

## Short Report: Epidemiologic Survey of *Mansonella ozzardi* in Corail, Haiti

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**Abstract.** An epidemiologic (cross-sectional study) survey on 462 inhabitants in Corail, Haiti showed that 16.5% were infected with *Mansonella ozzardi*. This finding was determined from a single 20- $\mu$ L sample of finger prick blood from each person. Among children, < 2% had a detectable microfilaremia. In persons > 15 years of age, the prevalence of infection for males and females was 23% and 21%, respectively. In general, the microfilaremias were low and 70% of positive persons had < 10 microfilariae per 20  $\mu$ L of blood; only 5% had > 50 microfilariae. This study shows that persons living near mangrove marshes that are breeding sites for *Culicoides furens* and *C. barbosai* biting midges, which are recognized vectors of *M. ozzardi* in Haiti, are consequently more frequently infected than those living in downtown area of Corail or inland.

*Mansonella ozzardi*, which is found strictly in the Western Hemisphere, is present in the subtropical, tropical, and temperate regions of Central and South America, and in the Caribbean. Adults live in the subcutaneous tissue, and juvenile stages require development in a dipteran host, namely biting midges of the genus *Culicoides* or black flies of the genus *Simulium*.

In Haiti, *M. ozzardi* is found in limited coastal foci.<sup>1</sup> Epidemiologic surveys conducted in the 1970s in Bayeux in northern Haiti reported that 16% of inhabitants had *M. ozzardi* microfilariae in peripheral blood.<sup>2</sup> In this area, *Culicoides furens* serves as an efficient intermediate host.<sup>3</sup> Experimental studies showed that the biting midge *Leptoconops bequaerti* is also capable of supporting the complete development of *M. ozzardi* but only on a very limited scale.<sup>4</sup> Studies in the southern peninsula of Haiti in the 1980s showed that another biting midge, *C. barbosai*, a species breeding exclusively in the mangrove marshes, may also support the development of *M. ozzardi* to the infective stage.<sup>5</sup> More than thirty years after these first studies on this neglected tropical disease, this report presents the results of an epidemiologic survey performed in Corail, Haiti.

The commune of Corail is located on the northern coastal area of the Grande Anse region between the communes of Roseaux, and Pestel (Figure 1). This commune, which has an area of 108 km<sup>2</sup>, consists of three municipal sections: Champy, Fond d'Icaque, and Duquillon. The main city in this district is also named Corail. The total estimated population in 2009 was 17,793 inhabitants. This population is engaged in fishing, agriculture, coffee and charcoal production, and production of small livestock. This area is mountainous and isolated because of poor access by roads. Corail is located near a bay colonized by mangrove marshes. An epidemiologic study was performed in June–July 2013 in Corail and its surroundings, Campêche (coastal marshes), and Fond d'Icaque (inland location, altitude = 164 meters above sea level) to characterize the endemic profile of *M. ozzardi* in these areas.

Blood films were collected as part of ongoing epidemiologic surveillance by the National Laboratory of Public

Health. After the objectives of the study were explained to the community in each location, a sample of volunteers for testing for *M. ozzardi* microfilaremia was selected on the basis of consent of each participant. A written informed consent was signed by each participant, and a parent or guardian had to provide consent for children. A thick blood smear (20  $\mu$ L of blood obtained by finger prick) was prepared for each patient, dehemoglobinized and stained with Giemsa.

A total of 462 inhabitants were included in the survey and 76 (16.5%) had microfilariae of *M. ozzardi* in peripheral blood (Table 1). The distribution of microfilaremia by sex and age of participants is shown in Figure 2. Microfilariae were rarely found in children < 15 years of age. Microfilaremia was higher in adults: 23% of men and 21% of women. In 70% of persons tested, the density of microfilariae was < 10 per 20  $\mu$ L of blood (Figure 3). Two men 42 and 85 years of age and one woman 70 years of age old had 79, 97, and 227 microfilariae/20  $\mu$ L of blood, respectively.

The epidemiologic characteristics of mansonellosis in this focus are similar to those observed 35 years ago in Bayeux in northern Haiti<sup>2</sup>: scarcity of infection in childhood, but a rapid increase in the rate of infection in persons > 20 years of age, which included 34% of the men and 41% of the women  $\geq$  50 years of age. The prevalence rate was similar in the two foci (16% and 16.5%, respectively, in Bayeux and Corail).

