Department
for Environment
Food & Rural Affairs

Next steps for the strategy for achieving bovine tuberculosis free status for England

The government's response to the strategy review, 2018

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Secretary of State's foreword: Next steps for a bovine tuberculosis free-England

Bovine TB (bTB) is one of the most difficult and intractable animal health challenges that England faces today. Around 30,000 cattle have to be slaughtered annually due to infection. Our cattle breeders suffer the loss of prize winning animals and valued herds and this loss creates considerable trauma in the farming industry.

BTB is a very difficult disease to eradicate for a number of reasons. It is a slow moving, insidious disease which is difficult to detect. The diagnostic tests that exist are not perfect; the disease can survive in the environment for several months. BTB is harboured in wildlife with badgers being a known vector. The BCG vaccine provides only limited protection and does not cure infected badgers. There is no example of a country that has successfully eradicated bTB without also addressing the presence of the disease in wildlife.

However, the United Kingdom (UK) has previously managed to turn the tide on bTB and we can do it again. In the 1930s around 40% of cattle herds suffered from bTB. A combination of cattle movement controls, testing and slaughter of infected cattle and wildlife controls through badger culling managed to bring the disease to near eradication by the early 1980s.

However, since the late 1980s, bTB has spread and the 2001 Foot and Mouth Disease outbreak led to a suspension in testing and then widespread restocking of farms. This meant that in the first five years of this millennium, the disease once again spread rapidly and became our number one animal health challenge.

Our 25-year strategy to eradicate bTB published in 2014 is founded in science. It applies the lessons of our history in previous attempts to control the disease as well as evidence from other countries around the world and trial work conducted in the UK during the 1970s and, more recently, during the Randomised Badger Culling Trial conducted between 1998 and 2007.

The cornerstone of our strategy, as before, is a policy of regular testing and removal of infected cattle from herds. We have also incrementally introduced tougher restrictions on cattle movements from herds at risk of infection and more sensitive tests. We have introduced measures to encourage greater risk management and more information for the keepers of cattle. We have also deployed wildlife controls in areas where the disease is rife and we have deployed new biosecurity measures to try to break the cycle of infection between cattle and badgers.

Since the initial badger cull pilot in 2013, a policy of badger control has been rolled out in many parts of the High Risk Area (HRA) in the south-west and west of

England. As of 2019, 57% of the HRA is now subject to a licensed cull of badgers. This policy, while difficult and inevitably contentious, is starting to yield results. The latest epidemiological analysis conducted by Downs and others has shown that the incidence of the disease in the first cull areas of Somerset and Gloucester has fallen substantially, by 37% and 66% respectively.

However, the badger is an iconic, protected species and no one wants to be culling badgers forever. An intensive badger cull was only ever envisaged as a phase of the strategy, not a perpetual state of affairs. Therefore, five years into the current strategy, it is appropriate to take stock and consider how the policy might be evolved. That is why the government asked Professor Sir Charles Godfray to conduct a review of the bTB strategy which concluded in October 2018. This response outlines the next steps the government intends to take.

The UK benefits from world-leading science and the government believes we should deploy our expertise to accelerate the development of a deployable cattle vaccine against bTB. While the current BCG vaccine will never provide full protection, the government will accelerate work to authorise a test that can differentiate between the disease and the vaccine, and initiate the research and trial work needed towards the aim of having a deployable vaccine in the next five years. Vaccination is manifestly easier to deliver to herds of cattle than to wildlife and could significantly reduce the spread of the disease both between cattle and between cattle herds and wildlife. BTB is a global challenge and not every country can afford to test and remove cattle. The UK can harness its world-leading science in developing solutions such as vaccination that would also be valuable to other countries trying to fight the disease.

The government will also begin an exit strategy from the intensive culling of badgers, while ensuring that wildlife control remains a tool that can be deployed where the epidemiological evidence supports it. As soon as possible, we intend to pilot badger vaccination in at least one area where the four-year cull cycle has concluded, with simultaneous surveillance of disease. Our aim is to identify an exit strategy from culling in those areas that have completed the four years of intensive culling by deploying vaccination to the remaining badger population.

While the government must retain the ability to introduce new cull zones where the disease is rife, our aim will be to allow future badger culls only where the epidemiological evidence points to a significant reservoir of the disease in badgers. We envisage that any remaining areas would join the current cull programme in the next few years and that the badger cull phase of the strategy would then wind down by the mid to late 2020s, although we would need to retain the ability to cull in a targeted way where the epidemiological evidence requires it.

In the Edge Area, where some vaccination projects have been supported, our aim will be to ensure that badger culling is only authorised in areas where the epidemiological evidence points to a problem in badgers. We will continue to support

badger vaccination projects in areas where the prevalence of disease is low. We will also investigate the potential for projects where adjacent vaccination and culling could complement each other in controlling disease. Changes to our guidance to Natural England on licensing badger control will be subject to consultation.

Finally, the government will support the deployment of better, more frequent and more diverse cattle testing so that we are able to detect the presence of the disease earlier and remove it from cattle herds faster. As a first step, the frequency of mandatory surveillance testing in two counties which form part of the HRA – Shropshire and Staffordshire – will increase from annual to six-monthly from later in 2020. We expect this to be extended to all parts of the HRA from 2021. Improving the efficacy of our testing regime through better diagnostics is a key component of a successful strategy.

There is no single answer to tackling the scourge of bTB but by deploying a range of policy interventions, we can turn the tide on this terrible disease and achieve our long-term objective of eradicating it by 2038.

The Rt Hon George Eustice MP
Secretary of State, Department for Environment, Food and Rural Affairs

Executive summary

1. Bovine tuberculosis (bTB) is one of the most pressing animal health problems in England. It results in the compulsory slaughter of over 30,000 cattle a year, combined costs to the taxpayer and industry of around £150 million a year, and has severe impacts on the health and welfare of farmers and farming communities. Left unchecked, bTB poses an increasing threat to animal health and welfare, and to public health.

2. The government's 25-year bTB eradication strategy ('the bTB Strategy') published in 2014 aims to secure officially bTB free (OTF) status for England by 2038. In 2018, the Environment Secretary commissioned Professor Sir Charles Godfray and a team of experts to conduct an independent review of the strategy and provide advice on how to take it to the next phase ('the Godfray Review'). Sir Charles submitted his report to Ministers in October 2018.

3. The government has considered the Godfray Review findings in detail, in partnership with stakeholders. The Review has provided an opportunity to regroup and refocus the shared government and industry efforts on achieving OTF status for England by 2038. There are no easy answers but we do have a range of effective tools available. The Review is clear that the current bTB situation cannot be allowed to continue and that what is required is a new drive and concentrated and concerted effort by all sectors involved.

4. This response sets out the approach planned for the next five years in pursuit of that goal.

5. The government's top priorities for this period are:

    a. Accelerating work to develop a deployable cattle bTB vaccine within the next five years.

    b. Evolving the badger control policy with increased support for badger vaccination, following the wide-scale deployment of effective, industry-led intensive badger culling. Detailed analysis has shown that this intensive culling has been associated with reductions in herd bTB incidence of 66% and 37% in the first two areas over the first four years[1]. The government envisages that the current intensive culling policy would begin to be phased out in the next few years, gradually

[1] Downs, S.H. and others (2019) Assessing effects from four years of industry-led badger culling in England on the incidence of bovine tuberculosis in cattle, 2013-2017. Scientific Reports, 9, 14666.

replaced by government-supported badger vaccination and surveillance. Culling would remain an option where epidemiological assessment indicates that it is needed. Changes to Defra's guidance to Natural England (NE) on licensing badger control will be subject to consultation.

c. Improving diagnostic testing to root out bTB more effectively, with deployment of more sensitive tests for surveillance supported by greater use of on-farm restriction of cattle with inconclusive test results.

A summary of plans for the next five years

Acceleration of work to develop a deployable cattle bTB vaccine, as part of a wider programme of bTB research – a deployable cattle bTB vaccine with the objective of introduction within the next five years is a top priority. It is expected to be a game-changer in terms of providing a strong additional tool to help eradicate bTB. Other research strands include diagnostic test development, managing TB in wildlife, on-farm biosecurity, socio-economic factors and policy design and evaluation.

Evolving the strategy for preventing the spread of TB from wildlife – following the wide-scale deployment of effective, industry-led intensive badger culling and recognising the need to bank the benefits, maintain progress on bTB eradication and shift towards non-lethal control methods. The government envisages that the current intensive culling policy would begin to be phased out in the next few years, gradually replaced by government-supported badger vaccination and surveillance. Culling would remain an option where epidemiological assessment indicates that it is needed. Changes to Defra's guidance to NE on licensing badger control will be subject to consultation.

Improving diagnostics, surveillance and epidemiology to root out bTB more effectively – increasing the sensitivity of cattle surveillance testing, strengthening the management of infected herds and roll-out of new epidemiological tools to understand better the likely source of bTB and better target delivery of disease control policies.

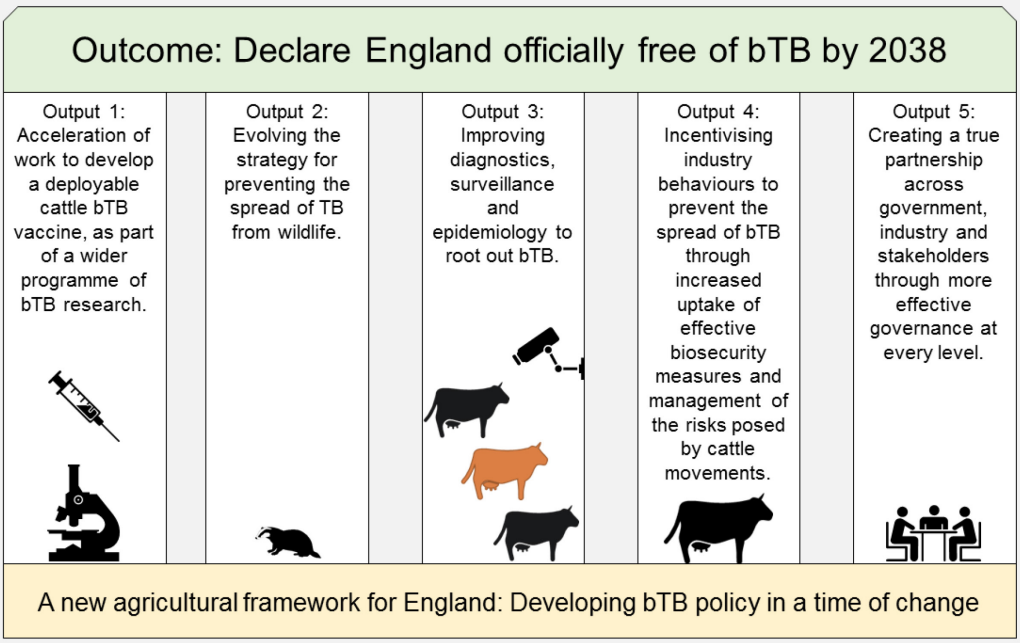
Incentivising the uptake of effective biosecurity measures and managing the bTB risks posed by cattle movements to reduce the risk of spread of bTB within and between farms – improving sources of advice, creating the right incentives, maximising the use of existing tools such as the Information bTB website (ibTB) and developing new innovations in partnership with industry. The Livestock Information Service (LIS) will be a particularly important tool for supporting responsible cattle movements.

Developing governance of bTB eradication – establishing a new 'Bovine TB Partnership' between government and industry to encourage shared ownership, coordination and decision making on bTB eradication and harness the collective will to eradicate bTB. The government plans to consider an animal health levy alongside other options for funding the delivery of bTB controls.

6. The Godfray Review highlights the opportunities presented by leaving the European Union (EU) and the Common Agricultural Policy (CAP). This government response considers the wider context in terms of regulatory reform, structural change and farm productivity. The government's Industrial Strategy aims to secure the UK's position as a global leader in sustainable, affordable, safe and high-quality food and drink. We cannot ignore the significant threat that bTB poses to the health, productivity, sustainability and reputation of our national livestock sector in an increasingly global market.

7. The UK as a whole continues to experience the highest levels of bTB of any developed country in the world. To achieve OTF status by 2038 and deliver benefits for a Global Britain, we must accelerate our efforts at farm, regional and national level supported by the best available evidence and tools. Priorities include reversing the rising bTB trend in the Edge Area, continuing to bear down on bTB in the High Risk Area (HRA) banking the disease control benefits in badger cull areas and keeping bTB out of the Low Risk Area (LRA). Eradicating bTB in England will come with more costs in the short to medium term and government is committed to playing its part.

8. The government does not underestimate the challenge for the farming sector, particularly in those parts of England worst affected by bTB. That is why it is essential that government, farmers, vets, local authorities, auction markets, retailers, food manufacturers, and wildlife and conservation groups rise to this challenge together and with urgency so that the sector and the wider economy can realise the ultimate prize that OTF status for England offers. We can achieve this if all interested parties work together to eradicate bTB.



1. Introduction

9. BTB is an infectious and contagious disease with a complex epidemiology. The UK has the highest level of bTB in the developed world, although Scotland is officially free of the disease and the east of England is relatively unaffected. BTB remains one of the most pressing domestic animal health problems in England with a significant number of affected herds. The cost and scale makes it one of the leading challenges that the cattle industry faces, particularly in the south-west and west of the country.

10. Tackling bTB in England is estimated to cost the taxpayer around £100 million a year, with costs to industry running to a further £50 million. It has a profound negative impact on the confidence and productivity of our cattle sector. The government is acutely aware of the burden that bTB places on the welfare and well-being of farmers and their families. The presence of TB infection in badgers remains a key challenge in parts of England and the government is also acutely aware of the range of, often strongly held, opinions about how best to address this issue. However, detailed analysis has shown that industry-led, intensive badger culling has been associated with reductions in herd bTB incidence of 66% and 37% in the first two areas over the first four years (see footnote 1).

11. The government published its bTB Strategy in April 2014[2] following extensive public consultation. The bTB Strategy sets out a range of interventions to fight the disease, aiming to achieve OTF status for England by 2038. It envisages farmers, vets, non-governmental organisations (NGOs) and government working together to free England of bTB.

12. Government oversees the bTB Strategy to ensure compliance on a national scale. The bTB Strategy safeguards England's farming sector and ensures that the UK complies with stringent international trade requirements for cattle and their products. Based on the experience of Foot and Mouth Disease in 2001 when bTB testing was temporarily suspended, we would expect the number of bTB-infected cattle herds to increase without the bTB Strategy. Over time we would see a decline in herd health resulting in productivity losses through poor growth rates and reduced milk yield. The estimated benefits in terms of avoiding productivity losses exceed the annual government costs of the bTB Strategy. There are a range of other potential

[2] A strategy for achieving Officially Bovine Tuberculosis Free status for England www.gov.uk/government/publications/a-strategy-for-achieving-officially-bovine-tuberculosis-free-status-for-england

benefits too, including for trade, public health, animal welfare and the environment.

13. The bTB Strategy recognises the need to apply different tools in different herds depending on local circumstances and disease risk, and defines three different risk areas in England (Figure 1.1). It aims to preserve the LRA in the north, east and south-east of England, stop and reverse the spread of bTB at the Edge Area and reduce the level of infection in the HRA spanning the south-west and west-midlands.

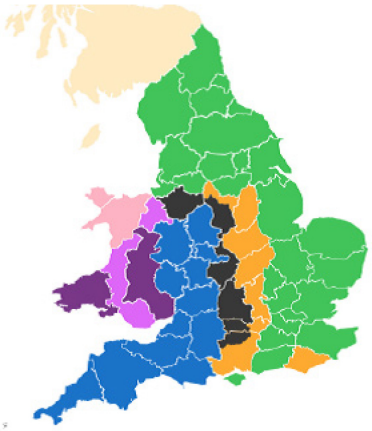


Figure 1.1: Map showing the current bTB risk areas of England. The LRA is shaded green. The HRA is shaded blue. The Edge Area comprises the orange-shaded area where cattle herds are tested for bTB annually and the black-shaded area where cattle herds are tested every six months.

14. To date, the principal elements deployed in the bTB Strategy have been the cattle TB surveillance programme, additional controls on infected herds, encouragement for biosecurity measures, licensed badger culling over a significant area of the HRA and government support for licensed vaccination in the Edge Area. The government has introduced a range of new bTB controls since 2014. These include: stricter testing protocols for bTB breakdown herds including wider use of the interferon gamma blood test; more frequent bTB testing of cattle herds in the Edge Area; additional licensed badger cull zones in the High Risk and Edge Areas; mandatory testing of cattle moved to herds in the LRA from higher risk areas (post-movement testing) and support for voluntary badger vaccination schemes in the Edge Area.

15. The independent review of the bTB Strategy, carried out by Sir Charles Godfray and his expert team in 2018 presents an important opportunity to evolve our approach further and reduce disease levels. This government response to the Godfray Review describes how, in partnership with industry and other stakeholders, we can ensure a clear direction of travel towards OTF

status, harness new tools and demonstrate that our domestic cattle sectors continue to meet the very highest standards of health and welfare post-EU exit. In doing so, our aim is to maintain and build on the disease control benefits we have already gained in the initial phase of the bTB Strategy.

