THE HUMANE SOCIETY OF THE UNITED STATES

An HSUS Report: The Welfare of Sows Used for Breeding in the Pig Industry

Abstract

The conditions afforded sows (adult female pigs) used for breeding on industrial pig production operations present a number of welfare problems. Sows are routinely confined in gestation and farrowing crates barely larger than their own bodies, where they are unable to turn around during their pregnancy and lactation periods, often in excess of 128 consecutive days. Behavioral abnormalities such as stereotypic bar-biting and aggression arise due to environmental deficiencies and restricted feeding regimens. Sows in large, industrial operations are also affected by a number of production-related diseases and suffer from higher mortality rates. A reevaluation of current confinement systems and management practices is urgently needed, as there are a number of grave animal welfare concerns for sows in the commercial pig production industry.

Introduction*

The natural behavior and biology of pigs in free-roaming environments have been researched extensively. Studies of wild boars and feral pigs (domestic animals who have reverted to a wild state) show that free-roaming pigs are adapted to diverse habitat, including wooded areas, scrub brush near watering holes, riverine forest, and marshland;[1,2] have a varied diet of roots, grasses, acorns, berries, and small animals such as earthworms, and frogs;[3,4,5] and display extensive foraging and rooting behavior, turning up soil and vegetation with the disc of their highly sensitive snout.[6]

Pigs show complex social behavior, segregating into small family groups. Herds are usually composed of 1-4 sows and their offspring.[7] Daughters often stay with their mothers following weaning, forming stable maternal units.[8] Pigs build nests in which to rest by bedding an often used area with grass, sticks, and leaves. At night pigs sleep in these nests together, huddling to stay warm.[9]

Farrowing is the process of giving birth. Approximately one or two days prior to farrowing,[10] the sow normally leaves her herd and seeks a private, sheltered place in which to build her nest. The process of giving birth takes 4-6 hours.[11] Mother pigs are attentive, respond to piglet vocalizations, and defend their piglets when they are threatened.[12] Sows and their adult daughters have been observed mixing their litters in the same shared nest[13,14] and groups of females may share mothering duties,[15] thus caring for their young communally.

Piglets begin to leave the nest approximately one week following parturition (birth) and gradually integrate into the herd by about 10 days of age.[16] There is little obvious aggression when piglets are introduced into the herd this way.[17] The age at weaning varies between studies, with some piglets nursing for as little as 60 days,[18] and others as long as 22 weeks, until they are gradually weaned.[19] Littermates associate strongly and piglets of approximately the same ages usually form well-integrated groups.[20]

Studies have demonstrated that domesticated pigs, like other domesticated animals,[21] retain the basic behavioral repertoire of their wild counterparts, even when reared in the industrial production systems of commercial

* For more detailed information, see: "An HSUS Report: The Welfare of Animals in the Pig Industry" at www.humanesociety.org/assets/pdfs/farm/hsus-the-welfare-of-animals-in-the-pig-industry.pdf and "An HSUS Report: The Welfare of Piglets in the Pig Industry" at www.humanesociety.org/assets/pdfs/farm/welfare_piglets.pdf.

farming operations.[22] However, they are severely limited in the behavior they are able to display in the constraints of artificial production environment.

Industrial Production

Farming methods have changed dramatically over the last century. Small, pasture-based farms where pigs and other animals were typically raised outdoors and were able to display much of their natural behavior have gradually been overtaken by massive, industrialized operations that restrictively confine animals in impoverished, artificial conditions. A 2006 survey by the U.S. Department of Agriculture (USDA) reported that approximately 80% of gestating sows and 88% of lactating sows were kept in total confinement.[23] Farming has also become more specialized, with the majority of facilities no longer raising a diversity of crops and animals as in years past, but now focusing on a single animal species, further divided into stages of production.[24] Nowhere is this more evident then with pig production.

