Infection Dynamics and Effective Control Options Of Tuberculosis In Cattle and Badgers

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In the Republic of Ireland (ROI), bovine tuberculosis (bTB) transmission between badgers and cattle has hindered national eradication efforts in cattle (Good 2006). Additional control measures are needed, either directed against the transmission of infection among badgers, among cows or a combination of both. Mathematical modelling is an essential tool to understand the maintenance and transmission of multiple host diseases as well as to assess the impact of control measures. The objectives of this paper are twofold. Firstly, two simple mathematical models were built to separately estimate the reproduction ratio R for bTB transmission between cattle and between badgers in Ireland with the current control strategies in place (R_{cc} and R_{bb}). Secondly, for each species, R under additional control strategies (R^1_{cc} and R^1_{bb}) will be obtained and the potential effects of new control options will be evaluated. To assess additional control options we postulate that: a) if we apply new control options in badgers (the same can be postulated when control measures are applied in cattle), and R^1_{bb} is $< R_{bb}$, then the applied measures will have a positive effect in reducing the R for the system b) if is $R^1_{bb} <1$, then eradication in cattle will be possible if the transmission matrix is "disjunct", c) otherwise, if the transmission matrix for the system is "separable", bTB eradication in cattle will only be possible if R^1_{bb} is $< (1-R_{cc})$. The outcomes from these models are discussed; these outcomes will help decision makers to optimize future control options for bTB in Ireland.