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UNDERNUTRITION DURING THE LACTATION AND/OR POST-WEANING PERIODS AND THE REPRODUCTIVE PERFORMANCE OF MERINO EWES

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The lower lambing rate, where ewes are mated in spring and early summer, compared to autumn, might be due to the fact that anoestrus can continue even into the summer months. (Dun, Ahmed & Morrant, 1960; Adler, 1964; Shelton & Morrow, 1965; Watson & Radford, 1966). The possibility also exists that inadequate nutrition during the preceding winter will further reduce the proportion of ewes mating during spring (Hunter, 1962; Smith, 1965).

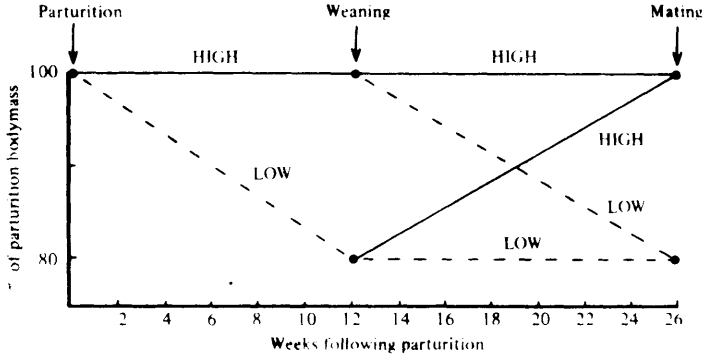

Fig. 1 *Planned changes in bodymass of ewes on high (–) or low (– –) pre- and or post-weaning planes of feeding*

Lishman, Stielau & Botha (1974 a, b) set out to test whether these factors would affect the lambing rate of ewes subjected to a regular annual mating-lambing regime. Contrary to expectation, they found that even where a 20% loss in bodymass occurred during the autumn lactation period, this had only a minor depressing effect on the lambing rate of the ewes. However, they emphasised that their results provided no indication of what the consequences would be if feeding conditions did not improve during the post-weaning period. Their caution was justified since Smith (1965) had found that the oestrous activity during the mating period was influenced by both the current level of nutrition and that which prevailed several months earlier. Accordingly, the object of this study was to examine the effect of periods of undernutrition which did not occur only during the lactation period.

One day after parturition, 113 Merino ewes (2–7 years old) which had been grazed on kikuyu pasture and which lambed 28 March to 21 April were weighed and randomly allocated into 4 treatment groups (Fig. 1) Each ewe sucked only a single lamb and during the 12-week lactation period 2 groups of ewes (HH and HL) were fed on dry-lot so as to maintain the bodymass

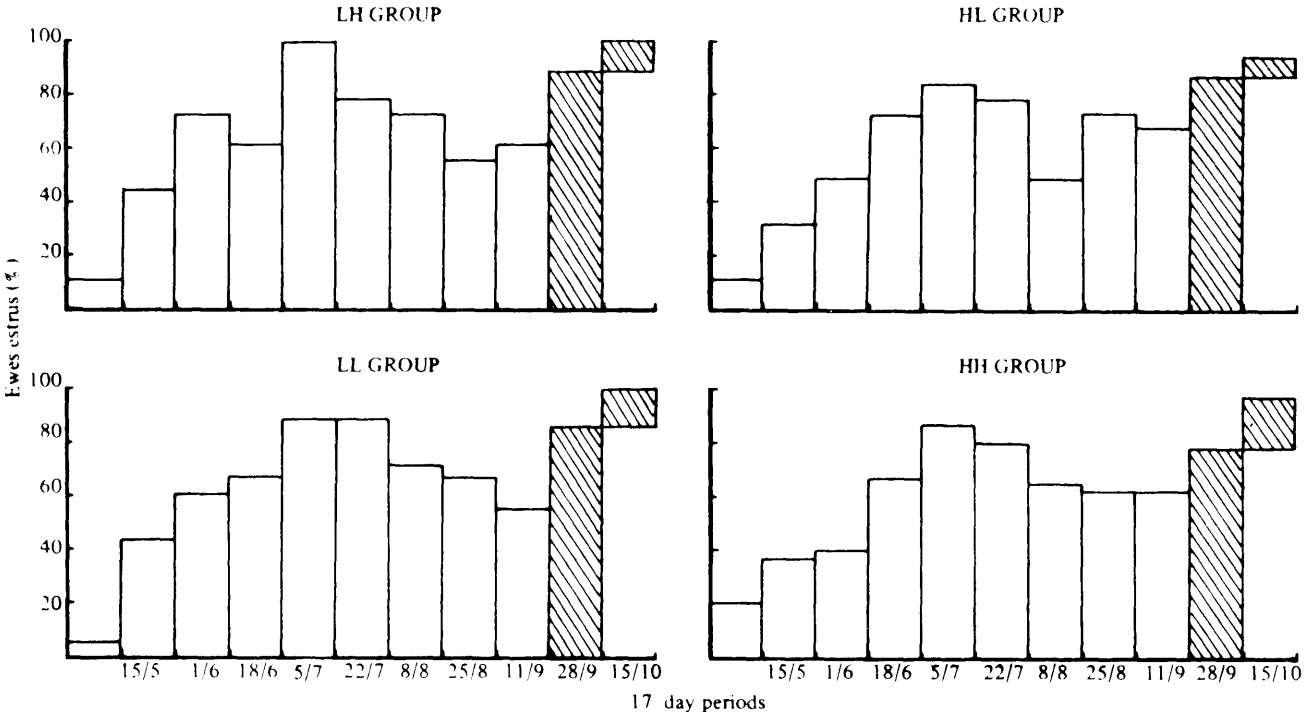

Fig. 2 *Seasonal variations in the occurrence of oestrus in groups of ewes underfed either during lactation (LH), post-weaning (HL), both during lactation and postweaning (LL) or not underfed (HH). The cross-hatched section refers to mating with fertile rams.*

