GENETIC AND ENVIRONMENTAL EFFECTS ON INCIDENCE AND CAUSES OF LAMB MORTALITY

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SUMMARY

Data from 7132 lambs born to Romney ewes in an exotic breed evaluation programme have been analysed to show the effects of sire breed, sex, age of dam, birth rank, birth weight and date of birth on lamb mortality. Sire breed had an important effect on mortality. In two of the four years analysed there was a significant positive regression of survival on birth weight. Dystocia was the main cause of death in singles with starvation-exposure more important in twins.

INTRODUCTION

Preweaning lamb mortality has a major effect on a farmer's net income. Between 5 and 25% of all lambs born on individual farms die between birth and weaning. A high proportion die within 3 days of birth (Hight and Jury, 1970). This paper examines the cause of lamb deaths when sires of several breeds were mated to Romney ewes.

METHODS

Data on lamb survival were collected from 1974 to 1977 for lambs born to Romney dams in the exotic breed evaluation trial. Sire breeds involved are shown in Table 1 and included four exotic breeds, two exotic × Romney halfbreds, four local breeds (including the Romney), and Booroola Merino. Six of the sire breeds were used in all four years, three in three years, and two in two years. Lambs produced in 1974 and 1975 were born at Mana Island Quarantine Research Station with dead lambs autopsied at Wallaceville Research Station. In 1976 and 1977, lambs were born at Crater Research Station with autopsies performed at the Ruakura Animal Health Diagnostic Laboratory in 1976 and by trained resident staff at Crater in 1977. In all years full records of pedigree, birth weights, weaning weights and survival were kept for individual lambs.

As many of the dead lambs as possible were autopsied during the peak period of lambing. For analysis purposes, cause of death was classed as due to pre-natal death, dystocia, starvation and/or

exposure (S/E), infection, misfortune, or unknown. Lambs dying but not autopsied included those dying very early or late in the lambing season. Lambs present at birth but not recorded present at weaning were listed as dead.

Data on birth weight and incidence of mortality were analysed within years by least squares procedures. Models were fitted with sire breed, sex, birth rank and age of dam as main effects plus first order interactions. Birth day was fitted as a covariate for birth weight, and both birth weight and birth day were fitted as covariates for survival. Overall means of mortality and birth weight were calculated by pooling within-year estimates after adjusting for between-year deviations of the six breeds present in all years. Data on all dead lambs were pooled over years and cause of death was analysed by models similar to those already described with year of birth added as a fixed effect.

Lambs with birth information but not accounted for at weaning were treated as dead with cause of death unknown. The inclusion of 40 to 50 lambs with lost eartags will bias upward the overall estimate of mortality but it is assumed no differential bias has occurred for any main effects. A few lambs of unknown parentage or with missing birth weights were excluded from the analysis.

RESULTS

Mean mortality levels and birth weights are shown for all sire breeds in Table 1. Mean mortality ranged from about 11% for Finn cross lambs to over 21% for straightbred Romney lambs.

TABLE 1: MEAN BIRTH WEIGHTS AND INCIDENCE AND CAUSES OF LAMB MORTALITY

Sire Breed	*Lambs*	*Years*	*Birth Weight (kg)*	*Mortality (%)*	*Cause of Deaths (%)*	
					Dystocia	*S/E*
Oxford	745	4	4.8	17.1	45	27
Finn	874	4	4.2	10.9	28	28
German Whitehead	673	4	4.8	17.3	46	24
East Friesian	316	3	4.6	13.0	41	33
Finn × Romney	559	3	4.3	16.0	38	29
E. Friesian × Romney	179	2	4.5	21.5	14	22
Romney	1202	4	4.5	21.6	32	35
Border Leicester	707	4	4.6	14.9	31	34
Cheviot	700	4	4.5	15.6	40	22
Dorset	655	3	4.5	14.7	52	28
Booroola Merino	522	2	4.3	11.3	39	25

Average overall mortality for the four years ranged from 13 to 19%. Mortality within breed varied considerably over years but breed ranking was quite consistent for the six breeds present in all years.

Mean birth weights ranged from 4.2 kg for Finn crosses to 4.8 kg for Oxford and German cross lambs. Although the two breeds with lightest mean birth weight had highest survival, the regression of mean survival on mean birth weights over the 11 breed types was small, nonsignificant and positive. Within two of the years the regression of survival on individual birth weight was positive and highly significant ($P < 0.001$); in the other two years it was very small and negative. Date of birth had a significant ($P < 0.01$) effect on birth weight in all years, the regressions ranging from 0.006 to 0.021 kg per day later born, but birth day did not significantly affect survival in any one year.

TABLE 2: SEX AND BIRTH RANK EFFECTS ON BIRTH WEIGHT AND MORTALITY

	Birth Weight (kg)		*Mortality*	*Cause of Death (%)*	
	Live	*Dead*	*(%)*	*Dystocia*	*S/E*
Female	4.36	3.95	14.8	36	32
Male	4.62	4.37	17.3	37	31
Single	4.91	4.94	12.0	45	22
Twin	3.85	3.52	20.5	22	39

Dystocia was the major cause of death, accounting for 37% of all lambs dying, with starvation/exposure responsible for 32% (Table 2). Within all breeds lambs dying of dystocia were heavier than S/E deaths; however, dystocia was not a greater cause of mortality among breeds with heavier mean birth weights. Likewise, the incidence of S/E among breeds was not related to mean birth weights.

Among single-born lambs, mean birth weights did not differ between surviving *vs* dead lambs; however, surviving twins averaged 0.3 kg heavier than dead twins. Dystocia was considerably more important than S/E as the cause of death among singles, with the opposite true for twins.

Mortality was 2.5% higher for males than females, but no difference was observed for cause of death. In both sexes the mean birth weight of lambs surviving was higher than for lambs dying.

DISCUSSION

Body size, as indicated by birth weight, plays an obvious role in lamb survival, with very large lambs subject to dystocia losses and very small lambs more susceptible to S/E. Birth weight is largely influenced by breed, birth rank and sex, each of which appears to have an effect on survival apart from its effect on birth weight. For instance, twins of the same birth weight as singles are more susceptible to mismothering and hence starvation losses, but similarly twins dying of dystocia are found to be no heavier than average surviving singles.

Probably the most significant effect influencing survival in this study is sire breed. With the Romney as the common dam breed, genotype of lamb is not confounded with breed of dam except for straightbred Romney lambs. The low survival of Romney lambs may be due to the lack of heterosis. Breed differences in losses due to dystocia, independent of effects of birth weight, may be due either to differences in lamb shape or to inability to withstand the trauma of birth.

Studies are continuing on the optimal birth weights for maximum survival. In general, these results indicate that increased birth weight is a definite advantage to survival of twin lambs, suggesting that selection for multiple births should be accompanied by selection for increased birth weight. Similarly, farmers can expect that, as fecundity increases, S/E will become a relatively more important factor in lamb losses and they may need to alter their management accordingly. Unfortunately, little information is available in the literature to serve as a guide to precise managemental recommendations.

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