Sentinel Chicken Surveillance Program in Australia, July 2003 to June 2004

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Abstract

Detection of flavivirus seroconversions in sentinel chicken flocks located in four Australian states are used to provide an early warning of increased levels of Murray Valley encephalitis virus (MVEV) and Kunjin virus (KUNV) activity in the region. During the 2003–2004 season low levels of flavivirus activity were detected in northern Australia with both MVEV and KUNV virus activity detected in the Kimberley and Pilbara regions of Western Australia and in the Northern Territory. A single case of Murray Valley encephalitis was reported from Central Australia. MVEV activity was also detected at Minindee in western New South Wales for the first time since 2000–2001. No activity was detected in Victoria. *Commun Dis Intell* 2005;29:65–70.

Keywords: disease surveillance; flavivirus; Kunjin virus; Murray Valley encephalitis virus

Introduction

The Sentinel Chicken Surveillance Program is used to provide an early warning of increased flavivirus activity in Australia. The main viruses of concern are Murray Valley encephalitis (MVEV) and Kunjin (KUNV) viruses. MVEV causes the disease Murray Valley encephalitis (formerly known as Australian encephalitis), a potentially fatal disease in humans. Encephalitis is less frequent in cases of Kunjin virus infection and these encephalitis cases have a lower rate of severe sequelae. Both viruses are enzootic in the Kimberley region of Western Australia and in the Top End of the Northern Territory and possibly in Far North Queensland (Western Cape and Gulf country). They are epizootic in the Pilbara, Gascoyne, Murchison and Mid-west regions of Western Australia, Central Australia and in western and central Queensland. MVEV is also responsible for occasional epidemics of encephalitis in south-eastern Australia, the most recent occurring in 1974.

In the northern areas of Australia, MVEV and KUNV presence varies depending on the extent and location of wet season rainfall and flooding in the region. MVEV and KUNV activity is monitored in Australia by detecting seroconversions in sentinel chicken flocks.[1] During the 2003–2004 season sentinel flocks were located in Western Australia, the Northern Territory, New South Wales and Victoria. The sentinel program was not funded in Queensland during the 2003–2004 season. These sentinel programs are funded by the state health departments and each state has a contingency plan, which will be implemented if one or more chickens in a flock seroconverts to one of these viruses. From 1992 to 2001 the results of the state sentinel chicken programs were reported bimonthly in *Communicable Diseases Intelligence*. From 2002 onwards, important results were posted either on the Communicable Disease Australia website or more recently on the National Arbovirus and Malaria website. Each state provides a brief summary of the results obtained from their state program.

During the 2003-2004 season, 29 flocks were maintained in the north of Western Australia, eight in the Northern Territory, six in New South Wales and 10 in Victoria. The flocks in Western Australia and the Northern Territory were sampled and tested all year round but those in New South Wales and Victoria were tested only in the summer months, during the main MVEV risk season. Additional information on the Australian sentinel chicken surveillance program has also been presented earlier.[1]

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Summary of recent flavivirus activity in Australia

MVEV and KUNV activity is detected in Western Australia and the Northern Territory in most years. Activity in other areas is less regular. Record rainfall was recorded in the north of Australia during the 1999–2000 wet season and cases of Murray Valley encephalitis were reported from the Northern Territory, Central Australia and Western Australia. Above average rainfall was recorded in central Australia in 2000–2001 and cases were again reported from the region. A single case was also reported from central Queensland. In 2000–2001 MVE activity was detected in New South Wales for the first time since 1974 but no human cases were reported. KUNV activity was also detected in New South Wales and Victoria in 2000–2001.

MVEV and KUNV activity was low in 2001–2002 with activity recorded only in Western Australia and the Northern Territory. Two cases of Murray Valley encephalitis were reported from Western Australia. Kunjin virus activity was reported from Western Australia, the Northern Territory and northern Queensland. Low levels of activity of both viruses were again detected during the 2002–2003 season.

