

## ANIMAL WELFARE

**Title:** Comparison of Management Factors Affecting Aggression in Group Housed Sows -  
**NPB # 05-067**

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### Abstract

A study was conducted using 18 groups of 16 sows each to study the aggression and injuries resulting from group formation in an 80m<sup>2</sup> pen after breeding. The treatments (3-4 groups/treatment) included 'Control', 'Familiar' (previously housed together), 'Dominant' (regrouped with three dominant sows to the study animals), 'Exposed' (mixed for 48h prior to being stalled for breeding), and 'Protected' (access to protective stalls). Data were analyzed using Proc Mixed in SAS with group as the experimental unit. Overall, the number of fights and injuries did not differ among the treatments. Salivary cortisol concentration also did not differ among the treatments. More fights tended to occur on the first day of regrouping compared to the following two days (Day 1: 10.2, Day 2: 4.7, Day 3: 7.5; P<0.1). The duration of fights also decreased over time, with the longest fights occurring on the first day (Day 1: 17.3s, Day 2: 5.9s, Day 3: 3.6s; P<0.05). At 24h post-regrouping, injuries were greater in the Control (5.0) and Dominant (4.9) compared to the Exposed (3.4) (P<0.05), and tended to be greater than in the Familiar (3.8) treatment (P<0.1). At 48 and 72h post-regrouping, injuries were greater in the Control (5.3) compared to Dominant (3.9), Exposed (3.3), Familiar (3.3) and Protected (3.9) (P<0.05). After 10d, injuries were greatest in the Control (3.1) and Dominant (3.2) compared to the Exposed (2.0), Familiar (2.2) and Protected (1.9) treatments (P<0.05). Cortisol increased following regrouping, and remained higher than pre-regrouping values (Pre:3.9nmol/L, Post-24h:5.9nmol/L, Post-48h:6.6nmol/L, Post-72h:5.6nmol/L, Post-10d:6.5nmol/L; P<0.05). Although there were no overall treatment effects on the measured variables, differences in injuries appeared over time. This could indicate that more subtle aggression and chronic stress persisted in the Control and Dominant treatments, and social stability occurred faster in the Familiar and Exposed treatments. Overt fighting persisted in the Protected treatment, even though injuries decreased over time.

### Introduction

Group housing of sows during gestation involves some degree of aggression when the groups are formed. Although short-lived, this aggression results in scratches to the animals and is cited as a welfare concern for group housing systems. Previous work in our lab has indicated that regrouping within a few days of breeding, as opposed to waiting for several weeks to regroup, results in a depression in farrowing rate. It is believed that

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this depression in reproductive performance results from the stress associated with regrouping, including that of aggression. Livestock producers are able to select which animals are grouped together on their farms and it may be possible to manage the aggression at regrouping using specific social combinations. In this study we created experimental social conditions through a combination of animal selection and environmental control. Our goal was to reduce the intensity and duration of regrouping aggression in recently bred sows. If one or more treatments proved to be successful in reducing aggression, it is hypothesized that it could have a beneficial effect on reproductive performance as well as improving the animals' welfare.

## **Objectives**

The overall objective was to reduce the level of aggression among sows regrouped within a few days of breeding. Specific objectives were to compare social behaviour, in terms of fighting and resulting injuries, among five experimental treatments:

- Control groups comprised of predominantly unacquainted animals vs.:
- Sows regrouped in the presence of socially dominant animals;
- Sows provided with protected lying areas during regrouping;
- Sows that were temporarily grouped together prior to breeding; and
- Sows that were already acquainted with each other.

## **Materials and Methods**

The standard experimental paradigm consisted of a group of 16 bred sows. All animals had spent a minimum of 6 weeks of the previous gestation in group housing, being fed by means of an electronic sow feeder (ESF). Farrowing was in individual farrowing crates, and unless otherwise noted, animals were weaned (at 19±3 days post-partum) into individual stalls for breeding. Regrouping at 11 days post-weaning, and subsequent observations occurred in a mixing pen providing approximately 80 m<sup>2</sup> of partially slatted floor in thermoneutral conditions. The pen was equipped with a single ESF station identical to that provided during the previous gestation.

Unless otherwise noted in treatment specifications, each group consisted of approximately equal numbers of parity 1-2 (Young) and 3-6 (Old) animals, and less than 50% of all social dyads within the group were familiar with each other based on sharing a pen during the previous gestation. The largest group of sows originating from the same previous gestation group were designated as Acquainted, while those from smaller groups were referred to as Unacquainted.

The experimental social treatments applied to the groups were:

- Control, group formed as above;
- Familiar, comprised entirely of sows from the same previous gestation group (all Acquainted);
- Dominant, comprised of a standard group of sows and three socially dominant animals that were large (5<sup>th</sup> parity or higher), had been housed together for at least 6 weeks, and well acquainted with the mixing pen;
- Protected, comprised of a standard group of sows but provided with 7 free-access half-stalls to provide protection to their head and shoulders; and,
- Exposed, comprised of a standard group of sows except that they had been weaned directly into the mixing pen and kept there for 48 hours before being moved to the breeding stall.

