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Impact of the social environment on the welfare and meat quality of pigs in entire male production systems



Key external stakeholders:

Pigmeat processors, pig producers, consumers

Practical implications for stakeholders:

- The social environment can influence aggression and sexual behaviour in pigs with resulting welfare improvements. Although these do not translate into improved growth performance or carcass traits they can be easily and cheaply adopted by producers and could contribute towards reduced veterinary bills
- We found little evidence that boar taint levels can be modified by changes to the pigs social environment. This means that immunocastration remains the most promising method of controlling boar taint in the future
- Bruising to the loins resulting in the downgrading of pigmeat products and financial losses to pigmeat processors could be reduced by the adoption of practices to reduce mounting behaviour in entire male pigs by producers

Main results:

- In restrictively fed pigs split marketing reduces aggression at feeding by increasing trough space allowance; this does not improve growth performance although carcass variation is reduced
- Pig welfare is improved (mounting behaviour and resulting skin damage reduced) in mixed sex compared to all-male pens but growth performance is not affected
- Reductions in aggression and sexual (i.e. mounting) behaviour arising from manipulation of the pigs social environment have little beneficial impact on growth performance of pigs or on boar taint levels in pigmeat

Opportunity / Benefit:

Teagasc in conjunction with WIT developed capabilities for measuring compounds responsible for boar taint in the meat of uncastrated male pigs using Gas Chromatography Mass Spectrometry (GC/MS) analysis. Further development of this technique will ensure that capabilities exist to examine the risks for boar taint of different management, nutritional etc. practices in pig production thereby helping to reduce the risk to consumers of purchasing boar tainted pigmeat. This project identified practical ways in which pig behaviour can be modified through changes to the animal's social environment. These can be easily and cheaply adopted by pig producers to benefit pig welfare.

Collaborating Institutions:

Queen's University Belfast, Northern Ireland
Agri-Food Biosciences Institute (AFBI), Hillsborough, Do. Down, Northern Ireland
Waterford institute of Technology (WIT)

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1. Project background:

In Ireland male pigs are not castrated which is advantageous for their welfare. However, the trend towards higher slaughter weights means that entire male pigs are sexually mature at the end of the finishing period. The intense aggressive and sexual behaviours they perform gives rise to a different, though no less serious, set of welfare problems, including stress and injury not only to the male pigs but also to the females they are housed with. Mounting is the main sexual behaviour performed by entire male pigs and where this is intense the loin area can be severely bruised. This results in increased trims and downgrading of product resulting in significant losses for pigmeat processors. Sexual and aggressive behaviour is also associated with the production in the males of androstenedione, a steroid hormone, and one of two main compounds responsible for boar taint. This is an offensive smell and taste that emanates from the meat of entire male pigs when it is cooked. Consumers who experience boar taint are unlikely to purchase the product again so the problem seriously threatens our export markets. The fact that male piglets are not castrated gives the Irish pig industry an important welfare advantage over its European competitors. However, this advantage can only be exploited in our export markets if the problems of boar taint and welfare issues for pigs in entire male production systems are addressed.

There are potentially 3 options for addressing these problems. The first is castrate male piglets. However, surgical castration is unlikely to be re-introduced to Ireland as even with modern genotypes, boars still grow more efficiently making them more profitable to rear than castrates. In any case, castration of young pigs is controversial and is soon likely to be limited in the EU to circumstances where analgesics and/or anaesthetics are employed. Immunocastration offers the most promising solution for the future as it addresses the problems of boar taint, aggression and sexual behaviour without the need for painful surgery. However, there are doubts as to whether the practice will be acceptable to pigmeat consumers in the EU owing to the perception that hormones are involved in the process. The third option is to manipulate housing/grouping and marketing strategies to try to reduce the problems of sexual and aggressive behaviour and thereby reduce boar taint. This was the focus of the current project.

2. Questions addressed by the project:

- What are the implications for growth performance and carcass traits of increasing the slaughter weights of entire male and female pigs?
- Are the aggressive and sexual behaviours performed by heavy entire male pigs influenced by the social environment?
- Are growth performance and carcass traits influenced by the pigs social environment?
- Does the pigs social environment influence boar taint levels?
- Is aggressive behaviour affected by removing pigs from an established group of pigs?