Activity this year was limited to Western Australia and the Northern Territory.

Flavivirus activity in the 2003–2004 season

Western Australia

Serum samples from the Western Australian sentinel chicken flocks are tested by the Arbovirus Surveillance and Research Laboratory at the University of Western Australia in Perth.

Although there was above average summer rainfall (December to March) in most areas of the Kimberley and Pilbara regions, MVEV and KUNV activity was low and, similar to 2002–2003, began later than usual in Western Australia. Activity was again restricted to the Kimberley and Pilbara regions. No human cases were reported.

Table 1 shows a summary of MVEV and KUNV seroconversions in Western Australia from January to June 2004. Results are discussed in the next section.

MVEV activity

MVE activity was first detected in March 2004 at Kununurra in the north-east Kimberley and activity in this region continued at a low level until June 2004. Activity was detected in the west Kimberley at Fitzroy Crossing and Broome in May. The Western Australian Department of Health (DOH) issued health warnings to residents and visitors to the Kimberley and Pilbara regions in April and June 2004. An additional localised warning was issued via the Kimberley Public Health Unit to the Kalumburu community in the far north of Western Australia in May 2004.

MVEV activity was only detected at two sites in the Pilbara (Harding Dam and Tom Price) in April and May.

KUNV activity

KUNV activity was more widespread than MVEV activity in the 2003–2004 season. KUNV activity was first detected in February at Kununurra in the north-east Kimberley and at Fitzroy Crossing, Derby and Broome in the west Kimberley from April to June. KUNV activity was first detected in the Pilbara region in March at Ophthalmia Dam (Newman) and activity persisted in the region well into the dry season.

The majority of flavivirus activity in the Pilbara region was focused at the two major dams (Harding and Ophthalmia) suggesting that these permanent water sources can prolong and perhaps maintain a focus of both MVEV and KUNV activity.

Northern Territory

MVEV activity is usually initiated later in the Northern Territory than in Western Australia. The flocks are funded and organised by the Northern Territory Department of Health and Community Services, while veterinary officers of the Department of Business Industry and Resource Development and volunteers maintained and bled the flocks monthly, and staff of the Arbovirus Surveillance and Research Laboratory in Perth tested the serum samples.

MVEV activity in the Northern Territory during the 2003–2004 wet season was low and equals the low level of last year. KUNV activity was relatively high compared to MVEV, and similar to the higher activity over the last two years (Table 2).

Table 1. Summary of Murray Valley encephalitis virus and Kunjin virus seroconversions in Western Australia, January to June 2004*

