

A CONFIRMED CASE OF FATAL MURRAY VALLEY ENCEPHALITIS ACQUIRED IN THE BATCHELOR AREA, NT.

**Nina Kurucz and Peter Whelan
Medical Entomology CDC NT. April 2009**

Case Report

A 58 year old male from Batchelor (Miles Rd) was admitted to Royal Darwin Hospital on 10/3/09 with suspected MVE (suspected onset date 8/3/09). A RDH doctor informed Medical Entomology (ME) of the suspected case on 13/3/09 but advised that test results were still pending. The patient remained in ICU for 10 days and passed away on 20/3/09. ME received the Flavivirus Disease Case Investigation Form from CDC on 24/3/09. Later test results indicated a significant rise in antibodies in the HI test and MVE IgM in the CSF, with MVE-RNA detected in multiple postmortem brain samples on 1/4/09. According to the patient's wife, her husband was bitten by mosquitoes on his rural property but had not been to Litchfield Park or any other rural areas.

ME surveillance

Since December 2008 some of the sentinel chickens in Katherine, Nathan River, and Tennant Creek, and in the Kimberley region of WA have seroconverted to MVE. On 29th January 2009 a MVE media warning for all of the NT was issued by DHF, based on sentinel chicken seroconversions in Katherine and Nathan River. After more information became available on the MVE case, a further media warning was released on 20/3/09.

Subsequent investigations

Two ME Technical Officers set six adult mosquito CO₂ traps in the Batchelor area on 23/3/09, close to potential mosquito breeding sites. Traps were set at the residence on Miles Rd (trap 1), Little Finnis River (trap 2), the Batchelor Sewage Ponds (trap 3), next to a billabong at the end of Miles Rd (trap 4), along Coach Rd (trap 5) and next to a nearby creek (trap 6) (see map 1). The traps were collected on 24/3/09 and relevant mosquitoes were processed for virus isolation on the same day at the ME laboratory. *Culex annulirostris* and *Cx. palpalis* from three additional routine Darwin monitoring traps (Holmes Jungle, Palm Creek and Karama) set on 24/3/09 were also processed for virus isolation. The processed mosquitoes were sent to the Berrimah veterinary laboratory for virus isolation and tests are continuing.

Two ME Officers returned to Batchelor on 30/3/09 to inspect the Batchelor sewage ponds for mosquito breeding, and to visit the patient's property to determine other possible transmission factors such as the presence of domestic animals on the premises and their approximate age.

Climate information

The significant rainfall events in Batchelor prior to the disease onset on 8/3/09 included 56mm of rain on 23/2/09, 23.6mm on 24/2/09 and 20.8mm on 25/2/09. The total rainfall in February for Batchelor was 430.2mm (BOM). There was no appreciable rainfall in March, with the highest rainfall of 16.8mm on 16/3/09, allowing potential mosquito breeding areas including the evaporation pond at the sewage ponds to dry significantly by the time of ME inspection.

Trapping & investigation results

The Batchelor area adult trapping results showed relatively low adult numbers of the main potential MVE vectors, *Culex annulirostris* and *Cx. palpalis*, at all sites, including the case residence and the Batchelor sewage ponds (see attached result sheet). However, high numbers of larvae were found breeding in the Batchelor primary sewage pond amongst the vegetation. The majority of the larvae were *Culex gelidus*, a potential vector for ME (see attached result sheet). However, *Cx. gelidus* does not disperse far from its breeding sites in appreciable numbers, and no adult *Cx. gelidus* were collected in the adult CO2 trap set at the sewage ponds boundary.

The Batchelor sewage evaporation pond was found heavily vegetated on 23/3/09. However, maintenance work (slashing) was carried out in the evaporation pond on 30/3/09, and the primary pond was also weedicided on the same day. Power and Water (PAWA) was contacted by ME on 30/3/09 and asked to carry out larval control in the primary pond using methoprene pellets. Due to a delay in supply of the recommended methoprene pellets, control in the primary pond was carried out on 3/4/09 using Abate 10SG granules. Vegetation was later physically removed from both the primary and evaporation pond by PAWA to discourage further breeding.

Adult geese, chickens and pigs were found at the residence. It was considered unproductive to bleed these animals for antibody presence because of their age and probable lack of any conclusive interpretation of any results. While the domestic animals may have been attractive to mosquitoes in the general area, they could also have acted as diversions from human biting, so the presence of these animals was not seen as a contributing factor for the local transmission. There were no indications of alternative locations where the patient could have been bitten by mosquitoes.

Virus isolation results

Not yet available.

