# Investigation of Japanese Encephalitis Virus Infection in Bogalay Township, Myanmar in 1999

Lay MYINT[1], Kyaw OO[2], Win HLAING[3]
Hlaing Myat THU[1], Kyaw-Zin-THANT[1], Sein Maung THAN[4], Kay Thi AYE[1]
Soe Win OO[1], Thi HA[4], Kyaw MOE[1] and Soe THEIN[5]

[1]*Virology Research Division, Department of Medical Research (Lower Myanmar) Ziwaka Road, Yangon 11191, Myanmar.*
[2]*Epidemiology Research Division, Department of Medical Research (Lower Myanmar), Ziwaka Road, Yangon 11191, Myanmar.*
[3]*Diagnostic Division, Department of Veterinary Science, Yangon, Myanmar.*
[4]*Medical Entomology Research Division, Department ofMedical Research (Lower Myanmar), Ziwaka Road, Yangon 11191, Myanmar.*
[5]*Department of Medical Research (Lower Myanmar), Ziwaka Road, Yangon 11191, Myanmar.*

**Abstract:** An investigation was in Nyi-naung-wa village, Bogalay township for Japanese encephalitis (JE) virus infection and the possibility of a JE outbreak. JE virus antibody was determined among the pigs and the people living near the pig farms in that village and at an adjacent village as a control. The known JE virus vector *Culex* mosquito species were also identified in both villages. Haemagglutination inhibition (HAI) methods were used for the detectioon of JE and dengue antibodies. Homotypic or monotypic JE antibodies were detected in 33% of the pigs tested. No homotypic nor monotypic JE antibodis was detected among the villagers. Although there was no JE virus infection among the people, because of the presence of JE virus infection among the pigs and the presence of *Culex* mosquito vector in that area, the possibility of a JE outbreak in humans in that area, if the number of pig breeding per household increase and the mosquito density become higher is discussed.

*key words:* Japanese encephalitis, Haemagglutination inhibition, Myanmar.

## INTRODUCTION

Over a large part of East Asia, Japanese encephalitis (JE) virus is the most common cause of encephalitis. This mosquito borne encephalitis has the potential for outbreaks and can be associated with a high fatality rates (World Health Organization, 1997)

Sporadic outbreaks of presumptive Japanese encephalitis have been reported in Myanmar, especially in the Shan State (Ming et al, 1977). One of these outbreaks has been iden-

Received for publication, April 1, 2000

tified by virologic methods as Japanese encephalitis (Soe Thein et al, unpublished manuscript). Evidence suggestive of Japanese encephalitis virus was provided by serological surveys of various areas of Myanmar (Than Swe et al, 1979).

*Culex* mosquitoes are the vectors for transmission of Japanese encephalitis. A preliminary entomological survey of the country vevealed that *Culex tritaeniorhynchus* was found to be widely distributed throughout the country even in areas over 5000 feet high, whereas *Culex gelidus* distributed throughout the country even in areas over 5000 feet high, whereas *Culex gelidus* was not found in higher altitudes. Tthe mosquitoes breed mainly in rice fields, irrigation ditches, ponds, marshes and swamps (Soe Thein et al, 1988). Host preference determination to *Culex* species revealed that they were zoophilic and that the most frequent host were cows (Kyin-Yee, 1979).

Domestic animals especially pigs are important sources of infection, acting chiefly as amplifiers of the virus, transmitted to them by mosquitoes (Horsefall and Tamm, 1965). Therefore those who work in the pig farms or those who live near the pig farms have a high risk of infection with the JE virus, if the virus amplification among the pig population is high and the vector *Culex* mosquito density near the pig farms is high. Usually pigs are asymptomatic to JE virus infection but female pregnant pigs may present with fever and abortion.

A team of virologists, entomologists and epidemiologists was sent to investigate a report of cases of abortion in a pig farm in Nyi-Naung-Wa village, Bogalay township. This study was done to investigate the possibility of a JE outbreak by determination of JE antibodies in pigs, determination of the JE antibodies among the people living near the pig farms and identification of the mosquito spepcies present in that village as a possible vector for JE transmission.

## Materials and Methods

### Study area

This study was undertaken at Nyi-Naung-Wa and Kyaung-Su villages which are situated about 1.5 miles west of Bogalay township of Ayarwaddy division. It is an area with ponds and rice fields scattered throughout. Buffaloes, cattle, pigs, chickens and ducks are raised there and penned close to the houses. About 70% of the houses breed pigs. Although the styles of the houses vary, almost none are screened against mosquitoes.

### Study population

A prospective serological survey of the people living near the pig farms in Nyi-Naung-Wa and Kyaung-Su villages were studied to asscess human Japaneses encephalitis virus infection. Eight pigs from a suspectted pig farm were bled twice, ten days apart. A total of 36 pigs from Nyi-Naung-Wa and Kyaung-Su villages were bled.

### Virological studies

Japanese encephalitis virus hemagglutinating antigen and dengue virus haemagglutiat-

ing antigen were prepared by sucrose acetone extraction of infected suckling mouse brain (Shope and Sather, 1979). Sera were tested for haemagglutination inhibition antibody against Japanese encephalitis virus and dengue virus according to the method of Clarke and Casals (1958) using micromethods (Sever, 1962).

