

c e n t r e d o n  
**SWINE**



The Newsletter of Prairie Swine Centre Inc.

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Spring 2002 Volume 9, Number 1

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# What's New with PSC Elstow



Program funding provided by



Ken Engele, BSA. P. Ag.,

The past year has been both a profitable and productive year for PSC Elstow Research Farm. The year was highlighted with the grand opening of the newly constructed feed mill on July 12th. As well, research projects were scheduled on a much larger scale with over 15 research projects completed or currently underway in the facility. So how does PSC Elstow benefit pork producers throughout western Canada? The expanded research capacity plays two important roles. First, the speed in which some projects are completed is significantly increased. For example,

growth trials that once took nine weeks to complete at the Floral facility now take three weeks. Second, the facility allows a wider array of trials to be conducted (ex. currently studying group sizes up to 105 animals). These roles allow greater and more diverse research to be conducted in a short time period, increasing the information producers have at their disposal.

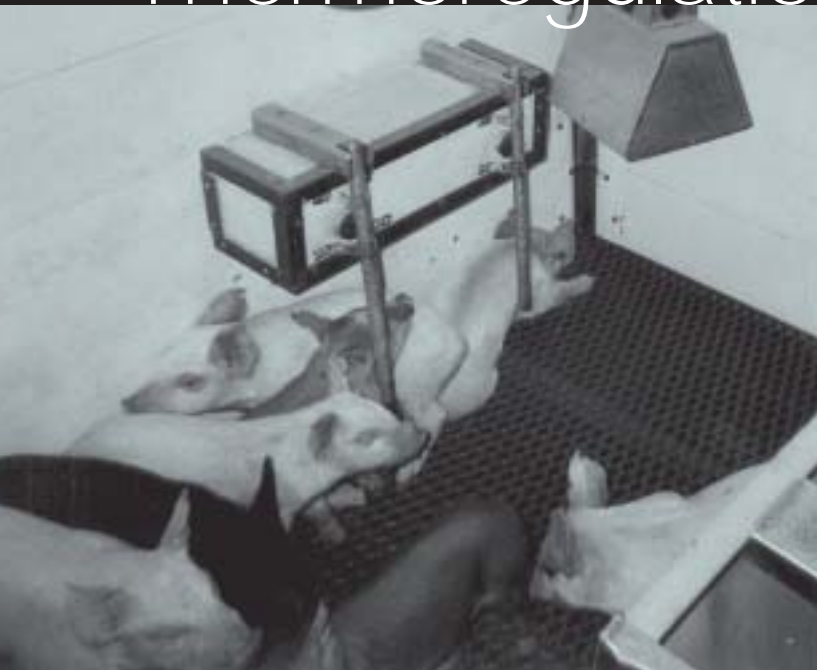
### Production Parameters

A highly productive and efficient operation not only adds to the profitability of the operation, it also enhances the integrity of the research results (it's

*Continued on page 3*

# Thermoregulation of the nursery

## by early-weaned piglets through operant conditioning



*Piglets enjoying warmth of a infrared heat lamp activated by the piglet hitting a lever in the pen*

*Clover J. Bench, M.Sc.  
and Harold W. Gonyou, Ph.D.*

The thermal environment has a large effect on the health and productivity of growing swine. This is especially critical in the case of newly weaned piglets, which require warmer temperatures in the nursery environment. Today's confined pigs are often prevented from selecting their optimal temperature. Instead, it is the farm manager that selects the temperature setpoint based on either experience or an educated guess, if research has been lacking. During cold weather in particular, nursery temperatures are frequently kept relatively uniform

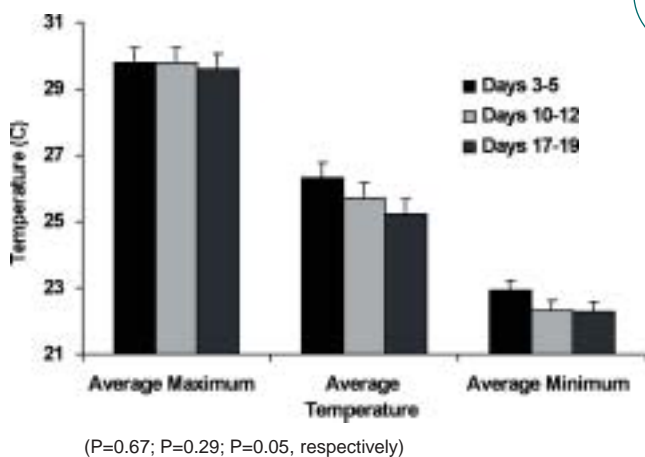
over space and constant over time, which deprives young pigs of the chance to select an environment more comfortable than the one chosen by the swine manager.

