MSU Pork Quarterly

Information for an Industry on the Move

March 2017 Vol. 22 No.1

In This Issue...

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ANIMAL AGRICULTURE INITIATIVE

This newsletter is edited by:
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& Emily Schmitt MPPA, Program Director

All about the ladies...

Dr. Madonna Benjamin, Editor for the March 2017 Pork Quarterly.

Starting with this issue, every quarter, one of the Michigan State University MSU) Extension Pork Work Group members volunteers to act as Editor for the Pork Quarterly within the Michigan Pork Magazine. This time, I find myself lucky.

With the assistance of Mary Kelpinski and Emily Schmitt, we are initiating an issue theme for each quarter. This quarter we are focusing on the girls – gilts and sows. Dr. Nathalie Trottier's research group is motivated to study sow nutrition, specifically during lactation. Nathalie shares her insight that, from the first lactation, every teat is sacred. In addition, Nathalie, along with nutritionist David Chamberlin reports on the findings for using crystalline amino acids to reduce both the cost of standard sow rations and reduce environmental footprint.

Dr. Janice Siegford, of MSU's Animal Behavior and Welfare Group, has shared a write up on how the work of her team may hold the key to "peaceful" pig grouping. Beth Ferry and Sarah Ison include the "nasty" side of girls in their article "Why MSU is focused on sow aggression".

My Soapbox: Pain mitigation in swine.

Perhaps the best part of acting as editor is the opportunity to rant. Tom Burkgren, Executive Director, of the American Association of Swine Veterinarians, wrote in his recent message *My view from the hospital pen,* that, "as a profession we need to do more to understand the relief of pain in pigs". I agree most heartedly. There is quantifiable evidence of behavioral and physiological indicators of pain in livestock such as lying behavior, huddling, leg loading and more. Pain relievers such as meloxicam and ketoprofen are Nonsteroidal Anti-inflammatory drugs (NSAID), which tend to persist in the synovial fluid. In Canada, meloxicam is approved for relief of post-operative pain associated with minor soft tissue surgery such as castration in swine, non-infectious locomotor disorders to reduce the symptoms of lameness and inflammation, and reduced toxemia. Ketoprofen is approved for reduction of fever and inflammation associated with respiratory infections. Flunixin e.g. Banamine®, the only NSAID approved in the United States, comparatively lacks adequate relief for both post-operative pain or musculoskeletal conditions such as chronic lameness in sows. Dexamethasone is a corticosteroid

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which will reduce inflammation but does not target pain receptors.

During my veterinary practice in Alberta, Canada, we had introduced an Standard Operating Procedure (SOP) for "off-feed or reduced feed intake" to sows during lactation to include meloxicam on farm. At the time, only ketoprofen was approved in swine. We compared and followed treatment protocols, records and estimated the number of injections on two 3,000-sow-wean sites (Farm A and Farm K) over 4 months.

Farm A treated 487 sows for 3 days with a traditional combination of dexamethasone and penicillin. **Farm K** treated 480 sows with ketoprofen - once.

Here is the math: Dexamethasone = 3 injections (1 injection X 3days) and penicillin = 9 injections (24-30 ml requires 3 injection sites X 3 days) for a total of 12 injections/sow treated or 5,844 injections.

Of the 480 lactating sows treated on **Farm K** with ketoprofen, there were 480 injections! During this short observation, **Farm K** had 2% lower sow mortality rate over **Farm A**. The ketoprofen treatment cost then was $8-10/ sow treated and based on lower mortality the ROI was 3:1. Since then, meloxicam has been approved in Canada for swine. As with most multisite systems, it did not take long for **Farm A** to recognize and change their treatment regime to include ketoprofen (NSAIDs) because stockpeople liked the idea of a) fewer injections b) better perceived results to treatment and c) lower sow mortality.

I believe it is important that swine producers and swine veterinarians look to pharmaceutical companies and regulatory agencies to understand how we can encourage and assist them to provide options of pain mitigation for swine. When asked of her success to changes in policy, Temple Grandin admits that "Heat bends metal", so let's all turn up the heat.

For our next issue we are including letters to the editor. We appreciate your questions and comments.

Michigan State University research and extension teams focus on pig aggression

By: Beth Ferry, Swine Extension Educator, MSU Extension and Sarah Ison, Department of Animal Science, Michigan State University

Why pig aggression?

