly and did a better job nursing their litter than the control sows, illustrating that pain control should be a consideration following a difficult birthing process but is possibly not needed for routine farrowings.

Acknowledgments
These studies have been sponsored by Ontario Pork, OMAFRA-University of Guelph Research Partnership, and Boehringer-Ingelheim (Canada) Ltd.

Copies of the papers referenced in the text can be obtained by request to rfriends@uoguelph.ca.

Ontario Pork Research and Partnerships

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Ontario Pork has initiated a number of projects with various funding partners encompassing the research priorities of production, innovation and societal trends. In total (research projects, including monies allocated to Swine Innovation Porc and other research related expenses) the board approved $939,958 in fiscal 2014. Six projects with $792,576 in funding make up the majority of the expense.

Ontario pork currently has 25 active projects including:

- research assessing feeding strategies and nutrient utilization
- alternatives to antibiotics, and impacts of antimicrobials such as zinc oxide
- welfare and issues of pain control are being researched to ensure products and practices benefit animals and producers
- heart lesions continue to be studied for prevalence and genetic links.

All combined, the research will result in scientific papers as well as articles in farm press and presentations at industry meetings in Ontario, such as the Centralia Swine Research Update, London Swine Conference and the Shakespeare Swine Seminar.

Swine Innovation Porc

In 2014, Swine Innovation Porc, the National Swine Research group was able to initiate 15 research projects between 27 lead researchers from 13 universities and research centres, within the target areas of:

- Reducing production and feed input costs
- Increasing product attributes and prices
- Enhancing adaptability and sustainability of the swine sector

This program is financially supported by Ontario Pork, Agriculture and Agri-Food Canada, the other provincial swine producer associations and industry partnerships, for a total budget of $17.2 million.

Livestock Research and Innovation Corporation

Research funding has been provided to support the Livestock Research Innovation Corporation, that together with the beef, dairy and poultry sectors in the province are collaborating on areas that impact all sectors.

Research requirements are being developed in areas including alternative feedstuffs, evaluating algae and potentially, insects as protein sources for the future.

The impacts of climate change and alternatives to antibiotics are other areas currently being evaluated.

Over the past 18 months LRIC has provided complete administrative services for 3 calls for proposals for Ontario Pork, including circulating the call, provision of technical refereeing and an evaluation of the industry and technical review forms.

LRIC is currently undertaking an evaluation of the last 10 years of Ontario Pork funded research and is developing an evaluation framework that will be used in a new research management system that will be available to Ontario Pork in early 2015.

LRIC has also facilitated discussions and produced a report on a potential exit strategy from the Arkell research station. In 2015 consideration will be given to the research infrastructure needs of the future for the Ontario Swine industry.

Prairie Swine Centre

A partnership with the Prairie Swine Centre continues to provide knowledge translation and transfer of research, and a collective searchable database where swine research funded by Ontario Pork and numerous other organizations is collectively compiled. Summaries are available in easy to understand language with links to the actual research reports.

OSHAB ARC&E Overview

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ARC&E Facts

- The Ontario Swine Health Advisory Board (OSHAB), a committee of OPIC; was formed in 2005/2006 to address swine disease issues in Ontario.
- OSHAB was initiated in response to the advent of more severe strains of Porcine Reproductive and Respiratory Syndrome virus (PRRSV) impacting the Ontario industry. The industry wanted to initiate a united effort to share information, reduce the impact of PRRS and be better prepared to address new and emerging disease challenges as well.
- OSHAB is a volunteer driven committee with broad industry representation.
- The first OSHAB project focused on PRRS communications was initiated by leveraging funds donated from the industry with government funds, utilizing funding opportunities through GF1.
- We have been working on Area Regional Control and Elimination Projects (ARC&Es) for 4 years – starting with the Niagara project in 2010.
- Together, the industry has invested approx. $2M in ARC&Es and infrastructure (including the PRRSV sequence database and ARC&E database and interactive mapping tool).
- The current ARC&E program (with funding provided through Growing Forward 2 (GF2), a federal-provincial-territorial initiative) runs from Jan 2014 – Jan 2016 and encompasses an all Ontario format – meaning any producer in Ontario is welcome to participate (rather than the area driven approach taken in past projects). We are adapting mapping and communication methods to serve this goal in 2015.
- OSHAB is investigating sustainability options in collaboration with Ontario Pork.
- ARC&Es began with a focus on PRRS; Porcine Epidemic Diarrhea (PED) was added to the structure early 2014.
- Currently, there are over 800 sites participating in the ARC&E with 100 PED sites enrolled.
- The ARC&E database houses large amounts of data and is now being used to analyze area risks in collaboration with the University of Guelph.
- The ARC&E program remains a voluntary program and producers must sign a participation agreement to participate and agree to share information about specific diseases.
- We believe that the ARC&E model is an approach which can be applied to any disease of significance to our industry. Transparency, cooperation and communication are the key concepts behind the ARC&E approach – concepts that are essential to successful disease control and elimination beyond the scale of the farm or production system.

PED ARC&E Update

To date 100 sites are enrolled in the OSHAB PED ARC&E. Of these, 42 sites are primary PED cases which represent 62% of the 68 primary cases reported in Ontario. This includes three sites infected with both porcine epidemic diarrhea virus (PEDV), and porcine deltacoronavirus (PDCoV). There are an additional three sites which were infected with PDCoV only enrolled in the ARC&E. The remaining sites are considered presumed positive due to pig flow based on veterinary notification and/or testing.

To support the control and elimination of PED, an OSHAB PED ARC&E workgroup has been struck. All veterinarians who work with PED positive sites in Ontario have been invited to participate in this workgroup. This group has reviewed site enrollment progress, discussed case

studies and elimination plans and developed criteria for establishing presumed negative status at previously positive sites.

As of December 25, 2014, 32 of the 42 (78%) primary sites enrolled in the ARC&E have eliminated PED and have met the criteria to be declared presumed PED negative. As well, an additional 33 secondary sites have met the criteria to be declared presumed PED negative, bringing the total sites within the ARC&E denoted as presumed negative to 65 (equivalent to 65% of the enrolled sites), leaving 35 sites currently actively working on PED elimination within the ARC&E program. Of the six sites which have tested positive for PDCoV, 5 have tested negative to date. Elimination status and details by farm type can be seen in Figures 1 and 2.

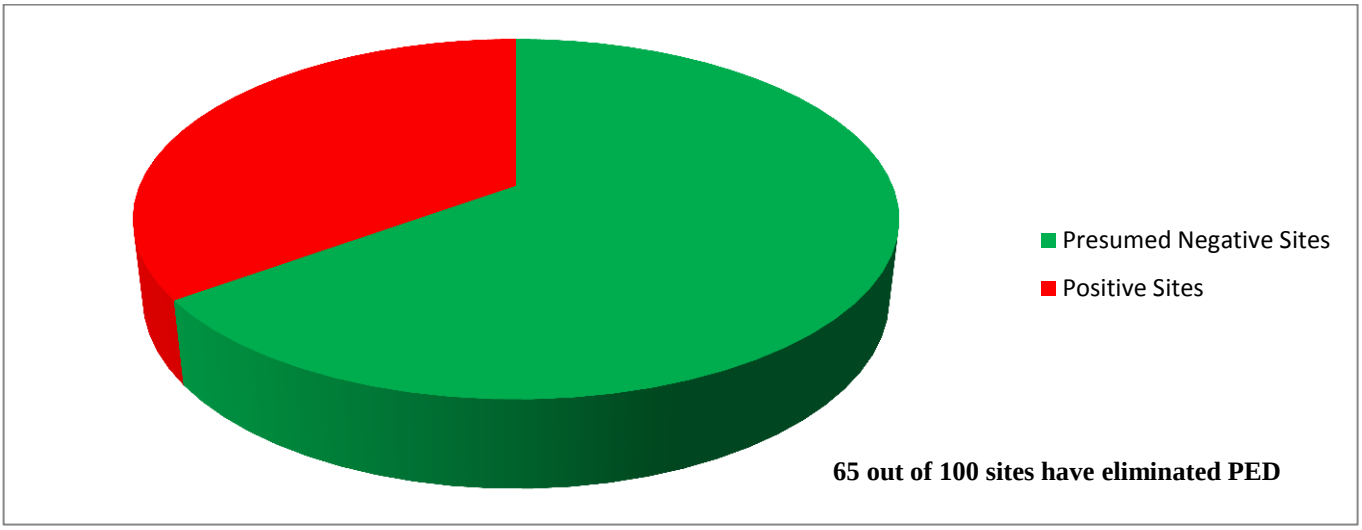

Figure 1. Overview of PED Site Status for Sites Enrolled in the ARC&E.

