

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

The Newsletter of Prairie Swine Centre Inc.



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Summer 2003 Volume 10, Number 2

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# 2003 Focus on the Future Conference

Ken Engle, BSA, P.Ag.

The 2003 Focus on the Future Conference recently wrapped up in Saskatoon on March 25-26. This year's Conference was the best attended to date, attracting 150 people over 2 days. Each year the Conference serves to highlight the latest research results available at Prairie Swine Centre, in addition to providing direct access to the Research Scientists conducting the research.

The first day of the Conference, entitled "Production and Politics", focused on specific production related issues that pork producers face in the day-to-day operation of their business. Some of these issues focused on feed quality of the 2002 crop, animal welfare and its relationship to the swine industry, Canada-U.S. trade. One of the highlights was Dr. John Patience's presentation on "Variation in the Finishing Barn: A Checklist to Improve Performance".

Dr. Patience began by explaining why there is an increased emphasis in monitoring and measuring variation within the finishing barn. The presentation went further to explain some of the financial costs associated with a relatively "poor" sort, for example by having over 90% of pigs at market in the core versus the industry average of 65%, is costing over three dollars on every pig shipped. The presentation further examined the causes of variation (genetic versus environmental factors),



*Dr. Ruurd Zijstra outlines some of the challenges and solutions when feeding lower quality feed grain.*

and some of the ways in which pork producers can measure variation, and reduce its subsequent impact.

Each year the Focus on the Future Conference challenges producers, and provides new insight to increase their competitiveness in the global pork industry.

### The Bottom Line

Variation in bodyweight has a significant impact on the profitability of pork production in western Canada. If a high level of variation exists within the finishing barn, reducing it is possible, and probably includes increasing access to feed and water, and addressing health concerns. If the coefficient of variation is less than 15% the best strategy is to manage the variation through sorting.

*Continued on page 3*

Program funding provided by



# Feasibility study for concrete swine buildings and manure storage facilities in Western Canada

Stéphane Lemay, Ph.d., Claude Laguë, Ph.d. and Liliane Chénard, M.Sc.

## Summary

A feasibility study has been completed to evaluate the potential of concrete swine buildings and manure storage facilities in Western Canada. Three building concepts combined with four manure storage options have been studied. A building with concrete walls and wood truss roof would increase concrete usage by 25% compared to a conventional wood frame building. The various combinations of building and manure storage concepts either decreased the annualized building cost by 16% or increased it by up to 34%. A swine facility design with concrete walls and concrete manure tanks is the most promising option for enhancing the life cycle and reducing the annualized cost of production facilities. Supplemental information should be gathered about the design and cost of swine buildings with concrete walls taking into consideration construction techniques and local availability of concrete in the Prairies.

## Introduction

Most of the building construction that occurs in the Prairies presently is done with traditional wood frame structures and earthen manure storage (EMS) facilities. Other types of livestock facility design with concrete wall panels have been constructed, mainly in Ontario (Figure 1), over the last 20 years. Concrete walls have been chosen as a way to increase building life cycle and also to improve rodent control.

Similar alternatives for buildings and manure

storage facilities have not been extensively explored for the Prairie condition. Limited information has been gathered and as a result, there currently exists a knowledge gap that prevents swine producers from assessing different building and manure storage alternatives.

Meanwhile, the Cement Association of Canada (CAC) is interested in expanding the market of its member companies and wanted to explore the potential of new building and manure storage facility designs for the swine industry. In 2001, CAC mandated PSC to complete a preliminary feasibility study on alternative buildings and manure storage facilities for swine operations in the Prairie Region.

## Study Procedures

Three building concepts and four manure storage options have been evaluated. The reference building and manure storage concepts (building concept 1 and manure storage concept A) were based on the Prairie Swine Centre Elstow Research Farm, a 600-sow farrow-to-finish operation with an EMS. The three building concepts included:

- 1) a conventional design incorporating wood frame walls and wood truss roof;
- 2) a building with concrete walls and wood truss roof; and
- 3) a building with concrete walls and an insulated concrete slab for roofing.

The studied manure storage concepts were:



**Figure 1** Fan arrangement and manure pit design along the sidewall of the concrete barn built by FRED GROENESTEGE CONSTRUCTION LIMITED (Sebringville, ON).

