Reducing Aggression in Pigs at Mixing by means of Environmental and Genetic Selection Tools

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Introduction

In commercial production systems, abrupt mixing of pigs commonly results in aggression to establish social ranking (Turner *et al.*, 2008). While mixing is beneficial for the producer, enabling batch finishing and space efficiency, significant welfare implications exist (Bracke & Hopster, 2006; Turner *et al.*, 2009). Pigs exhibit physiological stress responses in association with aggression (Arey & Edwards, 1998). In addition to affecting production traits such as daily weight gain and meat quality, aggression typically causes superficial injuries, social stress and impaired immunity (D'Eath, 2002). This paper looks at research into the genetic components of aggression and administering a synthetic maternal pheromone at mixing to enhance welfare.

Discussion

A pilot study by Guy *et al.* (2009) investigated whether synthetic maternal pheromone application at mixing of weaned pigs affected aggression, skin lesion count, feed intake and growth performance under commercial production conditions. Large White X Landrace 28-day-old piglets were placed in groups receiving either control or pheromone treatment (n=16 replicate pens of 20 pigs), where two litters were mixed per group and behaviour measured through direct and indirect observations. Skin lesions were recorded to enable associations between their number and treatment received. Contrary to earlier studies, no significant differences were reported in feed intake and growth performance between treatments (Guy *et al.*, 2009; McGlone & Anderson, 2002). However, in pheromone-treated pens, 25% less time was spent fighting than in control groups. Skin lesions at post-mixing recordings were also significantly lower in these pens. Although this study's power was reduced by limited replications and reliance on subjective behaviour measurements, the results highlight maternal pheromone application's potential as an economically viable method to reduce aggression at mixing (Guy *et al.*, 2009). While manipulation of olfactory environments has previously been investigated, it often results in postponement of aggressive behaviours rather than reduction (Arey & Edwards, 1998). In contrast, Guy *et al.* (2009) found that mounting behaviours replaced aggression, which indicates faster formation of a stable social hierarchy. Maternal pheromones may signal a larger dominant pig's presence or provide an analogue of familiarity at weaning. That said, the current study failed to evaluate the stress of mounting behaviours (Dudlink *et al.*, 2006). Consequently, assessment by larger studies on weaners and older pigs is necessary to determine maternal pheromone's usefulness at mixing.

These environmental changes to reduce aggression may be complemented by selection against aggressiveness, a stable trait in pigs, but this may be influenced by genetic selection (D'Eath *et al.*, 2009). Turner *et al.* (2009) aimed to describe a means of selecting against aggressiveness by estimating genetic correlations between post-mixing skin lesions and aggressive behaviour. Yorkshire and Yorkshire X Landrace pigs (n=1663) of known dam-line pedigree were placed in pens under commercial production conditions. Similarly to Guy *et al.* (2009), recent lesions received to specific body regions were counted. Using time-lapse video, three behavioural traits were also measured: reciprocal fighting and delivery and receipt of non-reciprocal aggression (NRA). Moderate heritabilities of reciprocal aggression and delivery of NRA were found, with strong genetic correlations between these traits (h^2=0.84), indicating a common genetic basis that may be affected by selection (Turner *et al.*, 2009). Heritability of these behaviours was consistent with previous studies (Turner *et al.*, 2008). Post-mixing lesions predicted numbers received under more stable social conditions, demonstrating that selection would affect aggression long-term (Turner *et al.*, 2009).

Lesion location emerged as a useful indicator of aggressive behaviour. While anterior lesions were associated with reciprocal fighting, central and caudal lesions principally indicated receipt of NRA. Further, central and caudal lesions were highly correlated (genetic correlation, r_g=0.98) and thus captured the same trait. Therefore, to formulate a selection index, anterior, and central or caudal lesions, may be used to select against aggressive animals (Turner *et al*., 2009). Selection methods without using correlated traits, such as lesion counts, are typically labour intensive (Turner *et al*., 2008). The ability to use a practical, easily measurable selection tool against aggressiveness in pigs would be highly beneficial in commercial production systems to improve welfare (Turner *et al*., 2009). The fact that aggressiveness is of moderate heritability and effects of genetic selection are not immediate, highlights the need to continue to uncover additional environmental strategies to reduce aggression-related stress in commercial production systems.

Although selection against aggressiveness may produce pigs better suited to commercial production systems, the effect of selection on other genetically correlated traits is an important consideration before its implementation. D'Eath *et al.* (2009) similarly explored the genetic basis of aggression, but sought to determine genetic associations between mixing-related aggression as well as pen activity and responses to handling at weighing. This study was conducted concurrently on the same subjects as those in Turner *et al.* (2009) and consequently pigs were housed under identical conditions. Using time-lapse video, D'Eath *et al.* (2009) monitored pen activity and aggressive behaviour. A subjective scoring system was employed on handling at weighing. Like Turner *et al.* (2009), this study reported moderate heritability of aggression. Levels of pen activity were not genetically correlated with aggression, suggesting that selection to reduce aggression would not alter activity levels (D'Eath *et al*., 2009).

In contrast, heritability of response to handling was significant (h^2=0.03 - 0.17) and aggressiveness at mixing was associated with higher activity levels during the final handling. Selection against aggression may cause decreased activity during physical restraint (D'Eath *et al*., 2009). This may indicate lower fear levels, and thus enhanced welfare, as fear during handling often manifests as rapid exit from weighing crates. Validation by additional studies is required, nevertheless, as some pigs show decreased activity in response to heightened fear. Reduced activity during handling may necessitate increased labour input; handling can be stressful so has welfare implications (Lewis & McGlone, 2007).

Conclusion

Strategies to reduce aggression at mixing need to combine both environmental strategies and genetic selection tools to enhance welfare of pigs in commercial contexts where mixing occurs. Recent studies describing heritability and effects of genetic selection against aggressiveness highlight the need for practical environmental modifications, for example, maternal pheromone application, to alleviate short-term aggression-related stresses.

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