As previously observed in the area of Bayeux, the prevalence rate in the commune of Corail was significantly higher in the areas located near mangroves marshes, such as Vinfort (26%) and Fond Févry (25%), and near swampy areas, such as La Combe (27%) and Campêche (20%). In these areas, the average density of microfilaria in blood of infected inhabitants was high and reached 39.5 microfilariae/20  $\mu$ L of blood in Vinfort where houses are built on the edge of mangrove marshes. These biotopes are favorable for development of sand flies in Haiti.<sup>6,7</sup> Conversely, in downtown (Cité Balaou) and inland (Fond d'Icaque) areas, the prevalence was low (4% and 5%, respectively) and there were low numbers of microfilariae in infected persons (1 or 2 per  $\mu$ L of blood). These results confirm the close correlation between the human type of habitat, its proximity with the breeding sites of sand flies, and the rate of infection by *M. ozzardi* in Haiti. This correlation explains why foci of mansonellosis in Haiti are specifically located in coastal areas.

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MAP OF CORAIL AREA, HAITI

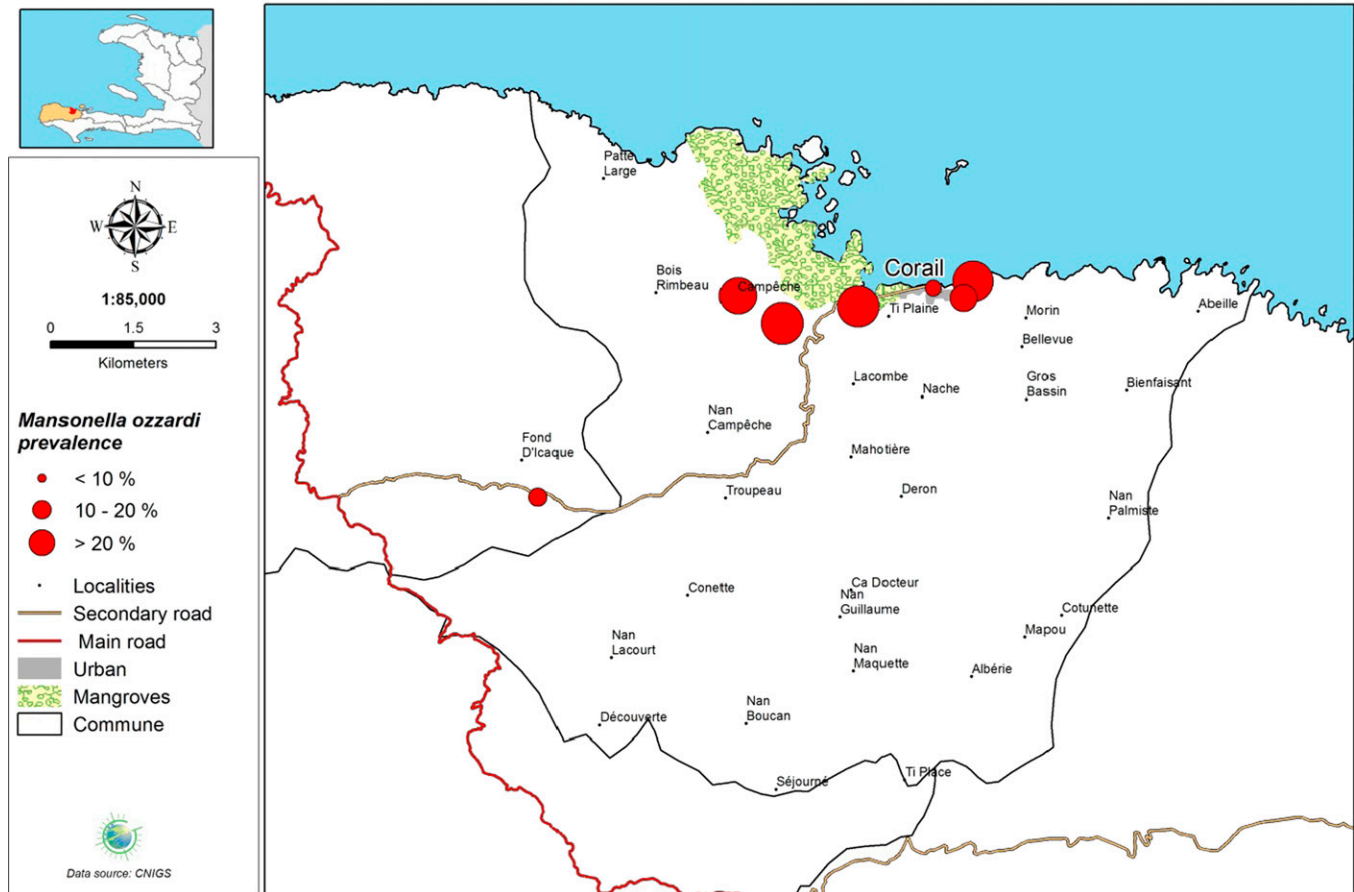


FIGURE 1. Surveyed localities in the commune of Corail, Grande Anse, Haiti, with prevalence rates for microfilariae of *Mansonella ozzardi*.

Although most infected patients are usually asymptomatic or have few signs and symptoms, such as fever, headache, cold legs, or joint pain, *M. ozzardi* microfilariae could be linked to ophthalmic pathologies. Lesions of cornea, such as nummular or punctuated keratitis, have been reported in populations in Brazil that have a high prevalence of microfilaremia.