- A) a regular EMS;
- B) an EMS with a synthetic liner;
- C) a concrete manure tank and;
- D) a deep pit concrete storage underneath the barn.

## Results and Discussion

Building concepts 2 and 3 would respectively increase concrete usage by 25 and 107% compared to a conventional wood frame building (Table 1). The concrete volume required by manure storage concepts C and D would exceed that required by concept A by 60 and 183%. If building concept 3 is combined with manure storage concept D, the total concrete usage would be nearly three times that used in typical farm construction (concepts 1 and A).

The various combinations of building and manure storage concepts either decreased the

**Table 1 Volume of concrete used for different building and manure storage concept combinations**

Building concept	Total volume of concrete (m3/site) [Increase compared to concepts 1 and A; %]			
	Manure storage concept			
	A	B	C	D
1	1,757 [0]	1,757 [0]	2,804 [60]	4,975 [183]
2	2,201 [25]	2,201 [25]	3,248 [85]	5,419 [208]
3	3,645 [107]	3,645 [107]	4,692 [167]	6,863 [291]


**Table 2 Annual cost for different building and manure storage concept combinations**

Building concept	Annual cost (\$/year) [Increase compared to concepts 1 and A; %]			
	Manure storage concept			
	A	B	C	D
1	267,488 [0]	271,729 [2]	281,886 [5]	357,780 [34]
2	225,544 [-16]	229,785 [-14]	239,941 [-10]	315,835 [18]
3	266,949 [0]	271,190 [1]	281,346 [5]	357,240 [34]

annualized building cost by 16% or increased it by up to 34%. Considering the concrete usage, the cost analysis, and the pros and cons of each combination, building concept 2 combined with manure storage concept C is considered to be the most feasible options that would provide Prairie pork producers with more durable facilities at a lower cost (see table 2).

A deep pit barn design (concept D) could offer some benefits and would greatly increase the concrete demand. However, considering potential safety risks associated with possible H<sub>2</sub>S accumulation in the barn and corrosion problems, more research needs to be completed before heavily promoting this barn concept.

### The Bottom Line

A swine facility with concrete walls and concrete manure tanks constitutes the most promising option for enhancing the life cycle and decreasing the annualized cost of production for the facility. Supplemental information should be gathered about the design and cost of swine buildings with concrete walls considering construction techniques and local availability of concrete in the Prairies and life cycle maintenance requirements. 

Continued from page 1

The theme for the second day of the Conference switched gears, focusing on "Environmental Management", and its relationship to the internal and external barn environment. A wide variety of topics were covered ranging from the pathogens and swine manure, hydrogen sulphide concentrations, manure handling and land application systems, balancing plant nutrients with swine manure, and outdoor air quality. The issue that generated the greatest response on day 2 of the Conference was Dr. Jeff Schoenau's presentation on "Balancing Plant Nutrients in Manured Soils".

The presentation began by outlining the important role that swine manure can play in crop production systems in western Canada. Dr. Schoenau went further to explain some of the challenges regarding the amount, form, availability, and balance of available nutrients in the soil following manure application. Dr. Schoenau also outlined how the incorporation of feed additives (phytase) has created a trend to lower phosphorus content in swine manure in recent years, and also explained how the sulphur content of swine manure (low N:S ratio) may have a yield limiting impact on high sulphur demanding crops.

### The Bottom Line

There is an opportunity to make more effective use of manure nutrients through balancing with commercial fertilizer. Important considerations identified include: 1) limited N availability in solid manure may require additional nitrogen fertilization, 2) the N:S balance of swine manure may require additional sulphur fertilization on manured soils.


### Conclusion

The Focus on the Future Conference is intended to change the way that we look at pork production. It is designed to provide, pork producers and the pork industry a competitive edge through examining ways to increase production efficiency and environmental sustainability.

Conference proceedings are available at a nominal charge (\$10/copy).



A Very special thank you to PIC Canada Ltd., the 2003 Focus on the Future Corporate Sponsor.

Next year we hope to see you in Red Deer. 

# Hydrogen Sulphide Gas can have deadly consequences



Shannon assisting Dennis Preston from Sand's Liquid Manure Services of Prince Albert

Shannon Laroche (H<sub>2</sub>S Awareness Program Delivery Agent)

In the time it takes to breathe, Collin LaRoche died from hydrogen sulphide gas while attempting a rescue inside a manure tankard. Today his mother Shannon is warning all to listen about the dangers of this gas and how to avoid deadly consequences.

