

Modelling the dynamics of Lyme Disease and Tick-borne Encephalitis in Trentino (northern Italy)

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Lyme Disease and Tick-Borne Encephalitis (TBE) are two emerging tick-borne diseases in Trentino (northern Italy) transmitted by the pan-european tick *Ixodes ricinus* [1, 2]. Rodents act both as reservoirs for pathogens and as hosts for ticks, while large herbivores such as the roe deer, serve principally as hosts for ticks. Starting from a general model framework for tick-borne infections [3] we apply the model to two specific systems and explore the dynamics of Lyme Disease and TBE in Trentino. We show numerical results, using parameter estimates based on a detailed field study and explore the effects of uncertainty on the endemic equilibrium of both models. Models also provide an explicit formula for the thresholds for ticks and disease persistence assuming only viraemic transmission for Lyme Disease while for TBE we permit only transmission through co-feeding ticks. We use joint threshold host density curves to

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illustrate the persistence of ticks and disease in both cases. With the parameter chosen for Lyme Disease the 'dilution effect' due to the increase of roe deer does not occur while for TBE both an increase of deer and rodent density might act against the persistence of the virus.

References

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