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A STUDY OF THE EPIDEMIOLOGY AND CONTROL OF
LEPTOSPIROSIS ON DAIRY FARMS.

A thesis presented in partial fulfilment of the
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Colin Grant Mackintosh

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ABSTRACT

A retrospective analysis of published statistics showed that in the last ten years an average of 488 cases of human leptospirosis was reported annually. Over 90% of these were reported as occupationally associated and the majority were males, 15 to 44 years of age. The geographical distribution of human cases was associated with the distribution of dairy cattle in this country. The majority of cases occurred in October and November which coincided with the seasonal peak of milk production of factory supply dairy farms on which over 90% of N.Z.'s dairy cattle reside. In the Hamilton Health District years of higher than average incidence of reported human leptospirosis were associated with years of higher than average spring rainfall. The rise in reported human incidence over the last 30 years appears to be associated with changes in dairy farm practices over this period which have probably resulted in increased exposure of milkers to infected urine. These changes included transitions from cream supply to whole milk supply and from walkthrough to herringbone milking sheds, and increases in herd size, stocking rates and the number of cows milked per man. These changes appear to have been accompanied by an increased prevalence of *hardjo* and a decreased prevalence of *pomona* infections in dairy cows.

A cross-sectional survey of 213 Manawatu dairy farm residents showed that 34% of the 193 people who milked cows had leptospiral titres of 1:24 or greater, of which approximately two-thirds were to *hardjo* and one-third to *pomona*. Women milkers and farm residents who did not milk were all serologically negative. A third of the seropositive milkers had a history of clinical leptospirosis. A subsequent case-control survey of 25 farms where the milkers had leptospiral titres of 1:96 or greater and 27 farms where the milkers were seronegative showed that leptospiral titres in milkers were associated with the presence of endemic *hardjo* infection in the milking herd

and evidence of *pomona* outbreaks in the herd in the past. Other factors which were significantly correlated with leptospiral titres included the time spent in the dairy shed during milking, the wearing of shorts, the keeping of pigs for sale and the number of years the individual had been working on a dairy farm. The type of milking shed and the size of the herd were interrelated and both showed strong trends towards an association with titres in milkers.

An attempt was made to determine the role of the dog in the epidemiology of leptospirosis in this country. A number of investigations were carried out including a case-study of a clinical outbreak of leptospirosis in a group of hounds, experimental infections of dogs with *tarassovi*, case-studies of *pomona* infections in dogs associated with epidemics of *pomona* infection in cattle and serological surveys of dogs living on dairy farms in the Manawatu and of city dogs which attended the Massey University small animal clinic. It appears that dogs are susceptible to infection with all the serovars present in this country and long term kidney infection may occur. However, dogs are not thought to be maintenance hosts for any of these serovars due to the low intensity of leptospiruria, the poor survival of these leptospires in dog urine and the lack of consistent dog-to-dog transmission. Therefore, dogs are not likely to be significant in the epidemiology of leptospirosis on dairy farms. No definite evidence was found of *canicola* infection in either farm or city dogs.

The results of an experimental infection of cattle and sheep with *balcanica* and an investigation of a natural outbreak of *balcanica* infection of cattle on a dairy farm indicate that, although sporadic infection may occur in cattle and sheep, they are not likely to be maintenance hosts for this serovar and infection is unlikely to become endemic in cattle herds

or sheep flocks. [Evidence is presented to suggest that cattle infected with *hardjo* or vaccinated with a *hardjo* bacterin may be resistant to infection with *balcanica*. Therefore, *balcanica* is unlikely to be a significant hazard to dairy farm workers.

An investigation of an epidemic of *pomona* abortions on a dairy farm showed that vaccination with a *pomona* bacterin during the epidemic appeared to prevent approximately 27% of the herd from becoming infected, a third of which may have aborted. It was also found that cattle which aborted had significantly higher titres than infected cattle which did not abort. The outbreak probably originated from infected pig effluent.

The results of vaccination trials showed that two doses of a *hardjo/pomona* bacterin, given four weeks apart, gave cattle significant protection against infection and leptospiruria after natural challenge with *hardjo*. A 30 month trial on a commercial factory supply dairy farm, which entailed the double vaccination of all the calves (9 months or older), yearlings, milking cows and bulls and then annual revaccination of all animals, apparently eliminated *hardjo* infection which had been endemic on the property previously. It is considered that annual revaccination will prevent the introduction of *hardjo* or *pomona* infection into this herd.

