BVZS policy statement of bovine tuberculosis control 2013

BVZS believes that there is a need to control the spread of tuberculosis (bTB, *Mycobacterium bovis* infection) in both cattle and wildlife. The weight of scientific evidence currently available suggests that this is best achieved through:

- Cattle management methods both on individual farms and through control of movements between farms
- Biosecurity to limit badger cattle interactions
- Badger vaccination, and when made available cattle vaccination.

BVZS does not believe there is currently scientific evidence to suggest that a targeted cull of badgers can contribute positively to the overall control of bTB in cattle, can be employed in a way that protects animal welfare, or is economically viable.

Supporting information

That there is a link between badgers, cattle and *M. bovis,* is in no doubt (Krebs, 1997). Several properties of *M. bovis* infection in badgers are consistent with that of a maintenance host for the disease (Cheeseman *et al.*, 1988; Corner, 2006; Kaneene and Pfeiffer, 2006); badgers survive for several years after infection (Clifton-Hadley *et al.,* 1995) and infected females can reproduce (Delahay *et al.*, 2000). Shedding of *M. bovis* occurs via several routes and may be intermittent (Clifton-Hadley *et al.*, 1993; Clifton-Hadley *et al.*, 1995). The social behaviour of badgers facilitates maintenance of infection through use of communal setts (Clifton-Hadley *et al.*, 2001), and latrines (Delahay *et al.*, 2007), and through conspecific bite wounds (Clifton-Hadley *et al.,* 1993; Gavier-Widen *et al.*, 2001; Jenkins *et al.*, 2008a; Jenkins *et al.*, 2012). The presence of identical bacteria in cattle and badgers in endemic areas has been illustrated in several scientific studies (e.g. Goodchild *et al.*, 2012) and is suggestive of disease transmission between the species. The mode of transfer however, although well studied, is poorly understood.

The true level of bTB in cattle that originates from badgers is unknown. Much cited figures, projected from the results of the randomised badger culling trial (RBCT), suggest that up to 50 per cent of confirmed new cattle infections may arise from a badger source (Donnelly and Hone, 2010). This conversely implies that even in areas where badgers are significantly implicated in disease transmission over 50% of breakdowns are still attributed to other factors such as cattle management and movements.

The overall aim of eliminating *M. bovis* from the UK cattle herd, must therefore involve a reduction in the level of infection in both the cattle and badger populations as well as a decrease in the level of transmission within and between the two species. Theoretically this should involve the identification of infected individuals/groups, and their removal. Several problems however, arise.

- Tests for tuberculosis to identify infected, or perhaps more importantly infectious, individual animals are far from perfect in both their sensitivity and specificity in both species. BVZS fully supports all initiatives to develop more sensitive and accurate testing methods for cattle and other species.
- Whilst livestock are under human control and their management, testing and movement are understood and can be regulated, the same cannot be said of wildlife. Before any attempts are made to 'control badgers' it is essential to fully understand the badger ecology and ecosystem. BVZS fully supports the funding of studies to help better understand badger biology, ecology and the factors affecting disease transmission.

If *M. bovis* is to be eliminated from the UK herd, then it will almost certainly need to involve some method of disease control in badgers, as well as in cattle, and /or minimising the contact between the two species. Currently this could utilise a number of methods:

i. Minimise contact between infected cattle - cattle controls
ii. Minimise contact between infected cattle and/or infected badgers - biosecurity
iii. Provide immunity to at risk cattle and badgers - vaccination
iv. Reduce population density and number of infected animals – culling.

i) Cattle controls
Cattle to cattle transmission of infection both on and between farms remains the most important method of transmission of bTB (Johnston *et al.*, 2011) and must continue to be addressed by the farming community with the assistance of farm animal veterinary surgeons. Reducing cattle infection rates may also lead to a decline in the disease in badgers (Bourne *et al.*, 2007). The ongoing commitment of Defra to tackle these issues, in particular new surveillance methods (Defra, 2012[a]) and movement controls (Defra, 2012[b]) is supported by BVZS.

ii) Biosecurity
Badgers are omnivorous, exploiting earthworms as one of their main sources of protein in their diet. These are of course found in abundance on the permanent pastures that cattle graze and this provides common ground for the two animals to come into contact. Badgers also make use of cattle resources, for both for both shelter and food, and this has been recognised as a further opportunity for contact between the species and for both direct and indirect disease transmission (Cheeseman and Mallinson, 1981; Garnett *et al.*, 2002; Garnett *et al.*, 2003).

Although it is impractical to suggest that cattle and badgers can be kept apart at pasture, due to the expense of fencing and the agility of badgers for climbing and digging, there is however evidence that biosecurity around farm buildings can be usefully employed. Appropriately deployed simple exclusion methods such as gates, metal panels and electric fences prevent incursion by badgers into farm buildings (Tolhurst *et al*., 2008; Ward *et al*., 2010; Judge *et al*., 2011) and have been shown to be 100% effective in preventing badger entry into farm buildings (Judge *et al*., 2011). Farmers have however been shown to be poor at employing such methods (Ward *et al*., 2008; Bennett *et al*., 2005; Judge *et al*., 2011) and their financial returns are currently unknown, however the veterinary profession could do more to encourage more proactive behaviour.

