Genetic parameters for VIA-derived muscle, bone and fat weights in Texel-sired crossbred lambs

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In the UK, 27% of the UK's 13M breeding ewes are mated to a Texel ram, thereby genetic improvement in this breed has a significant impact on the industry. However genetic improvement is largely undertaken in purebred flocks with a disconnect from the information generated from their crossbred progeny performance and carcass data in the abattoir. Meat yield and tissue distribution are 'hard to measure traits', however, recently calibrated Video Image Analysis (VIA) technology has been shown to better predict meat yield from primal regions (r~0.8-0.96) compared to existing EUROP carcass classification. The aim of this work is to quantify genetic and phenotypic properties of VIA-derived muscle, fat and bone weights in the shoulder, saddle and hind leg primal regions, and growth data from 2,340 Texel X Lleyn lambs to inform future genetic improvement for these traits. New data on these traits (2017-2019) were collected from seven Texel Sheep Society commercial phenotype farms across the UK, with all lambs slaughtered at one UK abattoir fitted with VIA technology. The pedigree consisted of 16,309 individuals including 2,340 lambs with 75 sires, 1,205 dams, 53 grand-sires, 71 grand-dams, 101 great grand-sires and 120 great grand-dams. Lleyn pedigree was not available. Lambs and sires were genotyped with a 17k and 50k single nucleotide polymorphism (SNP) bead chip respectively and genotypes were used for parentage verification. Variance components for X-bred lamb carcass traits were estimated using a multi-trait sire model including farm, year, slaughter batch, sex and adjusted for carcass weight. Variance components for growth traits were estimated using a single trait sire model including dam age, birth rank, sex, farm, and year. Heritability estimates ranged between 0.10-0.46 for muscle, 0.21-0.53 for bone, 0.19-0.34 for fat and 0.24-0.40 for growth traits. These results demonstrate the potential for VIA technology to enable genetic selection for hard to measure carcass traits.

Association between feed efficiency and methane emissions, performance and health in Merino sheep

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Decreasing feed intake without negative consequences on animal performance and health provides an opportunity to increase profitability of grazing sheep systems. Selection by residual feed intake (RFI) increases feed conversion efficiency by reducing dry matter intake (DMI) at constant body weight (BW) and bodyweight gain (BWG). The impact of selection by RFI on several performance traits was investigated (in the frame of H2020 project SMARTER no. 772787) in 278 Merino lambs (ewe and rams), sired by 12 rams. One-year old lambs were allotted to one of three RFI tests based on sex, birth type and age. In each test, animals were allocated to one of five automated feeding systems in accordance to BW and sire. During the 56-day RFI tests lambs were fed *ad libitum* with Lucerne haylage (DM 53.8%, CP 21.8%, FDA 29.3%, FDN 36.0%, EE 2.4%). Extreme 25% highest (148 g DMI/d/an) and lowest (-135 g DMI/d/an) RFI animals were selected for the analysis. The effect of RFI group was analysed by a general linear model including RFI group, dam age, birth type, contemporary group, sex and lamb age as fixed effects. RFI, DMI, BWG, fat depth, CH_4 and CO_2 emission and O_2 consumption during RFI test, clean fleece weight (CFW), fibre diameter, staple length, wool production potential (WPP=CFW/BW×100) at one-year old and faecal egg count after weaning were measured. RFI group affected ($P<0.05$) DMI, RFI, CFW, WPP, CH_4 (g/d, g/kg DM, g/kg BW) and CO_2 emission and O_2 consumption. Less efficient animals ate more (1.449 vs 1.157 kg DM), produced a heavier fleece (3.27 vs 3.14 kg), had a higher WPP (6.9 vs 6.5%), CH_4 (24.3 vs 22.8 g/d) and CO_2 emission (1,028 vs 958 g/d), methane yield (0.55 vs 0.52 g/kg BW) and O_2 consumption (941 vs 894 g/d), while their methane intensity was lower (15.5 vs 17.8 g/kg DM). Other traits were not affected ($P>0.05$) by RFI group. In agreement with other studies, improving RFI reduces DMI, and CH_4 (total and yield) emissions, without modifying BWG or wool quality. No significant effect of RFI on health traits was found in our study. These favourable results must be outweighed with a potential reduction on fleece weight or wool/BW in a fine-wool production system.