The effect of mid-pregnancy shearing on lamb birthweight and survival to weaning

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Abstract

Mid-pregnancy shearing has been promoted in New Zealand as a technique to improve both lamb birthweights and survival. In the literature mid-pregnancy shearing has resulted in an increase lamb birthweight. However, the results have been inconsistent in magnitude and birthrank specificity. Additionally the mechanism responsible for the birthweight response has not been identified. The objectives of this study were to: ascertain the causes of the variation in the birthweight response to mid-pregnancy shearing, identify a possible metabolic mechanism for the birthweight response and lastly, to examine the effect of mid-pregnancy shearing on the newborn lamb's thermoregulatory capability and survival rate to weaning.

The first study was designed to determine whether dam nutrition during the mid- to late- pregnancy period influenced the birthweight response to mid-pregnancy shearing. Mid-pregnancy shearing was found to significantly ($P<0.05$) increase lamb birthweight without differently affecting the birthweights single- or twin-born lambs. Dam feeding level post-shearing had no effect on the birthweight response. The newborn lamb's thermoregulatory capability was not affected by dam shearing treatment. When the results of this study were compiled with those of previous pregnancy shearing studies it was concluded that the birthweight response is greatest under conditions in which the unshorn ewe gives birth to a lamb(s) of low birthweight.

The second study was designed to examine the birthweight response to mid-pregnancy shearing under two differing maternal treatments (one designed to restrict foetal growth (low group), the other designed not to limit foetal growth (maintenance group)) allowing the conclusion made in Chapter 2 to be tested. Mid-pregnancy shearing was found to increase the birthweights of singletons ($P<0.05$) but not twins, and of lambs born to maintenance ($P<0.05$) but not low group ewes. Additionally, mid-pregnancy shearing had no effect on the thermoregulatory capacity of twin-born lambs. When the results of this study were considered with previous studies it became apparent that there are two criteria (not one) that must be met to achieve a birthweight response to mid-pregnancy shearing. First, the dam must have the potential to respond (i.e. give birth to an otherwise lightweight lamb(s)) and, second, she must have the means to respond (i.e. an adequate level of maternal reserves and/or level of nutrition to partition towards additional foetal growth).

The large-scale study was designed to investigate the effect of a mid-pregnancy shearing on lamb birthweights and survival rates to weaning under commercial conditions on two different farms. Mid-pregnancy shearing was found to significantly increase ($P<0.05$) the birthweights of twin-born lambs at each site and this tended to increase survival rates. However, at Tuapaka singletons born to shorn dams had significantly ($P<0.05$) lower survival rates than their counterparts born to unshorn dams. These findings indicate that under commercial conditions mid-pregnancy has the potential to increase the birthweight of at least twin born lambs. However, for this increase in birthweight to have any effect on survival rates to weaning, birthweights must otherwise be destined to be low and within a birthweight range in which survival rates to weaning are not optimal.

The final study examined a possible metabolic mechanism for the birthweight response to mid-pregnancy shearing. Twin bearing ewes were either; left unshorn or shorn during mid-pregnancy, and either had T3/T4 concentrations similar to that observed in the pregnant unshorn ewe or were subjected to elevated T3/T4 concentrations in the short to medium term post mid-pregnancy shearing (as previously reported in mid-pregnancy shorn ewes). Neither shearing nor T3/T4 treatment affected lamb birthweight or summit metabolism. Lamb birthweights in all groups were relatively high and as such a birthweight response to mid-pregnancy shearing was not expected. To successfully determine if elevated maternal thyroid hormones are the mechanism responsible for the birthweight effect, conditions must be present that would otherwise result in a birthweight response to mid-pregnancy shearing.

The present series of studies demonstrate that mid-pregnancy shearing is a technique that can be used commercially to increase lamb birthweights, but appears to have no effect on the newborn lamb's thermoregulatory capability. It is hypothesised that an elevation in maternal thyroid hormone concentration post-shearing is the mechanism responsible for the birthweight response but this requires further study. It has been shown that to achieve a birthweight response to mid-pregnancy shearing the ewe must meet two criteria, first; she must have the potential to respond (i.e. be destined to give birth to an otherwise lightweight lamb(s)) and second; she must have the means to respond (i.e. an adequate level of condition and/or nutrition). To increase lamb survival rates to weaning via an increase in birthweight alone, lambs must otherwise be destined to be born of a birthweight in which survival rates to weaning are below optimum.

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List of Abbreviations

BAT	brown adipose tissue
CIDR	controlled internal drug release
Cr_2O_3	chromic sesquioxide
CRL	crown-rump length
CS	condition score
CT	computer topography
d	day(s)
DM	dry matter
DMD	dry matter digestibility
DOMD	organic matter digestibility of dry matter
DOMI	digestible organic matter intake
g	gram(s)
ha	hectare(s)
h	hour(s)
IU	international unit(s)
kg	kilogram(s)
L	day of lactation (e.g. L34 = day 34 of lactation)
LCT	lower critical temperature
MJ	megajoules
ME	metabolisable energy
m	metre(s)
mm	millimetre
mg	milligrams
µg/dL	micrograms per deci-litre
min	minute(s)
NEFA	non-esterified fatty acids
ng/dL	nanograms per deci-litre
NPRQ	non-protein respiratory quotient
NST	non-shivering thermogenesis
OF	oesophageal fistulated
OM	organic matter
OMI	organic matter intake
OMD	organic matter digestibility
P	day of pregnancy (e.g. P70 = day 70 of pregnancy)
PMSG	pregnant mare serum gonadotropin
SMR	summit metabolic rate
s.u.	stock unit
T3	tri-iodothyronine
T4	thyroxine
vs	versus
W	watts
^{o}C	degree(s) celsius