The specialized stages of commercial pig production start with breeding and gestation. At breeding facilities, sows are bred or artificially inseminated,[25] and farrow after a 114-day gestation (pregnancy) period. Sows nurse their piglets until they are abruptly and prematurely weaned when they are 2-4 weeks of age.[†] The piglets are then typically moved to a nursery facility until they reach 18.1-27.2 kg (40-60 lb) by approximately 8-10 weeks of age, at which point the young pigs are then moved to different facilities for "growing" and "finishing."[26,27] Pigs are slaughtered when they reach 108.9-122.5 kg (240-270 lb),[28,‡] when they are approximately 6 months old.[29] Some gilts (young female pigs) are kept as replacements for the sows who are no longer considered profitable breeding animals to the industry, at which point the older sows are culled—i.e., removed and sent to slaughter.[30,31]

Sows used for breeding not only endure many of the welfare problems associated with other segments of the commercial industry, such as those arising from barren conditions, poor air quality, and stressful handling and transport, but are also subjected to more restrictive confinement, selective breeding for productivity, and additional health problems.

Gestation Crates

An estimated 60-70% of gestating sows in the United States are confined individually in gestation crates[§] (also known as sow stalls).[32] A typical gestation crate is 0.6 m (2 ft) wide by 2.13 m (7 ft) long,[33,34] which prevents the sow from turning around or making normal postural adjustments without touching the sides of the enclosure.[35,36]

Gestation crates are a serious welfare problem, and there is ample scientific evidence that farmed animals in chronic, close confinement want and need to move. Research has shown that turning behavior is not influenced by the location of feed and water within the crate, which has prompted scientists to note that most turning is independent of any obvious external stimuli[37] and provides evidence that turning is motivated from within, thereby meeting scientific criteria for a "behavioral need."[38]

Crates have been described as "unrewarding" and "uncomfortable."[39] Space restriction in the gestation crate may impede movement when the sow stands up quickly or while lying down.[40] From a management perspective, it is also more difficult to detect sick or injured animals when they are confined in crates, as behavioral signs are limited due to lack of space[41,] and cannot be used as indicators of illness or pain. Individually housed sows are

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[†] For more in-depth information, see: "An HSUS Report: The Welfare of Piglets in the Pig Industry" at www.humanesociety.org/assets/pdfs/farm/welfare_piglets.pdf.

[‡] For purposes of this report, the term "hog" will not be used to refer to pigs who weigh more than 54.4 kg (120 lb), as this industry term is not necessarily convention in the scientific literature.

[§] For more in-depth information, see: "An HSUS Report: Welfare Issues with Gestation Crates for Pregnant Sows" at www.humanesociety.org/assets/pdfs/farm/HSUS-Report-on-Gestation-Crates-for-Pregnant-Sows.pdf.

also subjected to social deprivation[42] and cannot move toward neighboring sows who may be amicable or away from those who may be aggressive.

The amount of space a sow needs in order to perform even the most minimal body movements have been determined: A sow weighing 250 kg (551 lbs) needs an area 220.3 cm (7.23 ft) long and 86.4 cm (2.83 ft) wide in order to stand up and lie down in one place without touching the sides of an enclosure[43]—a larger area than typical crates provide. Most gestation stalls are not wide enough to allow a sow to lie down on her side without "protruding outside the bars or being compressed against the bars of the side walls."[44] Indeed, sows can become injured in crates that are improperly designed, in poor repair, or too small.[45,46] Due to selective breeding programs for increasingly larger and faster-growing pigs raised for meat, sows are also gradually becoming larger, further compounding the welfare problems associated with confinement to a crate. According to the industry journal *National Hog Farmer*, Temple Grandin, Professor of Animal Science at Colorado State University and a leading scientific consultant to industry and corporations, has "argued that stalls represent very poor housing systems because sows are becoming bigger and crates are becoming narrower."[47]

Exercise is important for maintaining cardiovascular fitness, strong bones, and overall health. Feral pigs and wild boars have home ranges varying widely in size from less than 100 ha (0.39 mi^2) to over 2,500 ha (9.65 mi^2).[48] In contrast, crated sows are virtually immobilized, able to take only a step or two forward or backward. These restricted animals have higher basal heart rates, suggesting they are less fit than sows allowed to exercise.[49] Periosteal modeling (a sign of bone formation) is stimulated in weight-bearing bone during exercise,[50] and pigs show an increase in muscle weight, bone density, and bone strength when engaging in sufficient amounts of regular exercise compared to sows who are continuously confined in gestation crates.[51,52]

