

OCCURENCE OF TAIL AND EAR BITE INJURIES IN A HUNGARIAN COMPLEX PIG FARM

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Abstract

Abnormal oral manipulation, such as tail-, ear-, and flank-biting are among the most serious behaviour problems in modern pig husbandry. They not only affect the welfare of animals, but also have economic consequences. The prevalence of tail-, ear-, and flank-bite damage was estimated in a 1200 sow farrow-to-finish commercial farm in Hungary were pigs grouped by age. A total of 16,023 individuals were observed, of which 4,679 were housed in the batteries and 11,344 were housed in the fattening barns. In the batteries, the prevalence of tail-bitten and ear-bitten piglets in the different age groups ranged from 2.6 to 15.18%, 10.77 to 56.87%, respectively. The likelihood of tail injuries increased with the age of the animals, while the likelihood of ear injuries gradually decreased with piglet's age. No flank injuries were observed in piglets from the batteries. In the fattening barns, the prevalence of tail and ear injuries in the different age groups was between 2.73 and 6.1%, and between 3.38 and 58.16%, respectively. Flank biting appeared only in older animals, from 156 days of age, at a much lower frequency (1.96 to 3.26%) than the other injuries studied. Some elements of the housing and feeding technology applied in this farm could enhance the occurrence of abnormal oral bite behaviour in pigs. Changing from wet to granulate feed and replacing the grid flooring with solid flooring covered with straw litter could lead to a decline in the incidence of biting.

Key Words: battery, ear injury, fattening barn, flank injury, pig farm, tail injury

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INTRODUCTION

Abnormal oral manipulation, such as tail-, ear-, and flank-biting are among the most serious behaviour problems in modern pig husbandry. The occurrence of these abnormalities indicates poor welfare of the pigs (Brunberg et al., 2016; Schröder-Petersen and Simonsen, 2001), and the injuries have serious economic consequences (Zonderland et al., 2011a).

The reasons for pig biting are still not clear. However, it seems to be connected to the elevated stress level of individual animals (Munsterlhjelm et al. 2013; Zupan et al., 2012). These unwanted behaviours can be triggered by a number of risk factors, such as nutritional deficiencies, lack of manipulable material, improper space allowance, social disturbances etc. (Brunberg et al., 2016; EFSA 2014; EFSA 2007).

Behaviour patterns in domestic pigs greatly resemble those of their ancestor, the wild boar. The life of modern pigs has changed dramatically from that of their wild ancestors; however, their behavioural repertoire has not changed fundamentally over thousands of years of domestication. If some of their basic demands (e.g. foraging material, stable social environment) are not satisfied, that can lead to abnormal bite problems (Mendl, 1995; Stolba and Wood-Gush, 1989).

Tail biting occurs when a pig takes into its mouth the tail of another pig and bites on it. This biting can be extended to damage to tissues above the tail, which can cause the death of the animal (Schröder-Petersen and Simonsen, 2001). Tail biting can be largely prevented by tail docking (amputating a portion of the tail), and in most EU countries, approximately 99% of pigs are docked (Valros and Heinonen, 2015). However, it has been reported that 2 to 5% of docked pigs are still bitten by pen-mates (Sutherland and Tucker, 2011). The prevalence of tail biting varies greatly from study to study (Valros and Heinonen, 2015). Smulders et al. (2008) found 2.12% of pigs in their study had tail bites, as compared to Meer et al. (2017), who found 39% of their pigs had tail wounds. Tail biting mostly occurs during rearing and fattening phases, but it is not characteristic before weaning or in breeding animals.

Ear and flank biting behaviour has a similar aetiology to that of tail biting. Ear biting can be more frequent when tails are short docked and the attention of frustrated potential biters is redirected to the ears of pen mates (Fraser and Broom, 1990). In an Irish study, van Staaveren et al. (2018) found the overall prevalence of ear lesions related to injurious behaviour was similar to the prevalence tail lesions.

The aim of this study was to estimate the prevalence of tail-, ear-, and flank-bite damage in a 1200 sow farrow-to-finish commercial farm in Hungary.