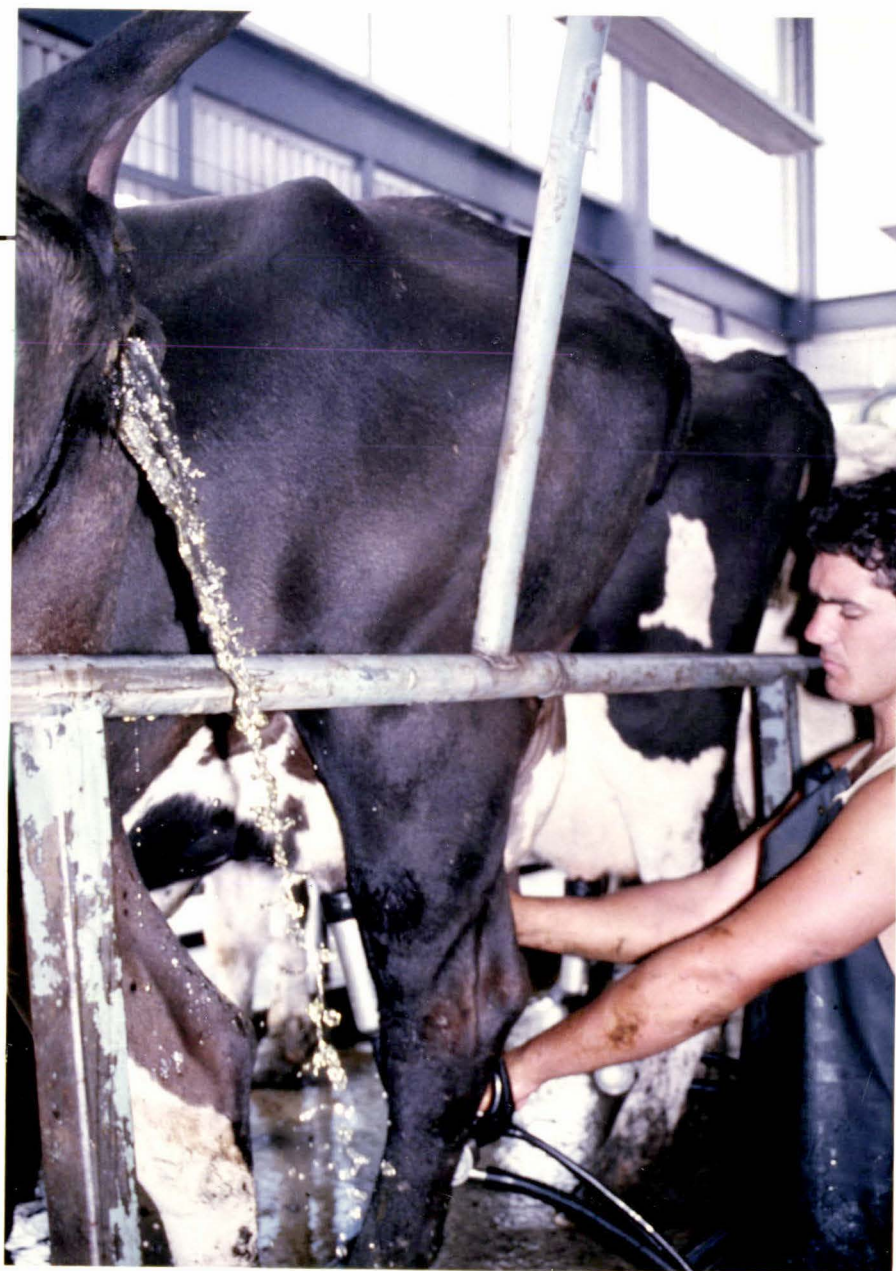
It is concluded that the incidence of leptospirosis in dairy farm workers could be significantly reduced by the elimination of *hardjo* and *pomona* infections in the cattle and pigs on dairy farms using an appropriate programme of routine vaccination.]

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Occupational exposure. This urine could contain up to a million leptospires per millilitre.

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