

ENTOMOLOGICAL EVALUATIONS OF HUMAN MALARIA TRANSMISSION
IN A VILLAGE-RICE FIELD SCENARIO ON THE
KORAT PLATEAU OF THAILAND

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OBJECTIVES :

1. To obtain epidemiological and vector information regarding human malaria transmission.
2. To confirm the presence of known primary, secondary and/or suspected *Anopheles* vectors of human malaria parasites.
3. To identify the vector(s) of malaria parasites by dissection.
4. To determine the human malaria prevalence and ratio of endemic: migrant infections.
5. To confirm the presence or absence of *An. philippinensis* and/or *nivipes*, and determine their role in the transmission of human malaria parasites.
6. Determine the parity rates, nocturnal biting cycle and host propensity of the vector(s), particularly that for *philippinensis* and/or *nivipes*.
7. Determine the natural larval habitats of potential vector(s), particularly *philippinensis* and/or *nivipes*.

BACKGROUND : The study site is a village-rice field area on the Korat plateau, Thailand. Records from the Thailand Malaria Division, Region 1, indicate that a low level *Plasmodium falciparum* and *P. vivax* endemicity exists in the study site in the absence of the primary vectors, *Anopheles dirus*, *An. maculatus* and *An. minimus*. These records also indicate that a relatively large number of *Anopheles philippinensis*, a known vector of human malaria parasites in parts of India (1), have been collected in the study area. The Malaria Division considers *An. philippinensis*, a suspected vector (2, 3, 4) in Thailand, to be

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the most likely vector candidate in the study area. However, *An. philippinensis* has yet to be confirmed by dissection as a vector in Thailand.

To further complicate matters, *An. philippinensis* appears to be a sibling species complex of at least 2 species, *nivipes* and *philippinensis*, and possibly more (5). At present, *nivipes* is differentiated morphologically from *philippinensis* primarily by pupal characters. Furthermore, *An. nivipes* is not presently recognized as a distinct species by the Thai Malaria Division and is not recorded from Thailand. However, AFRIMS collections currently suggest that *philippinensis* is primarily confined to the southern peninsular area and coastal areas in central Thailand, while *nivipes* is present in the central rice plains, the north, the northeast, as well as along the coastal areas of central Thailand. Therefore, previous records of *philippinensis* from the Korat Plateau probably refer to *nivipes*. *Anopheles nivipes*, in contrast to *philippinensis*, has never been incriminated in the transmission of human malaria parasites.

Both *nivipes* and *philippinensis* are known to feed primarily on bovines, but will bite humans. Significant numbers of suspected *nivipes*, rather than *philippinensis*, have been attracted to human bait during preliminary collections in the study area. This anthropophilic behavior by *nivipes* suggests a possible link with the low malaria endemicity in the area. The study area apparently has only a few swine and bovines.

This project has been designed to study the vector(s) and human malaria transmission in an area lacking the usual primary vectors of malaria parasites. The determination of the secondary vector(s) and their behavior and biology, in the village-rice field habitat of Thailand will significantly aid the Thailand Malaria Division in their program for the control and reduction of malaria in Thailand.

METHODS : The study area is located at Ban Thepnimit, Mu 10, Tambol Khok Chaliang, Amphur Khon Buri, Changwat Nakhon Ratchasima, approximately 250 kilometers northeast of Bangkok on the Korat Plateau. The area consists of low rolling hills, about 20 kilometers north of a mountain range. Vegetation is primarily scattered dry deciduous scrub forest and cultivated areas, primarily rice and tapioca.

The malaria Division records for the study site will be reviewed to determine the malaria species prevalence rate, the anopheline species previously collected, relative abundance and human biting propensity and peak biting times, and the larval habitat.

The malaria prevalence rate will be determined by taking thick and thin blood smears from all persons within the study site. Children below the age of 6 months will not be included. The slides will be stained and the thick smear examined for malaria parasites. If malarial parasites are found in the thick smear, then the thin smear will be examined and the parasitemia level determined.

Human biting collections will be done to establish a record of anophelines present during the survey. All anopheline mosquitoes will be identified and depending on parity status, dissected for parasites.

Larval collections will be conducted to determine the range and abundance of larval habitats in the area and the type of habitats where larval species are found.

RESULTS : This project was terminated early in the FY due to insufficient funds and personnel. Before termination, however, several aspects of the study were completed with the following results. (A) A blood smear survey (6) was conducted for malaria parasites in 519 people in the study village. This survey revealed one boy positive for *P. vivax*. This boy was a resident of the village and also had been found positive for malaria during the previous year. (B) Mosquito collections prior to and during the project revealed that *Anopheles nivipes* was very common in the area, while *An. philippinensis* was not collected. These data suggest that the previous Thailand Malaria Division records of numerous *An. philippinensis* from this area are based on misidentified *An. nivipes*. Several other species that are similar to *An. nivipes* and *An. philippinensis* also were common in these collection: *An. annularis*, *An. jamesii* and *An. splendidus*. (C) A colony of *An. nivipes* was established from specimens collected in the study area. The methods and techniques used for colonizing this species are described elsewhere (7). *Anopheles nivipes* was an avid human biters in human bait collections in the village and in the laboratory, but is very reluctant to feed on hamsters. (D) Several other *Anopheles* species, which may be involved in transmitting human malaria parasites were collected in small numbers in the study area, they are : *Anopheles aconitus*, *An. campestris* and *An. minimus*. In summary, these data indicate or suggest that :

(a) Human malaria parasites are present in the village, but the question of endemic transmission remains conjectural.

(b) *Anopheles philippinensis* is not present in this area.

(c) Several species, including *An. aconitus*, *An. annularis*, *An. campestris*, *An. minimus* and *An. nivipes*, should be suspected as possible vectors of human malaria parasites in the Ban Thepnimit, Mu 10, area.

(d) *Anopheles nivipes* does exhibit a propensity for feeding on humans

Project terminated.

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