Location	Jan		Feb		Mar		Apr		May		Jun		Total	
	n	+ve	n	+ve	n	+ve	n	+ve	n	+ve	n	+ve	Bled (n)	Positive (+ve)
Kimberley														
Kalumburu	20	0			20	0	10	4 2MK, 2M	13	1 1M	12	1 1K	75	6
Wyndham			9	0			20	0	9	1 1M	17	1 1M	55	2
Kununurra	24	0	11	1 1K	18	1 1M	9	1 1M	3	0	12	0	77	4
Halls Creek	11	0	22	0	22	0	11	0	21	0	11	0	98	0
Fitzroy Crossing	20	0	20	0	20	0	10	3 3K	7	2 2M	4	3 3K	81	9
Derby site 1	19	0	20	0	18	0	8	0	8	0			73	0
Derby site 2	20	0	19	0	20	0	10	1 1K	9	1 1K			78	2
Broome – Roebuck	21	0	11	0	12	0	30	0	8	2 2K	14	3 2K	96	7
Broome – Town	14	0	9	0	8	0	20	1 1K	4	1 1M	7	2 2K	62	4
Pilbara														
Port Hedland	24	0	11	0	12	0	24	0	11	0	11	0	93	0
Karratha	12	0	24	0	12	0	24	0	12	0	12	0	96	0
Harding Dam 1	20	0	18	0	9	0	14	1 1MK	14	0	8	1 1K	83	4
Harding Dam 2	20	0	20	0	9	0	16	0	21	2 2K	7	1	93	3
Marble Bar	24	0	23	0	36	0	12	0	12	0	23	1 1K	130	1
Nullagine	8	0	6	0			4	0	6	0			24	0
Tom Price	12	0	12	0	34	0	12	0	22	2 1M, 1K	9	0	101	3
Paraburdoo	9	0			10	0	9	0	10	0	10	0	48	0
Onslow	18	0	16	0	9	0	17	0	9	0	17	0	86	0
Ophthalmia	24	0	24	0	24	1 1K	22	2 2K	14	2 2K	18	2 2K	126	7
Newman Shire	24	0	24	0	24	0	24	0	12	0	36	0	144	0
Exmouth	11	0	22	0	22	0	22	0	33	0	33	0	143	0
Gasgoyne														
Carnarvon	5	0			12	0	11	0	10	0	17	0	55	0
Mid-west/Wheatbelt/ Goldfields														
Three Springs	24	0	12	0	35	0	24	0	34	0	24	0	153	0
Geraldton	7	0	6	0	5	0							18	0
Dongara	9	0	9	0									18	0
Gingin	24	0	24	0	35	0	12	0	24	0	24	0	143	0
York	10	0	23	0	33	0	22	0	22	0	22	0	132	0
Bindoon	12	0	12	0	12	0	12	0	12	0			60	0
Leonora	19	0	8	0	15	0	10	0	19	0	10	0	81	0

* Sentinel flocks tested for infection with Murray Valley encephalitis and Kunjin viruses, sampled fortnightly from December to May ('wet' season) and monthly from June to November ('dry' season). Previous (or repeat) positive chickens are not recorded on this summary.

N Number of samples.

+ve Number of Murray Valley encephalitis virus and Kunjin virus positive samples.

M Murray Valley encephalitis virus antibodies.

K Kunjin virus antibodies.

MK Murray Valley encephalitis virus and Kunjin virus antibodies.

Table 2. Summary of Murray Valley encephalitis virus and Kunjin virus seroconversions in the Northern Territory, 1993 to 2003

Location	Flock established	Virus	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	+ ve totals
Howard Springs*	January 1992	MVE	7	5					1	1	1	1	1	17
		KUN	3	2	1	2				1	2	3	3	17
Leanyer†	September 1992	MVE	1	10	1			1	1	3		3		20
		KUN		1	1			1	3	2		4		12
CPRS*	July 1993	MVE		13		4	4		5	3	3	1		33
		KUN				4		1			1	2		8
Nhulunbuy	January 1992‡	MVE							1	4			1	6
		KUN						2	3				2	7
Katherine	June 1993	MVE		12			3	1	2	3	2	4		27
		KUN				1	1	1		1	4	1	2	11
Tennant Creek	February 1995	MVE			7		7		10	11	12	6		53
		KUN					3	3		2			1	9
Alice Springs§	November 1996	MVE					7			5	8	2		22
		KUN								1	2			3
Totals		MVE	8	40	8	4	21	2	20	30	26	17	2	
		KUN	3	3	2	7	4	8	6	7	9	10	8	

* Darwin rural.

† Darwin urban.

‡ Data in this table are from 1997/98 onwards due to non–continuous sampling before this period.

§ Arid Zone Research Institute.

CPRS Coastal Plains Research Station (Fogg Dam) Adelaide River.

MVE Murray Valley encephalitis virus.

KUN Kunjin virus.

MVEV activity

Seroconversions to MVEV were detected in March in the Darwin area and in April at Katherine (Table 3). There was one case of Murray Valley encephalitis virus reported from Central Australia in April in a community between Tennant Creek and Alice Springs. The lack of activity in the Alice Springs area is in accord with the risk indicator of summer rainfall below 100 mm.[2] The Department of Health and Community Services (Northern Territory) issued media warnings for the whole of the Northern Territory in April and early June 2004.

