

## Serologic Evidence for the presence in Pteropus Bats of a Paramyxovirus Related to Equine Morbillivirus

Two outbreaks of a previously unknown disease in horses and humans occurred in Queensland in 1994. The outbreaks occurred within 1 month of each other in Brisbane and Mackay, which are approximately 1000 km apart. In the Brisbane incident, 21 horses were infected of which 14 died or were euthanized after severe clinical signs of an acute respiratory disease. Two human cases were in patients with less well defined clinical signs; one patient died (1,2). In the Mackay incident two horses became seriously ill and died, and one person also died (3). Although it is now known that the two outbreaks occurred in August and September 1994, knowledge of the Mackay outbreak did not occur until late 1995 when the infected person died of a relapsing encephalitis. The name equine morbillivirus (EMV) has been proposed for a paramyxovirus isolated from four of the Brisbane horses and the first patient who died (2).

In both locations, the index case appears to have been in a mare in late pregnancy, on pasture. The mode of transmission to other horses and to humans is unknown. In spite of intensive investigations, no connection has been established between the two incidents. At both locations, initial serologic studies of in-contact horses and humans failed to show evidence of neutralizing antibody, and it was concluded that infection by contact is uncommon. A subsequent state-wide serologic survey of 2,411 horses has also shown no evidence of infection (4). At present, only seven horses have had antibody, and all were involved in the Brisbane outbreak.

To evaluate the theory that EMV originated from a wildlife source, a trapping program was initiated, focusing on the location of the index cases, first in Brisbane and later in Mackay when the details of that incident became known. A total of 5,264 sera from 46 species were tested, none of which showed any evidence of antibody.

Further information from the Mackay cases enabled us to think more logically about a possible reservoir host. Although virus was not isolated from the two horses, it was possible to amplify part of the EMV matrix protein gene by PCR. A comparison of the sequence of this PCR product with PCR product from the Brisbane cases showed that they were identical, indicating a common source of origin (5). In our consideration of possible reservoir hosts, the following criteria were applied to prioritize species for investigation: 1) The species should

be present in both the Brisbane and Mackay areas; 2) the species should be capable of migrating between these areas, and 3) contact with horses should be possible. The two groups of animals which readily fit this description were birds (especially migratory waders) and flying foxes. Because EMV is a mammalian virus and transmission of paramyxoviruses from birds to mammals is uncommon, flying foxes were given a higher priority than birds.

In Australia four species of bats belong to the Suborder Megachiroptera (fruit bats or flying foxes). The spectacled fruit bat (*Pteropus conspicillatus*) occurs in the northern and eastern parts of Queensland while the black fruit bat (*P. alecto*) has a much wider distribution across the northern part of Australia. The little red (*P. scapulatus*) is found across northern and eastern Australia while the grey-headed (*P. poliocephalus*) occurs in eastern and southern areas of the country.

Serologic sampling of these species soon showed the presence of antibody to EMV. At present, 224 samples have been tested of which 20 have neutralizing antibody to EMV (prevalence rate of approximately 9%). Positives have been detected in all species but insufficient samples are available to provide any meaningful estimate of comparative prevalence. Animals with positive results have been recorded along the whole of the eastern coast of Queensland, from Cairns to Brisbane. Again, insufficient data are available to compare the seroprevalence in different locations. Titers vary from 1/5, the lowest dilution tested, to 1/640. For comparison, the neutralization titer of the control positive equine sera is 1/160.

In relation to the origin of EMV, the significance of finding antibody in fruit bats remains to be determined. Our interpretation of the neutralization test results is that a virus closely related to EMV is circulating in fruit bats. We propose referring to this virus as bat paramyxovirus to emphasize that its relationship to EMV is uncertain.

A serologic survey of persons who have had prolonged and close contact with fruit bats is under way. To our knowledge there have been no unexplained occurrences of severe infectious disease in fruit bats, nor have there been any recorded cases of severe disease in persons who have had extensive exposure to these animals.

We will continue sampling birds and other ani-

## Dispatches

mals because fruit bats may not be the only reservoir of this virus. Also transmission from bats to another species may be required before spillover occurs in horses. A high priority will be to isolate the bat paramyxovirus and compare it to EMV. The natural history of bat paramyxovirus infection should be investigated so that natural routes of infection can be established. This information should then lead to testable hypotheses about how infection of other species occurs.

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## References

1. Selvey L, Wells RM, McCormack JG, Ansford AJ, Murray PK, Rogers RJ, et al. Outbreak of severe respiratory disease in humans and horses due to a previously unrecognised paramyxovirus. *Med J Aust* 1995;162:642-5.
2. Murray P, Selleck P, Hooper P, Hyatt A, Gould A, Gleeson L, et al. A morbillivirus that caused fatal disease in horses and humans. *Science* 1995;268:94-7.
3. Rogers RJ, Douglas IC, Baldock FC, Glanville RJ, Seppanen KT, Gleeson LJ, et al. Investigation of a second focus of equine morbillivirus infection in coastal Queensland. *Aust Vet J* 1996 (in press).
4. Ward MP, Black PF, Childs AJ, Baldock FC, Webster WR, Rodwell BJ, et al. Negative findings from serological studies of equine morbillivirus in the Queensland horse population. *Aust Vet J* 1996 (in press).
5. Hooper PT, Gould A, Mitchell G, Russell GW, Kattenbelt J. The retrospective diagnosis of a second outbreak of equine morbillivirus infection. *Aust Vet J* 1996 (in press).