iii) Vaccination

An intramuscular BCG vaccine was licenced for use in badgers in the UK in 2010 following considerable experimental research in the UK and Ireland (Lesellier *et al*., 2006; Corner *et al*., 2007; Corner *et al*., 2008; Lesellier *et al*., 2008; Lesellier *et al*., 2009). Vaccination of badgers has been shown to result in significant reduction in the severity of disease, the number of tissues containing acid-fast bacilli, and reduced bacterial excretion (Lesellier *et al*., 2011). Field studies have shown the vaccine to reduce positive serological results in badgers by 74% (Chambers *et al*., 2011). Modelling studies have additionally suggested that vaccination of badgers can make a significant contribution to controlling bTB in cattle (Wilkinson *et al*., 2004; Smith *et al*., 2012). As well as the direct effects of reducing disease in individual animals, BCG vaccination of badgers has been shown to have significant indirect effects, including reducing bTB infection in unvaccinated badger cubs when only a proportion of the social group is vaccinated (Carter *et al*., 2012).

Badger BCG vaccination has been used in some areas of England and is currently an important part of bTB control methods in Wales. BVZS would support efforts to use the vaccine more extensively in England.

It is recognised that there are delivery issues with an injectable vaccine and that an oral baited BCG vaccine would be preferable. An oral lipid matrix vaccine has been shown to be effective with a decrease in the number and severity of gross lesions, lower bacterial load in the lungs, and reduce the number of sites of infection in vaccinated badgers (Corner *et al*., 2010) and field trials of this vaccine continue in Ireland. BVZS fully supports this work.

Vaccination of cattle with BCG would obviously not have the delivery issues associated with a badger vaccine. Lack of clarity relating to cattle trade, especially within the EU, and the development of appropriate tests to differentiate between vaccinated and infected animals, have both slowed progress in this area. BVZS supports the development of a cattle BCG vaccine program that can be successfully deployed in the UK.

iv) Culling

Culling of badgers would lead to a decrease in badger population density, thus decreasing the likelihood of badger/cattle contact, as well as removing infected animals. The Krebs report (1997) recommended the establishment of the RBCT led by an independent scientific group (ISG) to investigate the benefits of badger culling on the incidence of bTB in cattle. The final report of ISG concluded that 'badger culling cannot meaningfully contribute to the future control of cattle TB in Britain' (Bourne *et al*., 2007). This statement is based both upon the effects of culling (as carried out in the RBCT) upon the disease in cattle and an economic assessment of the benefits of culling. BVZS believes that this statement remains accurate for the reasons explained below.

In the RBCT culling of badgers had both positive and negative effects upon bTB in cattle (Donnelly *et al*., 2006; Donnelley *et al*., 2007). The negative effects of culling were considered to be due to changes in badger behaviour as a result of culling referred to as 'perturbation' (Woodroffe *et al*., 2006). These positive and negative effects have continued post culling, however the positive effects have been seen to waned more slowly than the negative effects (Jenkins *et al*., 2008b; Jenkins *et al*., 2010), leading to calculations that an overall net benefit from culling would eventually be seen (Jenkins *et al.,* 2010). As a result of these calculations it has been suggested by Defra that by four years after a five years proactive cull over a 150km^2 area net benefit of culling would be a relative 12-16.0% reduction in bTB cattle herd incidence over the cull area and surrounding 2km ring. The only way for such a cull to be financially viable is for it to be farmer-led since the costs of cage-trapping (as undertaken in the RBCT), are too great to have financial benefit (Bourne *et al*., 2007; Wilkinson *et al*., 2009).

Many of our membership argue that the suggested 12-16% is too small a benefit to justify the culling of badgers. BVZS however, additionally does not believe that the 12-16% figure is an accurate estimation of what can be achieved. The estimates are based upon 'average' effects in RBCT. Even if culling was carried out using the same methods as in the RBCT the overall effect in a given area would be dependent upon variables such as cattle herd size, density of badgers, badger bTB prevalence, culling efficacy (number of badgers caught in a given time period), land access and barriers to badger movement. To extrapolate the result of the RBCT to other situations in this way is highly speculative.

Defra is however been convinced that the results of the RBCT can be extrapolated and that the suggested 12-16% benefit is worth pursuing, but perhaps most significantly, in order to make a cull cost effective the same methods as the RBCT cannot be used. In the proposed pilot cull areas shooting of free ranging badgers will replace cage trapping and shooting. This method is unproven and carries with it welfare concerns. BVZS does not believe that adequate assurances have been given that badger welfare can be monitored or that the impact on non-target species and the impact on the environment have been adequately considered. Additionally culling in the pilot areas may take place over six weeks (rather than 12 days in the RBCT) and this is likely to increase the perturbation effects of a cull. Culling efficiency in the RBCT was 70% (Smith *et al*., 2007; Woodroffe *et al*., 2008) and this target has been suggested, however no information has been given as to how such a figure is to be assessed. The efficiency of culling beyond the initial pilot areas will additionally be compromised by the large number of people required to be involved, the quality of marksmanship employed, the likelihood of interference and non-compliance, all of which will additionally reduce the perceived benefits and increase the risk of perturbation. Importantly it should also be remembered that Defra's culling proposals are not designed experimentally. If the proposed culls were to go ahead then their effects on bTB in cattle, when they are introduced alongside other measures and with no experimental controls, can never be scientifically evaluated.

In summary BVZS does not believe there is evidence to support a badger cull, in particular the current format proposed by Defra, and that BVA should review its current policy statement in line with current science and the best protection of the health and welfare of all animals under our care.

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