

USE OF GIS TO ASSESS RELATIVE RISK IN DIFFERENT BIOTOPES WITHIN ENDEMIC SCRUB TYPHUS AREAS IN NORTHERN AND CENTRAL THAILAND

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GIS has been used extensively to analyze remotely-sensed data and to predict distributions of plant and animal species. In our study in northern Thailand, rodent-hosts and chigger vectors were collected from residential, rice field, forest edge, and forest habitats in areas highly endemic for scrub typhus. Vegetation distribution within each habitat was characterized. In each habitat we established rodent trap lines. Captured rodent specimens were identified to species and blood and tissue samples collected. All ectoparasites were removed from trapped rodents and chigger specimens will be collected for identification and for *Orientia* assay. Data was entered into a GIS which were used to define spatial relationships between rodent, vegetation, chigger and *Orientia* species.

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AN *IN VITRO* METHOD FOR EVALUATION OF REPELLENTS AGAINST *LEPTOTROMBIDIUM* (ACARI: TROMBICULIDAE) CHIGGERS, VECTOR OF SCRUB TYPHUS

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Leptotrombidium chiggers are the vectors of *Orientia tsutsugamushi*, the agent that causes scrub typhus, a disease occurs throughout much of Asia and the Pacific region. Currently, there is no standard system for evaluating the efficacy of repellents against chiggers. Therefore, the main objective of this study is to establish a quantifiable method of evaluating the *In Vitro* efficacy of candidate repellents against chiggers. Three sets of *in vitro* experiments (“repellent zone, repellent band and toothpick/Q-tip”) were designed to evaluate 4 different repellents (i.e., DEET (n,n-diethyl-3-toluamide), DEPA (n,n-diethyl phenyl acetamide), AI3-28724-A (n,n-diethyl-3-bromo benzamide), and AI3-26929 (n,n-diethyl-3-methyl phenyl acetamide)) against *L. imphalum* chiggers. In the “repellent zone” experiment, a series of concentric circles (ranging from 0.5-4.5 cm in diameter) were drawn on Whatman No.1 filter paper. The innermost circle (0.5 cm in diameter) was designated as the repellent-treated zone. 5µl of a given repellent was applied to this zone. A single chigger was released onto the repellent-treated zone and the distance that the chigger moved was recorded. Results indicated that there was no significant difference in movement of the chiggers in the repellent treated-zone when compared with the controls. This model system was therefore ineffective for evaluating candidate repellents. In the “repellent band” experiment, plastic vials with a charcoal substrate were used to hold experimental chiggers. A narrow band (0.5 cm in width) of filter paper was treated with varying concentrations of a given repellent and placed in a plastic vial (just above the charcoal substrate). The movement

and numbers of times that each chigger walked and/or crossed over the repellent treated area in a given time were the criteria used to evaluate repellent efficacy. The third experiment is known as the “toothpick/Q-tip (Cotton-bud) experiment”. Either toothpick and/or Q-tip (cotton bud) were soaked up with tested-repellent dilutions and later were placed in the middle of charcoal-substrate in the chigger-rearing plastic vial. The repellent zone was also designated on the side plastic vial. An un-infected *Leptotrombidium* chigger was released into the vials. Reactions and behaviors of chiggers approaching the tip of toothpick or the cotton bud as well as the repellent zone on the vial were observed and recorded. Our results revealed that the ranked efficacy of the different repellents using this system was: DEET = AI3-28724-A > AI3-26929 > DEPA.

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PATHOPHYSIOLOGICAL CHANGES IN A MURINE MODEL OF BETA-THALASSEMIA/HEMOGLOBIN E

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A novel C57BL/6 transgenic murine model of the Hb E thalassemia ($\beta^{m+}/\beta^{m+}; \beta^{hE}$), which showed a normal phenotype, was previously generated. To develop the anemic model mimicking the patients, Hb E transgenic mice were bred with β -knockout mice (β^{m+}/β^{m0}) to produce double heterozygous ($\beta^{m+}/\beta^{m0}; \beta^{hE}$) and β -thal/Hb E rescued mice ($\beta^{m0}/\beta^{m0}; \beta^{hE}$). Previous hematologic study showed that rescued mice developed variable degrees of anemia similar to β -thalassemia in human. In this study, we further define hematologic properties and clinicopathologic changes in these mice. Although double heterozygote was on the β -knockout background, its phenotype was definitely normal as resulted from Hb E transgene function. Rescued mice expressed variable thalassemic phenotype due to they copy numbers of β^{hE} transgene. The slightly increased oxidative stress of the red blood cells (RBCs) was observed as well as the percentage of RBC microvesicles. RBC survival study demonstrated that mean half-time ($T_{1/2}$) and life span of rescued RBCs were definitely decreased to the same level as β -knockout mice. At necropsy, splenomegaly and hepatomegaly were present in rescued mice but not in double heterozygotes. Histologic examination of spleen and liver of rescued mice revealed iron accumulation and variable degrees of increased extramedullary hemopoiesis. These results indicated that β -thal/Hb E rescued mice that have β^E -transgene under homozygous β -knockout background developed pathophysiologic changes similar to human β -thalassemia disease. Study of this murine model will further elucidate the pathogenesis of β -thalassemia and enable us to test new therapeutic regimes, such as γ -globin-stimulating agents, antioxidants, iron chelators and gene therapy. This study was supported in part by Thailand Government Research Fund 2004 to P.W. and Thailand Research Fund to S.F. as a Senior Research Scholar.

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