

## Increasing spread of borreliosis in Europe

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Lyme disease (LD) or borreliosis is the most common vector-borne disease in Europe, USA and Canada [1]. Since its identification in 1975 LD has become the most common tick-borne zoonotic disease world-wide [2]. The disease is caused by *Borrelia burgdorferi*, which is a spirochete transmitted into humans by ticks of the Ixodidae family [3]. There are at least five species capable of infecting humans, of which *Borrelia burgdorferi* is the most common one both in Europe and USA with over 600,000 cases of LD annually since 2010 [4,5]. With the growing number of LD incidents, it has become more important than ever to make a greater effort in trying to limit the spread of the disease [1]. Difficulties in diagnosis as well as surveillance need to be overcome for us to be successful in achieving that.

The most common clinical presentation of LD is erythema migrans, a cutaneous rash that can appear within the first days. Neurological manifestations such as neuroborreliosis can develop later as well as musculoskeletal, cardiac, skin, and ocular conditions. LD has significant health related quality of life implications as well as healthcare and societal cost [1].

Reasons for poor progress in limiting the disease are manifold. One factor that could be at play is that the surveillance systems for Lyme disease in humans vary highly, making epidemiological comparisons difficult. This remains true despite efforts to improve on this by adding neuroborreliosis under European Union surveillance to standardize definitions [1]. Another fact worth mentioning is that there are still substantial diagnostic gaps for the disease given its varied and unusual presentation. Diagnosis is further challenged by the absence of reliable assays for

acute infection, difficulty in differentiating past disease from current disease and an inability to monitor treatment response [5].

An increasingly more important factor of the spread of the disease is the issue of climate change. Climate change has influenced the transmission of a wide range of vector-borne diseases in Europe with LD not being an exception. Numerous theories have been developed in order to explain how tick-borne diseases are associated with climate change but have yet to be verified [3]. The linking of LD to issues related to climate changes only suggests that cases will continue to rise in the next decades.

Despite the rising incidents in other parts of Europe, LD has not been proven to be endemic in Greece and suggestions that the disease exists in Greece remains controversial. An attempt to definitively identify the presence of *Borrelia* that infects humans in Greece was made in the newly published study by Karageorgou et al. [4].

In this study the examiners retrospectively studied serum samples from 294 patients suspected of zoonotic infection that were sent to their laboratory through the year 2019. Two patients were given the diagnosis of probable *B. afzelii* infection, both of whom reported epidemiological risk factors and presented clinical manifestations that are commonly presented in patients suffering by Lyme neuroborreliosis or Lyme arthritis. Neither patient suffering from *B. afzelii* had traveled abroad suggesting it being endemic to Greece [4].

Supporting factors were that *B. afzelii* have been collected in regions close to Greece and Lyme disease is known to be endemic in neighboring countries. The true underlying rate of Lyme disease in Greece remains unknown and this is true also for other countries where the diagnosis and epidemiology of the disease continues to be a challenge [4].

As vector-borne diseases are becoming more prevalent with global warming continuing to be a threat it is not implausible to assume that an increase in Lyme disease could take place in Greece as is the trend in other European countries. There is

definitely a need to overcome diagnostic challenges when confirming the presence of the disease as well as a need to set in place better surveillance strategies and policies for LD, contributing to both patients and doctors' delay. Also, developing a safe and effective vaccine against *Borrelia* is necessary for us to gain better control of the spread of the disease as well as reducing the great number of antibiotic doses needed for treatment of the increasing number of cases.

### Conflict of interest

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HHA is Principal Site Investigator and BO sub investigator in the VALOR-study of Lyme disease vaccine financed by Pfizer starting September 2022 in Sweden. Their work is done within above affiliations, and they have no direct financial relations with Pfizer.

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