THE INFLUENCE OF LIVEWEIGHT ON OVULATION RATE IN THE EWE

A. J. ALLISON
*Lincoln College, Canterbury**

SUMMARY

Aged Romney ewes (187) and Border Leicester × Romney ewes (87) were fed high-plane or low-plane nutrition from December 2 to February 18, after which all were run as one mob. Ewes were laparotomized at first oestrus (mid-March) and slaughtered after second oestrus. The mean liveweight differences between high- and low-plane ewes at February 18, first oestrus and second oestrus were 33 lb, 27 lb and 24 lb, respectively.

The ovulation rate of the high-plane ewes exceeded that of the low-plane ewes by 0.05, 0.07, 0.07, 0.25 for the Romneys at first and second oestrus and for the crossbreds at first and second oestrus, respectively. The weighted means for high-plane and low-plane ewes were 1.52 and 1.42 ovulations per oestrus, respectively. The ovulation rates increased significantly from first oestrus (1.35) to second oestrus (1.60) and were greater in crossbred ewes (1.68) than in Romneys (1.37). The findings are discussed.

THE liveweight and nutritional status of the ewe at mating have a considerable influence upon reproductive performance as measured at oestrus by ovulation rate (Wallace, 1961; Killeen, 1967), and at lambing by the percentage of barren and twin-bearing ewes (Coop, 1962, 1966a). The literature in this field has recently been reviewed by Coop (1966a, 1966b). It would appear that the effect can be interpreted in terms of both the absolute magnitude of the liveweight and also whether or not the weight is rising or falling round the time of mating. It is considered that the absolute liveweight effect, independent of the rising or falling condition of the ewe, measured at lambing, is equivalent to an increase in twinning of approximately 6% for each 10 lb increment of liveweight.

Liveweight may have its alleged effect at any stage from the shedding of the ovum to the birth of the live lamb. Most New Zealand reports concern lambing percentage data only, and the only record of ovulation rate in high- and low-liveweight ewes is that of Wallace (1961).

The present experiment was undertaken to provide additional data.

*Present address: Department of Animal Husbandry, University of Sydney.

EXPERIMENTAL

A mob of 274 six- to eight-year ewes comprising 187 Romneys and 87 first-cross Border-Leicester Romneys was randomized into two treatments on the basis of breed, liveweight and previous reproductive performance.

The two groups were differentially fed at extreme levels in order to achieve a large liveweight difference before the onset of the pre-breeding season "silent oestrus". As most Romney ewes in Canterbury will take the ram in the second half of March, ovulatory activity would commence in mid-February. Consequently, all ewes were combined on February 18 and subsequently run together.

First oestrus was detected using raddled vasectomized rams which were introduced on March 3. Oestrous ewes were observed twice daily and separated from the flock. Ovulation rate was ascertained at laparotomy 2 to 4 days after detection of oestrus. Laparotomized ewes were mated at second oestrus with raddled entire rams and ovulation rate data were obtained from slaughtered animals.

All ewes were weighed fortnightly until the end of January and weekly from then until the end of the experiment. For the purposes of analysis, the weight of each ewe at oestrus was taken as that weight closest to detection of oestrus.

As the experiment was a $2 \times 2 \times 2$ factorial (nutrition $\times$ cycles $\times$ breed), the data were analysed accordingly. Analysis of variance was done after the percentage of multiple ovulations in each group had been transformed to angles. Treatment of data within groups was done using the χ^2 test or analysis of variance with disproportionate subclass numbers.

RESULTS

LIVEWEIGHT

Liveweight changes of both breed groups, initially on high and low planes of nutrition, are shown in Fig. 1. Weights at first and second oestrus on the graph are given at March 15 and April 1, the median dates of first and second oestrus, respectively.

For two months, from February 18 onwards, low-plane ewes showed a steady liveweight increase whereas high-plane ewes remained relatively constant.

