BODY OF REPORT

SEATO Medic Study No. 8	Ecology of Arboviruses in Thailand. Arbovirus Infection Rates in Residents of Thailand.
Project No. 3A 025601 A 811	Military Medical Research Program S. E. Asia
Task 01:	Military Medical Research Program S. E. Asia
Subtask 01:	Military Medical Research Program SEASIA (Thailand)
Reporting Installation:	US Army-SEATO Medical Research Laboratory APO San Francisco 96346
	Division of Medical Research Laboratories
	Department of Virology
Period Covered by Report:	1 April 1964 to 31 March 1965
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Objectives: To determine what arthropod borne viruses infect man, when and where. Specific infection rates are correlated with mosquito collection, climatologic and ecologic data and also correlated with specific disease attack rates.

Description: As time has permitted, this project has expanded to meet its objective as a study of arthropod-borne viruses infecting man. Initiated with an intensive area study of hemorrhagic fever in Bangkok, subsequently (1963) studies were enlarged to include a town on the Central Plain and towns in Northeast and Southeast Thailand. In each instance the study format is similiar. Residents are bled repeatedly as many times as permitted, records are kept of illnesses in the studied group and in hospitals in studied communities and mosquitoes are captured and processed for virus.

Progress: This report will be confined to a description of the 1964 Japanese encephalitis outbreak in North and North Central Thailand. Available hospital records suggest that viral encephalitis is not a substantial disease problem in Thailand nor do recorded cases have a seasonal incidence (Table 1).
It is known, however, that Japanese encephalitis virus occurs in Thailand (10 strains have been recovered in mosquitoes collected at Bang Phra 1962-4) and that this virus infects domestic animals and birds in large numbers (SEATO Medic Study No. 9, Annual Report FY 64).

In 1964, hospital statistics for encephalitis admissions were collected monthly by the Department staff from 15 selected hospitals in Thailand in 1964; Kanchanaburi, Ban Pong (Rajburi), Rajburi, Prachuabkirikhan, Ayudhaya, Korat, Saraburi, Chainat, Christian Manoram (Chainat), Pisanuloke, Lampang, Chiengmai, Ubol, Chacheongsao, and Chantaburi.

In the course of routine monthly visits, an unusual number of encephalitis admissions were noted at Pisanuloke Hospital in June 1964. Study teams were sent to Pisanuloke Hospital in June, July and August to collect clinical data, paired sera and brain aspirates from fatal cases. Table 2 shows the monthly distribution of encephalitis admissions by sex for 1964 (excluding December). Although the largest number of admissions was in June-August, a few cases with about the same mortality rate were admitted in other months. This could be explained if a certain number of patients with encephalitis admissions due to other causes were admitted throughout the year with JE cases superimposed during the rainy season, or alternatively if JE was endemic throughout the year. This is discussed further below.

The age distribution of cases admitted in May-September is shown in Table 3. Cases were predominantly, but no exclusively, in children. No virus was recovered from 7 brain aspirates. Of 36 paired sera collected, 12 had a 4 X or greater rise in HI and CF antibody with JE neutralizing antibody, 11 had high fixed HI and CF antibody ($>$ 1:640 and $>$ 1:32, respectively) with JE neutralizing antibody (LNI$>$1.7). These results were considered compatible with recent JE infection. In addition, 2 fatal cases of 9 studied, and 5 of 12 patients with single sera had high HI or CF antibody titers and JE neutralizing antibody. The age distribution of these positive and presumptive JE infections is shown in Table 4. Distribution of serologically confirmed and unconfirmed cases by month and severity of symptoms is shown in Table 5.

A strain of JE virus was recovered from a fatal case hospitalized at Chiengmai Hospital in August 1964 by Dr. Sman Watanabhuti. This virus has been received in this laboratory where neutralization tests confirmed its identification as JE.

As is apparent from Table 5 some severe cases of encephalitis were admitted to Pisanuloke Hospital in 1964 which were not Japanese encephalitis. This "background" encephalitis may be caused by a variety of other agents, or toxins, etc. It is possible that this "background" encephalitis (not JE) accounts for most of the encephalitis deaths reported in Thailand (Table 1). This surmise is based upon

Table 3

AGE AND SEX OF HOSPITALIZED ENCEPHALITIS PATIENTS, MAY-SEPTEMBER 1964, PISANULOKE HOSPITAL.