Because there is essentially no information available on the temperature conditions required by the early-weaned piglet, many hog producers have to rely on what is known about the thermal preferences of grow/finish hogs. Depending on the facility and manager, nursery temperatures for the early weaned pig can range

achieved through the process of operant conditioning.

During the Fall/Winter of 2000, 5 replications (20 days/rep) were carried out consecutively in a single nursery room of 6 pens of 8 piglets each (48 pigs/rep). All pigs were early weaned at 12-14 days of age. Within the nursery, one pen of 8 piglets controlled the temperature of the room using operant conditioning to a lever in the pen.

The results of the study showed that as age increased, average preferred temperature tended to decrease by approximately 1.0°C per week for the early-weaned piglet



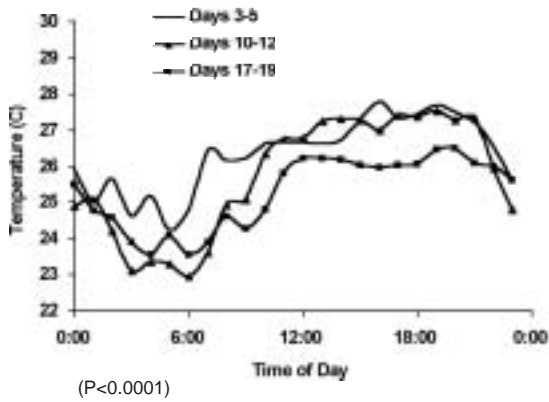
**Chart 1. Average preferred temperature with minimum and maximums for days 3-5, 10-12, and 17-19 days post-weaning.**

anywhere from 27-34°C. In order to provide producers with a better idea of the preferred thermal environment for piglets early weaned at 12-14 days of age, a study was designed in which the piglets themselves controlled their thermal environment through the use of a lever placed in one of the nursery pens. This was

When hit, the lever turned on an infrared heat lamp located directly above the pen in addition to the room's gas heater. Thermocouples, located throughout the nursery, monitored temperature every 5 minutes for the entire duration of each replication. This data was then collected by a datalogger and downloaded onto a computer for analysis. Temperature preference was averaged for the controlling pen for days 3-5, 10-12, and 17-19 days post-weaning (at 2, 3, and 4 weeks of age).

The results of the study showed that as age increased, average preferred temperature tended

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**Chart 2. Average temperatures preferred over a 24 hour cycle. Temperatures averaged for days 3-5, 10-12, and 17-19 days post-weaning.**

to decrease by approximately 1.0°C per week for the early-weaned piglet (Chart 1). Average temperature preferences were 26.33°C, 25.71°C, and 25.24°C for days 3-5, 10-12, and 17-19 days of age, respectively. Thermal preferences consistently ranged between 22°C to 29°C each week post-weaning (Chart 1). Thermal preferences reflected a circadian sinusoidal pattern in which piglets preferred the highest temperatures during the day and the lowest temperatures during the night (Chart 2). These results agree with trends found in studies done in grow/finish hogs and provides

the information producers need to consider more fuel efficient (and welfare friendly!) ways of managing the thermal environment of the early-weaned piglet.

### The Bottom Line

Thermal preference for early weaned piglets reflects a circadian sinusoidal pattern with higher temperatures preferred during the day and lower temperatures preferred at night. While the thermal preference range tends to stay relatively consistent as age increases, the average thermal preference decreases. 

*Continued from page 1*

PSCI's objective to be in the top 10% of PigCHAMP for the core production parameters). The past year has not been without its challenges, however attention to detail and a knowledgeable staff have improved production performance throughout the year. Table 1 provides a current and long-run detail of some important PigCHAMP production parameters.