**Entomological studies**

Mosquitoes were collected outdoors near the pig farms using cattle bait in both villages. Mosquitoes collected were identified for the presence of *Culex* species which is the vector for JE infection.

**Results**

A total of 36 pigs, 28 pigs from Nyi-Naung-Wa and 8 pigs from Kyaung-Su, was tested for the presence of JE and dengue antibodies. The results are shown in Table (1). Although JE virus and dengue virus antibodies were found in 32 pigs (88.89%) of total 36 pigs, 25 out of 28 (89.28%) from Nyi-Naung-Wa and 7 out of 8 (87.5%) from Kyaung-Su. Out of 36 samples, homotypic and monotypic JE antibodies were found in 12 samples (33% of the pigs). Eight pigs from Nyi-Naung-Wa (28.57%) and 4 pigs from Kyaung-Su (50%) had monotypic or homotypic JE antibodies. When the acute sera (S1) and convalescentt sera (S2) results were compared for the eight pigs which had abortion, there were no four fold rise in antibody titre between the two samples.

**Table (1).** JE virus antibodies detected in pigs from the two villages.

| | Number | Homotypic | Monotypic | H&M | % |
|---|---|---|---|---|---|
| NNW | 28 | 2 | 6 | 8 | 28.57% |
| KS | 8 | 1 | 3 | 4 | 50% |
| TOTAL | 36 | 3 | 9 | 12 | 33% |

NNW: Nyi-Naung-Wa village
KS: Kyaung-Su village

A total of 139 blood samples, 56 samples from Nyi-Naung-Wa and 83 samples from Kyaung-Su village were tested for JE virus and dengue virus antibodies by Haemagglutination-Inhibition method. No homotypic or monotypic JE virus antibodies were dettected among the samples. Only monotypic or homotypic dengue virus antibodies were found in 26 samples (46.4%) from Nyi-Naung-Wa and 31 samples (37.4%) from Kyaung-Su villages, Table (2).

**Table (2).** Homotypic and monotypic dengue antibodies detected among the inhalitants of the two villages.

| | Number | Homotypic | Monotypic | H&M | % |
|---|---|---|---|---|---|
| NNW | 56 | 8 | 18 | 26 | 46.4% |
| KS | 83 | 14 | 17 | 31 | 37.4% |
| TOTAL | 139 | 22 | 35 | 57 | 41% |

NNW: Nyi-Naung-Wa village

KS: Kyaung-Su village

Mosquito collections using cattle bait were done in both Nyi-Naung-Wa and Kyaung-Su villages. The mosquitoes collected are shown in table (3). *Culex* species mosquitoes were collected from both villages.

**Table (3).** Mosquitoes collected from 2 villages in Bogalay Township.

| Species | Nyi-Naung-Wa and Kyaung-Su villages |
|---|---|
| *Cx. vishnui* | 225 |
| *Cx. tritaeniorhynchus* | 45 |
| *Cx. quinquefasciatus* | 5 |
| *Cx. gelidus* | 25 |
| *Cx. fusocephala* | 25 |

## Discussion

Although JE virus antibody was detected in all eight suspected pigs, as there was no four fold rise in the convalescent sera when compared to the acute sera, there was no evidence of recent JE infection in these pigs. The haemagglutination inhibition antibodies against dengue detected in the seroconverted pigs (which was markedly lower than that detected for JE virus) is not surprising since broadly reactive serological patterns identical with those observed in these native domestic mammals have been reported after laboratory infection with JE virus of pigs, dogs, buffaloes, and cattle (Johnson et al, 1974). The reliance place upon the haemagglutination-inhibition test (to identify JE virus infection in the pigs) in this study seems justified since results of a study in Dawbon township (Soe Thein et al, 1988) showed agreement between the tissue culture neutralization and the haemagglutination-inhibition tests when antibodies to JE virus were measured in the pigs.

In this study, monotypic (only JE antibodies detected) and homotypic (both JE and a cross reaction to dengue antibodies detected with JE antibody titre having a four fold or greater rise) JE virus antibodies were detected in 33% of the pigs. Although we could not detect any recent JE virus infection among the pigs, it is obvious that JE virus infection existed among the pig population in these two villages.

*Culex* species mosquitoes had been collected from both villages. Therefore, the vector for the transmission of JE virus infection is present in both villages.

There were no homotypic nor monotypic JE virus antibodies among the human population. Only monotypic and homotypic dengue antibodies wre detected. Therefore, although there was evidence of dengue infection among the villagers of both villages, there was no evidence of JE infection in the same population.

A prospective serologic study was undertaken in a Yangon community (Dawbon) in 1982. JE virus infection was detected in 52.1% of the pigs, although concurrent human Japanese encephalitis was not detected.

In conclusion, although there was no evidence of human JE virus infection among these villages at the moment, if the ecological conditions for JE virus transmission become more favorable (i.e., increase in the density of mosquitoes as well as in the density of amplifying hosts, i.e., the pigs), it is possible that human JE virus infection may occur in these villages.

## ACKNOWLEDGEMENT

The authors would like to thank Dr. U Khin Soe, Township Medical Officer, Bogalay Township for his kind arrangements and assistance to hhelp make this study possible.

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