	Male		Female		Total	
Age (year)	Case	Death	Case	Death	Case	Death
Under 1	2	2	1	-	3	2
1-3	4	3	5	2	9	5
4-7	8	1	5	2	13	3
8-11	7	1	3	1	10	2
12-15	5	1	3	-	8	1
16-20	-	-	2	-	2	-
21-30	2	-	1	-	3	-
30 and over	7	-	1	-	8	-
	35	8	21	5	56	13

Table 4

AGE AND SEX DISTRIBUTION OF 25 SEROLOGICALLY CONFIRMED JAPANESE ENCEPHALITIS INFECTIONS, MAY-SEPTEMBER 1964 PITSANULOKE HOSPITAL

	Male	Female	Total
Age (year)	Case	Case	Case
Under 1	-	-	-
1-3	1	-	1
4-7	3	2	5
8-11	6	2	8
12-15	3	3	6
16-20	-	2	2
21-30	2	-	2
31- and over	1	-	1
	16	9	25

Table 1

DISTRIBUTION OF DEATHS ATTRIBUTED TO NON-BACTERIAL ENCEPHALITIS BY MONTH. THAILAND, 1959-1963. (DATA FROM MINISTRY OF HEALTH)

Year	Total	Deaths per Month											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1959	127	8	9	9	10	18	18	6	8	10	11	12	8
1960	129	5	8	12	15	8	14	8	5	9	13	18	14
1961	102	13	7	9	6	3	16	9	9	8	10	5	7
1962	132	9	11	11	14	6	14	16	6	7	7	15	16
1963	278	17	16	27	19	26	25	31	22	23	18	21	33
Total	768	52	51	68	64	61	87	70	50	57	59	71	78

Table 2

MONTH AND SEX OF TOTAL CASES WITH DIAGNOSIS OF ENCEPHALITIS AT PISANULOKE, 1964.

Month	Male		Female		Total	
	Case	Death	Case	Death	Case	Death
January	2	-	2	-	4	-
February	4	1	2	-	6	1
March	7	3	1	-	8	3
April'	6	2	4	2	10	4
May	3	1	1	-	4	1
June	13	5	5	2	18	7
July	13	2	5	1	18	3
August	5	-	5	2	10	2
September	2	-	2	-	4	-
October	2	-	5	3	7	3
November	2	-	1	1	3	1
December						
	59	14	33	11	92	25

Table 5

ANALYSIS OF ETIOLOGY OF PATIENTS ADMITTED WITH CLINICAL DIAGNOSIS OF ENCEPHALITIS BY SEVERITY OF ILLNESS AND MONTH OF ADMISSION. PRABHUDACHINARAJ HOSPITAL, PISANULOKE, 1964.

Serologic diagnosis / Month	Typical encephalitis				Meningitis or milder febrile syndrome			
	JE pos.	JE Presump.	Indeterminant	Not JE	JE pos.	JE Presump.	Indeterminant	Not JE
January	-	-	-	-	-	-	-	-
February	-	-	-	-	-	-	-	-
March	-	-	1	-	-	-	1	-
April	-	-	-	-	-	-	-	-
May	2	-	-	-	-	-	-	-
June	2	1	7	5	-	-	2	1
July	5	6	6	3	-	-	-	2
August	3	5	2	1	-	-	-	-
September	-	1	2	1	-	-	-	-
October								
November								

data from mosquito studies in 1962-3 and bird infections in 1962 which suggest that JEV is transmitted during the rainy season. Since there is no seasonal fluctuation of cases tabulated in Table 1 it is not likely that JE virus was responsible for much, if any, mortality reported.

The reported outbreak is the first in Thailand in which serologic evidence suggests that Japanese encephalitis virus was the cause of overt human disease.

Summary and Conclusions: A small outbreak of viral encephalitis in Pisanuloke and adjoining provinces was studied. Patients were hospitalized during the rainy season of 1964 at Pisanuloke Hospital. Although no virus was recovered from 7 brain aspirates, 12 patients with paired sera had 4 fold or greater rises in HI and CF JE antibody with significant JE log neutralization indices in convalescent sera. CF antibody for JE antigen exceeeded titers obtained with dengue virus antigens. These data were considered to be compatible with Japanese encephalitis virus etiology. One strain of JEV was recovered in Chiengmai from human brain by Dr. Sman Watanabhuti. The patient was hospitalized at Chiengmai Hospital in August 1964. This is the first known human outbreak of JE in Thailand.