### Design Highlights

One question quite often asked is, "what's new at the Elstow facility?" Table 2 lists some of the latest trials completed or currently underway at the Elstow facility. To date a majority of the public research has focused on the Nutrition and Ethology disciplines, with on-going work being conducted in the area of environment (ex. base-line study reported in the last edition of Centred on Swine). Private organizations have realized the benefit of the Elstow facility (including off-site) in its first year of operation. The External Research Services group has been the largest user of the main and off-site facilities, overseeing eight experiments throughout the past year.

### The Bottom Line


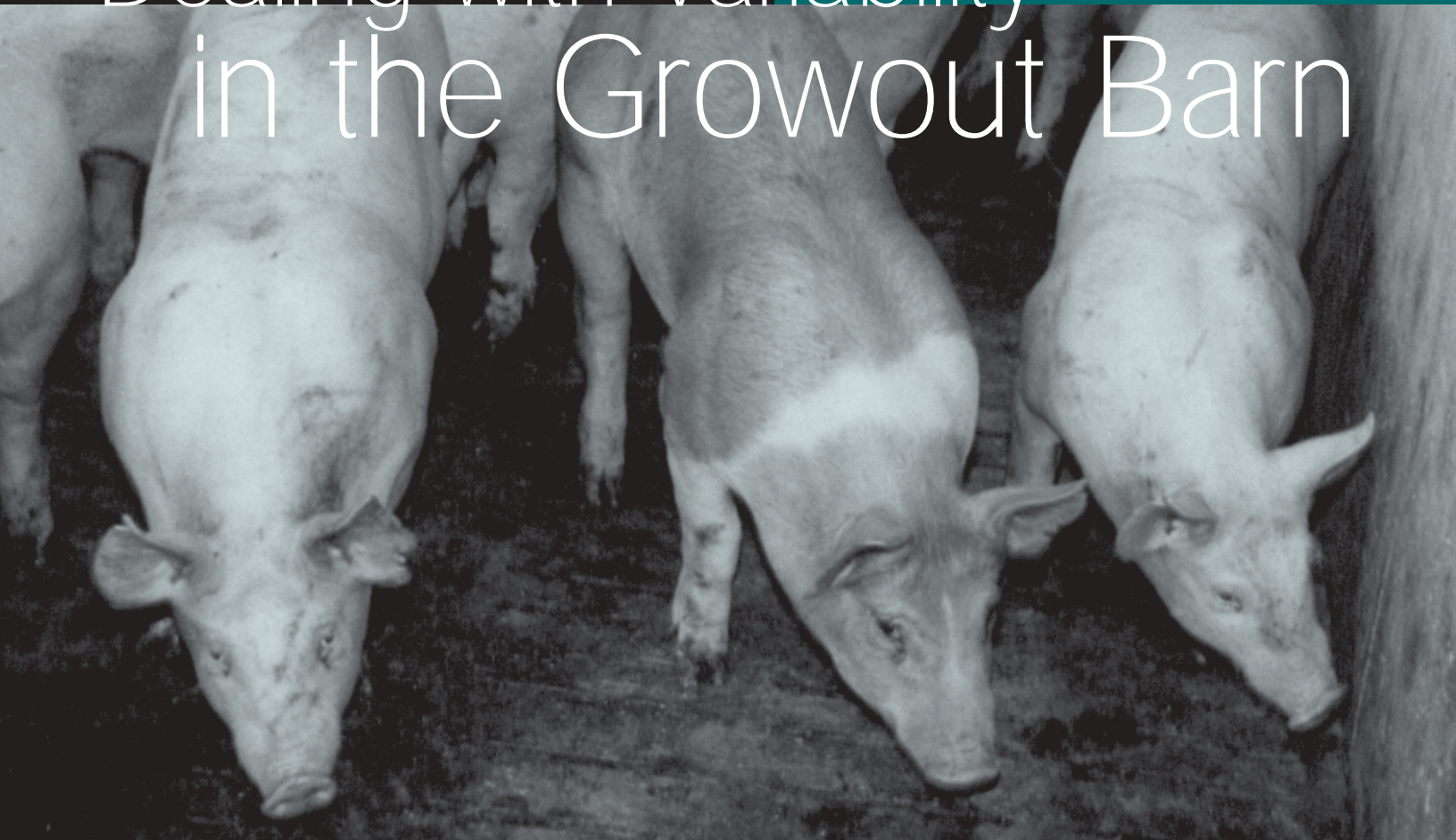
PSC Elstow Research Farm provides PSCI increased research capacity, but this is just the tip of the iceberg. Increased research capacity serves to support western Canadian pork producers in their push for long-run profitability and sustainability. It also provides a venue for organizations to conduct research on products and treatments that also contribute to the viability of pork production. 

