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The prevalence of Wobbly Possum disease in a bush/farmland environment

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ABSTRACT

The prevalence of Wobbly Possum disease was monitored in wild-caught possums captured at 16 different sites. All animals were assessed for clinical signs of Wobbly Possum Syndrome from the time of their capture. Any that displayed symptoms were euthanased immediately and submitted for *post mortem* examination to confirm disease status.

Of the 887 possums screened, 39 (4.4%) were infected with the Wobbly Possum virus. These had been trapped at 10 of the 16 sites (prevalence 0% to 23.3%). There were no significant differences in the proportion of infected animals among sites. The interval from time of capture to diagnosis ranged from 7 to 21 days. The presence of Wobbly Possum infection was not related to geographical location, sex of the animal or liveweight at the time of capture. This study suggests that both the natural prevalence of Wobbly Possum Syndrome, and the rates of cross-infection within a site are low.

Keywords: brushtail possum; Wobbly Possum Syndrome.

INTRODUCTION

Wobbly Possum Syndrome is a viral disease of brushtail possums, clinically characterised by progressive ataxia and imbalance, which was first identified in our possum colony at Invermay in 1995. Initially, the clinical signs are subtle with indications of dullness and a slightly raised head carriage. Over a period of 1-6 weeks, animals progressively show slowed reactions, an inability to judge distances, an exaggerated rolling gait, poor balance and difficulty in climbing. Terminally, infected possums become semi-comatose. The disease has been histopathologically described, and can be accurately identified at *post mortem* examination even in animals displaying very early clinical signs (Mackintosh *et al.*, 1995). The mortality rate following experimental inoculation or contact with infected possums in captivity is >95%.

Histologically, Wobbly Possum disease is characterised by widespread perivascular infiltrations with plasma cells and lymphocytes. These histopathological changes are severe in liver and kidney tissue, and moderate to mild in a variety of other tissues including spleen, skeletal and cardiac muscle and the brain (O'Keefe *et al.*, 1997). The disease has been associated with the presence of virus-like particles in tissues from infected animals. This virus has been isolated and characterised as an RNA, enveloped virus. It is spherical in shape, heat sensitive and approximately 45nm in diameter (O'Keefe *et al.*, 1997a, b). Collectively, these studies provide strong circumstantial evidence that Wobbly Possum syndrome is a viral disease, but it is yet to be unequivocally determined that this virus is the etiological agent.

The implication of a virus causing Wobbly Possum syndrome is of some importance, as there are few reported

viruses of marsupials and none have previously been isolated from the brushtail possum. This raises the question of what impact the disease has on wild possum populations and also whether the Wobbly Possum virus has potential for use as a biocontrol agent for possums.

It has been reported that direct possum to possum contact transmits the virus, probably through faeces and urine. It has been demonstrated that the disease can be transmitted from blood (and the blood-feeding mite *Trichosuroaelaps crassipes*) and urine of infected animals and that aerosol transmission does not easily occur (Perrott *et al.*, 1996; Meers *et al.*, 1997). It is not possible to determine precisely how long Wobbly Possum disease has been present in New Zealand, but anecdotal reports of possums acting strangely suggest that it may have been present in this country for many years (BJ McLeod and JL Crawford - unpublished). The aim of this study was to investigate the occurrence of Wobbly Possum Syndrome within a natural possum population.

MATERIALS AND METHODS

Capture and housing of possums

Animals were trapped at sites in coastal Otago, which, with the exception of one location (Clydevale, Balclutha) were within 40 kilometres of Invermay Agricultural Centre (latitude 45° 14' S). These locations included the interface between bush and/or *pinus radiata* forestry blocks and farmland and suburban areas that were adjacent to clover/ryegrass pastures grazed by sheep, deer and/or cattle. Possums were captured using wire-sided box-traps baited with apple. All traps were checked each morning and captured animals were transferred to hessian sacks for transportation to Invermay.

Screening for Wobbly Possum Syndrome

We have classified the clinical signs of Wobbly Possum Syndrome into the following four stages describing the progressive development of the disease.

Stage 1 - a slight change in behaviour, including a slowness to react to stimuli. Head carriage slightly raised.

Stage 2 - head carriage is high and some head bobbing is evident. Slight to moderate impairment of balance. Limbs moderately spread when mobile.

Stage 3 - head carriage high and head bobbing continuous. Moderate to extreme balance impairment. Limbs spread widely when stationary or mobile.

Stage 4 - animal very weak and semi-comatose. Eyes dull.

Any animal that displayed clinical signs was euthanased immediately by intra-cardiac injection of barbiturate (Euthal, 4-8ml; 170mg sodium pentobarbitone ml⁻¹, 25 mg sodium phenytoin ml⁻¹, Delta Veterinary Laboratories Ltd, Hornsby, NSW, Australia) and submitted for post mortem examination. Only possums considered to be carrying the disease at the time of their capture were included in the study. Those that displayed clinical signs of the disease after sharing pens with infected animals were considered to have contracted the virus from infected pen-mates and were excluded.