16. The rest of this chapter briefly summarises the latest disease situation in England and the measures introduced to date as part of the bTB Strategy. It explains the background to the Godfray Review and the important findings that it presents. It describes the government's ambition to build on the Godfray Review, evolving bTB policy, developing new interventions, and working in ever stronger partnership with other stakeholders. Finally, it explains how this government response is structured and organised, and the major themes that it addresses.

Trends in bTB

17. There has been an overall long-term upward trend in the incidence of bTB in cattle herds in England since the current statistical series began in 1996. However, there is evidence that the rate at which new herd incidents (breakdowns) are detected is levelling off in most areas of the country, if not starting to decline.

18. There are wide geographical variations in the incidence and prevalence of bTB in England. This is reflected in the division of the country into three different epidemiological areas, each with different disease control strategies and testing regimes. By default, cattle herds in the HRA are tested annually; cattle herds in the Edge Area are tested six-monthly or annually; and the majority of cattle herds in the LRA are tested every four years with a small percentage of high risk herds tested annually.

BTB risk area	Cattle (millions)[3]	Area (km^2)
High Risk Area	2.42	35,263
Edge Area	0.98	25,485
Low Risk Area	1.97	72,081
England Total	5.37	132,829

[3] Cattle population sourced from APHA SAM database based on holdings as at June 2018 and scaled to CTS total as published in official statistics at www.gov.uk/government/statistical-data-sets/structure-of-the-agricultural-industry-in-england-and-the-uk-at-june

19. The government uses statistics on the incidence of bTB in cattle herds and the number of cattle slaughtered as a result of bTB to monitor the spread and concentration of the disease and to inform decisions aimed at controlling it. Overall, bTB incidence and prevalence are starting to reduce in England, but the picture is complicated and further control measures are needed where the disease situation is worsening.

20. The epidemiological situation in England can be summarised as follows:

    a. In the LRA, the incidence of bTB is very low and stable. The majority of breakdowns in the LRA can be linked to movements of undetected infected cattle from other areas of the UK.

    b. In the Edge Area, the herd incidence is higher than in the LRA although this varies from county to county. Disease prevalence and incidence have been on a rising upward trend in the Edge Area for a number of years, despite a significant tightening of surveillance and control measures in cattle herds in recent years. The epidemiological pattern is complex with different drivers of bTB across the Edge Area. Some counties have a reservoir of infection in badgers while in others, disease spread is driven mainly by cattle movements. Reversing the ongoing increase is a key priority.

    c. In the HRA, the incidence and prevalence of infected cattle have increased steadily to stabilise at relatively high levels in more recent years. This is partly a result of a reservoir of Mycobacterium bovis infection (M. bovis - the bTB bacterium) in the local badger population. There is evidence of a slowing down, if not a decline, in both the incidence and prevalence rates in the HRA since 2012.

21. International standards for bTB freedom require 99.8% of herds to be officially free of bTB for at least three consecutive years. By the end of September 2019, 94.7% of cattle herds in England were officially free of bTB. This comprised 89.9% of herds in the HRA; 94.4% of herds in the Edge Area; and 99.6% of herds in the LRA[4].

Current measures

22. The bTB Strategy includes:

[4] Quarterly national statistics on tuberculosis (TB) in cattle in Great Britain published 18 December 2019
www.gov.uk/government/statistics/incidence-of-tuberculosis-tb-in-cattle-in-great-britain

a. **Cattle bTB surveillance** - comprising annual whole herd tuberculin skin testing in the HRA (transitioning to six-monthly from 2020) a mix of annual and six-monthly testing in the Edge Area and four-yearly testing in the LRA (except for high risk herds). Routine herd testing is supported by additional and more targeted risk-based testing of specific herds, mandatory pre- and post-movement testing and slaughterhouse surveillance.

b. **Management of infected cattle herds** - when infection is discovered, movement restrictions and more sensitive cattle testing protocols apply, with increasing use of interferon-gamma testing as a supplementary tool to improve detection of infected animals in bTB breakdown herds. The affected herd is subject to movement restrictions and tested more frequently until the animals give a negative result at two consecutive herd tests. Positive testing animals (reactors) are slaughtered without delay and compensation is paid to the farmer.

c. **Disease prevention** - voluntary on-farm biosecurity measures and responsible trading decisions are strongly encouraged, for example through the bovine TB Advisory Service (TBAS) for farmers in High Risk and Edge Areas. Wide-scale mandatory pre- and post-movement testing requirements aim to reduce the risk of bTB transmission through cattle movements.

d. **Preventing spread of TB from wildlife** - offering the option of farmer/landowner-led badger culling or vaccination subject to licensing and authorisation by Natural England (NE). The government's Badger Edge Vaccination Scheme (BEVS) has offered support for badger vaccination in the Edge Area, the aim of which has been to create locally protected badger populations which can act as a barrier between areas where bTB is present in cattle and areas without bTB.

23. The government also supports a substantial programme of **research** on bTB vaccines and diagnostics, biosecurity, wildlife and socio-economics.

24. Annex 5 sets out the wide range of specific measures introduced by the government since the bTB Strategy was published in April 2014.

25. In addition to government interventions, many farmers are making very considerable personal investments to help contain and eradicate the disease. The veterinary profession continues to play a major role in the control of bTB, delivering the vast majority of England's bTB testing and advising farmers on bTB prevention and control. Local authorities are responsible for enforcing animal health rules, and wildlife and conservation groups are leading local badger vaccination deployment projects.

Review of the bTB Strategy

26. In February 2018, the government announced an independent review of its bTB Strategy to be chaired by Professor Sir Charles Godfray. Sir Charles was supported by a working group comprising Professors Christl Donnelly, James Wood, Michael Winter and Glyn Hewinson. All reviewers were selected for their skills, competence, expertise, impartiality and experience of operating at a strategic level. The UK Chief Veterinary Officer, Christine Middlemiss, worked closely with the group to provide her expertise and a government perspective.

27. The review team was asked to reflect on progress made with implementation of the bTB Strategy and to advise on changes to take it to the next phase, in order to maintain momentum towards the government's target of achieving OTF status for England by 2038. The review took place during spring and summer 2018 and reported to Ministers in October 2018. The review team consulted with a variety of different stakeholders to understand different perspectives about the disease and to review key issues in detail. Its report was published in November 2018.

28. The Godfray Review concludes that bTB incidence in England is 'at best roughly stable' and that 'this cannot be allowed to continue'. It makes clear that there are 'no easy answers to reducing disease levels' and what is required is 'new drive and a concerted and concentrated effort by all sectors involved'. Its findings include:

    a. Industry must take greater responsibility for on-farm controls, biosecurity and safe trading practices to stop the disease spreading.

    b. More can be done to help farmers make purchasing decisions reflecting the risks of cattle being infected.

    c. A strong argument for targeted deployment of more sensitive diagnostic tests or test combinations to root out bTB-infected animals.

    d. Evidence shows that badgers do transmit bTB to cattle and contribute to the persistence of the disease.

    e. Disease reduction would benefit from greater flexibility and agility in adapting bTB control measures as new research findings emerge.

    f. A new independent body on disease control would be helpful to take over disease control operations from the Animal and Plant Health Agency (APHA) NE and local authorities.

29. The government wishes to thank Sir Charles and his team for their hard work. The Godfray Review is an important contribution that will inform next steps in the strategy to achieve OTF status for England by 2038. This document sets out how government will address its findings as part of a further concerted effort to accelerate progress towards tackling the disease.

Next steps

30. The government response to the Godfray Review focuses mainly on the next five years until 2025. It aims to accelerate progress in this period to help us achieve the overall goals of the bTB Strategy. It is essential that government, industry and other stakeholders work together and seize these opportunities in order to increase and target the shared response to the complexities and multiple challenges of bTB.

31. Since the Godfray Review report was published, Defra has held discussions with the bTB Eradication Advisory Group for England (TBEAG) and the Animal Health and Welfare Board for England (AHWBE) and met with farming, veterinary, environmental and wildlife NGOs, and local farmers to explore the Godfray Review findings and how we might respond. The consensus is that stakeholders are keen to step forward and evolve current policy if it is supported by evidence and can help to accelerate the control of bTB.

32. This response describes what we can do in the short-term to step up our efforts to control and eradicate the disease. It also looks forward to where we might be in five years' time through a further concerted effort by all concerned. The government's ambition is that this will involve:

    a. Starting to deploy cattle bTB vaccine in critical areas of infection.

    b. Evolving wildlife controls to address significant pockets of infection with the most appropriate measures, informed by epidemiology.

    c. Deployment of more sensitive diagnostic tests alongside the latest epidemiological tools.

    d. Harnessing the full potential of the LIS to support responsible cattle movements.

    e. More robust and closer partnerships jointly to design and implement future bTB policy.

    f. Seizing wider opportunities to enhance productivity, animal welfare, and on-farm investment now we have left the EU, and English farming policy continues to evolve.

This response

33. The rest of this response is structured as follows:

    a. Chapter 2 outlines the acceleration of work to develop a deployable cattle bTB vaccine, as part of a wider programme of research to fill evidence gaps and develop new tools for tackling the disease.

    b. Chapter 3 considers how to evolve the strategy for preventing the spread of TB from wildlife, banking the benefits accrued to date with greater emphasis on non-lethal approaches in future.

    c. Chapter 4 discusses how we can improve bTB testing, management of infected herds, and use of epidemiological tools to root out the disease and support bTB eradication.

    d. Chapter 5 describes the steps we can take to reduce the spread of bTB through behaviour change, responsible cattle movements and greater uptake of biosecurity measures.

    e. Chapter 6 looks at how we can improve partnership working between government, industry and stakeholders at every level.

    f. Chapter 7 sets out how our approach to bTB control can support and benefit from our wider ambitions for trade, productivity and high standards of animal health and welfare now we have left the EU.

    g. Chapter 8 summarises next steps and sets out an indicative action plan.

34. Annexes provide:

    a. A glossary at Annex 1.

    b. An indicative action plan for the next five years at Annex 2.

    c. An overview of Defra's bTB research programme at Annex 3.

    d. Statistics showing the evolution of the epidemic since 2014 at Annex 4.

    e. Details of government measures to accelerate disease eradication since 2014 at Annex 5.

Conclusion

35. This response sets out a positive and ambitious way forward to tackle the ongoing challenges of bTB. There are many complex areas where further

work is needed. However, there is much that can be done immediately and in the next five years to make a real impact on the disease. The Spending Round settlement for the 2020-21 financial year, which the Chancellor of the Exchequer announced in September 2019, committed an additional £8 million for animal health, including for bTB eradication. The government will play its part within a strong collective effort to control the disease.

2. Acceleration of work to develop a deployable cattle bTB vaccine, as part of a wider programme of bTB research

Developing a deployable cattle bTB vaccine

36. **The government's primary bTB research goal is to develop a deployable cattle bTB vaccine within the next five years.**

We have made good progress

37. The government has invested heavily in research since 1998 to develop a cattle vaccine for bTB and the associated tests that can Differentiate vaccinated-Infected from Vaccinated-uninfected Animals (the so called 'DIVA' test). The vaccine is not a new one. Bacille Calmette Guérin (BCG) is the only current vaccine for protection of humans and badgers from tuberculosis.

38. A DIVA test is necessary since BCG sensitises cattle to the tuberculin skin test used for TB surveillance and control in cattle in the UK and for some international trade. For that reason, BCG vaccination of cattle is not in line with international (World Organisation for Animal Health (OIE)) standards for trade in live cattle. The vaccine causes a substantial proportion of cattle to cross-react to the conventional tuberculin skin test - in other words to become false positive animals. The DIVA will enable vets to check if a skin test reactor in a vaccinated herd is a true positive or not.

39. This work has advanced to a point where the government's focus is now on the field trials necessary to assess the safety of the vaccine and performance of the DIVA test. Once these are complete we will then be able to seek Marketing Authorisations (MAs) for both and the current legal barriers to vaccinating cattle against bTB can be removed or relaxed. Provided those field trials go as hoped, the timeline envisages those MAs being granted in 2025.

Vaccinating cattle would be a strong additional tool to help solve our bTB problem

40. When combined with other disease control measures, the added value of cattle vaccination will be in reducing the prevalence and incidence of the disease. The government's current view is that it would be best used to reduce bTB prevalence in the HRA, with targeting of high risk herds to maximise the disease control benefits while reducing the costs from deployment, and from any false positive results.

41. The BCG vaccine produces a spectrum of protection in cattle whereby some animals are fully protected from infection, some partially protected (reduced pathology and bacterial shedding) and some are not protected at all. This is also seen in other animals (including badgers) and humans. The scale of disease reduction from the BCG vaccine depends on local circumstances and, crucially, whether cattle or badgers are the primary source of infection.

The DIVA test

42. The performance of the DIVA test is crucial in enabling BCG vaccination to realise disease control benefits. As well as identifying vaccinated cattle that are truly infected, it is essential that the DIVA test has a high specificity. In other words, we need to be confident that the number of false positive results is very low. Otherwise, we risk vaccinated herds having frequent and/or repeated reactor cattle and thereby remaining under bTB restrictions for a very long time, putting business viability at serious risk.

43. Previous attempts to develop a suitable blood test DIVA have failed because of insufficient specificity. But more recent APHA work has identified a DIVA format of the skin test, based on defined antigens, as the most likely useful candidate for use alongside the vaccine[5]. This is a major step forward and has had spin off benefits in terms of identifying possible defined antigen replacements for the current skin test. Work on further developing those possible replacement tests is ongoing and they have the potential to make a difference to bTB control across the world, with or without cattle vaccination.

Field trials are essential

44. Field trials will require commitment and support over the next five years. Field trial designs have been developed to further evaluate the cattle BCG vaccine and DIVA skin test and provide the evidence required for applications for MAs to be submitted and for the DIVA test to be internationally recognised. Field trial data are necessary to ensure that, amongst other issues, the products from the animal are safe and acceptable for consumption, that there are no animal welfare concerns around the use of the vaccine or the diagnostic test and that any efficacy claims about the vaccine or the test can be supported.

45. An experimental study has also been designed to assess the potential impact of the vaccine on cattle-to-cattle disease transmission. This is not a prerequisite for a MA but it would provide useful information on vaccine effectiveness in supporting bTB eradication.

[5] Srinivasan, S. and others (2019) A defined antigen skin test for the diagnosis of bovine tuberculosis. Sci. Adv. 5, eaax4899.

46. Under current regulatory requirements, field trials must be authorised by an Animal Test Certificate (ATC) issued by the Veterinary Medicines Directorate (VMD). APHA has completed substantial work on the safety data portfolio to support ATC applications for both the DIVA and the BCG vaccine itself. These were submitted in October 2019. The government will progress this work over the coming months and provide detailed timings for the start of field trials in due course.

Indicative timeline subject to a successful tender and assuming all aspects of the trial are completed on time with no problematic results

Action	2019	2020	2021	2022	2023	2024
Submit ATC applications for BCG and DIVA	Complete					
If application is successful, VMD issues ATCs		Expected				
Complete field trial tender process		Expected				
If tender process is successful, start field trials		Expected	Expected	Expected		
Submit applications for MAs					Expected	
If application is successful, VMD issues MAs						Expected
OIE validation of DIVA test						Expected
Deploy authorised vaccine						Expected
Deploy authorised, validated DIVA test						⇨

Deploying a vaccine

47. In order to assess the utility of a vaccine against bTB, various deployment strategies have been modelled. These strategies exclude deployment in the LRA, where disease is being successfully controlled using the existing tools. This modelling suggests the most adequate vaccination strategy is one that targets those herds most at risk within the HRA, in order to maximise the disease control benefits while minimising the costs of deployment.

Trade in vaccinated cattle and their products

48. The feasibility of deploying a cattle BCG vaccination programme and the associated DIVA testing in England will depend on a number of factors, including trade implications, cost of any additional animal identification and movement tracking, and the acceptability of cattle BCG vaccination, particularly by farmers and cattle buyers.

49. Although very few live cattle are exported from the UK, products of bovine origin are included in many processed food and other products exported all over the world. Standards for international trade relating to animal health are set by the OIE as the principle reference for World Trade Organization (WTO) members. The OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (OIE Manual) states that BCG cattle vaccination should not be used in countries where control or trade measures are based on tuberculin skin tests or other immunological tests relying on the use of tuberculin as diagnostic antigen, as they will be compromised. For cattle BCG vaccine to be permitted, therefore, the first step would be to validate the DIVA skin test and get it incorporated into the OIE Manual. The OIE Manual may then need to be amended to clarify how international trade standards apply to vaccinated cattle and possibly their products.

50. The government has also considered the risk of commercial cattle buyers discriminating against vaccinated cattle. A limited expert elicitation commissioned to seek the views of key UK meat sector decision makers concluded that there was no significant risk of discrimination of this nature, provided the safety of the products derived from vaccinated cattle could be assured.

