Short Report

Decreased prevalence and intensity of *Loa loa* infection in a community treated with ivermectin every three months for two years

S. Ranque, A. Garcia, M. Boussinesq, J. Gardon, J. Kamgno and J.-P. Chippaux *Antenne ORSTOM auprès du Centre Pasteur du Cameroun, Yaoundé, Cameroon*

Keywords: loiasis, *Loa loa*, prevalence, intensity, ivermectin

Loiasis is a filarial disease with a defined geographical distribution; its main vectors, *Chrysops silacea* and *C. dimidiata*, are confined to the great rainforest of Central Africa, from Zaire to Nigeria (HAWKING, 1977; FAIN, 1981). Within some endemic regions it is second only to malaria in contributing to the demand for medical consultation (PINDER, 1988).

Humans are the only reservoir for *Loa loa*. Simian *Loa* is a sympatric but divergent species which has a different host–vector–parasite complex (RHODAIN, 1980). At present, no efficient method exists for controlling *Chrysops* and the only way to control loiasis is to treat the endemic community. At community level, this strategy is justifiable by the low population density of *Chrysops* (*c.* 1000 flies per km^2) and its short flight range (usually <5 km) (BEESLEY & CREWE, 1963; CHIPPAUX *et al.*, in press). Both characteristics are conducive to a marked impact of community-based filaricidal treatment on the transmission of the parasite (NOIREAU, 1990).

Ivermectin mass treatment for onchocerciasis, initiated in West Africa, has been used in loiasis endemic areas in Cameroon since 1991. It brought about a marked decrease in microfilarial loads, and the drug was safer than diethylcarbamazine (CARME *et al.*, 1991; CHIPPAUX *et al.*, 1992; MARTIN-PRÉVEL *et al.*, 1993). Therefore, it seemed feasible to control both filariases with the same treatment. This study investigated the effect of repeated ivermectin treatments, over a period of 2 years, on the reservoir of *L. loa* in one village. The aim was to assess the feasibility of a large scale loiasis control programme.

The study took place in Ngat, a village in the tropical rain forest of southern Cameroon (3°23´N, 11°34´E), where loiasis is hyperendemic (30% microfilaraemia rate). The prevalence of *Onchocerca volvulus* was below 15%, and *Mansonella perstans* was the only other filarial parasite of importance (16% prevalence). In a previous longitudinal study carried out in Ngat during the year preceding the first ivermectin distribution, GARCIA *et al.* (1995) demonstrated the stability of the individual's *L. loa* microfilarial status. The population under study comprised about 700 inhabitants, of whom 450 were permanent residents, mostly field workers of the Ewondo tribe; 868 people were enrolled in the 2-year survey, including permanent residents, relatives living in nearby villages, and seasonal workers. The mean age was 28·6 years (range 0–87); the male:female ratio was 0·94. Of the 320 subjects who left the study, 12 (3·7%) died, 40 (12·5%) refused treatment, and 268 (30·9%) left the village. Most of the latter were students who left to attend school and young women who left to get married.

During the second year of treatment, 130 new inhabitants settled in the village. They therefore became part of the parasite reservoir and were included in the study.

Address for correspondence: Dr J.-P. Chippaux, CERMES, B.P. 10887, Niamey, Niger.

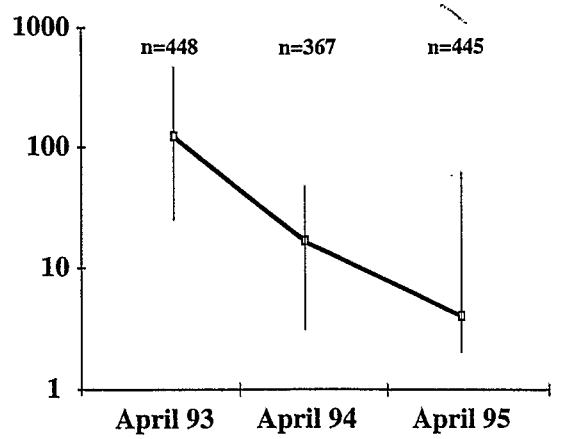

Fig. 1. Reduction of the median *Loa loa* microfilarial density in patients receiving ivermectin every 3 months; vertical lines indicate the 25th and 75th centiles.

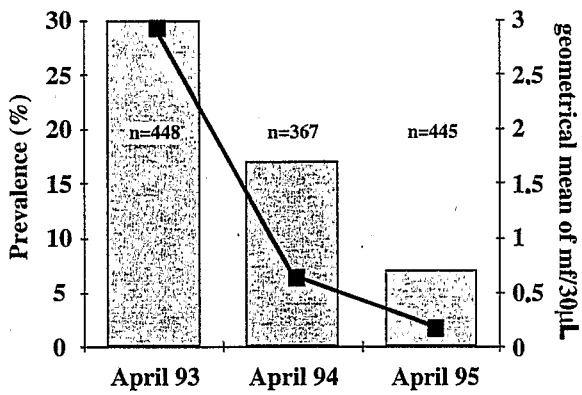

Fig. 2. Reduction of *Loa loa* prevalence (columns) and microfilarial density (line) in patients receiving ivermectin every 3 months.

This did not modify the initial population characteristics. The parasitological indices were, however, increased by the arrival of an untreated subpopulation with a microfilaraemia prevalence of 16% and a microfilarial density of 1·5 microfilariae/0·1 μL of blood. Health education activities were actively maintained during the study period, so that only 20 people (2·3%) did not receive any ivermectin treatment during the course of the study.