MATERIALS AND METHODS

In our study, we scaled tail damage according to Wallgren and Lindahl (1996) while in measuring the extent of ear damage, scores were prepared after DSBS ([http1](http://1)):

Type 1 tail injury (Figure 1): red scars, reddish skin, fur missing, no blood (mild)

Type 2 tail injury (Figure 2): open wound, fresh blood, loss of length (severe)

Type 1 ear injury: reddish ear, small red spots, no skin damage

Type 2 ear injury: red scars, bite spots, superficial lesions,

Type 3 ear injury (Figure 3): one or more open wound, necrosis (black-brown), no fresh blood

Type 4 ear injury: open wound, fresh blood

Flank injury: (Figure 4).



Figure 1. Type1 tail injury

The characteristics of the farm in March 2018 at the time of the study were:

- Farm size: 1200 sows
- Breeds of the sows: Large White, Landrace and the crosses of these two, but some sows showed the characteristics of Duroc and Pietrain breeds as well
- Breeds of the boars: Large White and Duroc x Pietrain
- Weaning of the piglets: at 21 days old (900 piglets weekly, out of 96 sows. (at weaning, three different size categories were formed and piglets were allocated to their pens based on similar body weight)
- Battery: grid flooring made of plastic, with plastic partition panels
- Feeding: swill, with automated feeding system
- Transport to the finishing barn for fattening: at 65 days old
- Fattening barn: concrete slatted floor,

In total, 16,023 animals took part in our study, of which 4679 individuals were kept in batteries while 11,344 were in the fattening barns. The 4679 piglets in the batteries were allocated to 6 same-age groups (from 29 to 65 days) with an average group size of 38 animals (min 20, max 45). The 11,344 fatteners in the fattening barns were



Figure 2. Type 2 tail injury



Figure 3. Ear injury (Type 3)



Figure 4. Flank injury

allocated to 13 same-age groups (from 65 to 172 days) with an average group size of 41 animals (min 33, max 52). Each age group was housed in a separate fattening barn. We recorded and analysed the data collected using Microsoft Office Excel 2007, and compared our results to those published previously.

RESULTS

On the farm, 876 (5.47%) tail-bitten individuals were detected, of which, 593 animals were classified in the Type 1 tail bite injury category, while 283 animals were in the Type 2 tail bite injury category. In total, there were 2608 (16.28%) ear-bitten animals, of which 739 were grouped in Type 1, 893 in Type 2, 931 in Type 3 and 45 in Type 4. There were also 41 (0.26%) flank-bitten pigs detected (for a summary of all pig bite injury types detected on-farm, see Figure 5).

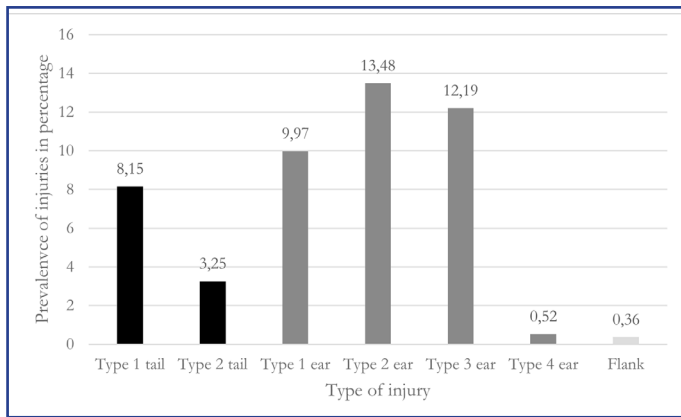


Figure 5. Overall prevalence of different bite injuries found in pigs on the farm, based on injury severity scoring

Bite Injuries in Batteries

Out of 4679 animals kept in batteries, 293 individuals (6.26%) had tail injuries. In total, 233 piglets had tail injury equivalent to Type 1 (4.98%), and 60 piglets to Type 2 (1.28%).

Ear damage was more common in the batteries than other types of bite injuries, with a prevalence of 22.42% (detected in 1049 animals), of which 275 had Type 1 injuries, 447 had Type 2, 317 had Type 3, and 10 had Type 4. A polynomial trend function (Fig. 6) had a very good fit ($R^2 = 0.99$) for the percentage by type of ear injury. The prevalence of ear injury decreased from the Type 2 to the Type 4 (Fig. 6).

