

# **Welfare Review of Alternatives to Gestation Stalls**

**The following is a literature review and summary of the research  
on alternative (group/loose) housing systems for gestation  
sows with an emphasis on North American conditions  
and research.**

**Report by: Kelly Lund  
Alberta Agriculture Food & Rural Development  
August 15, 2002**

# ABSTRACT

The practice of housing gestating sows in stalls has come under scrutiny in recent years. The EU will phase out the tethering of sows by 2003 and the housing of sows in gestation stalls by 2013. New production facilities will have to loose-house sows between 4 weeks after service and 1 week before farrowing, starting January 1, 2003, under Directive 91/630. The main argument against gestation stalls is the lack of mobility afforded to the sows.

This report presents details of scientific research in current group housing systems with regards to system elements, welfare indicators, system design, and specific studies. The components of system design investigated include: feeding, social grouping, environment, and capital cost. Details from a number of scientific studies that used different group system elements are discussed.

Considering the combination of capital cost, ability to control aggression, and management level suggested by the cited studies, this report concludes that group systems based on electronic sow feeders may be the most suitable system for new swine breeding facilities in the province of Alberta.

# TABLE OF CONTENTS

ABSTRACT .....	ii
LIST OF TABLES .....	iv
INTRODUCTION .....	1
GROUP HOUSING .....	1
System Elements .....	1
Welfare Indicators .....	2
Rationale for Stalls .....	4
Design .....	4
Feeding .....	4
Social grouping .....	5
Environment .....	6
Capital Cost .....	7
Systems and Studies .....	7
1. Small, stable group; individual feeding .....	7
2. Medium-large, dynamic group; individual feeding .....	8
3. Medium, stable group; individual feeding .....	8
4. Medium, dynamic groups; electronic sow feeding (ESF) .....	8
5. Medium-large dynamic group; electronic sow feeding (ESF) .....	9
6. Small, stable groups; individual feeding and medium dynamic group; electronic sow feeding (ESF).....	9
Group Housing in Alberta .....	10
CONCLUSIONS .....	11
LITERATURE CITED .....	13

# LIST OF TABLES

<b>Table 1</b>	Ranking of different gestation systems for each of the five freedoms of animal welfare. Higher scores are desirable. Adapted from [Gonyou, 2001 #2] .....	3
<b>Table 2</b>	The relative capital cost requirements of different dry housing systems in UK conditions (from PWAG leaflets). Adapted from [Edwards, 2001 #22] .....	7
<b>Table 3</b>	Summary of listed systems and studies .....	10

# WELFARE REVIEW OF ALTERNATIVES TO GESTATION STALLS

## INTRODUCTION

The welfare of gestating sows housed in crates is a global concern in pork production. This statement is supported by the many countries publishing scientific studies on the welfare assessment of sows in crates and alternative housing systems. Much of the research originates in Europe, as does much legislation currently in place. In recent years this topic has achieved significant importance in North America, mainly due to consumer pressures. The welfare of gestating sows has topped the National Pork Board (U.S.) list of research priorities for two consecutive years (Johnson 2002 A).

From the perspective of Canadian producers, it is very important to have research work on sow welfare produced at home. The body of knowledge of swine welfare specific to Canada, including gestation stalls and alternative systems, has been growing, thanks largely to the work of the Prairie Swine Centre in Saskatoon, and researchers at the University of Guelph, as well as the federal research station in Ottawa. These institutions are very active in swine welfare research, and are supported by industry, government and non-government organizations (Gonyou 2001). The federal research station in Ottawa is also a significant contributor to this field.

Neither the United States nor Canada presently has any legislated requirements for phasing out stall confinement of gestating sows. In the European Union, Directive 91/630 legislates the phasing out of tether and stall systems within certain specified periods, 2006 and 2013 respectively, for existing barns, and as of January 1, 2003 for new buildings. There is much debate about the production consequences of the change to group housing and the best group system to adopt (Edwards 2001).

This report reviews scientific and popular literature in an attempt to present details of existing group housing systems, how sow welfare is measured in group or stall systems, and to summarize welfare advantages and drawbacks of common housing systems. Factors of group systems are considered in the recommendation of a group housing system for Alberta producers.

