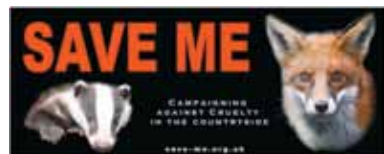




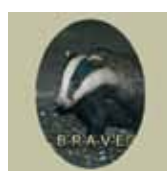
# **BACKING BADGERS:** **Why the cull will fail**

Team Badger refutes the top ten myths supporting the badger cull in England

Team Badger is a powerful coalition of the largest animal and wildlife welfare groups in the world. We are united in one purpose: to stop the badger cull.



RETHINK bovine TB



# Introduction

Bovine Tuberculosis (bTB), and the policy to control it, is devastating for farmers. It has a serious emotional and financial impact on their families and communities. bTB is a particular problem in certain areas, for instance it occurs at rates of high incidence in western England. A humane and sustainable solution needs to be found.

The government in England has announced that it is to proceed with pilot badger culls in two areas (likely to be west Somerset and around Tewkesbury, Gloucestershire with a reserve area in Dorset) to assess the effectiveness and humaneness of culling badgers by free shooting and public safety issues.

Licence applications for the culls, which will be delivered by farmers and landowners, are assessed against certain criteria set by the Department for Environment, Food and Rural Affairs (Defra). These include having the support of 70% of landownership in the area, ensuring that there is an appropriate level of competence for any marksman, ensuring that the cull takes place within a period of six weeks and that the application has sufficient funding for it to be sustained over a four-year period. Licences have been issued for both areas and it is expected that the cull could start as early as 1 June when the 'season' opens.

**Team Badger is against the badger culling policy and has previously expressed its concerns in briefings. These centre on the practical weaknesses of the cull and include:**

- rejecting claims that the policy will have a major impact on reducing bTB for cattle
- questioning the humaneness of shooting badgers
- questioning the monitoring of the cull and how this will ensure that the target of killing at least 70% of the badger population to reduce the disease is met but, at the same time, ensure that the culls are not detrimental to the survival of the populations of badgers
- questioning how long-term lessons can be gained from the pilots. In England, the government seems intent on rolling out the policy in up to ten additional areas despite any effect on the disease taking some years to be established.

**Our concerns remain but the cull is being driven and underpinned by wider claims from the government in England, farmers and others. This document will examine some of the claims being used and demonstrate how the government's underlying position is flawed.**

# Claim One:

You can only get rid of bTB by addressing the disease in wildlife.

The first assumption made by this claim is that the wildlife reservoir plays a significant part in spreading bTB to cattle and that bTB in cattle cannot be controlled without addressing the wildlife reservoir.

However, the major routes for infection of bTB in cattle are still uncertain but many studies clearly showing that spread directly from cattle is a major source.

The Independent Scientific Group (ISG) concluded, in their final report in 2007, that: “Our results indicate that while badgers contribute significantly to the disease in cattle, cattle-to-cattle transmission is also very important in high incidence areas and is the main cause of disease spread to new areas.” There are ways of addressing the disease in the wildlife reservoir that do not necessitate

the killing of animals. Other options such as vaccination or biosecurity measures reduce the risks of disease transmission between wildlife and cattle. Killing wild animals can be ineffective in preventing the spread of disease. The best-known example of the latter is rabies in Europe where culling foxes over many years was ineffective in halting the spread of rabies but a programme of vaccination using oral baits has now effectively controlled and virtually eliminated rabies over large areas of the Continent.

There are also risks associated with trying to control the disease by killing the wildlife reservoir. Badger culling seriously disrupts badger populations and has been shown to cause ‘perturbation’ in the remaining population, which may increase the risk of disease spread. Badger vaccination has been shown to reduce the severity and progression of bTB in badgers and, therefore, it is logical to assume that vaccinating badgers would reduce the number of bTB herd breakdowns in cattle. Maintaining the social stability of badger populations is key to reducing the potential for them to



## CLAIM ONE



**Cattle to cattle transmission is the main cause of disease spread to new areas.**

spread infection. A range of biosecurity methods exist which enable farmers to keep badgers out of farm buildings, therefore helping reduce the risk of disease transmission.

