BRIEF COMMUNICATION: Analysis of the on-farm cost of ovine pleurisy

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Introduction

Pleurisy is the result of an inflammation of the pleura producing fibrous adhesions between the lung and chest wall. In New Zealand (NZ) sheep, it has a substantial impact in terms of lost revenue, animal health and welfare, and in 2006 its cost was estimated at NZ$25.1 million (95% CI=NZ$10.2–48.1; Goodwin-Ray et al. 2008). Little is known about how to diagnose the disease prior to slaughter, although a NZ sheep industry report (Goodwin-Ray 2006) describes a "pneumonia-pleurisy complex", based on the findings of McGowan et al. (1978), Davies (1985) and Pfeffer (1986). Goodwin-Ray (2006) concludes that this complex has a poorly defined aetiology, likely reflecting the observation by McGowan et al. (1978) that some, but not all lambs with enzootic pneumonia, went on to develop pleurisy. In effect there is no evidence of an absolute link between pneumonia and pleurisy.

In the context of not knowing all the causes of pleurisy, it is difficult to assess the full impact of the disease, other than the direct cost to meat production following slaughter. However, if the age of lambs is known at slaughter then the impact of pleurisy (and/or its causes) on lamb growth can be estimated. Here we report the findings of a survey of almost 80,000 carcasses from lambs of known age that were slaughtered at three abattoirs.

Materials and methods

Data sources

We contacted 39 farmers who were lamb suppliers to Alliance Group Limited and they agreed to provide mating, lambing and weaning dates for their farms. The farms chosen were all in Southland. The farmers had to slaughter all their lambs through the Lorneville, Mataura or Pukeuri plants and make all their kill data available to us for the October 2010-October 2011 season. They could not buy or sell store lambs for the duration of the trial, which allowed us to obtain a picture of the prevalence of pleurisy in carcasses from lambs born and raised on the individual farms.

Carcass data collected included Hot Carcass Weights (HCW, kg – measured on the processing chain), and a rating of the severity of pleurisy (either "no pleurisy", "mild pleurisy" = lesions but no attachments, or "severe pleurisy" = attachments to the ribcage), based on an inspection and reporting mechanism that is standardised across Alliance plants.

Statistical Analysis

The prevalence of pleurisy in the carcasses of lambs from different farms, and the proportion of cases that were classified as severe, were analysed by log-linear generalized linear models (GLMs). Similarly the association between prevalence and the three abattoirs was also examined by log-linear GLMS. Relationships between the prevalence of pleurisy and "farm size" (measured as the number of lambs sent to slaughter) were examined using Spearman's rank correlation. Mean HCW and age at slaughter for each of the pleurisy classes were calculated for each farm, and comparisons then made between the three pleurisy categories by general linear modelling. Farm was included in these models as a random 'blocking' factor and *post-hoc* Tukey tests were used to make pairwise comparisons (at a significance level of $P < 0.05$).

Results and discussion

The 39 farms sent between 542 and 4544 lambs for slaughter and a total of 78438 records were obtained. In total, 2631 lambs had pleurisy (mild and severe), giving a prevalence of 3.35%, a figure comparable with past studies (Dysart 1976). There were 207 severe cases (0.26% of all carcasses). For lambs from individual farms, severe pleurisy prevalence ranged between 0 and 1.1% (mean = 0.27%), and as a proportion of all pleurisy on each farm, the range was between 0 and 20% (mean = 7.6%). There was a difference (log-linear GLM, $P<0.001$) among the farms in the prevalence of pleurisy and a difference (log-linear GLM, $P<0.001$) among farms, in the number of severe cases. This suggests that farm-specific effects are of importance.

The number of cases of pleurisy (mild and severe) increased with farm size ($r_s = 0.53$, $P < 0.001$; Figure 1a) and the number of severe cases of pleurisy increased as the number of mild cases increased ($r_s = 0.79$, $P < 0.001$). However, no significant relationship between farm size and the percentage of lambs with pleurisy could be found ($r_s = -0.16$, $P = 0.363$; Figure 1b), hence farm size does not appear to be a factor determining the proportion of lambs developing symptoms.