3. The experimental studies:

In the first study the effect of 3 slaughter weights (80, 100 and 105kg) on behaviour, growth performance and carcass traits of entire male and female pigs was assessed. In the 2nd study 200 hundred pigs were grouped according to within group weight variation (high vs low variation) and group gender composition (all male vs mixed gender) until slaughter at 21 weeks of age (c. 90kg). The 3rd study aimed at evaluating a split marketing (SM) strategy whereby some pigs in a pen are slaughtered earlier than the others. Twenty-eight single sex groups of 14 pigs were assigned to one of 4 treatments: Male Split, Female Split, Male Control and Female Control. In the control groups all pigs were slaughtered after 6 weeks on trial (c. 105kg) whereas the 3 heaviest pigs were slaughtered 2 weeks earlier in the SM groups. In both of these studies pig behaviour, growth performance, carcass traits and boar taint was measured. The objective of the 4th study was to determine the effect of the removal of the heaviest growing pigs on the dominance hierarchy in the remaining pigs. At 6 weeks of age 64 pigs were assigned to 4 groups of 8 females and four groups of eight males. Aggressive behaviour was recorded 5 days after grouping and pigs were subjected to a feed competition test after 18 hours of food deprivation. A dominance score was calculated for each pig according to the no. of pigs it displaced and the number of pigs that displaced it.

4. Main results:

The implications of mixed versus all-male groups for aggression depend on the feeding system in use. No effect on aggression was detected when pigs were fed *ad libitum* probably because this system is not associated with much competition between pigs for access to food. However, there are lower levels of aggression in mixed compared to all-male groups when pigs are fed restrictively i.e. a highly competitive feeding system (Boyle and Bjorklund, 2007). Furthermore, pig welfare is improved in mixed sex compared to all-male pens because of the lower overall rates of mounting and consequent benefits for skin health. In spite of these (potential) welfare benefits we do not wish to change previous recommendations (e.g. O'Connell and Lawlor, 2005; Teagasc Pig Conference) that pigs should be kept in single sex groups to facilitate feeding gender appropriate diets. The reasons for this are as follows:

- The experiment looking at different target slaughter weights showed that females are less efficient than males at converting feed into body weight at the heavier weights confirming that they have different nutritional requirements to males at heavier weights. Feed efficiency is crucial to profitability in this era of escalating feed costs and this can only be achieved by splitting the genders into single sex groups and feeding gender appropriate diets.
- Although there are welfare advantages for pigs in mixed sex groups these mostly benefit the males; females are generally better off in all-female groups where they are not exposed to any mounting by males.
- In spite of the welfare improvements for males in mixed sex groups there were no associated improvements in growth performance or carcass quality and most importantly no reduction in boar taint levels which weakens the case for keeping pigs in mixed sex groups.

So in spite of the increased workload we should strive to house males and females separately so that gender specific diets can be fed. We must look to some of the other strategies investigated in this project to improve the welfare of heavy finisher pigs, particularly the entire males.

The strategy of creating groups with high weight variation in an attempt to reduce aggression did not work. If the variation between pig weights had been greater the pigs may have been better able to establish the dominance hierarchy without aggression. However, the variation seen in slaughter and carcass weights would have worsened. Clearly this is undesirable as the risk of incurring penalties imposed by the slaughter plants for pigs outside the desirable weight range is increased. On the other hand, while grouping pigs uniformly led to reduced within group variability in slaughter and carcass weights this strategy led to more injuries among the males reared in single sex groups. The potential implications for entire males of housing in all-male groups of differing degrees of weight variation requires more investigation.

Behavioural patterns of pigs in studies 1 and 3 indicated that there was a lot of competition for access to the trough at the heavier weights. This was in spite of the trough space allowance per pig being 367mm. This is considerably higher than the 280-300mm feeder space allowance recommended for pigs between 90-120kg. SM resulted in a significant reduction in feeding related aggression because the removal of the 3 heaviest pigs increased the trough space allowance of those pigs remaining. These findings indicate that trough space allowances for heavy pigs should be revised upwards and that SM is a successful marketing strategy to improve the welfare of heavy pigs in entire male production systems. Unfortunately the reduction in feeding related aggression arising from SM did not result in a reduction in boar taint. However, SM also reduced within pen variation in carcass weight thereby reducing the risk of incurring penalties for pigs outside the desirable weight range.

SM not only increases the trough space but also the floor space allowance of pigs which is normally considered positive for pig welfare. However, we considered that the male pigs may have spent longer fighting outside of the feeding times because they had more floor space. The findings of Study 4 disputed this and confirmed that SM probably caused pigs to spend longer fighting because they were trying to re-establish the dominance hierarchy which had been disrupted following removal of the heaviest animals. We do not think that the associated stress would override the benefits arising from SM in terms of reducing feeding related aggression. In Study 4 the dramatic increase seen in aggression following removal of two pigs from a pen has important practical implications. It means that in addition to limiting re-mixing of pigs, producers should try to limit the removal of pigs from established groups to avoid stress unless absolutely necessary e.g. because of tail biting.