No flank-bitten animals were found in the battery part of the farm.

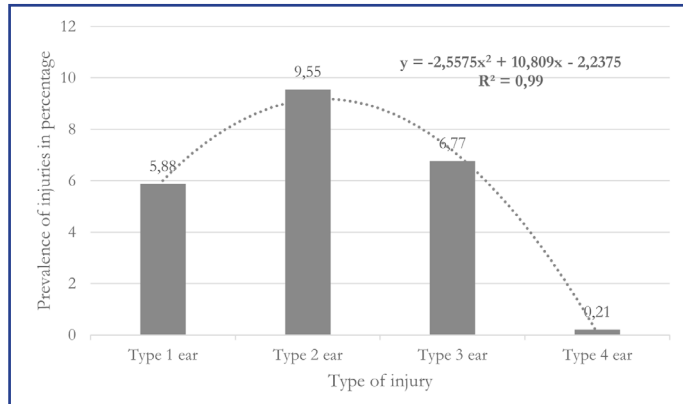


Figure 6. Prevalence of ear bite injuries in pigs in the batteries, according to the severity of injuries (type 1 least severe, type 4 most severe). Grey dotted line shows trend according to injury severity.

Bite injuries in batteries according to the animal age groups

The number and prevalence of the tail-, ear- or flank-bitten animals in the six age groups are shown in Table 1. The results of analysing the age of piglets kept in batteries according to their tail and ear bite injuries are summarized in Figure 7. For the impact of age on tail injuries, the best fit was given by the linear function ($R^2 = 0.89$), whereas for the effect of age on ear injuries, the polynomial trend function was the most accurate ($R^2 = 0.88$). It is clearly visible from Figure 7 that the ratio of tail to ear injuries changed in the opposite direction between 29 and 65 days of age, as the prevalence of tail injuries was gradually increasing, while the prevalence of ear injuries was decreasing then stayed at the same level.

Table 1. The number and ratio of injured pigs in the batteries, by age groups

Age group (n)	Tail injury: number of animals (prevalence)	Type1 tail injury	Type2 tail injury	Ear injury: number of animals (prevalence)	Type1 ear injury	Type2 ear injury	Type3 ear injury	Type4 ear injury	Flank injury
29 days (n=990)	26 (2.62%)	14 (1.41%)	12 (1.21%)	563 (56.87%)	0	302 (30.5%)	261 (26.36)	0	0
37 days (n=982)	41 (4.18%)	38 (3.87%)	3 (0.31%)	165 (16.80%)	120 (12.22%)	33 (3.36%)	10 (1.02%)	2 (0.20%)	0
44 days (n=880)	62 (7.05%)	48 (5.45%)	14 (1.59%)	109 (12.39%)	53 (6.02%)	37 (4.20%)	16 (1.82%)	3 (0.34%)	0
52 days (n=873)	65 (7.45%)	56 (6.41%)	9 (1.03%)	97 (10.77%)	51 (5.84%)	25 (2.86%)	19 (2.18%)	2 (0.23)	0
58 days (n=730)	65 (8.90%)	50 (6.85%)	15 (2.05%)	82 (11.23%)	38 (5.21%)	38 (5.21%)	5 (0.68%)	1 (0.14%)	0
65 days (n=224)	34 (15.18%)	27 (12.05%)	7 (3.13%)	33 (14.73%)	13 (5.80%)	12 (5.36%)	6 (2.68%)	2 (0.89%)	0

