

## Minimizing Aggression Among Group-Housed Gestating Sows at Mixing

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### Introduction

A common problem in group-housed gestating sows is aggression at mixing. Mixing-induced aggression can cause injuries to sows, such as skin lesions, vulva biting, and even lameness [1]. The initial aggression can also result in subordinate sows becoming fearful of further conflicts while attempting to obtain feed which leads to inadequate feed intake and poor body condition [2]. Poor body condition represents poor welfare. Mixing sows during the first few weeks after breeding may reduce pregnancy rate [3,4]. Reproduction failure and lameness can result in sows being culled, which reduces longevity of sows. So, management strategies are needed to minimize aggression at mixing thereby to enhance welfare and performance of group-housed gestating sows.

### Objectives

- Understand the hierarchical social structure of swine
- Describe factors that affect fighting among sows at mixing
- Demonstrate management tips to minimize aggression among sows at mixing

### The social hierarchy structure of swine

Under feral or free-ranging conditions, a group of pigs usually consists of 2 to 4 sows, their juvenile offspring and most recent litters [5]. Since early association among females often continues into adulthood, sows in a group are closely related, either mother-daughter, or siblings. Within a sow-offspring group, sows are dominant to all other members and form a linear hierarchy with their class. Older sows are usually dominant to younger sows. The hierarchy is maintained by subordinate sows avoiding dominants, rather than dominant sows attacking subordinates. Juvenile boars leave the sow-offspring group at about 7 to 8 months of age as they reach puberty. Young boars initially form small groups of 2 to 3, especially during the non-breeding season. As boars mature, they become solitary. During the mating season, a boar joins a sow-offspring group to form the breeding group, and the boar is dominant to all other group members. A contemporary farrowing group is formed when a sow leaves the sow-offspring group 1-2 days prior to parturition. About 10 days after farrowing, the sow brings her litter to the sow-offspring group. As the sow-offspring group grows, a new group may form if a sow and her juvenile female offspring leave or several juvenile females leave without a sow. Under feral or free-ranging conditions, sow-offspring groups do not merge into a single group. Separate groups may share home ranges, but will avoid each other, which means that mature sows do not mix with unfamiliar sows.

## Factors that affect aggression among sows at mixing

For modern swine production, sows kept in group-housing systems are mixed for each gestation. A dominance hierarchy is formed through aggressive interactions among unfamiliar sows in a group. Fights have been reported to last 1-180 s for sows when mixed [6,10]. Fighting among sows for dominant status is intense during the first several hours, and usually lasts for 1 to 2 days after mixing [7]. A relatively stable group may be formed after 2 to 3 days of mixing, but a full integration of new sows into a group may take 3 to 4 weeks [8]. In a recent study, Li et al. [9] noted that sows housed in groups of 20 with an electronic sow feeder fought for 3 times longer during the initial 6 hours than the rest of the 72 hours after mixing. Aggression among sows at mixing can be affected by many factors. Understanding these affecting factors can help us to develop management strategies to reduce aggression thereby to improve welfare and performance of group-housed gestating sows.

### Time of Mixing

Mixing can be conducted at weaning, after breeding, or after sows become pregnant. Time of mixing affects aggression among sows. Sows are more aggressive before implantation than after. Studies showed that sows fought for a longer period of time, and caused more injuries to each other when they were grouped immediately after breeding compared to 5 weeks after breeding [10]. Aggression during early pregnancy can result in loss of embryos, and the most vulnerable period to pregnancy was between 2 and 3 weeks after breeding [4]. During this period while embryos attach to the uterine wall (also called implantation) and maternal recognition of pregnancy takes place, many hormonal changes occur [11]. Stress induced by aggression can affect hormonal secretion, resulting in pregnancy failure.

Sow behavior is affected by time of day. Sows are more active and fight more frequently during daytime compared to nighttime [12]. However, mixing sows during nighttime did not reduce, but only delayed fighting [13].

As limit-feeding results in gestating sows fighting for feed, aggressive interactions increase at feeding time. Mixing sows after they are fed can eliminate fights during feeding [1]. In addition, ad libitum access to feed containing high fiber content was reported to reduce aggression among sows at mixing [12].

### Group Composition

Familiarity to each other affects fighting among sows at mixing. When sows that were housed in the same group during the previous gestation are regrouped, they seem to remember each other, and fight less compared with sows that were in different groups during the previous gestation [14]. Breeding gilts and sows can remember their pen-mates after they are separated for 4 weeks [14]. So, if they can be regrouped within 4 weeks for the next gestation, they do not fight as much.

The parity structure of a group can also affect aggression at mixing. Aggression at mixing is less in pens consisting of young sows (gilts and parity 1) compared to pens consisting of multiparous sows [15]. Young sows are usually subordinate in a group, and suffer more skin lesions caused by aggression [10]. Separation of young sows from mature sows can reduce aggression towards young sows, and shield young sows from severe injuries caused by aggression at mixing [15].

In a sow group, presence of a boar may suppress aggression among sows either due to the dominant status of the boar or the sexual distraction. However, studies of boar presence on reducing aggression among sows at mixing are not conclusive. Barnett et al. [16] reported that presence of a boar reduced aggression during the initial 90 min after mixing, but did not affect aggression-induced skin lesions over 3 day after mixing. In contrast, Seguin et al. [17] noted that boar presence did not affect total fighting time, but reduced skin lesions caused by aggression at mixing. Boar presence is reported to suppress aggression among gilts [18] and growing pigs [19].