It is common knowledge on swine farms that when you house animals together that have no prior knowledge of each other that there will be displays of aggression and fighting. Studies of pig's social behavior in natural settings have provided useful information about the role of these behaviors. Stolba and Wood-Gush, identified key features in the behavior of free-ranging pigs, living in social groups (sounders) of 2 to 6 females along with their litters, and juveniles [1]. Piglets are born in an isolated area, the nest, and begin social interaction as they slowly venture out with the sow to the point of communal living with other sows and piglets in the sounder. Sows and pigs form linear dominance hierarchies or pecking orders within the sounder, based on age and size, typically with one "boss sow" and the remaining individuals in order below. Since sounders typically consist of related individuals, the pecking order is established and maintained without or with very little aggression. Boars live as solitary individuals or as sub-adults, in small groups that were formed when they were young. They come into contact with the females only for breeding, and when they do, they take top spot in the dominance pecking order. In wild or feral populations that live in home ranges, when overlap between groups happens the wild pigs generally adopt an avoidance strategy rather than overt aggression [2]. When sows are housed in large groups in a commercial setting, they often form smaller sub-groups, as they would in the wild,

Figure 1. Sows fighting shortly after mixing. Photo courtesy of Dr. Sarah Ison

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occupying a certain space within the pen. It is found to be beneficial to provide the sows with barriers in the large pens, so that sub-groups can occupy these spaces. These barriers also help weaker sows to hide from the boss sow and move away from the acts of aggression.

Due to the nature of commercial production systems, pigs may have to be re-grouped at various stages, for example, entering the nursery stage, the feeder/finisher stage, for gestation in group housed systems, at transport and/or immediately before slaughter. On most commercial farms, nursery to finisher pigs are abruptly placed in new social groups of up to hundreds or even thousands of pigs. Due to replacement rates and other production factors, commercial breeding gilts and sows are housed individually, small groups of 8-10, or in larger groups, and breeding boars are housed individually. The innate need is to re-establish a dominance or pecking order and unfamiliar pigs engage in aggressive interactions and fight amongst each other. Vigorous fights associated with re-grouping events, causes injury [3], stress [4], altered immune function [5], and reduced average daily gain [6]. This means re-grouping events can be associated with a reduction in productivity and pig well-being. Work has been done to look at methods to reduce those acts of aggression, this has become especially important for Michigan producers as they look to implement new regulations regarding the housing of gestating sows.

MSU research project

By April 1, 2020, Michigan pork producers will no longer be able to house sows in individual gestation stalls from the point at which pregnancy is confirmed. Michigan is one of 10 States to put in place this regulation, several pork retailers are also requesting that their pork be from pigs raised in this manner, and several other countries globally have recently made this transition, or are embarking on the change in the next few years. Therefore, this is an issue of national and global importance.

Group-sow housing will enable sows to move around, engage in positive social interactions, and choose where to lie to improve thermoregulation. Housing gestating sows in this manner will involve several re-grouping events, and numerous potentially aggressive encounters. This leads to concerns from pork producers regarding sow well-being and productivity in group systems due to injuries and lameness from aggression. At MSU, a team of researchers are working on advancing the knowledge relating to the genetics and behavior of pig aggression, to further investigate the possibility, including potential side-effects of breeding a less aggressive pig. The overall aim of the project is to reduce production losses using behavioral and genomic tools to identify pigs best suited to group living (see below).

Figure 2. Grower pigs fighting shortly after mixing. Photo courtesy of Dr. Sarah Ison

MSU Research

The on-farm data collection phase of the project is now complete, including detailed behavioral data (phenotypes) for 1079 gilts and barrows. Individual pigs have been followed from birth, through re-grouping on entry to the nursery phase, feeder/finisher phase, and replacement gilts entering the breeding herd (Object 1, Page 4, Table 1). Researchers are currently studying the data to characterize the level of aggression at the different stages, as well as individual consistency of aggression. The researchers also obtained genotypes for these pigs, to conduct genome wide association studies (GWAS), associating variation in the aggressive phenotype of the pig, with regions on the genome (Object 2). This provides the potential for geneticists to incorporate selection against these 'aggressive' genes, without spending hours recording aggressive behavior of individual pigs, and ultimately create a pig better suited to group living. A third component to this project is to consider behavior in the development of on-farm management protocols to reduce production losses, by surveying pork producers, and pork industry advisers (researchers, extension educators, swine veterinarians). Survey results are being used to develop educational resources for pork industry stakeholders, including methods to better transfer and incorporate research results into on-farm management (Object 3).