51. The government commissioned an assessment of the risk posed to public health from consuming milk and meat products from cattle that had been vaccinated with the BCG. The study concluded that the risks to the vast majority of the general population consuming milk, milk products and minced meat from animals that have been vaccinated with BCG are negligible, i.e. the risks are so low that they do not need to be considered any further. For people who are severely immuno-compromised the risk is increased but still considered to be negligible if the cattle are vaccinated more than three months before they enter the food chain. In

addition, studies carried out by APHA have been unable to detect any shedding of BCG in the milk of vaccinated animals. The Food Standards Agency is reviewing this risk assessment.

52. Product traceability is important and government's assumption is that there would, most likely, be a requirement for a visible, permanent identification of all vaccinated cattle. This might entail an additional identification tag and record in the animal's passport. This will be an area for further consideration in the light of developments with bovine electronic identification (bovine EID) and LIS.

Cattle herd owners' attitude to possible vaccination

53. At present there is very little social science evidence on herd owners' attitude to vaccination of their cattle. The willingness of cattle keepers to deploy the BCG vaccine is a key to its success, although mandatory vaccination in target herds may be an option. Acceptance is likely to be influenced by economic considerations and social attitudes. A study of farmer attitudes towards bTB control measures suggested that cattle vaccination was the most accepted bTB control measure. Research has also shown that cattle farmers have a substantial willingness to pay for a cattle bTB vaccine, but this depended on its effectiveness and cost. The study also showed that the ability of the vaccine to prevent a bTB breakdown was considered more important than the ability to reduce severity of a breakdown.

Defra's wider bTB research objectives

54. Defra funds bTB research to inform policy and to provide tools to fight the epidemic, with a focus on high quality results with a real impact.

55. The Godfray Review has highlighted the need for improved understanding and improved technologies to improve control of bTB. The government recognises that it needs to increase the output of its research programme as part of the solution to achieving its target of OTF status for England by 2038.

56. Alongside the primary goal of developing a deployable cattle bTB vaccine, **Defra will continue to support policy-relevant bTB research addressing evidence gaps identified in the Godfray Review.** This includes both direct funding and co-funding leveraged from other providers.

57. This second goal recognises Defra's aim to expand greatly the breadth and scope of the research programme, taking advantage of the shift away from focusing on oral badger vaccines to free up resources for research in areas where we have scope to make greater strides in controlling disease. Defra welcomes novel ideas while not losing sight of the realities of controlling the epidemic in the field.

58. To this end, Defra launched a call in February 2020 for pump-priming development funding focused on novel, disruptive approaches or technologies, directly applicable to cattle diagnostics. Defra is also announcing:

    a. Funding for the validation of novel cattle diagnostics and provision of validated, blinded samples to assist with this work.

    b. An open call for ideas for potential future work.

Encouraging collaboration on bTB-related research

59. The Godfray Review noted that bTB-related research in this field is funded by a variety of bodies and occupies the whole spectrum from largely fundamental to highly applied. It considers this diversity to be a strength but believes that there would be a benefit from establishing ‘a forum that would better link research funders with the needs of customers of the more applied research’.

60. **Defra is adopting a policy of actively promoting research bids to other funders that address its policy needs. Defra is in discussion with the UK Science Partnership for Animal and Plant Health about coordinating research funding across government to fully draw on the expertise of the British research community.**

61. Defra encourages researchers to avail themselves of the wealth of data on the epidemic held by APHA to assist their research, and consider novel ways in which this data can be utilised to provide insight into disease biology and transmission pathways. Researchers should consider that collaboration with APHA is often essential to smooth the transition from fundamental research findings to field and policy use. Researchers should also consider joining the Global Research Alliance for Bovine Tuberculosis (GRAbTB) which is part of the STAR-IDAZ International Research Consortium.

3. Evolving the strategy for preventing the spread of TB from wildlife

Key messages

Detailed analysis has shown that industry-led, intensive badger culling has been associated with reductions in herd bTB incidence of 66% and 37% in the first two areas over the first four years (see footnote 1).

Effective, industry-led intensive badger culling has so far been deployed over approximately 57% of the HRA and 5% of the Edge Area.

The government envisages that the current intensive culling policy would begin to be phased out in the next few years, gradually replaced by government-supported badger vaccination and surveillance. Culling would remain an option where epidemiological assessment indicates that it is needed.

Changes to Defra's guidance to NE on licensing badger control will be subject to consultation.

Introduction

62. The government's current policy on bTB and badger control enables NE to license farmers and landowners to undertake badger vaccination or culling to prevent the spread of bTB[6]. The government provides financial support for badger vaccination projects in the Edge Area via BEVS.

63. The Godfray Review reconfirms the substantial role that badgers play in bTB epidemiology, and that badger culling can reduce bTB in cattle, as shown by evidence from the Randomised Badger Culling Trial and the ongoing analysis of the industry-led intensive culls[7].

64. As expected, the intensive culls are reducing the incidence of bTB in cattle. Detailed analysis of the effect of the current culls has shown that culling implemented by the

[6] Defra (2018) Guidance to Natural England: preventing spread of bovine TB www.gov.uk/government/publications/guidance-to-natural-england-preventing-spread-of-bovine-tb

[7] Brunton, L.A. and others (2017) Assessing the effects of the first 2 years of industry-led badger culling in England on the incidence of bovine tuberculosis in cattle in 2013–2015. Ecology and Evolution, 7, 7213-7230.

farming industry can result in statistically significant reductions in the incidence of bTB. This research found that culling was associated with reductions in herd bTB incidence of 66% and 37% in the first two intensive cull areas over the first four years (see footnote 1).

65. However, the Review rightly considers that moving from lethal to non-lethal control of the disease in badgers is desirable as we should not cull badgers indefinitely. It acknowledges that injectable BCG vaccine is the only viable non-cull control option currently available. This will be used more widely in the next phase of badger TB control, and will complement our future strategy on biosecurity and responsible cattle movements to reduce the risk of infection being re-introduced into badgers (see Chapter 5).

66. The Review also proposed a number of options for the future including maintaining the current policy of culling and, instead of supplementary badger disease control (SBC) suggests carrying out a trial of "periodic culling" or vaccination after intensive culling, and even to consider individual "farm-led culling".

67. As we reach the point where intensive culling has been enabled in most of the areas where it stands to have the greatest impact (57% of the HRA in 2019 and possibly an additional 20% by 2021) government will consider whether to put in place measures to make badger vaccination, combined with biosecurity, the focus of addressing ongoing bTB risks from badgers in these areas. The government aims to preserve the benefits to cattle from intensive culling and badger vaccination where deployed, and reduce opportunities for re-infection of badgers in the future through responsible cattle movements, the cattle surveillance programme and restrictions on infected herds.

68. While vaccinating badgers with BCG vaccine does not cure TB-infected badgers, it can provide significant protection to badgers from TB. Field studies suggest that injected BadgerBCG vaccine reduces the severity and progression of TB in badgers[8]. Further, in badger social groups where more than a third of adult animals in the group were vaccinated, the risk of the unvaccinated cubs in the group testing positive for TB was reduced by 79%, indicating within-social group immunity[9]. It is therefore logical to assume that badger vaccination will reduce transmission from badgers to cattle. However, the government acknowledges that field evidence is lacking on how quickly and to what degree badger vaccination will reduce bTB incidence in cattle and that this could, and has, held back more widespread uptake.

[8] Chambers, M.A. and others (2011) Bacillus Calmette-Guérin vaccination reduces the severity and progression of tuberculosis in badgers. Proceedings of the Royal Society B: Biological Sciences, 278, 1913-1920.
[9] Carter, S.P. and others (2012) BCG Vaccination Reduces Risk of Tuberculosis Infection in Vaccinated Badgers and Unvaccinated Badger Cubs. PLoS ONE, 7, e49833.

69. Badger vaccination is likely to be better and more cost-effectively deployed once the badger population has been reduced, to enable a healthy population to regenerate. However, cage-trapping badgers for vaccination is more challenging within a smaller population.

70. The government will look at the introduction of four different vaccination schemes, in different epidemiological situations:

    a. Post-intensive cull vaccination phasing out SBC.

    b. Complementary vaccination within a cull area.

    c. 'Cordon sanitaire' in defined at-risk parts of the Edge Area (refined BEVS).

    d. Vaccination of badgers in those parts of the HRA and Edge Area where there is a reservoir of infection in badgers but farmers have decided not to cull or have been unable to organise sufficiently to do so.

71. The government's immediate next steps will be:

    a. To define the area where there is a significant reservoir of TB infection in badgers to ensure that intensive culling in the HRA and Edge can be licensed where needed over the next few years.

    b. To consult on proposals for land which has been subject to effective badger vaccination, to contribute towards the 90% coverage requirement for intensive culling.

    c. To pilot deployment of badger vaccination post-intensive culling, ahead of phasing out SBC.

    d. To refine BEVS, to strengthen the 'cordon sanitaire' approach.

    e. To develop a scheme to support badger vaccination in areas where there is a reservoir of infection in badgers but farmers have decided not to cull or have been unable to organise sufficiently to do so.

72. Longer term, the government's ambition is to:

    a. Allow SBC to continue during a transition period until we are able to effectively deploy badger vaccination across as many post-intensive cull areas as possible. This will avoid having periods of no badger control and so preserve the benefits from intensive culling.

    b. Help to deliver injectable badger vaccination in all areas that have completed an intensive cull and carry out surveillance in the badger population to inform future decisions on disease management.

c. Modify our badger control policy to use a more adaptive approach such that in the future, epidemiology-driven culling would only be permitted where surveillance in badgers and cattle indicates re-emerging or persistent infection (modelled on the current LRA policy).

73. Figure 3.1 shows potential options. This would depend, for example, on cost benefit analysis, appropriate stakeholder and public consultations being undertaken, and on the basis that supplies of BadgerBCG vaccine (or a viable alternative) are not disrupted. Transition to the new model could be expedited by wildlife and farming groups working together to deliver effective disease control in badgers.

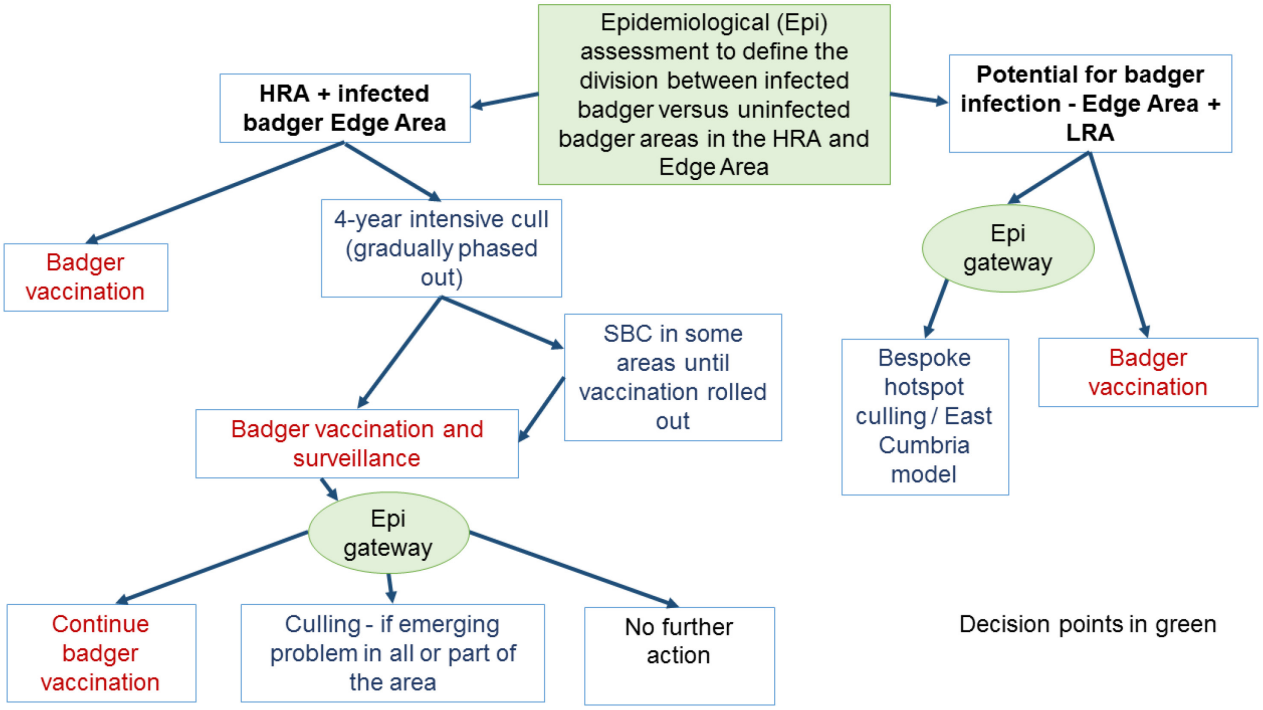


Figure 3.1: Overview of proposed new options for preventing the spread of TB from wildlife.

Intensive culling

74. Badgers have posed a significant source of TB infection across the HRA and much of the Edge Area. Government and industry have been motivated to address this in order to protect cattle and farm businesses. The Godfray Review confirms that the evidence does not suggest that other wild or feral species in England pose a substantial national threat to cattle.

75. The excellent progress that has been made on deployment of intensive culling across the HRA, reflects the enormous amount of time, money and effort that the farming industry has invested in badger culling.

76. In 2019, licensed culling covered approximately 57% of the HRA and 5% of the Edge Area. The analysis of the first four years of the culling policy provides us with a contemporary evidence base to continue to roll-out the current policy over as much as possible of the HRA and Edge Area where infected badgers remain. The government anticipates that the remaining affected areas of the HRA and Edge Area will be addressed soon, after which intensive culling will phase out.

77. The epidemiological basis for intensive culling across the HRA and Edge was set out in the 2011 policy[10]. Government will define the areas of the HRA and Edge where there is a significant reservoir of infection in badgers to ensure that all future intensive cull areas continue to comply with the Protection of Badgers Act 1992.

78. The bTB Strategy recognises that disease levels vary across the Edge Area, as is the nature of any front line of disease spread. To provide clarity to all stakeholders, **government will publish and periodically revise the location of the areas in the Edge Area with infected badgers and those where there is no evidence of infection in badgers.** This will be determined by epidemiologists using data such as cattle herd bTB incidence and recurrence rates; epidemiological assessment of individual breakdowns in the area; genetic analysis of the M. bovis in the locality; and, where available, data on disease prevalence and genetic analysis in badgers.

79. The existing policy on culling in the LRA will remain. This allows a bespoke approach to dealing with an emerging infected badger population linked with cattle herd breakdowns outside of the endemic area.

Policy transition

80. The government acknowledges that the challenges of widespread deployment of badger vaccination after intensive culling, including either directly using government staff or with supporting farmers to carry out licensed trapping for the purposes of vaccination. A number of stakeholders have pointed to the practical difficulties of vaccinating a high proportion of badgers in a low-density badger population after culling.

81. In 2018, the Irish Government announced a similar switch towards badger vaccination following the success of its culling programme[11]. One aspect that makes its programme more affordable is the use of 'stopped-restraints' to carry out

[10] Defra (2011) The government's policy on bovine TB and badger control in England www.gov.uk/government/publications/the-government-s-policy-on-bovine-tb-and-badger-control-in-england
[11] Department of Agriculture, Food and the Marine (2018) Creed announces vaccination of badgers as part of bovine TB eradication programme www.agriculture.gov.ie/press/pressreleases/2018/january/title,113880,en.html

the majority of vaccination. Government could look to trial these in England, as this could make injectable badger vaccination more deliverable over the scale needed.

Making badger vaccination training easier/amending licensing requirements

82. Badger vaccination is a licensed activity and those undertaking it must have passed accredited training courses in trapping and vaccinating.

83. It is essential for badger vaccination programmes to be effective, in order for government to be able to assess their impact on cattle incidence. The government will review and amend the reporting and licensing requirements to bring them in line with those required for culling, to improve effectiveness and analysis.

84. Training courses are currently provided by APHA in a modular format and comprise four modules[12]. Increased interest from landowners is likely to increase the availability of further sites in 2020 and beyond. Therefore, in addition to reviewing the content of the training course, **the government proposes to establish a "train-the-trainer" scheme for lay vaccinators.** The government also proposes that APHA should retain oversight through a hub/centre of excellence, with investment in 'regional spokes' as 'certified' trainers who can in turn deliver a 'train-the-trainer'-type course for badger vaccination and the associated cage trapping courses.

Improving communications on badger vaccination and working with local structures

85. Buy-in from farmers and landowners will be essential to the success of this new approach. Government needs to enter into a dialogue on the benefits and practical aspects of badger vaccination to address current concerns about whether or not it will lead to a reduction in cattle herd breakdowns. A first step towards this is to make the current information more accessible. **The government will refresh the information on gov.uk and develop a simple information pack for publication on the TB Hub. In parallel, the government is developing a communications strategy to ensure clearer messaging from its delivery partners to farmers.**

Transition period issues

86. The government acknowledges that it is unrealistic to switch immediately to badger vaccination. Phasing this in will take time. **The government proposes to pilot the approach as soon as possible with some areas, while others are authorised to**

[12] Defra (2018) Bovine TB: Badger vaccination training
www.gov.uk/guidance/bovine-tb-badger-vaccination-training

continue or start licensed SBC. The government anticipates subsequent vaccination rolling-out as the intensive culling programme and SBC tails off. This phasing-in period may also allow government to monitor the effect of SBC versus vaccination on cattle herd bTB breakdowns during the transition phase. It would partly address the suggestion in the Godfray Review of doing a head-to-head comparison of different options following a four-year intensive cull.

