Breeding for improved social behaviour

Domestic pigs are social animals that are highly adaptable to new environments and share many behavioural characteristics with wild boar, including social feeding, exploration, and hierarchy formation. In conventional pig production systems, pigs are typically kept in relatively large groups of 20-30, with restrictions on resources such as space and feed availability.

by Birgitte Ask,
Senior Scientist,
The Danish Pig Research Centre.
www.danbred.com

The groups typically consist of non-related individuals and the pigs are mixed with unfamiliar animals several times during their growth period. Social interactions, including competition for resources and dominance relationships, are therefore important aspects of a pig's life.

Some social behaviours are potentially damaging, for example, resulting in wounds on the ears and tail that may lead to infections. Similarly, aggressive fighting may be costly in terms of lesions or flank wounds and subsequent infections, but also in terms of energy consumption.

Damaging behaviours such as these may reduce welfare, as well as potentially resulting in reduced growth performance and increased fat deposition due to stress.

Heritability

Growth performance is heritable and is affected by the pig's own genes (direct genetic effects) and the genes of its group mates (social genetic effects).

Heritability is a measure that reflects the potential to change a population genetically through selective breeding, and the heritability for growth in pigs is generally reported to be in the range of 20-40%

When social genetic effects are taken into account, the heritability reputedly increases to 30-50%, or even higher. This may be due to genetic variation in behavioural traits such as aggressive behaviour and subsequent lesions, for which a heritability of between 4-43% has been reported.

Hope of breeding for pig sociability

The first methods used to breed for social genetic effects were developed back in the 1960s, and this 'group selection method' was proven in layer-hens in the 1990s. Considerable beneficial effects were observed as the prevalence of cannibalism was reduced by more than 50% in just the first generation of selection.

Similar success has been reported in pigs, where group selection not only resulted in improved rates of genetic gain for growth, but also in improved docility and reduced mortality. Such experimental results bring hope that the sociability of pigs may be improved through selective breeding.

Traditional individual breeding is based on the concept of measuring an individual pig's phenotypes (for example growth), and then selecting the individuals with the best phenotypes to be parents of the next generation.

However, this method is ineffective for social behaviours because they are complex and hard to measure objectively on a large scale. So far, the focus has been on quantifying and reducing the damaging consequences of social interactions. With individual selection, this implies selecting the pigs with, for example, the fewest tail bites or lesions.

These pigs were not on the receiving end of the damaging behaviour but may actually be the pigs that perform the damaging behaviour, where it would be more useful to select the pigs that do not perform the damaging behaviour.

Group selection has been a successful tool in achieving this in selection experiments, but in commercial breeding programmes where genetic gain is desired in multiple traits, it becomes more complicated. New genetic selection methodology that relies on social genetic effects on group mates may be used instead.

Some breeding companies have already attempted to implement this new method, but it has yet to be convincingly confirmed that it will improve either growth or social behaviour in crossbred pigs in conventional production herds.

Evidence that selection for social genetic effects on growth will improve growth in the offspring has so far been inconclusive.

A small Korean study indicated that it worked in purebred pigs, but a Dutch study showed that selecting pigs for high sociability did not result in a higher growth rate in the crossbred offspring.

There is, however, evidence that pigs that have a heritable beneficial effect on the growth of pen mates engage in less ear biting, have fewer tail injuries, and perform less aggressive biting.

Evidence of heritable social effects in pigs

Recent results from the Danish Pig Research Centre, which is in charge of the R&D of the DanBred breeding programme, now provide solid proof that genetic selection for social genetic effects on growth will in fact improve the growth of crossbreds.

A selection experiment involving 4,728 crossbred DanBred Yorkshire × DanBred Landrace finisher pigs from a total of 1,171 litters and kept in 273 groups was performed at a Danish production farm.

The pigs had been selected for either high or low social genetic effects for growth, and the results showed that selection efficacy was 37% with a 95% confidence interval of [-4, 78].

This means that the growth rate of each pig within a pen increased by on average 0.37g/day whenever the sum of its pen mates' social breeding values increased by 1g/day. The difference in growth rate across groups was up to 60g/day based on social breeding values alone.

The study also showed that the benefits of selection for social genetic effects are more pronounced in production herds with a relatively high uniformity in starting weight within the finisher pens. In other words, the growth of pigs in groups with such high uniformity increased by more than 0.37g/day.

This may be explained by body weight being a determinant of competitive ability in pigs.

The establishment and maintenance of dominance relationships is more likely to require the assessment of competitive ability through fighting in weight-matched pigs.

Future prospects for genetically social pigs

Two recent studies performed as part of the DanBred breeding programme showed that there are heritable social effects on growth in the DanBred breeds. If social genetic effects on growth are indeed a reflection of less damaging behaviours among pigs, then this additional genetic gain is also expected to lead to higher animal welfare in group-housed pigs.

The above-mentioned selection experiment will also verify whether social genetic effects on growth do reflect damaging behaviours.

In the experiment a number of behaviour traits were recorded, for example lesions (from fighting), ear bites, and tail bites.

The preliminary results show that the pigs in groups with high social breeding values had fewer ear bites and were also calmer than pigs in groups with low social breeding values.

Ideally, selection should be based on behavioural recordings rather than relying on the indirect measures of performance traits. In the future, automated recordings based on new camera technology and software to analyse pictures or videos may allow for this.

Research in this area is progressing rapidly, but for now, the DanBred breeding programme will continue focusing on and researching social behaviours with state-of-the-art methods. ■