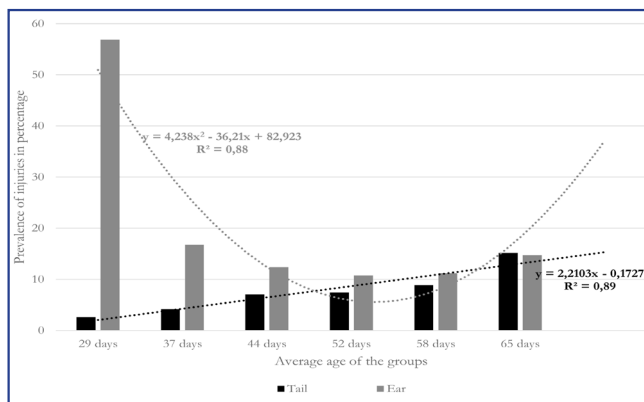


Figure 7. Prevalence of tail and ear injuries in pigs in the batteries according to age groups. Black dotted line shows trend of tail injuries according to age; grey dotted line shows trend of ear injuries according to age

Bite Injuries in the Fattening Barns

Altogether 11,344 pigs were housed in the fattening barns, all 13 age groups in separate barns. The prevalence of tail lesions was 5.14% (583 pigs). Of these, 3.17% had Type 1, while 1.97% had Type 2 injuries. The prevalence of ear injuries was 13.74% (1559 pigs). Based on the seriousness of ear injuries, Type 3 was the most common with a prevalence of 5.41%, while the most serious, Type 4 injuries were much less frequent (0.3%). Flank lesions also occurred in the fattening barns, in 0.26% of the animals (Figure 8).

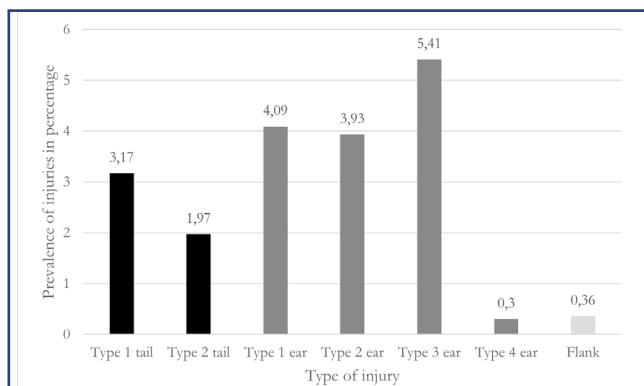


Figure 8. Prevalence of bite injuries in pigs in the fattening barns based on injury severity scoring

Bite injuries in the fattening barns according to age groups

The number and prevalence of the tail-, ear- or flank-bitten animals in the thirteen age groups are summarized in Table 2. The tendencies are visible in Figure 9. The specificity of the linear equation fitted to the tail injury data was quite low ($R^2 = 0.34$), but the result of the polynomial fit to the ear injury data was more favourable ($R^2 =$

0.59). Flank injury occurred only at the end of fattening period (156 days and 172 days), when the prevalence was 1.9% and 3.2%, respectively.

Table 2. The number and ratio of injured pigs in the fattening barns, by age groups