There have been instances where bTB has been controlled without managing the wildlife reservoir although it is unclear to what extent the disease was prevalent in wildlife. According to the European Commission many successful bTB eradication programmes have been implemented which led to seven countries being recently officially bTB free (OTF) such as France (2001) and

Latvia (2011) and in none of these did the occurrence of bTB in the wild population cause an insurmountable problem. Fifteen EU countries are currently OTF<sup>1</sup>.

There have been a number of other examples where bTB has been successfully controlled. In the UK, a bTB outbreak in north-west England was successfully controlled in the 1970s. Switzerland, where bTB in badgers has been found, has been free of bTB since the 1960s when entire herds were slaughtered rather than single reactor cows, as has been the policy in England<sup>2</sup>. A cow tested positive for bTB in 2013 resulting in the entire herd being slaughtered.

<sup>1</sup> European Commission 2011 Bovine and swine diseases annual report.

<sup>2</sup> <http://worldradio.ch/wrs/news/wrsnews/cows-infected-with-bovine-tb-culled.shtml?35284>; Sobrino et al 2008 bovine tuberculosis in a badger (*Meles meles*) in Spain. *Vet Record* 163: 159–160.

# Claim Two:

The reduction in bTB cases in cattle in the Republic of Ireland shows that a culling policy works.

It is unhelpful to compare the actual bTB situations in Ireland and England due to a number of factors, including those below.

- **The different testing regimens applied in the two countries.** In Ireland every herd is required to undergo a once-yearly bTB test, whereas in England the frequency varies from one to four years.
- **The differences in the badger populations.** Not only are the sizes of badger groups much larger in England than in Ireland<sup>3</sup> but there is a significant difference in the estimated badger population density, with reported national densities of 3.2 badgers km<sup>2</sup> in Britain and 1.9 badgers km<sup>2</sup> in Ireland<sup>4</sup>.

In his New Naturalist volume *Badgers* (2010) Tim Roper comments that: “... *there are differences in badger social organisation and population density between Britain and Ireland, and differences in farming practice, which almost certainly make the relationship between badgers and cattle rather different in the two countries.*”

Government ministers agree with this summary<sup>5</sup>.

In the Republic of Ireland, extensive badger culling has taken place over the past 25 years, and a reactive policy of badger culling in response to new incidents of bTB in cattle has been employed since 2002. A new cattle incident will trigger an intensive culling effort within a 2km radius of the affected farm, with the aim of reducing local badger density to below 0.5 badgers km<sup>2</sup> and then maintaining this low level. It has been estimated that the national badger population in the Republic of Ireland has been reduced by some 60% since the mid 1990s as a result of this policy, from around 200,000 in the early 1990s to around 84,000 today.

However, during this time the national cattle herd in Ireland also reduced by over 16% and the number of cattle herds by over 6%, whilst the testing on individual animals increased by 13.5%. Cattle testing also changed, with the IFN-γ test being used more regularly from 2000. This test is more

<sup>3</sup> Byrne, A. W. et al., 2012b. Impact of culling on relative abundance of the European badger (*Meles meles*) in Ireland. *European Journal of Wildlife Research*, pp. DOI 10.1007/s10344-012-0643-1.

<sup>4</sup> Bourne, F. J. et al., 2007. TB policy and the ISG's findings. *Veterinary Record*, 161(18), pp. 633–635. Sleeman, D. P. et al., 2009a. The effectiveness of barriers to badger *Meles meles* immigration in the Irish Four Area project. *European Journal of Wildlife Research*, 55(3), pp. 267–278.

<sup>5</sup> Hansard 16 May 2013 Col 379w.

## CLAIM TWO



**Northern Ireland has reduced bTB by improving testing, biosecurity and controls on cattle movement.**

accurate than the test previously used – the interferon skin test – so will identify infected animals more accurately. The annual total of reactors in Ireland has varied from year to year but after fluctuating between 23,000 and 30,000 it has dropped to around 18,000 in recent years. So, even this small reduction in bTB cannot be attributed to the badger culling policy. In 2012, 6,900 badgers were killed, at a cost of £3.4 million, but bTB reactors in cattle only reduced by 55 in the same time period.

In a long-term study of the impact of badger removal in the Irish Midlands, 16 years of badger culling, and a substantial reduction of the badger population density,

resulted in a decrease of some 22% in cattle herd TB incidence, however ongoing culling continued to reveal infected badgers. If, after such a long period of culling, the wildlife reservoir continues to be infected, the question of when the end-point of such policies would be is raised.