There was no difference in HCW between lambs with mild pleurisy and unaffected lambs, but severely affected lambs had HCWs that were reduced by

Figure 1 The relationship between farm size (expressed as number of lambs sent to slaughter) with cases of pleurisy reported at slaughter: (a) prevalence of pleurisy cases and (b) cases of pleurisy expressed as a percentage of total lambs. (N = 39).

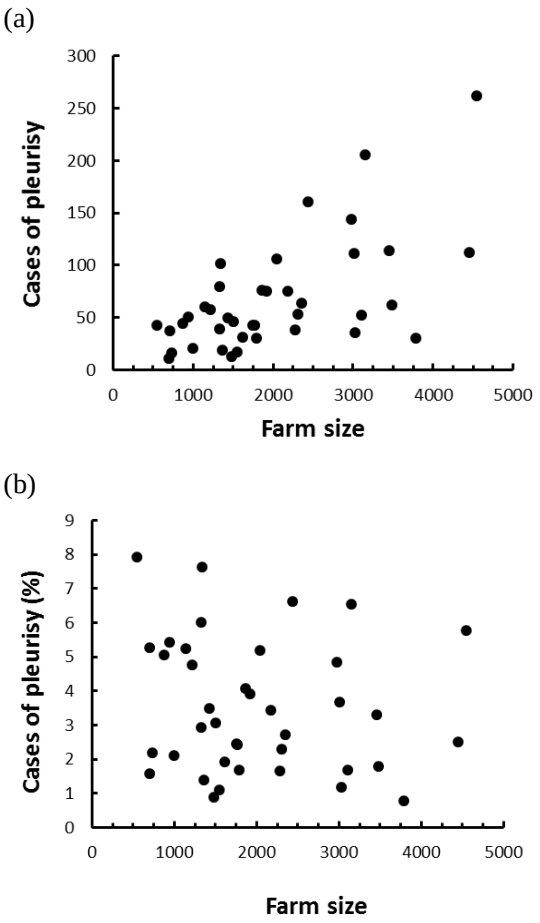
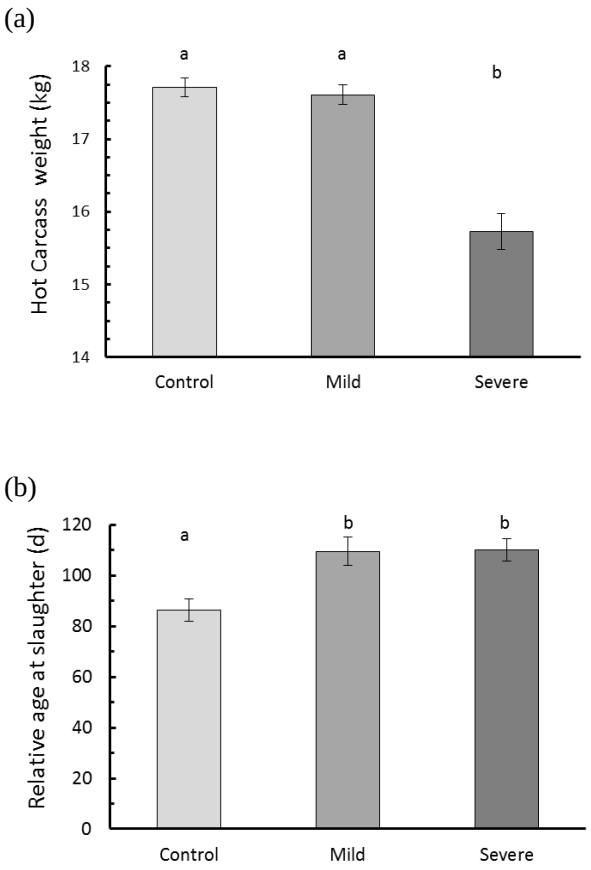


Figure 2 The relationship between mild and severe pleurisy in lambs on average (a) hot carcass weight (HCW) and (b) relative age at slaughter of lambs (mean ± se; N = 39 farms). Groups not sharing the same letter code were significantly different at P<0.05.



approximately 2 kg (GLM P < 0.001; Figure 2a). The lack of weight loss in lambs with mild pleurisy likely reflects that sheep are drafted for slaughter based on live weight (typically around 36-40 kg), so the effect seen on HCW is inevitably slight. The 2 kg loss of HCW in the severe cases is at least partially due to the trimming of severely affected regions of the carcass on the detain rail, prior to weighing.

