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Improving lamb birthweight through mid- to late-pregnancy shearing: a review of recent studies

P.R.KENYON[1], S.T. MORRIS[1], D.K.REVELL[2] AND S.N. MCCUTCHEON[3]

[1] Institute of Veterinary, Animal and Biomedical Sciences, Massey University, Palmerston North, New Zealand
[2] Institute of Food, Nutrition and Human Health, Massey University, Palmerston North, New Zealand
[3] Vice-Chancellor's Office, Massey University, Palmerston North, New Zealand.\

ABSTRACT

A series of five experiments have been conducted at Massey University to determine whether mid- to late-pregnancy shearing of ewes might provide an opportunity to increase lamb birthweights and enhance survival, particularly of multiple-born lambs, under New Zealand's pastoral conditions. Although birthweight responses were seen in most studies, they were not consistent with respect to the magnitude of the response or its occurrence in singles vs twins. However, when comparison was made across studies there was a strongly negative relationship between the size of the response and the birthweights of control lambs (those from unshorn ewes). We conclude that responses to mid- to late-pregnancy shearing are likely to be greatest when fetal growth in unshorn ewes is limited by maternal constraint.

Keywords: Birthweights; survivability; pregnancy; shearing.

INTRODUCTION

In New Zealand, 5 to 25% of all lambs born die before weaning (Scott 1962; Hight and Jury 1970). Many of these deaths are associated with low birthweights (McCutcheon *et al.,* 1981) resulting in loss due to 'starvation-exposure', especially in twin-born lambs (Dalton *et al.,* 1980). The incidence of starvation-exposure decreases as birthweight increases (Dalton *et al.,* 1980). Therefore, any treatment which increased birthweight in light-weight lambs could substantially increase returns to the New Zealand farmer. Indoor studies in the UK (Austin and Young 1977; Maund 1980; Symonds *et al.,* 1986) have shown that shearing during mid-pregnancy increases birthweights in lambs. Dabiri *et al.* (1995a and 1996) found no effect of shearing ewes at either day 114 of pregnancy (P114) or P118 on lamb birthweight in New Zealand pastoral conditions. However, Husain *et al.* (1997) found a significant increase in lamb birthweights by shearing at P115. It is conceivable that a greater or more consistent response might occur if the shearing treatment was applied earlier to coincide with fetal development and/or permit a greater response in feed intake after shearing.

A series of five experiments have been conducted at Massey University to determine whether the mid- to late-pregnancy shearing technique might be used to increase lamb birth weights and enhance survival. Here we review the studies, particularly with respect to factors which influence the magnitude of the birthweight response.

MATERIALS AND METHODS

Trial one: 1995

Mixed-aged Border Leicester (BL) x Romney (R) ewes (n = 214) were randomly allocated after pregnancy diagnosis to a 4 x 2 x 2 factorial experiment (Morris and McCutcheon, 1997) involving: four time of shearing treatments, pregnancy day 70 (P70), P100, P130 or unshorn; two methods of shearing (standard or cover comb); and two pregnancy ranks (single or twin). During pregnancy the ewes were fed at a level required to maintain maternal liveweight, with some gain in late pregnancy associated with fetal growth.

Trial two: 1996

Mixed-aged BL x R ewes (n = 151) were randomly allocated after pregnancy diagnosis to a factorial experiment involving: four time of shearing treatments (P50, P70, P100 or unshorn); two methods of shearing (standard or cover comb) and two pregnancy ranks (single or twin). During pregnancy the ewes were fed at a level required to maintain maternal liveweight, with some gain in late pregnancy associated with fetal growth.

Trial three: 1997 outdoor

Mixed-aged BL x R ewes (n = 180) were randomly allocated after pregnancy diagnosis to a factorial experiment involving two shearing treatments (shorn (P69) or unshorn) and two pregnancy ranks (single or twin) From P70 until lambing the ewes were fed *ad libitum* in an average pasture cover of 3200kgDM/ha.