Exercise of the mother also has important implications for the health and survival of her offspring. Piglets are more viable—able to survive the critical period between birth and their first nursing—when born to sows who have had regular exercise.[53] A 2008 study found that litters have greater total body weight and lower levels of mortality when born to gilts who had regular exercise during gestation, compared to sows who were continuously confined to a gestation crate throughout their pregnancy. The scientists postulated that behavioral differences between gilts who were able to exercise and those who were not may explain the lower mortality of piglets; sows who were given the regular opportunity to walk and run had greater control of their hindquarters, reducing the probability that piglets would be accidentally crushed as the sow laid down.[54]

Crated sows likely experience boredom, frustration, and psychological trauma caused by behavioral restriction. In naturalistic environments, pigs spend more than 50% of their daily time budget foraging, rooting, and grazing.[55] In a stall however, oral behavior is often directed to the only substrate available—the bars of the crate. Bar-biting is a type of stereotypy, an abnormal, repetitive behavior induced by repeated coping attempts, frustration, and/or brain dysfunction.[56] Stereotypic behavior, thought to be rooted in stress, lack of control, and lack of stimulation,[57,58] is common in captive animals confined in barren or restrictive conditions.[59] Although bar-biting behavior of sows is probably related to thwarted feeding motivation, many studies comparing housing systems show that sows confined in conventional gestation crates or tethered in stalls show *more* stereotypic behavior than those loose-housed in group pens,[60,61,62,63,64,65] even when fed identical diets.[66,67,68] The frequency of stereotypic behavior thus also depends on the degree to which sows are confined.[69] Where sows are housed in group pens rather than in individual gestation crates, they may partially compensate for the inability to forage naturally by engaging in more social behavior.[70] Stereotypic behavior is generally not observed when pigs are provided large, naturalistic enclosures.[71,72]

In a 2007 interview, Grandin definitively stated, "I think we need to get rid of sow stalls."[73]

Group Housing

Group housing systems, in which gestating sows are kept loose in pens rather than in gestation crates, are already in use by some producers, and others are phasing out intensive confinement stalls in favor of this method. Maxwell Foods, LLC, for example, has kept gestating sows in group housing since its inception, and the largest pig producer in the world, Smithfield Foods, has pledged to move away from crates and adopt group housing systems.[74,75,76,77] Compared to gestation crates, group housing improves the welfare of sows by allowing more behavioral freedom, including locomotory, investigative, thermoregulatory, and comfort (rubbing and grooming) behavior, and social interaction including mutual grooming, sniffing and nosing, and communal resting. The spontaneous activity of pigs in group pens improves muscle weight and bone mass, and positively affects locomotory ability compared to individual confinement to a stall.[78]

Injuries can occur when sows are newly introduced in group housing and form a dominance hierarchy or aggressively compete for access to feed, but this can be largely and successfully avoided with careful management. Reduced injury rates in stalls have been found compared with group housing,[79,80] although sows confined in crates can experience unresolved aggression from continuous encounters with sows in adjacent enclosures.[81] Aggression in group pens may lead to hoof injuries, lameness,[82] and in combination with restricted feed, fatal torsion of abdominal organs,[83] but it is important to recognize that under naturalistic conditions, aggression among sows is limited,[84] and problems with fighting are largely an artifact of the industrial production system. Pigs would naturally segregate into family groups.[85] Social relationships form between litter-mates early in life,[86] and groups of pigs in a naturalistic setting develop a stable dominance hierarchy with minimal fighting.[87] Aggression levels are low in free-range systems compared to indoor confinement systems, because aggressive interactions are more easily avoided when pigs have sufficient space to distance themselves.[88,89] Aggression in industrial production settings is thus, in large part, the result of artificial grouping arrangements and disruption of natural social, feeding and spacing behavior.