If trends in the incidence of bTB in the Republic of Ireland are compared to Northern Ireland, a similar trend has been occurring since 2006 and the incidence of bTB in the two jurisdictions is similar. However, the reduction in bTB in Northern Ireland has been achieved through enhanced testing, biosecurity measures and better cattle movement controls without any badgers being culled.



**A reduction in bTB has occurred in Northern Ireland without culling badgers.**

# Claim Three:

Case studies from the USA and New Zealand show that a cull of the wildlife reservoir is necessary.

New Zealand has seen a 94% reduction in bTB since it started culling possums in the early 1990s and to date more than 100,000 animals have been culled. The prevalence rate of bTB in herds has dropped from a peak of 3.87% in 1994/5 to just 0.35% in 2008/9.

However, as with Ireland, there are crucial differences between New Zealand and England. New Zealand has adopted a dual approach to controlling the disease and during this time has also had a clear strategy of cattle testing and implementing movement controls on infected cattle.

Unlike in England, New Zealand farmers have to pay for the cattle-related measures such as testing, which puts the onus onto farmers to oversee the strict testing guidelines and implement the biosecurity measures stringently. It was only when the farming community was subjected to strict biosecurity measures and cattle movement restrictions that the prevalence of bTB dropped.

Importantly possums, the wildlife reservoir in New Zealand, are an introduced alien species and cause significant damage to forests. Possums would be subject to a control/eradication programme irrespective of any bTB involvement whereas the badger in England is a protected, native species. Finally, there has been no perturbation effect seen in New Zealand when possums have been killed.

In Michigan, USA, bTB was found in white-tailed deer in the north-east of the state. A range of control measures were introduced, including: increased testing of cattle; depopulation of infected cattle herds; restrictions on artificial feeding of deer and increased culling of deer. The prevalence of bTB among deer has decreased over the last 15 years from about 5% in 1995 to about 2% in recent years in the core area of infection. However, the experience in the USA is not directly relevant to badgers in England. Firstly, the biology and behaviour of deer is different to badgers. Secondly, hunters were already culling deer and the artificial feeding of deer, which could easily be controlled, had exacerbated the disease problem. Finally, the range of measures adopted in Michigan were all implemented simultaneously so it is difficult to establish what impact, if any, the culling of deer had on reducing the disease. Crucially, unlike in England, positive tests among cattle were followed by depopulation of the affected herds, rather than the individual animal 'test and slaughter' approach that is used in the UK.





Species affected by bTB in other parts of the world include white-tailed deer in Michigan, USA and the possum in New Zealand.

# Claim Four:

The legal protection of badgers has coincided with the recent rise in bTB.

The badger has been a protected species since 1973. Initially this protection was rather limited but legislation was strengthened in 1981, 1985 and 1991.

It is difficult to extrapolate the impact this has had on badger population trends, as it is only in the past year that the first major population survey of badgers in ten years has taken place.

Badger protection has been effective in reducing badger persecution but in some research areas, where persecution has not been an issue, badger numbers have increased and it is suggested that this is a reflection of changing weather patterns.

Given that badgers rarely cover great distances, the widespread and frequent movement of cattle provides a much more convincing explanation of the spread of bTB in the UK. The map opposite shows the pattern of bovine TB from 2006 to 2010, highlighting that there are many confirmed cases which are isolated from each other.

Recently published research from Durham University has indicated that whilst badgers almost certainly play a part in spreading the disease, their impact over the decades has been far less than others have suggested. Professor Peter Atkins of Durham University has stated: "It is very

probable that other animals did and do carry TB, including badgers and deer, but cattle-to-cattle transfer is likely also to be an important factor. For example, only one out of nearly 400 badgers killed in road accidents in Cheshire over two decades tested for the disease turned out to be positive. This goes against received wisdom that bTB would have stayed in badgers which obviously weren't culled when the cattle were in previous decades, and they then re-infected cattle stocks. But this interspecies transference seems unlikely to have occurred on the necessary scale.

