Question to EURCAW-Pigs
30 June 2020

Question
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EURCAW-Pigs received the following question from a welfare policy worker in one of the Member States:

What is the current scientific knowledge on the space needed by mature (service) boars when kept in groups?

Answer
Several EURCAW experts contributed to the response below. The EURCAW secretariat did the final editing, and may be contacted for queries: info.pigs@eurcaw.eu.

In short, the answer is:

1. Under natural conditions, juvenile boars live in small groups, whereas mature boars lead a solitary life.
2. Even fully acquainted boars show agonistic behaviour such as fighting and biting and more sexual behaviour such as mounting compared to female or castrated pigs. Agonistic behaviour additionally occurs if access to resources such as food is restricted.
3. Mounting and agonistic behaviour can be stressful to the animals and often results in skin lesions and injuries. These Animal Based Measures should continuously be monitored, and remedial actions taken if sudden rises or consistent high levels occur.
4. Scientific results suggest that space allocated for individual service boars for lying in full recumbency should be at least 2.5 m^2. Space for defecating, feeding and exercise is also needed. The total minimum space allowance referred to in the European legislation of 6 m^2 per individually housed boar seems reasonable.
5. Group housed boars will share dunging and exercise space. However, in order to avoid poor welfare resulting from agonistic and sexual behaviour, additional space to perform or avoid these behaviours should be offered. Minimum values cannot be calculated scientifically, so again the provision of 6m^2 per animal seems reasonable.
6. Unacquainted adult boars should not be grouped together.

Background
Social and agonistic behaviour
Juvenile boars naturally leave the social group at approximately 7-8 months of age. Whereas small groups of two or three young boars may exist during the non-breeding season, adult boars lead an increasingly solitary life and only join the sow and offspring group during mating season (Gonyou, 2001). Under commercial housing conditions, boars are kept for slaughter of entire male pigs or for breeding. Entire male pigs for finishing, compared to female and castrated male pigs, show an overall higher behavioural activity (Cronin et al., 2003; Baumgartner et al., 2010; Fàbrega et al., 2010). Furthermore, they also show more agonistic behaviour than castrated males (Cronin et al., 2003; Fredriksen et al, 2008; Bünger et al., 2014) and female pigs (Boyle and Björkl, 2007). Bünger et al. (2014) observed in entire male pigs in pure sex groups more frequent

riding and more agonistic interactions than in mixed-sex groups. Studies carried out by Bünger et al. (2014) revealed that there are specific correlations between agonistic behaviour and injuries on certain parts of the body, for example between bites and injuries on the neck or between riding and lesions in the regions "back" and "ham" allowing conclusions on different kind of agonistic behaviour. Furthermore, studies of Salmon and Edwards (2006) revealed that sexual behaviour was less prominent in compartments where both entire male pigs and sows were housed in separate pens but in direct proximity.

Agonistic interactions are shown in newly mixed groups when pigs establish their social relationships. In addition, agonistic interactions occur whenever access to resources is restricted and, thus, also depend on husbandry factors such as the feeding method (Boyle and Björklund, 2007). Ad libitum feeding is essential for reducing the risk of fighting amongst entire male pigs housed in groups (Beilharz and Cox, 1967). To allow social and sexual behaviour with minimised risks for injuries, housing conditions for entire male pigs should provide sufficient space or visual barriers such as partitions within the pen for submissive animals to escape or hide (Ewbank and Bryant, 1972).

Breeding farms in general only have a few boars at their disposal which are kept most often in single pens according to Annex I Chapter II of the Council Regulation EC/2008/120 (minimum 6 m^2). However, on farms for artificial insemination (A. I.- centres), several hundred boars are kept in crates or in pens either with a partially slatted floor or with straw bedding Bruininx et al. (1998). If kept in littered pens, they are usually housed in small single-sex groups until first mating. However, boars' need for individual penning increases as the animals age. The decision whether male pigs will be utilised for breeding is usually made between an age of 6 and 24 months depending on their rating as intended breeding boars. In general, regrouping of post-pubertal boars results in a large amount of fighting and is generally avoided (Gonyou, 2001).

