Question to EURCAW-Pigs: Nutrition and tail biting
11 December 2024

Question
Received: 13 November 2023

EURCAW-Pigs received the following question:

What is the current scientific knowledge on the relationship between nutrition (feed composition) and tail biting?

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

Answer
In short, the answer is:
Access to sufficient amounts of good quality water (e.g. the number of drinking points) and feed is important to prevent tail biting. Exact diet recommendations for preventing tail biting are difficult to make because the optimum depends on the current requirements of the pigs, the feed composition and the method of feed delivery. However, abrupt changes in dietary composition may increase the risk of biting. There are some indications that dietary fibre reduces the risk of biting. Related to this: additional roughage is known to reduce pen mate directed behaviour, and thus tail biting. Low levels of amino acids are associated with tail biting behaviour, and this is worsened when health challenges are present. Offering licking blocks (salt) may help to reduce biting.

Background
Even though pig farmers have associated feed and water provision with tail biting for many decades, only very few studies have addressed this topic (Edwards, 2024). Investigating nutritional influences on tail biting is difficult because of the complex nature of feeding and the multifactorial causation of tail biting. While the nutritional requirements of the pigs depend on their genetic growth potential, production stage and health status, the biological availability of nutrients is influenced by the dietary components used (Edwards and Valros, 2020). Abrupt changes of feed composition may increase tail biting risk (EFSA AHAW Panel, 2007), therefore, these should be avoided.

There are interrelationships between the feed structure and how it is delivered. *Feed structure* (pelleted, crumbled, meal, liquid) has been associated with tail biting, but there are no studies which compare the effect of feed structure alone (Edwards and Valros, 2020). The recommendation for pig keepers is to consult a feeding expert for finding a feeding system and diet combination that suits the individual farm situation.

Water provision was rated as a very important tail biting factor by Finish and UK pig producers (Valros and Barber, 2019) as well as in tail biting risk management tools (e.g. WebHAT, SchwIP). The absolute number of drinkers was one of the most important risk factors in a large multifactorial tail biting risk analysis (EFSA AHAW Panel, 2014). Recommendations regarding number of pigs per nipple drinker and nipple flow rates vary across countries. Advice from tail biting experts is to use open surface drinkers like bowls or troughs to allow optimal water uptake.

Carbohydrates include digestible energy as well as dietary fibre. A sufficient amount of digestible energy (e.g. sugars, starch) is needed for growth and fitness. However, feed that contains too much energy may cause digestive problems (Edwards, 2014). Cereals are a common source of carbohydrates. There are some indications that certain cereals like wheat may be associated with higher tail biting risk but data are partly contradictory and insufficient for concluding nutritional recommendations (Edwards, 2024).
Dietary fibre components are not digested and absorbed in the small intestine of non-ruminant animals, but can be (partially) utilised in the large intestine (e.g. Turner and Lupton 2021). They are needed for e.g. gut fill (satiety), maintenance of epithelial barrier and a beneficial microbial composition (e.g. reduction of potentially harmful bacteria, promotion of certain bacteria; Montagne et al., 2003, Pieper et al., 2015, Kobek-Kjeldager et al., 2022), i.e. dietary fibre is promoting gut health (Wenk, 2001; Jha and Berrocoso, 2015). However, as potential negative effects, high fibre diets may decrease nutrient digestibility and reduce feed intake (Montagne et al., 2003, Pieper et al., 2015). Because dietary fibre is such a heterogeneous group, the effects depend not only on amount but on the functional characteristics such as solubility and fermentability of the respective fibre types as well as other feed components. Consequently, due to the complex relationships the effects are difficult to untangle (Agyekum and Nyachoti, 2017). So far, the results of the few studies investigating the effect of dietary fibre on tail biting were ambivalent: showing increased tail biting risk with increased dietary fibre (Chou et al., 2020) or large variations between batches, potentially masking treatment effects (Naya et al., 2019, Honeck et al., 2020). Related to this, roughage (e.g. hay, silage) should be provided to the pigs to help reduce tail biting risk. Looking at the effects of roughage provision across studies, behaviour (e.g. aggression and oral manipulation) was affected in a positive way, while performance and meat quality was either unaffected or impaired (Holinger, 2018)

Protein and especially *amino acids* are needed for growth and physiological functions. Different protein components have varying bioavailability (Edwards, 2024). Lack of protein inhibits growth, while too much protein may cause intestinal disorders including diarrhoea in weaners (Pieper et al., 2015, Xia et al., 2022). Tryptophan, phenylalanine and tyrosine are limiting amino acids for immunological and neurological functions, and low levels of amino acids are associated with tail biting behaviour (Van der Meer et al., 2017). Health challenges increase the demand for these amino acids and supplementation may have some beneficial effects (Van der Meer et al., 2017). However, no concrete nutritional recommendations can be drawn from existing studies (Edwards, 2024). Based on on-farm trials, pig keepers are advised to consult a feeding expert for adjusting the diet to the current situation on theirs farms.

Fat content and type have not been investigated in relation to tail biting, unless indirectly as energy source (Edwards, in press).

Sodium chloride (salt) has been investigated in relation to an attraction to blood (Fraser, 1987) and as a possible intervention to tail biting outbreaks (Watanabe et al., 2015). Offering salt as optional supplement e.g. as licking blocks is preferable to high NaCl concentration in the feed in order to avoid thirst.

Magnesium has been linked to tail biting via stress physiology, yet the results are inconclusive (Bushby et al., 2020).

Iron, copper, calcium or phosphorous, as well as calcium/phosphorus imbalance are also mentioned as possible factors yet without any evidence (Edwards, 2024).

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