The impact of pleurisy on the time taken for lambs to reach a slaughter weight was large (GLM P < 0.001; Figure 2b), but there was no difference between mildly affected lambs and severely affected lambs. Across all farms the effect of any pleurisy (mild or severe), was to extend time to slaughter by an average of 22.8 days.

There was a difference among abattoirs in the proportion of lambs that were reported to have pleurisy (GLM, P < 0.001). While no difference was seen between Lorneville (3.6%) and Mataura (3.3%), Pukeuri (0.9%) recorded a much lower pleurisy prevalence. This possibly reflects the small number of lambs (3269/78438; 4.2% of study) that were slaughtered at Pukeuri, but it might also suggest the criteria for inspection and diagnosis varied.

Economic considerations

Given that the first slaughter from any given farm was at weaning, the cost of the additional dry matter (DM) to finish lambs can be estimated. However, given that feed quality is a major determinant of growth, then in this project, where the nature of post-weaning nutrition was unknown, it is necessarily a rough estimate.

If post weaning lambs require 1.2 kg DM per day, then the additional requirement over 22.8 days to finish a lamb with pleurisy is 27.4 kg DM. At a conservative $0.14 per kg, affected lambs would cost an additional $3.84 to reach slaughterable weight, plus the cost of any additional animal health products used in finishing and the labour costs associated with their management. On two farms, lambs with pleurisy took in excess of 50 days extra to reach slaughter weight. Using the above estimates, these two farms spent at least an additional $8.40 on feed for each lamb that had pleurisy at slaughter. It is also conceivable that severely affected sheep may have never made it to the processor, but as no record was kept of on-farm deaths and/or pathology undertaken, accounting for this potential loss would be speculative.

The approximately 2 kg difference in HCW for severe pleurisy would at $7 per kg equate to a $14 loss on a severely affected carcass. Care needs to be taken in accepting this estimate though as it ignores the possibility that the trimmed carcass will be condemned and thus a greater loss occurs.

The overall conclusions of this study are that pleurisy poses a large on-farm cost to NZ, and that a better understanding of its causes would accordingly be very desirable for NZ sheep farmers.

Acknowledgements

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References

Davies DH 1985. Aetiology of pneumonias in young sheep. Progress in Veterinary Microbiology and Immunology 1: 229-248.

Dysart TH 1976. Enzootic pneumonia (of sheep) – its effect on the meat industry. Proceedings of the 6th Annual Seminar of the Sheep and Beef Cattle Veterinarians of the New Zealand Veterinary Association: 94-100.

Goodwin-Ray KA 2006. Pneumonia and pleurisy in sheep: Studies of the effect on lamb growth rate, prevalence, risk factors, vaccine efficacy and economic impact. Final Report March 2006, Meat & Wool New Zealand Project 97AH/AG188 (http://www.beeflambnz.com/Documents/Farm/Pneumonia%20and%20pleurisy%20in%20sheep.pdf).

Goodwin-Ray KA, Stevenson MA, Heuer C, Cogger N 2008. Economic effect of pneumonia and pleurisy in lambs in New Zealand. New Zealand Veterinary Journal 56: 107-114.

McGowan B, Thurley DC, McSporran KD, Pfeffer AT 1978. Enzootic pneumonia-pleurisy complex in sheep and lambs. New Zealand Veterinary Journal 26: 169-172.

Pfeffer AT 1986. The pathology and pathogenesis of pleural adhesions in sheep. New Zealand Veterinary Journal 34: 85-93.