Trial four: 1997 indoor

Mixed aged BL X R ewes (n = 20) were randomly allocated after pregnancy diagnosis to a factorial experiment involving two shearing treatments (shorn (P69) or unshorn) and two pregnancy ranks (single or twin). On P91, the ewes were moved into metabolism cages and fed *ad libitum* quantities of lucerne pellets until P119, when feed intake was restricted to an amount calculated to maintain maternal liveweight and allow for weight gain of the gravid uterus.

Trial five: 1998

Mixed-aged BL X R ewes (n = 160) were randomly allocated after pregnancy diagnosis to a factorial experiment involving: two shearing treatments (shorn (P70) and

unshorn); two pregnancy ranks (single or twin); two levels of feeding P70 - P101 (maintenance (M) or high (H)); and two levels of feeding P102 - P140 (M or H). Group M were fed at a level calculated to maintain maternal conceptus-free weight, while group H were fed to gain approximately 100g per day of maternal weight during the relevant period. In addition each group was allowed to gain in weight, equivalent to the expected conceptus growth.

Trial locations

All of the outdoor trials were conducted at Massey University's Keeble Farm (latitude 41° 10'S), 5km south of Palmerston North, New Zealand. The indoor study was undertaken at Massey University's Animal Physiology Unit.

Statistical analysis

Data are expressed as least square means and standard errors for lamb birth weights. Statistical analyses were conducted using the computer packages 'MINITAB'(MINITAB 1998) or SAS (SAS, 1985).

RESULTS

Trial one: 1995

Shearing during mid- to late-pregnancy (P70, P100, P130) tended to reduce the birthweights of single lambs, but not significantly so (Table 1). However, shearing significantly ($P<0.05$) increased twin birthweights. Twin-born lambs from ewes shorn at P70 were 0.3 and 0.4kg heavier ($P<0.05$) than lambs born to ewes shorn at P100 and P130 respectively and 0.7kg heavier than lambs born to unshorn ewes. The method of shearing (standard or cover comb) had no effect on birth weights.

Trial two: 1996

Shearing during mid- to late-pregnancy (P50, P70, P100) significantly ($P<0.05$) increased the birthweights of single lambs. Twin-born lambs from ewes shorn at P100 were 0.4 and 0.6kg heavier ($P<0.05$) than twin-born lambs from ewes shorn at P50 and P70 respectively, but none of these differed in weight from lambs born to unshorn ewes. The method of shearing (standard or cover comb) did not affect the response to shearing.

Trial three: 1997 outdoor and indoor trials.

Shearing during mid-pregnancy (P69) increased birthweight of single lambs by 0.8kg ($P<0.05$) (Table 1) but had no effect on twin lambs born to ewes run outdoors. In contrast, in the indoor study shearing during mid-pregnancy (P69) had no effect on the birthweights of single lambs, but increased twin birthweights by 1.0kg ($P<0.05$).

Trial five: 1998

Shearing during mid-pregnancy (P70) significantly increased lamb birth weights ($P<0.05$), but did not differentially affect the birth weights of single or twin lambs (Table 1).

DISCUSSION

Method of shearing (standard vs cover comb) did not significantly affect the birthweight response to shearing in trials one or two. Husain *et al*. (1997), however, found that while standard comb-shearing significantly increased lamb birthweights, cover comb-shearing had no effect. Winter shearing of ewes is often associated with increased ewe losses (Gregory, 1995), but the cover comb has been shown to reduce this problem (Dabiri *et al.,* 1995b). In light of the results from trials one and two, use of the cover comb may be a more acceptable option in commercial practise.

The exact time of shearing to maximise the birthweight response remains to be identified. Only in trial one was there a clear relationship between time of shearing and the birthweight response. Morris and McCutcheon (1997) have suggested that ewes shorn at P70 would a have greater opportunity to respond to the shearing effect than those shorn at either P100 or P130 as placental weight peaks at around day 100 of pregnancy (Alexander, 1964). The results summarised in Table 1, however, suggest that the shearing response depends on the conditions of the study rather than solely on the stage of pregnancy, as the shearing effect is seen in ewes that are shorn as late as P130.