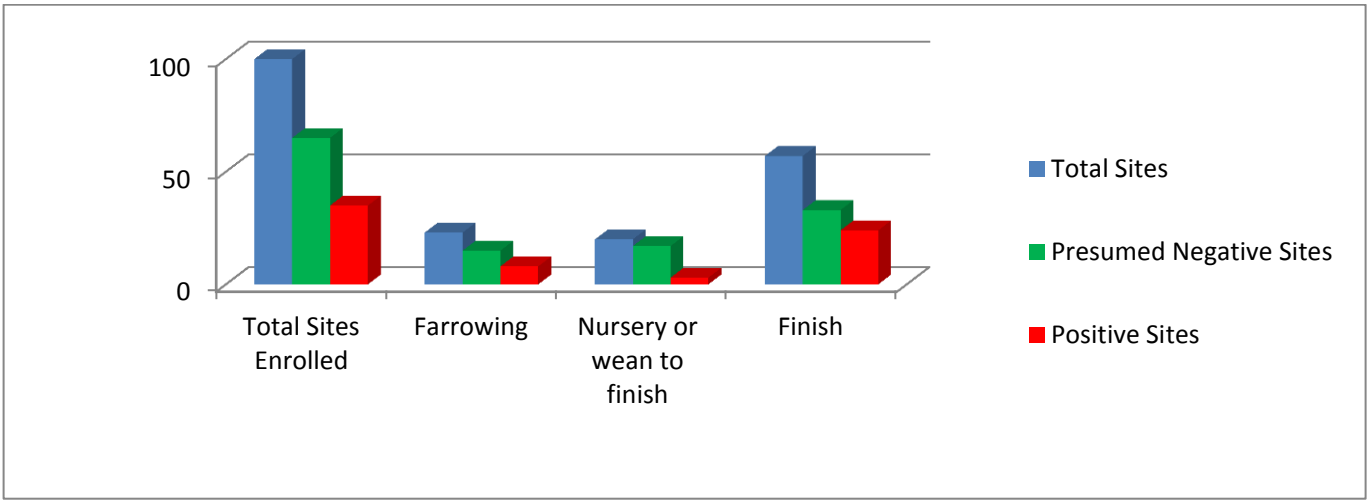

Figure 2. PED Status of Sites Enrolled in the ARC&E by Site Type.

OSHAB has included PED in the ARC&E format with funding support provided by Ontario Pork to advance on-farm actions in the control and elimination of PED and funding provided through Growing Forward 2 (GF2), a federal-provincial-territorial initiative. The Agricultural Adaptation Council assists in the delivery of GF2 in Ontario.

Ontario Farm Income Database – Benchmarking Swine Farms

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Introduction

It is important to have access to benchmark information to understand your farm's competitive position. Benchmarking can highlight areas of your farm that are performing well and areas where improvements might be undertaken. A comparison to a group or industry average can provide useful information while looking at the top producers in a group can provide an indication of variability that exists. Data from the Ontario Farm Income Database (OFID) is used for comparison in this analysis.

Database Background

The Ontario Farm Income Database contains Ontario tax files that reported farming income. It is used by Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) to administer their Business Risk Management (BRM) programs. Only swine farms that participated in BRM programs are included. The dataset consists of five parts: (1) non-financial characteristics of the farm operator; (2) income and expense data from tax files; (3) program payment data; (4) inventory data of commodities for each year; and (5) production data generated from the inventory data. The database contains information for the years 2003 to 2012. Farms are classified as swine operations if at least 50% of their total revenue is from swine sales. Results do not include program payments or family labour expense.

Selected Results

Table 1 shows selected data for 2012 only by gross income range (i.e. total operating revenue) category. In 2012, there were 622 farms in the database with 22% in the $500,000-$1 million category while 46% had at least $1 million in total operating revenue (TOR). The average farm in 2012 had $1.8 million in TOR and $184,640 in earnings before interest, taxes and amortization (EBITA). As a comparison, in 2003 there were over 1,400 farms in the database with the average farm having $679,758 in TOR and $64,430 in EBITA. Most farms in the database were very swine focused with the average farm having 86% of their revenue from swine. As farm size decreased in 2012, revenue diversity appeared to increase with the exception of the $0-$100,000 category.

Table 1. Selected OFID Data by Income Range Category, 2012.

Income Range Category	Number of Farms	Total Operating Revenue (Accrual) $/farm	EBITA (Accrual) $/farm	Swine Revenue as % of TOR
$0-$100,000	64	$38,204	-$1,542	93%
$100,000-$300,000	55	$220,959	$49,057	78%
$300,000-$500,000	80	$407,764	$89,701	81%
$500,000-$1 million	138	$746,841	$154,747	84%
$1 million & over	285	$3,405,091	$293,738	89%
Total	622	$1,801,823	$184,640	86%

Note: EBITA = earnings before interest, taxes and amortization; TOR = total operating revenue.

Table 2 shows selected data for 2012 only by swine production type category. Farms are categorized by type based on 67% of their production/inventory falling into a specific category. In 2012, 44% of the farms were farrow to finish while a further 35% were classified as finish operations. The most diversified farms in terms of % of total revenue from swine appeared to be mixed operations and farrow to finish.

Table 2. Selected OFID Data by Swine Production Type Category, 2012.

Production Type Category	Number of Farms	Total Operating Revenue (Accrual) $/farm	EBITA (Accrual) $/farm	Swine Revenue as % of TOR
Farrow to Feeder	84	$2,172,440	$126,425	89%
Farrow to Finish	275	$1,947,528	$226,575	84%
Farrow to Wean	29	$1,219,792	$264,026	91%
Mixed	18	$1,582,241	$257,812	79%
Finish	216	$1,568,631	$137,135	88%
Total	622	$1,801,823	$184,640	86%

Note: EBITA = earnings before interest, taxes and amortization; TOR = total operating revenue.

Table 3 shows selected financial ratios for the average of the entire period from 2003 to 2012 for the group of approximately 227 farrow to finish farms that were in the database every year. The group average is compared to the most profitable 40% of farms based on their accrual operating profit margin ratio. The operating profit margin ratio is calculated as earnings before interest and taxes (EBIT) divided by total operating revenue (TOR). The group of farms in the top 40% vary from year to year.

Table 3. OFID Farrow to Finish Financial Ratios, Average vs. Top 40%, 2003-2012.

Financial Ratio	Average (%)	Top 40% (%)	Top 40% - Average ($ / market hog*)
Feed Expense : Swine Revenue	64.9%	58.4%	-$9.42
Health Expense: Swine Revenue	3.6%	3.4%	-$0.33
Utilities Expense: Swine Revenue	4.9%	4.8%	-$0.17
Interest Expense: Swine Revenue	6.7%	6.7%	-$0.04
Feed : Swine Revenue (accrual)	65.1%	57.2%	-$11.40
EBITA : Swine Revenue (accrual)	19.2%	39.6%	+$29.68

Note: EBITA = earnings before interest, taxes and amortization;
Farms ranked by accrual operating profit margin;
*Difference based on $145 market hog value.

Summary

The Ontario Farm Income Database is a good source of information. Every farm is unique but it is helpful to benchmark periodically.

Acknowledgements

Thank you and appreciation is extended to Ontario Ministry of Agriculture, Food and Rural Affairs and Ontario Pork for their support.

An Epidemiological Study of Genetic Resistance against *Salmonella* Shedding and Immune Response against *Salmonella* in Pigs

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Background

Salmonella infect both humans and pigs. The disease in pigs often goes undiagnosed but is a cause of reduced performance and is difficult to control. Pork products can transmit *Salmonella* from pigs to humans, but produce and ground water can also become contaminated when manure is used as fertilizer. Some pigs colonized by *Salmonella* will remain carriers while other pigs are able to clear the bacteria. There may be a genetic explanation to this difference. Some genetic defects may alter the function and quantity of proteins that are involved in the immune response against *Salmonella*. Many genetic variations called single nucleotide polymorphisms (SNPs) in genes involved in the innate immune response have been identified that are related to recognition of *Salmonella* by the immune system and clearance of *Salmonella* in pigs (Kierstead et al., 2011; Muneta et al., 2012). In addition, certain SNPs have been associated with porcine enteritis and septicaemia, and were significantly more frequent in pigs that tested positive for *Salmonella* Typhimurium (Kierstead et al., 2011). However, the role of those SNPs in resistance against *Salmonella* in pigs under commercial farming conditions remains unknown.