## GROUP HOUSING

### SYSTEM ELEMENTS

There are a large number of variables in a group system. Major components of loose housing systems that are often the focus of studies include:

- size of group (number of sows)
- demographics of group (age/parity)
- social order of group (stable or dynamic)
- feeding system design (individual/ESF/group)
- physical environment (flooring/bedding/indoor or outdoor)

The number of variables contributes to the complexity of the assessment of interactions among the animals. Many studies investigate the effect these variables have on system output in order to help refine the design of future group systems.

## WELFARE INDICATORS

An added difficulty in comparing studies that assess the welfare of gestating sows in confined and group production is the large number of welfare indicators and measures that could be used. Some common welfare criteria for welfare studies include:

- behavior
  - prevalence of stereotypies
  - presence of abnormal behavior
  - levels of aggression especially in non-food related interactions
- health
  - number and/or severity of body lesions
  - presence and severity of vulva lesions specifically
  - body weight after a number of parities
  - presence of leg ulcers or other debilitating injuries
  - reproductive system health
- production performance
  - number of piglets born per litter per sow
  - number of piglets weaned per litter per sow
- system 'naturalness'

(Appleby 2002) suggests that the main aspects can be grouped as physical (health, growth, and reproduction), mental (pleasure and suffering), and 'naturalness'. Appleby considers physical aspects to be easy to measure and apply, but difficult to interpret, and naturalness the most difficult to define (Appleby 2002). Good levels of production and growth may not necessarily reflect improved welfare considering the intensive selection done for those production traits (Appleby 2002).

The main reason for so many welfare indicators is that there is debate on a standard definition of animal welfare, and therefore, which measures are most appropriate. One definition of animal welfare is that 'the welfare of an individual is its state as regards its attempts to cope with its environment' (Barnett et al. 2001). Variations in definitions of animal welfare exist and combined with variations in methodology and interpretation, lead to disagreement (Barnett et al. 2001). Where several measures of welfare are used, they will often have different levels of sensitivity and may reflect responses or effects which are present in some individuals but not in others (Broom et al. 1995).

Of the papers cited in this report, only Gonyou (Gonyou 2001) directly assessed group and stall housing systems with regard to the Five Freedoms as outlined by the Brambell Report (U.K) in 1965, and recently modernized by the Farm Animal Welfare Council (FAWC 2002) as follows:

1. Freedom from thirst, hunger and malnutrition – by ready access to fresh water and a diet to maintain full health and vigour.
2. Freedom from discomfort – by providing a suitable environment including shelter and a comfortable resting area.
3. Freedom from pain, injury and disease – by prevention or rapid diagnosis and treatment.
4. Freedom to express normal behavior – by providing sufficient space, proper facilities and companions of the animals own kind.
5. Freedom from fear and distress – by ensuring conditions that avoid mental suffering.

Table 1. Ranking of different gestation systems for each of the five freedoms of animal welfare. Higher scores are desirable. Adapted from (Gonyou 2001).

Freedom:	Floor Feeding	Feeding Stalls	Trickle Feeding	Gestation Stalls	Electronic Sow Feeders
From Malnutrition	1	3	2	4.5	4.5
From Discomfort	3.5	3.5	3.5	1	3.5
From Pain & Injury	1	3.5	2	5	3.5
Of Movement	3.5	3.5	3.5	1	3.5
From Fear	1	3	2	5	4
Overall	10	16.5	13	16.5	19

Each score was out of 5; total out of 25. The scores and the final ranking are considered approximate. Equal emphasis was placed on each freedom. It is important to note that stall housing did not have the lowest ranking. However, if variables were weighted differently (more emphasis on freedom of movement), the outcome would be different (Gonyou 2001).

The welfare of sows housed in groups is not automatically better than stall-housed sows. It is important that the alternative group-housing system be an improvement from the point of view of the sow's welfare (Hodgkiss et al. 1998) when switching from gestation stalls. If a group system is not managed correctly, the change is merely in the type of welfare problems encountered.

