

Research Note

Reduction in the Ingestion of *Onchocerca volvulus* Microfilariae  
by *Simulium ochraceum* after DEC Provocation

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Microfilarial intake by blackflies from patients infected with *Onchocerca volvulus* practically correlates to the skin microfilarial densities (Duke, 1962), although many other factors affect the intake (De Leon and Duke, 1966; Shelley *et al.* 1979; Tanaka *et al.*, 1980). When a therapeutic dose of diethylcarbamazine (DEC), which leads to a subsequent rapid reduction of microfilarial density, was given to a patient, microfilarial intake by blackflies decreased to zero immediately after the final dose of a course of DEC (Duke, 1968). Cupp *et al.* (1986) reported a high degree of correlation between reductions in microfilarial skin density and those in parasite intake by flies at 3 and 6 months after treatment with DEC or ivermectin.

A relatively low reduction of microfilarial

skin densities immediately after a single administration of a subtherapeutic dose of DEC was observed by Fazen *et al.* (1976) and Tada *et al.* (1981). Under such conditions, microfilariae are expected to be affected by DEC, although many remain in the skin tissue. In this study, we examined whether or not the microfilariae could be ingested by *S. ochraceum* from skin after a single oral administration of 100 mg DEC.

The experiment was conducted in Guatemala during August, 1986. A 35-year-old male (volunteer A) from Finca El Brote Chicacao who had never been treated with DEC was fed by wild *S. ochraceum* on the back before and after the oral administration of 100 mg DEC. In recording the biting sites, the back of the volunteer was divided into upper and lower parts by the line connecting the inferior angles of bilateral scapulae. Immediately after full feeding, flies were captured one by one with plastic tubes and dissected, and the number of microfilariae ingested was counted under a dissecting microscope. The microfilarial densities in the skin of the volunteer were measured on the left scapular (upper back) and left iliac (lower back) regions by the method reported by Tada *et al.* (1985).

The change in the number of microfilariae ingested by flies and the microfilarial density in the skin of the volunteer are shown in Table 1. Four hours after the administration of DEC, the microfilarial density remained at about one

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Table 1 Ingestion of *O. volvulus* microfilariae by *S. ochraceum* from the back of volunteer A\* before and after the administration of DEC.

Time (hr) after DEC administration	Upper back		Lower back	
	No. of mf† at scapular region by skin snipping	No. of mf taken per fly	No. of mf at iliac region by skin snipping	No. of mf taken per fly
Pre-treatment	299	163.5 ± 29.0 (n=2)‡	157	57.0 ± 39.4 (n=3)
2-3	NE §	0.8 ± 1.5 (n=4)	NE	0.5 ± 0.7 (n=2)
4-5	144	0.3 ± 0.5 (n=7)	NE	1.0 ± 1.7 (n=3)

\*100 mg of DEC was administered orally at 07.30 a.m. on the examination day.

†mf; Microfilariae. The microfilarial density at the scapular region 7 hours after the DEC administration was 67.

‡n; Number of blackflies examined.

§NE; Not examined.

half the pretreatment level at the scapular region. However, the number of microfilariae ingested by flies decreased drastically.

In order to study the ingestion of microfilariae within 100 minutes after treatment, a second experiment was carried out using a 30-year-old male (volunteer B). This time, the flies were collected at intervals of 6–13 minutes for the first 61 minutes and then at 91 and 100 minutes after the administration of DEC. As shown in Table 2, a sudden reduction in the number of ingested microfilariae was observed.

These results indicate that *Simulium ochraceum* ingested very few microfilariae of *O. volvulus* from infected persons immediately after a subtherapeutic dose of DEC.

Microfilariae of *O. volvulus* are thought to be passively ingested with blood by blackflies after emerging from connective tissues of the skin into blood pools at bite wounds. In our subjects, therefore, it is likely that not many microfilariae moved to the biting sites even though the microfilarial density in the skin was still relatively high.

Zea *et al.* (1980) reported that microfilarial densities in six skin snips from a given minute area showed a great variation. In our study, a high microfilarial density after treatment was observed only in a single skin snip from volunteer A. Therefore, we can not completely exclude the possibility that microfilarial densities

Table 2 A time study of microfilarial intake by *S. ochraceum* from the back of volunteer B\*

Time (min) after DEC administration	No. of microfilariae ingested by a blackfly†
Pre-treatment	185‡
11	4
21	4
27	61
37	16
50	9
61	4
91	5
100	3

\*100 mg of DEC was administered orally at 11.20 a.m. on the examination day. The microfilarial densities were 185 at the scapular and 160 at the iliac region, respectively.

†All flies were collected at the lower back.

‡No. of larvae found by the dissection of a fly 3 days after the feeding.

at the feeding sites rapidly fell either due to destruction (Gibson *et al.*, 1976) or to a migration to other sites (Anderson *et al.*, 1975), and that the rapid reduction in the number of ingested microfilariae simply reflected a decrease of the density in the skin. However, the destruction and migration of microfilariae do not seem to occur very early after a small dose of DEC (Mimori *et al.*, 1984; Mimori, 1985).

In conclusion, this study disclosed a marked

and rapid reduction of microfilarial intake by vector *Simulium* under the influence of DEC.

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