MOSQUITO PROBING AS A MEASURE OF HOST ATTRACTIVENESS

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INTRODUCTION. In a previous study (Khan *et al.*, 1965), utilizing a new bioassay humans were screened for degrees of attractiveness to mosquitoes. This consisted of recording the time when 50 percent of mosquitoes probed simultaneously on the bottom of a small cage held over the human forearm. We called this measurement probing time-50 (PT-50). A limit of 3 minutes was arbitrarily selected for recording each PT-50. If 50 percent of the mosquitoes exposed did not probe in 3 minutes the PT-50 was recorded as 180+ seconds.

This technique permitted us to screen humans for attraction to mosquitoes quickly. However, it did not give a wider spectrum of probing behavior in relation to host attractiveness. For this we devised another techinque.

METHODS AND MATERIALS. A cage (5 x 5 x 1.5 cm.) made of plexiglass frame and covered with 20 mesh nylon net with a hole on the top, was used to introduce the mos-

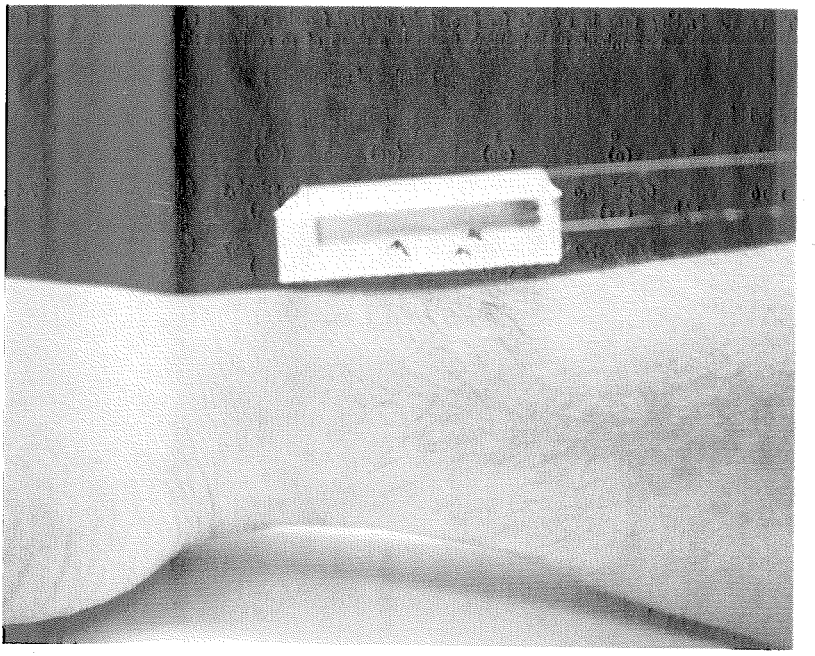

FIG. 1.—Cage used for quantitating probing. The cage with mosquitoes is positioned 1 cm. over the forearm of a subject.

quitoes (Fig. 1). Three of the 4 sides of the frame were scored to remove their smoothness. This allowed mosquitoes to alight on them. Mosquitoes could be viewed through the transparent side. Five *Aedes aegypti* (L.) females were placed in the cage through the hole which was then covered with a piece of nylon net. The cage was positioned 1 cm. over the subject's forearm. The mosquitoes were 8–10 days old, fed previously on sugar solution only. From the instant of first exposure the numbers of mosquitoes probing were continuously recorded against time with a stop watch. Experiments with the same mosquitoes were continued for a 30-minute period and the data divided into three successive 10-minute counts. Each 10-minute observation may be called a trial. In this way we obtained time in seconds when none, or one to all 5 mosquitoes were probing toward the forearm during the experiment. Ten 30-minute experiments were carried out on the same subject on different days with different mosquitoes to test the technique.

RESULTS AND DISCUSSION. Table 1 gives the average time during which the various numbers of mosquitoes probed during the successive three 10-minute periods. The period when all five mosquitoes probed simultaneously is the smallest (3–7 percent of the total time). The next lowest figures are for the time when no probing took place (11–17 percent of the time) or when four out of five probed simultaneously (13–15 percent of the time). Most of the time either one, two, or three mosquitoes probed toward the forearm. Compared with the respective means, the smallest standard error of the mean was obtained when two out of five mosquitoes probed. The mean error for the period when three out of five mosquitoes probed simultaneously was also low. The largest mean error, however, was found when none,

TABLE 1.—Probing time in seconds for five *Aedes aegypti* females exposed to a human forearm for a 30-minute period. Each figure is a mean of 10 replicates ± S. E.

Period of observation in minutes		Number of mosquitoes probing					
	% [a]	0 (0)	1 (20)	2 (40)	3 (60)	4 (80)	5 (100)
1–10	% [b]	69.5±20.0 (11)	141.0±28.0 (24)	140.0±17.0 (23)	140.5±28.3 (23)	88.5±21.6 (15)	20.5±7.4 (4)
11–20	%	85.0±37.0 (14)	139.5±31.3 (23)	144.0±23.7 (24)	123.0±26.7 (21)	89.5±28.4 (15)	19.0±8.7 (3)
21–30	%	101.5±45.9 (17)	93.5±23.0 (16)	137.5±20.2 (23)	145.5±28.0 (24)	77.5±16.1 (13)	44.5±13.5 (7)

Figures in parentheses are (a): percent mosquitoes probing; and (b): percent time mosquitoes probed.

or four, or all five mosquitoes probed simultaneously. In other words, while measuring probing as a criterion for attraction, the least amount of variation would be when time is recorded for half the mosquitoes probing simultaneously. This further confirms statistically the soundness of using PT-50 as a measure of attraction for screening humans (Khan *et al.*, 1965).

No significant difference is found among the probing periods for each number of mosquitoes in the three successive 10-minute trials (Table 1). This permits us to use the same mosquitoes for 30 minutes and also to use each 10-minute trial as a replicate.

The extent of probing measured both in time and number of mosquitoes can be used as a measure of attraction of the subject. If a significantly lower percentage of mosquitoes probe, or if probing occurs for significantly shorter periods of time compared to control, the subject can be classified as unattractive. This technique has been successfully used in evaluating attraction to mosquitoes of an anhidrotic individual we came across during our screening of humans (Maibach *et al.*, 1966).

SUMMARY. Five *Aedes aegypti* females were placed in a small cage and probing activity was quantitated by recording continuously for 30 minutes the number of mosquitoes probing over a human forearm. The experiment was replicated several times and the data divided into three successive 10-minute counts. Mostly one, two, or three mosquitoes probed toward the forearm. The periods when none or all five probed were shortest. The mean errors were large when none or four to five mosquitoes probed and small when one to three mosquitoes probed simultaneously. When the successive 10-minute data were compared no significant difference was found, suggesting that the same mosquitoes can be used for 30 minutes to evaluate host attraction and each 10-minute data can be used as a replicate. The extent of probing measured both in time and in number can be used as a measure of host-attractiveness.

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