Shearing during mid- to late-pregnancy commonly increased birthweights of lambs, without significantly de-

Table 1: Birthweights (kg) of single and twin lambs in five studies classified according to time of shearing (P = day of pregnancy when shorn) and method of shearing (standard (SC) or cover comb (CC)).

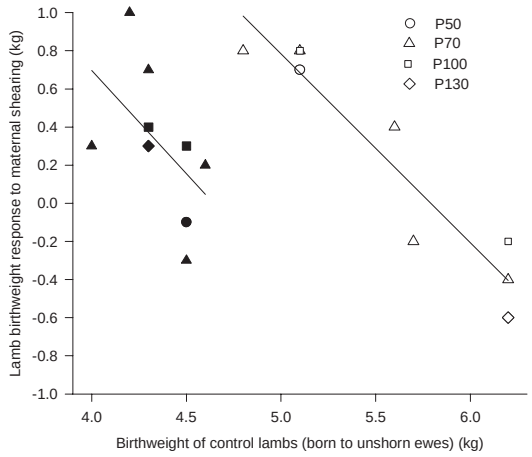
				Lamb Birth weight		
Year[1]	Method	Rank	Time	No.	Mean	s.e
1995	SC and CC	Singles	Unshorn	18	6.2	0.2
			P70	25	5.8	0.2
			P100	26	6.0	0.2
			P130	29	5.6	0.1
		Twins	Unshorn	27	4.3[a]	0.1
			P70	55	5.0[c]	0.1
			P100	59	4.7[b]	0.1
			P130	58	4.6[b]	0.1
1996	SC and CC	Single	Unshorn	14	5.1[a]	0.2
			P50	26	5.8[b]	0.2
			P70	25	5.9[b]	0.2
			P100	17	5.9[b]	0.2
		Twins	Unshorn	19	4.5[ab]	0.2
			P50	36	4.4[a]	0.1
			P70	36	4.2[a]	0.1
			P100	44	4.8[b]	0.1
1997 (outdoor)	SC	Singles	Unshorn	12	4.8[a]	0.1
			P69	8	5.6[b]	0.3
		Twin	Unshorn	20	4.0	0.2
			P69	26	4.3	0.2
1997 (indoor)	SC	Singles	Unshorn	5	5.7	0.3
		P69	5	5.5	0.2	
		Twins	Unshorn	5	4.2[a]	0.2
			P69	5	5.2[b]	0.2
1998	SC	Singles	Unshorn	32	5.6	0.2
			P70	30	6.0	0.2
		Twins	Unshorn	74	4.6	0.1
			P70	74	4.8	0.1

[1] Year = year of trial.

[a,b,c] Means within years and birth ranks with differing subscripts are significantly different at the 5% level.

creasing lamb birthweights in any of the trials or treatments. These results are in agreement with Austin and Young (1977), Maund (1980), Symonds *et al.* (1986) and Husain *et al.* (1997). The magnitude of the response varied between trials and treatments. When the shearing response across all trials is compared (Figure 1) it is apparent that the shearing effect was greatest when the control lambs (i.e. those born to unshorn dams) were lightest in both singles and twins. When birthweights in single and twin control lambs were high, the shearing effect was minimal.

Figure 1: Birthweight response to mid- and late-pregnancy shearing (singles- open symbols, twins- closed symbols) as a function of the birthweights of control lambs (each point represents a separate trial or treatment [shearing date] within a trial).



We therefore hypothesise that the mid- to late-pregnancy shearing policy is most beneficial when conditions are likely to result in poor birthweights. Any increase in birthweight of light lambs (predominately twins) should decrease losses due to starvation-exposure. However, increases in birthweight at the high end of the birthweight range may increase losses due to dystocia. A mid- to late-pregnancy shearing response of 0.7 kg (Figure 1) in light twin lambs (3.7 - 4.0 kg) would, based on the results of earlier studies (Hight and Jury,1970; Dalton *et al*.,1980; and Knight *et al.,* 1988) place these lambs in that part of the birthweight/mortality curve where survival is maximised.