Conclusions

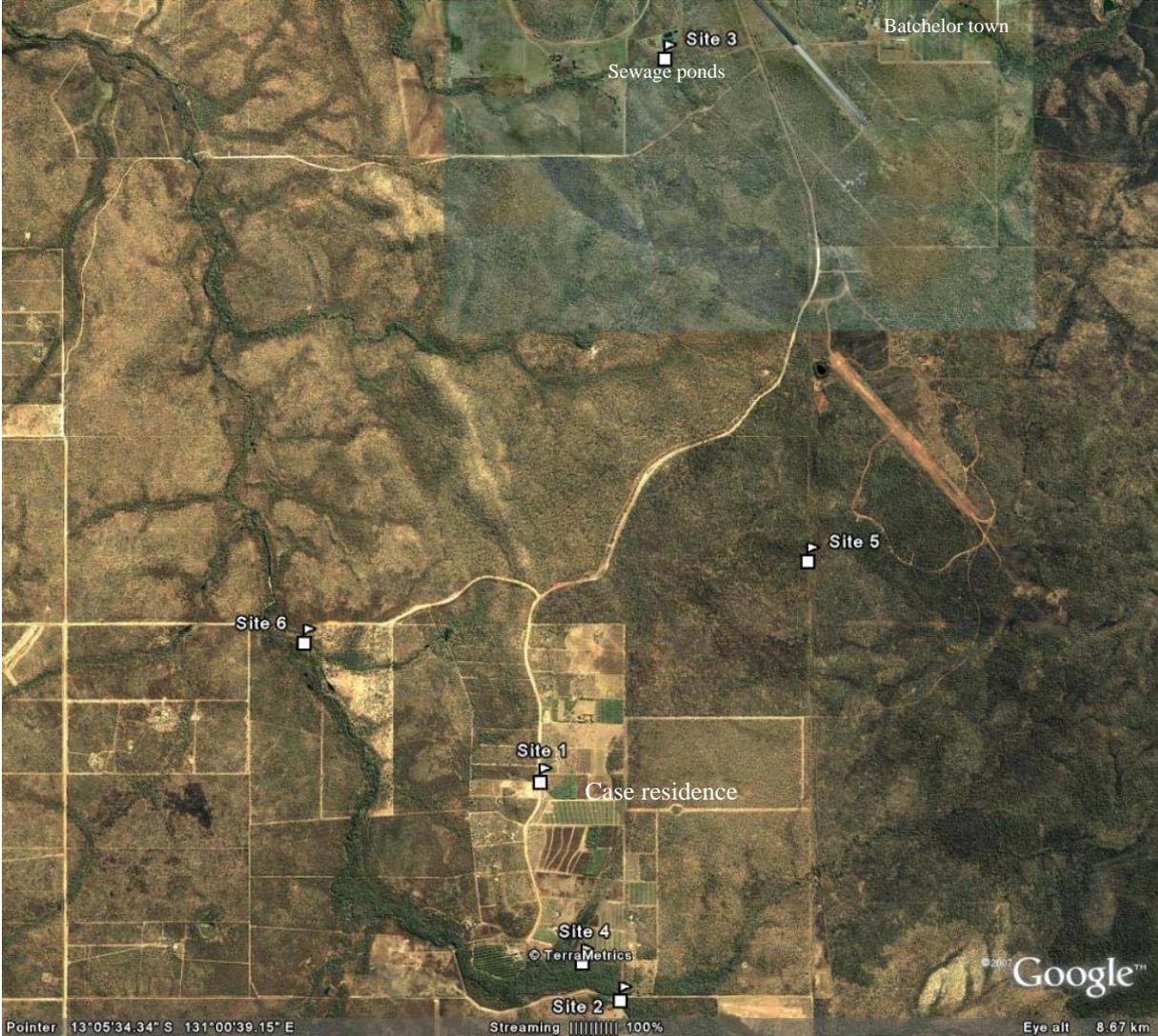
The incubation period for MVE is between 7 and 12 days. With an onset date 8/3/09, the patient most likely contracted the disease around the 27/2/09. The patient's wife reported that her husband was bitten by mosquitoes in the back of their property around this time, and that adult mosquito numbers were high in the two weeks prior to him feeling sick.

The rainfall February rainfall in Batchelor probably led to *Culex annulirostris* and *Cx. palpalis* breeding in grassy depressions and wetlands in the general case residence area, with *Culex annulirostris* also present in the Batchelor evaporation pond due to dense vegetation growth in the pond. Very high numbers of *Cx. annulirostris* can result from high organic sites such as sewage treatment facilities compared with natural flooded sites that are generally relatively low in mosquito productivity due to biological control agents. However, at the time of ME investigation on 23/2/09 and 30/3/09 the sewage evaporation pond had dried considerably, which did not allow a conclusive assessment of the mosquito productivity of this site. In addition the sewage ponds are a few kilometres from the case residence, and hence were not likely to have contributed greatly to the mosquito numbers at the residence. The patient was probably bitten in the two weeks prior to onset by *Cx. annulirostris* or *Cx. palpalis* originating from the general residence area, which has appreciable creeks and low lying areas.