Improved systems for feeding group-housed sows are available that reduce competition and thereby reduce fighting. For example, by using an Electronic Sow Feeder (ESF), or by using free-stalls competition for feed can be reduced. ESF systems are computer-controlled feeders that recognize a unique transponder fitted to each sow. In an ESF, one sow enters the enclosed feeding station at a time, where she is given her allotted daily feed allowance. While ESF systems must be carefully designed and managed to avoid potential pitfalls, they have the advantages of feeding each sow individually, recording any sows who are not eating (aiding in the detection of sick animals), reducing handling problems, and quieting the animals.[90] In free-stall systems, sows have access to an individual stall, typically with a back gate that closes behind her upon entry. After feeding, the sow can back out, but other sows cannot push their way into the stall from the outside.[91] In this way, each sow can be fed individually and protected from more aggressive sows who might attempt to dominate the feed source. As producers continue to move away from stalls toward group housing, innovation will undoubtedly continue to make further improvements.

Farrowing Crates

In industrial commercial production, sows are moved into farrowing crates after the gestation period for the birth of their young and the subsequent lactation period. The farrowing crate is comprised of two areas—one in which the sow is confined, similar to the gestation crate, and an adjacent "creep area" that is heated to draw piglets away from their mother when they are not nursing. Although they vary in design, farrowing crates typically measure 1.5 m wide by 2.1 m long (5 by 7 ft) with a space allotment for the sow measuring approximately 0.61 m (2 ft) in width.[92] Piglets can reach the sow to nurse, but, as with the gestation crate, the sow's ability to move is limited mainly to lying down and standing up, and she is unable to turn around.

Conventional farrowing crates have come under criticism due to their restrictive nature and subsequent consequences to the confined sow; however, arguments supporting their use include protection of piglets and space efficiencies, detailed below.

The farrowing crate causes a number of welfare problems. In addition to the physical and psychological challenges crated sows experience (as detailed above), sows in farrowing crates are also prevented from

performing normal nesting and mothering behavior. Lying down can be difficult in the confined space, and, depending on the floor type, sows may get sores on their feet, legs, and udder.[93] Like gestation crates, problems with farrowing crates are exacerbated as sows are selectively bred for larger body size, while crate sizes remain unchanged.[94]

Natural nesting behavior is completely thwarted in the artificial confines of a farrowing crate. In a natural environment, a sow might travel up to 6.5 km (4 mi) in search of a suitable nesting area.[95] This nesting motivation is triggered internally[96,97] by changing hormone levels,[98] and sows show increased restlessness, activity, and locomotion prior to farrowing.[99,100,101] Multiple studies have demonstrated that sows prefer to nest in an enclosed, generously bedded farrowing site,[102,103,104] completely unlike the farrowing crate. Sows in intensive confinement operations attempt to perform nesting behavior—pawing the floor and nosing the bars of the crate—even in the absence of a suitable site and without nest building materials.[105,106,107,108] Sows may even wear down their front hooves and suffer from abrasions on their snouts from performing this behavior in contact with the concrete floor.[109]

The early mortality of piglets is often high. Causes of newborn piglet death include hypothermia, starvation, and crushing by the mother sow,[110] the latter of which is typically used as the rationale for the use of farrowing crates—i.e., that they reduce the incidence of small piglets becoming accidentally crushed by the heavy sow as she changes position.[111,112] A survey of U.S. production sites in 2000 estimated that preweaning mortality was 11.77% (approximately one death per litter),[113] in basic agreement with figures from the European Commission's Scientific Veterinary Committee, which reported that the mortality of piglets generally ranges from 10-20%.[114] Further estimates are that approximately one-third to one-half of preweaning piglet death in the industry is caused by crushing.[115,116]

Scientists have suggested that at least part of the crushing problem within the pig industry may be due to selective breeding for larger sows and the concomitant side effect that heavy bodyweight has had on sows' ability to lay down in a way that would facilitate piglets in moving out from underneath them as they descend into a recumbent position.[117] Indeed, a newborn piglet may weigh just over 1 kg (2.2 lb), while the sow can weigh over 250 kg (551 lb),[118] and the disparity in size puts baby pigs at risk.[119] At least one study has shown that crushing is associated with heavier dams.[120]

Less restrictive alternative systems to the conventional farrowing crate exist with piglet mortality rates that are similar to or below those of farrowing crates. These alternative systems include the ellipsoid farrowing crate,[121] the sloped farrowing pen,[122,123] and English-style outdoor farrowing huts.[124]