Age group (n)	Tail injury: number of animals (prevalence)	Type1 tail injury	Type2 tail injury	Ear injury: number of animals (prevalence)	Type1 ear injury	Type2 ear injury	Type3 ear injury	Type4 ear injury	Flank injury
65 days (n=968)	53 (5.48%)	13 (1.34%)	40 (4.13%)	563 (58.16%)	5 (0.52%)	247 (25.52%)	301 (31.1%)	10 (1.03%)	0
76 days (n=958)	58 (6.05%)	17 (1.77%)	41 (4.28%)	209 (21.82%)	5 (1.67%)	14 (1.46%)	185 (19.31%)	5 (0.52%)	0
87 days (n=697)	51 (7.32%)	20 (2.87%)	31 (4.45%)	75 (10.76%)	49 (7.03%)	19 (2.73%)	7 (1%)	0	0
95 days (n=957)	56 (5.85%)	23 (2.4%)	33 (3.45%)	32 (3.34%)	13 (1.36%)	11 (1.15%)	7 (0.73%)	1 (0.1%)	0
104 days (n=931)	76 (8.16%)	39 (4.19%)	37 (3.97%)	94 (10.1%)	51 (5.18%)	19 (2.04%)	21 (2.26%)	3 (0.32%)	0
116 days (n=772)	34 (4.4%)	29 (3.76%)	5 (0.65%)	44 (5.7%)	15 (1.94%)	18 (2.3%)	10 (1.3%)	1 (0.13%)	0
123 days (n=884)	52 (5.88%)	46 (5.2%)	6 (0.68%)	94 (4.48%)	54 (3.86%)	26 (2.94%)	12 (1.36%)	2 (0.23%)	0
132 days (n=897)	44 (4.91%)	39 (4.35%)	5 (0.56%)	81 (9.03%)	47 (5.24%)	18 (2%)	13 (1.45%)	3 (0.33%)	0
140 days (n=936)	39 (4.17%)	29 (3.1%)	10 (1.07%)	120 (12.82%)	78 (8.33%)	18 (1.92%)	21 (2.24%)	3 (0.32%)	0
147 days (n=901)	25 (2.77%)	19 (2.11%)	6 (0.67%)	110 (12.21%)	73 (8.1%)	22 (2.44%)	14 (1.56%)	1 (0.11%)	0
156 days (n=917)	25 (2.73%)	20 (2.18%)	5 (0.55%)	52 (5.67%)	25 (2.73%)	15 (1.64%)	10 (1.1%)	2 (0.22%)	18 (1.96%)
164 days (n=821)	27 (3.29%)	27 (3.29%)	0	60 (7.31%)	38 (4.6%)	10 (1.22%)	9 (1.1%)	3 (0.37%)	0
172 days (n=705)	43 (6.1%)	39 (5.5%)	4 (0.57%)	25 (3.55%)	11 (1.56%)	9 (1.28%)	4 (0.57%)	1 (0.14%)	23 (3.26%)

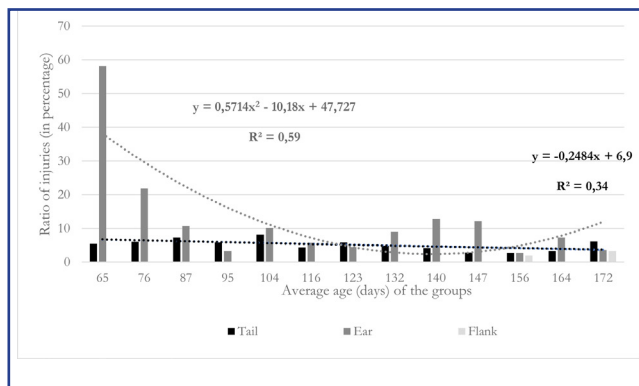


Figure 9. Bite injuries in pigs in the fattening barns according to age groups. Black dotted line shows trend of tail injuries according to age; grey dotted line shows trend of ear injuries according to age

DISCUSSION

In our study, in a 1200 sow farrow-to-finish commercial farm in Hungary, the farm-level prevalence of tail, ear and flank bite injuries was 5.47%, 16.28% and 0.26%, respectively. These prevalences were more or less comparable to the outcomes of other studies. For example, in a study on 31 Irish pig farms, van Staaveren et al. (2018) found that 7.57% of the pigs had tail injuries, 6.97% had ear injuries and 0.83% had flank injuries. However, they observed large variation between farms.

There could be several reasons for the relatively high prevalence of bite injuries. A grid floor could enhance high rates of tail biting. On one hand, on solid flooring, the straw litter keeps the animals occupied, so they can manipulate and dig it instead of biting each other. On the other hand, harmful gases (such as ammonia and carbon dioxide) can get through grid flooring, spoiling the air quality in the barn, which can enhance the risk of tail biting (van Putten, 1969).

Some studies indicated that too high or too low temperatures could also be risk factors for tail biting. Sufficient ventilation and heating/cooling is crucial for the air quality and for maintaining the temperature ideal for the animals. Farmers taking part in the research of Valros et al. (2016) also agreed that appropriate operation of ventilators is the third most important among twenty points in the prevention of tail biting.

Another explanation of our results, with noticeable prevalence of bite injuries, could be that the animals were fed with swill. Temple et al. (2012) and Palander (2016) suggested higher risks of biting in the case of moist feeds. The constitution and ingredients of the feed are crucial, and quantity of energy, fibre, protein and minerals all can affect the prevalence of tail biting (Valros et al., 2016).

