gave excellent control through the 72 hr test, but became ineffective after 1 week. Although decamethrin was applied at a lower dosage than the other insecticides, it was the most active of the pyrethroids tested.

Against permanent water breeding mosquito species, long residual efficacy is usually desired. However, compounds that exhibit quick, short term effectiveness may sometimes be desired especially against floodwater species. These preliminary data suggest that rapid control can be acquired with permethrin and decamethrin. Additional research is certainly warranted on all the compounds.

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ERADICATION OF THE BLACK FLY, *SIMULIUM NEAVEI*, FROM KENYA

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Prior to 1938 onchocerciasis and its vector, *Simulium neavei*, were unknown in Kenya, although Dry (1921) noticed that a small black fly was observed to bite people in the region of rivers and streams in the Kericho district, western Kenya, and stated that the local population attributed skin disease to the effects of the bite of the fly.

Onchocerca volvulus was identified later in a nodule by Dr. Geoffrey Timms (pathologist of the Medical Research Laboratory, Nairobi) and the presence of onchocerciasis in western Kenya was confirmed by Hawking (1939). Another focus of the disease was discovered in Kodera, South Nyanza, and McMahon (1940) carried out a comprehensive survey in a place where infection was so heavy that it was known as the "Valley of the Blind." A prolonged survey established the precise incidence of the disease and the distribution of the adult vector (*S. neavei*), but failed to discover its breeding place, which was suspected to be in rivers. The exact site remained a mystery. One river, the Riana south of Kisii, was dammed and its course diverted in order to expose the river bed and the base of waterfalls, but although larvae and pupae of other species were found, *S. neavei* was not included.

The war years (1939–1945) interrupted intensive investigations, although Dr. J. J. C. Buckley made restricted observations during this period. In an experiment carried out in 1943 he removed the riverine forest along the Yaba and Riana rivers in a minor, southern extension of the Kodera focus. This achieved complete eradication of *S. neavei* as no flies have been captured since that time (Buckley 1951).

Later, in 1946, intensive entomological investigations were resumed in Nyanza Province. It was thought at first that the essential first step was to find where *S. neavei* breeds, but an accidental occurrence made us anxious to start work immediately. In 1946, during the course of the first antimalarial campaign with DDT on a large scale in rural Africa, the emulsion had to be carried on donkeys across rivers and streams. On one occasion a donkey stumbled and the emulsion spilt into the river. We seized the opportunity to discover if the well-known breeding places of other *Simulium* species were eliminated and found that they had been completely destroyed. Accordingly, a small pilot scheme was instituted in the Kodera district, which entailed dosing the rivers Sanda and Kitare in the Valley of the Blind with DDT at the rate of 2.5 p.p.m.[2] for periods of 30 min. for a total of 13 applications, between January and June, 1946. The last adult fly was captured on 23 March, and none has been caught since. Eradication was thus achieved in this focus.

This result made it certain that *S. neavei* bred in rivers, and with this knowledge we decided to treat one of the larger foci. The Kakamega/Kaimosi area in North Nyanza was chosen. The first attempt was made in 1947 when all shaded rivers and streams in an area of 1500 sq. miles were treated with 11 applications of DDT at the rate of 1–2.5 p.p.m./30 min. However, *S. neavei* reappeared within a

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[2] River discharges were accurately measured with the use of Cipolletti weirs, and the concentration of DDT was precisely determined as a result.

few months and the scheme was temporarily abandoned. This was before the phoretic association between *S. neavei* and crabs had been discovered, and at that time it was impossible to determine the full extent of the breeding sites.

The discovery in 1950 (van Someren & McMahon) that the earlier stages of *S. neavei* bred attached to the crab, *Potamonautes niloticus*, enabled us to resurvey the Kakamega/Kaimosi area, this time paying particular attention to the breeding places in the rivers, and not, as in the first survey, in relation to the distribution of the adult fly.

The importance of preliminary surveys cannot be overstressed and, therefore, great care was taken to ensure that all possible foci were examined. The second survey lasted for nearly 3 years and was extended to an area of 2000 sq. miles. Many thousands of miles were covered by car and on foot and arrangements for the dosing programme were postponed until it was certain that reinfestation could not take place from any other source.

In 1954, with the new knowledge regarding the more extensive distribution of breeding, the total Kakamega/Kaimosi focus was treated, including rivers outside the forest zone. Seven treatments of DDT at 0.5–2.0 p.p.m. for 30 min. were applied at 10 daily intervals and met with almost complete success. A small stretch of the Yala river was found to be still infested with *S. neavei* in December, 1955, and retreatment of this river during 1956 resulted in the complete disappearance of *S. neavei* from the district. No flies have been captured since that year (McMahon 1957).

The other large focus, Kisii/Kericho area, was surveyed in 1951 and 1952 (after the discovery of the crab/*S. neavei* association) and was treated between October, 1952 and January, 1953 when 10 applications of DDT at 0.5–1.0 p.p.m. for 30 min. were applied at 10 daily intervals. Eradication was achieved. The last adult *S. neavei* was captured in this district in October, 1952 and none since.

Onchocerciasis was endemic in all 4 foci (Buckley 1949) and is probably still present in the older age-groups in some areas. No new cases have, however, been reported in children born since the eradication of the vector. In Kodera in 1946, 37% of children aged 4–8 years and 7% in the 3–4 year age group showed positive skin biopsies (Garnham & McMahon 1947). During subsequent surveys carried out in 1950 and 1953, infections in the 4–8 age groups had dropped to 5.8 and 5.0 respectively, and no infections were found in children aged 3–4 years (Garnham & McMahon 1954). Later, in 1957, eleven years after the vector had been eradicated from Kodera, no infections were found in children below the age of 15 (Nelson & Grounds 1958).

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