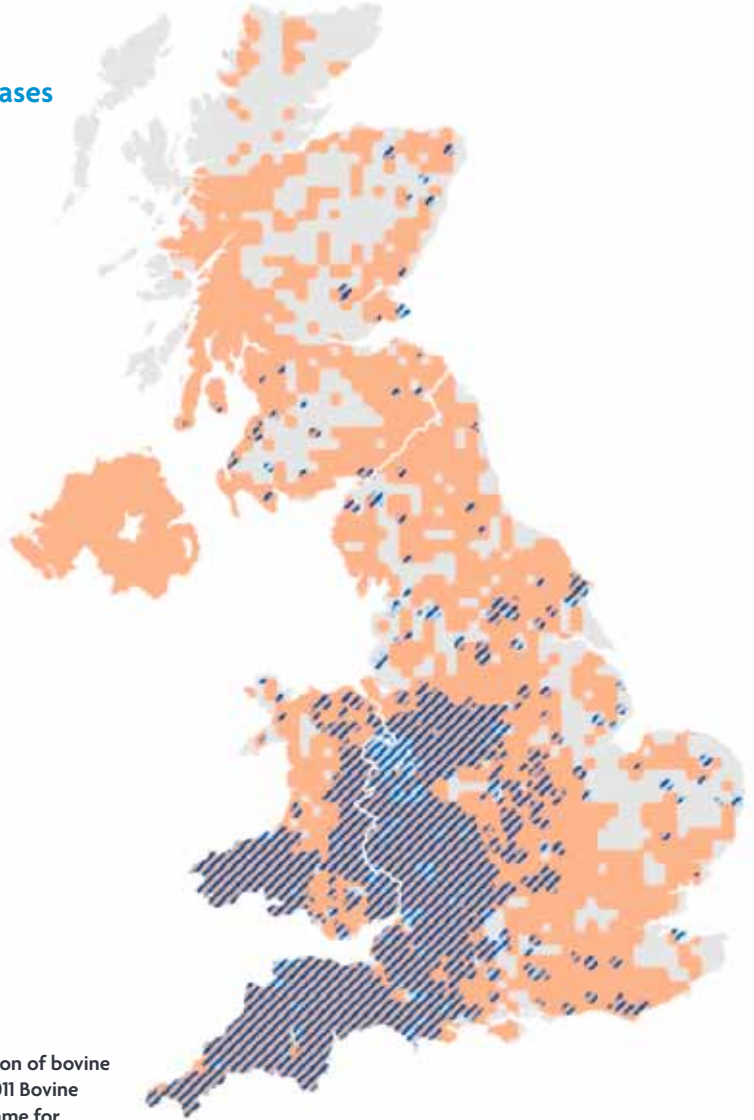
Research has shown that in undisturbed badger populations the animals' social structure mitigates against new incident cases of disease. Strategies based on culling may have been a contributory factor to the increase in disease."

Such recent research casts serious doubt on the likely rate of both direct and indirect interactions between badgers and cattle, bringing the importance of badgers as the source of infection further into question.

## Distribution of badgers and Bovine TB in the UK:

■ Badgers

▨ Confirmed cases  
of cattle TB  
2006–2010



Map showing distribution of bovine TB 2006–2010 (Defra 2011 Bovine TB eradication programme for England) and distribution of badgers.

Source: Defra

# Claim Five:

There continues to be a rise in bTB in cattle.

There is often variation from year to year in the number of new bTB incidence in cattle and the number of cattle slaughtered because of bTB. For example, in 2005, over 29,000 cattle were slaughtered as reactors but in 2006 this fell to 22,062 before rising in 2009 to over 39,000. It is also clear that testing of cattle has risen during this time.

**The changes below occurred since this time.**

- **There was a marked relaxation of cattle testing and movement and even by 2011 the removal of cattle reactors from a herd was below the time target set by Defra<sup>6</sup>.**
- **The badger culling policy in place from 1986 to 1998 may also have contributed to spreading bTB as a result of ‘perturbation’ in the badger population.**
- **The 2001 outbreak of Foot and Mouth Disease meant that over six million animals were slaughtered and farmers were forced to restock with cattle that often came from the south-west, a traditional cattle breeding area.**
- **Testing of cattle has increased but the percentage of cattle slaughtered to those tested has remained fairly constant.**

When a bTB outbreak occurs on a farm cattle movement restrictions mean that the farm may have to carry extra stock. If cows are subsequently removed for slaughter then the pecking order within the herd is continually changing, resulting in anxiety. Cattle under stress are more susceptible to infection and cows infected with bTB can spread the disease very efficiently within the herd through saliva or aerosol droplets or through the communal feeding and drinking areas.