The gradual increase in tail bites (from 2,62% to 15,18%) we observed as the pigs grow older in the batteries could be because the young animals are not transported to a bigger place before fattening, but their number in the batteries is almost constant. However, larger animals would require greater personal space, and in this farm, that cannot be provided, as the size and number of the batteries is limited. As a result, as the pigs grow older and larger, there is an enhanced possibility they start to manipulate each other by biting, driven by tension and boredom.

Another possible reason for biting is that after reaching a certain size, not all animals fit in front of the trough at the same time, so those left out start to bite their contemporaries. Studies unambiguously show that tail biters are smaller than average in all pig age groups, while those that suffer tail bites are bigger than neutral animals (who neither bite nor became victims of tail biting). The smaller size of the biters could imply lower feed intake or problems connected to nutrient absorption (Zonderland et al., 2011b). During data collection, we also found that smaller piglets bit larger ones, although no data was collected on the phenomenon in our case. According to the technology applied on the farm, vitamin shots were given to the biters, to help improve their general health status.

Studies showed that competition for feed is an important risk factor in the occurrence of tail biting. Pigs feel frustrated when they cannot approach a feeding trough at the same time as their pen-mates, so start to mouth the tails of the animals already there (Taylor et al., 2010). Sutherland et al. (2009) reported 30% of bites occurred at the feeder; according to Palander et al. (2012), half of the biting occurred within 1 m² of the feeding trough in a 12 m² barn.

According to one study (Valros et al., 2004), injuries caused by tail biting are more frequent in boars than in sows, while other researchers did not find a difference between sexes (Sinisalo et al., 2012). Pig farmers often report that after the fattening period, smaller females are more prone to tail biting than barrows (Schröder and Simonsen, 2001). Zonderland et al. (2010) indicated that already in the first month after weaning, sows are more likely to indulge in tail biting than intact boars. The constitution of groups was analysed (Zonderland et al., 2010), and the frequency of tail biting was higher in groups consisting only of females than in those of mixed sexes or containing only boars.

Initially in the current study, ear biting was outstandingly prevalent in the batteries, but then, after a prominent decline, the prevalence of ear biting stayed almost the same. Piglets from different dams and litters were initially mixed together in the batteries after weaning, which caused prominent fights in their attempts to establish a dominance order. During these dominance fights, animals often bit each other's ears. After those initial fights were over, the ear wounds healed and new ones only rarely arose. That could explain the similar prevalence of ear bites in the older age groups of battery pigs.

In the fattening barns, the prevalence of tail bite injuries was only 5.48 % in the youngest animals. The prevalence of tail bite injuries varied during fattening, with the lowest in the age groups of 147 to 156 days (2.77 %, 2.73 %). It is noteworthy that the prevalence of tail bite injuries at the end of fattening (172 days) was just the same (6 %), as at the beginning of fattening, at 76 days of age (6.05 %).

On the contrary, the prevalence of ear bite injuries was rather high in the youngest age groups of fattening. It decreased from a high starting level (58.16%) at the beginning of fattening until 132 days of age (9.03 %). Between 140 and 147 days of age, the prevalence of ear bite injury increased to 12 %, and it decreased thereafter (172 days of age, 3.55 %).

The large prevalence of ear bitten animals both in the lowest battery age group and the youngest age group of piglets in the fattening barn, can be explained by stress, as during the transport, the groups were also re-arranged somewhat. Transport itself is a stressor for the animals, considering the way they are handled. Transport and re-housing is stressful for animals facing a new habitat, new odours, and in some cases new group mates, with which dominance order is established by fighting.

The decrease in the prevalence of tail bite injuries over time was due to the grouping system in the farm. When young piglets were transported from the battery to the

fattening barn, the tail-bitten animals were put into a separate group, by selecting the most seriously injured ones, then adding some animals with mild injuries to the group to maintain the group size of 44. Pigs that were less damaged by tail bite injuries were transported to the slaughterhouse when they reached the end weight of 85 kg. Pigs that were seriously injured were sent to slaughterhouse as waste product one or two times per week.

