

Tick-borne Viruses in Thailand

3. A Survey for Human Antibody to T-1674

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OBJECTIVE: To detect any evidence of human infection with T-1674, a group B tick-borne arbovirus.

BACKGROUND: Tick-borne arbovirus infections of humans have not been recognized to occur in Thailand. The discovery of two different viruses in ticks collected in Khao Yai National Park (KYNP) stimulated the initiation of a survey of residents of the park for antibody to these agents (1). One of the viruses, T-1674, was previously shown to be a group B arbovirus (1) and is now tentatively identified as Langat virus. Natural infections of humans with Langat is infrequent in Malaysia, but induced infections of people with neoplastic disease has caused encephalitis (2). This study sought evidence of natural human infection with T-1674 in a human population with a high incidence of mosquito-borne group B arbovirus infection.

DESCRIPTION: Human sera were collected from as many residents of Khao Yai National Park (KYNP) as was possible during visits in September 1973, February 1974 and September 1974. At the same time historical information was obtained on the length of residence in KYNP, living site, size of families, occupation, general health and exposure to ticks.

Complement fixation (CF), hemagglutination inhibition (HI) and plaque reduction neutralization tests (PRNT) were used to detect antibody (1). CF antigen was standardized by block titration against homologous HMAF. The highest dilution of a sucrose acetone extract of suckling mouse brain (SMB) giving 50% hemolysis was considered one unit of antigen. A four-fold lower dilution of antigen (4 units) was used in routine CF tests. All sera were heated to 56°C for 30 minutes before testing. A serum titer of 1:4 or greater was considered positive by CF. Eight units of sucrose acetone extracted SMB were used as antigen in HI tests. Positive serum titers by HI were 1:10 or greater. PRNT titers were based on 50% reduction of the mean number of control plaques by a serum dilution of 1:10 or greater.

PROGRESS: Residents of KYNP included employees of the Forestry Department, Highway Department and the Tourist Organization of Thailand (TOT) and their dependent relatives. Between September 1973 and September 1974, serum was collected from 497 individuals representing 80% of the total population estimated from work rosters and interviews and multiple sera were obtained from 39% (Table 1). The median age of the people sampled was 22 years compared to 21 years for the entire population. The ages of people sampled ranged from 4 months to 60 years. The median length of residence in the park was 3 years and ranged from one day to 43 years. The ratio of males to females in the sample was 1.56 compared to 1.39 for the whole population.

The questionnaire survey yielded little evidence of illness. Between 12-55% of the residents experienced one or more of 11 specific symptoms, but the responses did not correlate with the presence or absence of group B arbovirus HI antibody. In September 1973, few people reported ever being bitten by ticks;

however, in February 1974 over 50% of the residents admitted to tick bites and many said ticks were abundant at that time. It appeared that human exposure to ticks was common and probably seasonal.

HI tests were done on at least one blood sample from 488 individuals with adequate demographic information. Of the entire sample, 246 people provided serial blood specimens. The age distribution of the follow-up group was representative of the larger group (Figure 1). Similarly, the age specific prevalence of arbovirus HI antibody for the follow-up group (Figure 2) was representative of all of the park residents. HI antibody to dengue virus type 2 (D2) and Japanese Encephalitis virus (JE) was found in over 65% of persons aged 10-15 years and over 90% after age 20 years. Antibody to T-1674 tended to appear later than that to the other group B arboviruses, was not found in more than 87% of any age group and declined in the oldest age group. Chikungunya antibody was found in only two of 66 persons under 15 years of age but thereafter increased steadily to age 50 years.