Finally, the testing protocols have flaws. There are significant false negatives with the Single Intradermal Comparative Cervical Tuberculin (SICCT) test resulting in infected cattle remaining in a herd, further spreading infection. There have been a number of cases of fraud and procedural abuse with animals being sent to market from herds that are under restriction.

<sup>6</sup> [http://rpa.defra.gov.uk/rpa/index.nsf/vContentByTaxonomy/BCMS\\*\\*Statistics\\*\\*2010%20Statistics\\*\\*?](http://rpa.defra.gov.uk/rpa/index.nsf/vContentByTaxonomy/BCMS**Statistics**2010%20Statistics**?OpenDocument)  
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# Claim Six:

It is difficult to control the movement of animals.

The European Commission in its evidence to the Environment Food and Rural Affairs committee (EFRA) states that the UK has more movement of cattle than any other country in the EU. They urged for greater movement restrictions to be introduced as a priority as cattle movement is such an important part of disease transmission.

Around 40% of all British cattle are moved annually and over 13 million cattle movements take place every year as farmers buy and sell stock. Closely mirroring the historical rise in bTB cases is the rise in cattle movements, with 480,294 more cattle moved in 2010 than 2009<sup>7</sup>. Cattle movements have more than quadrupled between 1999 (3,373,646) and 2010 (13,690,294) and have involved over 127 million animals since 1998<sup>8</sup>.

The outbreak of Foot and Mouth Disease in England in 2001 highlighted the extent to which cattle were moved around the country. The European Commission, in its last mission to the UK to assess bTB controls, found that there were numerous movement derogations and pre-movement test exemptions that led to incomplete herd testing and targets to remove reactors from herds where there was a disease outbreak were not being met<sup>6</sup>. Additionally, not all infected cattle 'on farm' were isolated.



<sup>7</sup> <http://rpa.defra.gov.uk/rpa/index.nsf/UIMenu/C2268E828EFED0B280256FE300347A0C?Opendocument>

<sup>8</sup> European Commission Report of an audit of the UK on the operation of the bTB eradication programme 2011-6057.

# Claim Seven:

Badgers that are infected with the disease suffer so culling badgers will improve their welfare.

Bovine TB in badgers can affect the lungs and other organs such as the kidneys. However, infected badgers can live for many years without showing any clinical signs of disease. In a large sample of badgers culled during the Randomised Badger Culling Trials (RBCT) only about 1% had extensive, severe, signs of disease.

There is no evidence that bTB has had any negative impact on the badger population. As infected badgers often show no signs of the disease and only post-mortem examinations will be able to assess if the animal had the disease, it is currently impossible for any cull to solely target and remove diseased animals.

As both infected and uninfected badgers will cohabit a sett it will also be impossible for any cull to target only setts containing diseased animals. Some setts may contain no diseased badgers but will still be targeted by the cull. Even in bTB

'hotspots', using the standard diagnostic tests, less than one in seven badgers were found to be infected and when road-killed badgers from seven hotspot counties were examined the proportions were almost the same (15% infected).

In the RBCT, although culling reduced badger density, it increased the prevalence and spread of bTB within the badger population. By the fourth year of culling, the prevalence of infection was approximately double that recorded following the initial cull. Culling did not eradicate bTB from the badger population.



Badger vaccination is being used successfully in many populations in England.

# Claim Eight:

Many scientists support the badger culls.

Lord Krebs, who chaired a review team which originated the idea of the RBCT, has argued: “The scientific case is as clear as it can be: this cull is not the answer to TB in cattle. I have not found any scientists who are experts in population biology or the distribution of infectious disease in wildlife who think that culling is a good idea. People seem to have cherry-picked certain results to try and get the argument they want.”<sup>9</sup>

Lord Robert May, a former government Chief Scientist and President of the Royal Society, has said: “It’s very clear to me that the government’s policy does not make sense.” He added: “I have no sympathy with the decision. They are transmuting evidence-based policy into policy-based evidence.”

The recently retired government Chief Scientist Prof Sir John Beddington has refused to back the cull. When asked if it could make a meaningful contribution to tackling TB in cattle, he replied: “I continue to engage with Defra on the evidence base concerning the development of bovine TB policy. I’m content that the evidence base, including uncertainties and evidence gaps, has been communicated effectively to ministers.”