Future culling in an epidemiologically-defined area

87. The current prevalence of bTB is such that we are still many years away from achieving OTF status for England and substantial pockets of disease remain across England. Therefore, if the gains from intensive culling are not to be eroded over the short-to-medium term, there remains the need for ongoing disease control in badgers after an intensive cull.

88. There is the possibility that vaccination does not have the desired effect in maintaining or reducing the number of infected badgers in an area, in which case a resumption of epidemiology-driven culling may be warranted. The government wants to ensure that any further badger culling in areas where intensive culling has already taken place is based on up-to-date surveillance in both cattle and badgers. The government proposes that disease in the badger population is monitored, with culling allowed to resume if epidemiological assessment suggests it is warranted. An important aspect of this proposal is that vaccination in badgers and surveillance would first have to be carried out before reverting to culling. **The government will consult on a new policy of culling in an epidemiologically-defined area, where epidemiological assessment suggests that badgers are still a source of disease despite effective vaccine deployment.** The experience gained during implementation of an adaptive management approach for dealing with the east Cumbria LRA hotspot, together with the results from the analysis by Downs and others (see footnote 1) on perturbation risks will be the basis for developing this aspect of the culling policy.

Complementary badger vaccination with culling

89. During the transition period, government sees opportunities for intensive culling and vaccination to be deployed alongside each other in a complementary manner, leading to increased uptake of badger vaccination. In particular, government wants to ensure the risk from badgers is addressed in those parts of the Edge Area where disease is increasing rapidly, and such a policy could enable culling in these areas.

90. Farmers, especially in the Edge Area, have indicated that they would be interested in this policy. Veterinary and science advice is that the addition of badger vaccination either around or within a wider cull zone would provide disease control benefits above not doing so.

91. Government therefore **proposes that land covered by effective badger vaccination programmes will be considered as equivalent to cull participant land in assessing whether there is sufficient land coverage for badger culling licences.** Epidemiological modelling has been commissioned at APHA to inform the balance between potential acceptable combinations of vaccination with culling.

92. As part of this policy, no-cull 'buffers' around badger vaccination programmes will be considered to ensure that the latter are not unduly affected by adjacent culling, balanced against the need for disease control across as much of the badger population as possible.

Badger vaccination where there is limited infection in badgers as a 'cordon sanitaire': a revamped BEVS

93. BEVS was set up in recognition that badger vaccination could create a 'cordon sanitaire' to prevent incursion into those parts of the Edge Area which are not considered to have a recognised reservoir of disease in badgers.

94. One important outcome of the epidemiological definition of where TB-infected badgers occur will be the identification of areas that do not have evidence of a reservoir of infection in badgers but are at risk of infection. These areas should be prioritised for 'cordon sanitaire' vaccination.

95. Despite government support of BEVS since 2014, to date it has only been taken up in an ad hoc, patchy fashion wherever wildlife groups have garnered sufficient interest.

96. To ensure that any 'cordon sanitaire' has the best chance of reducing the risk of future disease spread, sufficient badgers must be vaccinated, sufficient land must be accessible, and the land must be sufficiently connected. **Government will therefore review the BEVS funding scheme evaluation criteria** to ensure that it supports larger projects that are likely to achieve the objectives of this scheme and provide best use of public funds.

Badger vaccination where there is recognised infection in badgers (un-culled areas)

97. Injectable badger vaccination is available to address the reservoir of infection in badgers where farmers and landowners either cannot, or do not want to, cull. Various groups in the HRA and Edge Area are vaccinating badgers without direct government financial support. However, despite the vaccination option being available and the availability of vaccine, voluntary uptake has overall been disappointing.

98. Vaccination in large un-culled areas where there is a recognised infection in badgers would address the following three goals:

    a. Reduce disease in badgers in those areas which are not going to cull.

    b. Dramatically increase training capacity and act as a training ground for the increased number of vaccinators who will be required for the proposed post-cull transition. This would be more efficient if based in a non-culled area, which would have a denser population of badgers.

    c. Potentially demonstrate the effect of badger vaccination (if sufficiently large areas are vaccinated). The government has an ambition to collect evidence on the effectiveness of badger vaccination on cattle bTB incidence, where possible, and these areas could provide such an opportunity.

99. **Government would provide appropriate support to ensure that (i) badger vaccination projects in pockets or larger areas that are un-culled, such as East Sussex, go ahead to address the local infected badgers; and (ii) that existing vaccination projects continue.** These projects would also contribute towards a wider deployment of vaccination across England.

East Sussex as a potential large-scale vaccination area

The south-western corner of East Sussex is an area of increased incidence of bTB and has an infected badger population. However, given the area's low cattle density, it is considered unlikely that an application for an intensive cull licence will be made.

If badger vaccination was deployed in the area, it might be able to deliver the following benefits:

- Reducing disease in badgers.
- Bringing together farming and wildlife stakeholders.
- Developing and piloting a scheme that allows approved volunteers on farms.
- Establishing East Sussex as a regional spoke that can carry out train-the-trainer badger vaccination delivery.
- Monitoring of the effects of badger vaccination on TB levels in cattle.

Conclusion

100. Intensive badger culling is working as expected and is starting to reduce the burden of disease. The government is clear that widespread badger culling cannot continue forever and that there needs to be a gradual transition to badger vaccination, while retaining the option for culling in specific circumstances when and where it is necessary. We have reached a point in the bTB Strategy where it is right to move on from widespread culling being the focus.

101. As the disease picture evolves, the policy needs to evolve too. The time is now right to shift from a regional to a local adaptive management approach as envisaged in the bTB Strategy. The government will therefore be consulting on changes to the badger control policy.

102. The government's overarching goal remains to reduce the weight of TB infection within the badger population, and where necessary in any other wildlife species, to the extent necessary to achieve and maintain OTF status. This change maintains and builds on the intensive culls to date, but sets out a clear path to move to non-lethal alternatives while retaining the option for culling in specific circumstances when and where it is necessary.

4. Improving diagnostics, surveillance and epidemiology to root out bTB

Key messages

One of the key principles of the bTB Strategy is finding and eliminating bTB rapidly, and reducing the spread of bTB between cattle and between herds, as part of a range of practical and proportionate measures.

The government plans to make better use of existing range of tests to intercept bTB earlier and remove it from cattle herds more quickly. This means using the most appropriate bTB diagnostic tests for surveillance and breakdown management, in a targeted, evidence-based and flexible way.

The government will review and adapt the bTB surveillance programme to reflect the best available diagnostic tools and resources available to deliver them, taking account of the local epidemiological situation, statutory obligations and international standards required for trade.

Outside the EU, the government's ambition is for the UK to boost its influence on international standard setting for bTB diagnostics and surveillance.

Introduction

103. The government's aim is to have a targeted, risk-based approach that uses the most appropriate suite of diagnostic tests to support bTB surveillance and breakdown testing, based on good epidemiological assessment of individual breakdowns to understand the disease picture at local and national level. The approach will be evidence-based and more flexible, adapting as new diagnostic tools are developed and validated. The government sees a bigger role for private veterinarians, by delivering bespoke bTB management plans and advice to their clients.

104. The bTB Strategy already includes the ambition for more effective diagnostic tests and the development of epidemiological capacity and modelling to improve understanding of the disease and help design cost-effective interventions. This will enable us to find and eliminate disease in cattle rapidly, and to reduce the spread of bTB between cattle both within and between herds.

105. The Godfray Review:

a. Highlights the trade-off between the sensitivity and the specificity of diagnostic tests and the need to strike the right balance between removing uninfected cattle and restricting herds unnecessarily, and missing infected cattle and herds.

b. Sees a strong argument for moving to a more sensitive test for routine herd surveillance in the High Risk and Edge Areas to enable the detection of infected herds as early as possible.

c. Highlights the importance of identifying all the infected cattle in known infected herds and removing them as quickly as possible. It considers this particularly important in herds with persistent and recurrent infections, herds in badger cull areas where it is important to avoid re-infecting wildlife, herds in the Edge Area where preventing spread into the LRA is a high priority, and any emerging hotspots of infection within the LRA. In these cases, the Godfray Review proposes combining different types of tests to increase the likelihood of finding infected cattle.

d. Proposes investment in better tuberculin quality control and ideally, in the medium term, replacing tuberculin-based tests with defined antigen-based tests.

e. Emphasises the importance of an efficient pipeline to assess the value of potential new bTB diagnostic innovations and deploy them rapidly where appropriate.

f. Highlights the advantages of whole genome sequencing of M. bovis isolates in terms of allowing disease transmission pathways to be identified with greater accuracy and believes it should be used routinely to aid epidemiological investigation.

g. Considers that improvements to the so-called Disease Report Form (DRF) which APHA uses to investigate TB herd breakdowns, would improve the epidemiological evidence base.

International standards for bovine TB surveillance and diagnostics

WTO members are encouraged to base their animal health measures on international standards, guidelines and recommendations to facilitate safe international trade of animals and animal products while avoiding unnecessary impediments to trade.

The OIE is the WTO reference organisation for standards relating to animal health and zoonotic diseases. The OIE Terrestrial Animal Health Code aims to assure the safety of international trade in animals and their products with regard to bTB. The OIE Manual provides a harmonised approach to diagnosis of bTB by defining internationally agreed laboratory diagnostic techniques. The OIE also maintains a register of diagnostic kits that have been validated to rigorous international standards.

The APHA's Weybridge laboratory is one of three OIE international reference laboratories for bTB and the UK has been instrumental in supporting the OIE's international collaborative project to develop a new bovine tuberculin international standard.

Delivering improvements in bTB surveillance and diagnosis

Diagnostic tests for bTB

106. The tuberculin skin test remains the foundation of bTB eradication programmes and bTB-related trade controls worldwide. Its systemic application has enabled the eradication of this disease from many countries. The way in which tuberculin skin test is delivered, interpreted and supplemented by other OIE-approved tests[13] affects the overall sensitivity and the specificity of the surveillance programme.

[13] Register of diagnostic kits certified by the OIE as validated as fit for purpose www.oie.int/scientific-expertise/registration-of-diagnostic-kits/the-register-of-diagnostic-kits/

Internationally validated bTB tests

Tuberculin skin test

Involves injecting a TB bacterial protein mixture (tuberculin) into an animal's skin to measure its cell-mediated immune response.

The **comparative tuberculin skin test** measures the skin inflammatory reaction to the injection of tuberculin derived from the bacterium that causes bTB and compares it with that of tuberculin derived from the bacterium that causes avian (bird) TB. This test has a very high specificity (very low false positive rate) and its use is therefore favoured where other mycobacterial infections that cross-react with bovine tuberculin, such as Johne's Disease, are more prevalent.

The **single tuberculin skin test** involves assessing only the skin reaction to tuberculin derived from the bacterium that causes bTB. This test has a higher sensitivity (lower false negative rate) than the comparative test.

Tuberculin skin tests indicate early exposure to infection, usually before any visible evidence of disease in the live animal or its carcase. They are more sensitive when performed and interpreted at the herd level rather than at the individual animal level, and when interpreted severely.

Interferon gamma test (BOVIGAM)

A blood test, which like the skin test, measures the cell-mediated immune responses to tuberculin but using white blood cells in the laboratory. The interferon gamma test can detect infected animals earlier and is more sensitive than the tuberculin skin test.

Antibody tests (IDEXX and Enferplex)

Blood tests, which measure the antibody immune response to the bacterium that causes bTB. Antibody tests can have a role in detecting infected animals, particularly those with advanced infection, which can fail to react to tuberculin-based tests.

Routine bTB surveillance of cattle herds

107. Finding disease in cattle rapidly as part of a range of practical and proportionate measures is an essential component of the bTB Strategy.

108. Routine herd bTB surveillance of cattle herds at different intervals (depending on local area bTB risk) is supplemented with risk-based, targeted testing of certain herds, routine post-mortem meat inspection of commercially slaughtered cattle (slaughterhouse surveillance) and pre- and post- movement bTB testing of animals moved between herds. Each of these activities contribute to the overall sensitivity of the bTB surveillance programme in cattle and the continued detection of infected herds.

109. To enable earlier detection of infected herds and help accelerate eradication of bTB in endemic areas, **the government will replace annual surveillance testing of cattle herds with six-monthly surveillance testing in parts of the HRA in 2020. The government expects to extend this policy to the whole of the HRA in 2021.** Lower risk herds in the HRA that meet certain defined criteria for 'earned recognition' will continue to be tested at annual intervals.

110. **The government will look to further improve surveillance testing through the greater use of more sensitive tests (or test combinations) for surveillance of OTF herds**, taking into account the herd's bTB risk, and subject to a favourable cost: benefit analysis. The Godfray Review suggests moving to use of the single tuberculin test, supplemented by the interferon gamma blood test to confirm infection in SICT positive animals (i.e. as a serial test). APHA is modelling the impacts of this suggestion in terms of the number of additional herds restricted and cattle compulsorily slaughtered. The outputs from this analysis will inform cost: benefit assessments and potential future policy options, including the potential for piloting new approaches in specific areas. One option could be a default movement restriction of cattle in High Risk and Edge Areas which are comparative tuberculin skin test-negative but single tuberculin skin test-positive.

Statutory pre- and post- movement testing

111. Statutory pre- and post- movement tuberculin skin testing plays an important role in reducing the risk of the spread of TB between cattle herds.

112. **The government will now consult on extending compulsory post-movement testing to those parts of the Edge Area with annual, as opposed to six-monthly, surveillance testing.**

113. **The government will assess the costs and benefits of restricting the movement of 'higher risk' cattle following the negative short interval tuberculin test (SIT) which restores a herd's OTF status.** Currently this test can qualify as a pre-movement test, where this is required, enabling movements for the next 60 days. Withdrawing this option would increase our ability to detect infected cattle which might otherwise move to other herds and trigger new breakdowns. However, it would impose slightly longer restrictions on the movement of cattle from

some herds although animals could continue to move to slaughter either directly or via approved finishing units until OTF status was restored.

114. **The government will also assess the costs and benefits of adopting more sensitive approaches for statutory pre- and/or post- movement testing of cattle.**

Strengthening management of known infected herds

bTB testing in infected cattle herds

115. The government is committed to increasing efforts to detect bTB in infected cattle herds on a risk basis. It has substantially expanded the targeted use of the more sensitive supplementary interferon gamma blood test in infected herds over the last decade, as shown in Figure 4.1.

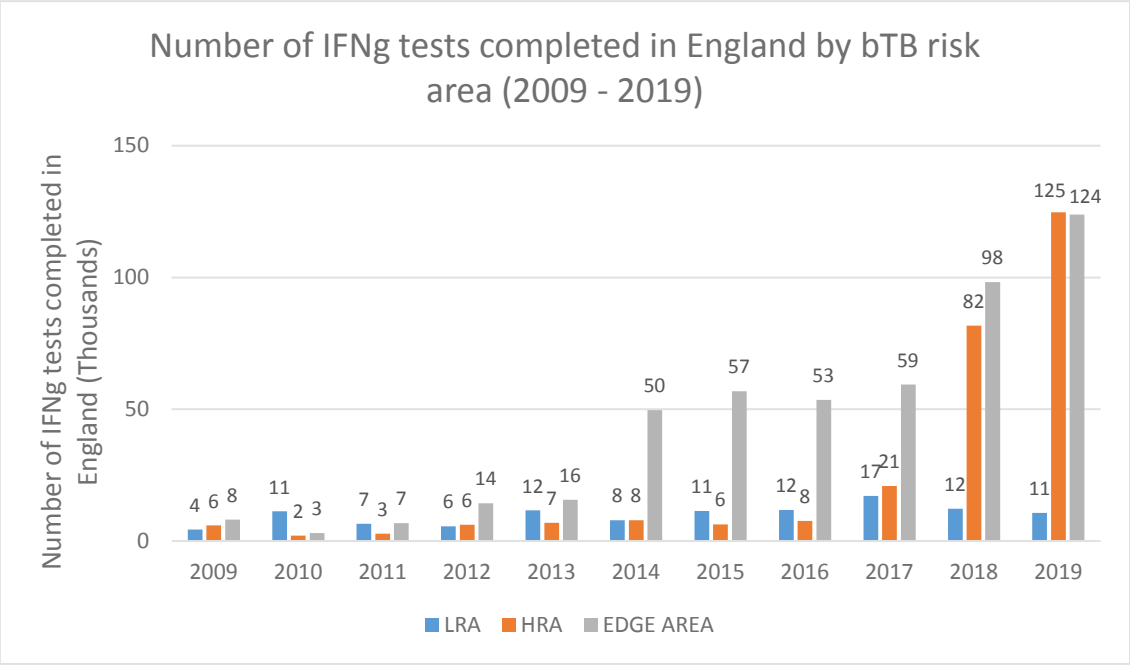


Figure 4.1: Number of supplementary interferon-gamma tests in England from 2009 to 2019

Current approach to risk-based targeting of supplementary interferon gamma testing

The interferon gamma blood test is used as a supplementary test alongside the tuberculin skin test in specific known infected herds (i.e. herds with animals with visible or laboratory evidence of bTB).

