Great Britain and Republic of Ireland badger culling trials: An initial comparative study

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Introduction

Bovine tuberculosis (BTB) is a disease of serious economic consequence in Great Britain (GB) and the Republic of Ireland (ROI) (Table1). Although BTB has been largely eradicated across both countries, 'hot-spot' regions of disease remain (Figure 2&3). Persistence of BTB in these areas has been attributed to the presence of badgers (*Meles meles*) as a wildlife vector of the disease. Badger culling trials were undertaken in GB[1] and the ROI[2] to determine the impact badger removal had on BTB incidence. In the ROI, badger culling was shown to be effective in reducing the number of BTB breakdowns in cattle herds[2], while in GB, the opposite was found – "reactive" badger culling had the potential to increase breakdowns, most likely due to a "perturbation" effect[3] (Table2). The objective of this research was to compile available data to allow an assessment of the epidemiology of the BTB epidemics and the culling trials in both countries.

Method

Baseline cattle, badger and BTB control regime statistics for GB and ROI were collated from the respective government bodies and the scientific literature. The published literature regarding the badger culling trials was examined and a comparative table was compiled (Table 2).

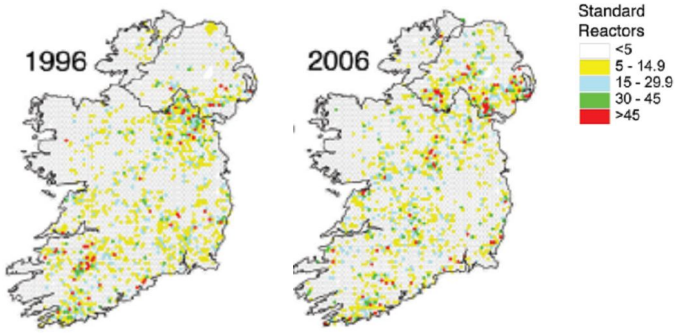

Figure 2. Thematic map of TB standard reactors in Ireland (ROI and Northern Ireland) in 1996 and 2006 [12]

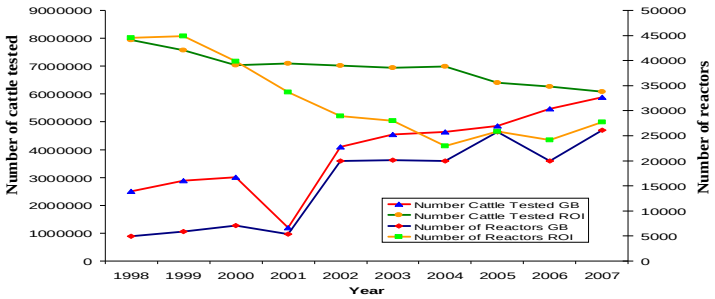

Figure 1. Graph comparing the number of cattle tested and the number of cattle reactors to BTB in GB and ROI.[10,11]

	GB	ROI
Cattle population (2007)	9,005,041[4]	6,162,266[5]
Badger population	300,000-350,000[6]	72,000-95,000[7]
Expenditure on TB control (2006)	£79.71 million[8]	€38.3 million[9]

Table 1. Depiction of comparative statistics for GB and ROI

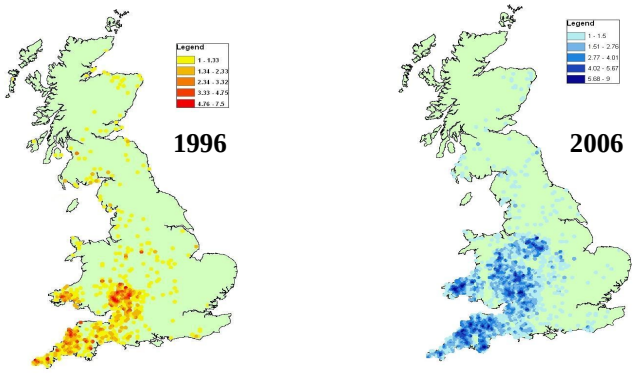

Figure 3. Average (mean) number of herds with confirmed reactors per 5km² in GB in 1996 and 2006

