

Impacts of a heavier live weight at breeding on the morphology of mammary glands of non-dairy ewe lambs

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A heavier live weight at breeding has been shown to improve the reproductive performance of ewe lambs during their first breeding season (Haslin et al., 2019). Increased growth prior to puberty, however, can impair mammary gland development and reduce milk production of ewe lambs (Umberger et al. 1985). In dairy ewes, the size of the mammary gland has been found to be positively correlated with milk yield (Lérias et al., 2014). The current study investigated the effects of a heavier live weight at breeding on the morphology of the mammary gland of ewe lambs over their first pregnancy and lactation.

Single-bearing Romney ewe lambs ($n = 59$, at approximately 300 days of age) were selected at pregnancy diagnosis from either 'Heavy' treatment ($n = 31$), preferentially fed from weaning to breeding to be 3 kg heavier at breeding, or 'Control' treatment ($n = 28$). Udder scoring, morphology, live weights of ewe lambs, and subsequently their progeny were undertaken at 107 days of pregnancy (P107), 29 days of lactation (L29) and at weaning (L100). The scores were adapted from Griffiths et al. (2019) and included udder and teat palpations, udder depth score and udder symmetry. Udder palpation scores 1, 2, 3 were diffuse soft, diffuse firm and soft consistency with nodule(s) and scores 4 and 5 being firm with nodule(s) and diffuse hard consistency. Teat palpation scores 1 and 2 were soft consistency and thickened orifice and score 3, 4 were hard consistency and orifice obstruction. Udder scores 1, 2, 3 and teat scores 1, 2 were considered "normal". Morphological traits included udder circumference (UC, cm) and the height of each half of the udder. Udder volume (UV, cm³) was estimated using UC and an average of udder height (UH, cm) and calculated according to Ayadi et al. (2011). Ewe lambs that died ($n = 2$) or lost their lambs before weaning ($n = 9$) were excluded from the analyses. The scores were analysed with generalised linear models, and morphological traits with general linear mixed models with lambing date as a covariate, both allowing for repeated measures and including day of measurement (P107, L29, L100), treatment group (Heavy vs. Control) and their two-way interaction as fixed effects.

Ewe lambs from the Heavy group tended to be heavier at breeding than Control ewe lambs ($P=0.09$; 47.5 ± 0.71 vs. 45.8 ± 0.71 kg respectively). Treatment group had no effect ($P>0.05$) on lamb growth to weaning (242 ± 0.009 vs. 236 ± 0.010 g/hd/d for Control and Heavy respectively). The udder palpation score of the Control group was greater ($P<0.05$) than the Heavy group at P107 but did not differ ($P>0.05$) at L29 or L100 (Table 1). The teat palpation score, the proportion of asymmetric udders, the udder depth score, UH, UC and UV did not differ ($P>0.05$) between treatment groups at any time (Table 1).

Table 1. Effect of treatment (Control $n = 24$ vs. Heavy $n = 24$) on the least square means (95% confidence limits) of udder palpation, the percentage (95% CL) of asymmetric udders and least square means \pm SE of udder height, circumference, volume during pregnancy (P107), early lactation (L29) and weaning (L100).

	Pregnancy (P107)		Early lactation (L29)		Weaning (L100)	
	Control	Heavy	Control	Heavy	Control	Heavy
Udder palpation	1.46 (1.20–1.77)**	1.08 (0.98–1.20)**	1.62 (1.39–1.90)	1.50 (1.29–1.75)	1.15 (1.02–1.30)	1.46 (1.15–1.85)
Asymmetric udders (%)	12.3 (4.24–30.7)	16.7 (6.35–37.3)	4.15 (0.53–25.4)	16.7 (6.49–36.8)	12.3 (3.75–33.5)	4.17 (0.59–24.4)
Udder height ¹ (cm)	1.90 ± 0.09	1.81 ± 0.09	10.36 ± 0.21	10.17 ± 0.21	8.85 ± 0.27	8.64 ± 0.27
Udder circumference (cm)	24.0 ± 0.36	24.0 ± 0.35	49.5 ± 0.53	48.7 ± 0.53	32.5 ± 0.64	33.6 ± 0.64
Udder volume (cm ³)	90.7 ± 6.28	85.3 ± 6.14	2026.2 ± 55.6	1900.6 ± 55.6	747.1 ± 47.13	801.8 ± 47.13

¹ Average of height of the right and left udder halves; ** Control vs. Heavy $P<0.01$ at the time point.

The difference observed in udder palpation score was seen only during pregnancy and was relatively small suggesting the udders had a score that was considered "normal" (Griffiths et al. 2019). The lack of difference in lamb growth and morphological traits between treatment groups suggests that greater liveweight gains prior to puberty had no impact on mammary gland morphological development and on the growth of their lambs.

References

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