

Oral presentation

## Loose housing of sows – is this good welfare?

Birgitte I Damm

Address: Department of Large Animal Sciences, Faculty of Life Sciences, University of Copenhagen, Denmark

from The role of the veterinarian in animal welfare. Animal welfare: too much or too little? The 21st Symposium of the Nordic Committee for Veterinary Scientific Cooperation (NKVet) Værløse, Denmark. 24–25 September 2007

Published: 19 August 2008

*Acta Veterinaria Scandinavica* 2008, **50**(Suppl 1):S9 doi:10.1186/1751-0147-50-S1-S9

This abstract is available from: <http://www.actavetscand.com/content/50/S1/S9>

© 2008 Damm; licensee BioMed Central Ltd.

### Introduction

In Denmark we have about 1.2 million sows that produce about 21 million pigs per year for slaughter or export. While the number of pigs produced for slaughter per sow year when Denmark entered the EU in 1972 was 11–12 it is now more than doubled [1]. Behind this development lie highly focussed efforts within breeding, housing and management. The goals have been achieved with particular attention to two factors – the reduction of space used per pig and increase in production per man hour [1]. To illustrate this, a gestating sow in tethers – a much used housing system in the 1980'ies, but now phased out due to legislative demands – took only 52 min per year to care for, i.e. an average of only 9 seconds per day [2]. The incentive of using as little space and as little time as possible, have lead to a number of welfare problems for sows, either directly or indirectly. One example is the use of mechanical slurry systems and extensive use of slatted floors that are difficult to combine with straw or other kinds of bedding and/or rooting materials, and that pigs do not like to walk or lie on.

Through EU and national legislation it has been attempted to alleviate several of the welfare problems for pigs (e.g. [3,4]). But even within the framework of recent welfare regulations, many of the old problems continue to exist and a range of new challenges emerges, because the restraints of using as little space and as little time as possible prevail. The very limited use of time per animal also in loose housing gestation systems is illustrated by reports of time use ranging between 0.14 – 0.38 min per "sow space" on weekdays and 0.06–0.15 min on weekend days [2,5], i.e. a few seconds per animal per day. A large amount of scientific knowledge of sow behaviour and welfare exists now, but the restraints of using very little time and very little space make it very challenging to put the knowledge to

good use. Many suggestions are bound to take a few seconds and utilise some cm<sup>2</sup>, which relatively speaking will increase use of space and time greatly. The explanation of the continued emphasis on using very little space and very little time per animal is of course the industry's desire to keep its high competition ability, which will become clear in other presentations at this meeting.

The first example, I will present, where the incentive of using as little time and as little space as possible is demonstrated very clearly is the predominant farrowing accommodation for sows in Denmark and other EU countries. In intensive pig production the use of the farrowing crate is almost exclusive, and real alternatives with loose housing are very difficult to get established in practise. Secondly, I will briefly present two of the loose housing systems for gestating sows that are now among the predominant ones in Danish pig production. Using the two systems as a starting point, I will then discuss some variants of the systems where sow welfare is very poor. These examples demonstrate how even in the better loose housing systems, there is a constant challenge of securing sow welfare due to the forces pulling in the direction of using as little space and time per animal as possible.

### Farrowing and lactating sows

In countries with intensive pig production almost all sows are kept confined in farrowing crates during all of their farrowing and lactation period (e.g. 97%, 90% and 82% in Denmark, Germany and France, respectively). In other Scandinavian countries routine confinement is not allowed, but this still seems to be practised to a large extent around farrowing and the first part of lactation. It is generally recognised that crating affects sow welfare severely. In Table 1, examples are given of the behaviours that are affected negatively, i.e. affected in a way that

**Table 1: Effects of confinement**

General behaviours (All confined sows)	Specific behaviours (periparturient and lactation period)
No direct social contact with other pigs Little possibility for exploration Altered getting up and lying down behaviour Altered lateral recumbency resting Reduced possibility for thermoregulation No possibility for eliminating away from resting area Highly reduced locomotion	No possibility for isolation during nesting phase No possibility for choice of nest site No possibility for nest building Altered sow-piglet interaction Altered nursing

implies reduced sow welfare relative to when the sow is not confined (see [6] and [7] for a discussion, and references).