Table 1		
	Recent Quarter Sep 01 - Nov 01	First Year Dec 00 - Nov 01
Avg Services/week	32.8	34.2
Percent sows bred by 7 days	98.4	96.7
Avg pigs born alive/litter	10.7	10.6
Avg Sows Farrowed/week	28.3	28.6
Farrowing Rate	83.9	83.6
Pigs weaned per Sow	9.6	9.4
Avg Pigs Weaned/week	274	265
Pigs weaned/mated female/year	23.8	23.1
Avg Nursery Transfer Weight (kg)	31	30
Avg Market Hog Weight (kg)	112	112

Table 2 Research projects completed & on-going in 2001	
Project	Principal Researcher
Playback of nursery sounds to modify suckling behaviour, improve piglet growth and sow feed intake	H. Gonyou, M. Spinka
The effect of group size on the social behaviour of grower-finisher pigs	H. Gonyou, T. Samarakone
Effect of feeder adjustment on weanling pigs from 3 to 10 weeks of age	J. Patience, L. Smith
Effect of cooling method and incubation time on survival of boar spermatozoa stored in three different commercial extenders at 5 degrees C	M. Pettitt
Effects of dietary energy and site of weaning on piglet performance	J. Patience, C. Levesque
Effects of pen density and diet heat increment during the summer months on finisher pig performance	J. Patience, D. Cooper

# Dealing with Variability in the Growout Barn



*J.F. Patience, Ph.D., H.W. Gonyou, Ph.D.  
and R.T. Zijlstra, Ph.D.*

Variation is becoming an increasingly important topic of discussion in the pork industry. Differences in growth impact the time that is required to empty a pen, or a room, or a barn and still meet the needs of the packing industry for uniform carcasses. Pork producers look with envy at the broiler industry, which empties its barns in a single day, while we take 3 to 5 weeks to accomplish the same end. In the broader scheme of things, variability is both a curse and a blessing to our industry. That being the case, management of variability becomes an essential key to success in pork production.

Because variation is the foundation of genetic selection, the industry's ability to select breeding stock for certain desirable traits in performance, meat quality, carcass quality, reproductive performance or even disease resistance requires variation within the pig population. In this regard, variability is a good thing, and indeed, an

essential part of our industry. Such variation can be managed, at least to some extent, by utilizing synthetic lines or crosses of pigs to achieve a more uniform final market animal. Clearly, we must be careful to not allow our desire for uniformity to diminish the availability of diverse breeds or lines within breeds that are the essence of future selection programs.

While genetic variation is a fundamental characteristic of the pig population, the environment clearly plays a significant role as well. This is perhaps best exemplified in cloning experiments. For example, many people were shocked when the famous Canadian Holstein dairy bull, Starbuck, was recently cloned at the University of Montreal and his son exhibited quite a different skin coat pattern. This was clearly unexpected when the genetic composition of Starbuck II was identical to that of his progenitor; how profound, then, is the impact of the environment on the expression of genetic make-up? If the environment has such an important influence on livestock performance, what strategies can pork producers adopt in order to most effectively and efficiently deal with variability?

## What is variability

First, what is meant by variability, and how much variability typically exists within a herd. Variability is defined statistically in many ways. One common term is "standard deviation." Standard deviation is a measure of the amount of variation that exists about the average of a group of pigs. It is defined such that one standard deviation about the mean will include about 66% of all pigs within that group; two standard deviations will include 95% of the pigs, and three standard deviations will encompass more than 99% of all of the pigs. For example, if a pork producer recorded the weight of all of his pigs at 140 days of age (20 weeks), the average might be 95 kg and the standard deviation 11 kg. In this example, 2/3 of the pigs would weigh between 84 kg (95 - 11) and 106 kg (95 + 11). More than 95% of the pigs would weigh between 73 kg (95 - 11 - 11) and 117 kg (95 + 11 + 11). When one talks about reducing variability, one is really talking about reducing the standard deviation. Figure 1 helps to explain the concept of standard deviation in graphic terms.