Objectives

Overall, this project will investigate the impact of certain innate immune gene single nucleotide polymorphisms (SNPs) on *Salmonella* shedding and colonization, and the SNPs of the innate immune system that influence cytokine and antibody response against *Salmonella* in pigs on commercial farms.

Methods

A cohort of 60 piglets will be selected from 10-15 sows within 1-4 days after farrowing on several Ontario swine operations. The piglets will be identified by ear tag and followed up to slaughter. Each farm will have a summer and a winter trial. Fecal and blood samples will be collected four times: at weaning, end of nursery, end of grower, and end of finisher stage. In addition, liver and tonsil samples will be collected from a subset of pigs at the slaughterhouse to investigate internal *Salmonella* colonization. Genomic DNA will be extracted from blood or tail dockings collected at the farrowing visit for SNP analysis. Feces and tissue samples will be cultured for *Salmonella*. Blood samples will be tested for the presence of anti-*Salmonella* antibodies and cytokines. A survey will be distributed to producers to collect information about farm management practices.

Work completed

To date, two farms have been studied. On one farm, fecal and blood samples were collected four times up to end of the grower stage, and on the other, animals were followed and sampled to the abattoir, and a winter trial has begun. In total, 502 fecal samples, 502 blood samples, and 70 tissue samples (liver, spleen, and tonsils) have been collected. DNA has been extracted from blood and tissue samples collected from 172 pigs on two farms; for one farm this was over two seasons. Sera were collected from blood samples and will be tested for presence of antibody against *Salmonella*. Fecal and tissue samples were cultured for *Salmonella*. No *Salmonella* was recovered from fecal

and tissue samples on one farm and only three samples tested positive for *Salmonella* on the other farm.

How you can help?

Currently, we are looking for more farms to participate in this study and will purposely include some farms that have experienced problems with *Salmonella* in the past.

By participating in this study, you will help to produce valuable information about genetics in your herd which may be affecting productivity or health. There will be compensation for pigs as well as free nursery feed for the pigs enrolled in the study.

Acknowledgments

Thank you to the following for their contributions to the project: OMAFRA Food Safety Research Program, Ontario Pork, Swine Innovation Porc, Alliance Genetics Canada, and Canadian Centre for Swine Improvement.

References

Keirstead ND, Hayes MA, Vander Voort G, Brooks AS, Squires EJ, Lillie BN. Single nucleotide polymorphisms in collagenous lectins and other innate immune genes in pigs with common infectious diseases. Vet Immunol Immunopathol. 2011;142: 1-13.

Muneta Y, Minagawa Y, Kusumoto M, Shinkai H, Uenishi H, Splichal I. Allele-specific primer polymerase chain reaction for a single nucleotide polymorphism (C1205T) of swine toll-like receptor 5 and comparison of the allelic frequency among several pig breeds in Japan and the Czech Republic. Microbiol Immunol. 2012;56(6):385-91.

Nursery Diet Complexity in Commercial Settings: Impact on Growth Performance and Carcass Quality

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Introduction

It has traditionally been assumed that rather nutritionally complex and costly phase I and II nursery pig diets are required to maximize post-weaning growth performance. However, in a large scale performance study recently conducted at the University of Guelph it was shown that feeding newly-weaned pigs low complexity diets reduced growth performance during the first three weeks post weaning, but then induced compensatory growth thereafter (Skinner et al., 2014). As a result days to market and carcass quality was not affected, resulting in a net gain of approximately $3 per pig fed low complexity diets due to reduced feed costs (Skinner et al., 2014). Compensatory growth has been well characterized in the swine research. For example, restricting amino acid intake in young pigs has been shown to result in decreased gain and body weight; however during a subsequent re-alignment period (when feeding higher levels of dietary amino acids), the previously restricted pigs re-gained weight 9% more efficiently and faster than the control group, resulting in identical final body weight (Marinez-Ramirez et al., 2009).

Reducing feed quality during the nursery phase may impact the pigs' immune function. This can be as a result of replacing easily digestible and expensive animal proteins that provide protective properties (e.g., milk, blood, blood plasma and fish products) with inexpensive protein sources that are not used efficiently by newly-weaned pigs (e.g., soybean meal). Feeding low complexity diets may make pigs more susceptible to disease, leading to increased morbidity and mortality.

The study performed by Skinner et al., (2014) was able to demonstrate compensatory growth in a research setting, where pigs had good health and limited exposure to environmental stressors. Further studies are required to study the use of low complexity diets under commercial farm conditions. The commercial setting is likely to provide increased environmental stressors (stocking density, air quality, feed competition) and possible disease challenges, which put pigs at a higher risk of compromised health and long term reduced performance.

Objective

The objective of this study is to characterize the ability for growing pigs to experience compensatory gain following a period of growth restriction during the nursery phase in a commercial setting, and to assess the effects of using a low complexity nursery feeding program on days to market, carcass quality, as well as short and long term immune function.

Methodology

This study will be conducted on several commercial farms in Midwestern Ontario. Strict bio-security measurements will be followed to protect health and liability of all farms on the study. Two trials will be done on each farm, one trial during the summer and one during the winter to account for differences in air quality and disease prevalence. For each trial 60 pigs will be selected within 72 hours of birth; they will then be ear tagged and weighed. At weaning, the piglets will be separated into two groups; one group will receive a fairly standard complexity nursery diet, while the other group will be fed a 'low complexity diet' formulated at the University of Guelph. Both

groups will be fed based on a three phase nursery program. Pigs will be weighed and, blood and fecal samples will be collected at weaning, end of nursery phase, end of the grower phase and prior to marketing. Once at market weight the pigs will be shipped to a provincial abattoir, where carcass quality and grading will be recorded. Blood samples will be processed at the University of Guelph and will be analyzed for indicators of growth and immune function, including: IGF-1(insulin-like growth factor 1) and IGF-1 binding proteins, thyroid hormone levels (T3/T4), immunoglobulin proteins (IgG) against porcine circo-virus (PCV2) or total serum immunoglobulin. Fecal samples will be tested to determine the level of cortisol levels in the feces. Any illnesses and death will be recorded by the producer for further use in the study. A survey will be conducted to collect data about farm management factors (e.g., in-feed medication, and management practises, as well as litter size and sow parity) that may affect the growth performance and carcass quality.

Current Work

To date two summer trials have been completed on two different commercial farms; the winter trial is currently being done on one of those farms. The two summer trials have provided interesting results, and information regarding limitations and restrictions when conducting the study on farm in commercial settings, it is however, too early to draw any conclusions on these results. The current methodology has been moderately adjusted to reduce as many limitations as possible. The enrolled farms would be visited once each time during the suckling phase, nursery phase, grower phase and finishing phase, and pigs must be able to be slaughters at a local provincial abattoir.

How you can help?

We are currently looking for more commercial farms to enroll in this project. This study will provide valuable information about growth performance and carcass quality of pigs on your farm if they are fed with a low complexity nursery diet that is less expensive than standard high complexity diets. In addition, by participating in this study, you will receive compensation and free nursery diets for all pigs included in the trial.

This project has been funded by OMAFRA-University of Guelph Research Program, Ontario Pork and Swine Innovation Porc.

References

Skinner, L.D., C.L. Levesque, D. Wey, M. Rudar, J. Zhu, and C.F.M. de Lange. 2014. Impact of nursery feeding program on subsequent growth performance, carcass quality, meat quality, physical and chemical body composition of growing-finishing pigs. J. Anim. Sci. **92**:1044-1054.

Martinez-Ramirez H.R., Jeaurond E.A., and C.F.M. de Lange. 2009. Nutrition-induced difference in body composition, compensatory growth and endocrine status in growing pigs. Animal **3**:228-236.

