Pigs suffering from injurious behaviours like flank biting and tail biting are more interested in manipulating a novel rope than uninjured control animals

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Abstract

Injurious behaviours in pigs may involve persistent or forceful biting in specific body parts and may result in wounds of the pigs' tails, ears, flanks and legs. Such behaviours, which may lead to progressive tissue damage, are difficult to counteract.

On a commercial farm 22 groups of pigs with wounds on flanks (n = 16) and tails (n = 6) were matched with 22 control groups without wounds. All groups were provided with a novel rope, applied as a 'tail chew test'. Interaction with the rope was recorded semi-automatically about 45 and 120 minutes after introduction of the rope. Statistical analysis showed significant decrease of interest in the rope over time and significantly elevated interest in the ropes in pens containing wounded animals (median number of pulls per minute in control pens, flank-biting pens and tail-biting pens were 7.8^{a}, 10.2^{b} and 14.3^{b} respectively, where superscripts indicate significance levels ($P < 0.001$).

These results suggest that flank biting and tail biting increase exploration and destructibility in pigs. The approach taken is valuable in further understanding strategies to reduce injurious behaviours in pigs and improving pig welfare, e.g. by providing enrichment materials.

Introduction

Tail biting and tail docking generate major welfare concerns for pigs, especially those kept in intensive husbandry systems [1, 9]. Other injurious behaviours besides tail biting include flank, ear and leg biting.

In order to prevent tail biting most intensively-kept pigs are tail docked. Docking does not counteract flank- and leg biting.

Tail biting is regularly seen despite the current practice of tail docking. In the EU on average about 3% of docked pigs show tail lesions at the time of slaughter, but in undocked pigs as many as 6-10% may show tail lesions [9]. While tail biting has attracted considerable scientific attention (e.g. [18, 9]), much less is known about other injurious behaviours seen in growing pigs (ear-, leg- and flank biting).

Rope-based and sometimes (semi-)automated models of tail biting have been developed, mainly for the purpose of better understanding the causal mechanisms involved in a tail biting outbreak [10, 12, 13, 14, 15, 16]. Beattie et al. [2] used ropes to study known tail biting pigs, and Breuer et al. [8] investigated effects of breed and reported that gilts tended to manipulate a rope more often than boars.

Previously, we used a semi-automated novel object (rope) test to measure the pigs' interaction with the rope to measure the value of environmental enrichment [4, 5] and to measure the efficacy of tail-biting ointments [3].

While injurious behaviours are clearly multifactorial, inadequate enrichment appears to be a major risk factor [7, 9]. For example, providing long straw on the floor substantially reduced tail biting [20]. Relatively little, however, has been documented on the value of enrichment materials during outbreaks of other injurious behaviours such as ear and flank biting [20].

The objective of this study, therefore, was to examine the value of enrichment in pens with injurious behaviours such as tail, ear and flank biting by testing pigs' responses to a novel nylon rope in pens with and without wounded animals. A secondary objective was to evaluate the use of the semi-automated tail chew test as a tool to study pen-mate-directed behaviours.

Materials and methods

The study was conducted on a Dutch conventional farm rearing 1103 growing-fattening pigs housed in 14 highly similar units with pigs kept in mostly uniform and single-sex groups of 10 pigs per pen. All pens were 2.10 m deep and 2.30 m wide with a partly solid floor. All pens had a dry-feeder and nipples providing drinking mix (soluble food), a chain and a rope with a rubber flap (about 10x20 cm) hanging about 40 cm above the floor.

On the farm all units containing growing/fattening pigs were visually inspected from the feeding passage, searching for wounds on tails, flanks ears and legs, presumably due to injurious biting behaviours (hence excluding scratches due to fighting). When such a pen was found a control pen was selected without injured pigs. These pens formed matched-control pairs in which the tail chew test with a novel rope was done.

For the test a piece of white braided nylon rope (4mm in diameter; 48 cm long) was hung in all pens from the front wall, reaching up to about 30 cm above the floor of the pen.

Rope pulling behaviour was recorded semi-automatically (as described previously ([3, 4, 5], see also Figure 1) at two observation times, i.e. at about 45 and 120 min following introduction of the rope into the pen (T45 and T120 respectively). Two slightly different counter types were tested as part of a programme to improve the measuring technique (counters differed in the way they were protected from the pigs with or without a pvc container; the same counter type was used within pairs of pens).

