**Recommendations for diagnosis and treatment of Lyme borreliosis: guidelines and consensus papers from specialist societies and expert groups in Europe and North America**

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**Introduction**

The European Union Concerted Action on Lyme Borreliosis (EUCALB) initiative, funded initially by the EU, continues to promote research and evidence-based clinical practice through European multi-disciplinary collaboration and a highly-regarded and frequently updated website. Its clinical case definitions for Lyme borreliosis were published in 1997. An updated version has been published on-line (Clin Microbiol Infect 2010 doi:10.1111/j.1469-0691.2010.03175.x). EUCALB’s work programme also includes a review of currently recommended treatments in Europe and the evidence on which they are based.

Since the publication of the Infectious Diseases Society of North America’s updated guidelines for Lyme borreliosis in 2006 there has been considerable public dispute in the USA and elsewhere regarding choice of antibiotic agents and duration of antibiotic treatment for Lyme borreliosis, particularly for patients who have persistent symptoms following standard treatment. Some patient support groups and a minority of physicians have been very active in promoting prolonged or multiple courses of antibiotics for patients with persistent symptoms in North America and in Europe. There has also been criticism about the use of the IDSA guidelines for patients in Europe, prompting this evaluation of European guidelines and recommendations and a comparison with American recommendations.

**Methods**

EUCALB participants collated diagnostic and treatment guidelines prepared independently by specialist societies and expert groups in various European countries and in North America. National and/or specialist society guidelines and recommendations of experts from the Czech Republic, Denmark, Finland, France, Germany, the Netherlands, Norway, Poland, Slovenia, Sweden and Switzerland have been evaluated and compared with regard to clinical and laboratory diagnostic and treatment recommendations (including antibiotic agents, dosages and durations) for erythema migrans, neuroborreliosis and Lyme arthritis. They have also been compared to those of the IDSA and the American Academy of Neurology.

The first-line treatment recommendations of the various European and North American guidelines are presented in tabular form to permit easy comparison.

**Findings**

The majority of guidelines and reviews listed here give explicit details about quality of evidence and strength of recommendations. They list references of published randomised controlled treatment trials and numerous other peer-reviewed papers on diagnosis and management of Lyme borreliosis in the international literature.

All guidelines give recommendations for clinical diagnosis and for the application of laboratory tests. There is overall agreement regarding the clinical features of Lyme borreliosis and on the requirement for supporting laboratory evidence of a clinical diagnosis of later-stage infection. Two-tier serological testing, with immunoblot as a second-stage test, is currently recommended in most guidelines and reviews. No guideline or review recommends serological testing in support of a diagnosis of erythema migrans.

Overall there are great similarities of antibiotic choice between the various treatment guidelines and reviews, with some minor differences in dosing and duration.

The most commonly recommended first-line treatments for different stages of Lyme borreliosis in non-pregnant, non-breastfeeding adults in Europe are:

### Erythema migrans:

- **Doxycycline 100mg bd (10-21 days)**
- **Amoxicillin 500mg tid (14-21 days)**

### Early neuroborreliosis:

- **Ceftriaxone 2g daily (14 days)**
- **Doxycycline 100mg-200mg bd (14-21 days)**

### Late neuroborreliosis:

- **Ceftriaxone 2g daily (14-28 days)**

### Lyme arthritis:

- **Doxycycline 100mg bd (28 days)**
- **Amoxicillin 500mg tid (28 days)**

These recommendations, independently developed by a wide range of European experts in infectious diseases and other specialties, are similar to those of the IDSA.

**Comments**

There are only minor differences in antibiotic treatment recommendations, with two Scandinavian countries favouring the use of high dose penicillin V over amoxicillin as first-choice B-lactam agent for erythema migrans, and slightly shorter treatment courses.

Doxycycline is widely recommended for treatment of all stages of Lyme borreliosis other than late neuroborreliosis.

Ceftriaxone is the antibiotic most widely recommended for parenteral use.

The most recently prepared guidelines have stronger recommendations for the use of doxycycline in neuroborreliosis without encephalitic or myelitic features, following publication in 2008 of a Norwegian double-blind randomised controlled trial which showed non-inferiority of oral doxycycline 200mg daily versus intravenous ceftriaxone 2g daily for 14 days. ([Jøstad U et al. Lancet Neurology 2008;7:690-95](https://www.thelancet.com/journals/laneur/article/PII:S147444220870206A/abstract))

No evidence-based European or North American guideline recommends prolonged or multiple courses of antibiotics for persistent symptoms following previously treated Lyme disease.

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We should be most grateful for notification of other evidence-based European guidelines to EUCALB for collation.