Pathomechanisms of Borrelia burgdorferi sensu lato and their implications for diagnostics, clinical appearance and treatment of Lyme-Disease

Borrelia burgdorferi grows slowly

Bb needs ca. 12-20 (8-35) hours for one generation-time
- cf E. coli needs ca. 20 min for one generation-time
- Bb sometimes needs 10 weeks for culturing


Borrelia burgdorferi sequester in tissue which is poorly vascularised
- connective tissue (present in all organs) and which is
- poorly infiltrated by defence cells - the immune system


"..In principle the disease symptoms result from the high affinity of the Borreliae to collagen fibre. Thus connective tissue (collagen) is particularly prone to chronic inflammatory processes. The result is vessel inflammation (vasculitis processes with perivascular infiltrates of lymphocytes and plasma cells) (literature: Meier, de Koning, Duray). Capillary occlusions lead to disturbances of the tissue-supply, e.g. the vessels by which nerves and blood-cells (macrophages), fibroblasts, endothelial, and synovial cells are supplied (Epineurium). This again leads to (ischaemia -) pain and increased vulnerability. So probably the periarthritic decalcifying process is a consequence of the poor local supply in the bone. Borreliae can probably partly evade the immune system by sequestering in collagen where they are inaccessible to antibiotics."

http://www.dieterr hassler.de/diagnostik_und_therapie.htm

Borrelia burgdorferi is able to invade human cells and persist there:
- e.g. blood-cells (macrophages), fibroblasts, endothelial, and synovial cells
- Perhaps Bb can even survive in CNS-cells?

1. Malawista, J Immunol 1999 Feb 1; 150(3): 909-15; Persistence in Maus-Makrophagen

Borrelia burgdorferi can change its appearance
- by "starvation" (antibiotics, CSF) Bb can change its appearance:
  - cyst, bleb, mesosom, granulum
- a "cyst" / L-form / spheroblast can later convert to living spirochetes again

2. Kersten; Antimicrobial Agents and Chemotherapy, May 1995; p.1127-1133: Effects of Penicillin, Ceftriaxon and Doxycycline on Morphogenesis of B. burgdorferi

The slow growing of Bb means for the infected human being:
- He / she can become ill a long time after infection (latency) 1
- treatment has to take a long time to reach as many generations as in treatment of fast-growing-bacteria (~ 60 -100 x?)
- Consider using therapy-principles of other slow-growing-bacteria; e.g.: M. leprae, M. tuberculosis, T. pallidum
- treatment of TBC: combi for at least 6 months;
- similar to leprosy: ca. 2 years combi-therapy (E. Freeskens, Borstel, Malta); before at least 10 years of Dapson 2

2. Hans Schiawedalid, Über die Rückkehr der Seuchen; VGS Köln 1994, S. 68; Robugen

"Considering an early germ-dissemination into CNS .. it seems being necessary to reach high antibiotic-levels in target-tissues like joint-synovia or CNS.. even in treatment of erythema migrans or Borrelia-lymphozytom."


Cell wall permeable antibiotics are required to treat intracellular Bb
- Tetracycline, Doxycycline, Minocycline
- Macrolides: Roxithromycin, Azithromycin, Clarithromycin, - no Erythromycin!


"Cysts" are resistant to the usual antibiotics
- Metronidazole can be used against cysts
- CNS tissue is highly permeable to it
- Metronidazole can cause cancer or harm an embryo / foetus
- Possible to use other treatment options against cysts: Hydroxychloroquin (anti-malaria-drug); ranitidine bismuth citrate