The aim is two-fold: to eradicate infection from the herd more quickly and reduce the risk of leaving undetected infected animals in the herd by the time movement restrictions are lifted.

Currently the interferon gamma test is compulsory for new known infected herds with visible or laboratory evidence of bTB in:

- The Low Risk Area
- The Edge Area
- The High Risk Area where any of the following three criteria are met:
  i. The APHA veterinary investigation concludes that the most likely transmission route for the affected herd was contact with infected cattle and measures are in place to prevent further spread of disease from this source.
  ii. The infected herd is located in one of the areas where at least two years of effective licensed badger population control have been completed.
  iii. There is clear evidence that repeated skin testing of the herd has failed to resolve infection in the herd.

https://tbhub.co.uk/guidance/testing-and-compensation/cattle-interferon-gamma-ifny-testing-bovine-tuberculosis/

116. **The government will review the use of the interferon gamma test in the High Risk and Edge Areas to target its delivery where it is expected to have the greatest impact**, aiming to maximise usage within the budget available. It will also look to gather field data on the benefits of deploying this test. The interferon gamma test will continue to be compulsory for new infected herds in the LRA with visible or laboratory evidence of bTB.

117. **The government will also assess the costs and benefits of alternative testing regimes for infected cattle herds, involving new combinations of tests.**

Additional measures to tackle persistently infected herds

118. Persistently infected herds which have been subject to movement restrictions for eighteen months or more are particularly frustrating to manage for the farmer, their private vet and for APHA. **The government will consider proposals for additional measures to help accelerate resolution of such herds.** Chapter 5 refers to development of a proposal for requiring owners of persistently affected herds to have a private veterinary herd health plan for bTB. There may also be scope for increased risk-based use of supplementary tests and of wider use of partial/total depopulation of persistently infected herds in High Risk or Edge Areas, especially where the risk of bTB from wildlife has been addressed.

Empowering private vets to help eradicate bTB

119. Private vets are fundamental to bTB eradication, particularly through their pivotal role in the statutory bTB surveillance programme. There is scope to build on this and **the government is committed to empowering private vets to help their clients eradicate bTB from their herds** in the same way as they do for other endemic diseases e.g. BVD, IBR, Johne's and leptospirosis (see Chapter 5). This role could include providing expert, bespoke advice and supporting vets and farmers to make informed decisions about the private use of supplementary tests, alongside statutory testing, to accelerate disease eradication at herd level.

The British Cattle Veterinary Association's view

"The British Cattle Veterinary Association (BCVA) is the key voice for cattle veterinary surgeons in the United Kingdom committed to driving tomorrow's practice. We recognise the requirement to deliver accredited and supported post-graduate training into the holistic control of bTB at a farm level, and feel we are ideally positioned to influence this. Our network of members is ready and willing to support cattle farmers to combat this destructive disease using all the tools made available to us by Defra.

BCVA supports the ongoing research into improving disclosure rates of bTB by improving testing on farm. We remain open to considering the evidence on the effectiveness of targeted 'bovine-only' interpretation, and request that greater consideration be given to how these results can be applied on farm.

Similarly, with novel accredited testing techniques, it is crucial that as a profession, we embrace their incorporation into a future control strategy. We warmly welcome the commitment by Defra to assess new combinations of tests. These points form part of the BCVA Bovine TB 2020 Strategy to be released shortly".

120. Most statutory tuberculin skin testing in England is undertaken by Veterinary Delivery Partners (VDPs) who are responsible for allocating local Official Veterinarians (OVs) in private veterinary businesses.

121. The Godfray Review highlights the importance of correct application of the tuberculin skin test. VDPs are responsible for auditing OVs to ensure that testing is carried out to a high standard. APHA also carries out risk-based audits to check that the test is being carried out in line with the agreed official procedures. This includes attention directed towards testing outcomes which differ from regional norms[14].

122. Currently APHA employs a number of para-veterinary professionals who conduct the majority of tuberculin skin testing undertaken by government. This testing is delivered efficiently and to a high standard. The government believes that enabling veterinary practices to use similarly trained para-veterinary professionals, called Approved Tuberculin Testers (ATTs) to perform tuberculin skin testing under the direction of an OV could offer a range of potential benefits, including efficient and effective delivery of diagnostic tests. **APHA is piloting the use of ATTs in a small number of VDP practices. The government will use the results of the pilot to inform a decision on whether or not to introduce the use of ATTs on a larger scale.**

[14] APHA (2019) Official Veterinarian Instructions: Official Veterinarian TB Testing Audit http://apha.defra.gov.uk/External_OV_Instructions/TB-testing-audit/index.htm

Potential benefits of enabling veterinary practices to use para-veterinary professional Approved Tuberculin Testers (ATTs) to perform tuberculin skin testing of cattle in England

- Enabling VDPs in England to increase the breadth of their workforce so that they can handle an increase in TB testing e.g. the introduction in 2020 of six-monthly surveillance testing, instead of annual testing, for higher risk herds in the HRA.
- Providing contingency in the face of the current and worsening shortage of cattle veterinarians in England by supplementing the practice workforce.
- Enabling veterinary surgeons to focus more on specific veterinary tasks that require veterinary judgement and/or sign off.
- Providing increased bTB testing resilience in the event of an exotic animal disease outbreak and also a pool of resource available to help in an exotic disease outbreak.
- Enabling veterinary businesses to provide a cost-effective bTB testing service, whilst maintaining high quality standards, to their commercial and government customers.
- Potentially providing a cost-effective solution for veterinary practices in England who carry out relatively low levels of bTB testing (e.g. in the LRA).

Diagnostic test development

123. The current tuberculin skin test will remain the focus of our surveillance testing in the short to medium-term. However, the government sees the development of new diagnostic tests for bTB in cattle as a priority. This includes a skin test based on synthetic defined antigens which may represent a promising alternative to the traditional tuberculin-based test, obviate the need for an injection of avian tuberculin and provide the ability to differentiate infected from BCG-vaccinated animals, thereby overcoming a major hurdle for the implementation of cattle vaccination programmes for bTB eradication (See Chapter 2).

124. Development of new diagnostic tests for a notifiable disease such as bTB is a protracted process potentially involving proof-of-principle experiments, field trials, international validation and marketing authorisation for any veterinary medicinal products deployed as part of a test. The government will continue to support bTB test development (see Chapter 2) and consider how best we can enable early use of promising tests for bTB control where farmers and vets wish to do so privately.

Additional epidemiological tools to support bTB eradication

Deployment of improved tools for genetic typing of M. bovis

125. **The government plans to roll out the routine use of detailed bTB 'genetic finger-printing' of M. bovis, a technique known as whole genome sequencing (WGS).** WGS will replace the less discriminating spoligotyping (a category of genetic variants) and VNTR (variable number of tandem repeat) genetic typing techniques currently used by APHA.

126. Whole-genome sequencing will allow APHA to understand better the likely source of TB in infected herds; this would be a powerful communication tool for farmers and vets to help them understand and control the risk of bTB to their herd. It will allow for better epidemiological analysis of bTB in England, locally and nationally. It will better flag unique or unusual breakdowns. In the future, it could help APHA better target delivery of disease control policies, for example badger control measures (see Chapter 3).

Whole Genome Sequencing Case Study

APHA declared a potential hotspot area in east Cumbria in the Low Risk Area of England in 2016 following the emergence of a cluster of breakdowns associated with M. bovis genotype 17:z. This genotype (combination of spoligotype and VNTR profile) had not previously been identified in Great Britain and investigations concluded that it was most likely introduced by cattle imported from Northern Ireland, where it is relatively common.

APHA initiated enhanced surveillance of found-dead badgers in September 2016 and tested cage-trapped badgers removed during the subsequent Area 32-Cumbria cull operations in 2018. A number of badgers also tested positive for M. bovis genotype 17:z.

APHA carried out WGS on all M. bovis isolates from cattle and badgers. As of August 2019, there were twenty-two unique genetic sequences (or clades) found in Area 32 (Figure 4.2) of which:

- Three clades were found in both species, including Clade A which is the most likely ancestor of the epidemic and which all the other clades are descended from.
- Fifteen clades were found in badgers only.
- Four clades were found in cattle only.

The presence of shared sequences across the two species provides more evidence that possible cattle-badger and/or badger-cattle transmission occurred in the area. However, direction of transmission cannot currently be inferred from these data. To do this requires more data and in-depth analysis.

Further details are available at www.gov.uk/government/publications/bovine-tb-surveillance-in-wildlife-in-england

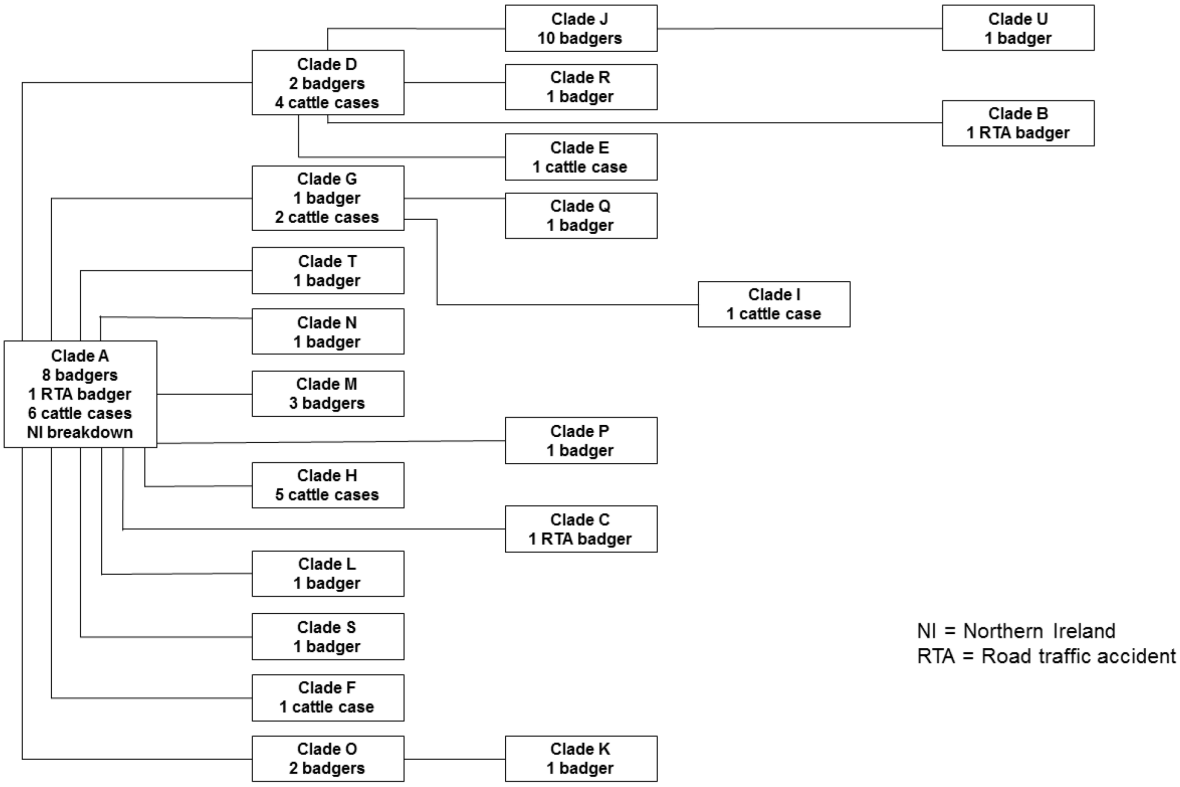


Figure 4.2: WGS tree for all M. bovis isolates from HS21, where Clade A represents the original imported strain and each column represents a single nucleotide polymorphism difference.

Better gathering of key epidemiological information

127. Getting accurate and useful epidemiological data from bTB incidents requires having the right tools. Currently, herd management data is gathered in the APHA's bTB epidemiological questionnaires, known as disease report forms (DRFs). This work supports the analysis and understanding of the source of infection and the potential pathways for transmission of bTB into a herd. Currently, a proportion of all herds experiencing a new bTB incident are subject to a farm visit by an APHA field vet to undertake an epidemiological survey using the DRF as a template.

128. **The government is committed to improving bTB epidemiology, including better understanding the sources and pathways of infection for herds affected by bTB breakdowns.** It will support APHA to refresh the format and content and use of the DRF to enhance the efficiency of epidemiological data gathering and its accuracy, as well as improve data extraction and analysis. In addition, the methodology for identification and selection of new incidents for DRF completion will be revised and targeted to address changing epidemiological and business requirements.

129. Systematic and accurate gathering of epidemiological data will lead to more accurate analysis of transmission pathways. This will lead to improved understanding of how disease is spreading at local and national levels, enabling more specific expert advice to be given regarding the control and eradication of disease.

5. Incentivising industry behaviours to prevent the spread of bTB through increased uptake of effective biosecurity measures and management of the risks posed by cattle movements

Key messages

Good biosecurity will not, on its own, resolve the bTB epidemic. However, it is essential if we are to bank the benefits from the collective action and investments of time, effort and money made by all since the launch of the bTB Strategy.

Many biosecurity measures and responsible actions on cattle movements are affordable, practicable and achievable and there is little excuse for those who choose not to put them into practice. Those who put their own and others' herds at risk by not meeting reasonable baseline standards should not have the same compensation safety net and/or herd testing regime as those who do.

Cattle movements are a necessary consequence of the structures of England's beef and dairy sectors. BTB controls need to be tailored to the needs of those sectors, rather than force them to change, but in return herd owners must take greater responsibility for managing the risks of translocating disease.

High quality advice, information and guidance, beyond what is currently available, are critical in order to equip herd owners to do the right thing for themselves and for their industry.

Introduction

130. Good biosecurity matters. It is not a panacea but in combination with all of the other necessary interventions it has the potential to tip the balance from controlling bTB to being on a trajectory to eventual eradication. That is the view of all of the parties that have worked hard since 2014 to help herd owners increase the resilience of their herds to the threat of bTB. That is why there has been considerable collective effort and investment into important, joined up, accessible and understandable information, advice and guidance. But still, too few herd owners

are acting on that information, advice and guidance. A new, stronger approach is, therefore, needed.

131. The Godfray Review refers to a disappointingly low uptake of relatively cheap 'no regrets' biosecurity options (such as separating cattle from badgers and other cattle on neighbouring holdings) ascribing this in part, to a lack of motivation. This conclusion is supported by the more recent results of a bespoke cattle farm practices survey carried out by Defra in 2019.

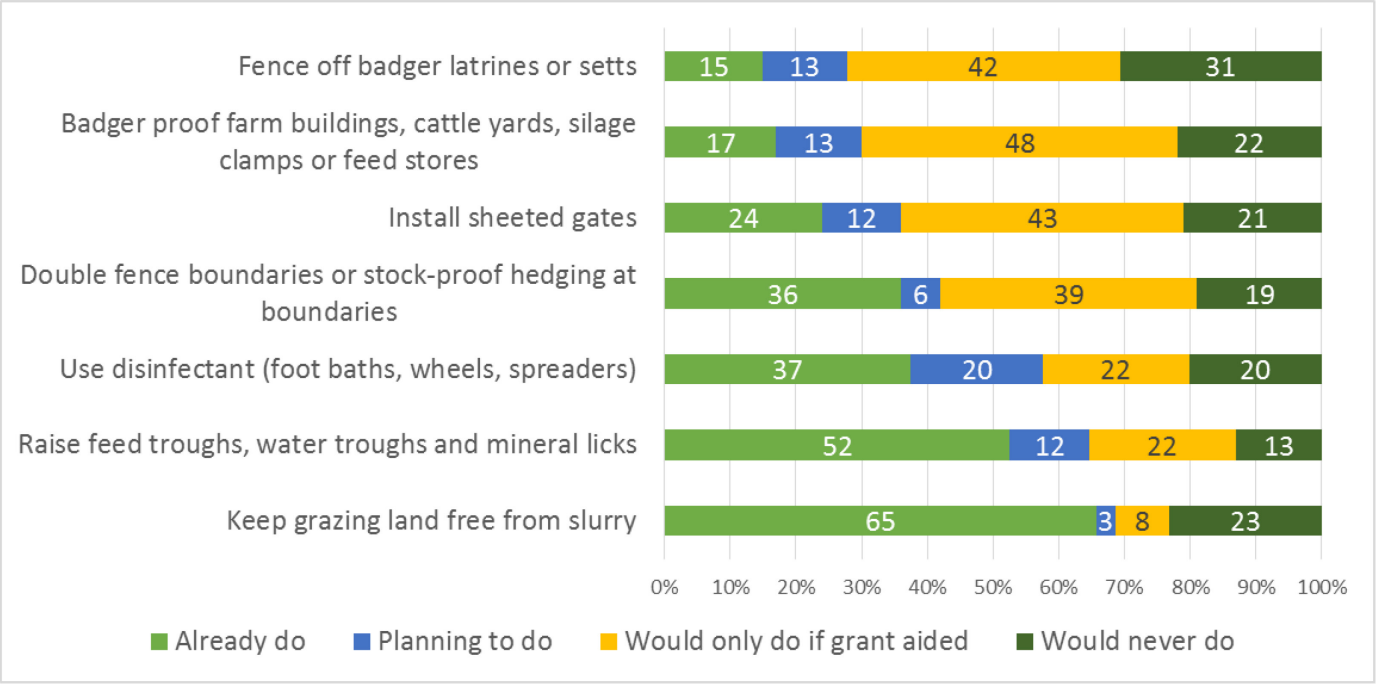


Figure 5.1 : Headline results from the Cattle Farm Practices Survey, April 2019[15]

132. The Godfray Review also highlights that the diversity of cattle farming businesses, including their locations and landscapes, means accessibility to appropriate, relevant, tailored advice is a barrier for many.