	Randomised Badger Culling Trial (GB)	Four Area Badger Culling Trial (ROI)
Dates of Study	November 1998 to October 2005 [1] (Closed season February to April each year)	September 1997 to August 2002 [2]
Aim of Study	Evaluating two options of badger culling as a means to reduce TB incidence in cattle [14]	To assess objectively the effect badger removal on BTB control at a number of sites representing a wider range of farming environments[2]
Study Design	Proactive culling area, Reactive culling area and Survey only area [4]	Badger removal area, Reference area (removal of badgers due to severe breakdown only), Buffer areas [2]
Size of Study Area	Total area: approximately 30,000km² [1] Ten triplet areas of approximately 100km² [1]	Total area: >22,00km² [2] Four areas of approximately 550km² [2]
Site Selection Criteria	Areas recruited in high BTB incidence areas of West and South West England. Badger survey carried out and sites randomly allocate in 9 of the 10 areas. [14]	Non-random selection of sites. Purposive sampling of areas of "higher than average" BTB incidence coupled with natural boundaries or where boundaries were absent, use of buffer areas. [2]
Treatment of Study Areas	Proactive sites: Remove as many badgers as possible [1] Reactive sites: removal of badgers in area of confirmed outbreak. No specific consideration given to whether or not badgers were implicated. [1] Surveys sites: badger density survey only [1]	Removal site: Remove as many badgers as possible. [2] Reference site: Badger removal due to severe breakdown (four or more standard reactors) only and badgers must have been implicated in outbreak. [2]
TB Testing Interval	All herds subjected to yearly BTB testing. More frequent testing applied if BTB outbreak recorded experts [1]	All herds subjected to standard yearly BTB testing. More frequent testing applied if BTB outbreak recorded [2]
Badger density pre-cull	6.05 setts/km² [1] Mean 5.44±4.27 badgers/social group [1] Mean badger density of 3.2 badgers/km² [1]	2.49 setts/km² [1] Mean 2.5±2.1 badgers/sett [7] Mean badger density of 1.9 badgers/km² [7]
Trapping Methods	Baited cage traps [1]	Stopped restraints [2]
Badger Removal Intensity (over all years)	Proactive area: 1.83 ±0.68 badgers/km²/year [1] Reactive area: Trial halted in November 2003.	Removal area (plus buffer): 0.38 ±0.1 badgers/km²/year [1] Reference area: 0.055 ±0.039 badgers/km²/year [2]
Number Badgers Removed	Total badgers removed: 10,979 [1] 8,910 in proactive sites, 2,069 in reactive sites [1]	Total badgers removed:2,618 [2] 1,579 in removal areas, 781 in buffer areas and 258 in reference areas [2]
% Badgers BTB Positive	Of 8910 captured in proactive area, 8892 were examined for TB: 14.7% considered TB positive [1] Of 2065 captured in reactive area, 2063 were examined for TB: 15.6% considered TB positive [1]	Of 2360 captured in removal and buffer areas, 2310 were examined for TB: 19.5% considered TB positive. [2] Of 258 captured in reference area, 218 were examined for TB: 26.1% considered TB positive [2]
Impact of cull on cattle BTB herd Incidence	Proactive area: Reduction of 23.2% (CI 12.4-32.7%) in comparison to survey only areas [1] Land neighbouring proactive area: Increase of 24.5% (CI -0.6 to+56%) [1] Reactive area: Increase of 27% (CI 2.4-65%) (experiment halted in November 2003) [1]	Removal area: Reduction of 51%, 64%, 68% and 59% for Cork, Donegal, Kilkenny and Monaghan respectively [1] Reference area: Increase of 0.88% on mean of herd incidence in 5years of study in comparison to mean of herd incidence of five years (1992-1997) prior to study [2]
Conclusions Drawn	"While badgers are clearly a source of cattle TB, careful evaluation of our own and others' data indicates that badger culling can make no meaningful contribution to cattle TB control in Britain." [1]	The significantly lower odds and hazard ratios of a confirmed restriction in the removal areas in comparison to the matched reference area can be reasonably attributed to the effect of proactive badger removal. [2]

Results and Conclusions

The inclusion of natural boundaries in the ROI trial is claimed[1] to have reduced the perturbation effect that was observed in the GB trail. However, other factors may have impacted on the discrepancy in the trials results, for example badger density, badger trapping efficiency and herd demographics. It is difficult to compare the actual BTB situation in both countries due to the differences in testing regimes applied; while every herd in Ireland is required to undergo a once yearly BTB test, in GB, the frequency of BTB tests depends on the TB status of the local parish, with testing regimes applied every 1, 2, 3 or 4 years. Though the trial sites underwent the same BTB testing regimes, the differences in the intervals between tests in GB and ROI make true herd incidence comparison a very difficult task, but one that is essential to allow a conclusive examination of both trials. Further work is required to reconcile the differences in herd demographics and BTB testing regimes in both countries to allow the most likely BTB incidence in both countries to be established.

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