

Borrelia burgdorferi

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Borrelia burgdorferi sensu lato (also known as ***Borrelia burgdorferi***^{[1][2]}) are bacteria of the **Spirochetes** class. It is one of the causative agents of the multiorgan disease called Lyme disease which is transmitted by ticks.

Morfology

- Borrelia is typical for its elongated **spiral shape** (with flagellas at both ends), this allows helical movement, which is advantageous especially in the highly viscous environment of the intercellular mass. This type of movement allows Borrelia to cross both the epithelial barrier and the blood-brain barrier.
- They are also able to enter cells, such as Fibroblasts, dendritic cells and macrophages, and survive in them.
- Borrelia are capable of **high speed movements**.^[3]

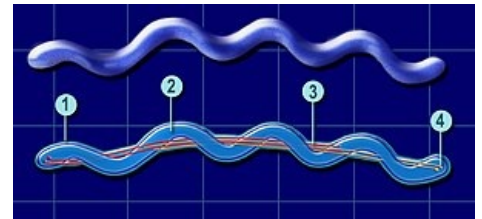
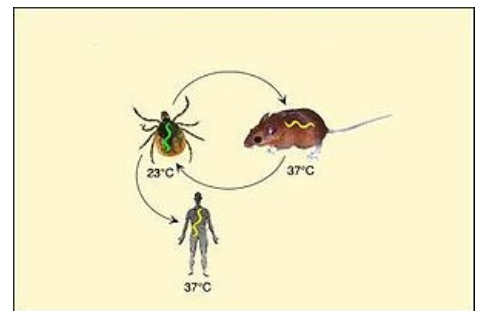


Diagram of the borrelia locomotor system: (1) capsule, (2) cytoplasm, (3) flagella, (4) flagella insertion site

Physiology a Cultivation

- Borrelia are **microaerophiles** that require an enriched complex medium with N-acetylglucosamine, amino acids, vitamins and nucleotides.^[4]
- They do not have their own metabolic equipment, so they are **fully dependent on the host**. Therefore, they are not able to grow in the external environment.
- They lack enzymes for the synthesis of amino acids, fatty acids and nucleotides that they obtain from the host organism.
- They are adapted to **low levels of iron**, the active reduction of which in body fluids is one of the main mechanisms of non-specific antibacterial host defense.^[3]
- Borrelia is able to form **so-called „non-spiral“ forms** with reduced metabolic activity. These are cystic forms and strangulation sacs containing cytoplasmic components. The transformation has been observed when exposing the classical spiral form to suboptimal living conditions such as low pH, lack of nutritional resources or low osmotic pressure. „Non-spiral“ forms are capable of 'reversing' into a fully metabolically active spiral form.^[3]



Life cycle

Antigen characteristics

- The antigens are bound to the **the surface membrane and to the flagella**.
- Flagella antigens are species specific. ^[4]

Pathogenicity factors

- Active movement of the flagella.
- Presence of **lipopolysaccharide complex**. ^[4]

Laboratory diagnostics

- Direct detection is performed in shadow, phase contrast, immunofluorescence, silvering.
- Lyme disease is diagnosed **serologically**. ^[4]

Imunity

- During the course of the disease, there is a significant proliferation of T-cells in the peripheral blood, cerebrospinal fluid and joint fluid.
- IgM antibodies to flagellar antigen can be detected in 1-3 weeks, followed by IgG antibodies.
- Antibodies can also be detected in cerebrospinal fluid.^[4]

Therapy

- In stage 1, oral penicillin - eg amoxicillin (in combination with clavulanic acid, which has no antibiotic effects) or doxycycline.

Classification

Borrelia burgdorferi sensu lato species group includes:

- *Borrelia burgdorferi* sensu stricto ((especially in north America, where it was apparently transferred from Europe);
- *Borrelia garinii* (especially in Europe and Asia);
- *Borrelia afzelii* (especially in Europe and Asia);
- *Borrelia valaisiana* (rare pathogen);
- *Borrelia lusitaniae* (rare pathogen).^[3]

Links

Related articles

- Lyme disease
- Repetitorium mikrobiologie

References

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2. Adeolu, M., and Gupta, R.S. "A phylogenomic and molecular marker based proposal for the division of the genus *Borrelia* into two genera: the emended genus *Borrelia* containing only the members of the relapsing fever *Borrelia*, and the genus *Borrelia* gen. nov. containing the members of the Lyme disease *Borrelia* (*Borrelia burgdorferi* sensu lato complex)." *Antonie van Leeuwenhoek* (2014) 105:1049-1072.
3. KŘUPKA, M – WEIGL, E. Lymská borelióza – biologie, patogeneze, diagnostika a léčba. *Dermatologie pro praxi* [online]. 2008, y. 2, vol. 5-6, p. 236-239, Available from <<http://www.solen.cz/pdfs/der/2008/05/07.pdf>>.
4. – SOUČEK, Andrej – FRÁŇKOVÁ, Věra, et al. *Lékařská mikrobiologie : Bakteriologie, virologie, parazitologie*. 1. edition. Praha : Marvil, 1999. pp. 191–192. ISBN 8023802976.