From April 1993 to April 1995, the population was treated every 3 months with 0·2 mg/kg of ivermectin. The drug was administered to all present available and compliant persons who agreed to be treated and for whom it was not contraindicated (CHIPPAUX *et al.*, 1992).

Before the start of microfilaricidal therapy, and after the first and second years of treatment, thick blood films, prepared with 30 μL of blood and stained with Giemsa's strain, were taken from the study population.

Side effects of the drug were monitored and treated by physicians 8 d after the first drug distribution and 5 d after subsequent ones. The major problem encountered was the occurrence of severe adverse reactions to the first treatment among people who had very high microfilaraemia (CHIPPAUX *et al.*, 1993).

Treatment coverage varied from 46% to 80% in the whole population, and from 74% to 94% among people with *L. loa* microfilaraemia; the 219 subjects with microfilaraemia were encouraged to participate in treatment in order to improve the impact on transmission. Other dwellings and important roads were about 10 km distant from the village, which diminished the possibility of interaction between the treated population and untreated infected persons and of the introduction of infected *Chrysops* from outside the study area.

The effect of treatment on the human parasite reservoir was dramatic. The reduction in the median microfilarial density was almost logarithmic (Fig. 1). After 2 years of treatment, the Williams's geometrical mean microfilarial density was reduced to 8% of its initial value (Fig. 2), and no microfilaria was seen in the thick blood films of 80% of people who had been microfilaraemic before treatment. The decrease in prevalence of microfilaraemia was particularly significant after the first year of treatment, suggesting a cumulative effect of ivermectin on the adults of *L. loa* and/or on the fecundity of the female worms.

A longer survey of the incidence of the disease, particularly in children less than 5 years old (who were not treated during this study due to ivermectin contraindication), and a study of the changes in the concomitant entomological transmission indices, would be helpful in estimating the effect on transmission of large-scale control of the reservoir *L. loa*.

In conclusion, whereas the impact of microfilaricidal treatment on the parasite reservoir has been demonstrated in one village in a hyperendemic area, the impact on transmission still remains to be assessed. Further studies are required to appraise the actual risk of severe adverse reactions. Mass treatment with ivermectin in loiasis endemic area should, in the interim, be carried out with caution (DUCORPS *et al.*, 1995).

References

Beesley, W. N. & Crewe, W. (1963). The bionomics of *Chrysops silacea* Austen, 1907. II.–The biting rhythm and dispersal in rain forest. *Annals of Tropical Medicine and Parasitology*, **57**, 191–203.

Carme, B., Ebiliki, B., Mbitsi, A. & Copin, N. (1991). Essai thérapeutique de l'ivermectine au cours de la loase à moyenne et forte microfilarémie. *Annales de la Société Belge de Médecine Tropicale*, **71**, 47–50.

Chippaux, J.-P., Ernould, J.-C., Gardon, J., Gardon-Wendel, N., Chandre, F. & Barberi, N. (1992). Ivermectin treatment of loiasis. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, **86**, 289.

Chippaux, J.-P., Garcia, A., Ranque, S., Schneider, D., Boussinesq, M., Cot, S., Le Hesran, J.-Y. & Cot, M. (1993). Adverse reactions following ivermectin treatment in hyperendemic loiasis area. *American Journal of Tropical Medicine and Hygiene*, **49**, supplement, 161.

Chippaux, J.-P., Bouchité, B., Demanou, M., Morlais, I. & Legoff, G. (in press). Study of the dispersal and the density of loiasis vectors *Chrysops dimidiata* in rain forest of Southern Cameroon. *Medical and Veterinary Entomology*.

Ducorps, M., Gardon-Wendel, N., Ranque, S., Ndong, W., Boussinesq, M., Gardon, J. Schneider, D. & Chippaux, J.-P. (1995). Effets secondaires du traitement de la loase hypermicrofilarémique par l'ivermectine. *Bulletin de la Société de Pathologie Exotique*, **88**, 105–112.

Fain, A. (1981). Epidémiologie et pathologie de la loase. *Annales de la Société Belge de Médecine Tropicale*, **61**, 277–285.

Garcia, A., Abel, L., Cot, M., Ranque, S., Richard, P., Boussinesq, M. & Chippaux, J.-P. (1995). Longitudinal survey of *Loa loa* filariasis in south Cameroon: long term durability and factors influencing individual microfilarial status. *American Journal of Tropical Medicine and Hygiene*, **52**, 370–375.

Hawking, F. (1977). The distribution of human filariasis throughout the world. Part III. Africa. *Tropical Diseases Bulletin*, **74**, 649–679.

Martin-Prével, Y., Cosnefroy, J.-Y., Ngari, P. & Pinder, M. (1993). Reduction of microfilaraemia with single high-dose of ivermectin in loiasis. *Lancet*, **342**, 442.

Noireau, F. (1990). Possibilités actuelles de lutte contre la filariose à *Loa loa*. *Annales de la Société Belge de Médecine Tropicale*, **70**, 167–172.

Pinder, M. (1988). *Loa loa*. A neglected filaria. *Parasitology Today*, **4**, 279–284.

Rhodain, F. (1980). Hypothèses concernant l'écologie dynamique des infections à *Loa*. *Bulletin de la Société de Pathologie Exotique*, **73**, 182–191.

Received 1 March 1996; accepted for publication 28 March 1996

Announcement

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Further information can be obtained from Charlotte DeFrances at the University of Alabama at Birmingham, Alabama, USA; phone +1 205 428 1700 or +1 800 633 4734.