Using Ketones as a Diagnostic Tool for Identifying Nursery Pig Anorexia

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Introduction

A predominate clinical sign of porcine periweaning failure-to-thrive syndrome (PFTS) is anorexia. The stressful and abrupt transition of weaning alters structural changes in the small intestine of pigs, resulting in anorexia (off feed). Although most pigs transition to feed within a few days after weaning, a subgroup of pigs fail to do so and possibly may have not transitioned to creep feed. Previous clinical trials have found elevated levels of beta-hydroxybutyrate (BHB), a serum ketone, in anorexic nursery pigs (1). PFTS-affected pigs are likely anorexic for prolonged periods and are not easily identified in the early stages (1). Other clinical signs observed in PFTS-affected pigs include sham chewing (chomping) and lethargy, later progressing to debilitation requiring euthanasia (2) and it is felt that the sham chewing is associated with prolonged anorexia (1). The early identification of piglets that are not transitioning to feed is needed in order to have a better understanding of anorexia; a predominant clinical sign observed in PFTS-affected pigs. The objective of this project was to determine if chomping pigs and pigs suspected to be anorexic observed 4-7 days post-weaning have elevated serum BHB compared to non-chomping (normal) pen mates.

Methods

Eight commercial swine farms were sampled. Four farms were located in Ontario and 4 farms were located in Saskatchewan. All farms were considered PFTS negative when pigs were sampled. Nursery piglets, 4-7 days post-weaning were observed for sham chewing (chomping). Thirty pigs per farm were purposefully selected at each farm. Pigs were selected if they demonstrated chomping behaviour (n=10) and were matched with a non-chomping visually healthy pen mate (n=10). Piglets that appeared thin, and hence were suspected of being anorexic, were also selected (n=10). Blood samples were taken at this time and analysed at Prairie Diagnostic Services, Inc., Saskatoon, SK to assess BHB values. Pigs with BHB values > 100 umol/L were defined as ketotic. Statistical analysis was used to determine if there was a difference in the various pig groups (chomping, non-chomping and thin) and their BHB values.

Results

This project found significant differences in nursery pig BHB levels when comparing farms and provinces. Pigs from Saskatchewan farms had statistically significant higher BHB levels compared to pigs from Ontario farms. Thus, more Saskatchewan nursery pigs had BHB levels > 100 umol/L and were classified as ketotic compared to Ontario nursery pigs. There was a significant difference between all three groups of pigs (chomping, not chomping, normal) based on behavioural observation, physical appearance and BHB values.

Take home messages

The findings from this study are important and applicable for the swine industry, since the identification of the early stages of anorexia is essential for understanding the risk factors associated with PFTS-affected pigs. If nursery pigs are identified in the earlier stages of anorexia, management practices and prevention techniques can be established. Lastly, identifying anorexic pigs early will address animal welfare concerns with prolonged anorexia in general, as well as

assisting researchers in identifying PFTS-affected pigs at an early stage and possibly increasing the likelihood of establishing risk factors associated with this condition.

Acknowledgments
This work was supported by Ontario Pork and Saskatchewan Agriculture and Development Fund (ADF). We are grateful for the participation of pork producers in both Ontario and Saskatchewan.

References

1. O'Sullivan T, DeLay J, Friendship R, & Harding, J. Effects of prolonged anorexia on development of clinical signs associated with porcine periweaning failure to thrive syndrome. 2013 *Proc 10th Mike Wilson Swine Research Day.* University of Guelph:12.
2. O'Sullivan T, Harding J, Friendship R, Henry S, Madson D, & Schwartz K. Estimated prevalence and impact of periweaning failure to thrive syndrome in Canada and the United States. *J Swine Health Prod* 2013; *22*(1):24-28.

Factors Associated With the Use of Antimicrobials Commonly Applied For Treatment of Swine Dysentery in the Grower-Finisher Phase of Production

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What is swine dysentery?

Swine dysentery (SD) is a disease caused by *Brachyspira hyodysenteriae*, which recently re-emerged in the North American swine industry. In addition, there are other forms of SD-like disease including the emergence or recognition of newly identified *Brachyspira hampsonii*. The classical clinical sign of SD and SD-like disease is muco-hemorrhagic diarrhea (bloody diarrhea). Under current conditions, the epidemiology of the SD is not well described. The disease is costly because of losses due to morbidity and mortality, impaired growth, cost of treatment for disease control and prevention, interference with the pig flow and its impact on animal welfare.

Objectives

- To examine risk factors associated with the use of antimicrobials as an indication of clinical disease progression
- To estimate the serial interval number using treatment rates of Denagard™
- To estimate the reproductive number as an indication of disease transmissibility

The study

In this study, production data from a grower-finisher barn over a period of two years and 12 batches were used to analyze the risk factors (such as season and use of other antimicrobials) of injectible treatment rates of tiamulin (Denagard™) as an indication of treatment due to clinical SD only. Data were used to estimate the serial interval using the treatment rates for Denagard™ and to estimate transmissibility of disease in this early phase, using reproductive number (R_0) as the indication of transmissibility. R_0 is an important parameter for how the disease is transmitted within the herd. In addition, the use of injectable treatment rates of lincomycin was also evaluated over seasons during this time since this antimicrobial was used for treatment of SD-like disease, but also for the treatment of other infectious diseases.

Results and Conclusions

Results indicate that tiamulin treatment was used less in the winter season. This could indicate that clinical swine dysentery was not present during the winter time and it is possible that SD shows a seasonal pattern. Lincomycin, a different drug used, exhibited a different seasonal pattern than tiamulin. Using tiamulin treatment rates, a predictable pattern of SD peaked in 17 day intervals. There is possible cyclic pattern of clinical disease every 17 days.

The R_0 ranged from 0.45 to 2.15 according to the treatment rates of tiamulin. In this case, the current conditions did not show sustained within herd transmission. A possible reason for this is that environment has a strong role in swine dysentery transmission. A combination of good biosecurity practices and treatment protocols could prevent signs of clinical disease.

Take home message
Good drug records can provide information about risk factors for disease and can be used in studying disease transmission patterns.

Acknowledgments
Funding was provided by the Ontario Ministry of Agriculture, Food and Rural Affairs. We would like to acknowledge the swine producers and veterinarians for their contribution and participation for this project.

Characterizing *Streptococcus suis* From Clinical Cases and Healthy-Carrier Pigs

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Background

The Gram positive bacterium *Streptococcus suis* causes a wide range of diseases in swine (Gottschalk et al., 2012). Decreased performance and mortality resulting from *S. suis* infection have a significant economic impact on swine production. The prevalence of *S. suis* appears to be very high on Ontario swine farms (MacInnes et al., 2008). Monitoring *S. suis* and understanding the spread of the organism within a herd is difficult because *S. suis* can reside as a commensal in the upper respiratory tract of clinical healthy pigs, and can be shed from sows through bodily fluids such as vaginal secretions. On most pig farms several different *S. suis* serotypes are present within the herd and some serotypes more likely to cause disease than others. In addition, many healthy pigs carry pathogenic *S. suis* but disease outbreaks seem to generally require triggering factors or stress.

Objectives

The objectives of this study are to characterize the serotype and antimicrobial susceptibility of *S. suis* isolated from clinical and healthy-carrier pigs, as well as to investigate risk factors associated with disease outbreaks and control measures commonly employed. A further goal is to evaluate PCR methods for *S. suis* serotyping.

Methods

A total of 50 Ontario farrow-to-finish swine farms will be studied. Twenty-five farms undergoing an outbreak of *S. suis* disease and 25 farms with no recent history of *S. suis* will be selected. Nasal and tonsilar swabs will be collected from pigs with clinical signs of *S. suis* infection; a tissue sample from tonsil and/or lymph nodes will be collected if the pig is dead or euthanized. In addition, on each farm visited nasal and vaginal swabs will be taken from 5 sows, and tonsilar swabs will be collected from 5 suckling piglets, 5 nursery piglets, and 5 grower-finisher pigs. Samples will be cultured for *S. suis* quantitatively. Multiple *S. suis* isolates from each positive sample will be selected and serotyped using coagglutination and PCR tests. Selected isolates will also be tested for antimicrobial susceptibility. In addition, bacterial community DNA will be extracted directly from samples (swabs and tissues) and tested for presence of *S. suis* DNA by PCR. A survey will be administered to participating pig producers to collect information regarding disease history, vaccination, and farm management practices.