Flank bite injuries were noticed only in pigs over 156 days old, and not in all of the barns. The barns in the farm had two types of partition walls: concrete or plastic. Flank bite injuries occurred only in barns with concrete partition walls, and among those in ones, which were close to the back door of the building.

Zonderland et al. (2011b) suggest that best tail bite prevention measure is to remove from the herd those animals with potential to later become tail biters. According to Hunter et al. (2001), in the UK, farmers remove animals with tail bite damage, and they provide the animals with suitable objects to keep them occupied. In Finland, litter is used for this purpose, and they try to not overcrowd the barns (Valros et al., 2016). It is also important to add mineral salts to the feed, and to place straw on the ground, which gives an opportunity for the pigs to satisfy their innate instincts. Tail docking is used in many countries to prevent most tail bite injuries (EFSA 2007).

CONCLUSIONS

The occurrence of tail biting is influenced by various genetic and environmental factors. Some factors that according to the literature trigger the appearance of tail biting were present on the farm we studied, and based on our results, these factors could be behind the prevalence of this behaviour in the studied pigs.

Some elements of the housing and feeding technology applied on this farm could enhance the occurrence of tail biting, as stated in the literature and supported by our observations. In the case of feeding technology, changing from wet to granulate feed could lead to a decline in the incidence of tail biting. Another suggestion is to change the grid flooring, partially or totally, to solid flooring, which would provide the opportunity for straw to be given to the animals, in order to occupy them and allow them to satisfy their instincts for exploring and rooting.

It will not be easy to prevent tail biting occurring altogether, because of space limitations in the batteries where the piglets grow, as the size of the buildings is fixed. However, cost/benefit calculations should be done based on the number of injured pigs that have to be sent for slaughter before reaching terminal weight, to determine whether decreasing the number of animals – starting with dams – could be profitable. In the fattening barns, changing the concrete partition walls for plastic ones is an opportunity for preventing flank biting, but as the prevalence of this behaviour was rather low in the pigs, calculations would tell whether it would be beneficial for this farm.

Authors' contributions

KM designed the study, responsible for the theoretical background and made the final corrections of the manuscript; AP recorded the injuries on the pig farm and prepared the excel tables; NF wrote the final version in English of the study; JT prepared the figures and statistics.

Competing interests

The authors declare that they have no competing interests.

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POJAVA GRIŽENJA UŠIJU I REPA NA VELIKIM FARMAMA SVINJA U MAĐARSKOJ

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Kratak sadržaj

Patološki oblici ponašanja svinja, kao što su griženje repova, ušiju i bokova predstavljaju najozbiljniji problem u svinjarskoj proizvodnji. Ne samo da utiču na dobrobit životinja već imaju i ekonomske posledice. Na ispitivanoj komercijalnoj farmi u Mađarskoj, utvrđeno je oštećenje repa, ušiju i bokova kod 1200 svinja. Ukupan broj posmatranih životinja je bio 16023, od čega 4679 iz odgajivalištu, a 11344 iz tova. Učestalost prasadi sa izgriženim repom u odgajivalištu se kretala od 2,6 do 15,18%, a sa izgriženim ušima između 10,77 i 56,87%. Šansa da rep bude oštećen je rastao sa starošću životinje, dok je oštećenje ušiju opadalo kod starijih prasića. Nisu zapažena oštećenja bokova kod prasadi u odgajivalištu. Kod tovljenika, učestalost povreda na repu je bila između 2,73 i 6,1%, dok se učestalost povreda na ušima kretala između 3,38 i 58,16%. Griženje bokova primećeno je samo kod životinja starijih od 156 dana, sa mnogo manjom učestalošću (1,96 do 3,26%) u odnosu na druge povrede. Neki elementi smeštajnog prostora kao i tehnika hranjenja koja se koristi na ispitivanoj farmi, mogli su da utiču na pojavu patološkog oralnog oblika ponašanja kod svinja. Zamena vlažne hrane za granulat i promena rešetkastog poda za čvrstu podlogu prekrivena slamom bi moglo da dovede do smanjenja učestalosti griženja.

Ključne reči: odgajivalište, povreda uha, obor za tov, povreda boka, farma svinja, povreda repa