Appropriate design of an alternative system ensures that the system has the potential to be adequately managed, but does not guarantee the management. In a well-designed group system, welfare concerns can be addressed, although they cannot all be eliminated. Each welfare criteria will not necessarily be superior in a group system than the stall system

when compared measure for measure. A number of authors presented later show that overall welfare is improved by group housing.

## RATIONALE FOR STALLS

Swine naturally desire to establish a social hierarchy (Borell et al. 1997), (Gjein and Larssen 1995), (Morris et al. 1993), and use aggressive encounters and fighting to prove dominance. While not often serious, there is potential for injury with these encounters. Housing gestating sows in stalls allows producers to reduce outright aggression, and most stress and injury associated with fighting. However, aggression is not entirely eliminated in stall housing. Stall housed sows experience undecided agonistic interactions up to three times as often as group housed sows, are scarcely able to use active avoidance behavior and escalated agonistic interactions most often, which has been suggested to be likely to cause stress (Broom et al. 1995).

Pigs are social animals that prefer to eat in groups (Gjein and Larssen 1995). This can lead to competition, especially when feed is available in limited amounts. Gestating sows are fed a strict ration to limit excessive weight gain, stimulate lactation feed intake, and increase the overall sow productivity (Douglas et al. 1998). This serves to increase the difficulty with competition in feeding systems where sows could steal another's ration by bullying. With stall housing, each sow is able to consume her full ration without competition or stealing by another sow. In terms of feeding automation, and labour requirements in general, stalls are very convenient.

## DESIGN

While gestation stalls reduce aggression and offer more control over feed distribution, they do not allow the animal freedom of movement (Gonyou 2001). Freedom of movement is important for three reasons. It provides the animal with control over its environment; it reduces frustration; and it maintains physical condition (Gonyou 2001). Confinement of sows, with a consequent lack of exercise, results in reduction of muscle weight and considerable reduction of bone strength (Marchant and Broom 1996).

According to Prairie Swine Centre's *Practical Considerations for the Group Housing of Sows*, the main factors that producers need to consider when selecting an appropriate sow system are (Prairie Swine Centre 2002):

1. Control of individual sow feed intake
2. Low levels of aggression associated with feeding
3. Potential to reduce aggression on regrouping
4. How many sows make up a group

## Feeding

The design of group housing systems is highly influenced by the constraints imposed by current sow feeding practice (Borell et al. 1997). There are a number of feeding options

available to the manager of a group system. (Edwards 2001) describes the following systems:

- pens/yards with floor feeding (dump or spin) can be adopted in most buildings for small or large groups. Aggression at feeding time can be severe.
- pens/yards with individual feeders have a separate feeding stall for each sow and high labour requirement during feeding, but allows individual rationing (only with hand feeding unless electronic identifiers are used) and protected simultaneous feeding.
- cubicles and free-access stalls serve as both lying and feeding places so less space per sow is required. There can be aggression at feeding unless the stalls are fitted with rear gates. Individual rationing requires hand feeding or electronic identifiers.
- pens/yards with short stall feeders require even less space for the separate feeding system. Partitions separate the sows only at the head and shoulders which creates potential for aggression and feed-stealing. They are often used with a trickle feeding or liquid feeding systems. In trickle feeding, the feed is metered slowly to each feed place to prevent inequality of eating speed. There is no provision for individual rationing, and the metering system does not entirely eliminate aggression.
- electronic sow feeders (ESF) electronically identify individual sows by a transponder on a collar, ear tag or implant and allocate a specified daily amount of ration within the computer controlled feeding station. An ESF is usually shared by 40 to 60 sows, so feeding must be done sequentially. There is some potential for aggression with this system, but individual feeding is the key benefit.
- ad libitum feeding systems are not in common use with concentrate diets because dry sows will eat to excess and become obese (Borell et al. 1997). Systems employing this type of feeding may use bulky diets of low nutrient density. In North America, ad libitum feeding might be used on an interval basis – ad libitum for a limited time only, such as a 24 hour period twice weekly (Borell et al. 1997). Some systems with feed roughage ad libitum in addition to feeding concentrate by a method listed above.