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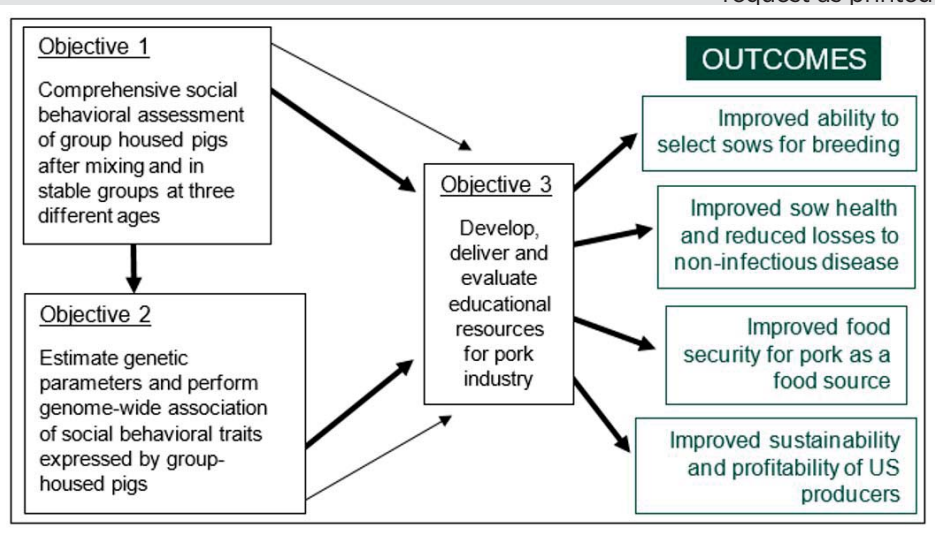
Table 1.



MSU Extension resources

As Michigan prepares to implement regulations for sow housing, the pork team at Michigan State University Extension has identified it as an issue and area of education. The team conducted focus groups to identify strategic educational needs relating to the group housing of sows, which included: retrofitting existing facilities, feeding systems, employee training, new construction, genetics, and production scheduling [7]. In response to this, the team has put together factsheets outlining the systems available, which are published on the MSUE pork webpages, along with other industry information on gestation sow housing options [8]. Also available on the website is the Sow Housing Options Tool (SHOT), which allows producers to economically evaluate group housing options, including new builds and retrofitting existing facilities. The SHOT consists of a standard Microsoft Excel spreadsheet along with a guide, allowing users to input personalized farm data and cost estimates for various systems, in order to calculate a cost comparison for different systems, or directly compare the same system with equipment from different manufacturers. This enables users to complete an economic comparison of the GSH systems that they may consider adapting to, based on their individual production scheme. All materials are also available upon request as printed copies.


E3239
Gestation Group Sow Housing Options:
Electronic Sow Feeding

Introduction

General description of system

To complement existing materials, the team is currently putting together video case studies of producers who have existing group sow housing systems. The videos will include a description of the system, and interviews with production staff responsible for sow management. Based on the outcome of the national pork producer, and industry advisor surveys, several educational materials will be constructed, relating to the breeding and selection of replacement breeding sows, and on-farm techniques to minimize aggression between pigs. MSU researchers will use the survey data to establish the best methods to communicate the latest research to pork producers, to better incorporate research advances into on-farm practice.

In summary

MSU research and extension are working together to use cutting edge knowledge of behavior, genetics, and industry education to reduce production losses in an evolving pork industry.

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Improving Genetic Selection May Hold Key to Peaceful Pig Grouping

By: Janice Siegford, Department of Animal Science MSU College of Agriculture and Natural Resources

Growing concern over the welfare of agricultural animals has led many states to pass legislation that mandates a fresh set of care practices. California did so in 2008, and many others have followed suit.

