Project Title: Study of the Dengue Fever Control in Taiwan Area. I. Distribution of Aedes aegypti in Taiwan, II. Insecticide Susceptibility of Dengue Vectors in Pingtung County
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Abstract:

The first part of this project include the surveillance of dengue vectors, ovitrap collection, and source reduction in southern Taiwan. In addition to Kaoshung, Pingtung and Tainan counties, none *Aedes aegypti* (AE) vector was found in the areas around 30km of tropic cancer at west southern of Taiwan. Meanwhile AE can only be found in 3 Li of Taitung city and 3 Li in MaKo city of Pescadores. Low *Aedes albopictus* (AA) and AE larvae density in year round surveillance in Fungshan and Pingtung cities showed the efforts of community-base source reduction in executing the integrated control of vector mosquitoes.

The tests of pesticide resistance of dengue vectors showed that (1) both AE and AA collected from Kaoshung, Pingtung and Taitung county showed the reducing susceptibility of 0.10% Propoxur, (2) 100% AE adults collected from all surveyed areas died after contact with 1% Fenitrothion in 24 hr, (3) only 0~26% mortality was found for AE from Pingtung, Fungshan, Zuoying, and Taitung county after treating with 0.5% Etofenprox, (4) 97~100% mortality of AA and <35% mortality of AE showing 0.75% Permethrin can no longer be used, (5) high (95%~100% mortality) susceptibility of AA and AE form center and northern Pingtung to 0.05% Deltamethrin, (6) <65% mortality of AE from Tunkung, Fungshan, Zuoying and Taitung after treatment with 0.15% Cyfluthrin, and (7) 0.05% Deltamethrin can cause 91~100% mortality of AA, but high variation in the susceptibility of AE.

The study was conducted from March 2007. The surveyed areas included three districts of Kaoshuing city where the recent outbreak had occurred in these districts, and four districts of Kaoshuing city where were neighbored with three outbreak districts. Five hundred households from each district were sampled randomly 5 boroughs that selected randomly 100 households. Population density of dengue vectors were determined by house index, container index and Breteau index per month. In addition to, thirty households from each district were sampled randomly 3 boroughs that selected randomly 10 households. Population density of dengue

vectors were determined by ovitrap index per tree months. From March to October 2007, house indices were 2.1% to 10.3% , container indices were 2.2% to 10.7% , and Breteau indices were 2.6 to 16.2. The indoor ovitrap indices were 11.4% to 26.7% and the indoor ovitrap indices were 20.0% to 38.6%. They were lower than those of the same period in the last year (53.3% and 83.3%). Base on the finding, they have revealed the effectiveness of surveillance and cleanliness the sources of dengue vectors.

We conducted evaluation of the feasibility of the personal use of insecticidal aerosol cans as the measure to reduce the dengue vectors in the three years. The results were found that residential usages were 50% to 59.5% in insecticidal aerosol cans groups. In addition to, aerosol cans group I (Bioallerthrin 、Phenothrin 、Cyphenothrin): knockdown time (KT_{50}) of *Bora Bora* (control group, *Aedes aegypti*) , *Aedes albopictus and Aedes aegypti* were 0.98 ± 0.56 , 1.10±0.58 and 3.07±1.47 minutes, respectively. Aerosol cans group II (Permethrin 3.75% w/w) : knockdown time (KT_{50}) of *Bora Bora* (control group, *Aedes aegypti*) , *Aedes albopictus and Aedes aegypti* were 1.60±0.62 、1.49±1.02 、3.04±1.35 minutes, respectively. Aerosol cans group III (Cypermethrin 1.716 w/w) : knockdown time (KT_{50}) of *Bora Bora* (control group, *Aedes aegypti*) , *Aedes albopictus and Aedes aegypti* were 2.02±1.33、1.45±1.03、2.94±1.55 minutes, respectively. There were no significant differences among three groups by Kruskal-wallis one-way analysis of variance by Rank，statistically ($p>0.05$). The mortality (twenty four hours) of *Bora Bora, Aedes albopictus and Aedes aegypti* all were 100% among three groups.

Global warming makes the effects of climate on occurrence of dengue become more and more important. Epidemics of dengue have frequently occurred in Taiwan since 1987 after the imported of cases before 2002. The epidemic of dengue /dengue hemorrhagic fever (DHF) in Kaohsiung in 2002 was the largest resulting in 5,388 confirmed cases. This study tended to analyze the possible correlations among climate factors, mosquito larval indices and the occurrence of confirmed dengue cases in KH Area. The warm winter in Dec. 2001 till Feb. 2002 might be related to the persistence of dengue cases occurring and resulted in the over-wintering of dengue virus in Kaohsiung Area. Furthermore, temperatures in spring and summer of 2002 were significantly higher than the average from 1980 to 2006, while the rainfalls in summer and autumn were significantly lower. The rainfall in 2002 first peaked in May, which

was followed by the peak of means of mosquito larval indices and also the increases of dengue cases in June. The decrease of rainfall subsequently initiated increases of dengue cases. Similarly trends were also identified in Singapore and Thailand in 2002. The 2002 epidemic of dengue/DHF firstly detected from May, and case number increased dramatically from mid-June, and finally reached to the peak (1,299 dengue fever plus 77 DHF cases) in September. The correlation of larval indices between climate/dengue cases was not significant. Future efforts will investigate more important social factors and try to establish a climate-based prediction model of dengue incidence rate in Taiwan.

Keyword: *Aedes albopictus* , *Aedes aegypti*, .insecticide, insecticide resistance, index.