In 1994, scientists working at the University of Guelph published a paper on the ellipsoid farrowing crate, which allows the sow to turn around completely, yet does not result in higher piglet mortality. They also found a reduced rate of stillborn piglets (possibly due to the ability of the sow to assume more comfortable postures), more hygienic birthing conditions since piglets did not drop into accumulated manure at the back of the crate, and improved interaction between piglets and their less-restricted mothers.[125] However, sows need freedom to walk rather than simply to turn around in order to more fully accommodate their natural behavior.[126]

Carefully designed sloped farrowing pens can also be effective and offer higher welfare to sows compared with crates. Sloping the pen floor causes the sow to adjust her resting posture, and reduces the rate of accidental crushing to a level comparable to farrowing crates.[127,128] Historically, outdoor sow herds have farrowed and nursed their young in rolling hills without difficulty, and this is the basis for the sloped floor pen design, also called the Hillside pen. The slope of the pen floor causes the sow to more carefully stand up and lie down.[129]

Although less common in the United States, approximately 40% of pig production occurred outdoors in the United Kingdom in 2008.[130] The British Meat and Livestock Commission compile yearly data on productivity measures for indoor and outdoor pig production systems. The Commission found that, outdoor breeding herds in the United Kingdom have lower mortality rates than indoor, crated herds.[131] Outdoor farrowing accommodation for sows is generally small huts on pasture or in paddocks. A number of different farrowing hut

designs for outdoor pig production are in use, but some types have higher piglet mortality rates, highlighting the importance of design.[132,133] Huts that have ample floor space of 3.9-4.6 m^2 (42-50 ft^2), and guardrails or safe space created by the curved shape of the hut walls provide protection for piglets from a descending sow.[134] Two different studies have found that English-style arc-shaped huts and blunt-top A frames with guard rails have the lowest mortality, as low as 3.7%.[135,136] In a U.S. study directly comparing conventional farrowing crates and English-style outdoor farrowing huts, there was no significant difference in overall mortality rates or stillbirths. In the same study, piglet mortality rates were reduced when sows had previous experience farrowing outdoors.[137] Breeding programs have the potential to further improve the survival of piglets in crate-free, outdoor systems.[138,139]

Within industrial pig production, however, conventional farrowing crates improve the profitability of intensive production enterprises by allowing a greater number of sows to be confined per building[140] and are more convenient for the producer.[141] However, farrowing crates should be phased out in favor of alternative systems that enable higher animal welfare.

Breeding and Productivity

In commercial production, pigs are selectively bred for such industry-preferred traits as rapid growth rate, feed conversion efficiency, carcass leanness, and litter size.[142] Productivity of sows is assessed within the industry in terms of the number of piglets produced per sow per year.[143] The selection of economically important traits without due regard to how they affect the welfare of the animals has had a number of consequences for sows and their piglets.

Small, wild boar sows typically give birth to one litter of five to seven slowly growing, fat piglets each year. Through the use of selective breeding, however, large sows in the commercial pig industry now bear 20 or more fast-growing, lean piglets annually.[144] Genetic selection for increased litter size has led to a decrease in the number of surviving piglets.[145,146,147] Researchers have postulated that genetic changes have altered body fat metabolism, body composition, and hormonal state, resulting in lean tissue growth that makes piglets heavier but less mature at birth, reducing their survival rate.[148] Selection for leanness may have also inadvertently decreased the nutritional quality of sows' milk,[149] in turn affecting survival of the piglets.