Under some circumstances (trial one, 1995) the shearing effect has been found to be twin-specific. A twin-specific response could be used to enhance twin birthweight and survival, without having detrimental effects on the survival of single lambs. Our results suggests that this is most likely to occur when there is a substantial maternal constraint acting on the growth of the twin fetuses.

CONCLUSIONS

In New Zealand pastoral conditions, mid- to late-pregnancy shearing can be used to enhance lamb birthweights. In conditions that are likely to result in poor birthweights, mid- to late-pregnancy shearing should be used to increase birthweights and lamb survival. Under some circumstances the effect is specific to twin lambs and could be used to enhance their birthweight and survival, without having a detrimental effect on survival of lambs. A possible mid- to late-pregnancy regime in commercial practise is for farmers (post-scanning) to mid- to late-pregnancy shear their twin bearing ewes only. This should increase birthweights and survival in twin lambs without affecting single lamb survival.

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REFERENCES

Alexander, G. 1964. Studies on the placenta of the sheep *(Ovis aries L.)*. *Journal of Reproduction and Fertility*. **7:** 289 - 305.

Austin, A.R., Young, N.F. 1977. The effect of shearing pregnant ewes on lamb birth weights. *Veterinary Record*. **100:** 527 - 529.

Dabiri, N., Morris, S.T., Parker, W.J., McCutcheon, S.N., Wickham, G.A. 1995a. Productivity and cold resistance in ewes pre-lamb shorn by standard or cover comb. *Australian Journal of Agricultural Research*. **46:** 721 - 732.

Dabiri, N., Holmes, C.W., McCutcheon, S.N., Parker, W.J., Morris, S.T. 1995b. Resistance to cold stress in sheep shorn by cover comb or standard comb. *Animal Science*. **60:** 451 - 456.

Dabiri, N., Morris, S.T., Wallentine, M., McCutcheon, S.N., Parker, W.J., Wickham, G.A. 1996. Effects of pre-lamb shearing on feed intake and associated productivity of May- and August-lambing ewes. *New Zealand Journal of Agricultural Research.* **39:** 53 - 62.

Dalton, D.C., Knight, T.W., Johnson, D.L. 1980. Lamb survival in sheep breeds on New Zealand hill country. *New Zealand Journal of Agricultural Research*. **32:** 167 - 173.

Gregory, N. G. 1995. The role of shelterbelts in protecting livestock; a review. *New Zealand Journal of Agricultural Research.* **38**: 423 - 450.

Hight, G.K., Jury, K.E. 1970. Hill country sheep production. II. Lamb mortality and birthweights in Romney and Border Leicester X Romney flocks. *New Zealand Journal of Agricultural Research*. 13: 735 - 52.

Husain, M.H., Morris, S.T., McCutcheon, S.N. 1997. Pasture management to minimise the detrimental effects of pre-lamb shearing. *New Zealand Journal of Agricultural Research*. **40:** 489 - 496.

Knight, T.W., Lynch, P.R., Hall, D.R.H., Hockey, H.W.B. 1988. Identification of factors contributing to the improved survival in Marshall Romney sheep. *New Zealand Journal of Agricultural Research*. **31:** 259 - 271.

McCutcheon, S.N., Holmes, C.W., McDonald, M.F. 1981. The starvation-exposure syndrome and neonatal lamb mortality: A review. *Proceedings of the New Zealand Society of Animal Production.* **41:** 209 - 217.

Maund, B.A. 1980. Shearing ewes at housing. *Animal Production*. **30:** 481.

Minitab, 1998. Minitab version 12.1. Minitab Inc.

Morris, S.T., McCutcheon, S.N. 1997. Selective enhancement of growth in twin foetuses by shearing ewes in early gestation. *Animal Science.* **65:** 105 - 110.

SAS. 1985. SAS Users Guide, Statistics, Version 5 edition. Cary NC, SAS Institute Inc.

Scott, J.D.J. 1962. Lamb mortality, Determining main causes of losses. *New Zealand Journal of Agriculture*. **105:** 421.

Symonds, M.E., Bryant, M.J., Lomax, M.A. 1986. The effect of shearing on the energy metabolism of the pregnant ewe. *British Journal of Nutrition*. **56:** 635 - 643.