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Intra-host dissemination dynamics of *Borrelia sp.* during Lyme disease

Chronic inflammatory diseases, caused by bacteria, viruses and eukaryotic parasites pose a threat to public health. A strong inflammatory reaction causing tissue damage often plays an important role in the pathogenesis of these infections. Lyme disease, caused by an infection by spirochetes of the *Borrelia burgdorferi* sensu lato group (*B. afzelii, B. garinii, B. burgdorferi* s.s.), is a common tick-borne disease in North America, Europe and parts of Asia. The early infection stage consists of mild and mainly localized symptoms. In later stages, the spirochetes can migrate to different tissues, including the central nervous system, heart and joints, where it causes strong inflammatory reactions and tissue damage, leading to severe clinical symptoms. The infection of these tissues can also become chronic.

This project aims at modelling the dissemination of the bacteria from the infected skin site to other tissues inside a mouse. The model is based on experimental data on the bacterial concentrations in different tissues from qPCR studies of artificially infected mice of a strain displaying clinical disease symptoms similar to those in humans and also develops a systemic infection. The dynamics of this dissemination are described by a simple deterministic model on the level of bacterial populations in three different compartments, including the interactions of macrophages and spirochetes as an important component of the innate immune response and inflammatory reaction caused by *B. burgdorferi*. Central questions that may be answered by this model include the infectious bacterial concentration and elucidation of the transition from the acute to the chronic infection.