Feeding response of *Aedes aegypti* and *Anopheles dirus* (Diptera: Culicidae) using out-of-date human blood in a membrane feeding apparatus

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ABSTRACT: The colonization of *Aedes aegypti* and *Anopheles dirus* was performed using out-of-date human blood from a blood bank as a nutritional supply dispensed from a common artificial feeder. Preserved human blood was collected and used for feeding on days 5, 15, and 25 after date of expiration and dispensed from a common artificial feeder to rear the mosquitoes. *Ae. aegypti* had a feeding rate of 78.7, 62, and 18% at the respective intervals while *An. dirus* had a rate of 80, 56.8, and 7.3% on the same respective days. Direct feeding on live hamsters resulted in a rate of 96 and 90% for *Ae. aegypti* and *An. dirus*, respectively. Although egg production rates decreased from the day 5 feeding to the day 25 feeding, all of the developmental stages resulting from *An. dirus* fed at day 5 and 15 showed insignificant differences when compared with direct feeding on the blood of a hamster. ***Journal of Vector Ecology* 35 (1): 149-155. 2010.**

Keyword Index: *Aedes aegypti*, *Anopheles dirus*, colonization, out-of-date blood, artificial feeding, Thailand.

INTRODUCTION

The laboratory colonization of *Aedes aegypti* and *Anopheles dirus*, the main human vectors for dengue and malaria in Thailand, respectively, is of major importance for purposes of research, control, and experimentation. For most mosquito species, blood-feeding is essential for the production of viable eggs and blood-feeding on laboratory animals has some definite advantages. It has been reported that females of *Aedes* and *Anopheles* mosquitoes maintained on blood from live animals laid a higher number of eggs during their lifetimes and had greater longevity than those fed only sugar (Day et al. 1994, Straif and Beier 1996).

Various species of live animals, including mice, rats, gerbils, guinea pigs, hamsters, rabbits, chickens, non-human primates, and humans, have been used successfully to blood-feed mosquitoes (Nayar and Sauerman 1977, Klein et al. 1986, Canyon et al. 1999, Harrington et al. 2001, Braks et al. 2006, Xu et al. 2006, Xue et al. 2008). However, the use of live animals has many drawbacks, including pain and distress caused by blood feeding and additional/unsustainable expense for the maintenance of animals in the laboratory (Kasap et al. 2003). Moreover, there are evidences of accidental disease transmission and hypersensitivity to mosquito bites (Bailey et al. 1978). Evidently, it is somewhat effective, in terms of cost, safety and welfare of animals, to employ an artificial membrane feeding technique.

An artificial membrane feeding technique has been utilized for at least 40 years. The technique has been proven to be not only an effective method for delivering a blood meal to mosquitoes but has also been used to determine infection and transmission thresholds of viruses, *Plasmodium* spp., and filarial worms in the mosquitoes (Collins et al. 1964, Rutledge et al. 1964, Ponnudurai et al. 1971, Sattabongkot et al. 2003, Pothikasikorn et al. 2007). Various kinds of membrane have been applied in this technique, for instance, the skin of bat's wings, latex condoms, and paraffin films (Bailey et al. 1978, Wirtz and Rutledge 1980, Hagen and Grunewald 1990, Novak et al. 1991, Kasap et al. 2003, Rampersad and Ammons 2007). As for the blood meal, blood from various hosts, such as avian blood, rodent blood, mammalian blood, and stored human blood from blood banks have been used (Bunner et al. 1989, Nasirian and Ladonni 2006).

An effective storage system for human blood has been sought for the past 90 years (Hess 2006). At the present time, the common RBC storage solutions (anticoagulants) work well for blood banks, allowing three to seven weeks storage. There are many blood storage solutions or anticoagulant formulae in use from the blood banks of Thailand, for instance, acid citrate dextrose (ACD), citrate phosphate dextrose (CPD), (citrate phosphate dextrose plus adenine (CPDA-1), and citrate phosphate dextrose with additive solution (CPD-AS). However, the storage solution ACD is the one commonly used in many blood banks in hospitals throughout Thailand. This solution provides for 21 days of effective preservation of RBC. After day 21, RBC will lose some components and hemolysis may commence