It must be stressed that these findings were based on only one removal of 25% of the pigs from the group. Repeated removal of pigs from a group as might occur with very high weight variation groups, might lead to

a very different response in terms of behaviour and performance. Furthermore, small numbers of removed pigs will be exposed to more unfamiliar animals during transport and lairage than if marketed on per pen basis and this will have negative implications for their welfare.

5. Opportunity/Benefit:

Teagasc in conjunction with WIT developed capabilities for measuring compounds responsible for boar taint in the meat of uncastrated male pigs using Gas Chromatography Mass Spectrometry (GC/MS) analysis. Further development of this technique will ensure that capabilities exist to examine the risks for boar taint of different management, nutritional etc. practices in pig production thereby helping to reduce the risk to consumers of purchasing boar tainted pigmeat. This project identified practical ways in which pig behaviour can be modified through changes to the animal's social environment. These can be easily and cheaply adopted by pig producers to benefit pig welfare but they will have limited implications for the problem of boar tainted meat.

6. Dissemination:

Main publications:

Conte, S., Boyle, L.A., O'Connell, N.E., Lynch, P.B., and Lawlor P.G. 2011. Effect of target slaughter weight on production efficiency, carcass traits and behaviour of restrictively-fed gilts and intact male finisher pigs. *Livestock Science* 136: 169-174.

Conte, S., O'Connell, N.E., Lawlor P.G., and Boyle, L.A. 2011. Effect of split marketing on the welfare, performance and carcass traits of finishing pigs. *Journal of Animal Science* doi:10.2527/jas.2010-3453.

Boyle, L.A., Lawlor, P.G., Conte, S. and O'Connell, N.E. 2010. Grouping and slaughter management of entire male pigs. *TResearch*, 5 (1), Spring 2010. pgs. 32-33.

Conte, S., O'Connell, N.E., Lawlor, P.G. and Boyle, L.A. 2010. Behavioural implications of grouping and marketing strategies for entire male pigs. Meeting of the EAAP Working Group on the Production and Utilisation of Meat from Entire Male Pigs, Bristol, UK, 18th March 2010. p. 24.

Conte, S., Boyle, L.A., Lawlor, P.G. and O'Connell, N.E. 2010. Influence of within pen gender composition and weight variation on the welfare and growth performance of finishing pigs. In: *Advances in Animal Biosciences. Proceedings of the BSAS and the Agricultural Research Forum, Belfast, 12th April 2010.* p. 184.

Boyle, L.A., Conte, S. and Lawlor, P.G. 2009. Rearing entire male pigs. In: *Proceedings of the Teagasc Pig Farmer's Conference, Cavan, 10th November 2009.* p.9.

Conte, S., Lawlor, P.G., Lynch, P.B., O'Connell, N.E. and Boyle, L.A. 2009. Effects of split marketing on agonistic behaviour and carcass characteristics of entire male pigs and gilts in a restricted feeding system. In: *Proceedings of the 43rd Annual Congress of the ISAE, Cairns, Australia, 6th July 2009.* p. 51.

Conte, S., O'Connell, N.E., Lawlor, P.G., Lynch, P.B. and Boyle, L.A. 2009. Effect of split marketing on performance and carcass characteristics of heavy entire male pigs. In: *Proceedings of the Agricultural Research Forum, Tullamore, Co. Offaly, 12th March 2009* p.28.

Conte, S., Lawlor, P., O'Connell, N.E. and Boyle, L.A. 2008. Behaviour of gilts and entire male pigs at the end of the finishing period in a restricted feeding system. In: *Proceedings of the 42nd Congress of the International Society for Applied Ethology, UCD, Dublin, Ireland. 5-9th August 2008.* p. 189.

Conte, S., Lawlor, P., O'Connell, N.E. and Boyle, L.A. 2008. Behaviour of gilts and entire male pigs at the end of the finishing period in a restricted feeding system. In: *Proceedings of the EAAP Working Group meeting on Production and Utilisation of Meat from Entire Male Pigs. Monells, Girona, Spain, 26-27th March.*

Popular publications:

Housing pigs in mixed sex groups could reduce aggressive behaviour

Sarah Trickett, *Farmers Weekly*, 19th April 2010

<http://www.fwi.co.uk/Articles/2010/04/19/120847/Housing-pigs-in-mixed-sexed-groups-at-finishing-could-reduce-aggressive.htm>

7. Compiled by: Dr. Laura Boyle