133. Managing the disease risks from movements of cattle between herds is a part of good biosecurity - possibly the most important part, but certainly one that farmers have the most control over. Traditionally, managing these risks has been referred to as 'risk-based trading' but we believe that is an unhelpful term since movements of cattle for any purpose, not just sale, constitutes a risk that should be managed. So from now on, government will simply refer to the need to ensure responsible cattle movements. That responsibility falls partly on herd owners to

[15] The survey focused on farm practices such as grazing systems, slurry spreading and storage, purchasing cattle, biosecurity and advice. The results are based on questions sent to 3,001 holdings with cattle in England. The survey was voluntary and 1,363 responses were received.
Source: www.gov.uk/government/statistics/cattle-farm-practices-survey-april-2019

share information to mitigate the risk of disease transmission. But it also falls on government to regulate such movements, where necessary, and ensure the sharing of important risk-reducing information.

Communicating and promoting collective action on biosecurity

134. There are different interpretations of the meaning of biosecurity. In this context, however, we mean measures designed to improve herd resilience to bTB. These measures would reduce rather than eliminate the risk that a herd will suffer from bTB, but it would be reasonable to assume that where breakdowns do occur, they would, on average, tend to be shorter and less severe.

135. There is agreement between government and industry on the measures all herd owners should at least consider. The bTB biosecurity Five Point Plan[16] and the TB Hub website[17] are initiatives developed and supported by a consortium of organisations to help keepers and their vets improve herds' resilience to bTB. **Government will seek to build on that collaboration through joint promotion of those tools and also other tools such as ibTB.** Government hopes and expects industry organisations will play their part in that.

136. The proposed new governance arrangements set out in Chapter 6 will further support the ambition for more collective action and shared responsibility. Government's ability to reach and influence herd owners is limited, whereas farmer, veterinary and other representative organisations can provide their members and supporters with trusted information, advice and guidance. By working together, and building on the biosecurity workshop held in June 2019 and the progress report published in December 2018[18], we can make more and faster progress.

[16] The bovine TB biosecurity Five Point Plan is a joint industry and government initiative launched in 2015. It describes simple, practical biosecurity measures that cattle keepers can take to protect their herds from TB. https://tbhub.co.uk/biosecurity/protect-your-herd-from-tb/

[17] TB Hub: The home of UK TB information https://tbhub.co.uk/

[18] Defra (2018) Government and the cattle industry working together to improve Bovine TB biosecurity - A progress report and next steps (a joint publication by Defra and the Welsh Government on behalf of the government and industry partnership group) www.gov.uk/government/publications/bovine-tb-biosecurity-progress-report-2018

137. The TB Hub delivers collectively agreed, consistent and coherent information, advice and guidance to herd owners and others with a professional interest in controlling bTB. It includes some powerful case studies, reporting the experiences of a number of keepers who have taken steps to improve their herds' resilience to bTB. The TB Hub has not been used as extensively or frequently as all partners would like and that is due, in part, to too few herd owners knowing about it. It has also not always been easy to navigate the site and find the precise information needed. That is why Defra allocated £25,000 to improve the design of the TB Hub and make it easier for everyone to access the information they need. That work was completed in February 2020.

Paul Brereton – New Farm, Market Drayton

"The consequences of a TB breakdown are just not worth it, both financially and emotionally. Although TB is a complex disease there is a lot you can do to control it, whether that is checking the TB history of a farm you are purchasing cattle from or ensuring all cattle feed is securely locked up preventing access by badgers, it's worth prioritising. For me it makes sense to invest time and money implementing as much biosecurity as possible because the financial loss from a breakdown is considerably more. Also breakdowns take up quite a lot of your time too, as you have to get all your cattle TB tested, so why not spend that time installing electrical fencing or locking up feed securely"?

Source: https://tbhub.co.uk/biosecurity/case-studies/case-study-8-paul-brereton-new-farm-market-drayton/

138. Previous work to quantify the likely financial impacts of a bTB breakdown is strong evidence of the potential value of good biosecurity. That previous work is out of date, however. **A research project is underway to quantify the current economic cost of a bTB breakdown to herd owners. Defra expects to be ready to publish the results of this research in early 2020.** The economic impacts go beyond the lost market value of compulsorily slaughtered cattle. There are also significant social impacts, though these are more difficult to monetise. This research will inform how government communicates bTB control messages and will be incorporated into future cost: benefit and other economic analyses of policy options flowing from this response to the Godfray Review and other developments.

Improving herd resilience through extensive uptake of 'no regrets' measures

139. The Godfray Review noted the perceived low uptake of what it termed 'no regrets' biosecurity options. Government's starting point for 'no regrets' measures is the following subset under the Five Point Plan developed with industry partners. A further 'no regrets' measure for cattle breeders is the uptake of TB Advantage, the index of the degree of genetic resistance to bTB a particular dairy bull is likely to pass on to its offspring. TB Advantage has the potential to improve herd resilience over time. Defra is co-funding research to develop a similar index for beef cattle.

Subset of measures under the bTB biosecurity Five Point Plan

- Restrict badger access to feed stores, troughs and mineral licks.
- Don't put feed on the ground at pasture and clean up spillages.
- Use clean, fresh water and restrict badger access to water troughs.
- Only feed waste milk to calves if it has been boiled or pasteurised.
- Put in place effective barriers between neighbouring herds.
- Avoid sharing equipment or vehicles with other farms.
- Only spread manure on arable land or pasture that is not going to be grazed by cattle for at least two months.
- Don't spread manure from other farms.

140. Some of these measures are straightforward and applicable to all herds. But others need to be considered in different ways in the different bTB risk areas - for example, restricting badger access to feed stores and ensuring effective barriers between neighbouring herds. Furthermore, certain common practices such as using contractors for some on-farm operations mean it is not always practical to avoid sharing equipment or vehicles. However, ensuring the cleansing and disinfecting of shared equipment and vehicles is a sensible, basic measure that should be carried out by all as a matter of course.

141. For manure and slurry, there are various environmental measures in place, which may offer synergistic animal health benefits. These include the storage

requirements in Nitrate Vulnerable Zones,[19] the Code of Good Agricultural Practice for reducing ammonia emissions from the storage and application of organic manures[20], and the additional initiatives announced in the government's Clean Air Strategy[21]. The Tuberculosis (England) Order 2014 provides specific animal health powers relating to treatment, storage, spreading or spraying of manure and slurry from cattle under bTB restrictions. Research is underway to look at the frequency of M. bovis excretion in cattle faeces (see Annex 3). **Government will use the outcome of this research to take a decision on introducing tighter licensing requirements for the use and movement of slurry and/or manure from premises under bTB restrictions.**

142. Organisations with significant power to influence herd owners to adopt 'no regrets' measures include the providers of the various farm assurance schemes and retailers who set down requirements for their suppliers.

143. The government has met a number of these organisations to discuss the merits of adding proportionate bTB risk-reducing measures to their requirements. Most have welcomed this interest and expressed a willingness to work with government on the details. The government believes it can **agree proportionate and sensible revisions to the assurance scheme standards** which would, in effect, mean that the 'no regrets' measures become member requirements. If that does happen members of those schemes deserve recognition and reward. The next section covers the means by which they may be recognised and/or rewarded.

Improving herd resilience: setting the baseline and incentivising best practice

144. The bTB Strategy highlighted the need to consider the extent to which compensation levels influence farmers' approaches to managing their bTB risks. The government of the time said it would review compensation arrangements with a view to better incentivising risk-reducing practices, ensuring that keepers who observe defined best practice benefit over those who do not.

145. In recent years some relatively minor compensation policy changes have been made. For example, since November 2018 herd owners who re-stock while

[19] Defra (2017) Storing organic manures in nitrate vulnerable zones
www.gov.uk/guidance/storing-organic-manures-in-nitrate-vulnerable-zones
[20] Defra (2018) Code of Good Agricultural Practice for reducing ammonia emissions
www.gov.uk/government/publications/code-of-good-agricultural-practice-for-reducing-ammonia-emissions/code-of-good-agricultural-practice-cogap-for-reducing-ammonia-emissions#apply-organic-manures-effectively-and-efficiently
[21] Defra (2019) Clean Air Strategy 2019
www.gov.uk/government/publications/clean-air-strategy-2019

under bTB restrictions receive just 50% of full compensation rates for any cattle added to the herd that are removed due to bTB while the herd is still restricted.

146. The government believes that anyone who takes steps to improve a herd's resilience to bTB should be recognised and rewarded. Further differentiation of compensation rates is one way to do that.

147. The current practice of compensating bTB-affected cattle at average market value is an important lifeline for some businesses, as it enables replacements to be purchased on a like for like basis. But providing the same level of compensation to those who do not maintain basic biosecurity controls, thereby putting their own and others' herds at risk, is not equitable. The government believes that having in place **basic on-farm biosecurity, based on the 'no regrets' elements of the five point plan outlined above, should in future be a pre-requisite for receiving compensation at current rates.**

148. For this to work the bio-security conditions (for full compensation) must be objective and verifiable, rather than dependent on the subjective judgement of an individual. They also need to be practicable and affordable. At present, the main tool for recognising herd owner investment in herd resilience is the Cattle Health Certification Standards (CHeCS) accreditation standard for bTB. That is, in effect, a very high standard requiring compliance with tough conditions, particularly in relation to the isolation and testing of animals brought into the herd. While this is a standard the government wants many more herd owners to aspire to, it recognises that it is unlikely to be practicable for many. So the government wants to supplement the current scheme with one that any herd owner can achieve.

149. The government therefore **plans to introduce an additional, new, more achievable and affordable baseline standard, compliance with which would earn herd owners the right to the full rates of compensation.** The hope is that verifiability could still be provided by the industry-led, not for profit, established CHeCS standards body allowing, in effect, the introduction of a 'CHeCS entry level' standard. But it could also be provided by the different assurance scheme providers referred to in the previous section.

150. **The government will establish a working group to take this forward** and help inform recommendations to Ministers on (i) the rates of compensation that should be payable to those who do and do not meet baseline biosecurity standards; and (ii) appropriate higher incentives for those who meet the tougher, full CHeCS standard.

151. Another way to incentivise biosecurity is by varying the frequency of herd surveillance testing. The government has already introduced six-monthly testing in the worst affected parts of the Edge Area. It has announced that the extension of

this to the HRA will be accompanied by earned recognition (in the form of annual testing) for herds that are CheCS-accredited and/or have been bTB free for at least six years. The government's focus at present is on putting those arrangements in place. Once that is complete, **government will consider whether further differentiation of surveillance testing frequency would be merited.**

152. The government recognises that bTB is a significant risk for herd owners and that the shock of a new breakdown can affect the financial sustainability of a business. That is why it is considering the scope for increasing the accessibility and attractiveness of insurance cover. Some herd owners, including in the worst bTB affected areas, already benefit from insurance for consequential losses. Previous work in partnership with the Government Actuary's Department indicates that there may be things that could be done to make the insurance option a more attractive proposition for more people. **The government will continue to look at these longer-term options to help herd owners mitigate the full impacts of a bTB breakdown.**

Developing and professionalising bTB advice services

153. The Godfray Review highlights the importance of making sure that farmers receive the best advice from trusted sources. It notes that existing information provided through the TB Hub is very good and that the bovine TB Advisory Service (TBAS) is playing an important role.

154. BTB risk pathways are complex and multiple. While there are, as outlined above, some basic bio-security measures that all keepers could take to reduce their risks, what constitutes robust resilience measures will differ from herd to herd and some herd owners will need expert advice and assistance. The veterinary profession and farm advisory service providers are well placed to provide that, but not without support from government to ensure quality assured advice is accessible.

155. TBAS[22] offers free one-to-one on-farm advice visits in the High Risk and Edge Areas. Advisors provide bespoke recommendations to help improve herds' resilience to bTB, explain trading options and identify measures to reduce the risk of repeat bTB breakdowns. TBAS also offers a telephone advice service and has organised sessions for groups of farmers with specific questions about bTB and biosecurity.

[22] TB Advisory Service http://www.tbas.org.uk/

156. This service, currently funded through the Rural Development Programme for England, runs until 2020. The government believes there will continue to be a need for bespoke advice, and **will engage with stakeholders to explore future arrangements**.

TB Advisory Service Endorsements

Cornwall dairy farmer: “The advice call was excellent, good practical advice”.

Somerset dairy farmer: “We were in a rut of thinking that TB is inevitable. The TBAS visit helped us to realise that there are many things we can do to reduce our chances of getting TB”.

Gloucestershire dairy farmer: “The advice helped me better understand the cattle movement risks and testing requirements”.

East midlands beef producer: “Our TBAS visit really quantified our farm's bTB risk profile. It both highlighted issues we hadn't previously considered and gave us a nudge to actually act on some we were already aware of. The TBAS visit isn't a silver bullet to eliminate the risk to your herd, but it‘s certainly one of the pieces in the biosecurity jigsaw to reduce the likelihood of breakdown. It was a very worthwhile investment of our time. With the help of TBAS we hope never to experience the blight of bTB”.

Cheshire dairy farmer: “While the advice won’t eliminate the risk of TB, I feel it’s my responsibility to take the simple and cost-effective actions to reduce the risk - every farmer should do the same”.

Source: www.tbas.org.uk/endorsements/

157. The government does not want expert advice to be limited to formal, government subsidised services. We know that many herd owners rely heavily on their local veterinary practices to guide them through their options for increasing their resilience to bTB. It would be wrong to assume that all farm vets have the confidence and expertise to give good advice on bTB. Representative bodies for farm vets have expressed their keenness to continue to be involved in the provision of bTB training to their members. **The government will discuss with them the options for developing an affordable (for government and for the profession) training offer for private sector vets.** In doing that, government will need to consider what else would be necessary to have confidence that herd owners will use the services trained vets could provide (see also Chapter 4).

Responsible cattle movements: the power of information

158. It is a truism that information is power. Government frequently hears from stakeholders that if herd owners are helped to understand the risks posed by individual cattle they will take steps to mitigate those risks. This section focuses on cattle movements. This includes movements within and between the three bTB risk areas (not just into the LRA). The government accepts that it has a responsibility to empower herd owners by enabling the flow of relevant risk information. Government hopes and expects that herd owners will accept responsibility for acting on it.

159. The volume of cattle movements within and into England is an inevitable consequence of the structure of our beef and dairy sectors, with many herd owners specialising in a particular aspect of rearing or production. That has led to a dependence on movements on and off many keepers' holdings. As the Godfray Review noted, we need to know more about these economic drivers and the impacts of government interventions on trading patterns. **That is why the government has commissioned economic and social research projects to get a better feel for the regulatory and economic drivers for cattle movements across England and a better understanding of how herd owners make choices about the animals they buy.**

160. It is important that bTB controls on animal movements do not unnecessarily undermine the efforts of the dairy and beef sectors to operate profitably in an increasingly global market place. But much more could be done to aid those at risk of bringing undetected infection into their herds. The government's view is that information necessary for mitigating those risks needs to be made available as a matter of course. That may mean requiring, not just encouraging, relevant testing and health information to be communicated when cattle are offered for sale.

161. Defra and the livestock industry are already investing in tools to provide the necessary information. LIS will replace three existing livestock traceability services with a new single multi-species service that will deliver statutory requirements, including bovine EID, whilst enabling wider benefits for industry. It will enable the sharing with industry of key data about animals, their keepership and location and make it possible for this data to be integrated with other government and industry data. LIS is the product of a shared vision.

The Livestock Information Programme Vision Statement

Working in partnership, Defra and industry will develop world-leading standards of livestock traceability in the UK. This will deliver a competitive trade advantage, make us more resilient and responsive to animal disease and will drive innovation, interoperability and productivity improvements throughout the meat and livestock sectors.

Source: https://ahdb.org.uk/LIP

162. The Godfray Review placed a very high priority on supporting and implementing LIS, and government is doing that. As a first step, **the LIS team is engaging with farmers and livestock market operators to understand their needs.** The LIS team will then identify potential solutions and build prototypes to test their ideas in a real-world setting to find one or more credible options to develop further.