In April 2011, Defra brought together a number of experts, and claimed they had agreed that a badger cull carried out in the right way would help to prevent the spread of bTB in cattle. Professor Rosie Woodroffe, of the Zoological Society of London, said: “The document simply doesn’t endorse the policy.” She also stated: “Furthermore, all the evidence shows that culling badgers increases the proportion of badgers that have TB.” The meeting also concluded that: “The RBCT provides the best scientific evidence available from which to predict the effects of a future culling policy. Informed expert opinion suggests that the more a future culling policy deviates from the conditions of the RBCT (such as industry versus government-led and changing culling methods) the more likely it is that the

<sup>9</sup> BBC Radio *Today* programme October 12 2012.

## CLAIM EIGHT



effects of that policy will differ, either positively or negatively, and with potential variability in outcome between areas.”

The current policy differs widely from the conditions of the RBCT in several key respects, including the method of culling, the people who will be responsible for conducting the cull, and the areas and time period over which culling will occur.

In a letter to *The Observer* on Sunday, 14 October over 30 scientists, including Professor John Bourne, former Chairman of the ISG, Professor Sir Patrick Bateson,

President of the Zoological Society of London, Professor Sir John Lawton, former Chief Executive of the Natural Environment Research Council, Dr Chris Cheeseman, formerly of the Food & Environment Research Agency, Professor Denis Mollison, former Independent Scientific Auditor to the RBCT, and Professor Richard Kock, Royal Veterinary College, wrote that: “... the complexities of TB transmission mean that licensed culling risks increasing cattle TB rather than reducing it”. The letter ends stating: “... culling badgers as planned is very unlikely to contribute to TB eradication.”



# Claim Nine:

It is cheaper to cull than to vaccinate badgers or introduce better biosecurity.

The costs of the two trial culls are estimated to be £1.45 million for survey work and the costs of Natural England administering the cull. Added to this is the figure for policing which the government estimates as £2 million per cull area<sup>10</sup>, a cost that has risen four-fold in the past year.

If the cull is rolled out across England, the bill for taxpayers could reach between £10 million and £20 million. Defra has estimated that the cost of vaccinating badgers is around £2,250/km<sup>2</sup>/year<sup>11</sup>, a cost that it is likely to come down. For example, giving evidence to EFRA, scientists from the Food and Environment Research Agency (FERA) indicated some ways in which volunteers might work in conjunction with professionals that would reduce the costs of using the injectable vaccine to vaccinate badgers. Additionally, for farmers in the cull areas monetised costs exceed benefits.

Measures have already been taken in England by the government to improve biosecurity but much more can still be achieved in terms of limiting contact between cattle and local wildlife, stringent

application of cattle testing and, perhaps most importantly, eliminating the spread of bTB between herds by better control of cattle movements. From 2005 to 2009 the Central Science Laboratory (CSL) conducted an experiment to assess whether it is possible to reduce contact between badgers and cattle within farmyard buildings, and concluded that badgers were not able to access the building if the exclusion measures suggested were used, with a success rate of 100%<sup>12</sup>. Recent data indicates “... the average cost to farmers to improve biosecurity is about £4,000. Considering the average cost of dealing with a TB herd breakdown in GB (about £27,000), these measures would appear to be a cost-effective way of attempting to reduce potential TB transmission between species.”<sup>13</sup>

<sup>10</sup> Hansard 25 March 2013

<sup>11</sup> Measures to address bovine TB in badgers. Final Impact Assessment. Defra. November 2011.

<sup>12</sup> Godwin-Pearson, G. Common sense and bovine TB. The BOW Group. 2012

<sup>13</sup> <http://www.dardni.gov.uk/afbi-literature-review-tb-review-badger-to-cattle-transmission.pdf>

# Claim Ten:

## Badger vaccination is impractical.

An injectable badger vaccine, Badger BCG, has been licensed for use in the United Kingdom since March 2010 and was introduced following ten years and £11 million of Defra-funded research and development<sup>14</sup>.