In 2009, the Michigan Legislature passed an amendment to the Animal Industry Act introducing a series of new standards for gestating sows, laying hens and veal calves. Included is the requirement of additional living space for gestating sows. By April 1, 2020, all producers will need to house pregnant pigs in stalls where they can turn about freely, something typically not found in most current operations.

The majority of agricultural producers don't have the physical capacity to give each sow an individual pen. And though pigs are social by nature, they don't always get along well in group settings.

Researchers at Michigan State University (MSU) and Scotland's Rural College are looking for ways to place pigs so they are more likely to live in harmony together. The basis for the solution may be rooted in genetics.

"Being cognizant of how we treat animals is a great thing, and the new standards sound really good in principle," said Janice Siegford, an MSU associate professor of animal science who's working on the five-year project. "But pigs are currently being selected for breeding with no respect to how they perform in social situations. There's a lot of evolutionary history that says it's best if the animals know each other and are raised together, but that's not often what is done in practice."

Pigs naturally live in small groups that consist of their mothers and other close relatives. There is a social hierarchy within these groups, which normally works to reduce aggression and fights because they know the social order. When unrelated pigs are mixed in a shared space, fighting can become intense.

"Unfamiliar pigs oftentimes fight like the dickens when they are put in the same pen," Siegford said. "This becomes problematic for a number of reasons. Obviously, the animals' welfare is adversely affected. And injured or stressed pigs don't perform as well, and they can even die from exhaustion or heat stress."

Breeding programs have traditionally focused on production traits and other relatively easy-to-measure physical characteristics, such as number of offspring, growth rate and depth of back fat. Though it's sometimes difficult to quantify, Siegford said that behavior should also be taken into consideration.

Siegford and the rest of the project team — which includes MSU faculty members Juan Pedro Steibel, Cathy Ernst, Ron Bates, Madonna Benjamin and Sarah Ison, as well as graduate and undergraduate students — are examining the heritability of social behavior using genetic selection. They are characterizing social interactions, relating those behaviors to health and productivity, and identifying the genetic components that factor into certain behaviors. They hope that the work will help to answer a critical question: Can pigs be selected for heritable behavioral traits that lessen the severity of conflict among grouped animals?

The MSU team is compiling behavioral and genomic data from more than 1,000 pigs at the MSU Swine Teaching and Research Center. The data will be combined with information from 3,000 pigs obtained by collaborators Simon Turner and Rick D'Eath of Scotland's Rural College, experts in analyzing aggression heritability in pigs.

Most previous research on heritability of aggressive behavior has been dedicated to the finishing stage of production when animals are being prepared for market. Siegford believes that monitoring interactions earlier could be useful.

"We've been studying behavior of the pigs beginning at the first time they are mixed in the nursery after weaning," Siegford said. "If we can predict behavior at an early age, maybe we can manage those pigs better throughout their lives."

"We're not just looking at fighting. We want to know about positive behaviors. Some pigs like to rest or feed with certain pigs, and we want to know what behaviors they use toward preferred social partners. All of that is extremely important to understand when it comes to selecting pigs for breeding that best fit the social environment we keep them in."

Ison is surveying producers and breeding companies to

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determine how they manage their pigs and if they take social behavior into account during the breeding selection process. Early findings have shown that many producers receive information on behavior from their swine veterinarians. This knowledge offers insight into the best way for the team to share research findings for maximum exposure and impact.

Siegford said she wants to help ensure the sustainability of Michigan's pork industry, valued at $500 million.

"These changes to animal care standards have been made for positive reasons," Siegford said. "The idea of giving animals more space is wonderful, but when you allow for more behavioral expression, pigs will perform both good and bad behaviors. We need to make sure that we're giving producers information so they can meet legislative and consumer requirements in the right way for the pigs, and in a way that makes sense economically."

Funding for this project has been provided by the U.S. Department of Agriculture, the National Pork Board and the Rackham Foundation.

Critical Determinants of the First and Future Lactations

Dr. Nathalie L. Trottier. Department of Animal Science, Michigan State University
Editor: Dr. Madonna Benjamin

The outcome of the first lactation will dictate whether the gilt remains in the herd or is culled. Our lab has focused our research efforts to understanding sow lactation and physiology. While our work is ongoing, this article represents a summary of what I believe are the most important goals for lifetime sow productivity and, it starts with the gilts.

Goal #1 - Prevent gilt obesity in gestation.