163. LIS is not the only means for sharing information to support responsible cattle movements. IbTB already allows users on a variety of platforms, including mobile phones, to identify holdings where there have been bTB breakdowns in the last five years. It is possible for those sourcing new cattle to check the bTB history of the herd(s) from which they originate through a simple county parish holding (CPH) or postcode search.

164. **The government is developing ibTB so that it can be a more effective tool to support responsible cattle movements.** That may include using it to share information on the locations of lower bTB risk herds and/ or the number of years that all registered herds have been OTF.

Responsible cattle movements: incentives and regulation

165. The development of LIS and ibTB represent significant investments by government. However, we need to be confident that that information will be made available to those who need it and acted upon.

166. The Godfray Review recognised that ibTB could facilitate responsible cattle movements but noted that its profile should be increased. Recent evidence suggests that use is increasing. The April 2019 Cattle Farm Practices Survey found that 28% of farms with cattle (excluding closed herds) made some use of ibTB.

More can be done, however. The government is confident that targeted marketing will make a difference. After reviewing feedback from stakeholder workshops and discussing options and ideas with key stakeholders and communication experts, the government now has firm plans for an **ibTB communications strategy.**

167. However, that may not be enough. So, just as government plans to consider the merits of varying bTB compensation rates to incentivise good biosecurity (as set out above) it wants to consider how compensation might also be used to incentivise responsible cattle movements. There are pros and cons to doing that. Compensation helps shield affected businesses from some of the financial impacts of the disease. We therefore need to ensure any changes would not significantly affect the sustainability of affected businesses. On the other hand, the risks from failing to take action to mitigate the risks posed by additions to a herd extend beyond the individual business in that they put at risk the disease control gains resulting from the efforts of others.

168. The options for varying compensation in order to incentivise responsible cattle movements and improve herd resilience range from the simple to the complex. Simple options include reducing compensation for all reactors not born on the holding. Complex options include basing compensation on an individual animal risk score which is linked to its movement history. The government **will develop proposals for discussion with key industry representative groups.**

169. For parts of England still relatively untouched by bTB, our aim is to continue to help protect that status. In 2016, we enhanced the disease control framework in the LRA by requiring the post-movement testing of animals sourced from herds in higher TB risk areas. **The government will now consult on extending compulsory post-movement testing to those parts of the Edge Area with annual, as opposed to six-monthly, surveillance testing.**

170. The government believes that legislating to prevent the movement of cattle from higher bTB risk herds into low bTB risk areas would not be appropriate at present but it does not rule this out for the longer-term.

171. There is a range of other regulatory options for managing the risks of disease transmission via cattle movements. Where there is a higher risk of residual cattle infection when a herd regains OTF status, the government will consider the option of ending the practice whereby the herd owner can use the final SIT as a pre-movement test. This is covered more fully in Chapter 4 alongside options for improving the sensitivity of testing used to restore OTF herd status.

172. Another measure which the government consulted on in 2017 was to stop licensing slaughter markets for TB-restricted cattle in the LRA. Responses highlighted the pros and cons of the proposal. Concerns were raised about whether

slaughter cattle from bTB-restricted herds would have to be transported over longer distances. However, the main veterinary organisations felt this needed to be balanced against the negligible impact on industry (given the very small number of such sales) and the likelihood that the change would give further protection to the status of the LRA. On balance, the government sees benefit in proceeding with the original proposal. **Slaughter markets for sales of bTB restricted cattle in the LRA will not be permitted after 31 August 2020.**

173. Movements into herds with a long history of bTB problems are another concern. While the government recognises that these herds need to re-stock to remain economically viable, it is important that added cattle do not effectively fuel the disease problem. Most owners of persistently affected herds do much to manage this risk in partnership with their vets, but we believe there is a minority that could do more. With that in mind, the **government will develop a proposal (for consultation) requiring owners of herds under bTB restrictions for over eighteen months to have a herd health plan in place (developed by their private vet) to manage TB and other herd health risks.** Movements of cattle into these herds would not be permitted if there was not an approved health plan in place. The details will be developed in partnership with veterinary and farming industry representatives.

6. Creating a true partnership across government, industry and stakeholders through more effective governance structures at every level

174. Many individuals and groups have a direct involvement in controlling bTB and will benefit from England achieving OTF status. The bTB Strategy stresses the importance of effective partnership working between government, the farming and food industries, the veterinary profession, local authorities, wildlife groups and other stakeholders to eradicate the disease. Badger culling deployment, BEVS and the bTB biosecurity Five Point Plan provide good examples of what has already been achieved via effective partnership working.

175. This Chapter addresses some of the important governance issues concerning bTB control raised by the Godfray Review. These include: questions about overall ownership and responsibility for managing the disease; regulation and enforcement; the provision of bTB advice; how the costs of bTB control are shared between government and industry; and the frequency and purpose of government consultation.

176. The Godfray Review focuses on strengthening current governance arrangements for bTB control to improve coordination, agility and shared ownership of the disease. It makes a compelling case for a 'new drive and a concerted and concentrated effort by all sectors' to reduce disease levels. There are many examples of positive engagement between government, industry and other stakeholders. Industry-led culling companies and volunteer vaccination groups play a crucial role in the practical application of bTB controls. However, the government accepts the review's findings and agrees that there are valuable opportunities to consolidate and strengthen existing relationships, structures and decision-making in order to drive progress towards bTB eradication.

BTB: roles and responsibilities

- Outside of the EU, the government will take the lead in setting the strategic direction for bTB control in England and the economic and regulatory framework for dealing with the disease.

- Government works in partnership with the devolved administrations to deliver shared goals for bTB eradication in the UK. Government also collaborates with other countries facing similar animal health challenges.

- The farming industry needs to feel a shared sense of ownership of bTB and be able to work effectively with government to develop new policies and interventions and ensure that the bTB Strategy meets its aim of maintaining an economically sustainable livestock industry.

- Farmers, landowners and NGOs play a pivotal role in delivering the government's policy for controlling the spread of TB from badgers, through licensed badger culling and vaccination.

- The veterinary profession plays a major role in the control of bTB. Farm vets' close working relationship with their clients and detailed local knowledge, makes them ideally placed to help farmers avoid bTB and, when herd breakdowns occur, to get rid of the disease as quickly as possible.

- Auction markets, retailers and food manufacturers have a role to play in terms of promoting responsible cattle movements and biosecurity, and setting out requirements for their suppliers.

- APHA is the lead delivery body on bTB, carrying out or managing surveillance and auditing, removal of reactors and disease controls (e.g. movement restrictions), and field epidemiology to inform management and control measures. APHA is also responsible for diagnostic services and other bTB research.

- NE provides advice as the government's statutory adviser on the natural environment and nature conservation, as well as assessing and issuing licence applications to cull or vaccinate badgers to prevent the spread of bTB.

- Under the Animal Health Act 1981, the responsibility to enforce all aspects of domestic bTB legislation rests with local authorities.

Improving regulation

Developing a new 'Bovine TB Partnership'

177. The Godfray Review recommends that the government should devolve disease control operations to a new body that would take over functions currently performed by APHA, NE and local authorities. Centralising functions in this way would be more efficient. Separation from government would make it easier for the new body to work collaboratively with industry and other stakeholders. The Review suggests that were government to decide on a broad-based independent regulator as recommended by Dame Glenys Stacey's Farm Inspection and Regulation review,[23] these activities would naturally fall within it.

178. The government will respond to Dame Glenys's review in due course. In the meantime, there is scope for further action to strengthen the partnership between government, industry and other stakeholders to control bTB, building on the success of TBEAG.

179. **To improve current arrangements, the government will work with industry and other stakeholders to develop a new 'Bovine TB Partnership' which can encourage shared ownership, coordination and decision-making, and be a driving force for further progress with disease eradication.** The Partnership will start work in 2020, absorbing the strategic advisory function currently performed by TBEAG to become a senior-level and high impact government and stakeholder group for bTB control. Compared with TBEAG, the new 'Bovine TB Partnership' will have greater autonomy and a stronger leadership role. The Partnership will be co-designed with industry and other stakeholders in the coming months. In principle, however, it should:

a. Bring together senior Defra, APHA, NE and local authority representatives (including the CVO), with appointments from the farming industry, the private veterinary profession, NGOs, retailers, processors, representatives of accreditation schemes, and experienced practitioners able to advise and make stronger and more coherent decisions about bTB control. The Partnership will be jointly chaired by Defra and an independent member.

b. Set direction, identify priorities, and address specific opportunities and risks. The Partnership should have a genuine impact on decision-making.

[23] Final report from the independent Farm Inspection and Regulation Review www.gov.uk/government/publications/farm-inspection-and-regulation-review

c. Co-design new policies and communications, e.g. through specific task-and-finish groups.

d. Set standards, monitor progress, and identify where new approaches might be needed.

e. Be outward-facing – able to engage widely across the sector to champion agreed bTB policy and bring in other perspectives.

180. The new group would work within the strategic framework provided by the bTB Strategy and the government response to the Godfray Review and be mindful of financial and legal constraints.

181. Over time an enhanced 'Bovine TB Partnership' would influence key areas of bTB control. For example: setting standards for responsible cattle movements and biosecurity; improving the provision and take-up of bTB advice; looking at alternative ways to deploy compensation and other incentives to drive positive behaviours; encouraging bespoke approaches to bTB control in particular local areas, e.g. in response to new epidemiological evidence; enhancing relationships at all levels, changing culture and creating opportunities for stakeholders and local groups to work together; engaging with developments in wider domestic agriculture policy.

The Bovine TB Compliance and Enforcement Group (TBCEG)

182. The bTB Strategy makes clear that it is crucial for current high levels of farmer compliance with bTB controls to be maintained. The small minority of farmers that contravene or ignore disease control rules jeopardise their own business and undermine the efforts of others. The Godfray Review also emphasises the importance of continuing to monitor and promote compliance.

183. The TBCEG is a group of experts that meet quarterly to provide technical and operational support on TB compliance and enforcement issues to local authorities in England and Wales. Representatives are drawn from APHA, the Association of Chief Trading Standards Officers, the Local Government Association, the Welsh Government, the Welsh Local Government Association, Defra and local authorities. The role of the group is to:

a. Facilitate, promote, coordinate and implement best practice by encouraging effective and consistent compliance and enforcement standards.
b. Promote the work of local authorities with regards to bTB compliance and enforcement.
c. Profile extent and cost of bTB by improving intelligence systems.

d. Generate a forum for discussion, exchanging ideas, information and liaising with local authorities, regions and central government.
e. Consider consultation papers, guidance documents and matters of national interest.

184. TBCEG sub-groups to work independently and provide regular updates to the main group. TBCEG has a sub-group considering future civil sanctions.

Simplifying regulations

185. The Godfray Review noted that TB can occur in farmed animals other than cattle but is less of a problem. It advised that consolidation of current legal provisions relating to TB in non-bovine farmed animals to make a more coherent and transparent regulatory regime, would make it simpler for businesses to comply and for regulators to police and enforce.

186. Statutory provisions for controlling TB in non-bovine farmed animals are held within different pieces of legislation and the government agrees that this can make it challenging for stakeholders to understand the controls and their obligations. **The government has previously consulted on plans to simplify TB disease control measures for non-bovine farmed animals and will now bring forward plans to consolidate current legislation in order to provide a more coherent and transparent regime for keepers and regulators.**

Engagement at local level

187. The Godfray Review highlights the need to apply different tools in different herds depending on local circumstances and disease risk. It identifies the important role played by existing bTB Eradication Groups. The government believes that there are opportunities to build on and extend the existing network of local bTB partnerships, driven by shared government-industry governance, and incorporating bespoke biosecurity interventions and wildlife control. This approach could:

a. Encourage greater awareness and understanding of local epidemiology and disease risk.

b. Help to explore how measures aimed at targeting disease spread could be tailored to local conditions.

c. Support the introduction of targeted local strategies.

d. Improve the incorporation of local information into the national picture of the epidemic.

Case Study: Working in partnership with the National Trust

Defra and the National Trust are collaborating on a 'Bovine TB Operational Management Scheme' desk study. Informed by the Godfray Review and with the support of an expert Advisory Group, the study aims to set out a package of practical and accessible measures to help farmers tackle bTB. The approach will be tested on National Trust land, with the aim of making the case for an extended roll out in future.

The study is exploring badger vaccination, biosecurity, best-practice cattle trading, and alternative strategies for surveillance/testing. Potential options are being assessed on the basis of:

- Potential disease control benefits;
- Affordability;
- Feasibility;
- Feedback and expert opinion from farmers, veterinarians and other key stakeholders; and
- Whether or not they are compatible with current disease control legislation.

The study aims to present its findings in 2020.

188. **To encourage stronger relationships between farmers, private and APHA vets and wildlife and conservation groups, without disturbing other established local or regional representative groups (e.g. NFU county groups) we will develop a new dedicated 'taskforce' within Defra's wider TB policy team.** This will consist of a hub in Defra, drawing on wider expertise as required. Local groups would be able to bid to Defra for taskforce time. The taskforce will offer constructive advice, help to develop clear objectives and action plans, and provide regular input, attendance, and support.

189. In addition, the new 'Bovine TB Partnership' will play an important role in championing and encouraging local groups, and gathering local intelligence and perspectives to inform decision-making.

Sharing the costs of disease control

190. The Godfray Review explores the potential consequences and implications for disease control of industry bearing more of the costs of bTB eradication. The

government acknowledges that tackling bTB carries significant costs for farmers and other taxpayers and that many farmers also bear substantial costs associated with badger culling. The government will continue to promote effective partnership working and ensure that a fair balance of costs falls to the general taxpayer, the food and farming industry and other stakeholders, as set out in the bTB Strategy.

191. Future options for compensation and increasing the accessibility and attractiveness of insurance cover are discussed in Chapter 5. Further work in this area will be informed by ongoing research aimed at quantifying the economic cost of bTB to herd owners. Drawing on input and advice from the 'Bovine TB Partnership' **the government will also continue to look at other cost-sharing options, such as the use of levies and fees/charges for statutory services delivered by government.**

Consultation frequency

192. The Godfray Review highlights concern about excessive and slow-paced consultation exercises, which may be delaying quick action and the ability of policy to adapt to new evidence or changing conditions. It sees advantages in consulting less frequently and at a higher level on broad strategy, mechanisms of adaptive management and direction of travel.

Case Study: East Cumbria

Between 2014 and 2016, a cluster of bTB cattle herd breakdowns emerged in the LRA in eastern Cumbria and APHA declared a potential hotspot area in September 2016. A potential hotspot is defined as an area of enhanced surveillance where bTB breakdowns with confirmed disease of uncertain origin emerge in a region of historically low TB incidence. Cattle, non-bovine farmed animals and wildlife in the area were automatically subjected to enhanced bTB surveillance without lengthy public consultation. This included:

- Six monthly whole-herd testing of cattle herds.
- Pre-movement testing of all cattle over 42 days moving out cattle herds.
- Movement restrictions applied to herds with inconclusive reactors alone pending the 60-day retest.
- Discretionary parallel interferon gamma testing of OTF-suspended (OTFS) herds, in addition to the mandatory blood testing of all OTF-withdrawn (OTFW) herds.
- Severe interpretation of skin tests for both OTFW and OTFS breakdown herds.
- Samples from all cattle with visible lesions of bTB at post mortem submitted for culture and genotyping.
- Ad hoc surveillance of camelid (skin testing followed by serology) and goat (skin testing only) herds.
- Biosecurity advice provided to farmers in the area.
- Testing of ‘found-dead’ badger and deer carcasses from the area.

193. The government agrees with the spirit of this. However, as the Godfray Review acknowledges, it may be harder to achieve consensus and buy-in amongst stakeholders for policies and decisions that have not been described and consulted on in detail. The government believes that stronger engagement with industry and other stakeholders, including through the new 'Bovine TB Partnership', can help to establish a clear direction and ensure high quality discussion of new evidence to inform timely and effective operational decisions. **The government will continue to apply the latest government consultation principles, which aim to reduce the risk of 'consultation fatigue'[24].**

194. Additionally, Annex 2 sets out an **indicative plan for developing the strategy over the next five years.** This will provide a framework for future consultation and greater clarity about when key decisions need to be made. It will allow stakeholders to understand better the purpose of any individual consultation exercise and how it supports the overall direction of bTB policy.

[24] Cabinet Office (2018) Consultation principles: guidance
www.gov.uk/government/publications/consultation-principles-guidance

7. Developing bTB policy in a time of change

195. In developing this response to the Godfray Review, the government has been acutely aware of the scale, pace of change and impact of leaving the EU and the CAP on British farming. The Godfray Review highlights the opportunity this presents to explore better disease control interventions, and that it is critical to ensure that changes to British farming facilitate bTB control in order to achieve eradication of the disease.

196. The bTB Strategy is an integral part of achieving our ambition to become a world-class food-producing nation that upholds high standards of animal health and welfare, underpinned by more resilient, productive and internationally competitive farm businesses. Our beef and dairy industries contribute billions of pounds to the UK economy every year. Tackling the disease will play a role in helping to grow our exports into new and developing markets and drive demand for UK produce around the world.