The animals were video-taped for 72 hours following regrouping. Initial screening of the tapes indicated that aggression occurred primarily during the light portion of each day (12:12 light:dim), and observations were subsequently confined to the period of 10:00 – 16:00 each day. Within each group, 6-8 focal animals were designated and observed continuously during periods of observations. To the extent possible, the focal animals

represented a factorial combination of Young vs Old and Acquainted vs Unacquainted sows. Aggression was summarized as number of aggressive events, the total duration of aggression, and the most intensive form of aggression evidenced by each focal sow.

All animals were assessed for injuries (fresh scratches) prior to, at 24 hr, 48 hr, 72 hr and 10 days after regrouping. A scratch was considered to be fresh if it was red, either from vascular exposure or from inflammation present during healing. Scratches were assessed using the methodology of Hodgkiss et al. (1998), which combines scores of 0-3 from 12 regions of the body.

Saliva samples were obtained from focal sows in each treatment on the same days that injuries were assessed: prior to, at 24 hr, 48 hr, 72 hr, and 10 days after regrouping. Saliva was collected using absorbent cotton swabs, removed by centrifugation, frozen and then analyzed by radioimmunoassay (Cook et al. 1996).

Initially designed to provide 4 experimental groups per treatment, two groups had to be eliminated due to equipment malfunction. The resulting 18 groups represented 3-4 replicates of each of the experimental treatments.

## Results

The incidence of aggression and injuries among the five social management treatments are presented in Table 1. On the first day of regrouping, the Familiar treatment, in which all animals in the group had spent the previous gestation together had similar numbers of fights as the Control ( $P>0.05$ ), but those fights had a significantly shorter duration ( $P<0.05$ ) compared to the Control. In addition, the average length of an aggressive event was less in the Familiar treatment (approx. 4 sec per event) compared to the other treatments (approx. 10 sec per event). Although sows in Familiar groups engage in some aggression, the fights are short and probably represent reinforcement of social position rather than the establishment. Likewise, the average length of events in the Control group decreased over the three days, also indicative of the reinforcement rather than establishment of social status on the 2<sup>nd</sup> and 3<sup>rd</sup> days. More injuries ( $P<0.05$ ) occurred in the Control treatment than in the Familiar treatment.

The Dominant treatment, which involved the presence of three older animals from a well established social order, did not differ significantly from the Control treatment ( $P>0.05$ ) with respect to number and duration of fights. Although there were more injuries ( $P<0.05$ ) occurring in the Control treatment on the second and third days after regrouping, there are no differences ( $P>0.05$ ) in injuries at 10 days after regrouping. The concept behind this treatment is that sows would avoid initiating aggression when in the presence of a clearly dominant individual. Although this concept has been shown to be effective in finishing pigs, whose aggression was suppressed by the presence of a boar (Grandin and Bruning, 1992), it was less effective when used with gilts (Luescher et al., 1990).

The Exposed treatment, in which the sows had spent 48 hrs together after weaning but before being stalled for breeding, did not reduce the incidence of aggression compared to the Control group ( $P>0.05$ ). However, the level of injuries was reduced. A variation of this management method (a 4-day exposure rather than two) has been shown effective in reducing aggression if the length of subsequent stalling was only 7 days, compared to 28 (Hoy and Bauer, 2005). Perhaps only a weak social order was established due to the pre-exposure.

This study confirmed the ineffectiveness of protective stalling on the aggression among regrouped sows. More fights ( $P<0.05$ ) continued to occur on the third day after regrouping, compared to the other four treatments. However, fewer injuries ( $P<0.05$ ) occurred compared to the Control and Dominant treatments. This could indicate that sows escape to the protective stalls before the end of the fight when the winner and loser are established. This could result in the hierarchy never being properly established, and therefore aggression

persisted in this treatment. Although McGlone and Curtis (1985) reported that weanling pigs used such protective areas to avoid aggression and reduce injuries, Luescher et al. (1990) reported higher levels of injuries among sows on a similar treatment.

There were no differences in overall salivary cortisol concentration among the five treatments (Table 1). However, there were differences in cortisol levels on different days, with the lowest concentration prior to regrouping and the highest concentrations on all the days following regrouping (Table 2).

