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Leptospirosis in humans and pastoral livestock in New Zealand

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Abstract

This PhD investigated leptospirosis in humans and pastoral livestock in New Zealand (NZ). A longitudinal 'abattoir study', in which blood from workers ($n=592$) from sheep ($n=4$), deer ($n=2$) and beef ($n=2$) slaughtering abattoirs was tested by the microscopic agglutination test (MAT), revealed that 10-31%, 17-19% and 5% of workers respectively, had antibodies against *Leptospira interrogans* sv Pomona (Pomona) and/or *L. borgpetersenii* sv Hardjobovis (Hardjobovis). While the annual infection risk for meat workers of sheep plants was 11.1%, it was 0% in workers processing deer and 1.2% in those processing beef cattle. Sixty workers had a history of probable leptospirosis while working in abattoirs between 1962 and 2010 and three sheep abattoir workers within the one year study period. In sheep abattoirs, new infection with Hardjobovis or Pomona measured by serology was associated with a two-fold higher risk of 'flu-like' illness, and an average of four days absence from work. The average annual risk of experiencing flu-like symptoms due to infection with *Leptospira* measured by serology was 2.7%. The under-ascertainment of officially notified cases with leptospirosis in the last five years was estimated at between 16 and 56 times. Work position was the strongest risk factor for sero-positivity with Pomona and/or Hardjobovis in sheep and deer abattoir workers. The prevalence and new infection risk was highest in workers at the beginning of the slaughter board and the use of personal protective equipment (PPE) appeared not to reduce the risk of sero-positivity or new infection. The risk factor analysis revealed that the infection risk prevailed in the abattoirs and was not evident for non-work related risk factors, such as hunting, home slaughtering and farming.

In a multi-species cross-sectional 'farm study' ($n=238$), 97% of sheep and beef and 76% of deer farms had at least one in 20 animals MAT sero-positive against Hardjobovis and/or Pomona. Overall, 50% of adult sheep, 58% of adult beef and 34% of yearling/adult deer were positive against either serovar. Hardjobovis was more prevalent in all three livestock species than Pomona. The regional prevalence distribution in sheep was different for Hardjobovis and Pomona. Grazing beef with deer reduced the likelihood of positivity against Pomona in beef. Co-grazing with another species did not increase the odds of the within-herd prevalence for deer and sheep of Pomona or Hardjobovis and for beef the within-herd prevalence of Hardjobovis controlling for other farm-level risk factors. The incidence of probable leptospirosis in cattle herds in 2009 was 2.6%, in sheep flocks 0% and in deer herds 1%. Tailing rates of sheep farms were positively correlated with prevalence of Hardjobovis: a 1% increase in prevalence was equivalent to a 0.11 increase in tailing percentages, which is unlikely to be causative since this association lacks biological plausibility. All other reproduction and culling rates of any species were not significantly associated with prevalence.

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“Ehara taku toa, he taki tahi, he toa taki tini”

“My success should not be bestowed onto me alone, as it was not individual success but success of a collective”

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List of Publications

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Preface

"The intuitive mind is a sacred gift, the rational mind a faithful servant, we have created a society that honours the servant and has forgotten the gift"

Albert Einstein