In 2012 over 2,500 badgers have been vaccinated using the injectable vaccine. Most of these have been in the Intensive Action Area in Wales (over 1,400)<sup>15</sup> and the Badger Vaccine Deployment Project area in Gloucestershire (989)<sup>16</sup>. However,



Over 2,500 badgers were vaccinated in 2012.

conservation organisations such as the National Trust, the Wildlife Trusts, the RSPB and private individuals have also been vaccinating badgers. This indicates that using an injectable vaccine in wild badgers is feasible and contradicts claims that such vaccination is “impractical”. In addition, there is good evidence that an injectable bTB vaccine is safe and provides at least partial protection in badgers as it has been shown to reduce the severity and progression of bTB in infected badgers. Vaccinated badgers showed a reduction in lesions and bacterial count compared to unvaccinated animals<sup>17 18</sup>. Recent research has also shown that BCG vaccination in a wild badger population significantly reduces the risk of bTB infection in vaccinated badgers and in unvaccinated cubs. The unvaccinated, susceptible cubs were indirectly protected from disease transmission through a ‘herd immunity’ effect<sup>19</sup>. The benefit of this is that there is no need to vaccinate 100% of susceptible animals in a population to get a protective effect, only enough animals to break the transmission cycle<sup>20</sup>.

## CLAIM TEN



**The injectable vaccine 'Badger BCG' has been licensed for use in the UK since 2010.**

As a significant percentage of those wild badgers that receive an injectable vaccine are likely to become resistant to infection and/or disease and will play a reduced part in transferring the disease between badgers and cattle, repeated vaccination in an area is likely to reduce the level of bTB infection and disease in the local badger population and thus reduce the risk to local cattle from badger-to-cattle transmission<sup>21</sup>.

So, a badger vaccination programme in targeted hotspot areas can not only have an impact on the disease but also get

farmer support, as has happened after one project, run by the National Trust, which shows a substantial shift in the views of tenant farmers now that trapping and vaccinating badgers has been shown to be practical<sup>22</sup>.

Vaccination modeling has shown that the differences between the outcomes of culling or vaccinating badgers are quite modest. Over a 300km<sup>2</sup> area, over a ten-year period, the difference between strategies appears to be less than one herd breakdown per year<sup>23</sup>.

<sup>14</sup> Joint VLA & Fera Press Release. First tuberculosis vaccine for badgers is authorised. 29 March 2010.

<sup>15</sup> Welsh Government Press Release. Badger vaccination total tops 1,400. Wednesday 28 November 2012.

<sup>16</sup> FERA website. Badger vaccine deployment project. (Downloaded 13.12.2012).

<sup>17</sup> Report of the Bovine TB Science Review Group. Welsh Government. November 2011.

<sup>18</sup> Chambers et al (2011) Bacillus Calmette-Guerin vaccination reduces the severity and progression of tuberculosis in badgers. *Proceedings of the Royal Society B – Biological Sciences* 278:1913-1920.

<sup>19</sup> Carter et al. (2012) BCG Vaccination Reduces Risk of Tuberculosis Infection in Vaccinated Badgers and Unvaccinated Badger Cubs. *PLoS ONE* 7(12): e49833. doi:10.1371/journal.pone.0049833.

<sup>20</sup> Defra (2011) Veterinary assessment of vaccination of badgers against *M. bovis*.

<sup>21</sup> Op cit. Reference 5.

<sup>22</sup> Minutes of evidence. Northern Ireland Assembly Agriculture and Rural Development Committee report. November 2012.

<sup>23</sup> Smith et al. Comparing Badger Management Strategies for Reducing Tuberculosis Incidence in Cattle. *PLoS ONE* 7(6): e39250. doi:10.1371/journal.pone.0039250.

# Conclusions:

The top ten claims supporting badger culling have been addressed in this report and shown to be wanting.

Team Badger strongly advocates improvements in biosecurity measures in cattle, and the use of vaccination in badgers and cattle as solutions to the problems associated with bTB infection.

Badger vaccination would avoid the negative perturbation problems associated with badger culling. It would not cure already infected animals but since the prevalence of bTB in badger populations is relatively low, and since the typical lifespan of a badger is three to five years, infected animals would die off naturally therefore reducing the disease risk to cattle. It is not necessary to vaccinate

all badgers in order to have an impact on disease transmission. Cattle vaccination may be the final solution once the existing legal obstacles at an EU level have been overcome (after the recently developed differentiation of infected from vaccinated animals test (DIVA) has been validated by the World Organisation for Animal Health) and the relevant European laws are amended.



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