## **Discussion**

The results of this study would suggest that the most effective means of reducing regrouping aggression is to maintain sows in similar groups from gestation to gestation. There are limitations to this approach as new females must be introduced to the herd and animals that fail to re-breed with their cohorts may be shifted to another group. Pre-exposing animals to each other prior to breeding, did not result in a reduced aggression compared to the Control treatment, but did result in fewer injuries. This could indicate that the aggression, although similar in the amount observed, could have differed in intensity. The short period of pre-exposure used in this study may have only accomplished a weak social order that required additional establishment after the subsequent regrouping. The dominant treatment did not differ much from the Control. The Control and Dominant treatments both had more injuries than the other three treatments 10 days after regrouping. This suggests that more subtle aggression continued in these treatments, which could result in chronic stress. The provision of protection to sows during the regrouping period resulted in aggression persisting, with more fights occurring on the third day, but with fewer injuries resulting. This suggests that when a fight starts, a sow could escape without many injuries, but the fight is left unresolved. Therefore, fights continue in order attempt to establish the hierarchy.

The stress associated with regrouping aggression, if regrouping occurs approximately a week after breeding, can lower conception rates by 4%. Thus some animals are particularly sensitive to this stress, or experience a substantially greater amount of stress than their group members, and fail to achieve or maintain pregnancy. The number of animals per treatment in this study was inadequate to statistically assess the effect of treatment on reproductive performance. However, two of the methods examined appear to have some potential to reduce regrouping aggression, or the intensity of aggression, and presumably the associated stress.

The cortisol concentrations indicate that sows in all the treatments experienced stress during the days following regrouping.

## **Lay Interpretation**

If sows are maintained in similar groups from gestation to gestation, aggression is reduced compared to the other regrouping strategies tested. However, this method would not always be practical. When sows were exposed to each other before breeding, aggression was similar to the control, but injuries were less. This suggests that pre-exposure may create a weak social bond, but the hierarchy still needs to be established. Providing protection during regrouping resulted in more fights, but fewer injuries, suggesting that being able to escape from fights, could prevent the establishment of a stable hierarchy. Having dominant sows in the group may result in more subtle aggression and chronic stress persisting within the group.

## **References**

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Table 1: Incidence of aggression and injuries among regrouped sows on five social management treatments.

Item	Social Treatment					SEM
	Control	Dominant	Exposed	Protected	Familiar	
<b>Fighting (#/6 hrs)</b>						
Overall	6.4	4.3	5.7	9.0	5.7	3.0
1 <sup>st</sup> day	9.1 <sup>a</sup>	5.8 <sup>a</sup>	8.6 <sup>a</sup>	17.5 <sup>b</sup>	10.8 <sup>ab</sup>	3.5
2 <sup>nd</sup> day	3.9	3.1	6.3	6.5	2.9	3.4
3 <sup>rd</sup> day	3.7 <sup>a</sup>	3.9 <sup>a</sup>	5.8 <sup>a</sup>	17.7 <sup>b</sup>	3.5 <sup>a</sup>	3.5
<b>Duration (sec/6hrs)</b>						
Overall	59 <sup>a</sup>	48 <sup>a</sup>	71 <sup>ab</sup>	105 <sup>b</sup>	21 <sup>a</sup>	32.3
1 <sup>st</sup> day	156 <sup>a</sup>	86 <sup>ab</sup>	119 <sup>a</sup>	195 <sup>a</sup>	45 <sup>b</sup>	40.3
2 <sup>nd</sup> day	13	32	65	44	11	39.0
3 <sup>rd</sup> day	9	28	34	87	8	41.2
<b>Injuries (Total Score)</b>						
Pre	1.9	2.1	1.2	1.3	1.9	1.0
24 h	5.0 <sup>a</sup>	4.9 <sup>a</sup>	3.4 <sup>b</sup>	4.3 <sup>ab</sup>	3.8 <sup>b</sup>	1.0
48 h	5.3 <sup>a</sup>	4.0 <sup>b</sup>	3.3 <sup>b</sup>	3.9 <sup>b</sup>	3.3 <sup>b</sup>	1.0
72 h	4.7 <sup>a</sup>	3.2 <sup>b</sup>	2.7 <sup>b</sup>	2.9 <sup>b</sup>	2.5 <sup>b</sup>	1.0
10 d	3.1 <sup>a</sup>	3.2 <sup>a</sup>	2.0 <sup>b</sup>	1.9 <sup>b</sup>	2.2 <sup>b</sup>	1.0
<b>Cortisol (nmol/L)</b>						
Overall	5.9	7.2	5.6	5.8	3.9	1.0

<sup>a,b</sup>Means in the same row not sharing a letter are different at (P<0.05)

Table 2: Salivary cortisol concentration according to the day prior to and days following regrouping

Item	Day					SEM
	Pre	24 hr	48 hr	72 hr	10 days	
Cortisol (nmol/L)	3.9 <sup>a</sup>	5.9 <sup>b</sup>	6.6 <sup>b</sup>	5.6 <sup>b</sup>	6.5 <sup>b</sup>	1.5

<sup>a,b</sup>Means in the same row not sharing a letter are different at (P<0.01)