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Epidemiology of *Mansonella perstans* filariasis in the forest region of South Congo

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A study of *Mansonella perstans* filariasis conducted in the Chaillu mountains, Southern Congo, showed that 108 of 134 Pygmies (80·6%) and 79 of 302 Bantus (26·2%) presented with microfilaraemia. The mean microfilarial densities were also significantly higher in the Pygmies (1213 ml^{-1} of blood) than in the Bantus (136 ml^{-1}). Ninety eight per cent of the *Culicoides* taken which had bitten man in the daytime were *C. grahamii*, and 0·8% of these were infected with filarial larvae. Two other species of *Culicoides* (*C. kumbaensis* and *C. rutshuruensis*) might also play a role in the transmission of *M. perstans*.

Mansonella perstans is an endemic human filaria in forest regions of Africa and in intertropical America and the Caribbean Islands (Hawking, 1977, 1979). In some of these regions, particularly in Central Africa, the whole exposed adult population is infected (Kershaw *et al.*, 1953; Dujardin *et al.*, 1982). The pathogenicity of *Mansonella* infection is questioned here. Some authors, however, attribute various clinical manifestations such as headache, arthralgia, fever, oedema, pruritus and asthenia to it (Holmes *et al.*, 1969). Hyperoesinophilia is often marked (Wiseman, 1967) and could be responsible for a clinical syndrome (Gelfand and Bernberg, 1959). The vectorial role of *Culicoides austeni* in intertropical Africa (Hopkins and Nicholas, 1952) has been reconsidered (Cornet *et al.*, 1974), and a review of probable vectors has recently been published (Linley *et al.*, 1983). *Loa loa* and *M. perstans* filariases are endemic in the Congo, reaching high prevalences in the Chaillu mountains (Noireau *et al.*, 1989). In the present work, conducted in this region in April 1987 and January 1988, the epidemiology of *M. perstans* was studied with particular references to the vectorial species involved in its transmission.

MATERIALS AND METHODS

The village of Missama (03°37'S; 13°20'E) comprises a population of 470 inhabitants belonging to the Pygmy and Bantu groups. It is situated in the forest (Chaillu mountains, between 500 and 900 m altitude), in the region of the Lekoumou. In the immediate vicinity of the village the forest has been cleared for banana, coffee and cocoa plantations.

Three hundred and two Bantus and 134 Pygmies (92·8% of the whole population) had a capillary blood sample taken to detect *M. perstans* microfilariae (mf). Two 20 µl thick blood films were prepared from each subject. After Giemsa staining, the mf were counted and the number was recorded per ml of blood. The microfilarial densities (m.d.) were expressed as the

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geometric mean. In order to detect dermal mf, 118 skin snips were taken from adults selected at random (41 Pygmies, 77 Bantus). Double skin biopsies were taken from the iliac crests and placed in 50 µl of normal saline, and four hours later a drop of formaldehyde was added. Specimens were transported to the laboratory, where emerged mf were identified.

A survey of anthropophilic *Culicoides* was carried out in April 1987 (diurnal and nocturnal species) and January 1988 (diurnal species), for a total of 11 capture days. The *Culicoides* were collected with a mouth aspirator, preserved in 70% alcohol, and then mounted for taxonomic studies (Cornet, 1974). The diurnal species were caught in the morning between 07.00 and 09.00 hours and in the evening between 17.00 and 19.00 hours, and the nocturnal species were caught between 23.00 and 01.00 hours. Some 629 of the dominant species of *Culicoides* were anaesthetized with ether, then dissected in order to detect *Mansonella* larvae (Sharp, 1928). The lacerated fly tissue, fixed in human serum, was stained with acid haemalum.

RESULTS

The prevalences of *M. perstans* mf carriers, and the mean microfilarial densities, are shown in Table 1. The prevalence rate was 80·6% in the Pygmies and 26·2% in the Bantus. No difference was observed according to sex. In the Pygmies the maximum rate was reached early (age group 10–19 years), whereas it increased with age throughout life in the Bantus. The m.d. were 136 mf ml^{-1} in the Bantus and 1213 mf ml^{-1} in the Pygmies. In the Pygmies the densities increased regularly with age, and were twice as high in the women as in the men (1595 *v.* 685 mf ml^{-1} of blood). In the Bantus, however, the densities were slightly higher in men than in women (160 *v.* 110 mf ml^{-1} of blood).