"We think the agricultural sector should take this issue very seriously," she says. "You can't run on luck. Sometimes it just runs out."

LaRoche delivers the Hydrogen Sulphide Awareness course on contract for the Prairie Swine Centre. The four-hour course is delivered throughout the Prairie Provinces. The course material provides information on the properties of hydrogen sulphide gas, effects the gas may have on humans and hogs, monitors available for hydrogen sulphide detection and basic rescue techniques to be used in an emergency situation. A demonstration on how to use and gear up with a self contained breathing apparatus is also part of the course material taught. The course is

of hydrogen sulphide gas. Many who pull pits, clean lagoons or operate manure spreading equipment may not realize the potential danger of H<sub>2</sub>S when it is released.

Typically, one worker may be agitating the manure and is knocked down by the gas. A co-worker spots the first person or notices he or she is missing and rushes to the injured person's aid. Then that worker collapses. Sometimes a third person tries to rescue both victims and all three succumb to the gas. This situation is more likely to occur in a confined entry space such as a manure tankard. However knock downs can occur as a result of the exposure to high levels of the hydrogen sulphide gas in the barns.

An extensive Hydrogen Sulphide Risk Assessment was conducted for the Saskatchewan Swine Industry in the summer of 2002. The study focussed on H<sub>2</sub>S concentrations when pulling pits and power washing rooms at six different barn located throughout Saskatchewan. The results indicated the levels of the gas spiked up and down throughout the room when the pit was being pulled and not necessarily right at the source of the pit pull. "There is the potential for very high

found that individuals may or may not suffer the same effect since individual tolerance levels to the gas vary. The study compared hydrogen sulphide gas exposure to that alcohol consumption. Some may react quicker and have more severe symptoms than others exposed to the same gas levels using the same time factors.

At low levels the gas smells like rotten eggs,



On December 12<sup>th</sup>, Shannon delivered the Hydrogen Sulphide Awareness Course to a group from Big Sky at the Grisdale barn located just north of Weekes.

however at high concentrations your sense of smell becomes impaired. This is why many barn workers now wear monitors to warn of high levels of hydrogen sulphide when pulling plugs and power washing.

"The Hydrogen Sulphide Awareness Course uses a hands-on approach in bringing safety to the industry."

geared to provide awareness of the dangers of the gas and how to make yourself safer in your work place.

Hydrogen sulphide gas is released when liquid manure is agitated. The gas is created from the anaerobic decomposition (meaning without oxygen) of manure. Hydrogen sulphide gas clings to the manure particles, when manure is agitated the gas is released.

Trained workers can safely work in the presence

levels of the gas being released at the time of emptying the manure pits" says Dr. Stéphan Lemay.


A person's reaction to the gas may depend on how long they have been exposed or how high the concentration is. Short term symptoms include: irritation to the eyes, nose, mouth and throat, sensitivity to light, eyelid spasm and sneezing, giddiness, depression, loss of appetite and lack of energy. In a toxicology study (Francis, 1994) it was

## The Bottom Line

People working in barns and manure handling need to be trained to recognize the real dangers of hydrogen sulphide gas.

The Awareness Course emphasizes:

1. understanding the gas
2. monitoring gas levels
3. creating standard operating procedures
4. safe rescue techniques
5. using safety equipment

Most of all we need to be "PROACTIVE" in bringing safety to the industry." 

# The Story of Pork

Lee Whittington, BSC (Agr), MBA

Attendees of the Focus on the Future Conference were the first to visit the nearly completed Pork Industry Interpretive Centre and Sask Pork Viewing Gallery during our Industry Preview on March 26. Located 40 km east of Saskatoon at the PSC Elstow Research Farm, the facility provided a fitting end to the two-day conference, and a chance to focus on what the future holds for the industry.

