Hendra virus spillover risk in horses: heightened vigilance and precautions being urged this winter

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Alison Peel,[a] Peggy Eby,[b] Maureen Kessler,[c] Tamika Lunn,[a] Andrew Breed[d] and Raina Plowright[a,c]

[a] Environmental Futures Research Institute, Griffith University, Nathan, Queensland

[b] School of Biological, Earth, and Environmental Sciences, University of New South Wales, Sydney, New South Wales

[c] Department of Microbiology and Immunology, Montana State University, Bozeman, Montana, USA

[d] Epidemiology and One Health Section, Animal Health Policy Branch, Animal Division, Department of Agriculture and Water Resources, Canberra, Australian Capital Territory

On Friday 26 May 2017, Biosecurity Queensland announced that an unvaccinated horse in the Gold Coast hinterland had been euthanased following a positive detection of Hendra virus.[1] This was the first Hendra virus case for the year and serves as a reminder to horse owners, veterinarians and allied workers to protect themselves and their animals. Given similarities between current environmental conditions and those that preceded a surge of spillover events in 2011, it may be worthwhile to be especially vigilant this year.

The number of equine Hendra virus spillover events in the winter of 2011 was unprecedented and remains the largest spillover period to date.[2] More incidents were reported in a 12-week period than in all of the preceding 16 years since Hendra virus was first described.[3] In total, there were 18 incidents (23 individual cases) between late June and early October.[3] At the time, it was unclear why such a large number of equine cases occurred, though an ABC News report suggested that severe weather events were a possible contributing factor.

The 2011 spillover events were preceded by a steep rise in the southern oscillation index (SOI) in March–April, 2010, which marked the end of a severe spring/summer El Niño and the beginning of a prolonged and strong La Niña event that lasted until April 2011. La Niña events are typically characterised by increased rainfall and cooler maximum temperatures, which shifts eucalypts into a growth phase, rather than a flowering phase,[4] and restricts available food resources for flying foxes. From May 2010 to January 2011, flying foxes across eastern and southern Australia experienced a severe food shortage. Wildlife carers received exceptionally large numbers of flying foxes; these, and animals captured for research studies, were in very poor body condition and reproductive success was low.[5–7] Moreover, flying foxes expanded their distribution (primarily inland, but as far south as Tasmania) and formed new roosts near alternative food sources, as is often observed during food shortages.[5,8] Prolonged and unusually heavy rains in late 2010 and early 2011 resulted in severe flooding across Queensland, New South Wales and Victoria.

Recent environmental conditions and weather events are consistent with the circumstances that preceded the exceptional number of Hendra virus spillover events in winter 2011. According to the Bureau of Meteorology, a severe El Niño event in spring/ summer of 2015–16 was followed by a sharp rise in the SOI in April–May 2016. A widespread food shortage for flying foxes occurred in November–December 2016,[9] which coincided with a period when grey-headed flying fox (*Pteropus poliocephalus*) and black flying fox (*P. alecto*) females had dependant pups.

Large numbers of pups died, probably because females ceased lactation from nutritional stress, resulting in a 50% reduction in the number of successfully weaned pups compared with the preceding year (Eby et al. unpubl. data). As in 2011, the affected area included southern and eastern Australia and, again, multiple new roosts formed as populations fragmented in the search for food. Moreover, a Hendra virus spillover infection of a horse was coincident in both space and time with the nutritional stress event.[10] Previously, Hendra virus spillover events had not been recorded in summer in the subtropics.[2] In March 2017, widespread flooding occurred across New South Wales and Queensland associated with cyclone Debbie.

These climatic events may affect eucalypt phenology and food provisioning in ways that contribute to nutritional and immunological stress in flying foxes that are concurrently adapting to a fragmented landscape. Compromised immunity, altered feeding behaviours and fragmentation and urbanisation of flying fox roosts may drive Hendra virus spillover through increasing viral excretion and/or horse–bat contact rates.[11] There are levels of complexity in this system that are not yet understood. Nevertheless, as causal links for this series of correlations have not yet been demonstrated, we believe they deserve further investigation.

Although an effective vaccine for Hendra virus in horses is now available,[12] uptake of the vaccine has been well below expected levels[13] and recent analysis suggests as many as 400,000 horses remain unvaccinated and at risk.[14] The Hendra virus vaccine is the most effective way to prevent spillover to individual horses;[15] it is unknown to what extent current vaccination rates will affect the overall incidence of spillover events if there is a repeat of 2011 conditions. Given the ongoing threat of Hendra virus to equine and human health, it may be prudent for

veterinarians, their staff and their clients to review the Australian Veterinary Association[16] and government information and guidelines[17] for mitigating the risk of Hendra virus spillover.

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