TABLE 1

Distribution and microfilarial load of Mansonella perstans *by age and sex among Bantu and Pygmy inhabitants of Missama*

Age (years)	*Sex*	*Bantu*			*Pygmy*		
		No.	*mf+ (%)*	*m.d.**	*No.*	*mf+ (%)*	*m.d.**
1–9	M	45	3 (6·7)	70	7	4 (57·1)	105
	F	28	2 (7·1)	140	11	7 (63·6)	280
10–19	M	32	3 (9·4)	80	20	18 (90·0)	555
	F	24	6 (25·0)	75	10	8 (80·0)	1215
⩾20	M	54	24 (44·4)	210	33	27 (81·8)	1040
	F	119	41 (34·4)	115	53	44 (83·0)	2205
Total	M	131	30 (22·9)	160	60	49 (81·7)	685
	F	171	49 (28·6)	110	74	59 (79·7)	1595

*m.d. = Geometric mean microfilarial density 1 ml^{-1} of blood.

Only one of the 118 skin snips (0·8%) showed *Mansonella streptocerca* mf. No *Onchocerca volvulus* mf were detected.

The captures of diurnal anthropophilic *Culicoides* (Table 2) showed that *C. grahamii* was the species most aggressive to man. This species accounted for over 98% of the captures irrespective of the period. Some 0·8% of the dissected *C. grahamii* (five of 629) were carriers of indistinguishable filarial larvae of the *Mansonella* genus, including one third-stage larva. Only

TABLE 2
Biting densities of diurnal anthropophilic species of Culicoides

	April 1987			*January 1988*		
	No.	*%*	*F/MH*	*No.*	*%*	*F/MH*
C. grahamii	1470	98·0	367·5	211	98·6	70·3
C. kumbaensis	8	0·5	2·0	1	0·5	0·3
C. fulvithorax	23	1·5	5·7	2	0·9	0·4
Total	1501	100·0	375·2	214	100·0	71·3

F/MH: no. of flies caught per man-hour.

one species, *C. rutshuruensis* (group *milnei*), was found attacking man at night, and it occurred in low densities (nine flies per man-hour).

DISCUSSION

The clinical impact of microfilaraemia filariases is not insignificant in this region of South-West Congo (Noireau *et al.*, 1990). However, the respective role played by mansonellosis is difficult to assess because of the coexistence of loaiasis. Nevertheless, severe pathogenic effects have been reported with *M. perstans* in Zimbabwe, in areas in which mansonellosis occurs alone (Gelfand and Bernberg, 1959; Holmes *et al.*, 1969). This might be due to the particular virulence of the local strains which are morphologically distinguishable from West African strains (Duke, 1974). Unlike loaiasis, for which the percentage of mf carriers in the adult population never exceeds 35% (Fain, 1978), *M. perstans* microfilaraemia can be observed in a high percentage of the population (Kershaw *et al.*, 1953; Richard-Lenoble *et al.*, 1980; Dujardin *et al.*, 1982). In our study major differences between the Bantus and the Pygmies were observed. The exposure to the vector certainly plays an appreciable role, and might account for the earlier occurrence of microfilaraemia in the Pygmies. On the other hand, the differences in the trend of microfilarial load with age (significant increase in the Pygmies, unlike the Bantus) perhaps support the theory that microfilaraemia might be regulated genetically.

Four species of *Culicoides* which are preferentially or occasionally anthropophilic were identified in the study region. Of these species, only *C. fulvithorax* has never been reported to have played a role in the transmission of *M. perstans* (Linley *et al.*, 1983). *Culicoides grahamii*, *C. kumbaensis* (group *inornatipennis*) and to a lesser extent *C. rutshuruensis* (group *milnei*) are currently considered as vectors of *M. perstans* in Africa (Duke, 1965; Linley *et al.*, 1983). However, the respective role of these species as vectors cannot be assessed, given the lack of data on their annual cycles. Although there is a lack of knowledge regarding sources of blood meals for *C. grahamii* (man remains, nevertheless, the main host), the evidence of their infection with *Mansonella* larvae (including one infective stage) and their high densities in the study zone implies that this species plays a major role in the local transmission of *M. perstans*.

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