*Continued on page 5*

Sometimes, people prefer to use the term "coefficient of variation" or CV; it is the standard deviation expressed as a percent of the average. In the above example, the CV would be 11.6%  $((11/95) \times 100)$ . In typical pig populations, the CV is commonly in the range of 8 to 12%.

Two fundamental approaches to variability exist. The first would be to manage the environment in such a way as to minimize variability, and the second would be to manage the pig to minimize the impact of variability on net income. In other words, one approach would be to seek ways to minimize variability, and the second would be to manage whatever variability exists within a herd.

### Minimizing the Amount of Variability

In recent years, there have been many attempts at reducing the amount of variability in a group of pigs. Most have failed. For example, until recently, it was common practice to sort pigs as they enter the nursery or the growout barn, to achieve greater uniformity with the pen, and thus increase

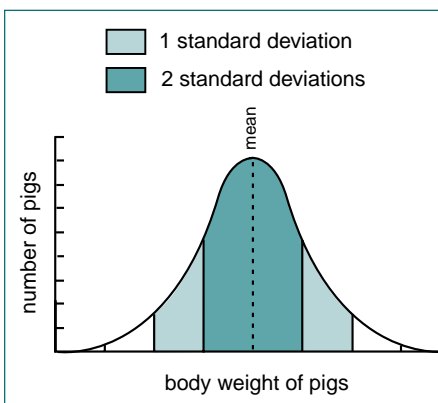


Table 1

the uniformity of growth. Recent studies completed at the Prairie Swine Centre found that sorting failed to reduce variability, and if anything, had an adverse impact on overall performance; these findings were later confirmed by experiments at Kansas State University.

Other research at the Centre has found that only severe restriction of access to feed will increase variability. Changing group size or crowding pigs was also found to have no effect. As shown in Table 1, the coefficient of variation of bodyweight was unaffected by providing additional floor space per pig. We have also looked at the impact of nutritional status of the diet, and found that only when amino acids, for example, are severely limited is variability increased.

We expect to conduct additional

research in this important area, and indeed, expect to see new results from other institutions as well. At the present time, we conclude that when growth rate is high and there is relatively little variation in bodyweight, rearing conditions

market weights 7 to 10 days sooner than gilts; barrow pens/rooms can therefore be turned faster than gilt pens/rooms, with attendant increases in facility utilization.

Table 2 summarizes the bodyweights of over

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are optimal. When growth is below expectation and variation is high coupled with poor feed conversion, social conditions within the pen are probably sub-optimal and pigs low in the social order perform poorly. (eg. Limited access to feed.) When growth rate is below expectation and variation is normal, then some aspect of the physical environment, such as crowding or poor diet, is depressing performance, and all pigs are affected uniformly.

### Minimizing the Impact of Variability

Given our current state of knowledge, the most practical strategy would appear to be to manage the herd to minimize the impact of variability, rather than attempt to reduce variability per se. For example, depending on the grading grid employed by a given packer, time spent sorting pigs at marketing may result in a greater increase in net income than any other activity. In other words, hitting the range of carcass weights that maximize index, and avoid penalties for light and heavy carcasses, has increased average index on some farms by up to 4 points with a net value of \$5 per pig sold.

Another strategy is to house barrows and gilts in separate pens (in continuous flow barns) or in separate rooms or buildings (in all-in-all-out facilities). In this manner, barrows will reach target

400 pigs individually weighed at various intervals from birth to market and sorted according to the week in which they reached market weight. The data clearly shows the disparity in weights that can be traced back to weaning, and indeed to birth; the extent of this variation surprised us. The final strategy for minimizing the impact of variability, then, is to impose management practices that raise the growth curve for all pigs from the fastest growing to the slowest. In this way, variation may not be reduced, but with better overall performance, rooms or pens can be emptied according to schedule and the best market weights achieved in the grow out time available. All of the factors that we know so well will impact performance, such as overcrowding, inadequate diets, poor temperature control and poor health, should be minimized if not avoided in order to achieve an overall performance that maximized net income.