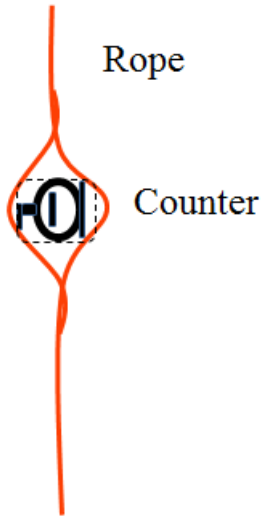

Figure 1. Schematic diagram of counter measuring rope pulling. The dotted line indicates 'logger type', i.e. extra protection of half of the loggers intended to better protect the logger from being destroyed by the pigs .

A mixed model analysis was performed using Genstat 11.1 [11] to determine the effects of observation time (T1, T2), wound type (flank biting, tail biting, control), gender (barrows; gilts, mixed sex), counter type (with and without pvc), unit, pair and their interactions on pulling frequencies (number of pulls per minute per pen). The response variable was analysed on the LOG-scale ($_e$log). Random effects for unit, case-control number/pair (within unit) and pen (within case-control) were included in the model.

The experiment was conducted in accordance with the Dutch and European legislation on the use of animals for scientific purposes. Since this was an observational study that did not negatively affect the welfare of the pigs no dispensation from the ethical care and use committee was needed.

Results

In total 22 pens were identified with wounds related to either tail biting (n = 6) or flank biting (n = 16). Out of 16 flank-biting pens, 4 pens contained only barrows and 12 contained only gilts. Out of the 6 pens with tail-biting wounds, 1 group was mixed-sex, 2 groups were all gilts and 3 groups were all barrows.

The analysis showed a significant effect of time (P = 0.01) and wounds (P < 0.001), and a trend for countertype (P = 0.09). Gender was not significant and neither did any of the interactions reach significance.

Pulling frequencies were higher at the first recording (T45) compared to T120 (predicted means on $_e$log scale were 2.47 and 2.21 respectively, sed 0.10). Control pens pulled significantly less frequent compared to pens with wounds due to flank biting and tail biting, while the two latter types of pen did not differ significantly (predicted means for controls[a], flank biting[b] and tail biting[b] (superscripts indicating significance levels) on $_e$log scale were 2.05, 2.32, 2.66 respectively, sed ranging from 0.097 to 0.19, with an average of 0.150). These values on $_e$log scale correspond with the values 7.8, 10.2 and 14.3 pulls per minute respectively.

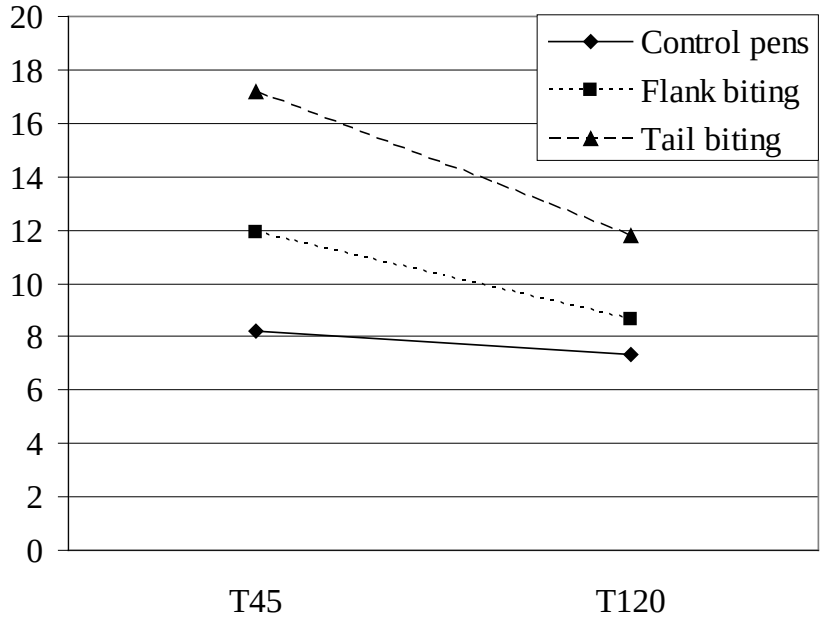

Figure 2. Backtransformed predicted means of rope-pulling frequency for control pens (n = 22), pens with flank-biting (n = 16) and pens with tail biting (n = 6), tested at two time points, 45 and 120 min. after introduction of a novel rope respectively (T45; T120).