An interesting effect of feeding system on group activity is noted by (Edwards 2001): sows fed simultaneously, once daily, can establish clearly defined group activity and resting times, while those fed sequentially (ESF) will have continual group disturbance, which can lead to increased aggression in a poor system design. Once a day feeding in an ESF system was cited by (Gjein and Larssen 1995) to lead to less vulva lesions than twice per day feeding.

In a study with stall-housed sows, (Douglas et al. 1998) found that there was no difference between body weight change in daily-fed and interval-fed sows, but interval fed (once every 3 days) sows expended less energy overall, including on stereotypic behavior, over the 42 day trial period.

### Social Grouping

When kept under free-range conditions, pigs live in small (matriarchal) social groups (Borell et al. 1997). There is little evidence for an optimum group size at which fighting and aggression are minimized between sows (Arey and Edwards 1998). More work is needed to determine whether pigs adopt different agonistic strategies where group size

and composition go beyond their ability to form a social hierarchy (Arey and Edwards 1998).

In practice, group size is often confounded with group stability, since larger groups can usually only be operated on a dynamic basis while smaller herds have a weekly farrowing routine (Edwards 2001). In dynamic groups the composition is constantly changing with sows leaving to farrow and returning from service, which may increase aggression compared with stable groups (Edwards 2001). Research at the Prairie Swine Center continues in the attempt to determine whether a static or dynamic system is better for the animals and if different size animals do better in one system or the other (Gonyou 2001).

Characteristic sub-grouping patterns shown by sows in large social groups may serve to restrict aggressive encounters if space allowance and pen layout are appropriate (Edwards 2001). Practical experience suggests that introduction of new sows can be accomplished with less aggression in larger group sizes, but this has not been experimentally proven (Edwards 2001). Evidence gained from (Hodgkiss et al. 1998) suggests that group housed sows tend to form sub-groups that are based upon parity cohorts.

### Environment

The optimum space allowance for reducing fighting is unknown; although the provision of more space does not seem to reduce aggression at mixing, it can decrease aggression levels over the longer term (Arey and Edwards 1998). Barriers can limit aggression by allowing losers to escape more easily (Arey and Edwards 1998). Group housing on straw affords the animals social interaction and the opportunity to express a greater repertoire of natural behavior (Connor et al. 1997).

In Europe, the 2001 Directive revision to Directive 91/630/EEC introduces specified housing requirements for dry sows in relation to space and flooring (Edwards 2001). These requirements are based on group size and specify solid floor and total floor area per sow or gilt as well as a minimum pen side length. The minimum space requirement for total area per sow ranges from 1.48 m<sup>2</sup> for a gilt in a group over 40 sows to 2.48 m<sup>2</sup> for a sow in a group of six or less. Under this Directive, sows can no longer be kept on fully slatted floors, and must have permanent access to manipulable material (Edwards 2001).

While animal welfare legislation relating to gestating sows is not on the visible horizon in North America, many industry groups are proactively developing or pursuing auditable on-farm animal welfare assessment models. The purpose of such tools is to provide a consistent measure instead of producers being subject to multiple welfare auditing programs from various packers and retailers. The National Pork Board in the US has developed a Swine Welfare Indexing System that they are testing at farm level (Johnson 2002 B). It would be used both for sows in stall and group housing.

It is widely recognized that the quality of stockmanship is paramount to ensuring good pig welfare (Edwards 2001). While labour requirements may increase slightly in a group

system, the need for an increase in the quality of management will also occur. The focus on the role of housing systems in the welfare of animals may have delayed recognition of the relative importance of the stockperson (Barnett et al. 2001) in both group and stall housing systems.

### Capital Cost

A paper from the UK tables the relative cost of different sow housing systems (capital), based on UK conditions.

Table 2. The relative capital cost requirements of different dry housing systems in UK conditions (from PWAG leaflets). Adapted from (Edwards 2001).

System	Relative Capital Cost
Group floor feeding	100
Electronic sow feeders	108
Cubicles	144
Short stall feeders	144
Individual feeders	159
Outdoor	14

With group floor feeding as the baseline, electronic sow feeders (ESF) are the next least expensive feeder that provides some level of aggression control. Outdoor systems are not common in the Alberta context. When considering a retrofit to a facility where stalls are already in place, the relative costs could be somewhat different. It is assumed that this relative model could be generally applied to the North American cost situation.

