

## 17. Inferring Bovine Tuberculosis Transmission Between Cattle and Badger via Environment and Risk mapping

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Bovine tuberculosis (bTB), caused by *Mycobacterium bovis*, is one of the most complicated and persistent issues in the cattle industry. This is mainly due to the fact that the European badger plays an important role in maintaining bTB transmission. However, the quantitative role of cattle and badgers in the transmission is unclear and varies spatially depending on local badger and cattle density. Moreover, these two species rarely have direct contact between them, which indicates the importance of environmental transmission. Therefore, the objective of this study is to better understand bTB transmission between cattle and badgers via the environment in a spatially explicit context and to identify high-risk areas. We developed an environmental transmission model that incorporates both within-herd/territory transmission and between-species transmission, with the latter facilitated by badger territories overlapping with herds. Model parameters such as transmission rate parameters and the decay rate parameter of *M.bovis* were estimated by maximum likelihood estimation, using the infection data from badger and cattle collected during the Kilkenny trial (2009-2013). Our estimation showed that the environment can play an important role in the transmission of bTB, with an estimated decay rate of 0.0039 per day. Based on the estimated transmission rate parameters, we generated a first between-herd basic reproduction ratio (R) map. Our results suggest that the badger-to-badger and cattle-to-badger transmission in each herd area depends on the badger density in each local area. The R maps identify high-risk areas and disentangle how local factor badger density dictates the risk.