

## Comparison of sow welfare in the Swedish deep-bedded system and the US crated-sow system

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Among the most heated farm animal welfare issues is gestation-sow housing. The use of gestation stalls, 2 × 7-foot enclosures used to house pregnant sows, caused such consternation among members of the AVMA that an AVMA task force was created<sup>1,2</sup> to evaluate scientific evidence regarding the welfare of sows in gestation housing systems and gestation crates in particular. The task force report<sup>3</sup> concluded that “no one system is clearly better than others....” This conclusion was based largely on objective scientific evidence. Another approach is to consider animal welfare in terms of an animal’s quality of life by use of, in part, subjective impressions of the experiences of animals.<sup>4</sup>

Gestation-sow housing has been considered in legislation by the European Union (EU) and individual member countries for many years; scientific evidence and subjective impressions of experiences of animals are considered in such decisions. In the EU, gestation crates must be phased out by 2013 and, at this time, crates cannot be used for gestation housing on new farms.<sup>5,6</sup> The EU requires that sows and gilts be kept in groups from four weeks after breeding to one week before the expected time of farrowing. In Sweden, not only are gestation crates not allowed, but straw bedding must be used, among other requirements.<sup>7</sup>

Animal welfare advocacy groups vary on what they desire in pig production systems. One organization, the Animal Welfare Institute, uses the Swedish deep-bedded system as the example of the system most suitable for adult sows.<sup>8,9</sup>

The 2005 annual meeting of the European Society of Animal Production was held in Uppsala, Sweden. During the meeting, a tour was conducted of a pig farm that was heralded as a high-welfare farm. Because some people believe Sweden has one of the highest animal welfare standards, and because this farm was among the best in Sweden, the tour was intended to educate scientists present at the meeting, many of whom were international experts in animal husbandry and welfare.

Prior to departing on the tour, a paper on the labor requirements associated with the Swedish sow welfare system was presented by a Swedish scientist.<sup>3</sup> The labor requirements for sows housed via the deep-bedded sys-

tem reportedly add 34% to the overall labor needs of the sow unit, compared with systems without the same welfare laws in nearby Denmark. If labor accounts for an estimated \$5 US/weaned pig, use of this system would add \$1.70 to the cost of a weaned pig. In the United States, this would be an added labor cost to the swine industry of > \$200 million.

The total increased cost of production would be much more than simply the increased labor cost. In addition, sows in Sweden are given more floor space and bedding, which adds to the mass of waste that must be handled, and have a later weaning age, compared with the US system; all of these factors add to the cost of production. It is possible that the cost of swine production in the US would increase more than \$1 billion if the Swedish deep-bedded system were adopted as the only system in the United States.

The conclusion of the scientist giving the presentation was that Swedish pig farmers were not getting appropriate monetary compensation for the added cost of production. It was concluded that the situation was unfair to Swedish pig farmers, which seems a reasonable conclusion. Regarding animal welfare, however, the real question is: does the added cost result in proportionately improved pig welfare?

The Swedish farm we visited was operated via a system called a sow-pool system. The farmer kept 1,500 sows in a breeding and gestation unit. Sows were bred, confirmed pregnant, and housed in the unit for most of their 114-day gestation. A week or two before the anticipated date of parturition, sows were transported by truck to contract farrowing units operated by other farmers. The farrowing-unit farmers returned the weaned sows to the breeding unit 4 weeks after farrowing. The breeding unit had a small farrowing area where replacement females could farrow.

The farrowing rooms on this Swedish farm were organized in pens (not farrowing crates) that measured approximately 10 × 12 feet. The sow area included a solid concrete floor and a slotted concrete floor dunging area behind the sow. Guard rails were on the sides of the solid concrete area. On the solid part of the floor, a small amount of wood shavings was added.

A farrowing-unit worker reported that a mean of 12.2 piglets was born alive and a mean of 9.2 pigs was weaned per litter. That is, mortality rate was approxi-

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mately three of 12.2 (25%) piglets. In the United States, improvement is considered needed if preweaning mortality rate is > 15%. If preweaning mortality rate is > 20%, most US pig specialists believe that serious problems exist in management or facilities. Indeed, any US farm with a 25% preweaning mortality rate would be considered to have poor welfare. Decreasing preweaning mortality rate from 25% to 15% would save the lives of more than 3,000 piglets on a 1,500-sow farm. On such a farm, a 25% preweaning mortality rate would require the use of > 300 extra sows to provide the same output of piglets for grow out.

