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Badgers

The badger cull – key science questions answered

How many badgers are infected, will enough badgers be culled and is it all worth it? Here is a guide to the recent badger cull



There are concerns that not enough badgers have been culled in order to reduce cattle TB. Photograph: Christopher Mills/Alamy

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Most badgers aren't infected, is that correct?

The largest study of bovine tuberculosis (TB) in badgers was [the randomised badger culling trial, RBCT](#), which reported in 2007. Nearly 8,900 badgers were culled across large (100 km sq) areas where there was high risk of cattle TB. Their carcasses were subjected to detailed examination and testing, although the standard postmortems missed half of the

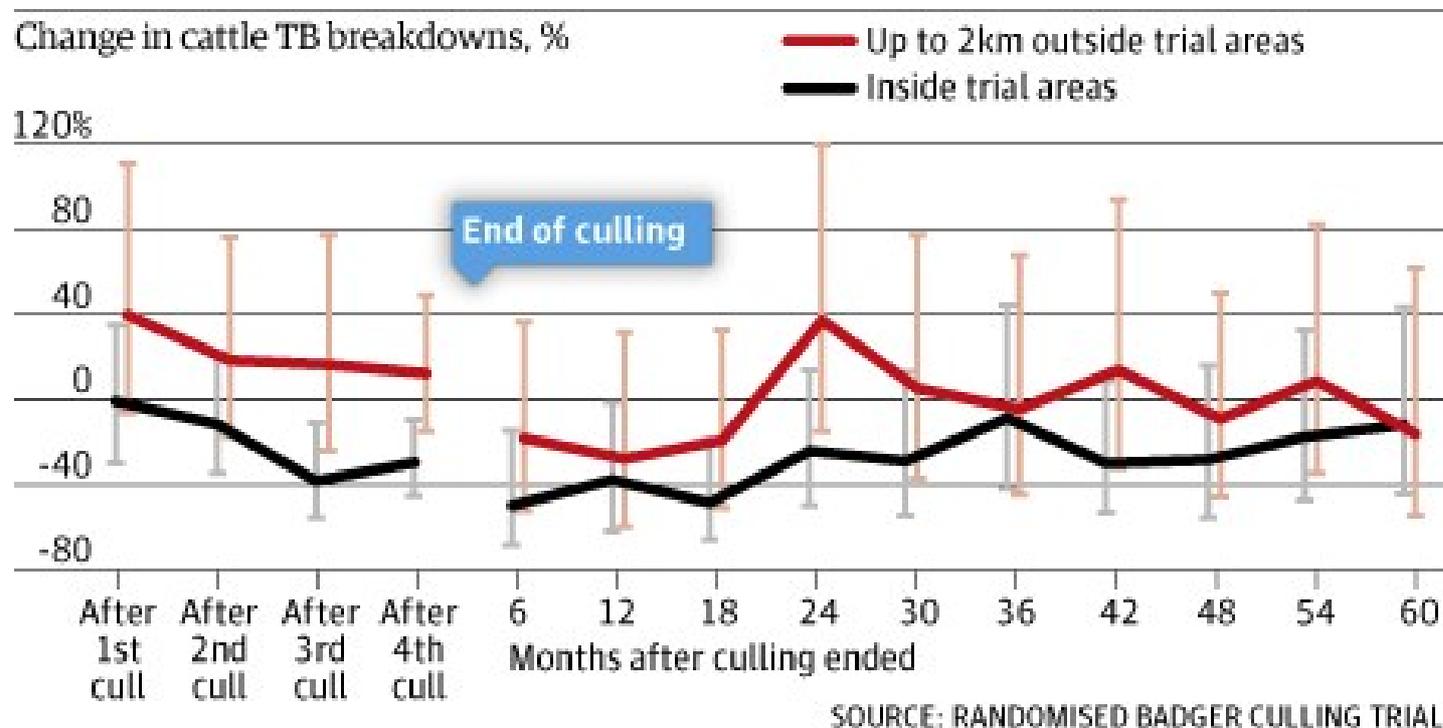
infections compared with extended postmortems. Overall, 16.6% of the badgers culled between 1998 and 2005 were found to be positive, based on the standard postmortem, indicating that about 33% were actually infected. But this percentage varied geographically and by year in the trial.