The explanation why crates have become such a popular housing method varies depending on who is asked. Many emphasise the improved survival chances of the piglets, when sow behaviour is controlled in the crate. (In papers from the time when crating came into common use it does not seem to be a much used argument, but it apparently becomes so concurrent with a tremendous increase in litter sizes). Others place great emphasis on the fact that sows take up as little space as possible when housed in crates and that management becomes less time consuming due to the easy control of manure, supervision, handling of piglets etc. In any case, the dimensions of the crate relative to the body size of the sows demonstrate that it is certainly a housing method that has optimised on the animal-space relationship. In 2003 Danish sows had an average length of 184 cm with some sows being over 2 m long. At the time the Danish recommendation for the length of crates was 190 cm, which according to the investigators meant that 35% of the sows were too long for the crates [8]. In 2004 the recommendation was changed to 210 cm. This gives the average sow 26 cm beyond its body length and longer sows even less. The limitations that this imposes on sow behaviours are evident (see Table 1). In addition, it makes it impossible to make zones in the sows' environment, which could give her choices in relation to her well being (areas for resting, eliminating, thermoregulation etc.).

Based on the given information, the spontaneous answer to the question posed in the title of this talk "Loose housing – is this good welfare?" would be yes. Yes, because confinement can never provide sows with opportunities for important behaviours, and choices in relation to her own well being – this can only be achieved in a loose housing environment. This line of thought is in accordance with most researchers of sow welfare and behaviour, and also the EU Scientific Veterinary Committee in their report on the welfare of intensively kept pigs from 1997 [7]. This report has a number of recommendations on how the welfare of pigs could be improved based on sci-

entific and practical knowledge. Many of the recommendations have since been implemented in EU regulations and subsequently in national laws, most importantly the demand for loose housing of gestating sows. On the subject of farrowing and lactating sows, however, the Committee was only able to strongly encourage research and development aiming at loose housing that would not compromise piglet survival.

Since then, much research and development has been carried out, but the solution is not simple. Housing equipment companies have developed and manufactured farrowing pens. In Denmark, these pens are very small (e.g. 5 different pens from different manufacturers measure 3.9 – 5.9 m<sup>2</sup>), and usually they ignore the complexity of the sow's maternal behaviour and sow-piglet interaction [9]. Systematic comparisons of piglet mortality in pens and crates are scarce, but the impression is often that piglet mortality is high, and sow welfare does not seem much improved.

A large Danish research project involving several universities and the pig industry has recently been carried out with the aim of finding an alternative to the crate that could work in Danish pig production. In the project, we came up with a number of features that we would like to include in a new farrowing pen – factors derived from our own research, the research of others, and practical knowledge. The overall idea of this was to provide sows with an environment that would encourage the behaviour that we want (e.g. behaviours that improve piglet survival chances directly or indirectly) instead of what the crate does, which is to prevent behaviours that we do not want (by taking away sow choices). Among these features were a solid floor resting/nesting area, provision of nesting materials, one or more sloping walls to lie down along and various thermal regions in the pens (in addition to more traditional, but necessary features such as a feed trough, drinking device, and usually a heated piglet area). The challenge was to incorporate as many of the features as possible in pen designs. Firstly some relatively large prototypes were made in order to evaluate function in relation to animals and stock people, and secondly these prototypes were to be adjusted so that they could be tested

on farms using a large number of sows and litters (the only way to get a valid estimate of piglet mortality as this is highly variable). However, for this to be interesting to pig producers, the pen had to be small. In example, two pens in which some of the features were incorporated measured 1.8 m × 2.8 m (5.0 m<sup>2</sup>), and 2.4 m × 2.7 m (6.5 m<sup>2</sup>), respectively. In comparison the Danish recommendation for the pen holding a crated sow and her piglets is 1.8 m × 2.7 m (4.9 m<sup>2</sup>). It seems that for loose housing pens to be attractive to pig producers they have to be of the same size or only very slightly larger than the current pens in which sows are crated. The severe limitation in size makes it difficult for researchers to come up with suggestions of how to utilise scientific knowledge to stimulate sows to perform adequate behaviour towards piglets, and thus improve their survival chances. The need for a very limited time use places further restrictions on the use of knowledge, e.g. on the use of nest building materials, which in amounts that have biological relevance is bound to take a few seconds per animal per day. Different pen sizes (and their consequences for pen design) may be the explanation why some studies show no differences in piglet mortality, when crates and pens are compared, whereas others do. The latter seems to be reported primarily from small pens below 5 m<sup>2</sup> [10]. Therefore, it is very important that the discussion of pens versus crates is nuanced so that we constantly keep in mind whether we are comparing piglet mortality in crates to piglet mortality in very small intensive farrowing pens with slatted floor throughout and e.g. no nesting materials and supportive features for lying down, or larger pens with zones for various needs (nesting, elimination, thermoregulation etc.).