Post-mortem examination

After euthanasia, the animals were weighed, assessed for body condition and the fur dampened with a dilute disinfectant solution (1% Clearsol 50, Whiteley Industries). A midline incision was made and the sternum severed to allow the abdominal and thoracic cavities to be examined. If the large intestine was dilated and fluid-filled and there was no evidence of pelleted faeces, an intestinal smear was taken stained (Ziehl Neelsen stain) for direct microscopic examination for cryptosporidia oocysts. Samples of liver and brain were collected and fixed from all possums and small pieces of these tissues (approximately 5µm³) were immersed in buffered formalin for a minimum period of one week, then trimmed, dehydrated and embedded in paraffin wax. Sections (5 mm) of liver and brain were stained with haematoxylin and eosin and were viewed under light microscopy for changes indicative of Wobbly possum disease. These included lymphocyte infiltration of hepatic veins and perivascular infiltrations of veins in the meninges of the brain.

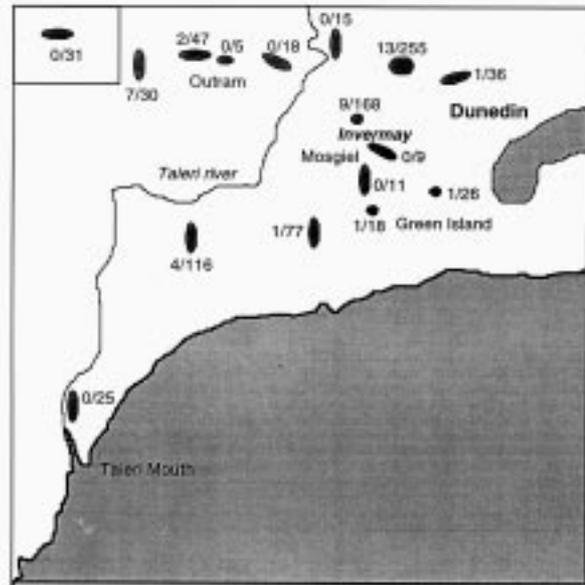
Statistical analysis

Comparison of the prevalence of possums infected with Wobbly Possum disease among capture sites was made using Chi-squared analysis.

RESULTS

All animals that were submitted for post mortem examinations had been diagnosed as infected in the early stages (Stage I or Stage II) of the disease. Without exception, these possums were subsequently confirmed to be infected with Wobbly Possum disease.

FIGURE 1: Map of coastal Otago showing the location of the 16 capture sites with the number of possums infected with Wobbly Possum disease and the total number of animals captured at that site. Data from the single capture site not included in this map is shown in the inset.



The location of the 16 sites at which animals were trapped, and those from which infected possums were collected, are shown in Figure 1. The proportion of captured animals that were infected ranged from 0 to 23.3%. This ratio was not significantly different among locations. The presence of Wobbly Possum disease was not related to geographical location. At the time of capture there was no significant difference in mean liveweight between animals that were infected with the disease and those that were not. Of the 39 infected animals identified, 6 were detected in summer (Dec-Feb), 15 in autumn (Mar-May), 7 in winter (June-Aug) and 11 in spring (Sept-Nov). There was no significant seasonal effect.

DISCUSSION

This study has shown that the prevalence of Wobbly Possum disease within free-living populations of brushtail possums is low. In addition, although the disease appears to be widespread in coastal Otago, the rate of transmission between animals within locations is also low. In all except one of the 10 sites at which the disease was detected, the prevalence ranged from 1.3 to 5.6%. At the remaining site 23.3% of the captured animals carried the disease.

As it would appear likely that animal-to-animal contact is necessary for transmission of the Wobbly Possum virus, animal interactions such as den sharing would have marked effects on the rate of spread of the disease. However, there are conflicting reports of the extent to which possums share nesting sites. For example, several radio-tracking studies have found that den-sharing was uncommon, although many dens were used sequentially by several different possums (Cowan, 1989), or that den-sharing was restricted to mother:joey pairs (Paterson *et al.*, 1995).

However, others have reported the occurrence of den sharing, including situations where live possums share dens with a dead animal (Fairweather *et al.*, 1987). These authors also recorded incidents of mutual grooming and fur licking, a behaviour that would contribute to cross-infection.

Our own experience with housing wild-caught possums in pens, as groups of 8-15 animals/pen is that den sharing is very common (McLeod *et al.*, 1997). We frequently observe pairs of animals sharing a nest-box and groups of two to seven possums sharing a single sack or huddled together in secluded corners of the pens. There is also evidence of mutual grooming under this group-housing situation. Nevertheless, transmission of Wobbly Possum disease under these conditions, even though animal density was very high, did not occur at a high rate. For example, 92 possums that had shared accommodation with infected animals and then remained in captivity for 2 months or more, failed to show any clinical signs of the disease. Eighteen possums did contract the disease from infected pen-mates.

In summary, possums captured from a number of locations in coastal Otago were infected with Wobbly Possum disease, indicating that the disease is widespread in this region. However, the rate of infection was usually low, suggesting that transmission of the virus is poor. This was confirmed by low transmission rates between possums in captivity where they are housed at very high densities.

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