(wool growth excluded) recorded at parturition (PBM). The ration was compiled so as to meet the requirements of a 45 kg lactating ewe (Morrison, 1956; NRC 1968) and consisted of 1,6 kg maize silage, 0,9 kg milled lucerne hay and 0,7 kg of a maizemeal-fishmeal concentrate. The remaining 2 groups (LL and LH) were fed so that at weaning they would weigh approximately 20% less than at lambing. Their daily feed allowance was 50% of that fed to the HH and LH groups, except for maize silage which was reduced to 42%. After weaning of the lambs, the plane of feeding was reversed in two groups (HL and LH) and during the post-weaning period the ewes were fed the same ration as during the suckling period, except that the quantities were reduced.

The body mass of the experimental ewes was measured weekly until commencement of the annual breeding period. Observations for oestrus were made twice daily using sexually active vasectomized rams. On 15 October the ewes were returned to kikuyu grazing and joined with vasectomized rams bearing raddle crayons (Radford, Watson & Wood, 1960). The ewes marked were recorded daily during the 42-day breeding period and service was by hand mating to fertile rams. Dosing, inoculation, shearing and mineral supplementation were according to standard procedures.

The changes in bodymass were such that at weanning the average bodymass of the high plane (HH + HL) ewes was 99,2% of the PBM (range 92,6–116,4%). In contrast, the low plane (LL + LH) groups very nearly attained the desired 20% loss, with the average bodymass after 12 weeks of lactation being 83,1% of the PBM (range 65,4–89,4%). During the post-weaning period the change from the low to the high plane of feeding did not result in complete compensation in bodymass (LH = 107,1%; HH = 116,9% of PBM), whereas by 15 October the HL group had achieved a 12,9% loss in bodymass. At this time the LL group averaged 86,0% of the PBM. The change in bodymass of the underfed ewes is similar to that reported for ewes on poor quality pasture during lactation (Allden, 1970).

The nutritional treatments did not significantly influence the occurrence of oestrus until 1 November (Fig. 2) and except for 2 ewes (Table 1) breeding was completed within 30 days after mating with fertile rams had commenced. The failure of underfeeding to depress the oestrous activity of the ewes was surprising in view of several studies which indicated that undernutrition reduced the incidence of oestrus (Allen & Lamming, 1961; Hunter, 1962; Smith, 1962, 1965; McKenzie & Edey, 1975). However, Lishman *et al.* (1974a) showed that the effect of poor nutrition was not consistent from year to year. Furthermore, even where the incidence of oestrus during late winter was reduced by earlier poor feeding, very few ewes failed to be mated during the spring breeding period (Lishman *et al.* 1974a).

The data in Table 1 show that although the proportion of barren ewes (served but not lambing) was considerably higher (35,7%) in the LL than in the HH group (11,4%) this difference was not significant (χ^2 = 2,481; P < 0,10). Similarly, when underfeeding during lactation was considered (LH + LL) the percentage of barren ewes (26,6) was not significantly greater (χ^2 = 2,557; P < 0,10) than among ewes on the HP at this time (HH + HL = 11,6%). When the nutritional treatments were disregarded, more ewes (χ^2 = 2,58; P < 0,10) that had a bodymass of less than 45 kg at mating (28,5%) did not lamb, than ewes weighing in excess of 45 kg (11,1 %). Although not statistically significant, the marked increase in the occurrence of barrenness, where ewes were underfed throughout the period from parturition to mating (Table 1), supports the findings of Coop (1966) and Gunn, Doney & Russell (1969). Both Mullaney (1966) and Lishman *et al.* (1974b) have reported that, at times, more than 30% of the ewes which were mated, failed to lamb. The figure of 35,7% for the LL treatment is similar to that recorded for ewes on restricted feeding during lactation and not flushed prior to mating (Lishman *et al.*, 1974b).

The results presented here suggest that if ewes suffer a severe loss in bodymass during an autumn lactation and are unable to compensate for this loss during the post-weaning period then their subsequent lambing rate is likely to be reduced. Contrary to expectation, the ability of such ewes to exhibit oestrus during the spring mating period may not be deleteriously affected. Consequently, the reduced lambing rate observed must be the result of a failure of some mechan-

Table 1

Reproductive performance of ewes subjected to different pre- and post-weaning planes of nutrition

Level of feeding:		Number of ewes					Lambs as a % of ewes mated
Pre-weaning	Post-weaning	Mated	Not mated	Culled+	Lambing	Not lambing	
High	High	36	1	4	31	4	112,9
	Low	35	1	2	30	4	103,3
Low	High	17	0	2	13	3	107,7
	Low	14	0	4	9	5	100,0

+ Old age

ism other than that which controls the occurrence of oestrus. this hypothesis is supported by the observation of a reduced conception rate in beef cows that received inadequate feeding during lactation (Wiltbank, Rowden, Ingalls, Gregory & Koch 1962). Although these workers did not determine whether ovulation, fertilization or gestation failed, Spitzer, Niswender, Seidel & Wiltbank (1975) concluded that the sub-normal pregnancy rate of heifers on a low energy diet was the consequence of early embyonic loss and not due to a failure of fertilization. Supporting evidence can be found in the observed association between the occurrence of abnormal ova and diet restriction in ewes (Hill *et al.*, 1969). Spitzer *et al.* (1975) could not implicate changes in the secretion of luteinizing hormone and of progesterone in the early death of embryos and further attention needs to be given to the basic mechanisms whereby undernutrition reduces the birth rate in cattle and sheep.

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