Do cattle really catch TB from badgers?

Most badgers are not infected, but those that are can transmit infection to cattle. Using a mathematical model and data from the start of the trial, I estimated that confirmed cattle TB rates would be halved if there were no transmission from badgers (meaning neither direct badger-to-cattle transmission nor onward cattle-to-cattle transmission of those primary infections). But this estimate is quite uncertain. Even without using the model, it is clear that in an 18-month period after widespread culling stopped in the trial, cattle TB in the culling area was reduced by roughly half. This estimate was more precise, being almost certainly between 38% and 66%. Thus, it is very likely that at least 38% of the confirmed cattle TB in trial areas stemmed from badger-to-cattle transmission, with half being the best estimate.

What is "perturbation" and why does it matter for cattle?

Effect of badger culling on cattle TB infections



The results of the £50m randomised badger culling trial that ended in 2006 showed that, five years after a series of four annual culls, there was a reduction in confirmed TB infections in cattle in the cull zones

There are fewer badgers per square kilometre in recently culled areas (unsurprisingly), but the badgers found there ranged more widely. This behavioural effect has been called social "perturbation". Areas with fewer badgers ranging more widely had reduced cattle risks when the reduction in badger density was large (70%). However, in areas with much smaller reductions in badger densities (in particular, land up to 2km outside extensive culling areas and areas subjected to small, reactive culls) there were increased cattle infections, presumably due to the increase in contact with perturbed, infected badgers. Within the trial, badgers culled in areas previously subjected to recent culling were more likely to be infected, presumably due to the perturbation.

Can we really expect a 16% reduction in cattle TB over several years for a single big cull?

The 16% figure was an estimate for the local impact of repeated culls over 150 km sq, taking into account the assumption that the background risk of cattle TB was higher in the culling area than on the land up to 2km outside it. It is not a 16% reduction nationally. Indeed, the impact of a single such cull would not be visible in national statistics.

16% was an average over several years of the cattle risk reduction, observed inside the culling area during four years of annual culling and in the years after culling stopped, set against the cattle risk increase observed up to 2km outside the

culling area during the years of annual culling.

How was the number of badgers to be culled arrived at?

For a particular cull zone, the size of the badger population was estimated (call this estimate N). The minimum cull number was then set sufficiently high to be confident that at least 70% of badgers would be culled. Due to statistical uncertainty in the estimate N, that minimum figure was more than 70% times N.

Will the current pilot culls be able to remove enough badgers?

We will have to wait for the report of the independent panel after the pilot culls have finished. The uncertainty over whether enough badgers can be removed (so that the reduction in badger density more than offsets the impact of badger perturbation) arises due to the use of a badger culling technique not used in the RBCT: shooting of free-running badgers. If substantially fewer than 70% of badgers were removed, there would be a risk that the population reduction was insufficient to reduce TB risks to cattle. In a worst-case scenario, it could conceivably be low enough to *increase* TB risks to cattle, due it seems to social perturbation of the remaining badger population. The tipping point for a reduction in badger density at which a cattle risk reduction becomes a cattle risk increase is not known. This has been a key concern among scientists arguing against the current culling approach.

The government is culling badgers in England. Why don't they cull cows instead?

The government does cull so-called "reactor" cattle every year, after they "reacted" to a diagnostic skin test for TB. [In 2012 more than 28,000 cattle were slaughtered in England to control TB](#). Cattle slaughtered for consumption are also inspected to detect any evidence of infection. Bovine TB control currently costs the government (in other words taxpayers) about £90m a year.

Is badger culling worth doing?

This is the big question. The answer cannot just be purely scientific. There are ethical, animal welfare and economic aspects, in addition to health and safety issues, that must be considered. However, science can provide quantitative predictions for many of the important "what if we?" questions.

- Christl Donnelly is professor of statistical epidemiology at Imperial College London and was a key member of the randomised badger culling trial (RBCT).

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