Work done

To date, five farms have been visited. Three farms had no pigs with signs of *S. suis* disease when visited, another farm had a single pig with clinical signs of *S. suis* disease at time of the visit, and the last farm had an outbreak of *S. suis* disease when visited. In total, 86 samples were collected from 76 pigs (65 healthy pigs and 11 sick pigs). *S. suis* could be isolated from suckling and nursery pigs samples, and was detected in samples from 52 and 62% of sows and grow-finisher pigs, respectively. To date, 108 *S. suis* isolates have been identified in 76 samples of which 46 isolates have been serotyped. On one farm, serotype 34 strains were isolated from clinical cases as well as from healthy pigs. On the other farm with an outbreak of *S. suis* disease, serotype 8, 25, and 34 isolates were cultured from diseased pigs while isolates from healthy pigs were either serotype 22 or

remained untypable. All of the isolates recovered from healthy pigs on the three farms -with no clinical cases present at the time of visit- were untypable. However, since this study is at very early stage, more farms and pigs need to be tested to determine the differences in prevalence and *S. suis* serotypes from healthy and diseased pigs.

How you can help?

We are looking for farms with *S. suis* problems to include in this study. This research will provide valuable information on current antimicrobial resistance in *S. suis* isolated from healthy carrier pigs as well as from sick pigs on Ontario swine farms. This knowledge can be used to help in identification of the most effective antibiotics, provide information to ensure that the right strains are chosen for autogenous vaccines, and to design appropriate management changes to reduce the prevalence of *S. suis* disease outbreaks. Participating producers will receive information about *S. suis* isolates from their farm including serotype and the antibiotic susceptibility of the bacteria. There will be no charge for this service.

Acknowledgement

Thank you to OMAFRA-University of Guelph Research Partnership Program for funding this project, Gallant Custom Laboratories and the Animal Health Laboratory for their support and technical assistance, as well as pig producers for their participation in this study.

References

Gottschalk M. Streptococcal diseases. In: Zimmerman JJ, Karriker LA, Ramirez A, Schwartz KJ, Stevenson GW, editors. Diseases of Swine. 10th ed. Oxford, United Kingdom: Blackwell Publ; 2012. pp. 841–855.

MacInnes JI, Gottschalk M, Lone AG, et al. Prevalence of *Actinobacillus pleuropneumoniae*, *Actinobacillus suis*, *Haemophilus parasuis*, *Pasteurella multocida*, and *Streptococcus suis* in representative Ontario swine herds. Can J Vet Res. 2008; 72:242–248.

Mixing (Compounding) Iron Dextran with NSAIDs for Use in Piglets

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Background and Objective

The updated version of the Canadian Code of Practice for the Care and Handling of Pigs states that "as of July 1, 2016, castration performed at any age must be done with analgesics to help control post-procedure pain" (1). Research trials have shown that non-steroidal anti-inflammatory drugs (NSAIDS), such as meloxicam and flunixin meglumine, relieve pain related behaviours in piglets (2). The incorporation of analgesics into piglet processing would increase the amount of handling and injections received by piglets as well as increase the time and labour for the producer. To maximize the level of compliance surrounding the use of analgesics on farm, the ability to give an injection of analgesics at the same time as iron supplementation would be helpful. Additionally, by mixing (compounding) the two medications (iron dextran and an NSAID) into one injection, piglets can receive their required analgesia without significantly increasing labour for producers. The objective of this study was to determine if the mixing of iron dextran and the NSAID meloxicam (Metacam® Injectable Solution 20 mg/mL) or flunixin meglumine (Banamine® Sterile Solution Injectable 50 mg/mL) in the same bottle prior to administration would reduce the amount of efficacious drug available to the piglet. Additionally, it was noted whether the combined administration was a safe treatment for piglets.

IMPORTANT***:*** *the compounding of any medication for use in food-production animals is considered extra-label drug use. This project was conducted under a research setting. Please contact your herd veterinarian to discuss the implications of compounding products on farm as well as refer to the Canadian Quality Assurance Program (3) guidelines prior to compounding any products.*

Methods

Part 1: Iron dextran in 100mg/ml (Dexafer®) and 200 mg/ml (Dexafer-200®) was mixed with either meloxicam or flunixin meglumine. Samples were collected daily for 7 days and analyzed for NSAID concentration using high performance liquid chromatography (HPLC).

Part 2: Sixty piglets from 10 litters were selected at 2 days of age. The piglets were assigned to 1 of 3 treatment groups: iron dextran, iron dextran and meloxicam mixed, and iron dextran and flunixin meglumine mixed. A baseline whole blood sample was taken at 5 days of age, after which piglets were injected with their assigned treatment. A second blood sample was taken at 20 days of age. Blood samples were submitted to the Animal Health Laboratory at the University of Guelph to determine hemoglobin concentration (Hgb).

Part 3: Forty piglets were selected at 3-4 days of age and assigned to 1 of 5 treatment groups: iron dextran, iron dextran and meloxicam mixed, iron dextran and flunixin meglumine mixed, meloxicam alone, and flunixin megulmine alone. Blood samples were taken at regular intervals over 72 hours. Plasma was analyzed using mass spectrometry to observe NSAID levels. Platelet analysis was done using a multiplate analyzer to determine platelet aggregation. At the completion of the trial the piglets were euthanized and an injection site biopsy was examined histologically.

Results

The stability test in Part 1 documented that the concentration of NSAIDs decreased over the 7 days when mixed with iron dextran. Statistical analysis (Part 2) showed that the mixing of the selected NSAIDs with iron dextran had no effect on the hemoglobin concentration of piglets. The results of the NSAID concentration levels are pending (Part 3).

Take Home Message

This project has demonstrated that the mixing of iron dextran with either meloxicam or flunixin meglumine resulted in a decreased concentration of the NSAIDs when stored mixed in the bottle. Iron supplementation was evaluated by measuring hemoglobin and found that the mixing of the products did not reduce the hemoglobin concentration levels in the piglets. This indicates that the uptake of iron is not affected by mixing the products. The results of the NSAID concentration analysis is pending and is an important aspect of this study to complete before conclusions regarding efficacy of the NSAIDs when mixed with iron dextran can be made.

Acknowledgments

Research support was received from Ontario Pork and from the University of Guelph-OMAFRA research partnership. This project involved extensive collaboration with other researchers, technicians, and graduate students.

References

1. The Code of Practice for the Care and Handling of Pigs. Canadian Pork Council and The National Farm Animal Care Counsel (2014). Available from: http://www.nfacc.ca/pdfs/codes/pig_code_of_practice.pdf. Last accessed Jan 7, 2015.
2. Tenbergen, R., et al. (2014). Investigation of the use of meloxicam for reducing pain associated with castration and tail docking and improving performance in piglets. *J Swine Health Prod* 2014;22(2):64-70.
3. Canadian Quality Assurance Program for Hog Producers. Canadian Pork Council and Agriculture and Agri-Food Canada (2014). Available from: http://www.cqa-aqc.ca/index-e.php. Last accessed Jan 7, 2015.

The Search for a Nutritional Solution for the Control of Boar Taint

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Background and Objectives

Raising intact male pigs presents many potential benefits for the producer and consumer including high growth performance and leaner pork, enabling producers to reduce their cost of production. However, off-flavours that arise in pork due to boar taint is a challenge that has prevented boar production in North America. Surgical castration to prevent boar taint is an increasing welfare issue and there is pressure for welfare and trade legislation in countries that import Canadian pork. Existing alternative methods to control boar taint are expensive and/or laborious to implement in a commercial swine operation. A nutritional approach was derived from the use of adsorbents to treat mycotoxicosis in production animals. Mycotoxins such as aflatoxin and zearalenol have similar chemical structures to sex hormones such as estradiol and androstenone. Jen and Squires (2011a,b) demonstrated effective intestinal binding of boar taint compounds (androstenone and skatole) with activated carbon, but this additive was too expensive to implement in a commercial operation. Therefore, the objective of this study was to evaluate four low-cost feed additives that may potentially absorb compounds responsible for boar taint *in vitro*, which may be used in future feeding trials to determine their effectiveness.