At the time of the trapping investigation, adult mosquito numbers were relatively low and were not indicative of a high risk disease situation. However this situation may have been very different two to three weeks previous to the investigation. The presence of domestic animals on the rural property may have contributed to both mosquito breeding and attractiveness to the locality but was not seen as an appreciable contributing factor for transmission. Mosquito adult or large scale larval control in rural areas is not feasible due to the large number and extent of potential mosquito breeding sites in such areas. However, mosquito control will be carried out at the Batchelor sewage treatment plant during the rest of the risk season.

In summary, the patient most likely contracted the disease on his property due to numbers of *Culex annulirostris* or *Cx. palpalis* present in February 2009.

Map 1.



Batchelor adult mosquito CO2 trap sites.

Adult mosquito monitoring results, Batchelor area 24/3/09

Site location	<i>Ae. (Cha) elchoensis</i>		<i>Ae. (Fin) kochi</i>		<i>Ae. (Fin) notoscriptus</i>		<i>Ae. (Mol) peccatorius</i>		<i>Ae. (Och) normanensis</i>		<i>Ae. species</i>		<i>An. (Ano) bancroftii</i>		<i>An. (Cel) meraukensis</i>		<i>An. Species</i>		<i>Cq. (Cog) xanthogaster</i>		<i>Cx. (Cux) pullus</i>		<i>Cx. (Cux) annulirostris</i>		<i>Cx. (Cux) bitaeniorhynchus</i>		<i>Cx. (Cux) gelidus</i>		<i>Cx. (Cux) palpalis</i>		<i>Cx. (Cux) squamosus</i>		<i>Ma. (Mbd) uniformis</i>		<i>mosquitoes unidentifiable (damaged)</i>		<i>Tr. (Trp) magnesianus</i>		<i>Ye. (Yer) reesi</i>		TOTALS	
	No. of females	No. of males	No. of females	No. of males	No. of females	No. of males	No. of females	No. of males	No. of females	No. of males	No. of females	No. of males	No. of females	No. of males	No. of females	No. of males	No. of females	No. of males	No. of females	No. of males	No. of females	No. of males	No. of females	No. of males	No. of females	No. of males	No. of females	No. of males	No. of females	No. of males	No. of females	No. of males	No. of females	No. of males	Total No. of females	Total No. of males						
Site 4, Billabong end Miles Rd	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	4	0	4	0	0	0	0	0	6	0	1	0	12	0	0	0	0	0	0	0	30	0			
Site 1, 43 Miles Rd	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	19	0	13	0	17	0	0	0	1	0	19	0	0	0	0	0	0	0	1	0	73	0		
Site 3, Sewage Ponds	0	0	0	0	1	0	0	0	3	0	0	0	0	0	1	0	0	0	10	0	7	0	61	0	1	0	2	0	73	0	0	0	45	0	0	0	0	0	0	0	204	0
Site 2, Little Finnis River	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	6	0	2	0	0	0	0	0	3	0	0	0	0	0	0	0	0	1	0	15	0	
Site 6, Creek	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	13	0	3	0	0	0	0	0	7	0	0	0	2	0	14	0	0	0	0	0	40	0
TOTALS	11	1	1	0	2	0	5	0	5	0	1	0	4	0	4	0	1	0	42	0	44	0	93	0	1	0	3	0	146	0	4	0	59	0	14	0	1	0	2	0	443	1

Please note: When "Trap failure mosquitoes" and "Not collected" = "1" in the insect species c

Summary of larval mosquito survey, Batchelor 30 March 2009.

Record no	Date collected	Trap Location	Specific conductivity (uS/cm)	Water presence	Breeding	Water area (m2)	Breeding area (m2)	No. of dips	Average no per dip	Species	Total no in sample	1st instar	2nd instar	3rd instar	4th instar	Pupae
LN01961	30-Mar-2009	Batchelor Sewage Ponds, Evaporation Pond	0	Dry	No	0	0	0	0	<i>Nil mosquitoes</i>	0	0	0	0	0	0
LN01959	30-Mar-2009	Batchelor Sewage Ponds, Primary Pond	0	Flooded	Yes	1000	300	5	50	<i>Cx. (Lop) species 155</i>	1	0	0	1	0	0
LN01959	30-Mar-2009	Batchelor Sewage Ponds, Primary Pond	0	Flooded	Yes	1000	300	5	50	<i>Cx. (Cux) annulirostris</i>	1	0	0	0	1	0
LN01959	30-Mar-2009	Batchelor Sewage Ponds, Primary Pond	0	Flooded	Yes	1000	300	5	50	<i>Cx. (Cux) gelidus</i>	28	8	15	3	2	0
LN01960	30-Mar-2009	Batchelor Sewage Ponds, Secondary Pond	0	Flooded	No	5000	0	4	0	<i>Nil mosquitoes</i>	0	0	0	0	0	0
LN01958	30-Mar-2009	Billabong Miles Rd.	0	Flooded	No	20000	0	5	0	<i>Nil mosquitoes</i>	0	0	0	0	0	0