The Interpretive Centre uses the science and social studies of everyday life in a pig barn to capture the visitor's attention and separate fact from myth. By taking advantage of the large amount of space in the attic of the barn, the facility has created a 'gallery' with a birds eye view on the pigs. Playful weanlings stop their scraping long enough to look up and appear to ask "you looking at me?", before going about their normal

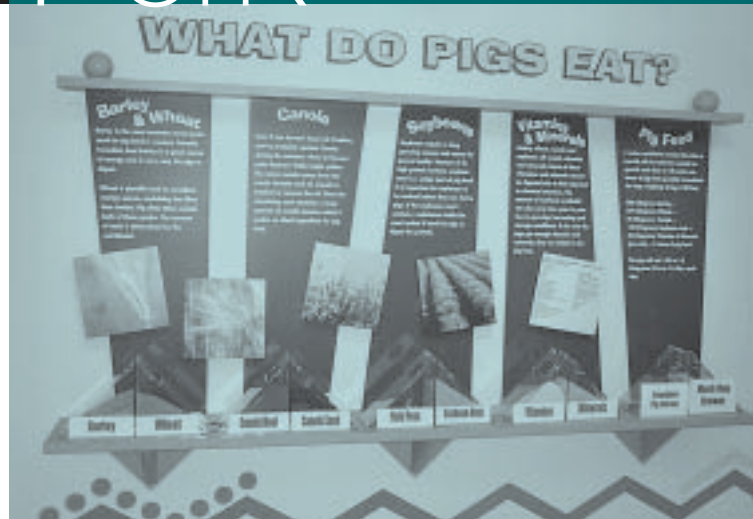
councils, regulatory authorities, prospective neighbours to a planned barn and investors are among the main groups the Centre hopes to attract. Already we have 7 groups booked, ranging from a local grade 5 class, to a seniors group out of Saskatoon, to international visitors.

Each visit will be accompanied by a trained tour guide to assist the group in understanding not only how the typical hog barn operates, but how the science of chemistry, physics, biology, and animal behavior help us to operate the barn and deal with the larger social issues being discussed in the industry. The signage supplements the tour,

describing what the visitor sees inside and outside the barn. In one article we cannot describe all of the signs but as an example, at the top of the stairs the first window looks out onto the earthen manure storage (EMS). The sign has three messages; firstly that manure is a valuable source of plant nutrients, the sign states 'manure is worth saving' and explains why we store it; secondly an EMS is safe storage, emphasizing it is "not just a hole in the ground" but an engineered structure; and thirdly the proactive approach

to odour control being used on many farms with photos of both straw and permanent covers being demonstrated.

To help the visitor enjoy their visit, a number of interactive displays have been included. The first is a biosecurity shower, where the visitor can get




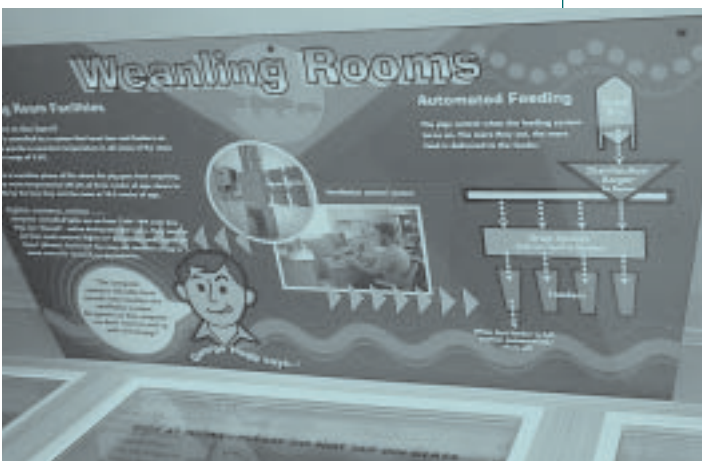
*Interactive display has grains and feed to touch*

the message of the importance of biosecurity without getting wet — well maybe just a little wet! How many kids does it take to equal the weight of a sow? At the 'How Big Is A Pig' display you can get all your friends on the hydraulic scale, and as the needle rolls to the right on the dial face it passes over the key weight categories of weanling, grower pig, finishing pig and sow. A display to the left discusses the biology of growth and there are life-size two-dimensional cutouts of pigs at various sizes for them to compare to.

The youngest visitor at the Industry Preview was Darcy Pauls' (Puratone) daughter Rhyanne. The grain and feed samples in pyramid-shaped plexiglass containers, proved to be the most interesting display to the 2 year old as she made sure she had a chance to touch all ten feedstuffs.