Discussion and conclusion

Growing and fattening pigs in pens with biting wounds showed more interest in a novel rope as compared to matched controls.

Previously studies showed that pigs in barren pens had increased interest in novel objects [5, 19]. Hence, pigs in pens where injurious behaviours were evident may be experiencing their environment as more barren, hence be more interested in novel ropes and pen-mate-directed behaviour, leading to the injurious behaviour. Alternatively, however, injurious behaviours themselves are known to have a tendency to escalate due to reinforcing effects of the behaviour itself or its consequences (e.g. taste of blood). This may increase destructive behaviours generally, including rope manipulation (pulling hard). In other words, the present findings may relate to either a difference in cause or effect of the abnormal biting behaviour. In either case, the finding is in line with hypothesis that injurious behaviours are related to barren housing and may be solved by providing better

enrichment materials [22], perhaps not only to prevent, but also to treat these behaviours as pigs in such pens seem to have a higher demand for enrichment materials.

The present results confirm the relationship between pen-mate-directed behaviours and pen-directed/exploratory behaviours (here tested as rope-directed behaviours; see e.g. [6, 17]), but as far as we know, this is the first quantitative studies reporting on flank biting as an injurious behaviour in growing-fattening pigs.

The finding that pigs from both tail and flank biting pens showed an increased interest in the rope, may indicate a similar etiology for both injurious behaviours i.e. increased interest in exploration.

The lack of a significant difference between flank biting and tail biting, despite the fact that predicted means for tail biting were almost as much elevated above the means for flank-biting pens, as these pens were elevated above control pens (see Figure 21) may be related to the fact that the number of flank-biting pens was much higher (16) compared to tail-biting pens (n = 6). This observation may also be related to the fact that the novel rope, which has previously been used as tail model as 'tail chew test' [3], morphologically resembles a conspecific's tail more than a flank, and hence may be expected to elicit a higher level of response in the case of tail biting compared to flank biting.

Previously, Breuer et al. [8] reported that gilts had a tendency to manipulate a rope more often than boars. Similarly, Zonderland et al. [21] found that gilts showed more tail biting. In this study we found no such effect for tail biting. In our small tail-biting sample (n=6) we found 3 groups of barrows, 2 groups of gilts and 1 mixed-sex group. For flank biting, however, the results seem to suggest a confirmation of the previous studies in that out of 16 pens with flank biting only 4 pens contained barrows and 12 pens contained gilts. Since there were considerably more pens with gilts compared to barrows on the farm (n = 57 versus n = 47), this effect was not significant (p = 0.087, Binomial test in Genstat 11.1).

Following our earlier work in relation to tail biting this study used a semi-automated rope model. It was confirmed that rope pulling behaviour may be a useful parameter to measure aspects of injurious behaviour in pigs. It may, therefore, not only be a suitable tail chew model, e.g. to test tail biting treatments [3], but it may also be useful to study related injurious behaviours such as flank biting.

Compared to earlier test applications (e.g. [3]) we here used a longer test duration (up to 120 minutes). This is related to on-going modifications directed at improving the test. In this study there was no substantial benefit of prolonged measurement as there was no specific effect of time (i.e. no interaction with wound presence), suggesting that there only was a general 'habituation' to the rope over time (but the pigs may also just get tired after a bout of exploratory activity). With respect to test optimalisation it was found that the modification of the counter type, that was directed at improved 'longevity', resulted, unfortunately, in a tendency for a lower pulling frequency in the better-protected recorders, perhaps indicating reduced sensitivity of the 'improved' design.

This study confirmed the suitability of the semi-automated rope test in helping to improve our understanding of injurious behaviours such as tail flank biting in pigs, and confirms that inadequate environmental enrichment may be implicated in injurious behavioural pathologies in pigs.

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