Setting body condition goals for gilts entering the breeding herd and monitoring body condition during the gestation period will optimize feed intake for lactation. The over-conditioned gilt coupled with limited mobility during gestation is far more susceptible to dystocia (difficult and extended length of farrowing) than her P2+ sows. Coming full circle, dystocia then results in lower feed intake in lactation, and higher rate of piglet mortality at birth and in early lactation. Over-conditioned gilts are less willing to stand compared to well-conditioned gilts and will tend to have more fat in their mammary tissue. Fat in the mammary tissue is linked to reduced ability of the alveoli (mammary milk-secreting compartment) within the mammary gland to produce milk.

We believe that objective methods to monitor gilt body condition, such as body weight, girth tapes, backfat thickness and Caliper can result in accurate determinants of an animal's true condition and reduce unnecessary feed intake costs. We are currently working on a large scale project using commercial facilities to assess the impact of gilt feeding with higher fiber-containing diets on their growth, body condition and performance over 3 successive parities. As part of this study, mammary tissue is biopsied from the first litter gilts and then from these same gilts as they progress into P2 and P3. We will determine if the mammary gland composition (fat vs. milk-secreting cells) is affected by the developing gilt diets.

Goal #2 - Increase fiber intake during gilt gestation

In addition to restricting caloric intake during gestation, increasing dietary crude fiber from 3.8% to 7% will benefit the gilt considerably. Increasing fiber will increases gut fill and stimulate bowel movement. Increasing fiber results in expanded stomach volume and feed intake capacity in preparation for improving feed capacity intake during lactation - as much as 2 kilograms more feed per day. Increased bowel movement is important in gilts because it reduces the time fecal matter remains in the large intestine and ultimately reduces the risk for bacterial endotoxin production. These circulating endotoxins may interfere with the secretion of prolactin, the hormone needed to initiate and maintain lactation. Sows fed higher fiber containing diets also drink more, with some studies showing increased water intake in early lactation by nearly 2.5 gallons per day. More water intake means more gilt mobility and subsequently, bowel movements. Quesnel and co-workers found that the effect of increased gestational dietary fiber - 7% starting d 25 of gestation - can offer a significant increase in piglet and litter ADG.

Therefore, it is advisable to include a good source of fiber, for example wheat bran, to ensure at least 7% crude fiber in the gestation diet. Other fiber provisions, depending on the facility type, include straw and/or shavings to stimulate fiber intake, foraging, nesting behavior and thus encouraging gilt mobility. Consider keeping the gilts on the high fiber gestational diet to the end of gestation and into the first

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4-7 days of lactation to maintain the physiological benefits associated with feeding fiber.

Goal #3 - Optimize mammary gland utilization.

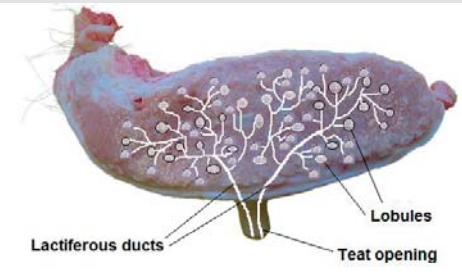

Figure 1. At right, a cross section of an actual mammary gland with the drawing representing the lactiferous ducts and the lobules (not drawn to scale). Within each lobule (not shown here), thousands of milk producing cells line up the inside compartment of thousands of alveoli. Oxytocin stimulates each alveoli to "contract" to push the milk into the lactiferous ducts at time of milk ejection.

Of all livestock species, the female swine is the only one that give birth to a litter, which makes them unique in terms of how they regulate their milk production and interact with the progeny. The sow is equipped with 14 to 16 "complex" mammary glands or teats (Figure 1). They are termed complex because each gland is composed of two "simple" glands and two lactiferous ducts draining into two separate teat openings. Each simple gland is composed of lobules. Milk is freshly synthesized within these lobules, and unlike other species, the pig mammary gland has a very limited milk storage capacity. The lobules fill up with milk about every 50-70 minutes and must be emptied every 50-70 minutes by the piglets to optimize milk production.

