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A ticking time bomb: A case of Lyme disease

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## Title Page:

### *Article Title:*

A ticking time bomb: A case of Lyme disease

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Article type : Case Letter

*A ticking time bomb: A case of Lyme disease*

Lyme disease is a disorder affecting many organs including the skin and reticuloendothelial, cardiovascular, nervous and musculoskeletal systems.<sup>1</sup> It is the most common tick-borne infectious disease in North America and its incidence is increasing in Asia, the United States and European countries.<sup>1</sup> Despite a number of putative case reports, locally acquired classic Lyme disease has not been identified in Australia, however it should be considered as a differential diagnosis in the returned traveller.<sup>2</sup> Lyme disease is caused by the spirochetal bacteria from the genus *Borrelia*.<sup>1</sup> The genospecies *Borrelia burgdorferi sensu stricto* is particularly arthritogenic, compared to *Borrelia afzelii* which primarily causes cutaneous manifestations and *Borrelia garinii* which is typically neurotropic.<sup>3</sup> Symptoms of early localised Lyme disease usually begin 1-2 weeks after a tick bite and are similar to a non-specific viral illness including fatigue, malaise, myalgia, and headache.<sup>1</sup> If left untreated, the bacteria disseminate systemically and can cause acrodermatitis chronica atrophicans of the skin, as well as extracutaneous involvement in the joints and nervous system, causing chronic morbidity.<sup>1,3</sup> We describe a case in a recent migrant and highlight an infrequent skin disease in the Australian setting.

A 43 year-old woman presented with a 4-month history of an erythematous, enlarging, annular lesion on her right lower calf (Fig. 1). This lesion had a central patch surrounded by clear skin within a ring and was consistent with erythema chronicum migrans. She had recently moved from Switzerland to Australia 5 months earlier and had no significant medical history or medication use. In the last 3 months she had developed localised dysaesthesia and constitutional symptoms, including intermittent flu-like

illness, lethargy and arthralgias. She was initially commenced on pulsed oral prednisolone and topical betamethasone dipropionate cream (0.05%) for a diagnosis of erythema annulare centrifugum. Table 1 outlines the differential diagnoses for annular erythema. She reported no improvement in her symptoms and developed headaches and sinusitis. Full blood examination, inflammatory markers and autoantibodies were all within normal limits. A central lesional biopsy showed a hyperkeratotic epidermis and perivascular polymorphic infiltrate of neutrophils and lymphocytes within the dermis. Spirochete immunostain showed occasional spiral-shaped organisms (Fig. 2). Her serology was positive for the *Borrelia*-specific antibody. This prompted Western blot testing (MarDx) which showed 5 specific IgG bands confirming *Borrelia* exposure. She was treated with oral doxycycline 100mg, twice a day for 28-days and upon follow-up her rash and constitutional symptoms had resolved, but calf dysaesthesia remained.

The characteristic Lyme disease rash appears 7–14 days post-tick bite, but can also be caused by southern tick-associated rash illness.<sup>1</sup> It has a rapid and prolonged expansion, which can be found in ~80% of patients, but central clearing may be lacking.<sup>4</sup> Some patients may develop borrelial lymphcytoma, a solitary bluish-red nodule located on the earlobe, nipple or scrotum.<sup>4</sup> Atypical presentations may include neurological manifestations, such as facial nerve palsy, meningitis or encephalopathy.<sup>4</sup> Direct tests to detect the organism are required for optimal diagnosis of active Lyme disease, with culture and/or polymerase chain reaction preferred.<sup>3</sup> Clinical presentation guides treatment, but for early disseminated disease, oral doxycycline, 100mg twice a day for 28-days is recommended.<sup>3,4</sup> An advantage of doxycycline is that it also has efficacy against the rickettsial agent *Anaplasma phagocytophilum*, which causes human granulocytic anaplasmosis, a possible co-infection with *B. burgdoferi*.<sup>3,5</sup>

Randomised controlled trials have shown no benefit in extending treatment duration or administering intravenous antibiotics unless development of multiple erythema chronicum migrans, acrodermatitis chronica atrophicans or cardiac manifestations.<sup>3,5</sup> Prospective studies using systemic corticosteroids are lacking, but steroids with antibiotics were found to be inferior to antibiotic monotherapy.<sup>5</sup> Despite treatment, 3–27% of patients with Lyme disease, may experience antibiotic-refractory fatigue, dysaesthesia, myalgias or difficulty concentrating that can last months to years.<sup>3,5</sup>

Patients treated for Lyme disease do not develop an immunological response to protect against reinfection and there have been no documented cases of antibiotic resistance.<sup>1,3</sup> Given the small set of documented cases in Australia, further research on tick-borne disease is required. Clinicians should be aware of the acute cutaneous presentation of an annular erythematous eruption in the returned traveller within the Australian setting.