## SYSTEMS AND STUDIES

### *1. Small, stable group; individual feeding*

The Hurnik-Morris (HM) System for group housing permits socially coordinated eating and resting, controlled and socially undisturbed feed intake, physical exercise, and regular exposure to boars (Morris et al. 1993). The group sizes in this system are small, six animals per pen, and are considered stable. Individual feeding compartments were located outside the pen and not included in the space estimate of 2.0 m<sup>2</sup> per gilt.

In the study, there was a significantly higher incidence of stereotypies in gilts housed in gestation crates compared to those housed in the HM system (Morris et al. 1993). The HM gilts engaged in overt aggressive behavior at the initial grouping, after which it was rare, occurring occasionally shortly before feeding (Morris et al. 1993). An important consideration with a system of this type of design may be the impact on cost that the required space will have.

## *2. Medium-large, dynamic group; individual feeding*

A two-level group housing system for dry sows was investigated by (Phillips 1997) in Ottawa, Ontario. The system utilized standard gestation crates with the rear door removed, as feeding stations (only). The second floor was built over the gestation stalls and provided an area for resting sows. The grouping was a dynamic, 50-sow group studied over a 2.5 year period. With the second floor addition, space allowance was approximately 1.8 m<sup>2</sup> per sow.

The health of sows in this system was comparable to stall housed sows, but stall housed sows produced about 3% more pigs per sow per year. The labour requirement for cleaning in this system was comparable to that required for a similar area of conventional stalls, but the sows were much cleaner. The two level design requires about 25% less barn space than other systems using recommended space allotment and stocking density is likely above that found on commercial farms that use stalls (Phillips 1997). The material cost of the addition of the second floor area cost about \$50 per sow place (Phillips 1997).

## *3. Medium, stable group; individual feeding*

A study in Manitoba presented the results of group-housing two stable groups of 24-30 gestating sows over nine farrowing periods. They were housed in a low-cost shelter (BioTech shelter) which was uninsulated, unheated, naturally-ventilated, and straw-based (Connor et al. 1997). Feeding was on a concrete floored area in individual feed stalls. The lying area provided approximately 2.3 m<sup>2</sup> per sow. Access to the feeding area was only at feeding time. Comparison was made with small-group loose housing in a standard barn with floor feeding.

Key findings from this study were that results on reproductive performance demonstrated no significant differences in reproductive performance between sows housed during gestation in the two housing types, and that weight and body condition were similar. The capital cost of this system was estimated at 30% of that of a conventional confinement barn. During winter, feed intake was 5 to 20% higher in the shelter, including a winter of extended cold below -19 C and a recorded low of -27.5 C. The fact that this type of system has solid manure system is of consideration and may be of benefit in issues such as permitting, odour, and neighbor relations.

## *4. Medium, dynamic groups; electronic sow feeding (ESF)*

A comprehensive field study in Norway (Gjein and Larssen 1995) looked at vulva and body lesions, culling reasons and production results from 15 loose-housed and 18 stall- or tether-housed commercial herds. The loose herds had group sizes from 15 to 40 and were socially dynamic except for one stable (integrated farrowing) group, and all used electronic sow feeding and partly slatted concrete floors. A few used straw. The range of space allowance was not noted.

Vulva lesions occurred only in loose housing and the risk of vulva lesions was somewhat reduced in herds with roughage feeding, and somewhat increased when feeding stations had a mechanical hind gate. In addition, general body lesions were slightly higher in the group sows. In group housing, first parity sows had the most body lesions. In confined herds the prevalence of body lesions increased with age. The total culling caused by reproductive failure was the same in the 2 cohorts (Gjein and Larssen 1995), but the category of reproductive failure differed. This study looked at group and stall systems that were in commercial operation, and speaks to the commercial viability of group housing systems.

