**FOCUS ARTICLE**

**Endemic equine viral disease down under 1: Hendra virus in Australia**

Kristopher Hughes BVSc (Hons) FANZCVSc DipECEIM
School of Animal & Veterinary Sciences, Charles Sturt University, NSW 2678 Australia

### Introduction

In recent times, Australia has experienced several outbreaks of equine viral disease, both endemic and exotic. Equine influenza (EI) virus, an exotic pathogen in Australia, breached quarantine in August 2007, resulting in widespread respiratory disease and disruption to equine industries until containment and eradication of the virus. Australia was declared officially free of EI in June 2008. While Australia is one of few countries that has successfully eradicated EI, the widespread outbreak was a costly reminder of the potential effect of an introduced infectious pathogen into a susceptible population.

From an endemic perspective, Australia also experiences sporadic and unpredictable outbreaks of equine viral diseases, which may result in considerable animal morbidity and mortality and are caused by zoonotic pathogens. Of greatest importance are Hendra virus (genus Henipavirus) and arboviral infections, including flaviviruses in the family Flaviviridae (Kunjin virus, Murray Valley encephalitis virus (MVEV) and Ross River virus (RRV), a member of the genus *Alphavirus*, family *Togaviridae*.

The equine viral events in Australia over the past two decades highlight the evolving nature of infectious diseases and the need for ongoing monitoring, veterinary and industry awareness, greater understanding of disease epidemiology, reservoir and vector ecology and optimisation of prevention and early disease detection. In the first of two articles an overview of Hendra virus in Queensland and New South Wales is provided with a review of arboviruses affecting horses in Australia appearing in a subsequent report.

**HeV: Clinical syndrome**

Hendra virus results in a widespread vasculitis and a typically rapidly progressive clinical deterioration. Initial signs include pyrexia, tachycardia, and weight shifting between limbs. Progression results in often dramatic and non-pathognomonic clinical findings. Most commonly, respiratory signs (respiratory distress, coughing, pulmonary oedema, frothy nasal discharge) or neurological signs (including ataxia, behavioural and mentation changes, head tilt, circling, muscle fasciculations, recumbency, stranguria) predominate [1,2] Horses may be found dead without any prior demonstration of illness, and some horses have demonstrated signs of abdominal pain. Most horses die or are subjected to euthanasia within 48 hours of onset of clinical abnormalities, however some horses have demonstrated a more prolonged course of disease over several days and horses may occasionally survive acute infection [1,2]

**HeV: Timeline and geographical distribution**

Hendra virus (HeV) was first isolated in 1994 in a Thoroughbred stable in the suburb of Hendra, Brisbane, Queensland, when a Thoroughbred trainer and 14 horses succumbed to a rapidly progressive and fatal respiratory/neurological disease. Subsequently, there have been sporadic and unpredictable occurrences of HeV disease in horses. Up to 2010 there were 14 separate incidents, while in 2011 alone there were 18 outbreaks with involvement of 24 horses [3] Outbreaks continue to occur annually: most recently there have been outbreaks in the Australian autumn and winter of 2014.
To date, all HeV outbreaks have occurred in Queensland and New South Wales, despite the widespread distribution of the natural reservoirs, including the black flying fox (Pteropus alecto) and the grey-headed flying fox (P. poliocephalus) from Western Australia to Victoria and South Australia.

The zoonotic potential of HeV is clear: to date, seven people have been infected with HeV after direct contact with infected horses, of which four died (including two veterinarians). An important implication for the veterinary profession is the emerging issue of the departure of veterinarians from equine practice as a result of HeV outbreaks and associated human health implications [4]

HeV: Reservoir hosts
Flying foxes are the reservoir host for HeV, however mechanisms of transmission within flying fox populations and infection of horses are not clear, although the virus is present in urine, fetal fluids and aborted flying fox pups. Despite an incomplete understanding of transmission methods, there is increasing evidence of epidemiological relationships between the environment, flying foxes and horses. Climatic, environmental and ecological changes, including urban habituation, likely result in seasonal forcing of HeV excretion and risk of transmission to horses [5-6] Urban habituation and decreased flying fox migration from anthropogenic influences may reduce flying fox population immunity, greater risk of local virus reintroduction and activity, and with increasing direct/indirect contact of flying foxes with horses, greater risk of spill-over events and outbreaks of equine HeV infection. (6)

An additional epidemiological development of HeV was the detection of antibodies in a dog on a farm that had three HeV infected horses: this is the first report of antibody detection in a dog outside of an experimental setting [3]The biological importance of this finding is difficult to determine, however it does raise the possibility that other species could be involved in the transmission of HeV.
HeV: Recent advances in the control of infection in horses

Eradication of HeV is not realistic due to maintenance in the fruit bat reservoir. A major advance for the prevention of HeV infection was the release of a commercial Hendra virus vaccine for use in horses under a special Minor Use Permit issued by the Australian Pesticides and Veterinary Medicines Authority in November 2012.

While the efficacy of the vaccination has not yet been established in field settings, experimental studies undertaken during vaccine development found vaccinated horses were protected from experimental challenge with HeV. Under the Minor Use Permit conditions, the vaccine can only be used by veterinarians, who must undertake online training. Further, horses must have a microchip inserted prior to vaccination and the microchip and vaccination details entered into a HeV Vaccine National Online Registry. Further, through vaccination of horses, a public health benefit is hope to be realised through reduced risk of HeV exposure of horse owners, veterinarians and other personnel involved in the horse industry.

References