The space needed by pigs depends on their seize/weight. For young boars weighing > 110 kg housed in groups, the minimum space allowance required for different lying postures can be calculated using a formula developed for finishing pigs by Petherick (1983) and by Ekkel et al. (2003). The minimum space allowance required for a pig lying in full lateral recumbency can be estimated by the following formula:

$$\text{Area} = 0.047 \times W^{2/3}$$

W = live bodyweight of the pig

A mature boar after puberty will weigh between 250 and 400 kg. Thus, the space required by mature boars of 250 kg to allow for lying in lateral recumbency is at least 1.8 m^2. For a boar weighing 400 kg, the minimum space required is at least 2.45 m^2. However, this space is required just to ensure that the boars will be able to lie in full recumbency. This by itself is insufficient for boars in pens. Related to this, Spoolder et al (2009) discussed the behavioural space occupied by adult sows during activities such as feeding and dunging. Also relevant is to estimate what space is required to get access to the area were the behavior (feeding, dunging) is performed. Exact figures on the behavioural space needed by boars are lacking, and should be linked to the design of the pen including its functional areas. Bruininx et al. (1998) illustrates this for housing of boars

held in single pens intended for artificial insemination, and argues that pens should be separated into different functional areas enabling e.g. lying and defecation at different places. Their study suggests that in single pens a lying area of 2.5 m^2 is sufficient for totally recumbent lying which, based on a total floor space of at least 6 m^2 per boar, implies 40% solid floor. For optimal health (minimal leg and skin lesions and minimal dirtiness) and possibly also for sperm quality the use of straw on the pen floor is recommended in this study.

Space allowances for group housed sows need to take space for social interactions into account. Interaction space requirements are the most difficult to estimate. Behavioural interactions are, for example mating, fighting and fleeing. Baxter (1985) estimated the amount of space adult sows need when engaging in a two sided fight to be $0.11*W^{2/3}$. This equates to 3.8m^2 for a fight between two 200 kg sows. Obviously, the amount of space required for these behaviours depends on the frequency of occurrence and level of concurrence in a group of animals.
The absolute distances for flight can be quite large. Edwards et al. (1986) observed in a large group house system that although 75% of interactions were associated with a chase of 2.5m or less, there were also instances that sows were pursued for more than 20 m. In a mixing pen of 18×10.5 m, Kay et al. (1999) found that 50% of flight distances were <4.7 m, 95% <13.6 m and 4% >20 m. (Cited from Spoolder et al., 2009).
Nevertheless, the grouping and hierarchy establishment between unfamiliar boars is far more stressful and is associated with severe welfare problems, compared to that of sows. It should be avoided.

Legal requirements
According to the Council Directive 2008/120/EC pigs from 10 weeks to slaughter or service are addressed as rearing pigs and minimum space allowance for pigs over 110 kg generally shall be at least 1.0 m^2 per pig. There are no particular legal requirements for mature boars weighing over 110 kg and mature boars specified as "intended for breeding".

Furthermore, the Council Directive 2008/120/EC, Art. 2) No 2 defines a 'boar' as a male pig after puberty, intended for breeding. According to Annex I Chapter II of the Council Directive 2008/120/EC boar pens must be sited and constructed so as to allow the boar to turn round and to hear, smell and see other pigs. The unobstructed floor area available to an adult boar must be at least 6.0 m^2. However, the Directive does not conclude whether this space requirement refers to boars kept in single pens or also for boars kept in groups.

Opposed to this, according to the Council Directive 2008/120/EC Art. 3 No 1 b), the unobstructed floor area available to each sow is at minimum 2.25 m^2 housed in groups of six to 39 animals. In smaller groups, 10% larger area must be added, in larger groups 10% less area may be offered per sow.

Conclusions
In general, based on the scientific knowledge on the behaviour of boars, special attention should be paid to the risks for lesions, injuries and stress due to their increased sexual and specific social behaviour when kept in groups. This accounts especially to (juvenile) boars that are not fully utilised as breeding boars. The risks for injuries and stress should be minimised by suitable measures such as sufficient space, sufficient access to resources and visual barriers. The amount

of space that is needed for groups of mature service boars is difficult to estimate, but will be substantially more than for sows due to greater social instability. A cut-off value for an adequate amount cannot be scientifically established, but the legal minimum of 6m^2 per animal does not seem unreasonable. Unfamiliar adult boars should not be grouped together.

Single housing of mature (service) boars is not in contradiction to their natural behaviour and group-housing should in general be avoided due to the risk of fighting and mounting. Given that breeding boars have a high market value, the keeper ought to be interested in applying "best practice" and thus maintaining a high level of welfare and health for juvenile and for service boars. In pens with clear separation of dunging, feeding and lying area a space of 6m^2 also to function well, although there is no clear scientific evidence for 6m^2 as a minimum required for good welfare.

In all cases, animal welfare issues of keeping entire male pigs can best be evaluated by assessing scientifically validated animal-based indicators e.g. skin lesions, agonistic behaviours and lameness (see reviews and factsheets EURCAW). Continued high levels or sudden increase should be a cause for concern.

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