What can be done to achieve real improvements for farrowing and lactating sows, when recognising that the task of coming up with pens that can compete with crates is very difficult in intensive pig production? Should we continue to search for solutions that can compete with crates on equal terms? Or should crates be banned, so that a real interest in finding alternatives would be stimulated in the industry? One could argue that it would involve great suffering for a number of sows and piglets, if there were no ready solution meeting the new requirements. But one could also argue that it may be the only opportunity for bringing about improvements for a very large number of animals, because it would mean the phasing out of a widespread system that involves very poor welfare for sows.

### **Gestating sows**

Gestating sows were previously kept in narrow stalls, where they took up very little space per animal and very little time was needed to take care of each individual. However, in the fall of 2001 changes to the European Council directive lying down minimum standards for the

protection of pigs was passed, becoming effective by January 1<sup>st</sup> 2003 [3,4]. First and foremost the legislation states that sows must be kept loose in groups from 4 weeks after mating until 7 days before expected farrowing. In Denmark, 70% of gestating sows are currently loose housed. A range of other requirements were also given, many in recognition that loose housing in it self is not a guarantee of good welfare. Examples of these requirements are the demand for measures to control aggression and food competition, provision of bulky or high-fibre food and materials to explore.

Loose housing – is it good welfare? Once again the overall – but simplistic – answer must be yes, because only loose housing has the perspective of good welfare on a number of points that cannot be met in confinement (see Table 1). In Denmark, two of the most used systems are the "electronic sow feeding" (ESF) and "one eating stall per sow" (OESPS) systems. When these systems are well designed and management is good, they provide better welfare for sows than stall housing.

In the ESF system sows are given individual rations of feed, which are elicited electronically in a feeding station by the sows earmark. In this system the sows' high motivation to eat, and their propensity to want to eat at the same time have been taken into account by providing protection while eating. From a welfare perspective it is a disadvantage that the sows cannot eat at the same time. On the other hand, the possibility of giving individual sow rations, and the possibility of providing a good environment (e.g. resting and activity areas) make this a contender for being a welfare friendly system. It should, however, still be noted that it is a system which has optimized on the time use per animal. Here sows feed themselves so to speak, and to secure sow welfare it is very important that computer lists are used actively, e.g. to ascertain that all sows are eating.

A variant of the ESF system has emerged, which is referred to as "Fit-mix". The system is apparently not widespread, but herds in e.g. Denmark, Switzerland and Germany have been described in papers (e.g. [10,11]). As is the case in the ESF system, the sows eat individually at feeding automats, and their individual feed rations are elicited by a transponder in the earmark. In contrast to what is the case in ESF, however, the sow eats by taking a tube deep into its mouth, and she is unprotected from other sows while doing so. The sow can eat her ration over a 24 h period, but once she has eaten her whole ration no more feed is delivered when she takes the tube into her mouth. A Danish report described that it took 5–10 seconds before the tube was closed after having delivered feed, which made it attractive for waiting sows to chase away the eating sow and take the part of the sow's ration that

