

Mansonelliasis, a neglected parasitic disease in Haiti

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Reported in Haiti as early as 1923, Mansonella ozzardi is still a neglected disease ignored by the health authorities of the country. This review is an update on the geographic distribution of the coastal foci of mansonelliasis in Haiti, the epidemiological profile and prevalence rates of microfilariae in people living in endemic areas, the clinical impact of the parasite on health and the efficiency of the transmission of the parasite among three Culicoides biting-midge species identified as vectors in Haiti. Additionally, interest in establishing a treatment programme to combat this parasite using a single dose of ivermectin is emphasised.

Key words: mansonelliasis - *Mansonella ozzardi* - Haiti - neglected tropical disease

Mansonella ozzardi was first reported in Haiti by the Rockefeller mission in 1924 (Raccurt 1999) and remained unknown among medical authorities for 50 years. In 1974, a thick-smear study performed throughout the country by the National Service of Major Endemic Diseases (SNEM) showed the presence of microfilariae in peripheral blood, which were identified as *M. ozzardi* in most cases (Ripert et al. 1977). Following this rediscovery, epidemiological and entomological studies were conducted in Haiti (Raccurt et al. 1980, 2014, Lowrie Jr & Raccurt 1981, 1984, Lowrie Jr et al. 1983). To date, health authorities have paid no attention to this disease and, as a result, mansonelliasis can be considered as a neglected filariasis. This review reviews knowledge about *M. ozzardi* and its vectors in Haiti. The slight pathogenicity of this parasite is most likely related to the little interest in this filariasis among health authorities.

A mapping of foci of mansonelliasis in Haiti has been established using the geographic origin of *M. ozzardi* microfilaria carriers detected by the SNEM study (Ripert et al. 1977). The data showed that all of the foci are strictly located in the coastal areas. A large focus is located in the north, between Port-de-Paix and Cap Haïtien. Another large focus is located in the Miragoâne area, within the Nippes district. This focus includes the area stretching from Petit-Trou-de-Nippes to Roseaux in the Grande Anse district, including the Baradères peninsula and the Cayemites islands. In the south, a focus is located in the Saint-Louis-du-Sud area, near Les Cayes and on the island Ile à Vache. Limited foci are located in the western district, north of Port-au-Prince, in Leogane and around Gonâve Island.

In Haiti, *M. ozzardi* microfilariae have rarely been detected in infants. Among the 489 cases reported in 1974, only two paediatric cases were identified, affecting a six-month-old and an eight-month-old. In contrast, 91% of carriers were found to be adults more than 20 years old (Ripert et al. 1977). An epidemiological study, performed in collaboration with the Department of Tropical Medicine of Tulane University (Raccurt et al. 1980) and conducted on 1,165 inhabitants of Bayeux, in the north, from 1977-1979, showed a 16.1% prevalence of microfilariae in 20 µL of peripheral blood. Among those tested, only 1.4% of positive cases affected two-19-year-olds. In adults, males were infected twice as often as females were (48.8% vs. 23.5%, respectively) and prevalence increased with age. In 1983, a prevalence of 18.8% was reported among 80 inhabitants of Bon Dos, a small fishing village in the Nippes district (Raccurt 1984). An open study conducted in 2013 in Corail, located in Grande Anse district, showed a 16.5% prevalence among inhabitants and positivity was less than 2% in those under 15 years old (Raccurt et al. 2014). In contrast to the study in Bayeux, performed 35 years before, 23% of positive adults were male and 21% were female. The density of blood microfilariae was weak in Haiti. In Bayeux, 134/188 (71%) of positive individuals had one-nine *M. ozzardi* microfilariae in 20 µL of peripheral blood and in 27%, only one microfilaria was found. In Corail, 70% of the 76 carriers had less than 10 microfilariae per 20 µL and only 5% had 50 or more. Rare cases with high levels of microfilariae were observed in three males (109, 149 and 560 microfilariae per 20 µL).

