Published in final edited form as:
N Engl J Med. 2013 January 17; 368(3): 291–293. doi:10.1056/NEJMc1215469.

Human *Borrelia miyamotoi* Infection in the United States

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To the Editor:

Borrelia miyamotoi, a spirochete that is genetically related to species of *Borrelia* that cause relapsing fever, has been detected in all tick species that are vectors of Lyme disease.[1,2] It was detected in *Ixodes scapularis* ticks from Connecticut in 2001 and subsequently has been detected in all areas of the United States where Lyme disease is endemic. The first human cases of *B. miyamotoi* infection were reported in Russia in 2011.[3] We now provide evidence of *B. miyamotoi* infection and of the prevalence of *B. miyamotoi* infection among people in the United States.

Enzyme-linked immunosorbent assays and confirmatory Western blot assays of archived serum samples obtained from three groups of patients who were living in areas where Lyme disease was endemic between 1990 and 2010 were used to detect antibody against *B. miyamotoi* GlpQ protein (an antigen that is nonreactive to *B. burgdorferi* antibody). [4] Group 1 consisted of 584 patients who participated in serologic surveys for tick-borne infections on Block Island and Prudence Island, Rhode Island, and Brimfield, Massachusetts. Patients in the serologic survey were healthy at the time of blood sampling and were enrolled during the spring and autumn of each year. Group 2 included 277 patients from southern New England who were evaluated for suspected Lyme disease. Group 3 consisted of 14 patients from southern New York who were evaluated at a Lyme disease clinic with a viral-like illness in the late spring or summer; these patients did not have symptoms or signs suggestive of an upper respiratory tract infection or gastroenteritis.

The seroprevalence was 1% in group 1, 3.2% in group 2, and 21% in group 3 ($P<0.001$ for comparison across the 3 groups). In one patient in group 2 and two patients in group 3, the antibody titer was at least four times as high in the convalescent serum samples as in the acute serum samples; these findings suggest that these patients were recently infected with *B. miyamotoi* (Table 1). All symptomatic patients presented with a viral-like illness and were treated with doxycycline or amoxicillin Unlike the patient with well documented *B. miyamotoi* infection described by Gugliotta et al. [5] elsewhere in this issue of the *Journal*, none of the 3 patients with evidence of recent *B. miyamotoi* infection in our study were immunocompromised. One patient had *B. miyamotoi* seroconversion and no erythema migrans skin lesion or laboratory evidence of human granulocytic anaplasmosis coinfection (Patient 17). This patient had a temperature of 39.4°C, chills, sweats, a headache, neck stiffness, fatigue, myalgias, arthralgias, abdominal pain, cough, sore throat, and right inguinal lymphadenopathy. He was treated successfully with 14 days of doxycycline. The identification of *B. miyamotoi* antibody in 18 of our study patients, including seroconversion associated with symptoms in three patients, suggests that *B. miyamotoi* infection may be prevalent in areas where Lyme disease is endemic in the United States.

Acknowledgments

This work was supported by Grant Number R21AI088079 from the National Institute of Allergy and Infectious Diseases at the National Institutes of Health (PJK, DF). The content is solely the responsibility of the authors and

does not necessarily represent the official views of the National Institute of Allergy and Infectious Diseases or the National Institutes of Health. Additional support was provided by the Gordon and Llura Gund Foundation (PJK), the G. Harold and Leila Y. Mathers Foundation (DF), and the Howard Hughes Medical Institute (EF).

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Table 1

Serologic and Clinical Characteristics of *Borrelia miyamotoi* Infection in Study Patients*

Group, Patient No., and Serum Phase†	Assay method			Coinfection‡	No. of symptoms
	ELISA	Western blot			
		IgM	IgG		
Group 1					
Patient 1	Positive at 1:320 dilution	Positive	Positive	None	None
Patient 2	Positive at 1:320 dilution	Positive	Negative	None	None
Patient 3	Positive at 1:320 dilution	Positive	Positive	None	None
Patient 4	Positive at ≥1:320 dilution§	Not done	Positive	None	None
Patient 5	Positive at ≥1:320 dilution§	Not done	Positive	None	None
Patient 6	Positive at 1:320 dilution	Positive	Positive	None	None
Group 2					
Patient 7	Positive at ≥1:320 dilution§	Not done	Positive	None	5
Patient 8	Positive at 1:320 dilution	Negative	Positive	None	9
Patient 9	Positive at 1:320 dilution	Negative	Positive	None	8
Patient 10	Positive at ≥1:320 dilution§	Not done	Positive	None	6
Patient 11	Positive at ≥1:320 dilution§	Not done	Positive	None	3
Patient 12	Positive at 1:1280 dilution	Negative	Positive	Lyme disease	4
Patient 13	Positive at 1:320 dilution	Negative	Positive	Lyme disease	Uncertain
Patient 14	Positive at 1:320 dilution	Positive	Positive	Lyme disease	Uncertain
Patient 15					
Acute	Negative at 1:160 dilution	Negative	Negative	Babesiosis	12
Convalescent	Positive at 1:1280 dilution	Positive	Positive		
Group 3					
Patient 16	Positive at 1:1280 dilution	Positive	Positive	None	5
Patient 17					
Acute	negative at 1:80 dilution	Positive	negative	None	10
Convalescent	Positive at 1:320 dilution	Positive	Positive		
Patient 18					
Acute	negative at 1:80 dilution	Positive	Positive	Lyme disease	12
Convalescent	Positive at 1:320 dilution	Negative	Positive		

*ELISA denotes enzyme-linked immunosorbent assay.

†See text for the definition of various groups

‡The diagnosis of Lyme disease was based on a typical erythema migrans skin lesion in Patients 12, 13, 14, and 18. Patients 8 and 16 had an atypical erythema migrans skin lesion (<5 cm in diameter).

‡Tests to determine the presence of antibody in serum dilutions greater than 1:320 were not performed.