The facility will be open in June and offers a great experience for those outside our industry to get good information and a positive experience about the production of pork. A series of family days and a Grand Opening are being planned for you to get a good look at the facility.

In the meantime, all groups are welcome and we are taking bookings now for June through fall. If you have a group that would be interested in touring the Centre please encourage them to call Brenda Chomyn at Prairie Swine Centre 306-373-9922. 



*A three foot by five foot sign over each window describes barn activities*

behaviour of sleeping, shoving, pushing and running around.

The experience of watching pigs is expected to be the highlight for the visitors to the Centre. School groups (primarily grades 6-10), young adults seeking careers in agriculture, municipal

# Airborne Dust, Endotoxin and DNA Downwind from Swine Barns: An Update

Jayda Cleave, M.Sc., Laura Ingram<sup>2</sup>, M.Sc.  
Ernest Barber<sup>3</sup>, Ph.D., Phillip Willson<sup>1</sup>, Ph.D.

## Introduction

The intensive livestock industry is under continuous scrutiny in relation to potential environmental impacts and health safety issues. Adverse health effects due to dust exposure from intensive livestock facilities have received increasing attention and today are a recognized concern. There is reason to believe that endotoxins and microbial DNA are present in dust exhausted from swine barns. Endotoxin is a

concentrations must be investigated. Therefore, the objective of this study is to quantify the amount of airborne endotoxin and DNA downwind from a swine facility. It is hypothesized that increased levels of endotoxin and DNA will be detected close to the exhaust fans and that airborne endotoxin and DNA a few hundred meters away will not be different from "fresh air" upwind from the barn.

## Project Sites

The project sites were Prairie Swine Centre, Elstow Research Farm Inc. and Big Sky Farms,

at each time point, prior to seeding, during seeding and in mid-summer to incorporate times of high and low dust loading. High volume sampling was performed at 2400m upwind ("fresh air"), 600m downwind from the barn and at an outlet (0.1m). A standard sampling time of 24 hours was used as recommended by Saskatchewan Environment. Total dust was determined by weighing the filters, in triplicate, before and after each sampling event. A weather station that provided continuous data on wind direction, wind speed, air temperature, and relative humidity was established by Dr. Maule (Department of Agriculture and Bio Rescue Engineering) to aid in the interpretation of all air samples. Three samples were excluded from analysis (and repeated) due to change in wind direction or other problems.

The dust was then extracted from the filter with sterile nonpyrogenic water during incubation in a sonicator. The extract was analyzed for endotoxin, using a Limulus Amebocyte Lysate test kit, and DNA, using standard UV absorbance techniques.

## Results and Discussion

Total dust (Figure 1;  $P < 0.001$ ) and endotoxin (Figure 2;  $P < 0.001$ ) concentrations declined significantly at a distance from the barn. Comparison of mean ranks indicated that at both study sites there was no significant difference between the dust and endotoxin concentrations

There was no significant difference between dust and endotoxin concentrations 600 m downwind compared to 2400 m upwind from the barn.

pulmonary irritant contained in the cell wall of Gram-negative bacteria that when inhaled may cause cough, phlegm, wheezing, fever and in severe cases may lead to chronic airway inflammation. In addition, a natural property of the immune system is to respond to the stimulus of microbial DNA. In order to determine the impact of barn aerosols, endotoxin and DNA

Rama, SK. Total dust sampling for the determination of airborne endotoxin and DNA commenced in April 2001 and was completed in August 2002.

## Air Sampling

A total suspended solids high volume air sampler was utilized. Three samples were taken

<sup>1</sup> *Veterinary Infectious Disease Organization, University of Saskatchewan*

<sup>2</sup> *Department of Agricultural and Bioresource Engineering, University of Saskatchewan*