M. ozzardi is considered to be a non or only slightly pathogenic filaria. An evaluation of morbidity among 150 inhabitants of Bayeux in 1984 confirmed that there was no major disorder due to the presence of this parasite (McNeeley et al. 1989). However, a high level of eosinophilia was strongly related to parasitic density. Few non-specific clinical signs were frequently reported by patients, such as pruritus, headache, joint pain and fever. Recently, in Brazil, among Indian and riverine communities living in mansonelliasis foci (Garrido & Campos 2000, Cohen et al. 2008, Vianna et al. 2012), *M.*

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ozzardi microfilariae were considered to be a cause of ocular lesions and particularly nummular keratitis. Consequently, a systematic examination for ocular lesions is appropriate among microfilaria carriers.

In Haiti, the main vector is *Culicoides furens*, which was identified at brackish or freshwater breeding sites during the studies in Bayeux, in the north, from 1977-1980. Within the vector, the microfilariae required nine days to reach the infective stage (Lowrie Jr & Raccurt 1981). The infestation rate of *C. furens* is correlated to the microfilaria density of the carrier from whom it is taking blood. In 1983, studies in Bon Dos, located in the Nippes district in the southern peninsula of Haiti, showed that the biting midge *Culicoides barbosai* was capable of supporting the development of *M. ozzardi* to the infective stage, with a capacity to transmit *M. ozzardi* as potent as that of *C. furens* (Lowrie Jr & Raccurt 1984). This species breeds exclusively in mangrove salt marshes (Raccurt 1984).

A third species of Ceratopogonidae, *Leptoconops bequaerti*, which breeds in sand on beaches, can ensure *M. ozzardi* maturation to third-stage larvae, but with a more limited efficiency than that of *C. furens* and *C. barbosai* (Lowrie Jr et al. 1983).

M. ozzardi persists in Haiti, as in several countries of South America, where it occurs in small foci with a high prevalence rate, especially infecting adults. In contrast to the Amazon Basin and northern Argentina, where Simuliid blackflies are the main vectors of *M. ozzardi* (Shelley & Shelley 1976, Shelley et al. 1980, Tidwell et al. 1980, Nathan et al. 1982, Tidwell & Tidwell 1982, Shelley & Coscarón 2001), only *Culicoides* are responsible for transmission in the Caribbean. In Haiti, six main coastal foci have been identified in the mangrove areas where fishermen live and *C. furens* and *C. barbosai* breed and in the swampy plains along the coast, where farmers live, which are favourable to *C. furens* proliferation. The high prevalence rates observed in Haiti are close to those reported in the Amazonian area (Lightner et al. 1980, Kozek et al. 1982, 1983, 1984, Formica & Botto 1990, Bartoloni et al. 1999, Gómez & Guerrero 2000, Medeiros et al. 2008, 2009, 2011, 2014, Martins et al. 2010, Basano et al. 2011, Adami et al. 2014) and in the northeast of Argentina (Taranto & Castelli 1988). The non-specific symptoms reported in most cases could not be easily related to *M. ozzardi*. However, since 2000, ocular lesions have been reported in Brazil (Garrido & Campos 2000, Cohen et al. 2008, Vianna et al. 2012), requiring management of these patients. Whereas usual antifilarial drugs are not effective for treating *M. ozzardi* infection, the use of ivermectin has proven to be very effective against microfilariae (Nutman et al. 1987). A decrease of 82.5% in microfilaria density was obtained in Trinidad four years after treatment with a single dose of 6 mg ivermectin among adult carriers (Gonzales et al. 1999). In Brazil, significant microfilaraemia reduction was observed and its residual effect was maintained for at least 12 months (Basano et al. 2014). However, certain early side effects, such as Mazzotti reactions, have been reported in Argentina (Krolewiecki et al. 2011). Considering the importance of the foci in Haiti and the high prevalence of infection in adults first and the possibility

of mansonelliasis dissemination to other non-endemic regions due to the large migration of Haitians second, ivermectin treatment could be recommended for carriers identified during a control programme for this neglected parasite. Special care should be taken for those with high parasitaemia to prevent and to cure early side effects, such as Mazzotti reactions, because the intensity and severity of the side effects seem to be correlated with the parasitic load before treatment. With the migration of Haitians to the Caribbean and South America, where vectors of *M. ozzardi* are present, filariasis expansion is of concern, particularly in the Amazonian countries.

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