### Take Home Message

Variation in bodyweight is an innate characteristic of all populations of animals. While variability is essential in breeding programs, it creates operational difficulty, especially during the grow out phase of production. It is now known that sorting does not improve uniformity of performance of a group of pigs, nor does reducing or increasing group size or increasing floor space allowance. Given the current state of our knowledge, the best strategy appears to be to minimize the impact of variation, rather than trying to change the amount of variation. Careful marketing, separate sex housing and increasing the overall performance of a group of pigs are likely to pay much bigger dividends than anything that can be done to reduce variation. Indeed, the benefits of such improvements will be measured in dollars, not cents, per pig! 🐷



Table 2

# Over 700 Trained in

# Hydrogen Sulphide Awareness

*Instructor, Mary Petersen, B.Ed., helps a student use a Self Contained Breathing Apparatus (SCBA) for the first time.*



The month of November was a busy month for deliveries of the Hydrogen Sulphide Awareness course. Manitoba Pork Council brought Mary Petersen to seven locations – Niverville, Landmark, Steinbach, Portage La Prairie, Somerset, Winkler and Brandon. A total of 102 pork producers gathered together to discuss liquid manure and the risk of Hydrogen Sulphide gas (H<sub>2</sub>S) in hog barns.

The participants recognized the need to understand the gas, the effects that it has on humans and the importance of managing liquid manure responsibly. Despite the seriousness of the topic, instructor Mary Petersen from the Prairie Swine Centre, made the course fun by keeping the lecture portion of the day to a minimum and by encouraging open discussion among the producers enabling them to learn from each other. In small groups they analyzed and discussed real life incidents that have occurred in hog barns throughout western Canada. This portion brought them to realize that these incidents can happen to anyone who is uninformed and unprepared. "The concepts behind H<sub>2</sub>S and how fast accidents can happen without proper precautions," was a realization expressed by a participant from the Portage course.

Of special interest to the producers was the

examination of different styles of H<sub>2</sub>S monitors. There are many different personal monitoring devices on the market. Some styles warn the barn worker by sounding an audible alarm while others also provide a readout of the gas levels. Discussion about compliance with provincial

and found himself drawn into the fun. A demonstration of the Self-Contained Breathing Apparatus (SCBA) prompted many questions about the need for this apparatus and its cost. The individuals who put on the device were

*Continued on page 7*

"It is extremely rewarding to deliver this course to people who are concerned about their own safety and that of their employees."

Occupational Health and Safety Act and Regulations was a topic of concern to barn workers and to employers, who are required to provide a safe workplace for employees.

Much to their surprise participants were required to practice rescue techniques on a fellow participant. This caused much confusion and fun. Ted Muir, General Manager of Manitoba Pork Council came to the course at Niverville to take photos



*Kelly Bowen and Christina Morassutti with Mary Petersen at the Niverville Course*




*Ted Muir being rescued.*

impressed with the ease that it could be worn.

One knows when a course has been well received when comments such as "Regardless of your farm set up, H<sub>2</sub>S awareness and safety together with SOPs are essential to any hog operation. This course was very timely, informative and useful to my operation. My staff will see improvements to our SOPs." "Excellent job done by the instructor and by the people who worked on the manual."

In speaking to instructor, Mary Petersen, she is delighted with how well the course is received by the participants and by the industry. "It is extremely rewarding to deliver this course to people who are concerned about their own safety and that of their employees." To date 711 people have attended the course.

For further information on delivery dates, contact Mary Petersen 306-667-7436 (phone) 306-955-2710 (fax) or Petersen@sask.usask.ca (e-mail). 

# Graduate Student Profile

## Marnie Shaw




Marnie Shaw was born in Brampton, Ontario but moved westward, graduating from high school in Calgary, Alberta. In 1997, after spending seven years teaching English as a Second Language in Japan, Marnie returned to school and earned a B.Sc. degree majoring in Biology at the University of Saskatchewan. Marnie began a Master's degree in Animal Science under the guidance of Dr. John Patience at the Prairie Swine Centre in January of 1999. For her M.Sc. research Marnie is studying the effect of protein and mineral level on water consumption patterns in growing pigs. Marnie hopes to defend her thesis in the spring of 2002.