KUNV activity was detected in July in Nhulunbuy and in August in Katherine, but this was probably a continuation of the previous season's activity (Table 3).

KUNV activity was detected in Tennant Creek in December, April and May, and in the Darwin area (Leanyer, Howard Springs and Coastal Plains Research Station) in November, March, May and June (Table 3). KUNV activity in the Northern Territory over a 10 year period has been highest in the months of April and May, with most in May. The November activity in Darwin (Leanyer) was unusual as KUNV has not been detected anywhere in the Northern Territory in October or November in the last 10 years.

New South Wales

Samples from sentinel chicken flocks were tested weekly for flavivirus antibodies in New South Wales (Westmead Hospital) from December 2003 to April 2004. There was one seroconversion to MVEV in the Minindee flock in December 2003. This is the first indication of MVEV activity in New South Wales since the 2000–2001 season and this activity occurred in the absence of seroconversions in northern Australia. It was previously thought that MVEV was most probably introduced into New South Wales, after heavy rainfall, from areas of northern Australia where the virus is enzootic. However, this result suggests that it is more likely that MVEV exists in small enzootic foci in this region and activity was reactivated after rainfall in late 2003. Additional studies are required to confirm this.

Victoria

Samples from sentinel chicken flocks were tested weekly for flavivirus antibodies at the Veterinary Research Institute from October 2003 to March 2004. No MVEV or KUNV activity was detected in this region.

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The following laboratories were responsible for testing sentinel chicken sera:

Arbovirus Surveillance and Research Laboratory, Discipline of Microbiology, University of Western Australia

Veterinary Research Institute, Victoria

Virology Department, Westmead Hospital, New South Wales

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Table 3. Annual summary of the Northern Territory sentinel chicken program, July 2003 to June 2004*

Location	Jul		Aug		Sept		Oct		Nov		Dec		Jan		Feb		Mar		Apr		May		Jun		Total	
	n	+ve	n	+ve	n	+ve	n	+ve	n	+ve	n	+ve	n	+ve	n	+ve	n	+ve	n	+ve	n	+ve	n	+ve	n	+ve
Alice Springs (Arid Zone Research Institute)	12	0	12	0	12	0	12	0	12	0	12	0		–	11	0	12	0	12	0	12	0	12	0	131	0
Alice Springs (Ilpara)	12	0	12	0	12	0	11	0		12	0	–		–	12	0	11	0	11	0	11	0	11	0	115	0
Howard Springs	7	0	7	0	7	0	7	0	7	0	7	0	6	0	6	0	6	0	6	0	17	1 1K†	12	0	95	1
Leanyer	9	0	9	0	9	0	9	0	9	1 1K	8	0	8	0	8	0	8	2 1M,1MK	6	5	13	0	11	0	107	8
Katherine	6	0	6	1 1K	5	0	5	0	5	0	5	0	17	0	11	0	11	0	11	1 1M	8	0	8	0	98	2
CPRS	10	0	10	0	10	0	10	0	10	0	8	0	17	0	11	0	11	0	10	1	9	0	9	2 1K	125	2
Tennant Creek		–	9	0	6	0	6	0		–	18	1 1K†	12	0	12	0	12	0	12	1 1K	11	2 1K,1K†	9	0	107	4
Nhulunbuy	9	1 1K		–	8	0	8	0		–	7	0		–	8	0	8	0		–	7	0	7	0	62	1

* Sentinel chicken flocks are tested for antibodies to Murray Valley encephalitis and Kunjin viruses.

† Not confirmed (no second sample sent).

– No samples were sent.

CPRS Coastal Plains Research Station (Fogg Dam) Adelaide River.

M Murray Valley encephalitis virus antibodies.

K Kunjin virus antibodies.

MK Murray Valley encephalitis virus and Kunjin virus antibodies.