Because the progeny of breeding sows are selected for rapid growth, pregnant pigs have a tremendous appetite. However, they are commonly feed-restricted to ensure their "longevity,"[150] an industry term used to convey usefulness until productivity declines and they are slaughtered.[151] If energy intake in feed is not restricted, pregnant sows can get excessively fat and heavy,[152] and gestational diabetes can be exacerbated.[153] Feed restriction prevents obesity and lessens the detrimental effects of excessive weight on reproductive output.[154] Thus, sows are typically given only 50-60% of their voluntary feed intake,[155] which can be consumed in as little as five minutes.[156] In contrast free-ranging pigs spend a great deal of time foraging, approximately half their daily time budget.[157,158] Such severe feed restriction leads to persistent, unfulfilled feeding motivation,[159,160,161] which can in turn lead to frustration and aggression.[162,163] The psychological effect is manifested in the occurrence of abnormal behavior, such as object chewing (repetitive biting of the bars of the crate or other objects), sham chewing (repetitive chewing with nothing in the mouth), and head weaving (repetitive back and forth movements of the head). These abnormal behavior patterns could be reduced if sows were fed a high fiber, bulky diet instead of, or in addition to, concentrates.[164,165,166,167,168]

Water may also be restricted. While most sows are given free access to water, feed restriction can lead to excessive water consumption, and some producers limit access to water to specific periods of the day. Given the risk of thirst and the potential for dehydration during hot weather, this practice is objectionable on welfare grounds.[169]

Disease and Mortality

Ill health and morbidity can affect animals in any setting. On farms where pigs have outdoor access, for example, they may come into contact with pathogens in the soil, other domestic or wild animals such as cats and raccoons, or the feces of these animals,[170] so it is imperative that managers of pasture-based systems take preventative measures such as raising hardy breeds[171] and using management practices that limit contact between animals. However, confinement on large, industrialized farming operations, and breeding programs aimed at maximizing productivity are directly linked to many prevalent disease and mortality issues of sows.

Larger operations tend to have higher sow mortality rates. A survey of more than 600 U.S. farms published in 2000 in the journal *Preventive Veterinary Medicine* found greater annual mortality risk with larger herd size and that the mortality risk increased by 0.44% for every herd size increase of 500 females.[172] Increasing sow mortality with herd size was also found in a 2009 report by the National Animal Disease Information Service in the United Kingdom. In that report, the mortality rate in herd sizes of 1-100 animals was 1-2%, but in herds of more than 500 animals, the mortality rate was 5-6%.[173] Lack of individual care on larger facilities has been implicated as a possible cause of higher sow mortality rates, as personnel on large operations may not have enough time to care for compromised sows showing clinical symptoms.[174,175] Indeed, with the use of modern technology and efficient barn and pen designs, one person may be responsible for the care of 8,000 pigs per day on a large, commercial operation.[176]

Of further concern, sow mortality[**] in the U.S. pig industry appears to be increasing.[177,178,179] According to USDA records of 6-month mortality figures, 5% of breeding-age female pigs on large facilities (500 or more animals) died in 2006[180] compared to 4% in 2000.[181] The reasons for possible increasing mortality are not clear, but one hypothesis is that it is difficult to adequately care for highly productive females, who have enormous metabolic demands for lactation and increasing numbers of litters per year. Sows' physiological requirements are greater than ever before, and veterinarians have argued that producers may have difficulty managing the nutrient intake of highly productive sows.[182]

Pigs have a delicate cardiovascular system and a small heart with enhanced sensitivity to oxygen deficiency. This predisposes sows to heart failure.[183] Obesity, parturition (giving birth), high environmental temperatures, and stress due to transport, for example, can all trigger cardiac failure. In addition, lack of exercise due to confinement such as that found in commercial production facilities has been implicated as a related factor.[184]

Cardiovascular failure can result from heat stress. Data from 130 pig breeding herds in Canada showed that 11% of the annual death loss occurred on just 3 of the hottest days during June and July.[185] Pigs primarily use behavior to thermoregulate. Because they have only a small number of sweat glands, they are not able to cool themselves by sweating and, in natural environments, wallow in mud when too hot.[186] However, in industrial confinement operations, sows are not afforded the opportunity to wallow and thus are particularly susceptible to heat stress. Even well-designed ventilation systems may not always be adequate to keep sows cool, especially under conditions of high humidity.[187]

One of the most significant causes of sow death is torsions and accidents involving the abdominal organs. Prior to 1980, however, such torsions were not considered a prevalent cause of sow mortality. Veterinarians have suggested that management changes and the intensification of pig production may be involved. The use of finely ground feed rations, rapid feed intake by the sow, the common practice of feeding fewer meals on the weekends,[188] and providing restricted feed amounts[189] may all play a role in the rise of fatalities due to disorders of the abdominal organs.