#### *5. Medium-large dynamic group; electronic sow feeding (ESF)*

Another study with electronic sow feeders in group housing, (Hodgkiss et al. 1998), investigated a commercial herd over a period of 18 months. The group was dynamic and had from 55 to 70 sows with a ratio of about 28 to 35 sows per feeder. The building had solid flooring and the lying area was bedded with straw. The lying area provided 1.7 m<sup>2</sup> per sow.

The sows were assessed weekly for injuries. Lesion scores were low, with the most found on the shoulders, flanks and hindquarter, and few on the head or vulva. The total injury score was related to parity (lower parity had more injury) and negatively related to bodyweight (Hodgkiss et al. 1998). More agonistic interactions were observed between sows in the lying area and in the vicinity of the feeders than in the dunging area. The results indicated that sows kept in a dynamic group on a commercial unit could coexist without sustaining serious levels of injury (Hodgkiss et al. 1998).

#### *6. Small, stable groups; individual feeding Medium dynamic group; electronic sow feeding (ESF)*

(Broom et al. 1995) compared a group of stalled sows (no straw) to three stable 5-sow groups (straw) using individual feeding stalls and a dynamic 38-sow group (straw) using an ESF. The small groups had 1.3 m<sup>2</sup> per sow lying area and 2.2 m<sup>2</sup> per sow overall (excluding feed stalls). The ESF group had a lying area of about 1.7 m<sup>2</sup> per sow and total area of 2.4 m<sup>2</sup> per sow and included a barrier wall. Using a wide range of welfare indicators, they showed that stall-housed sows had more problems than group housed sows and that the problems worsened over the life of the sow.

Stalled sows spent more time performing stereotypies, experienced undecided agonistic interactions more frequently, had a long-term decrease in body weight, and a high incidence of health problems (Broom et al. 1995). Overall frequency of aggression was higher in the group housing (Broom et al. 1995). High intensity aggression and fights which can cause immediate and severe injury, were only seen in the ESF system (Broom et al. 1995).

Table 3. Summary of listed systems and studies.

	Study 1	Study 2	Study 3	Study 4	Study 5	Study 6	Study 6
Name of system	Hurnik-Morris	N/A	N/A	N/A	N/A	N/A	N/A
Author	(Morris, Hurnik et al. 1993)	(Phillips 1997)	(Connor, Fulawka et al. 1997)	(Gjein and Larssen 1995)	(Hodgkiss, Eddison et al. 1998)	(Broom, Mendl et al. 1995)	(Broom, Mendl et al. 1995)
Size of group	6	50	24-30	15-40	55-70	5	38
Social structure	Stable	Dynamic	Stable	Dynamic	Dynamic	Stable	Dynamic
Feeding system	Individual stalls	Individual stalls	Individual stalls	ESF	ESF	Individual stalls	ESF
Lying space per sow m <sup>2</sup>	N/A	N/A	2.3	N/A	1.7	1.3	1.7
Total space per sow m <sup>2</sup>	2.0 excludes feeders	1.8	N/A	N/A	N/A	2.2 excludes feeders	2.4
Straw	Wood shavings	Yes	Yes	Some herds	Yes	Yes	Yes
Aggression	low	low	low	moderate	low	low	moderate
Feeding system component costs	high	high	high	moderate	moderate	high	moderate

## GROUP HOUSING IN ALBERTA

There are many options for group housing available to producers, as shown in the examples above. In all studies the authors concluded that group housing in the respective method was feasible. Management was cited as a key factor to the success of any system. It is important for the producer to recognize and be able to deliver the management required by the particular system that is chosen.

Cost of group housing systems vary, from very low cost in the BioTech shelter system, to group systems that cost more than conventional stall systems, mainly depending on the sophistication of the feeding system, or because of the amount of space required.

Factors influencing the suitability of group housing systems for Alberta conditions are similar to those considered by producers in any area:

- reasonable cost (capital and operating)
- productivity of system
- ability to make necessary management shift
- building compatibility when renovating

Alberta producers should have no greater problems adopting group housing systems than any other locale where group housing is presently used. Some industry consultants switching to group housing of sows if building new barns or remodeling, as this will increase marketing options in the future (Peet et al. 2002), assuming a major shift to group housing occurs in the near future, either by legislation or public and market pressures. Others in the Alberta industry are estimating that it will be many years before such requirements are legislated in Canada, and that incorporating group housing in new construction is unwarranted at the present time.

