# IGN-Forschungspreis 2018 – Dr. Mirjam Holinger

## Summary

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*Roughages and chronic stress in entire and castrated male pigs:*
*Effects on health, behaviour and performance*

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The here presented thesis addresses two common management practices that negatively affect welfare of fattening pigs: Castration of male piglets, in many countries performed without an application of anaesthesia and analgesia, and provision of finely ground concentrate feed. One alternative to castration is rearing entire male pigs, which is generally considered as an improvement to welfare. However, the typically high level in agonistic and sexual behaviour has been associated with more skin lesions and disturbances in groups of entire male pigs. It could thus be assumed that chronic stress level in entire male pigs is higher than in castrated male pigs. Provision of finely ground concentrate feed, as the second problematic management practice, is the predominant risk factor for the development of gastric ulcers. Additionally, such feed is ingested very rapidly without entirely satisfying the motivation to display feed-related behaviours. This may cause frustration and trigger damaging behaviours such as tail biting.

The aim of the here presented thesis was to generate basic knowledge as well as possible solutions to the two following questions: (1) Does chronic stress level differ between entire and castrated male pigs? and (2) Is the provision of roughages, additionally to concentrate feed and straw, an appropriate measure to reduce the prevalence of gastric ulcers and damaging behaviours in fattening pigs? We investigated these two questions both separately and in combination in order to look into interacting effects.

An additional experiment was carried out on a commercial organic farm to provide information on effects of group composition with entire male pigs. In the experiment, single-sex groups with entire males were compared to mixed-sex groups with entire males and females as well as to groups with castrated males and females. Behaviour and analysed boar taint compounds did not differ between entire males from single-sex and mixed-sex groups. No pregnancy was detected in females housed with entire males when inspected after slaughtering. However, results showed that entire males indeed display considerably more agonistic and sexual behaviour.

The second experiment was designed to analyse in detail, how the higher frequency of agonistic and sexual behaviour affects the baseline level of chronic stress in entire and castrated male pigs. In order to assess chronic stress and to obtain reference indicators that allow a comparison between pigs irrespective of their hormonal status, we applied an additional chronic intermittent social stressor. This stressor consisted of repeated short-term confrontations with unfamiliar pigs, as well as short-term separations. Furthermore, we investigated the effects of providing grass silage to fattening pigs in terms of behaviour, health, performance and meat quality within the same experiment and combined it with the factors chronic stress and castration. The design allowed looking into interactions between these three factors. All pigs had access to straw in a rack. Behaviour was observed on two days each at

the beginning, in the middle and at the end of the fattening period. We determined the circadian rhythm of salivary cortisol during two days. Additionally, we measured the response of salivary cortisol to exogenous adrenocorticotropin as parameter for the reactivity of the hypothalamic–pituitary–adrenal axis. After slaughtering, we visually inspected all stomachs for pathological damages including gastric ulcers. Fat samples were obtained and analysed for fatty acid composition. Samples of the longissimus thoracis muscle were analysed for several meat quality parameters.

The chronic intermittent social stress treatment was found to affect behaviour, gastric health and lipid metabolism. Stress-treated pigs displayed less posture changes and less head knocking/biting. Their stomachs exhibited more pathological damages and gastric ulcers. Moreover, theses pigs had thicker backfat with a lower proportion of polyunsaturated fatty acids, indicating deviations in lipid metabolism. Based on these indicators, we did not find evidence for an increased baseline level of chronic stress in entire male pigs. However, interactions between stress treatment and castration suggested that the behavioural response to stress is more pronounced in entire male pigs. Castrated males, on the other hand, had a considerably higher concentration of basal salivary cortisol throughout the day, whereas the temporal course did not differ between entire and castrated males. Giving pigs access to grass silage reduced pen-mate directed manipulations and prevalence of gastric ulcers. Entire male pigs displayed more pen-mate directed manipulations, but also responded more pronouncedly to the provision of grass silage by reducing this behaviour. We thus assumed that while the provision of grass silage seems to be beneficial to pigs irrespective of hormonal status, it is especially advantageous for entire male pigs.

The third experiment aimed to assess the implementation of grass silage in an on-farm situation. On six farms operating according to organic regulations, two groups each with access to grass silage were compared to two groups with straw only. Straw was provided as litter in all pens. Behaviour and tail lesions were assessed three and four times, respectively. After slaughter, stomachs were inspected. Giving access to grass silage did not affect manipulative behaviours as it did in the previous experiment, but it increased the overall proportion of time spent with either grass silage or straw. Prevalence of tail lesions was in general very low, and nearly absent in groups with grass silage. Severe damages of the gastric mucosa and gastric ulcers were only found in pigs of two farms, unaffected by treatment. Considering only those stomachs that showed any damages at all, severe damages in the gastric mucosa and gastric ulcers were less frequent in pigs with access to grass silage.

In conclusion, results of this thesis show that the omission of castration did not result in an increased baseline level of stress. The more pronounced behavioural stress response in entire male pigs, however, suggests that handling and management should be adapted in order not to impair welfare in these pigs. Stress treatment caused an increase in prevalence of gastric ulcers, equally for entire and castrated male pigs. *Post mortem* inspection of stomachs thus turned out to be a valid option for animal based welfare assessment. Finally, we recommend giving pigs access to grass silage or similar roughages. Especially the clear benefit for gastric health, which was partly reproduced under commercial farm conditions, demonstrates the positive impact on welfare.