Materials and Methods

Methods were adapted from the study by Jen and Squires (2011a). Candidate additives (bentonite, **BNT**; diatomaceous earth, **DE**; Spent Filter Aid, **SFA**; sodium-calcium aluminosilicate, **JUMP/"Jumpstart 360"**) were serially diluted in phosphate buffer saline solution (PBS, pH 7.4). Activated carbon (**AC**) was also prepared in identical concentrations to confirm previous findings and to serve as a reference. Radiolabeled androstenone and radiolabeled estrone were used to estimate hormone binding. A 1 mL aliquot of each additive was transferred in duplicate to glass tubes containing an equal amount of radiolabeled hormone and incubated in a shaking water bath at a temperature of 37 °C for 30 minutes. Each sample was vortexed for 8-10 seconds at 0 min, 15 min, and 30 min of incubation. Tubes were then centrifuged for 30 minutes and 1 mL of each supernatant was transferred to a liquid scintillation tube along with 4 mL of Eco-Lite cocktail and counted for radioactivity in a liquid scintillation counter. An additional tube with the radioactive hormone solution without any additives (blank) was included as a control for subsequent binding calculations.

Results

The adsorption of each additive was calculated as a ratio of radiolabeled hormone bound to the respective adsorbent compared with the radioactivity count in the blank sample. Adsorption data is summarized in Figure 1, in which additives displaying similar binding curves are grouped together. All adsorbents bound androstenone above 80%, with highest binding seen with AC at nearly 100% even in small concentrations. Less binding of estrone was seen compared to androstenone, with the exception of AC and SFA.

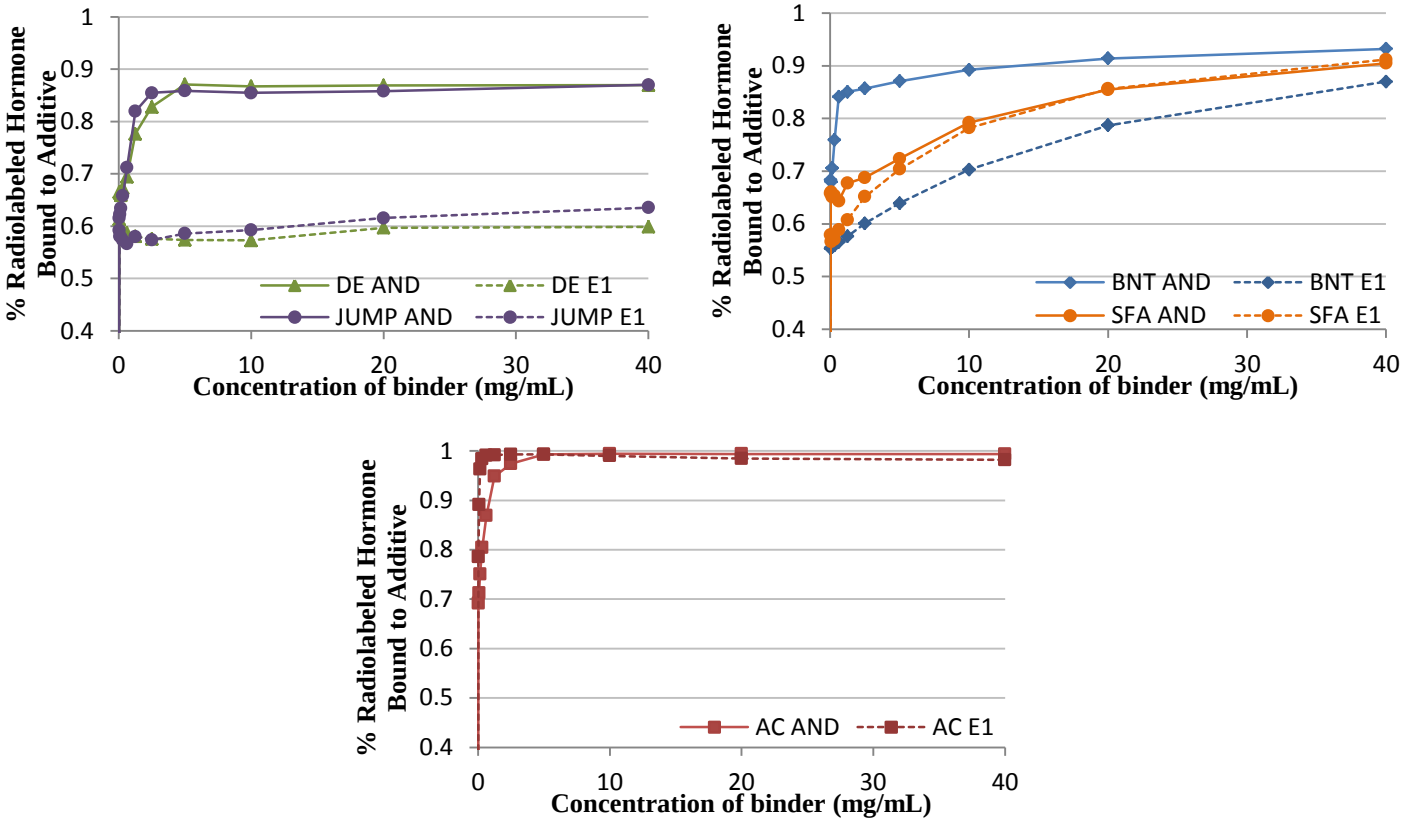

Figure 1. Effects of sorbent materials BNT, DE, SFA, JUMP, and AC on the binding of androstenone (AND) and estrone (E1) at physiological pH (7.4). DE and JUMP specifically bind AND more than E1. BNT and SFA exhibit a less specific binding which increases over a wide range of adsorbent concentrations. AC binds both hormones extremely effectively, even in very small concentrations.

Discussion and Conclusion

Androstenone is produced in the testes and serves as a pheromone as well as a major component of boar taint; no dietary approaches to reduce its levels in boars have been explored. Skatole is a degradation product of tryptophan and can be controlled by various dietary means. Tested additives range from $0.09 - $56/kg in cost, and have wide therapeutic applications in both humans and animals. An ideal adsorbent should be cheap and selectively bind boar taint compounds without compromising performance. For instance, Spent Filter Aid (cost $90/tonne) is also rich in crude protein and fat; it has potential to be an alternative feed ingredient for pigs. A universal adsorbent such as AC is not preferred as it is expensive and may bind nutrients and sex steroids along with the boar taint compounds. A feeding trial is planned in 2015 to test the effectiveness of key additives to control boar taint in vivo as well as their effects on growth performance. In conclusion, some cost-effective additives which bind boar taint compounds have been identified in the laboratory and will be evaluated for their effectiveness in animal trials.

References

Jen, K. and Squires, E.J. 2011a. *In vitro* assessment of the effectiveness of non-nutritive sorbent materials as binding agents for boar taint compounds. *Animal* 5(11):1821-1828.

Jen, K. and Squires, E.J. 2011b. Efficacy of non-nutritive sorbent materials as intestinal-binding agents for the control of boar taint. *Animal* 5(11):1814-1820.

Investigation of the Spread of PRRS Virus between Swine Sites Participating in an ARC&E Project in Ontario

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Introduction

Porcine reproductive and respiratory syndrome (**PRRS**) area regional control and elimination (**ARC&E**) programs became relatively common over the last few years in Ontario, with currently over 40% of all provincial swine sites enrolled. During the summer of 2014, herd veterinarians from a specific region expressed concerns with regard to the spread of a specific PRRS virus genotype within the region ("RFLP 1-3-2").

The goal of the present study was to conduct a disease investigation of this "RFLP 1-3-2" genotype to investigate spatial location and truck network membership as risk factors for a site being positive with this specific PRRS virus genotype.

Materials and Methods

Information regarding site location, production system and pig transportation providers were collected at enrollment. Sampling was conducted by herd veterinarians, and viral sequencing of all PCR samples from positive sites was attempted. Sites were considered positive for "RFLP 1-3-2" when there was over 96% similarity between strains. Three kilometer buffers were constructed to define the spatial exposure and network analysis was done to define the transportation exposure. A network component was defined as a group of sites/ truck companies that were connected directly or indirectly. Multivariable statistical models were constructed to investigate location and truck network membership as risk factors for being positive with "RFLP 1-3-2".

Results

A total of 136 swine sites were enrolled in the project. A total of 46 sequences were included in the phylogenetic tree (Figure 1). The 3 km buffers showed that approximately 20% of all sites did not have any neighbour within 3 km, 45% had between one and three neighbours, and 35% had four or more. Thirty-nine truck companies were involved in transporting pigs from all sites, and one truck company transported animals for over 40% of the sites. More than 50% of all sites were part of the weak giant component, which represents a potential upper limit of an outbreak (Figure 2).

According to the statistical analysis, proximity to another site that is positive with the same genotype outside the production system could not be identified as a risk factor for being positive for "RFLP 1-3-2". Being part of the same transportation network, however, was a risk factor for being positive for "RFLP 1-3-2".