One of the challenges of manure management in intensive swine production involves handling the volume of slurry produced, which is directly related to water consumption. Unlike other nutrient sources water is abundant, inexpensive and usually given ad libitum to pigs in commercial production units. Consequently, water demand relating to optimum performance in pigs is not well documented.

The objective of this project was to determine dietary modification, which can be implemented to reduce water consumption without harming the health and well-being of the pig. Diets were formulated to examine the effect of protein and mineral level on water usage patterns. Pigs were housed individually in metabolism pens measuring 1.5m<sup>2</sup> and water balance determined from daily data collection including water intake, urine output and water wastage.

### The Bottom Line

The results of the first experiment showed considerable individual variability in water consumption patterns such that detection of significant differences due to treatment was not possible. A trend towards increasing urinary nitrogen excretion with higher dietary crude protein levels was observed, while growth performance in pigs on the low protein diet was numerically reduced relative to control and high protein levels. A second experiment designed to reduce individual variability in water intake and pursue any effects of dietary protein or mineral level is currently underway. 

# FOCUS ON THE FUTURE CONFERENCE 2002

**February 19-20, 2002**  
**Winnipeg, Manitoba Radisson Hotel**

## February 19

- 12:00 Registration  
1:00 Welcome, Lee Whittington, PSCI  
1:15 Is PRRS Eradication an Option for Your Farm?,  
Camille Moore, Veterinary Swine Consultant  
Sponsor: Elanco Animal Health  
2:00 Nursery Management and Performance, John Patience, PSCI  
2:30 Addressing Variability in the Finishing Pig, TBA, Sponsor: Roche  
3:00 Refreshment Break Sponsor: Prairie Pit Crew  
3:30 Water Usage in the Barn: What affects it and how to control it,  
Stéphane Lemay, PSCI  
4:00 Water Quality and Nursery Pig Performance: How Important is it?,  
Martin Nyachoti, University of Manitoba  
4:30 Session Ends

## Evening Program

- 5:30 Reception  
6:00 Supper Sponsor: ScotiaBank  
7:00 Boar-Pit Session "Positioning Your Business to Profit from Change"  
Marc Martens, Harold Gonyou, John Patience

## February 20

- 7:30 Registration  
8:00 Understanding the Needs of the Individual, Mary Petersen, PSCI  
8:30 Using the Most Recent Science to Manage Reproduction  
Marc Martens, Veterinary Relations Officer, Intervet International,  
Sponsor: Intervet Canada  
9:15 Practical Considerations for Group Housing of Sows,  
Troy Donauer, PSC Elstow Research Farm Inc.  
9:45 Refreshment Break, Sponsor: Mitchell's Gourmet Foods  
10:15 What do we know about the Group Housing of Animals?,  
Harold Gonyou, PSCI  
10:45 Systems for Minimizing Nutrient Losses from Manure,  
Claude Laguë, PSCI, University of Saskatchewan  
11:15 Diet Manipulation to Reduce Nutrient Content in Swine Manure,  
Ruurd Zijlstra, PSCI  
11:45 Understanding the Barn Environment and its Relationship with  
Odour Emissions, Lilliane Chénard, PSCI  
12:15 Adjourn

# Coming Events

## Banff Pork Seminar

January 22 – 25, 2002  
Banff, AB

Contact: 780-492-3236

## Manitoba Hog Days

January 30 & 31  
Winnipeg, MB

Contact: Ian Seddon 204-745-0353

## Air Quality & Odour Management Seminar

Prairie Swine Centre

February 5

Contact: Brenda 306-373-9922

## Focus on the Future Conference

Radisson Hotel

Winnipeg MB

February 19 & 20

Contact: Ken Engele 306-373-9922

## Sask Pork Expo

Feb 26 & 27

Trade Centre

Saskatoon Prairieland Park

Contact: Tara or Angie 306-933-5079

## Alberta Pork Congress

Westerner Park

Red Deer, AB

March 12 – 14



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