Effect of genotype and immunocastration on the fatty acid composition in pork backfat

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Objectives: Surgical castration without anaesthesia was the predominant method of piglet castration in Germany until the recent ban in late 2021. As German consumers have become more concerned with animal welfare in recent years, practical alternatives to surgical castration had to be found. The alternative under investigation in this study was immunocastration. This study aimed to investigate the effect of immunocastration, relative to the effect of genotype. Fatty acid (FA) composition in pork backfat was selected as the target parameter, as FA composition is deterministic of nutritional value and processing properties of pork backfat.

Materials and Methods: Samples were taken from n=50 pigs of two different genotypes and three different sexes. This included samples from carcasses of Piétrain (PI, n=20) and Duroc (DU, n=30) sired pigs selected from commercial production in two different sites. PI included two sex categories, immunocastrates (IC, n=10) and gilts (FE, n=10). DU was split into three sex categories,
i.e. IC (n=10), FE (n=11), and surgical castrates (SC, n=9). Carcass characterization was conducted in the abattoir using ultrasonic image analysis. For this study, hot carcass weight (kg), lean meat yield (%), muscle thickness (mm), backfat thickness (mm), belly weight (kg) and the belly meat yield (%) were evaluated. Gas chromatography coupled with flame ionization detection was used for FA analysis. Two-factorial analysis of variance was applied to test the effect of sex and genotype and the statistical significance of mean differences for FA data and carcass characteristics between genotypes and sexes, respectively. Principal component analysis was used to evaluate multivariate correlations between FA composition and sex as well as genotype.

Results and Discussion: For the purpose of this study, genotype has to be understood as the cumulative effect of the differences in the production process between the two production sites. All results are presented as mean and standard error (M±SE). Genotype significantly affected hot carcass weight ($p<0.05$), muscle thickness ($p<0.001$), and backfat thickness ($p<0.001$). DU and PI exhibited hot carcass weights of 102.26±0.72 kg and 99.18±0.98 kg respectively, with thicker backfat in PI (13.75±0.4 mm) than in DU (12.00±0.3 mm) and greater mean muscle thickness in PI (72.02±1.11 mm) than in DU (60.73±0.74 mm). Sex did not significantly ($p>0.05$) affect carcass characteristics. Within DU, sex significantly ($p<0.001$) affected lean meat yield and backfat thickness. Genotype significantly ($p<0.001$) affected the total concentration of saturated fatty acids (SFA), monounsaturated fatty acids (MUFA), polyunsaturated fatty acids (PUFA), n-3 fatty acids, and n-6 fatty acids. PI exhibited higher concentrations than DU for SFA (41.61±0.62 % and 37.54±0.37 %) and MUFA (47.56±0.67 % and 44.13±0.51 %). Consequently, the PUFA concentration was smaller in PI (10.83±0.33 %) than in DU (18.33±0.55 %). The concentration of n-3 fatty acids was smaller in PI (0.83±0.03 %) than in DU (1.52±0.04 %). The concentration of n-6 fatty acid was also smaller in PI (9.43±0.3 %) than in DU (16.06±0.5 %). Sex did not significantly ($p>0.05$) affect total concentration of SFA, MUFA, PUFA, n-3 fatty acids, or n-6 fatty acids. The variability between genotypes was greater in IC than FE. Within DU, FA composition was not significantly ($p>0.05$) affected. As both PI and DU samples were taken from ongoing commercial production and no concise results suggest otherwise, it can be assumed that the greater variability in FA composition between genotypes is still within an acceptable range in terms of processing properties.

Conclusions: Based on the results of this study, the effect of genotype outweighs the effect of sex. Thus, immunocastration does not inhibit pig farmers from producing pork which is satisfactory in terms of FA composition. If processing properties (e.g. oxidation stability, firmness of backfat) are of concern, genotype and diet should be controlled as immunocastration does not cause significant changes to FA composition. Ongoing research within the overarching project is further examining sex vs. farm differences with about 800 pigs from 40 sites in Germany.

Key words: Meat quality, Pork production