LEPTOSPIROSIS IN FREE-LIVING ANIMALS IN NEW ZEALAND, WITH PARTICULAR REFERENCE TO THE POSSUM (*TRICHOSURUS VULPECULA*)

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Stephen Clive Hathaway

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ABSTRACT

A serological survey of 600 possums (*Trichosurus vulpecula*) from farmland environments in the southern half of the North Island of New Zealand revealed that titres against leptospires of the Hebdomadis serogroup were present in 52% of sera. Bacteriological studies identified the causative organism as *Leptospira interrogans* serovar *balcanica*. This serovar had previously been isolated only in Eastern Europe; from man, cattle and pigs.

Isolation of leptospires from kidneys was aided by the use of a system involving whole kidney homogenisation in γ-sterilised plastic bags in a 'Coleworth Stomacher'. Comparison of cultural and serological results demonstrated that, when titres were read at low minimum serum dilutions, the serological prevalence was an accurate indicator of the bacteriological prevalence.

Field surveys and experimental studies demonstrated that the possum was a typical maintenance host for *balcanica*. Experimental infection was easily established and 50% of animals were still leptospiruric one year after infection. Experimental infection with *hardjo* could not be established, and it is considered that previous reports of endemic *hardjo* infection in possums in New Zealand could be incorrect.

There was a marked difference in the age-specific prevalence of *balcanica* infection in possum populations, with infection being restricted to sexually-mature animals. Evidence is presented to support the hypothesis that infection becomes established following behavioural changes associated with the onset of sexual maturity. It is suggested that the transmission of *balcanica* within a population is dependant on direct contact between animals rather than environmental contamination. No correlation could be shown between the prevalence of infection in different populations and the nature of the habitat.

A consistent paradoxical reaction to *hardjo* was found in sera from possums infected with *balcanica*. Chromatographic studies revealed that this was due to heterologous agglutinating activity of antibodies of the IgM class. Chromatographic studies also indicated that, following

infection, the transition of the predominant agglutinating activity in sera from antibodies of the IgM class to antibodies of the IgG class was considerably slower than in eutherian mammals.

Balcanica was found to haemolyse red blood cells of several species. An *in vitro* haemolysin test for the differentiation of *balcanica* and *hardjo* isolates is described. Haemolytic activity has not been previously demonstrated in other members of the Hebdomadis serogroup.

Investigations of other small free-living mammals revealed that serogroup Ballum infection was endemic in ship rats (*Rattus rattus*), house mice (*Mus musculus*) and hedgehogs (*Erinaceus europaeus*) in natural and syanthropic biotopes. The Norway rat (*Rattus norvegicus*) was also shown to be capable of maintaining a focus of Ballum serogroup infection when the population density was high. No leptospires from other than the Ballum serogroup were isolated from the rodents examined.

Field evidence suggested that there was no predator-chain transmission of leptospiral infection from rodents to free-living carnivores. Birds were similarly found to be unimportant in the epidemiology of leptospirosis in the ecosystems studied.

The nidality of leptospirosis was investigated in an intensive farming environment for a period of two years, and well-defined maintenance-host parasite relationships for different serovars were defined in both domestic and free-living species. No cultural and very little serological evidence of interspecies transfer was found, despite the apparent opportunity for transfer of infection.

The concept of a maintenance host for a particular leptospiral serovar was investigated using a laboratory mouse model. As a consequence of this investigation and field studies, the characteristics of a maintenance host for a leptospiral serovar are redefined.

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Frontspiece : The Australian brushtailed possum (*Trichosurus vulpecula*)

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