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Transmission of *Trypanosoma congolense* by chemosterilized male *Glossina morsitans*

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Transmission of *Trypanosoma congolense* by chemosterilized male *Glossina morsitans*

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The release of relatively large numbers of sterile male *Glossina* during control programmes could result in a temporary increase in the transmission of trypanosomes, owing to the immediate upsurge in the density of the vector. Theoretically, this increased risk would be transient because the sterile males would finally break the cycle by eliminating the natural population of *Glossina*. Because of the possibility of even a temporary increase in transmission, however, it is important to know whether chemosterilization alters the ability of tsetse males to harbour and transmit trypanosomes.

Little is known about the capacity of sterile dipterous males as vectors, though chemosterilization inhibited the transmission of *Plasmodium* by females of *Aedes aegypti* (L.) (Altman, 1963; Bertram *et al.*, 1964). The present paper reports the results of investigations of the effect of the chemosterilant tepa on the ability of *G. morsitans orientalis* Vanderplank to harbour and transmit *Trypanosoma congolense* Broden.

MATERIALS AND METHODS

Adult male *G. morsitans* were collected as pupae in the field and allowed to emerge in the laboratory at 78° ± 3° F. and 70 ± 5 per cent. relative humidity. One third of the males emerging daily were allocated to one of three test groups: (*i*) flies sterilized on day 0 (before their first blood-meal); (*ii*) flies sterilized on day 21; and (*iii*) control flies that were not sterilized. The tests were started during the four days that the 625 males emerged. Two to six replicates of 33–35 flies were maintained in 8-inch × 8-inch × 11-inch cages by the use of techniques described previously (Dame and Ford, 1966). The flies were sterilized by exposing them for 60 minutes to a 10 mgm. per sq. ft. residual deposit of tepa on glass; one group of flies, however, received two such exposures. Control flies were exposed to glass surfaces treated only with the solvent (methanol).

All flies were fed daily for 21 days on guinea pigs artificially infected by intra-peritoneal injection of a wild strain of *T. congolense* in heparinized whole mammalian blood. The period was sufficient to allow cyclical development of the parasite in the fly. Daily blood smears of the host animals were made before feeding to verify the presence of parasites. After the 21 days, the infected hosts were discarded, and thereafter each cage of flies was fed on an uninfected guinea pig; again daily blood smears of the host animals were made (except on Sundays) to detect transmission of the parasite by the flies. During this period, the dead flies were collected once or twice daily and dissected to determine the presence of trypanosomes in the gut or mouthparts. After the host developed an observable level of parasitaemia, however, no further dissections were made because recently ingested para-

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sites could not be differentiated, on wet smear preparations, from those which had developed cyclically. Each replicate series of flies was fed daily on an uninfected host for 48 days, until parasites were detected in the host, or until no flies survived; host animals that did not develop parasitaemia were checked regularly for three months more and then recorded as uninfected.

RESULTS AND DISCUSSION

The studies were designed to test the ability of male *G. morsitans* to transmit *T. congolense* when the flies were sterilized (*i*) before they encountered the parasite, and (*ii*) after they encountered the parasite. The results (Table I) show that three out of six hosts were

TABLE I

Showing the infection with and transmission of *T. congolense* by male *G. morsitans* sterilized before (day 0) and after (day 21) engorging infected blood

Sterilization treatment		No. of cages	No. of flies dissected	Percentage of flies with infected			Positive transmission
Day of exposure	No. of exposures			Gut	Labrum	Hypo-pharynx	No. of cages
21	2	2	42	14·3	2·4	2·4	0
21	1	4	97	15·5	4·1	4·1	1
0	1	6	90	25·6	7·8	5·6	3
—	0	6	73	31·5	8·2	4·1	6*

*One guinea pig died of unrelated causes after 8 days and was replaced by a second host that subsequently developed parasitaemia.

infected by flies that were sterilized before their first blood-meal. One out of four hosts was infected by flies that fed on infected hosts for 21 days before they were sterilized once, but neither of the hosts fed on by flies sterilized twice became infected. All six cages of controls produced infected hosts.

TABLE II

Showing the survival of male *G. morsitans* sterilized before (day 0) or after (day 21) feeding on guinea pigs infected with *T. congolense*

Sterilization treatment		Mean number of flies per cage after indicated number of days				
Day of exposure	No. of exposures	0	21	28	35	42
21	2	35	21	8	4	2
21	1	35	24	20	13	10
0	1	35	21	16	14	12
—	0	35	23	20	17	16

The incidence of cyclical infection (Table I) in the labrum and hypopharynx of flies treated before infection was similar to that of the controls (13·4 and 12·3 per cent., respectively); flies treated after exposure to the parasite had a lower rate of cyclical infection (4·8–8·2 per cent.). Survival of the flies was similar in all groups for the first 21 days (Table II). Thereafter, the flies treated twice had a higher rate of mortality which decreased

the opportunity for transmission. Flies treated only once had a survival rate similar to that of the controls throughout the test period; thus, in these groups, the reduction in transmission can be attributed to sterilization.

SUMMARY

Chemosterilized males were effective vectors of trypanosomes, though the rate of transmission was reduced by sterilization. Treatment of flies after infection appeared to reduce the amount of cyclical development and the rate of transmission more than treatment of flies before infection.

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