Of the 246 residents of KYNP from whom two or three serum samples were obtained, 24 (10.2%) demonstrated a four-fold rise in HI antibody titer to one or more arbovirus antigens (Table 2). A rise in antibody to JE antigen was more frequent than to any other type and was found in individuals ranging in age from 16 months to 54 years. Two people showed a four-fold rise in antibody to T-1674 but both had pre-existing group B antibody. No one developed a higher titer of antibody to T-1674 than to either D2 or JE. The people with multiple serum samples were screened for PRNT antibody at a 1:10 dilution. The highest titer of neutralizing antibody to T-1674 in any resident was 1:10. Since the PRNT is considered to be more specific than the HI test the evidence suggests the HI reactivity to T-1674 was due to cross reactive antibody to other group B arboviruses. The constant presence of mosquito-borne group B arboviruses in KYNP, the low level and infrequent rises in HI antibody to T-1674 and the absence of high levels of PRNT antibody to T-1674 indicate that infection of residents with T-1674 virus is quite infrequent if it occurs at all.

SUMMARY: A prospective survey of arbovirus antibody was made from September 1973 to September 1974 of all residents of Khao Yai National Park. Although evidence was found of near uniform exposure to Dengue 2, Japanese Encephalitis and Chikungunya, there was no conclusive evidence of any natural infection with T-1674 during that time period. It is concluded that HI reactivity to T-1674 antigen is probably due to the presence of cross reactive antibody produced to other group B arboviruses. There appears to be little or no risk of human infection with T-1674 in the park.

REFERENCES:

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SEATO Medical Research Laboratory Annual Report, March 1974.
2. Webb, H.E., Wetherley-Mein, Smith, G. et al: Leukaemia and Neoplastic Processes Treated with Langkat and Kyasnur Forest Disease Virus: A Clinical and Laboratory Study of 28 patients. Brit. Med. J. 1:256-266, 1966.

Table 1. KYNP Residents: Serological Sampling
Sept 1973—Sept 1974

Dept. Group	Residents No. (%)	Sex			Age*		Length of Residence*	
		Male	Female	M/F	Median	(Range)	Median	(Range)
TOT								
Bled	230 (86)	123	107	1.15	21	(7/12-48)	3	(2 day-10)
Missed	38	18	20	0.90	3	(1/12-48)		N.D.
Combined	268	141	127	1.11	20	(1/12-48)		
Forestry								
Bled	170 (82)	117	53	2.21	22	(9/12-60)	2	(1 day-13)
Missed	37	18	19	0.95	11	(9 day-59)		N.D.
Combined	207	135	72	1.88	21	(9 day-60)		
Highway								
Bled	97 (65)	63	34	1.85	26	(4/12-54)	3	(3 day-43)
Missed	53	24	29	0.83	10	(1/12-75)		N.D.
Combined	150	87	63	1.38	21	(1/12-75)		
All Depts								
Bled	497 (80)	303	194	1.56	22	(4/12-60)	3	(1 day-43)
Missed	128	60	68	0.88	9	(9 day-75)		
Combined	625	363	262	1.39	21	(9 day-75)		

* Time is in years unless otherwise indicated.

Table 2. Frequency of HI Antibody Rise to Arboviruses
In 246 Residents of KYNP

Antigen	Four-fold Increase		Eight-fold Increase	
	No.	(%)	No.	(%)
Group A				
Chikungunya	6	(2.4)	0	(0.0)
Group B				
T-1674	7	(2.8)	2	(0.8)
Dengue 2	12	(4.9)	4	(1.6)
Japanese Encephalitis	15	(6.1)	7	(2.8)
Any Group B	19*	(7.7)	7	(2.8)