<sup>8-10</sup> A recent study conducted in Coari on the Solimões River in Brazil reported that the prevalence of *M. ozzardi* was 26.4%, and a positive correlation was found between microfilaremia and corneal lesions. In some patients with a positive blood smear, the presence of microfilariae were observed in the cornea by using confocal microscopic

examination of the eye.<sup>11</sup> Because our study reported a high prevalence in the region of Corail, we look will conduct further investigations on a potential positive correlation between microfilaremia and corneal lesions within this community.

In conclusion, in coastal areas of Haiti where persons live near mangrove marshes, a survey of *M. ozzardi* infection should be conducted, particularly for adults. This parasite

TABLE 1  
 Prevalence of *Mansonella ozzardi* microfilariae and density average in surveyed sites of the commune of Corail, Grande Anse, Haiti

Municipal town/section	No. persons	No. positive persons	Prevalence rate (%)	Average microfilaria/20 µL of blood
<b>Corail</b>				
Cité Balaou	50	2	4	2.5
Cité Bédard	56	6	11	9.2
Fond Févry	75	19	25	8.3
Vinfor	50	13	36	39.5
<b>Champy</b>				
Campeche	101	21	20	12.9
La Combe	41	11	27	15.5
Fond d'Icaque	89	4	5	1.5

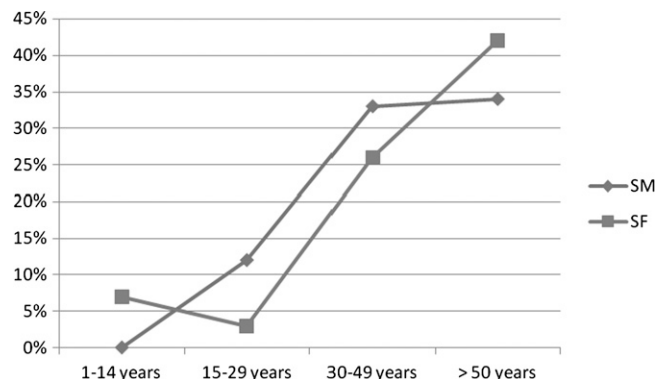


FIGURE 2. Distribution by sex and age of the holders of microfilariae *Mansonella ozzardi* in the population of the commune of Corail, Grande Anse, Haiti. SM = males; SF = females.

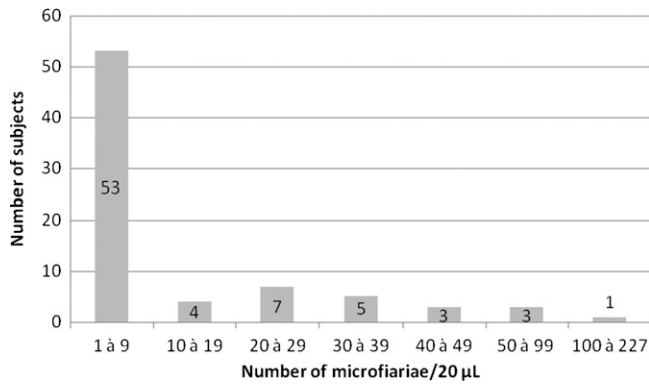


FIGURE 3. Density distribution of microfilariae of *Mansonella ozzardi* among 76 persons infected in the commune of Corail, Grande Anse, Haiti.

could be considered as a potential eye pathogen, and treatment of heavily infected patients with ivermectin is recommended.

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