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Mycobacterium lepromatosis Infections in Nuevo León, Mexico

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The frequency of infection caused by the recently described pathogen *Mycobacterium lepromatosis* is unknown. Here, we describe the demographics, clinical characteristics, and therapeutic outcomes of five lepromatous leprosy patients suffering from *M. lepromatosis* infection in Nuevo Léon, Mexico. Diagnosis was facilitated by a new highly specific PCR procedure.

Mycobacterium leprae causes Hansen's disease, or leprosy, a chronic infection transmitted from human to human by close contact and manifests clinically in several forms. Leprosy was recently declared to have been eliminated from most regions of the world (1). Since its original description by Armauer Hansen in 1873, the diagnosis of leprosy has relied on the detection of acid-fast bacilli (AFB) in clinical samples. In 2008, a new etiologic agent, *Mycobacterium lepromatosis*, was associated with leprosy in the United States (2). It was detected in autopsy specimens from two patients of Mexican ethnicity, using molecular biology techniques. On screening samples from patients attending our dermatology clinic who were diagnosed with Hansen's disease, we detected *M. lepromatosis* in a diffuse lepromatous leprosy (DLL) case (3) but found no evidence for *M. leprae* in the biopsy sample. Subsequently, cases of *M. lepromatosis* infection have been reported in Canada, Singapore, Brazil, and Myanmar (4, 5).

In Mexico, the largest study conducted was that of Han et al. (6), and this included 120 samples from patients with various clinical forms of leprosy; 63.2% of the cases harbored *M. lepromatosis* alone, and 16% were mixed infections in which both *M. leprae* and *M. lepromatosis* were present. In all these cases, the bacteria were identified using a PCR assay employing primers for the 16S rRNA gene. The genome sequence of *M. lepromatosis* was recently obtained (7), and loci present in *M. lepromatosis*, but absent from *M. leprae*, were identified, thus enabling a highly specific PCR procedure to be established.

In the present work, we screened biopsy specimens from patients currently receiving treatment at our clinic to determine the prevalence of *M. lepromatosis*, or of mixed infections, using a new specific PCR procedure. A diagnosis was initially made clinically and confirmed by the detection of AFB in Fite-Faraco-stained skin biopsy specimens. For molecular analysis, DNA was extracted from the biopsy specimen and used in PCR assays with primers designed to detect *M. leprae* (RLEP-7 and RLEP-8) or *M. lepromatosis* (LPM244-F [5′-GTTCCTCCACCGACAAACAC-3′] and LPM244-R [5′-TTCGTGAGGTACCGGTGAAA-3′]) (7). The pair for *M. lepromatosis* amplifies a 244-bp fragment from the *hemN* gene missing in *M. leprae* (7).

A total of 38 patients were analyzed; among them, we observed 5 cases positive for *M. lepromatosis* (Table 1), constituting 13% of the total cases. Four were from Nuevo León and one from the neighboring state of San Luis Potosi, and none were related. Four presented with lepromatous leprosy, of whom three were diagnosed with DLL and one with nodular lepromatous leprosy (NLL); none of them presented any immunological reaction, such as erythema nodosum leprosum or Lucio's phenomenon. Clinically, they were identical to patients infected with *M. leprae* (Fig. 1).

All patients were treated with the WHO regimen for multiba-

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TABLE 1 Demographic and clinical features of patients with *M. lepromatosis* infection

Patient	Age (yr)	Gender[a]	Origin[b]	Classification[c]	Duration of infection	Treatment (mo)	Sequelae	Dietary risk factors
1	49	M	Monterrey, NL	DLL	18 yr	50	Peripheral neuropathy	None declared
2	46	F	Juárez, NL	BL	9 yr	25	None	None declared
3	65	F	Charcas, SLP	DLL	25 yr	24	None	Rat meat consumption
4	70	M	San Nicolás, NL	DLL	14 yr	24	None	None declared
5	69	M	Los Herrera, NL	NLL	6 mo	2	None to date; on therapy	Armadillo and rat meat consumption

[a] M, male; F, female.
[b] NL, Nuevo León State; SLP, San Luis Potosí State.
[c] DLL, diffuse lepromatous leprosy; BL, borderline leprosy; NLL, nodular lepromatous leprosy.

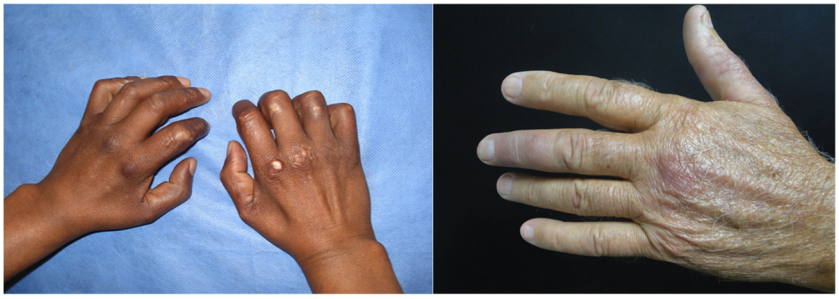

FIG 1 Patients with infection by *M. lepromatosis*. Left, smooth, thick, and shiny skin in the hands of a patient with diffuse lepromatous leprosy (DLL). Right, skin nodules (lepromas) in the left hand of a patient with nodular lepromatous leprosy (NLL).

cillary leprosy, namely, 600 mg of rifampin, 300 mg of clofazimine, and 100 mg of dapsone once a month, and 50 mg of clofazimine and 100 mg of dapsone daily. The only variation was in the number of months used to treat the patients. Remission of the symptoms was observed in all cases, except in patient 5, who had only just begun therapy.

Since the first description of *M. lepromatosis*, there has been little information regarding its prevalence, clinical presentation, or therapeutic response of the patients. In 2010, Han et al. (6) identified the etiologic agent in 87 confirmed leprosy cases: 55 (63%) harbored *M. lepromatosis*, 14 were mixed infections, and 18 were *M. leprae* (6). In our study, we found a much lower frequency (13%) of *M. lepromatosis* infection and no mixed infections with *M. leprae*. There are different possible reasons for this discrepancy. These include the PCR procedures and the storage of specimens. Another possibility is the geographical origin, as in the earlier study, no samples from Nuevo León were analyzed, and most *M. lepromatosis* or mixed infection cases were observed in the West Coast states of Mexico (6).

Organisms similar to *M. leprae* and *M. lepromatosis* have been described very recently in diseased squirrels and bovines (8, 9), which raises the possibility of carriers in nature other than the well-known armadillo. In Mexico, where most of the *M. lepromatosis* cases have been described, it is a custom to eat meat from armadillos and field rats (*Rattus rattus*) (10). Consequently, since this might be a risk factor for *M. lepromatosis* infection, all five patients were asked whether they had consumed meat from armadillos or field rats. Two of the patients admitted having eaten field rat meat, and one of them had also eaten armadillo meat. One patient had not eaten such meat, and two other patients did not answer this question (Table 1).

Because of the inability to culture *M. leprae*, the diagnosis of leprosy has been based on a simple method, such as the visualization of AFB, in addition to clinical symptoms. The use of DNA-based techniques has revolutionized the taxonomy of human pathogens, particularly for organisms previously identified on the basis of simple morphological or biochemical tests (11, 12). More widespread use of molecular diagnostic techniques for Hansen's disease will provide us with better identification of the bacteria involved in this infection in places like Brazil or India, where a high prevalence still exists, or even in specimen banks in parts of the world where this infection has been eliminated.

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