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**Figure Legends:**

**Figure 1:** Right medial lower extremity showing an erythematous plaque with a central, annular lesion consistent with erythema chronicum migrans “bull’s-eye”.

**Figure 2:** Spirochete immunohistochemistry showing scattered spiral shaped organisms in the dermis (arrows), consistent with spirochetal diseases, including Lyme disease. Scale bar = 20 microns.

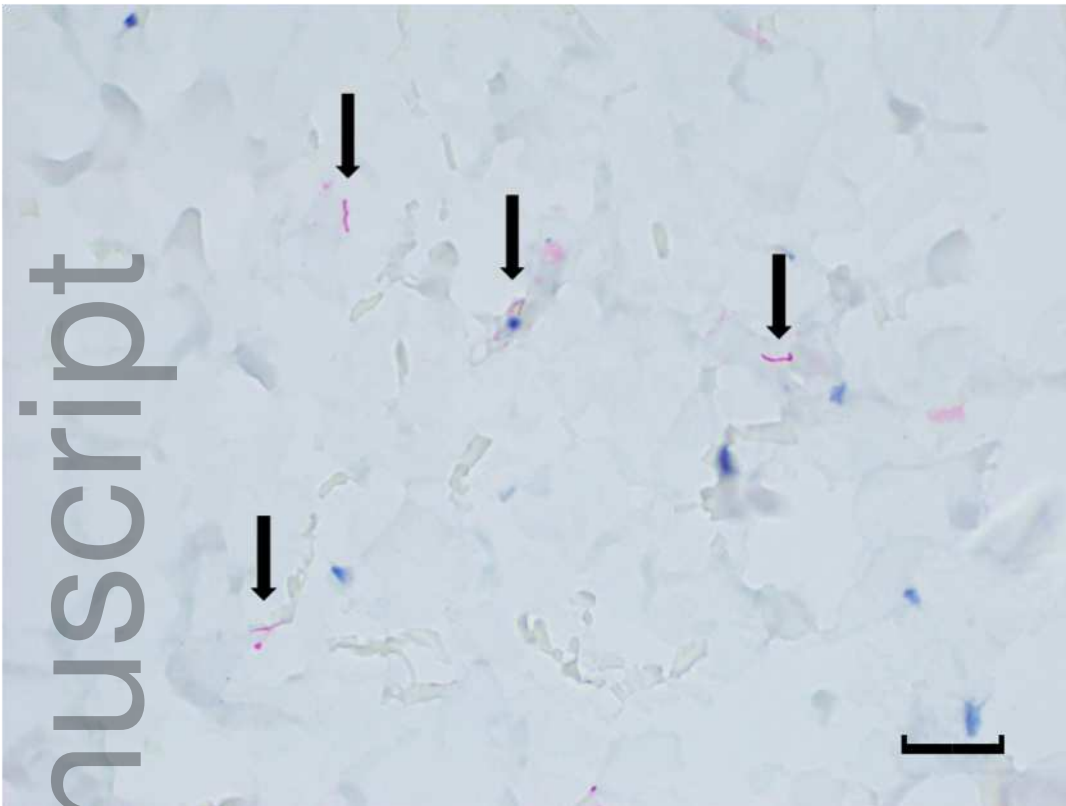
**Tables:**

**Table 1:** Differential diagnosis for annular erythema

Differential Diagnosis	Clinical Presentation
Granuloma annulare	Indurated, smooth skin-coloured to violaceous plaques, usually on the extremities
Tinea corporis	Annular or ring-form lesions of variable size with central clearing
Cellulitis	Homogenous erythematous lesions associated with oedema, tenderness and warmth
Erythema multiforme	Symmetric target lesions with sharp margin and variable concentric colour zones, usually with membrane involvement
Spider bite	Erythematous lesions of variable size that may be associated with necrotic escha
Hypersensitivity reaction	Lesions of variable shape and size that may resemble contact sources
Erythema chronicum migrans	Expanding, erythematous lesion with usually a central patch surrounded by clear skin within a ring
Urticaria	Raised, erythematous lesions with an associated serpiginous border
Sarcoidosis	Indurated, erythematous plaques, nodules and infiltrated scars
Erythema annulare centrifugum	Slowly enlarging, raised, erythematous lesions forming a ring-shape with central spreading
Pityriasis rosea	Erythematous, oval plaque with fine scale along the borders, following skin cleavage lines



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