Is there genetic variation in foetal loss after pregnancy scanning in sheep?

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Pregnancy scanning in sheep has become an important management tool for the Australian sheep industry. Industry statistics suggest significant losses from pregnancy scanning to lamb marking, ranging from 10% for singles and 28%for twins (Allworth *et al.* 2016). This difference is a combination of loss (foetal and lamb) and also errors in the data and/or incomplete recording. This also means that it is not always loss when a ewe has more lambs born than scanned and this could be a combination of scanning error and/or lamb identification error. The expectation is that most foetal loss occurs early in pregnancy. Pregnancy loss after pregnancy diagnosis (typically mid-pregnancy) in healthy sheep is normally low (<5%) and is influenced by litter size (Dixon et al, 2007).

Ram breeders using Sheep Genetics have been supplying both pregnancy scanning records and lambing data for a number of years. Lambing data (birth date, weight and litter size) are most collected on the day of lambing but there is no way in these data to determine how accurately these have been collected. While earlier research demonstrated that the correlations between these two sources of information are high (Bunter et al. 2015), there is interest from industry to understand if perceived foetal loss is under genetic control.

Using the Sheep Genetics Maternal LAMBPLAN database the heritability of apparent foetal loss was estimated using 71,131 records from 41,288 ewes. Foetal loss was defined as the number of lambs born per ewe scanned pregnant - the number of lambs scanned per ewe scanned pregnant; foetal loss could be positive when more lambs were born than scanned and in these data this occurred in 4.8% of the litters. The genetic correlation between number of lambs scanned and lambs born was also estimated using a bivariate animal model.

Table 1. Summary of data by litter size and genetic parameters for each trait (standard errors)

Trait	0	1	2	3+	Mean	Variance	Heritability	Repeatability
Lambs scanned		24,881	41,999	4,251	1.71	0.26 (0.01)	0.08 (0.01)	0.11 (0.01)
Lambs born	2,070	26,539	37,536	4,986	1.64	0.35 (0.01)	0.06 (0.01)	0.08 (0.01)
Foetal loss					0.07	0.18 (0.01)	0.01 (0.01)	0.02 (0.01)

Average lambs scanned was 1.71 while average lambs born was 1.64, suggesting an average foetal loss of 7.0% after scanning at mid-pregnancy (Table 1). Apparent foetal loss also varied according to scanned litter size with single scanned ewes gaining 0.01 lambs at lambing, while ewes scanned as twins and higher order multiples lost 0.09 and 0.31 lambs per litter respectively. However, no data were edited based on the distributions of trait values within flock-years, which can be used to infer recording errors. Common errors include both failing to scan for multiples (ie under-estimating scanned litter size) and assigning birth type as single by default or failing to observe all lambs (underestimating lambs born), along with positive errors in lambs scanned or born (e.g. mis-mothering). The heritability for foetal loss was 0.01, with repeatability of 0.02. Very high phenotypic (0.80±0.01) and genetic (0.97±0.01) correlations were also estimated between lambs scanned and lambs born.

These results suggest that there is very little genetic variation in apparent foetal loss between pregnancy scanning and lambing. The differences observed were largely random error, which would reduce the accuracy of some observations for individual ewes but which does not affect the utility of pregnancy scanning data to infer litter size. These results may in part be due to recording strategies and the way in which breeders have supplied data to Sheep Genetics including the way in which some breeders may utilise scanning information when entering lambing records into the database. Based on these results it appears that foetal loss is not a useful trait for genetic evaluation. The results also support the current approach of using both pregnancy scanning and lambing data in the evaluation for reproduction traits but also highlights the need for breeders to record both traits with as much accuracy as possible.

References

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