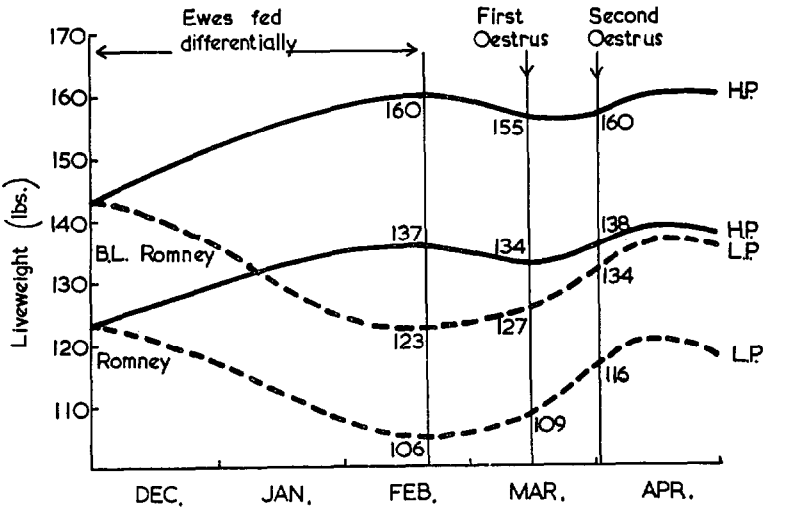

Fig. 1: Mean liveweights of ewes.

Ovulation Rate

Table 1 records the ovulation rates.

The differences in ovulation rates in ewes between first and second oestrus and between breeds were statistically highly significant.

Positive differences in ovulation rate between high-plane and low-plane ewes were also found, these being for Romneys and Border Leicester × Romneys, respectively, 0.05 and 0.07 at first oestrus and 0.07 and 0.25 at second oestrus. However, none of these differences was statistically significant although analysis of data pooled for the two breeds showed a significant effect due to treatment in number of ovulations at second oestrus. Considering

Table 1: Mean Ovulation Rate per Ewe

		1st Oestrus	*2nd Oestrus*	*Mean of Breeds*	*Weighted Mean of HP/LP*
Romney	HP	1.26	1.55	1.37	HP 1.52
	LP	1.21	1.48		
Border-Romney	HP	1.61	1.89	1.68	LP 1.42
	LP	1.54	1.64		
Weighted Mean		1.35	1.60		

all observations, the weighted means for ovulations per oestrus in high-plane and low-plane ewes were 1.52 and 1.42, respectively; the difference of 0.10 ovulations just failed to reach statistical significance.

Analysis of data within groups showed there was a positive and significant relationship between multiple ovulation and liveweight in high-plane ewes. However, this was not apparent within the low-plane groups.

DISCUSSION

A comparison of the present results with the numbers of ovulations in differentially fed ewes of Wallace (1961), and Killeen (1967) is summarized in Table 2.

In Wallace's experiment with Romney ewes, the performance of the medium group was little better than the results of the group at low plane of nutrition, and, in Killeen's study involving Border-Merino ewes, it was actually inferior. Thus, in both these studies, the major comparison was between the ewes at high plane of nutrition and those at medium and low levels. These differences in ovulation rate averaged 0.24 or 24% for a 19 lb weight difference (Wallace), and 7% for an 18 lb difference (Killeen). In the present experiment, the difference was 10% for a 25 lb difference in liveweight.

On the assumptions that twinning rate at lambing increases by 6% per 10 lb increase in pre-mating weight and that ovulation rate is responsible for the effect, the present difference of 10% is below expectation. The low-plane ewes in this experiment made steady liveweight increases during the pre-mating and mating periods. As Coop (1966a) has

TABLE 2: COMPARISON OF RESULTS OF PLANE OF NUTRITION AND OVULATION RATE IN EWES

Author and Type of Data		*Plane of Nutrition*		
		High	*Medium*	*Low*
Wallace (1961) (180 ewes)	L.W. diff. above low ewes (lb)	19	8	0
	Ovulation rate	1.77	1.58	1.53
	Lambs born/ewes lambing	1.51	1.34	1.35
Killeen (1967) (480 ewes)	L.W. diff. above low ewes (lb)	18	9	0
	Ovulation rate	1.40	1.26	1.31
Allison (1968) (270 ewes)	L.W. diff. above low ewes (lb)	25	—	0
	Ovulation rate	1.52	—	1.42

shown that liveweight change creates a corresponding change in twinning rate and Killeen (1967) has shown the same for ovulation rate, it is likely that the weight increases have offset the effect of liveweight *per se* and thus reduced the difference in ovulation rate between the planes of nutrition.

Although this experiment, in agreement with that of Killeen (1967), suggests that the response in ovulation rate to high liveweight is not as great as data from other New Zealand work would suggest (Wallace 1961; Coop 1962, 1966a), there is a consistent effect for the ovulation rate to be higher in high-liveweight ewes.

The large increase in ovulation rate from first to second cycles is of considerable significance and is much greater than that reported by McDonald and Ch'ang (1966) who obtained ovulation rates of 1.71, 1.85 and 1.88 at first, second and third oestrus, respectively. The superiority of the Border Leicester × Romney ewes in number of ovulations compared with Romney ewes of the same age is also notable.

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