<sup>3</sup> *Dean, College of Agriculture, University of Saskatchewan*

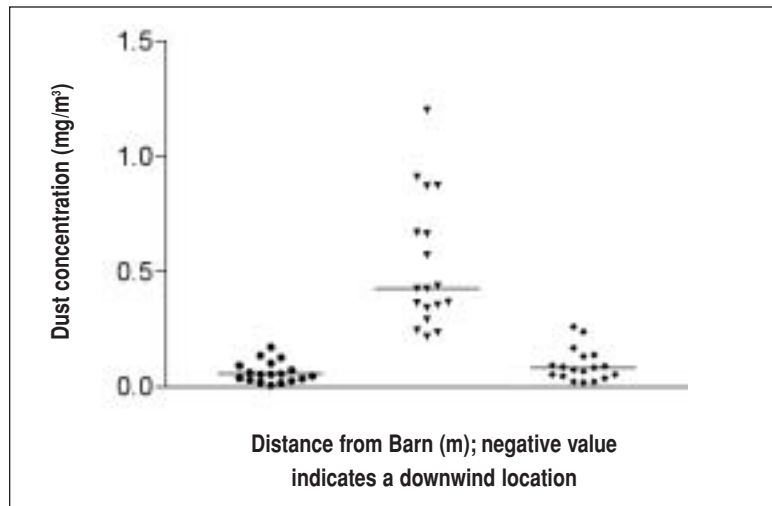
600m downwind compared to 2400m upwind but the concentrations at the outlet were significantly higher than the upwind and downwind locations. Location did not have a significant effect on DNA concentrations ( $P=0.0733$ ; Figure 3) around the swine barns. Season did not have an impact on total dust ( $P=0.3496$ ), endotoxin ( $P=0.3982$ ) or DNA ( $P=0.8117$ ) concentrations downwind from swine barns.

The results support the hypothesis that the concentration of total dust and endotoxin 600m downwind from the barns is not statistically different from the "fresh air" upwind from the barn. However, neither distance from the barn nor season had a statistical impact on DNA. Microorganisms are ubiquitous, therefore more detailed research is required to attribute the endotoxin and DNA found in the air downwind from the barns to the swine operation. The data shows that contaminants expelled from the two Saskatchewan swine barns, are diluted to that of background levels 600m downwind from the barn. It may be suggested that airborne contaminants downwind from swine operations are not necessarily a direct result of the swine facility itself, especially in agriculturally active areas. In addition, many environmental factors may have an impact on the distribution of the airborne contaminants. For the purposes of this study it was assumed that the activity within the barn was consistent and would not have an impact on the output of contaminants from the barn, however the activities within the barn could in fact have an impact on the types of contaminants and the amount of contaminants exiting the barn.

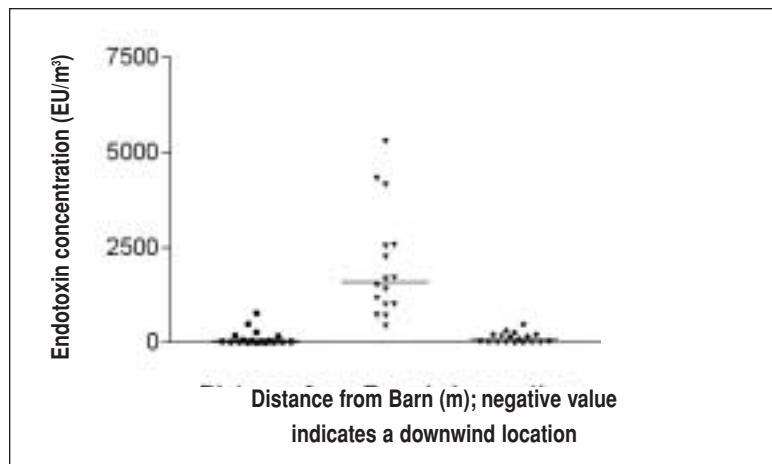
### The Bottom Line

There appears to be modest environmental impact downwind from barns, which may be managed with controls such as landscaping. These results are applicable to modern confinement livestock operations that interact with neighbours or the general public. 🐷