* Group B arbovirus incidence rate = $19/246/\text{yr} = 77.2/1000/\text{yr}$

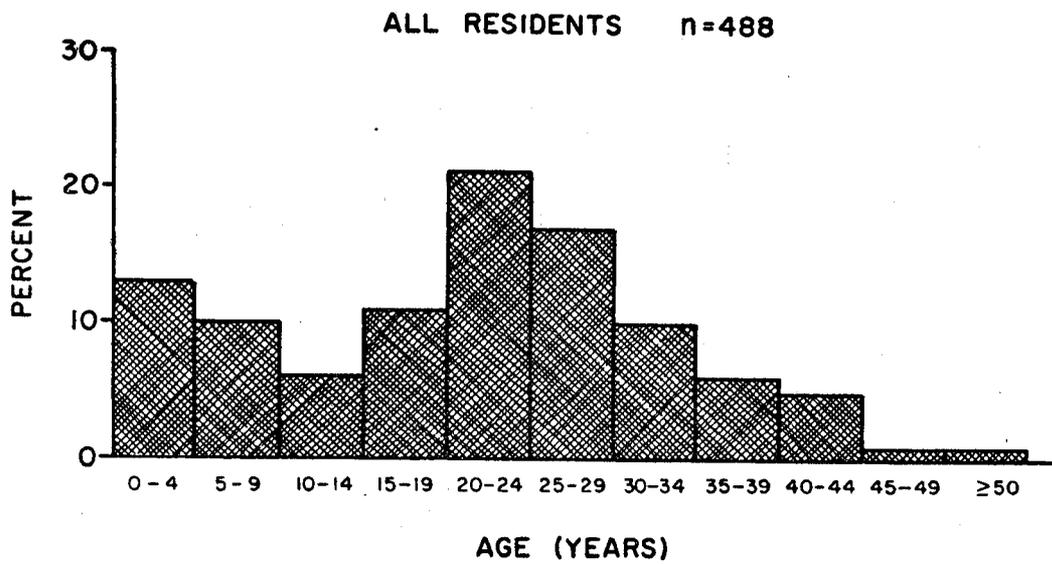
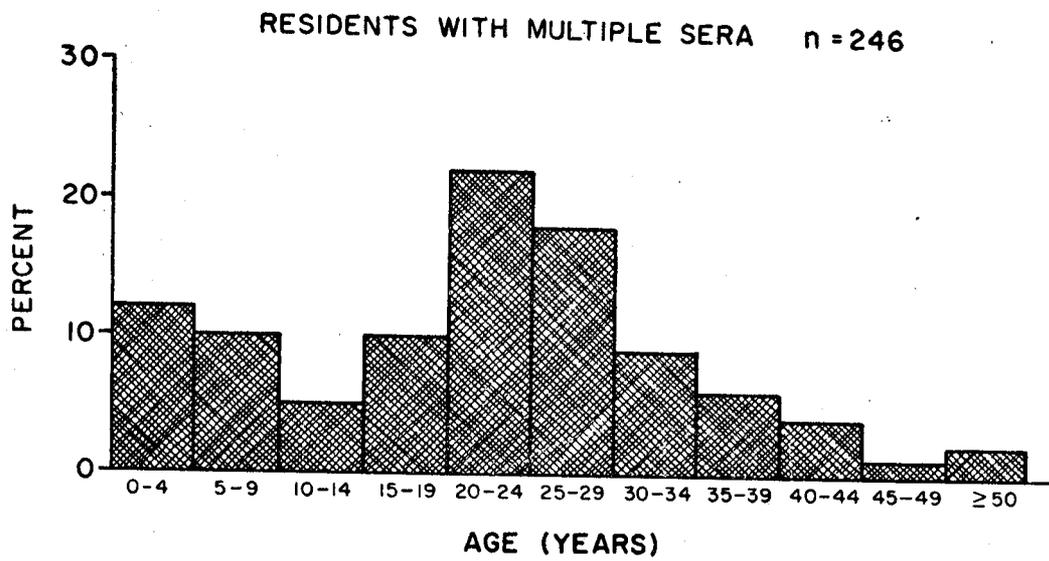