Modifications can be made to existing confinement facilities to incorporate group housing that will best fit and most efficiently use the existing infrastructure. Examples of this include the two-level system (Phillips 1997). New production units have the flexibility to design their facility around the requirements of the group system the manager chooses. There is even potential for a profitable gestation system in a facility without environmental control as shown from the Manitoba BioTech Shelter study (Connor et al. 1997), which provides an economic advantage in the low capital requirement.

The Minnesota Department of Agriculture published a report, entitled *Hogs Your Way* that details some types of alternative systems for all stages of hog production. It includes case histories of farm families that are using those systems in the United States. It explains some of the advantages of the alternative systems, including improved neighbour relations, low capital cost and improved return per pig, flexibility to enter and exit the marketplace, and opportunity for niche marketing. It also lists some of the disadvantages that might be experienced in each system, including potential health concerns and how to minimize them, and contains useful field experience for producers considering alternative housing systems.

The decision by the Prairie Swine Centre to focus on refining group systems for use with ESF came from the industry through producer meetings in the three prairie provinces (Donauer 2002). While there can be aggression around the electric sow feeders while sows are in queue, ESF's are popular because of the management control they allow. Not only can individual rations be fed electronically, some ESF stations can be set up to mark sows as required, and can also be set up to control exit gates for sorting. The technology for ESF's has improved measurably since they were first developed. Compared to other indoor group systems, ESF systems perform favourably in terms of cost (Edwards 2001). Considerable labour and management is required with the ESF systems, particularly when training sows (Donauer 2002).

While individual feeding stalls more consistently reduce aggression, ESF systems would appear to be a good option for Alberta producers considering making the transition to

group housing. ESF systems offer a comparably priced group system that allows individual feed control, can incorporate other barn management tasks such as marking and sorting, and reduces but does not eliminate aggression at feeding.

Other elements of an ESF system such as pen layout, group size, a solid laying area, and addition of straw could help in minimizing aggression in the system. ESF is a feeding system that can be adapted to existing infrastructure or be the focus of a new design to cut down on the space requirements compared to stall-feeding. However, as in any group system, good design cannot overcome poor management, and the operator's role cannot be overstated in ensuring good welfare for their animals.

## CONCLUSIONS

The many components of a group housing system and large number of welfare indicators used in scientific research make direct quantitative comparison between studies and systems difficult. The conclusion of many authors researching the welfare of sows housed in alternative systems is that the overall welfare of the sow is improved. They also indicate that the role of system management is key to the success of a group system. It is important that continued research into group sow housing occur. In time it may be possible to recommend to producers one or selected-few group systems over others based on further research. Group systems based on electronic sow feeders (ESF) are recommended at the present time as the most suitable for Alberta producers when considered in terms of individual feed control, level of aggression, ability to manage, successful production, cost, and ease of implementation in new or retrofit facilities.