Piglets are indeed programmed to nurse their specific teat, just about every hour following the transition of colostrum to milk. If the mammary glands are not emptied within that short time frame, intra-mammary pressure increases. If the pressure persists for 6-7 hours, involution (reduction of the size of the gland) will begin. Once involuted, the mammary gland will not come back to its original size, even if more piglets are placed on the sow. Nursing of all of the available functional glands is crucial to stimulate mammary growth during the first lactation. A study by Ford and colleagues first suggested that mammary glands which are suckled in a first lactation have enhanced productivity in the next lactation compared with glands that are not suckled. They reported that mammary glands at the end of involution period (seven days post-weaning) which are suckled during lactation are larger than un-suckled glands (Figure 2) and presumably have more mammary tissue available for redevelopment during the next pregnancy.

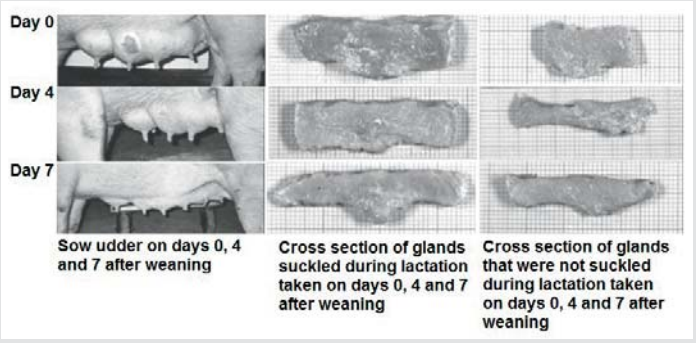

Figure 2. External and internal morphological changes in sow mammary glands follow weaning: Impact from nursing (Adapted from Ford et al., 2003)

Other research (Theil and co-workers) examined the impact of leaving a gland un-suckled for 24 hours from day 1 to day 2 of lactation on piglet growth until weaning. Still on day 28, Theil's study showed that un-suckled glands for as short as 24 hours are never quite "rescued" for the rest of lactation (Figure 3).

Figure 3. (left) The second thoracic gland (II) was covered one day post-farrowing to prevent sucking; (right) The gland that was covered (II) completely involuted, and the involution was visually apparent within 4 days compared to gland I (Source: Theil et al., 2006).

There are, of course, many logistical issues that may prevent fostering as early as one would like, nonetheless, knowing the impact of a non-suckled teat assist in setting goals toward cross-fostering.

There is a good biological reason why adding one or two piglets to an existing litter to maximize the uses of functional glands by cross-fostering from another gilt or sow should be done well within 24 hours following birth if at all possible. While gilts tend to have fewer piglets at birth compared to multiparous sows, data from the studies of both Ford and Theil would indicate that it is wise to exploit all her functional glands through maximizing the number of piglets nursing on a gilt. It would appear that if we don't take advantage of mammary cell proliferation during the first lactation, we may have lost the window of opportunity.

Dairy producers have long recognized the importance of udder conformation for milk yield. Does udder conformation

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matter in sows? There is little published regarding the relationship between udder traits per se and litter performance. The status quo is that the sow udder should be equipped with 14 or 16 equidistant, well-defined, functional teats with no inverted nipples.

Goal #4 - Prevent teat injury

Unlike other livestock species, each gland will eventually belong to a single piglet. Consequently, for each malfunctioning teat, there is one piglet out of luck because piglets tend to associate with and nurse one particular gland. Figure 4 shows the effect of 8 piglets nursing from a sow with 12 functional teats following parturition. By the middle of lactation, the glands were completely involuted. Teat injury, as the one depicted in Figure 5, may unfortunately prevent nursing of an otherwise fully, well-developed functional gland. If at all possible, it is a good practice to check on gilts during late gestation for any teat trauma and attempt to allow healing with rubber mats, prior to lactation.

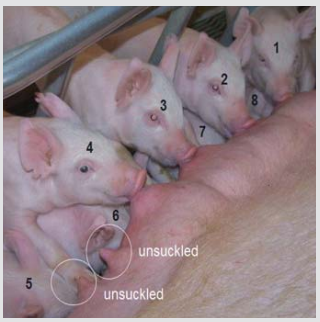

Figure 4. At left, the number of piglets in the litter was 8, with each piglet numbered 1 through 8. As shown, each piglet is nursing one functional gland. Piglets establish early on after birth a hierarchy and dominance for one gland in particular. The remaining, unsuckled mammary gland involute rapidly. Glands remaining unsuckled for 48 to 72 hours will never be rescued into producing milk again. (Photos courtesy of Kevin Turner and Nathalie Trottier, Michigan State Universiry, Department of Animal Science).