Figure 1. Percent age distribution of residents of Khao Yai National Park

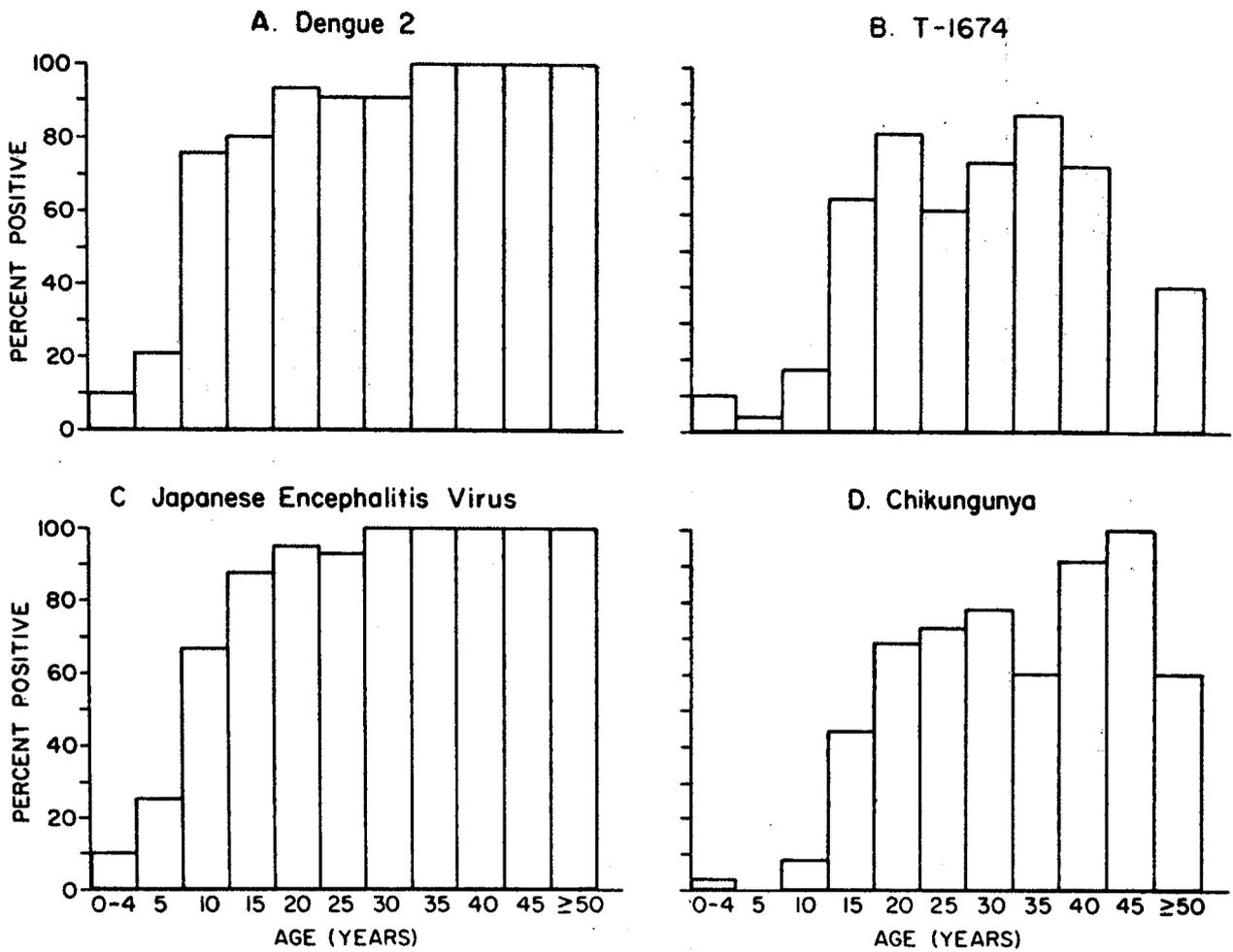


Figure 2 Age specific prevalence of HI antibody to A. Dengue type 2; B. T-1674; C. Japanese encephalitis Virus; and D. Chikungunya in 246 residents of Khao Yai National Park