The Swedish law<sup>7</sup> permits weaning no earlier than four weeks of age, and to ensure this, producers typically wean piglets at 4.5 weeks so that no individual litters are less than four weeks of age at weaning. On many US farms, piglets are weaned at 17 to 21 days of age; the younger weaning age is used to increase the numbers of pigs produced per sow per year. The Swedish law is based on the supposition that an older weaning age is better for sow and piglet welfare. This is an arguable point. Piglets are demanding of the sow and, by 21 days of age, are obtaining more calories in milk than the sow can obtain through its diet. Sows lose weight and at times appear to be agitated by the piglets. In outdoor units, sows spend an increasing amount of time away from piglets as piglets grow and become more demanding.<sup>10</sup>

In breeding and gestation, the Swedish system maintains about 50 sows/pen with about 50 feet<sup>2</sup>/sow. The pens have a complete feeding stall in which sows can be locked. Sows are fed a liquid diet, a holdback from when dairy products were less expensive and more readily available, two or three times per day. Liquid diets are certainly not in the evolutionary history of the pig, a forest- and river-bottom-dwelling animal. When special-fed veal calves are fed an unnatural liquid diet for extended periods, the veal industry is criticized.<sup>11</sup> Although young mammals' digestive systems are well-suited for liquid diets, adult digestive systems are not. Teeth, the jaw, and mandibular muscles have evolved for a purpose and are not able to perform their evolutionary function in adult omnivores fed a liquid diet. Use of a qualitative value-laden assessment of the situation, as proposed by Rollin,<sup>4</sup> can only lead to the conclusion that feeding adult swine a liquid diet is not in their best interest.

The feeding area was located on a concrete floor, behind which was a large bedded area. The straw bedding was deep (approx one to two feet in some places). A large straw bale was in the center of the bedded area for sows to take apart. The bale was given to provide a type of enrichment in that the sows pulled out straw from time to time. Provision of straw is thought to reduce stereotyped bar biting, which some believe is a sign of poor welfare.<sup>12</sup> However, provision of fiber does not eliminate stereotyped bar biting and may not even reduce this behavior.<sup>15</sup>

The front of the gestation feeding stall at the time of the visit (sows were locked in during feeding) looked much like US systems. Horizontal bars kept the sows in. The stall also provided metal, concrete, and straw on which the sows could bite, chew, root, and

rub. These behaviors are described as stereotyped or termed stereotypies or oral-nasal-facial (ONF) behaviors. Although there are differences of opinion regarding how to define each of these terms, the term ONF behavior is considered by some to be the most objective.<sup>13-15</sup> To call a behavior a stereotypie is to imply an abnormal behavior, perhaps even a sign of psychological distress. Oral behaviors and snout and face rubbing can be called just that (ie, ONF), and this phrase is more objective; some ONF behaviors might be quite normal, and some may develop into pathologic stereotypies. Further evaluation is required before an ONF behavior can justifiably be labeled a stereotypie.

In three highly controlled comparisons, the amounts of ONF behaviors performed by sows in pens versus crates were essentially similar.<sup>13-15</sup> Sows in the Swedish deep-bedded system performed ONF behaviors despite being in a reportedly high-welfare system. One Swedish veterinarian on the tour indicated that sows have this behavior but at a lower level than sows in crates, although evidence that is available appears to indicate that sows have essentially similar levels of ONF behaviors in a variety of housing systems.<sup>14</sup> Being on a limited calorie diet (as most Swedish and US sows are) is more likely to influence the expression of ONF behaviors than will the housing system (individual vs grouped).<sup>16</sup>

At about four weeks after mating, sows were moved to a pregnancy-check area. A technician confirmed pregnancy by use of ultrasonography, and then sows were moved to a third area where farrowing groups were established. One to two weeks before farrowing, the sows were transported to the farrowing farms for farrowing, and the cycle was repeated.

Swedish sows are not allowed to be bred again (ie, they are culled) after the eighth litter, in the interest of the sow's welfare. In the United States, most sows are culled after their eighth litter, but some may stay in the herd longer if they are productive and healthy. Personnel on the farm we visited reported a sow death rate of approximately 5% and a sow euthanasia rate of 10%; total sow mortality rate was, therefore, approximately 15%. They said that if a sow is lame, injured, or very thin and a government inspector at a sow slaughter plant sees this single animal, government officials will investigate how this could have happened and impose corrective action or fines. Therefore, any sow of even marginal health was euthanized on the farm, which is clearly good for sow welfare. Still, the sow mortality rate seems high for a high-welfare system. In the United States, if sow mortality rate is > 9%, it is considered a problem<sup>17</sup> and at 15%, it is considered a serious problem. Because of the high rate of euthanasia in Sweden and the unknown number of sows sent to slaughter that might be lame or have an injury, sow mortality rates in the United States and Sweden cannot be precisely compared.