## LITERATURE CITED

- Appleby, M. (2002). Farm Animal Housing: Time for change. Livestock Care Conference 2002, Edmonton AB Canada.  
<http://www.afac.ab.ca/LCC/LCC2002Summary.htm>
- Arey, D. S. and S. A. Edwards (1998). "Factors influencing aggression between sows after mixing and the consequences for welfare and production." Livestock Production Science **56**: 61-70.
- Barnett, J. L., P. H. Hemsworth, G.M. Cronin, E.C. Jongman, and G.D. Hutson. (2001). Public perception not to be confused with welfare. Pig Progress. **17**: 29-31.
- Borell, E. v., D. M. Broom, D. Csermely, A.A. Dijkhuizen, S. Hylkema, S.A. Edwards, P. Jensen, F. Madec, and C. Stamataris. (1997). The Welfare of Intensively Kept Pigs. Scientific Veterinary Committee.  
[http://europa.eu.int/comm/food/fs/sc/oldcomm4/previous\\_en.html](http://europa.eu.int/comm/food/fs/sc/oldcomm4/previous_en.html) .
- Broom, D. M., M. T. Mendl, and A.J. Zanella. (1995). "A comparison of the welfare of sows in different housing conditions." Animal Science **61**: 369-385.
- Connor, M. L., D. L. Fulawka, and L. Onischuk. (1997). Alternative Low-cost Group Housing for Pregnant Sows. Livestock Environment V, American Society of Agricultural Engineers, 2950 Niles Rd., St. Joseph, Michigan
- Donauer, T. (2002). Practical Considerations for Group Housing of Sows. Focus on the Future Conference 2002, Winnipeg MB, Prairie Swine Center, Elstow Research Farm Inc., P.O. Box 21057 2105-8<sup>th</sup> Street East, Saskatoon, Saskatchewan
- Douglas, M. W., J. E. Cunnick, J.C. Pekas, D.R. Zimmerman, and E.H. von Borell. (1998). "Impact of Feeding Regimen on Behavioral and Physiological Indicators for Feeding Motivation and Satiety, Immune Function, and Performance of Gestating Sows." Journal of Animal Science **76**: 2589-2595.
- Edwards, S. (2001). Has Europe Gone Back to Nature? Saskatchewan Pork Industry Symposium, Saskatchewan Pork. Bay 2 Main Floor 502-45<sup>th</sup> Street West, Saskatoon, SK.
- Edwards, S. (2001). Sow Group Housing Blessing or Bane? Saskatchewan Pork Industry Symposium, Saskatchewan Pork. Bay 2 Main Floor 502-45<sup>th</sup> Street West, Saskatoon, SK
- Farm Animal Welfare Council (2002). The Five Freedoms. 5<sup>th</sup> Floor IA Page Street, London, England. <http://www.fawc.org.uk/freedoms.htm>
- Gjein, H. and R. B. Larssen (1995). "Housing of Pregnant Sows in Loose and Confined Systems - a Field Study 1. Vulva and Body Lesions, Culling Reasons and Production Results." Acta vet. scand. **36**(2): 185-200.
- Gonyou, H. W. (2001). Animal Welfare: North American Developments. Saskatchewan Pork Industry Symposium, Saskatchewan Pork. Bay 2 Main Floor 502-45<sup>th</sup> Street West, Saskatoon, SK
- Gonyou, H. W. (2001). Group Housing of Sows: The Potential for the Future. Focus on the Future Conference 2001, Red Deer AB Canada, Prairie Swine Centre Inc., P.O. Box 21057 2105-8<sup>th</sup> Street East, Saskatoon, SK

- Hodgkiss, N. J., J. C. Eddison, P.H. Brooks, P. Bugg. (1998). "Assessment of the injuries sustained by pregnant sows housed in groups using electronic feeders." The Veterinary Record **143**: 604-607.
- Johnson, A. (2002 A). Personal Communication. National Pork Board. P.O. Box 9114 Des Moines, Iowa
- Johnson, A. (2002 B). Personal Communication received from P. Hodgman. Alberta Pork, 4828-89 Street, Edmonton, Alberta
- Marchant, J. N. and D. M. Broom (1996). "Effects of dry sow housing conditions on muscle weight and bone strength." Animal Science **62**: 105-113.
- Morris, J. R., J. F. Hurnik, R.M. Friendship, M.M. Buhr, and O.B. Allen. (1993). "The Behavior of Gestating Swine Housed in the Hurnik-Morris System." Journal of Animal Science **71**: 3280-3284.
- Peet, B. (2002). Will we be told how to raise our pigs? Banff Pork Seminar 2002, Banff AB Canada <http://www.banffpork.ca/proc/2002pdf/BO10Peet.pdf>
- Phillips, P. A. (1997). A Two-Level System for Housing Dry Sows. Livestock Environment V, American Society of Agricultural Engineers, 2950 Niles Rd., St. Joseph, Michigan.
- Prairie Swine Centre (2002). Practical Considerations for the Group Housing of Sows. Focus on the Future Review, Prairie Swine Centre: 1, Prairie Swine Centre Inc., P.O. Box 21057 2105-8<sup>th</sup> Street East, Saskatoon, Saskatchewan .