Occupational Exposure to Pathogenic *Leptospira* from Sheep Carcasses in a New Zealand Abattoir

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Abstract

This research was undertaken in response to a rising trend in the incidence of notified human leptospirosis cases, particularly in meat workers, between 2000 and 2005 in New Zealand. Meat workers constituted the highest proportion (65% during 2004) of notified leptospirosis cases. Sheep either alone or in combination with other animals constituted the second most important animal contact source of human infection (after cattle). Further justification of this research was due to the fact that a number of cases were reported from meat workers employed in sheep-only abattoirs and concerns were raised that sheep may be a significant source of human infection.

A longitudinal study was undertaken to determine the serological and cultural prevalence of two of the most commonly diagnosed serovars, *Leptospira borgpetersenii* serovar Hardjobovis and *Leptospira interrogans* serovar Pomona. Lines of sheep and individual sheep were systematically randomly sampled at a sheep-only abattoir in Feilding from May 2004 to June 2005. In addition, an assessment of the risk of occupational exposure of meat workers to carcasses shedding live leptospires was carried out using a stochastic model. The association between white-spotted kidney lesions and the serological and cultural prevalence of leptospirosis in sheep was determined along with the diagnostic value of these lesions to predict serological and culture status at the line and individual carcass levels.

The study showed that the prevalence of lines with sheep seropositive to one or both serovars was 44% (95% CI 35–54), corresponding to 45% (95% CI 35–55) of farms. This indicates that nearly half the sampled farms had been exposed to infection previously. The overall individual serological prevalence in the sample of 15,855 sheep processed was 6% (95% CI 5–7). Lambs born in the 2003–2004 season had a significantly higher serological prevalence to one or both serovars at the line and individual animal levels compared with lambs born in the 2004–2005 season, suggesting a strong seasonal effect. The serological prevalence of Hardjobovis was significantly higher than Pomona at the line and individual animal levels. The overall isolation rates of live leptospires from seropositive kidneys of Hardjobovis and Pomona were 22% and 17% respectively, and 1% from seronegative carcasses. From a purposively selected line (suspected of being from a farm with active leptospirosis) all

13 kidneys of seropositive carcasses were culture positive indicating a high risk of exposure of meat workers to leptospires in such a situation. Kidneys from seropositive carcasses were significantly more likely to return culture positive compared with kidneys from seronegative carcasses. The assessment of daily risk of exposure of meat workers indicated moderate risk for eviscerators and meat inspectors ranging from 3–11 (95% CI 0–22) and 6–18 (95% CI 1–34) carcasses potentially shedding live leptospires respectively, and a high risk for offal-handlers that ranged from 18–54 (95% CI 7–91) shedding carcasses.

The results from the third study showed that the prevalence of white spotted kidneys was 16% and 91% at the individual sheep and line levels, respectively. Carcasses with white spotted kidneys were 5.2 times (95% CI 3.9–7.1) more likely to test seropositive to one or both serovars, but lesions were poor predictors of serological status as judged by test sensitivity and positive predictive values. Furthermore, a positive linear association between white-spot kidney lesion scores and seropositivity to either or both serovars was evident. Consideration of lesion status of lines rather than for individual animals resulted in higher test sensitivity but still suffered from a low positive predictive value. Leptospires were isolated from 5% (95% CI 4–8) kidneys that were cultured. There was no statistically significant association between white spotted kidney lesion scores and culture test results in the survey data; however, a significant linear positive association was evident when culture data from a purposively sampled farm was merged with the survey data.

We conclude that the processing of sheep in sheep-only abattoirs constitutes a definite exposure risk of meat workers to leptospirosis and that exposure risks ranged from moderate to high degrees depending on type of duties performed on the slaughter room floor. Furthermore, since grossly visible white-spotted kidney lesions were positively associated with serological and cultural prevalence of disease it would be advisable for meat workers to take extra care when processing lines with a high prevalence of carcasses with these lesions to reduce the risk of infection. This recommendation is made despite the poor predictability of serological and cultural status of these lesions.

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