ran out during these seconds. The same report showed that on average sows visited the feeding automat 53–67 times (average from different pens) where they obtained feed, and 45–54 times where they did not get feed [11]). Half of the sows had over 50 feeding visits to the automat per day, and there were even sows that specialised in chasing away other sows. Hence, some sows visited the station over 200 times per day and one sow as many as 464 times in a day. German and Swiss experiences are similar [11,12]. These numbers reflect severe competition among sows, and there can be no doubt that it is an extremely stressful environment. It is a system that uses the technology of ESF to automatise feeding and thus save time, and then further attempts to optimize on use of space by taking away the protection of the sow, which is quite large in the ESF system. However, in doing so it is also a system that ignores all knowledge – even the most fundamental – of sow behaviour and welfare. Sows live in a social rank order that helps them minimise the costs (e.g. fighting) of deciding access to resources. Sows in intensive pig production are challenged in relation to the establishing and keeping of a rank order, because they are frequently moved and mixed with other sows. Even on the assumption that gestating sows in groups establish a well functioning rank order, sows with established rank orders will compete and fight when access to important resources are severely limited. Gestating sows are given about half their ad lib intake of concentrate feed and they are very hungry. At the same time eating is socially facilitated, i.e. the eating of other sows makes a sow want to eat. In combination this basic knowledge explains why the eating behaviour in the Fit-mix system is so extreme. It also explains why it was reported from a Danish herd that after 10–14 days in the system some sows delivered only "horse droppings" and looked like "deer". As stated by the authors, these sows had probably been eating nothing but straw for the entire period because they were low ranking animals that did not dare use the feeding tubes in a setting characterised by extreme competition. The EU legislation states that; "measures shall be taken to minimise aggression in groups" of sows and that they "must be fed using a system which ensures that each individual can obtain sufficient food even when competitors for the food are present" [3,4]. The intention of this requirement must have been to prevent systems that ignore basic knowledge of the social behaviour of sows, and it can be discussed whether the system is in accordance with current legislation. It is likely that the Fit-mix system is so extreme that it will be phased out by itself, but it is still worth considering what measures could be made to ensure that at least the most basic knowledge of behaviour and welfare is taken into consideration when making new housing systems? Should we be more willing to report systems like these when they clearly seem to be in conflict with legislation concerning animal welfare? Or is it perhaps necessary

to make requirements that new systems must be tested according to certain standards and approved for use on live animals by a relevant authority? Or is it best left to the market mechanisms to close down the worst systems, because the entrepreneurship of stock people would be hindered by doing otherwise, which in turn would affect also the development of good systems?

Another example of a promising system giving rise to a variant with poor welfare can perhaps shed a slightly different light on the questions raised above. This is a variant of the "one eating stall per sow" system (OESPS), and it is a variant that is unlikely to go out of use due to production costs associated with poor sow welfare. In fact, it may in some cases give quite good results because it resembles the stall systems for gestating sows that is now being phased out due to the legislative demands, a system that is still preferred by some producers. However, as seen from the point of view of an animal welfare researcher (at least this one) it is yet another demonstration of how the emphasis on using as little time and as little space per animal can bring about solutions that are in direct contrast to the welfare improvements intended by the recent welfare legislation.

In the OESPS system sows are kept in a pen with eating stalls of a number similar to that of the individuals in the group. The sows have free access to the stalls, which close behind them when they enter, thus giving them protection from other sows while eating. In contrast to the ESF system, this system has the advantage of allowing sows to eat at the same time. In the intensive variant of the system, two rows of stalls are placed opposite each other and the use of space is at the law's minimum demands. The stalls are usually made with solid floor in front and slatted floor at the back. The law has a minimum requirement for area with solid floor per sow, but until May 2003 the interpretation in Denmark was that the area in the stall could be included, leaving only very little space for the activity area (0.89 m<sup>2</sup> to 1.14 m<sup>2</sup> per sow depending on group size). In the small activity area very minimal amounts of straw are used, and there are no efforts made to make the area attractive to the sows in other ways, e.g. by providing zones for various behaviours. (It should be mentioned, that after may 2003 the stalls can no longer be included in the solid floor area per sow, and hence the area between the rows of stalls has to be larger or additional solid floor areas have to added, as in the T-pen (see e.g. [6] for details).

Observation of sows in the intensive variant of the system showed that during most of the 24 h day 70–95% of sows were in the stalls. Various explanations have been sought for, and even though the picture is not completely clear, factors such as thermoregulation (the use of stalls to cool

down) and escape from other sows (protection because stalls close behind the sow) play a role. These explanations deal with the attractiveness of the stalls. However, the unattractiveness of the activity area should also be addressed. Moving into a narrow area with a slippery floor to meet other sows of various ranks in relation to that of the sow itself is not a good choice for many sows. To some pig producers, however, this appears to be good system as they can continue to keep sows in stalls by using what is a sort of biological confinement where the sows stay in stalls by their own choice. There are several problems with this attitude. Firstly, according to the law sows are now to be kept loose during gestation – a law that was passed with the objective of improving sow welfare. The idea was, therefore, not to find other ways to make sows stay in stalls, but to make loose housing systems where sows could benefit from being loose housed. Secondly, the stalls are not dimensioned to accommodate sows for longer periods of time. Overall, the welfare benefits for sows in this loose housing system are highly questionable.

