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### BORRELIA BURGDORFERI ANTIBODIES AND AMYOTROPHIC LATERAL SCLEROSIS

**SIR.**—Neurological involvement in Lyme disease usually takes the form of symptoms of meningoencephalitis, mononeuritis multiplex, radiculoneuritis, and/or cranial nerve neuritis developing within months of primary infection with *Borrelia burgdorferi*. Recently, however, long-term sequelae have been described; these include a remitting/relapsing neurological syndrome (simulating multiple sclerosis), focal encephalitis, and psychiatric disease.<sup>1-4</sup> These tertiary symptoms are thought to be due to a latent infection of the central nervous system.

A patient's query as to whether her amyotrophic lateral sclerosis (ALS) could be caused by Lyme disease led us to test a series of ALS patients for *B burgdorferi* antibodies in serum. 4 of 54 patients from Wisconsin and Illinois had antibodies at titres thought by the Wisconsin State Laboratory of Hygiene to be significant (256 or greater).

*B burgdorferi* antibody was sought.<sup>5</sup> Briefly, antigen spotted slides were stored at -20°C for no longer than four months before use. Spotting dilutions of sera on antigen slides were washed and overlaid with fluorescein isothiocyanate-labelled sheep anti-human immunoglobulin (Wellcome Diagnostics). Serum antibody titres were expressed as the highest dilution that exhibited barely visible staining of at least 50% of the spirochaetes per microscopic field. The results at the Wisconsin State Laboratory of Hygiene were confirmed by another of us (R. J.) in Minneapolis.

**Case 1.**—A 65-year-old woman had slurred speech 3 months after she had had a generalised rash while on holiday in Oxford, Wisconsin. 6 months later she saw a neurologist for progressive weakness, dysarthria, and dyspnoea. Atrophy, fasciculations, and brisk reflexes were observed on examination. An electromyogram (EMG) demonstrated widespread denervation. Her *B burgdorferi* antibody titre in her serum was 512. She died of respiratory failure 3

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years after onset. Her spinal fluid was never examined. Anterior horn cell loss and cortical spinal tract degeneration were demonstrated at necropsy. Conventional stains for central nervous system (CNS) spirochaetes were negative.

**Case 2.**—A 42-year-old woman who had been on holiday in northern Wisconsin had arm weakness followed by dysarthria and weakness in all four limbs. There was no history of rash or arthritis. Atrophy and fasciculation were noted on examination. *B burgdorferi* antibody titres ranged from 64 to 4096 in this patient. Her CSF was normal. In view of the rise in titre while she was getting progressively worse intravenous ceftriaxone<sup>6</sup> was administered. Her disease seems to have stabilised.

**Case 3.**—A 33-year-old man had left median prolonged motor and sensory distal latencies in September, 1985. He had previously been on holiday in northern Wisconsin. These findings progressed into hand weakness, generalised muscle fasciculation, and weakness characteristic of ALS. A first test for *B burgdorferi* was negative but a repeat test revealed a titre of 256.

**Case 4.**—A 61-year-old man from Chicago had developed bilateral arm weakness. There was no history of rash or arthritis. Wasting, fasciculations, and depressed reflexes were present in the arms. The serum anti-*B burgdorferi* titre was 512. He died of respiratory failure. No necropsy was done.

The finding of cases of ALS with high titres of *B burgdorferi* antibodies should be viewed in the context of other CNS diseases as diverse as dementia and multiple sclerosis for which similar antibodies have been reported. This could mean that the cross-reactivity potential of *B burgdorferi* antigen is high—or that this spirochaete causes a wider diversity of common CNS syndromes than is generally recognised. Since there is no treatment for ALS and there is for chronic Lyme disease clinicians will ask if patients with ALS who have high-titre anti-*Borrelia* antibodies should be treated empirically with ceftriaxone, one of the antibiotics of choice for chronic *B burgdorferi* infection.<sup>6,7</sup> At the least, it seems reasonable to find out if a patient with ALS does have *B burgdorferi* antibodies.

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