Sows in the Swedish system were involved in a large amount of fighting after weaning and slightly less when later regrouped, as estimated by the number and severity of fighting-induced wounds. A sample of 50 sows in a group from which piglets had recently been weaned was evaluated as might be done in a welfare assessment.<sup>17</sup> The piglets had been weaned five days

previously. Wounds from fighting, riding, and other activities were extensive. Many sows had shoulder lesions. Some sows had bitten vulvas. They were, without question, a highly bruised, scratched, and wounded group of sows by any standard. Forty-six percent (23/50) of these sows had severe wounds, and all sows had wounds of some kind. By severe, I mean deep wounds that covered an area larger than the palm of a hand. The same evaluation technique was used for sows in mid to late gestation and revealed that 26% (13/50) of sows had mild wounds. No sows had severe wounds in this group. In my experience (four years of on-farm evaluations of sows in crates), the rate of mild wounds in US sows was much lower than 5%, with a severe wound observed very rarely. Problem farms have wounding rates > 15%.<sup>17</sup> Pregnant sows on concrete slats indoors in social pens and their crated contemporary sows have < 2% wound rate.<sup>15</sup>

On the farm in Sweden, the back side of the shed was open and the side walls had tall wooden slats that provided year-round ventilation and were not adjustable. In that part of Sweden, ambient temperature reaches -15°C (5°F) or less regularly, according to the farm staff. The preferred low temperature for gestating sows is 60°F, and the lowest extreme temperature recommended for gestating sows is 5°F.<sup>18</sup> Therefore, sows in this Swedish system were cold in winter, an indication that their physical welfare needs were not met. Many gestation and farrowing barns in the United States are heated unless they are in the South, and even then, few indoor-housed sows would be subjected to below-freezing temperatures.

With the information in a recent balanced scientific review<sup>3</sup> and comparison of the results of the qualitative assessments made during my tour of this Swedish farm and my regular visits to US farms, I believe I can make an informed conclusion about sows in these two systems (the Swedish deep-bedded system vs the gestation crates on commercial US pig farms). These conclusions may not hold if other variations on the Swedish deep-bedded system were considered. To be clear, this comparison is about two sows: one on the particular Swedish farm I visited and one on a US farm that uses gestation and farrowing crates indoors.

The Swedish sow is on deepbedding, and in the sow-pool system is cold in winter, fed an unnatural

liquid diet, at high risk of being wounded, and transported (a real stressor for pigs) by truck twice each pregnancy. The Swedish sow, however, has bedding, more space than the US sow, and access to social interactions (both positive and negative).

The US crated sow is unable to turn around, does not have straw to play with or to provide comfort on concrete floors, and has limited ability to socially interact (either positively and negatively); however, the crated sow is warm in winter and rarely severely wounded.

Which sow has the better welfare? One objective scientific review<sup>3</sup> suggests each system has positive and negative aspects, and on the whole, one cannot make a definitive conclusion that one system promotes better sow welfare. My value-laden, qualitative conclusion is that sows in the Swedish system have poor welfare.

Human and animal welfare government philosophy holds that basic physical needs should be met for food, water, shelter, and protection from abuse. In my view, physical needs for thermal comfort in winter, solid food, protection from attack, and freedom from the stress of unnecessary transportation are not met for sows in this Swedish system. Thus, I must conclude that Swedish sows in this system have poor welfare.

In contrast, the physical needs of the crated US sow are met, including needs for thermal comfort, solid food, protection from attack, and absence of unnecessary transportation. The US crated sow lacks social interaction and bedding for comfort.

The utilitarian view of the sows in the two systems creates a balance sheet that includes the sow's physical and psychological needs, food quantity and quality, stressors experienced, the economic cost to the farmer and the country, and the number of sows required to produce a given number of weaned pigs (Table 1). Note that the net result favors the sow system that uses gestation crates. If one wanted to value some items more or less, the balance sheet would change.

The lack of productivity (pigs weaned per sow) and need for more animals to be used per unit of animal product cannot easily be overcome in the Swedish deep-bedded system and is a negative factor. The economic disadvantage of a production system can be offset by legislation or regulation within a country or, in the future, via animal welfare tariffs in international markets.

Table 1—Quantitative and qualitative assessment of the welfare of sows in the Swedish deep-bedded system and the US crated-sow system.

Variable	Swedish deep-bedded system	US crate system
Physical need for thermal comfort	0	1
Psychological need for movement	1	0
Psychological need for social interaction*	1	0
Need for food quantity (calories)	0	0
Need for food quality	0	0
Need for avoidance of stressors (transport)	0	1
Economic needs of farmer	0	1
Economic needs of country	0	1
Need to minimize number of animals per unit of animal product	0	1
Net value	2	5

0 = Need not met. 1 = Need met.  
 \*Social interaction is viewed as a positive factor for group-housed sows with the recognition that some sows are submissive and therefore stressed and that some crated sows socially interact with their neighbors.

Improvement of farm animal welfare cannot result from giving up some aspects (eg, physical well-being and productivity) to allow for possible improvement in other aspects (eg, psychological well-being). Additionally, without consideration of economics, harm may be done to people (in this case the economic well-being of the Swedish pig farmer and the country of Sweden).

A quantitative and qualitative examination of production systems and a utilitarian cost-benefit analysis will suggest which systems have the highest overall animal welfare. In the case of the two systems considered here, in my opinion, sows in the gestation-crate system have superior overall animal welfare, compared with sows in the Swedish deep-bedded system.

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