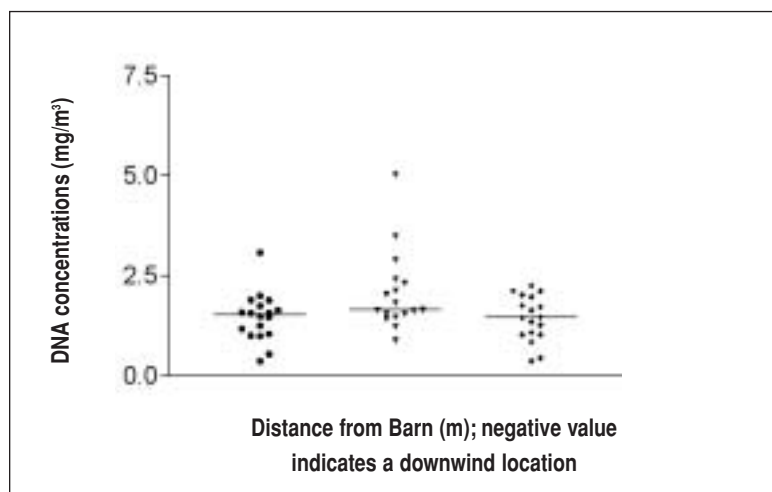
**Figure 1. Total dust concentration ( $\text{mg}/\text{m}^3$ ) upwind 2400m, at the outlet (0.1m) and 600m downwind from the barns.**



**Figure 2. Endotoxin concentrations ( $\text{EU}/\text{m}^3$ ) upwind 2400m, at the outlet (0.1m) and 600m downwind from the barns.**



**Figure 3. DNA concentrations ( $\text{mg}/\text{m}^3$ ) upwind 2400m, at the outlet (0.1m) and 600m downwind from the barns.**



## Brenda Chomyn

**B**renda Chomyn joined the staff of Prairie Swine Centre on October 15, 2001 in the position of Secretary. She is a tremendous asset to the Centre sharing her warm personality, professionalism and wonderful baking with staff and visitors alike.

Brenda and her husband, Rob, and two children, Michael age 15 and Kristin age 12 relocated to Saskatoon from Humboldt after residing there for 14 years.


Brenda brings a wealth of agriculture-related experience to this position. She was employed at Big Sky Farms as the Feed Coordinator, Bunz Electric Ltd. in the position of Secretary /Bookkeeper and as office administrator with Pratchler Agro Services Inc. All of this experience



**Brenda Chomyn**

makes her very well suited to her position here.

Brenda keeps extremely busy with her two children. Michael is involved in basketball and hockey. Kristin is also involved in basketball but also participates in dance (jazz and tap) and has been accepted to the A Raiders team in softball.

Please say hi to Brenda next time she answers the phone or greets you at the front desk with her cheerful voice and pleasing personality. 

## Clover Bench

**C**lover Bench was born in El Paso, Texas and grew up in the San Francisco Bay Area of California. In 1997, she graduated with a Bachelor of Science degree in Animal Science and a specialization in Animal Biology from the University of California at Davis. Under Dr. Ed Price, Clover earned a Master of Science degree in Animal Science at UC Davis studying the artificial selection of sexual performance in rams. In August of 1999, Clover joined the Applied Ethology group at the Prairie Swine Centre under the guidance of Dr. Harold Gonyou. Her Ph.D. research has studied the influence of genetics and the environment on the development of belly nosing behaviour in early weaned pigs.

It is well documented that as weaning age decreases, the incidence of belly nosing behaviour increases. The objective of this research was to determine the development of belly nosing behaviour in pigs early weaned at 12-14 days of age from birth to market, while also determining the effects of breed line, sire, and environmental enrichment and management on the




**Clover Bench**

incidence of oral-nasal behaviour vices.

Clover plans to defend her dissertation in the early summer of 2003.

### The Bottom Line:

The development of belly nosing behaviour was found to be influenced by breed line, activity level, time of day, weight at weaning and type and phase of environmental enrichment. Gender and the provision of milk replacer were not found to be significant contributors to the behaviour vice. Choice of breed line and providing environmental enrichment specific to the stage of development of vices can effectively prevent and/or reduce such behaviours from developing.

Clover has previously contributed to *Centred on Swine*. See Spring 2002 Vol. 9, Number 1. 

## Manure Management 2003 Conference

June 24-26, 2003

Lethbridge Lodge

Lethbridge, Alberta

## Summer Swine Seminar

June 13, 2003

Travelodge Hotel

Saskatoon, Saskatchewan



## World Pork Expo

June 5-7, 2003

Iowa State Fairgrounds

Des Moines, Iowa

## International Swine Seminar

June 9, 2003

Best Western Victoria Inn

Winnipeg, MB

## Touch The Farm at the Red River Exhibition

June 19-28, 2003

Red River Exhibition Park

Winnipeg, MB



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