Conclusion

In conclusion, the Ontario PRRS ARC&E database contains information that can be utilized for regional disease investigations, and should be used to guide decisions for prevention and control of infectious diseases such as PRRS.

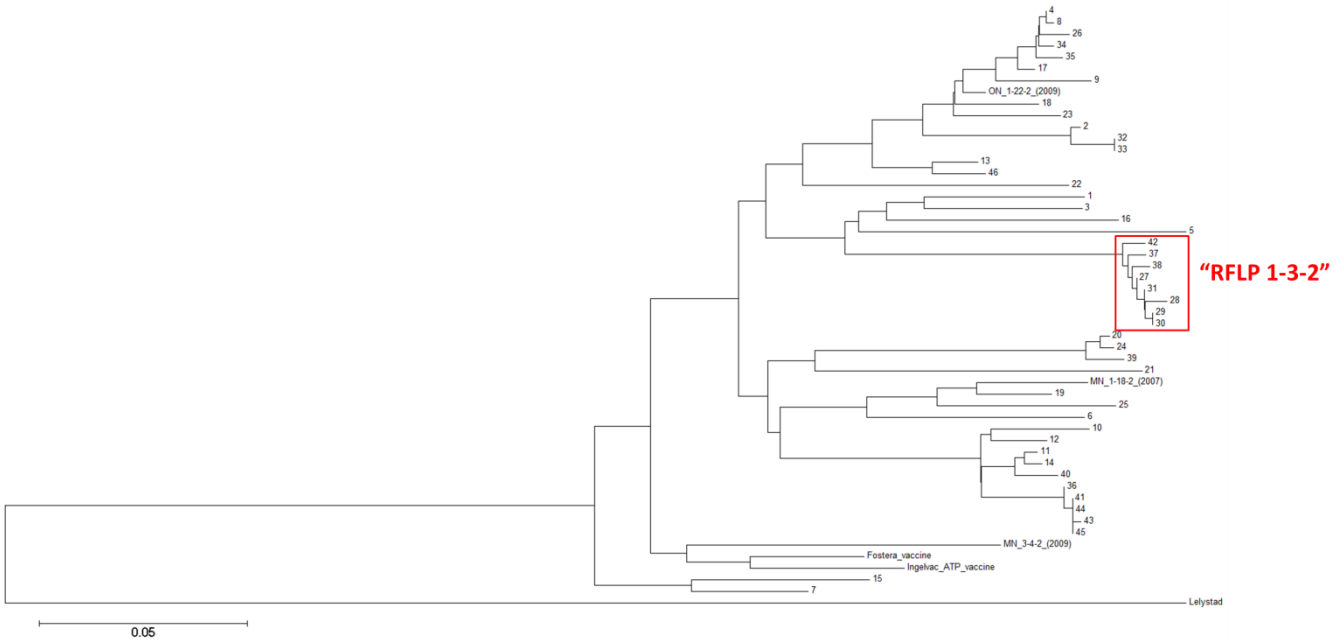

Figure 1. Phylogenetic tree showing the group of interest

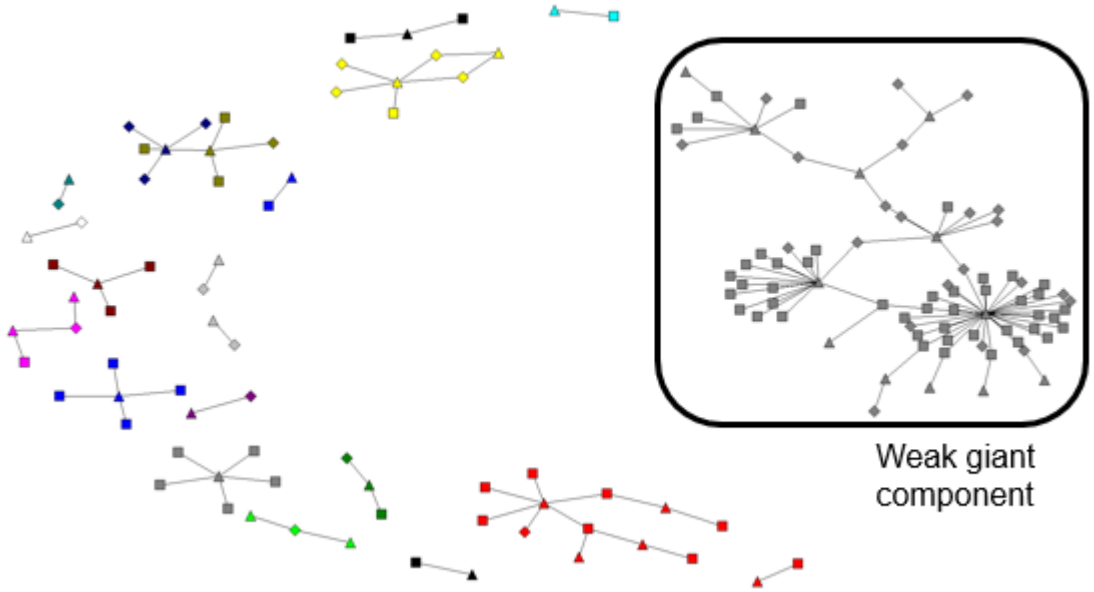

Figure 2. Truck network showing the weak giant component

Ontario Animal Health Network (OAHN)

Melanie Barham, Animal Health Network Coordinator
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SUMMARY

Vision
Public trust and confidence from a collaborative animal health network in Ontario

Mission
Coordinated preparedness, early detection, and response to animal disease, through sustainable cross-sector networks

The Ontario Ministry of Agriculture, Food and Rural Affairs (**OMAFRA**) and the Animal Health Lab (**AHL**), University of Guelph, have formed the Ontario Animal Health Network (**OAHN**), a new way to discuss disease and animal health issues for all species across Ontario. Each species (bovine, swine, equine, poultry, small ruminants, fish, bees, wildlife, fur-bearing, alternative species, zoo animals, companion animals and public health) will have a species network. The make-up of each network will be slightly different, but all will focus on animal health, disease surveillance and making change. Funding is from federal and provincial grants sourced from "Growing Forward 2" grant monies. OAHN is part of a larger program called the Disease Surveillance Plan (or DSP).

Synopsis of OAHN Species Networks:

- Each species will have a "Species Network"
- A brief, anonymous, species-specific survey will be distributed quarterly to private veterinarians to identify disease prevalence across Ontario (e.g., have private veterinarians seen increased cases of greasy pig disease in the past 3 months).
- Laboratory data will be compiled and anonymized quarterly noting top pathogens/diseases affecting each species from lab data
- Species Networks will meet quarterly to discuss and interpret lab and survey results in a confidential call, what it means for the industry, and create action items (e.g., OMAFRA veterinarian to create a fact sheet, AHL to make a podcast)
- No client names or information are ever mentioned and the calls are strictly confidential
- A cross-species Network call, involving all species networks, occurs to discuss inter-species issues (such as rabies or diseases that jump between species)
- Networks focus on trends, risks and actionable items for each industry (e.g., continuing education needs, research needs, emergency preparations)
- Based on the network meetings, a report for veterinarians is generated, summarizing trends and issues identified. A report for producers is also generated and distributed via the producer groups' information channels. Feedback is encouraged from both producers and veterinarians.

Who is part of the species network?

- An Animal Health Laboratory pathologist, OMAFRA veterinarian, and a University of Guelph specialist are participants
- 3 private practitioner veterinarian representatives chosen by their colleagues (*species experts may be elected in place of a veterinarian if not available, in industries such as bees)

Figure 1. OAHN Species Network members.

How does OAHN function in the swine industry?
The OAHN swine network has been assembled and began working together in October, 2014. The group has produced veterinary reports for practicing veterinarians, and is working to create producer reports for distribution this winter. Educational podcasts discussing timely, relevant topics for veterinarians have been produced and are published. The swine information is fed into the national CSHIN (Canadian Swine Health Intelligence Network), and OAHN representatives participate in a national level call to discuss swine heath and disease issues across Canada. Participation increases the sharing of information about porcine disease across Canada. Should an outbreak of disease occur, or a major animal health issue arise, the Species Network will be assembled and participate, together with industry, in providing expertise, informed opinion, and help, as government agencies navigate risk assessments and emergency preparedness.

