

MORTALITY OF UNFED *ANOPHELES GAMBIAE* AND *ANOPHELES FUNESTUS* CAPTURED IN EXIT TRAPS

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For the past several years, promising compounds for the control of mosquitoes have been examined in the World Health Organization Scheme for the Evaluation and Testing of New Insecticides. An important technique for assessment is to place exit traps in treated and control huts. Data on mortality of trapped mosquitoes, coupled with other entomological information, are used to decide whether an insecticide offers promise in malaria eradication programs. The criterion for satisfactory control is 80 percent corrected mortality of all female vectors which enter treated huts (WHO, 1964).

In many field trials which utilize the exit trap technique, little importance is often given to possible differences in mortality in respect to abdominal stage. From the standpoint of malaria transmission, it is, of course, desirable to obtain mortality of all female vectors. However, more precise information on the insecticidal treatment may be obtained if the mortality of each stage is known.

The purpose of the present study was to determine whether the unfed anopheline vectors, captured in exit traps in untreated huts, exhibited the same mortalities as the fed and gravid stages.

METHODS. Exit traps were placed every 8 to 10 days in 15 untreated huts in Lema

and Sabon-Gida villages, located 8 miles west of Kaduna in the Guinea Savannah belt of Northern Nigeria. Observations were carried out from August to November, 1965, when densities of the two main vectors of the area, *Anopheles gambiae* Giles and *Anopheles funestus* Giles were high. Service (1963) has described the villages and environmental conditions typical of the area.

The well-known cubical-shaped exit traps, with an inward projecting funnel of netting, were sewn to a heavy cloth which covered the one small entrance of the huts. The huts were of mud, had thatch roofs, and ranged in size from 50 to 70 square meters. An average of two people occupied each hut.

The traps were placed in the evening, and the following morning all mosquitoes were transferred to paper cups, given glucose on cotton pads, and held for 24-hour percent mortality counts. Afterwards, the live mosquitoes were killed and separated according to species, sex and abdominal stage. Similar separations were made on mosquitoes which died in the traps or paper cups. It should be emphasized that "unfed mosquitoes" refers to those anophelines which did not show evidence of a blood meal but were offered glucose in the laboratory.

RESULTS AND DISCUSSION. The 24-hour percent mortality of *A. gambiae* and *A. funestus* captured in the traps is shown in Table 1. High mortality occurred with males and unfed females of both species. The fed and gravid females exhibited low mortality, and the results for those stages are combined. Higher mortality occurred with males and all female stages of *A. funestus* than with corresponding stages of *A. gambiae*.

The results also show that the overall mortality of female *A. funestus*, irrespective of abdominal stage, was 22.1 percent. In contrast, the mortality of only fed and

TABLE 1.—The 24-hour percent mortality of *A. funestus* and *A. gambiae* captured in exit traps.

Males	Unfed Females	Fed-Gravid Females
	<i>A. funestus</i>	
84.5 (936)	73.9 (924)	12.7 (5,157)
	<i>A. gambiae</i>	
68.7 (279)	44.2 (495)	7.2 (1,548)

In parenthesis: Number of insects captured.

gravid stages was 12.7 percent. With *A. gambiae* the overall mortality was 16.3 percent, in contrast to 7.2 percent for the fed and gravid females. The unfed mosquitoes represented 15.2 percent of the female catch for *A. funestus*, and 24.2 percent for *A. gambiae*. The effect of unfed mortality on overall mortality would have been greater had the unfed mosquitoes represented larger proportions of the female population.

It is of interest to note that, out of 17 observations, no mortality occurred with unfed *A. gambiae* (110 ♀) and unfed *A. funestus* (105 ♀) on two occasions. The unfeds were not dissected or crushed, and it is possible that a small quantity of undetected blood was in the gut of some surviving mosquitoes. Survival also could be related to age and, in this connection, recently emerged adults, 1-2 days old,

may have higher survival rates than older unfed mosquitoes.

Results of experiments carried out in Lagos, Southern Nigeria indicated that low mortality occurred with young unfed mosquitoes. It was found that fed and gravid stages of *A. gambiae* (725 ♀), captured in exit traps, had consistent low control mortalities after the 24-hour holding period in the laboratory. With the unfed stages (97 ♀) of unknown age, 51 percent died. However, a mortality of 8 percent occurred with 1-2-day-old unfed *A. gambiae* (235 ♀), obtained by placing wild caught pupae inside exit traps and returning the emerged adults to the laboratory. In laboratory resistance studies, reliable results were obtained with 1-day-old unfed anophelines of both sexes (Davidson 1958, 1959).

CONCLUSIONS. The data herein reported indicate that, when exit traps are used for the assessment of insecticides, high mortality may occur with those anophelines which do not show evidence of a recent blood meal. Such mortality may not be due to the lethal action of the insecticide. In order to obtain more precise information on an insecticidal treatment, it is suggested that the unfed anophelines be separated from other female stages.

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