Figure 5. Injury to a teat due to crate flooring in lactatiob. This teat lost its functionality and the mammary gland involuted. Such injuries occurring 48 hours post lactation means that the piglet "owing" this gland will only have access, if any, to "free" glands that have reduced milking potential. Injuries occurring as early as after the 4th day in lactation will lead of a starving piglet since any free glands at this point into lactation cannot be rescued to produce milk again.

Goal #5 - Increase length of lactation period

There are a number of reasons why a longer lactation period is associated, in the long-term, to improved sow and piglet quality. Here I am listing 3 of them: 1) sows naturally have long lactation period and from an evolutionary basis, long lactation periods optimize socialization and positive behavioral development; 2) extending the lactation period contributes to increasing stomach volume; 3) Longer lactation is beneficial for the mammary glands compared to weaning at an earlier age. Our research at Michigan State University showed that cellular activity in the mammary tissue is very high on day 17 of lactation, which corresponds to peak lactation. Weaning close to peak of lactation does not allow for the natural involution which usually takes place quite later into lactation, and the remodeling processes of mammary tissue to occur. The impact of weaning during this period on mammary "preparedness" for growth during the subsequent lactation cycle is unknown.

Conclusion

Culling of gilts following a poor first lactation represents an economic drain for producers. Preparing the gilt for a successful first lactation will impact lactation performance in subsequent parities. Setting body condition goals for gilts entering the breeding herd and monitoring body condition during the gestation period will optimize feed intake for lactation. Feed intake in gestation should be restricted to meet the amino acid and energy demand associated with products of conception and mammary tissue growth, and to maintain good body condition without causing excessive fat accumulation into the mammary tissue. In production settings whereby gilts are housed in gestation stalls it is advisable to feed several times a day to encourage gilts to stand up. Fiber is an underutilized production tool. Increasing fiber has many benefits, namely increasing feed consumption during lactation, reduced farrowing time, reduced pre-weaning mortality and piglet average daily gain.

Finally, understanding factors that lead to a dysfunctional teat in the first parity is crucial. An underused mammary gland is a lost opportunity toward improving sow lifetime productivity. Every Teat is Sacred!

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Refining lactation diets to reduce environmental impact

David Chamberlin, and Dr. Nathalie L. Trottier. Department of Animal Science, Michigan State University

Modern swine production systems require highly productive animals. To ensure high productivity, diets formulated and fed to modern sows should meet the highest sow nutritional demand first. However, this often results in an excess of nutrients given to certain sows, with lower nutrient requirements. This nutrient excess, in particular nitrogen (N) or phosphorous (P), can negatively impact the environment.

At Michigan State University, we have spent a number of years developing and testing "green" diets that improve nutrient digestibility, or reduce total manure nutrient excretion to lessen environmental impact of sow diets. Prior to our work with sows at MSU, much of the efforts on green diets were centered on grower and finisher pigs. Fortunately, our interest in sows rations and environmental impact have provided an opportunity to combine our on-going interest in nutritional requirements for lactating sows to her nutrient role in our environment. For example, lactating sows consuming nearly 50 lbs. of dietary crude protein (CP) over a 21-d lactation period, will excrete around 18 lbs. of CP in total manure, of which 3 lbs. is nitrogen (N).

A recent study entitled: "Lactation performance in sows fed diets with graded levels of crystalline amino acids as substitute for crude protein at lysine requirement" was part of the graduate work of David Chamberlin (Nutritionist, Barton Farm Company). As background to the study, dietary reduction in CP has been shown to reduce ammonia emissions (Li et al., 2015), and crystalline amino acids (CAA) are thought to be a cost effective substitute to a percentage of CP in the diet, as well as reducing nitrogen excretion to the environment. In addition, Huber et al. (2015) showed that reducing CP by 2.8% (from 16% to 13.2%) with supplemental CAA, increased sow milk protein yields and improved the utilization of N.