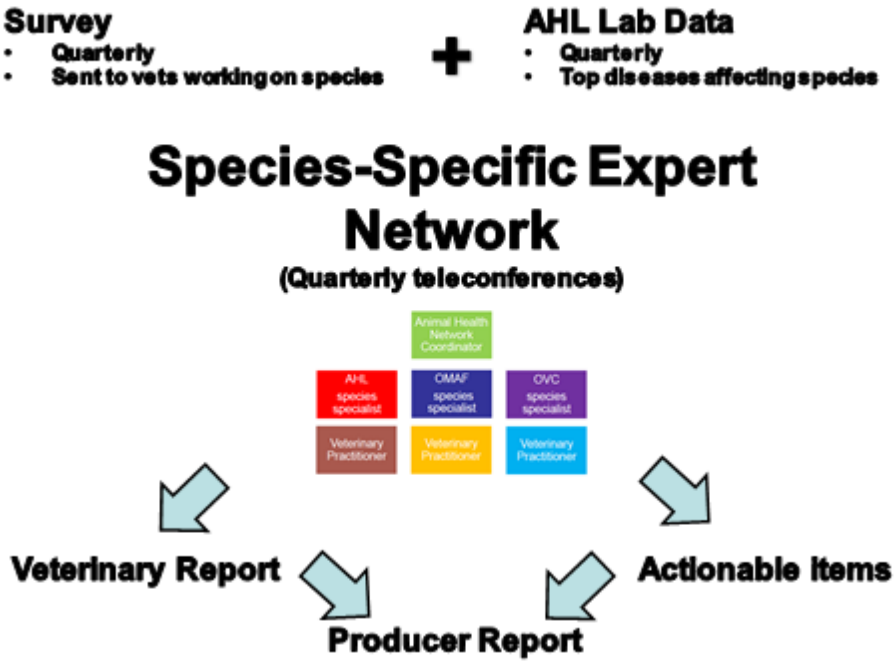

Figure 2. Schematic representation of OAHN activities in the swine species network.

Other aspects of the Disease Surveillance Program:
As mentioned, OAHN is part of a larger program, called the Disease Surveillance Plan (DSP). DSP's other mandates, or program pillars, include:

- Improving surveillance and surveillance tools: As part of the DSP program, many disease issues have been investigated since the inception of funding. Initial clinical PEDv diagnosis (Porcine

Epidemic Diarrhea virus), has been subsidized by the DSP. Development of the PEDv triplex PCR test, carried out at the Animal Health Laboratory in Guelph, ON, was possible through DSP funding.

- Integration with national surveillance systems: A new national animal health surveillance system across Canada is currently under development. Part of the DSP program is devoted to ensuring that our Ontario program is aligned and ready to integrate with the new national system.
- Stakeholder engagement and feedback: The program solicits feedback from stakeholder groups in a variety of ways, including meetings with industry groups, surveys, and an annual stakeholder meeting.

What does this mean for me as a producer?

Your veterinarian will be receiving information about diseases and health concerns from across Ontario. The information will help you and your veterinarian make better decisions about your herd. As a producer, you will receive information about diseases/issues of note for herds in Ontario through industry publications, emails, blogs, etc. Information about disease/health issues are meant to provide a refresher on a particular issue, and alert you, as the producer, to clinical signs you may recognize if a disease is present on farm, and where to find additional resources. Recognizing an issue on farm is a first step to starting a conversation with your veterinarian about how to diagnose and address the problem, optimizing health and herd efficiency. Feedback through your veterinarian or the OAHN program coordinator is always encouraged.

Further questions may be directed to: Dr. Melanie Barham at (519) 824-4120 x 53364 or barhamm@uoguelph.ca.

Prairie Swine Centre Research Reports

The following summaries are reprinted from the Prairie Swine Centre 2013-2015 Annual Research Report. The Report, with the complete articles on each topic, is available at: http://www.prairieswine.com/annual-reports/.

Are My Pigs Eating?

R. Gauvreau and A.D. Beaulieu

SUMMARY
The objective of this project was to demonstrate to swine producers the proportion of piglets who actually consume some feed during a 48 hour period. We focused on piglets in the farrowing crate offered creep feed (supplemental feed to milk during lactation) or on piglets early post-weaning.

Bovine Colostrum for Piglets: Can it Mitigate the Post-Weaning Growth Lag?

J. Wu, J. DeNure, D.A. Gillis and A.D. Beaulieu

SUMMARY
Bovine colostrum is a good source of nutrients and growth factors, and is very palatable. It was added to the creep feed of piglets in the farrowing room and to the phase one diets immediately post-weaning to determine if it would increase feed intake, and help reduce the impacts of the post-weaning growth lag. Overall, the bovine colostrum had no beneficial effects on growth or feed intake of the piglets. However, it did increase the number of piglets that consumed the creep feed or phase one diet immediately after weaning.

Impact of Various Parity Groupings on Welfare and Productivity in ESF Housing

Y.M. Seddon, F.C. Rioja-Lang and J.A. Brown

SUMMARY
Electronic sow feeders (ESF) provide an automated system for controlling the individual feed intake of group-housed sows. However, this system can prompt increased aggression, especially in the initial period following mixing, as sows compete for access to the ESF. The primary objective of this research was to compare different methods for grouping sows and their effects on feeding behaviour, sow injury and production. Sows were housed in groups of mixed parity (control), or uniform groups of low (parities 1-2), medium (parities 3-4), and high parity (≥ parity 5). Of specific interest was whether low parity sows experience less aggression and injury during gestation when managed in uniform groups than in mixed groups, and what effects these treatments may have on production measures.

Preliminary results indicate there are some benefits to housing sows in uniform groups, especially for younger sows. Sows in uniform groups had reduced lameness, and younger sows were able to increase backfat over gestation, as opposed to losing it. Younger sows in mixed groups lost backfat, suggesting feeder competition was more of a challenge for these sows in the mixed parity group. No production differences were found among the different grouping methods. Managing gilts as a separate group is already a common practice, and the results from this study suggest that parity 1 and 2 sows can also benefit from this practice. Maintaining uniform groups also reduced mixing

injuries, in uniform medium and high parity groups with injuries sustained following mixing being equal to or lower than in mixed parity groups. However, the low parity uniform group had higher injury scores. Greater injuries in younger sows is more likely related to the social ability of these animals, and management of gilts to improve sociability is a further management consideration that could be implemented.

National Sow Housing Conversion Project: Initiation and Pilot Demonstrations

J.A. Brown, Y.M. Seddon, H. Thoday and D.L. Whittington

SUMMARY
Increasing numbers of food retailers and supermarket chains have announced plans to develop a 'stall-free' pork supply chain. Consequently, the Canadian pork industry is under pressure to convert existing gestation stall housing of its approximately 1.3 million sows to group systems. However, there are major concerns within the industry around the conversion from stall to group housing. The process requires a large capital investment, and selecting the 'right' system can be a daunting task.

Within the Canadian industry there is relatively little knowledge and experience on the management of sows in group systems. The National Sow Housing Conversion Project (NSHCP) is intended to facilitate the successful conversion of Canada's sow barns to group housing. The project brings together industry and scientific expertise to produce a comprehensive national strategy involving demonstration farms and technology transfer to support Canadian pork producers. This report describes the initial phase of this initiative. Building on the outcomes of a University of Manitoba project on group housing, it involved the establishment of a national working group, preparation of educational materials for producers, and the initiation of two barn conversions along with detailed costing information. Selected barns in Saskatchewan and Manitoba were used as pilot sites to develop a strategy for barn conversion and technology transfer activities. This information will aid producers in making effective decisions that will sustain and enhance Canada's access to domestic and export markets.

Can Group-Housed Sows be Raised at Lower Temperatures to Reduce Barn Heating Costs?

B. Predicala, A. Alvarado, D. Beaulieu and J. Brown

SUMMARY
In this project, an operant mechanism that will allow sows housed in a group system to control their own environmental temperature was developed. The mechanism was configured with a manual control switch that the sows can access and operate, which in turn activated the supplementary room heating system, as well as a localized radiant heater above the location of the switch as an immediate reward. Testing of a prototype system installed in a controlled-environment chamber with two sows showed that the mechanism functioned satisfactorily to allow the sows to control their environmental temperature. Preparations for subsequent tests in group-housed sow gestation rooms to assess overall heating cost savings, associated sow behavior, and optimal dietary requirements when raised at lower temperatures are underway.