### Pen Design, Space Allowance, and Group Size

Pen design may affect aggression among sows at mixing. Rectangular pens are reported to be better in reducing aggression compared to square pens and round pens [20]. Pens with divisions to separate the pen into several false compartments are reported to reduce overall levels of aggression among sows at mixing [21].

Space allowance for group-housed gestating sows is not legislated in the U. S. Within the European Union, the minimal space allowance of 18 to 24 ft<sup>2</sup> has been legislated [22]. In Australia, the recommended minimal space allowance is 14 to 18 ft<sup>2</sup> [23]. When sows are provided with more floor space, they have enough room to retreat or display 'avoidance' behavior so that they would perform less aggressive interactions and have less skin lesions caused by aggression in

developing a stable social group [1,4]. Outdoor studies indicate that when space is virtually unlimited, levels of aggression are very low [24]. Compared with sows housed in pens with space allowance of 40 ft<sup>2</sup>, sows with space allowance of 65 ft<sup>2</sup> tended to increase aggressive interactions, but reduced injuries caused by fighting [1]. Salak-Johnson et al. [25] did not find difference in aggression at mixing among sows provided with space allowance of 24, 19, or 14 ft<sup>2</sup>, but found that skin lesions decreased as space allowance increased. In contrast, Seguin et al. [26] reported that skin lesions associated with aggression at mixing was not different in sows group-housed with space allowance of 25, 30 or 34 ft<sup>2</sup> in groups of 11 to 31, suggesting that neither group size nor space allowance (over 25 ft<sup>2</sup>/sow) affected aggression among sows.

Although there is no optimal group size for minimizing aggression, it is generally accepted that relatively large group sizes are better than small sizes [1,4]. Aggression is reported to be reduced when sows are mixed into large groups compared to small groups [27]. The large area in large pens may allow subordinate sows to flee from fights or perform submissive behavior. It is also possible that sows cannot form a social hierarchy in large pens due to too many pen mates [28].

Straw bedding is recommended to be provided in mixing pens for gestating sows [1,4]. Straw bedding itself does not reduce aggression, but can prevent leg problems caused by fighting. Sows mixed into a pen with bad floor structure or slippery floors have a higher risk of becoming lame compared to sows mixed into a bedded pen [4].

## Management Tips to Minimize Aggression Among Sows at Mixing

In group-housing systems, aggression among sows at mixing will never be eliminated. However, aggression can be reduced by good management. Given that many factors affect aggression among sows [29], all affecting factors should be considered when developing management strategies to minimize aggression in group-housing systems. Key factors to good management include choosing time of mixing, group size and composition, and preparing pens for mixing. Following tips can be considered in order to reduce aggression among sows at mixing:

- Mix sows after confirming that they are pregnant. Avoid mixing sows during week 2 to 3 after breeding.
- Mix sows that were housed in the same group during the last gestation.
- Separate young sows (gilts and parity 1) from mature sows if possible.
- When young sows have to be mixed with older sows, introduce a group of familiar young sows to the pen and make young sows the majority in the pen. Avoid introducing a few young sows that are unfamiliar to each other into a mature sow pen.
- Mixing sows after they are fed to avoid fighting over feed at mixing.
- Provide more space and hides for subordinate sows to flee from fighting in the mixing pen.
- Provide straw bedding at mixing if possible. When straw bedding is not an option, the mixing pen should have dry, even and non-slippery floors to avoid leg injuries caused by fighting.

## Summary

Since sows form a hierarchical social structure in a group, fighting for dominance status at mixing can never be eliminated. However, aggression can be reduced through good management to avoid the detrimental impact on welfare and reproductive performance of group-housed sows. Key factors to good management to reduce aggression include mixing sows after they become pregnant, separating young sows from mature sows, and providing sufficient space allowance with bedded and good quality floors.

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## FAQ and Answers

### 1. Can aggression affect reproductive performance of the sow?

Yes. Studies indicate that when mixing sows during implantation period, both farrowing rate and litter size can be reduced. A study conducted in Canada on a large number of sows demonstrated that farrowing rate was reduced by 5% when mixing sows before implantation compared to after implantation. An early study in Europe showed that both pregnancy rate and litter size were reduced when sows were mixed during week 2 compared to week 4 after breeding.

### 2. Is a static system better than a dynamic system?

Studies comparing differences in aggression and reproductive performance of gestating sows between static and dynamic systems are not conclusive. Given that aggressive interactions occur when unfamiliar sows are mixed, dynamic system may cause more aggression when new sows are introduced into the system. However, some studies showed no difference in aggression-induced injuries and reproductive performance between sows housed in static and dynamic systems. So, a dynamic system can be as successful as a static system with good management.

### 3. What is the optimal group size to minimize aggression among group-housed gestating sows?

There is no optimal group size to minimize aggression among sows. Usually, large groups have fewer fights per sow than small groups. In addition, large groups are usually associated with large pens which can provide more space for subordinate sows to escape aggression from dominant sows. However, many factors can affect aggression and all affecting factors should be considered in choosing a group size.