

# What is the risk of the introduction of Nipah virus to Australia via flying foxes?



A C Breed<sup>1</sup>, H E Field<sup>3</sup>, S C Donnellan<sup>2</sup>, J Meers<sup>1</sup>

<sup>1</sup>University of Queensland, Brisbane, Australia. <sup>2</sup>South Australian Museum, Adelaide, Australia.

<sup>3</sup>Queensland Department of Primary Industries and Fisheries, Brisbane, Australia

## 1 BACKGROUND

Flying foxes (family Pteropodidae, genus Pteropus), are the natural hosts of several recently emerged zoonotic viruses of animal and public health significance including the novel paramyxoviruses Hendra virus, in Australia, and Nipah virus in south-east Asia. The extent and nature of contact between Australian flying fox populations and those to the north of Australia is unknown, although anecdotal reports suggest seasonal movements from Papua New Guinea to the islands of Torres Strait and Cape York. Also unknown is the southern geographic limit of Nipah virus in flying foxes, and whether this limit is stable or changing.

## 3 METHODS

**1:** A series of cross sectional surveys of flying fox populations in northern Australia, Papua New Guinea and East Timor to collect samples for henipavirus serology, viral RNA detection by PCR and viral isolation.

**2(a):** Use of molecular genetic techniques to determine the population structure of the black flying fox (*Pteropus alecto*) where it occurs within and outside Australia. Maternally inherited mitochondrial DNA sequence analysis is being used, and biparentally inherited markers (e.g. nuclear DNA microsatellites) or paternally inherited markers (e.g. Y chromosome SNPs) will be used to balance the study as necessary.

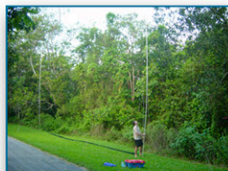
**2(b):** Satellite telemetry of flying foxes is being used to determine current and actual flying fox movements in Australian border areas.



Searching for flying foxes in East Timor



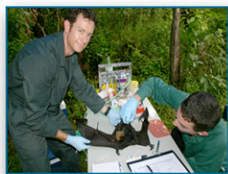
*Pteropus vampyrus* in East Timor



Setting up a mist net for catching flying foxes in north Queensland



Removal of a flying fox from a mist net following capture



Anaesthesia of a flying fox with isoflurane and oxygen for sample collection in north Queensland



Collection of wing membrane biopsy for molecular genetic studies



Collection of blood for Henipa viral serology and PCR testing



Collection of a throat swab for Henipa viral PCR testing

## 5 DISCUSSION

**1:** Preliminary results indicate the presence of a henipavirus in *Pteropus vampyrus* but not in two other Pteropodid genera in East Timor. Results from north Queensland indicate the presence of Hendra virus at a high seroprevalence in two of the three flying fox species found in the region.

**2 (a):** Preliminary molecular genetic studies show evidence of possible significant population structuring in *P. alecto* within Australia.

**2 (b):** Satellite telemetry confirms the movement of a *P. alecto* between Australia and New Guinea and hence potential contact of flying fox populations within and outside Australia.

## 2 OBJECTIVES

- To describe the occurrence of henipaviruses (the only current known members being Hendra and Nipah viruses) in targeted northern Australian and pre-border flying fox populations.
- To investigate the extent and nature of contact between flying fox populations in northern Australia and pre-border populations using (a) molecular genetic and (b) satellite telemetry techniques.

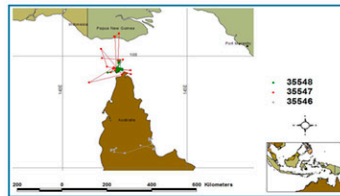


Figure 2: Detected movements of three flying foxes in north Queensland and Torres Strait



*Pteropus alecto* with satellite transmitter attached

Release of flying fox carrying a satellite transmitter



## 4 PRELIMINARY RESULTS

**1:** Table 1 shows serology results for a survey of fruit bats conducted in East Timor in September 2004. Viral RNA PCR results are pending.

Table 2 shows serology results for a survey of flying foxes conducted in north Queensland in January 2005. Viral RNA PCR results are pending.

**2 (a):** A 425 base pair fragment from the mitochondrial DNA control region was sequenced from 13 *P. alecto* from three different regions of Australia. Sequence comparisons are shown on a neighbour joining tree (Figure 1).

**2 (b):** Satellite telemetry of 3 *P. alecto* was undertaken on Cape York Peninsula and Torres Strait. Animal movements are shown in Figure 2.

TABLE 1 Serology results of bats from East Timor

Species	Total number sampled	Henipa virus antibody positive N (%)	Henipa virus antibody negative N (%)
<i>Pteropus vampyrus</i>	8	3 (37.5)	5 (62.5)
<i>Dobsonia peroni</i>	1	0 (0)	1 (100)
<i>Rousettus amplexicaudatus</i>	30	0 (0)	30 (100)

TABLE 2 Serology results of bats from north Queensland

Species	Total number sampled	Henipa virus antibody positive N (%)	Henipa virus antibody negative N (%)
<i>Pteropus conspicillatus</i>	81	48 (59.3)	33 (40.7)
<i>Pteropus alecto</i>	55	23 (41.8)	32 (58.2)
<i>Pteropus scapulatus</i>	1	0 (0)	1 (100)

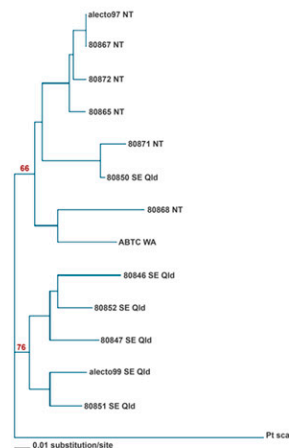


Figure 1: Neighbour joining tree of mt DNA sequences.



## 6 FUTURE WORK

The results obtained so far support the importance of pursuing the objectives of this project. Further field work is planned to survey flying fox populations in East Timor, New Guinea and northern Australia for Henipa viruses. A larger mitochondrial DNA molecular genetic study of *P. alecto* including samples from Indonesia is currently underway. Satellite telemetry is planned for flying foxes in East Timor and New Guinea.

## 7 ACKNOWLEDGEMENTS

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