In his study, David monitored and compared the performance of two sow groups fed diets containing 3% and 6% less CP, supplemented with crystalline amino acids (CAA), to sows fed a diet containing the standard CP levels as the sole sources of amino acids. Multiparous sows were fed the following diets: 17.16% CP (Normal), 14.48% CP (Medium CP: Medium CAA) and 11.82% CP (Low CP: High CAA). Voluntary feed intake was measured daily and sow and piglet body weight were recorded every 3 days until day 21 of lactation. Milk samples were collected on days 4 and 16. The findings in this study are interesting. Production variables such as piglet average daily gain and feed intake of sows fed the Medium and Low CP diets were not different than that of sows fed the Normal diet. While the milk samples analyzed showed no difference in available protein for piglets (casein), the N excretion concentration in the form of milk urea had decreased by 20% of sows fed the Medium CP diet and over 65% in milk urea of sows fed the Low CP diet. In a separate study, David's research found that these diets also reduced the sow urine urea concentration of N by similar folds as those found for milk and that the lower concentration of N in urine led to a dramatic decrease in ammonia emission rates.

More studies are emerging from our program as we continue to focus on refining diets to reduce feed costs, meet high nutritional needs of our modern lactating sows, and reduce the environment impact of pig production.

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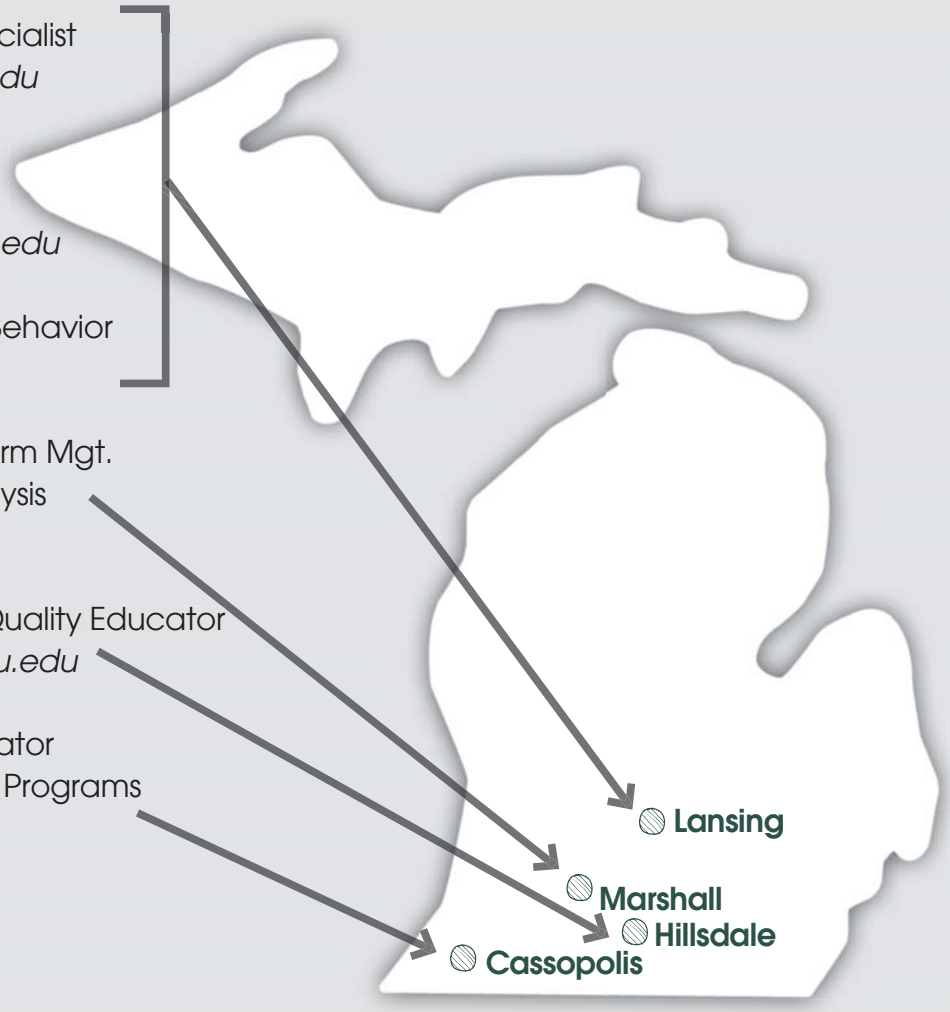

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