Cystitis-pyelonephritis is a bacterial infection of the urinary tract. The disease may cause hematuria and pyuria (blood and pus in the urine, respectively), anorexia, and, in severe cases, acute renal failure and death. The incidence of cystitis-pyelonephritis is increasing worldwide, and the rise in cases is thought to be correlated with

[**] These figures are for sows who died and do not include the number of sows who were culled (selectively sent to slaughter) by the producer to be replaced in the breeding herd by younger gilts.

the widespread adoption of confinement housing.[190] Gestation crates may predispose sows to urinary tract infections due to lack of exercise and the fact that sows must lie in their own waste.[191]

Sows are often culled or killed on the farm due to leg problems.[192] Those kept in industrialized confinement systems are often crated on slatted floors, despite the recognized leg problems they cause.[193] The National Animal Disease Information Service in the United Kingdom reports that mortality levels are much higher in indoor systems, especially those using slats, compared to pasture-based systems where sows walk on soil. In the 2009 survey, death losses were 5.4% in indoor facilities with slatted floors, whereas sows kept on straw only suffered a 4.3% mortality rate.[194]

Older sows are more likely to become non-ambulatory, unable to rise and walk on their own accord. There are a number of reasons that sows can become "downed," but they are especially vulnerable following the lactation period, which takes a substantial metabolic toll. Other causes are traumatic or infectious arthritides,[195] ascarid (worm) infection, respiratory disease, liver damage, ulcers, subtle bone injury, and feet and leg problems.[196] If veterinary intervention is not provided, sows who become, or are likely to become, downed suffer one of two fates: either they are killed on-farm or transported for slaughter. Both of these ends are of grave concern, as some of the current on-farm euthanasia methods in use are problematic and transport of animals, especially those who are compromised in some way, is stressful, at best.[††]

Health issues and leg problems often result in the untimely death of the sow. Large producers usually cull sows after about four years.[197] In contrast, however, the natural lifespan of a pig is 12-15 years[198] and wild boar can live to be 21.[199] As an animal's health is inextricably linked to overall welfare, these concerns must be addressed promptly.

Conclusion

Sows used for breeding purposes on industrialized pig production facilities suffer from a number of highly significant welfare problems. Intensive confinement to a crate during gestation and farrowing, selective breeding for productivity, and concomitant disease and mortality issues are scientifically documented welfare concerns on large-scale industrial operations. A reevaluation of current practices is badly needed. A case in point is the farrowing crate, and the mismatch this confinement system creates between the sow and her environment. As Seaton Hall Baxter of the North of Scotland College of Agriculture, now known as the Scottish Agricultural College, explained:

> [T]he entire rationale upon which conventional farrowing pens are designed and used needs to be question[ed]…Crate farrowing is also an 'unnatural' method of animal exploitation inasmuch as it attempts to suppress rather than exploit the animal's own biological adaptations. For example, although the main objectives in the farrowing pen design are the provision of a safe (from crushing) and climatically suitable environment for the piglets, restraining the sow in a crate prevents her nest-building, the functions of which would appear to be mechanical and climatic protection…[200]

Scientifically proven alternative systems, which do not so severely confine mother pigs and their young, are readily available,[201,202,203,204,205] yet industry has failed to adopt them broadly. Industry must change course, keep pace with ethical concerns, and work to put the welfare of animals first, so that badly needed reforms can be implemented.

Improvements in welfare also require a more animal-centered view point. Within the pig industry, sows may be referred to as little more than "a pig manufacturing unit."[206] This underlying attitude toward animals is demonstrative of the lack of compassion that led to the development of current systems and practices that so jeopardize animal well-being. A shift in thinking will be necessary to address growing societal concern and to

[††] For more information see: "An HSUS Report: The Welfare of Animals in the Pig Industry" at www.FarmAnimalWelfare.org.

ensure that the welfare of sows used for breeding improves. This begins with recognizing the welfare problems outlined herein and taking tangible, meaningful steps to address them. Such an effort would raise the bar for the level of care and treatment of sows used for breeding.

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