## Conclusion

As opposed to confinement, loose housing of sows provides a framework in which systems with high welfare can be developed. However, high welfare is only achieved when adequate attention to the complexity of the animal and its housing system is given. This is a very challenging task when the industry has a strong interest in using as little space and as little time as possible per animal. Various ways of approaching this challenge have been suggested in this talk. Several of the suggestions go beyond the expertise of an animal behaviour and welfare researcher. They have, however, been given in the hope of stimulating discussion, and in the recognition that securing the welfare of sows requires efforts from many different parties, e.g. researchers, industry, authorities, animal welfare organisations, and not least farm advisors such as veterinarians.

## References

1. Kærgaard N, Bredahl B, Frandsen SE, Hermansen JE, Ovesen L, Sandøe P, Wegener H, Walter-Jørgensen : **Den danske svine-sektors samfundsmæssige betydning**. Jordbrugsforlaget Det Kgl Danske Husholdningsselskab 2002. (in Danish).
2. Rasmussen J, Duus LK: **Erfaringer med tidsforbrug i drægtighedsstalde**. Landsudvalget for svin/Danske Slagterier 2003. Experience **0301** (in Danish).
3. Anonymous: **Council directive 2001/88/EC of 23 October 2001 amending Directive 91/630/EEC laying down minimum standards for the protection of pigs**. Official Journal of the European Communities 2001. 1.12.2001.
4. Anonymous: **Commission directive 2001/93/EC of 9 November 2001 amending Directive 91/630/EEC laying down minimum standards for the protection of pigs**. Official Journal of the European Communities 2001. 1.12.2001.
5. Petersen LB: **Drægtighedsstalde med løsgående søer opstaldet i stier med en ædeboks pr. so**. Landsudvalget for Svin/Danske Slagterier 2000. Experience **0010** [in Danish].
6. Damm Bl: **Velfærdsproblemer hos de danske søer**. Dyrenes Beskyttelse 2004 [<http://www.dyrenes-beskyttelse.dk>]. [in Danish].
7. Anonymous: **The welfare of intensively kept pigs**. Report of the Scientific Veterinary Committee 1997 [[http://europa.eu.int/comm/food/fs/sc/oldcomm4/out17\\_en.pdf](http://europa.eu.int/comm/food/fs/sc/oldcomm4/out17_en.pdf)].
8. Moustsen VÅa, Poulsen HL: **Anbefalinger vedr. dimensioner på fareboks og kassesti**. Landsudvalget for Svin/Danske Slagterier 2004. Note **0414** [in Danish].
9. Moustsen VÅa, Poulsen HL: **Erfaring med farestier til løsgående søer**. Landsudvalget for Svin/Danske Slagterier 2003. Experience **0505** [in Danish].
10. Weber R, Kiel NM, Fehr M, Horat R: **Piglet mortality on farms using farrowing systems with or without crates**. Animal Welfare 2007, **16**:277-279.
11. Hansen LU, Gamby N: **Fit-mix, et fodringssystem til løsgående drægtige søer**. Landsudvalget for Svin/Danske Slagterier 2003. Experience **0302** [in Danish].
12. Weber R, Ibscher A, Stauffacher M: **Aggressionsverhalten und tageszeitliche Verteilung der Futteraufnahme von Zuchtsauen am Breinuckel**. KTBL Schrift 2002, **407**:28-35.

Publish with **BioMed Central** and every scientist can read your work free of charge

"BioMed Central will be the most significant development for disseminating the results of biomedical research in our lifetime."

Sir Paul Nurse, Cancer Research UK

Your research papers will be:

- available free of charge to the entire biomedical community
- peer reviewed and published immediately upon acceptance
- cited in PubMed and archived on PubMed Central
- yours — you keep the copyright

Submit your manuscript here:  
[http://www.biomedcentral.com/info/publishing\\_adv.asp](http://www.biomedcentral.com/info/publishing_adv.asp)