197. Our goal to eradicate bTB also supports the government's plans to create a National Food Strategy[25], which will set out a vision for the kind of food system we should be building for the future to deliver safe, healthy and affordable food. Central to this will be ensuring that our food system is built upon a resilient, sustainable and humane agriculture sector that promotes high standards of animal health and welfare.

Farm productivity

198. BTB has a direct impact on farm productivity, for example through the disruption to farm operations and the loss of animals when infected cattle are sent to slaughter. This can have significant impact on farm businesses, affecting in particular their ability to buy and sell cattle and meet beef supply contracts and milk quotas.

199. The government has set out an ambition in the Industrial Strategy[26] to create an economy that boosts productivity and earning power. Underpinning this, our aim is to ensure future policy enables farmers improve their productivity, and therefore increase profitability and competitiveness. Taking steps now to enable more herds to attain and maintain official TB freedom is one of the most effective things we can

[25] Defra (2019) Developing a National Food Strategy: independent review 2019
www.gov.uk/government/publications/developing-a-national-food-strategy-independent-review-2019
[26] BEIS (2017) Industrial Strategy: building a Britain fit for the future
www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future

do to achieve that. There are opportunities to do this through research, adoption of best practice, and skills, new tools and technologies.

200. The Rural Development Programme for England (RDPE) Countryside Productivity Small Grant (CPSG) scheme has provided funding for farmers to purchase equipment to improve the productivity of their farm. Under this scheme, farmers have been able to access funding for a limited number of bTB-related small capital items. The Countryside Productivity Scheme also includes TBAS. As part of the future farming programme, during the agricultural transition, the government will provide support for farmers to invest in equipment, technology and infrastructure that will help them deliver public goods, and improve productivity. In addition, consideration is being given to grant funding for enhancements to animal health and welfare above the regulatory baseline, which are valued by the public but are not sufficiently provided by the market. The government is also exploring the possibility of providing support for collective and local efforts to improve resilience to bTB, learning the lessons from existing local and regional bTB eradication groups and wider initiatives such as the LEADER initiative under the RDPE.

201. The government intends to phase out the income support which farmers receive through Direct Payments now we have left the EU. Direct payments have been shown to hinder productivity growth, undermining the incentives to adopt best practice and encouraging suboptimal investments that impact profitability. Delinking Direct Payments from the requirement to farm the land will facilitate more rapid restructuring of the agricultural sector and offer choice to farmers. This may potentially be of benefit to our goal of bTB eradication, for example by driving decisions to specialise or increase outputs by improving animal health.

202. LIS should also play a critical role in driving innovation and productivity improvements throughout the meat and livestock sectors. This should help deliver a competitive trade advantage, and make us more resilient and responsive to animal disease. The Godfray Review places a very high priority on supporting and implementing LIS, and strongly advises that consideration be made to how it can be used to combat bTB at the design stage. A great deal of investment by government and industry has laid the groundwork, and work continues to deliver LIS in partnership through a newly established public company. Further discussion about the power of information to support responsible cattle movements, for the benefit of disease control, is discussed in Chapter 5.

203. The government is also currently considering the future of the Agriculture and Horticulture Development Board (AHDB) following a Request for Views exercise in late 2018. AHDB's role in working with farmers to improve efficiency and productivity is one area being explored. The outcomes of this work may have read-across to achieving the aims of the bTB Strategy, as improving animal health and

tackling disease is a fundamental part of achieving that. The government will continue to consider how these two work areas feed into and support each other.

Governance and regulatory reform

204. Another potential opportunity to drive progress with the bTB Strategy is through the work flowing from Dame Glenys Stacey's independent Farm Inspection and Regulation Review, which was commissioned in February 2018. This complemented the consultation on Health and Harmony: the future for food, farming and the environment in a Green Brexit, which set out a vision for a changed regulatory culture as a foundation of our new domestic policy for farming and land management.

205. Dame Glenys proposes that a modern, effective regulatory system will require a new, stronger partnership between those being regulated, and those doing the regulating. She recommends the creation of a new independent regulator for farming and land management. In a similar vein, the National Food Strategy Review will look at how food production is regulated and may offer further suggestions. The Godfray Review suggests that government should devolve bTB disease control operations to a new body that would take over functions currently performed by APHA, Natural England and local authorities.

206. Work is underway to explore the option of a broad-based independent regulator, alongside other possible approaches, in response to Dame Glenys' review. This would need to consider:

a. What scale of remit would be manageable and efficient, across farming and land management, plant health and animal health and welfare?

b. What activities or industries would be in scope and where the boundaries with other bodies carrying out wider regulation or enforcement are?

c. What the costs of set-up would be, and how future funding would work?

207. That work is also looking at developing a suite of enforcement tools that are most appropriate to replace the current cross-compliance penalties. For example, consideration of civil sanctions for certain offences which might, in future, also include bTB-related offences.

208. In the meantime, the government has developed proposals to strengthen the governance arrangements for bTB (see Chapter 6). These proposals contribute to the plans for a new approach under the Future Farming Programme, which aims to promote industry leadership in partnership with government in improving the health and welfare of livestock.

Facilitating structural change

209. The Godfray Review also raised concerns about a number of issues linked to the current legislation/policy surrounding agricultural tenancies and the potential impact on disease spread. Firstly, the incentives to hold land for investment which has increased the short-term letting of agricultural land e.g. for grazing. Secondly, the current rules for Temporary Land Associations, allowing unrecorded short-distance movements. Thirdly, the disincentive arising from short-term tenancies for investments that are of benefit to disease control.

210. There are various reasons why the government may want to pursue changes to current legislation on agricultural tenancies. From a bTB policy perspective, it may provide an opportunity to help address some of the problems which lead to some tenants not investing in long-term improvements to increase productivity and reduce the risk of bTB because of short-length tenancies. The Godfray Review made a number of suggestions to help encourage longer-term agricultural lettings. For example, providing tax breaks on rental income; de-risking longer-term leases for agricultural landlords; and encouraging industry bodies to be more proactive in providing best practice advice to land agents and other professional advisers on the benefits of longer-term lets for both landlord and tenants, to encourage a culture shift away from short-term agreements.

211. A consultation on options to reform agricultural tenancy law in England, to help remove barriers to productivity improvement and facilitate structural change in the tenant farming sector, closed in July 2019. This explored some of the suggestions made by the Godfray Review mentioned above. A summary and government response will be published shortly. The Agriculture Bill includes provisions for tenancy reform. In further developing policy proposals flowing from these initiatives, the government will consider the potential animal health benefits.

Supporting innovation – research and development

212. Defra's wider work on Future Farming will establish an innovation research and development package, enabling farmers to work with research organisations to carry out projects to address farming industry challenges and increase the take up of innovative solutions on farms. This will build on the £90 million Transforming Food Production initiative, which will support a technology and data-driven transformation in UK agriculture now we have left the EU. There should be opportunities to promote the aims of the bTB Strategy as part of this. Further discussion about encouraging collaboration on bTB research can be found in Chapter 2.

Conclusion

213. The Godfray Review makes clear that the next decade will see arguably the greatest change in British farming since the 1940s. The government will fully explore the potential to harness changes in domestic agriculture policy outside the CAP, including through the National Food Strategy and the response to the Stacey review, to facilitate bTB control. This will be critical to successful elimination of the disease.

214. Many of the issues explored in this response i.e. including around partnerships/shared responsibility, incentives and communications, are not unique to bTB. The government continues to work as part of a much wider picture to strike the right balance in the continued relationship between government, industry and other key stakeholders to deliver shared ambitions for agriculture and the farming industry now we have left the EU. The government's Farming for the future: policy and progress update[27] provides further detail of the agricultural policy for England over the next ten years. It also outlines how the Agriculture Bill will help achieve this.

[27] Defra (2020) Farming for the future: policy and progress update www.gov.uk/government/publications/the-future-for-food-farming-and-the-environment-policy-statement-2020

8. Next steps

An action plan for the next five years

215. Annex 2 sets out an indicative plan for developing the strategy over the next five years. It is impossible to set out a definitive plan, as policy making is an evolving process which needs to be adaptable and take account of multiple factors.

Resourcing this plan

216. As set out in Chapter 1, the 2019 Spending Round settlement commits an additional £8 million for animal health in the 2020-21 financial year, including for bTB eradication. Future funding will be kept under review.

217. The bTB Strategy includes the ambition for a sustainable funding model and Chapter 6 refers to government considering a range of options for ensuring a fair balance of costs between the general taxpayer, the food and farming industry and other stakeholders

Monitoring and evaluation

218. The bTB Strategy highlighted the importance of monitoring and evaluating progress both in terms of the outputs and the outcome of achieving OTF status for England by 2038. The government will work with new 'Bovine TB Partnership' to monitor and evaluate progress, including through published statistical and epidemiological reports, keep the indicative plan under review and update it as necessary.

Annex 1 – Glossary

AHDB - Agriculture and Horticulture Development Board

APHA - Animal and Plant Health Agency

ATC - Animal Test Certificate

ATT - Approved Tuberculin Tester

BEVS - Badger Edge Vaccination Scheme

BCG - Bacille Calmette Guérin

BCVA - British Cattle Veterinary Association

BOTMEW - Bovine Tuberculosis Model for England and Wales

Bovine EID - Bovine electronic identification

Breakdown - A cattle herd which has had its OTF status suspended or withdrawn

bTB - Bovine tuberculosis

bTB Strategy - The strategy for achieving Officially Bovine Tuberculosis Free status for England, published in April 2014

CAP - Common Agricultural Policy

CHeCS - Cattle Health Certification Standards

CPH - Livestock holdings describe the land and buildings that people use for keeping livestock. Each holding has a unique County Parish Holding number.

CPSG - Countryside Productivity Small Grant

CTS - Cattle Tracing System

CVO - Chief Veterinary Officer

DAERA - Department of Agriculture, Environment and Rural Affairs, Northern Ireland

DAFM - Department of Agriculture, Food and the Marine, Republic of Ireland

Defra - Department for Environment, Food and Rural Affairs

DIVA - A diagnostic test which can Differentiate vaccinated-Infected from Vaccinated-uninfected Animals

DNA - Deoxyribonucleic acid

EU - European Union

GB - Great Britain

Godfray Review - The independent review of the bTB Strategy led by Professor Sir Charles Godfray, published in November 2018

GRAbTB - Global Research Alliance for Bovine Tuberculosis

HRA - High Risk Area of England

iBTB - Information bTB

LEADER - Liaison Entre Actions de Développement de l'Économie Rurale which roughly translates as 'Liaison among Actors in Rural Economic Development', part of the RDPE

LIS - Livestock information system

LRA - Low Risk Area of England

M. bovis - Mycobacterium bovis

NE - Natural England

NFU - National Farmers Union

NGO - Non-government organisation

OIE - World Organisation for Animal Health (Office International des Epizooties)

OIE Manual - The OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals

OTF - Officially free of bovine tuberculosis

OTFS - OTF herd status suspended

OTFW - OTF herd status withdrawn

OV - Official Veterinarian

PCR - Polymerase chain reaction

PPD - Purified protein derivatives

RDPE - Rural Development Programme for England

SBC - Supplementary badger disease control

SIT - Short interval test

SOA - Sole Occupancy Authority

TB - Tuberculosis

TBAS - Bovine TB Advisory Service

TBCEG - Bovine TB Compliance and Enforcement Group

TBEAG - Bovine TB Eradication Advisory Group for England

TBMI - TB Modelling Initiative

TRT - Tuberculin replacement test

UK - United Kingdom

VDP - Veterinary Delivery Partnership

VMD - Veterinary Medicines Directorate

VNTR - Variable number of tandem repeats

WGS - Whole genome sequencing

WTO - World Trade Organization

Annex 2 – Indicative five year plan

Action	2020	2021	2022	2023	2024
Evolving the strategy for preventing the spread of TB from wildlife					
Publish and periodically revise the location of those parts of the Edge Area with TB infected badgers and those parts where there is no evidence of infection in badgers.	Expected				
Pilot badger vaccination and surveillance post-intensive culling, ahead of phasing out SBC.		Expected	Expected	Expected	Expected
Refresh the information on gov.uk and develop a simple information pack for publication on the TB Hub. Develop a communications strategy to ensure clearer messaging from Defra delivery partners to farmers.	Expected				
Review and amend badger vaccination licensing requirements and vaccination training courses.	Expected				
Consult on a new policy of badger culling in epidemiologically-defined areas.		Expected			

Action	2020	2021	2022	2023	2024
Consult on considering land covered by effective badger vaccination programmes as equivalent to cull participant land in assessing whether there is sufficient coverage for an intensive culling licence.	Expected				
Review the BEVS criteria.	Expected				
Provide appropriate support to ensure that badger vaccination in pockets, or larger areas that are un-culled, goes ahead to address the local infected badgers, and that existing badger vaccination projects continue.	Expected				
Improving epidemiology, diagnostics and surveillance tools to root out bTB					
Phased introduction of six-monthly cattle surveillance testing in the HRA.	Expected	Expected			
Further improve surveillance testing through the greater use of more sensitive tests (or test combinations) for surveillance of OTF herds.		Expected	Expected	Expected	

Action	2020	2021	2022	2023	2024
Assess the costs and benefits of restricting the movement of 'higher risk' cattle following the negative short interval tuberculin test which restores a herd's OTF status.	Expected				
Assess the costs and benefits of adopting more sensitive methods for statutory pre- and/or post- movement testing of cattle.	Expected				
Review the use of the interferon gamma test in the High Risk and Edge Areas.	Expected	Expected			
Assess the costs and benefits of alternative testing regimes for infected cattle herds, involving new combinations of tests.	Expected	Expected			
Completion of ATT pilot & decision on roll-out to VDP practices.	Expected	Expected			
Strategy for routine use of whole genome sequencing of *M. bovis* at APHA.		Expected	Expected		
Roll out of a revised APHA epidemiological questionnaire for infected herds (the so-called bTB Disease Report Form (DRF)).	Expected	Expected			

Action	2020	2021	2022	2023	2024
Incentivising industry behaviours to prevent the spread of bTB through increased uptake of effective biosecurity measures and management of the risks posed by cattle movements					
Analyse the outputs of social research commissioned on the rationale for cattle purchasing decisions.	Expected				
Commission and publish the outputs of research into the cost of a bTB breakdown. Analysis to inform bTB comms and cost: benefit analyses of future policy options.	Expected				
Commission and analyse the outputs of research into the regulatory and economic drivers for cattle movements.	Expected				
Development of the iBTB online mapping tool to better support responsible cattle movements and implement further communications strategy to increase uptake.	Expected	Expected			
Scoping/initial development of options to support responsible cattle movements through the Livestock Information Service and agreement of next steps.	Expected				

Action	2020	2021	2022	2023	2024
Complete improvements to the design of the TB Hub.	Complete				
Scope, consult and agree next steps for changes to bTB compensation.	Expected	Expected			
Scope, consult and agree next steps for increasing accessibility and attractiveness of insurance cover to help mitigate the full impacts of a bTB breakdown.	Expected				
Consult on extending compulsory post-movement testing to parts of the Edge Area and agree next steps.	Expected				
Introduce policy on prohibiting slaughter markets for sales of bTB restricted cattle in the LRA.	Expected				
Develop and consult on proposals requiring herd owners under bTB restrictions for over 18 months to have a herd health plan in place and restrict movement of cattle into these herds in the absence of a herd health plan. Agree next steps.	Expected				

Action	2020	2021	2022	2023	2024
Complete exploratory discussions with providers of assurance schemes and agree steps to unify biosecurity advice/accreditation schemes with a baseline standard covering ‘no regrets’ biosecurity measures.	Expected				
Engage on and design a successor to TBAS.	Expected				
Discuss options for developing an affordable training offer for private sector vets and agree next steps.	Expected				
Decision on introducing tighter licensing requirements for the use and movement of slurry and/or manure generated on premises under bTB restrictions.	Expected				
Creating a true partnership across government, industry and stakeholders through more effective governance structures at every level					
Explore if bTB control functions should fall within the remit of a new broad-based independent regulator.	Expected	Expected			
Development and roll out of new ‘Bovine TB Partnership’.	Expected	Expected	Expected	Expected	Expected

Action	2020	2021	2022	2023	2024
Publish findings of the joint Defra and National Trust ’Bovine TB Operational Management Scheme‘ desk study.	Expected				
Bring forward plans to consolidate current legislation relating to TB in non-bovine farmed animals in order to provide a more coherent and transparent regime for keepers and regulators.	Expected				
Launch of dedicated bTB unit with an ongoing programme of engagement and support for local groups.	Expected	Expected	Expected	Expected	Expected
Assess the costs and benefits of options for sharing costs of bTB eradication.	Expected	Expected			

Annex 3 – Defra bTB research programme overview

Introduction

1. This annex summarises the Defra bTB research portfolio, which covers the research needs of Defra, the Welsh Government and the Scottish Government, and also identifies research areas to be considered in the short and medium term. The Defra research budget is shared with the two devolved administrations.

2. The Godfray Review focused principally on the bTB Strategy in England, while taking account of lessons learned from elsewhere. It identified many areas where further research is warranted and these are referred to throughout the document.

3. Defra also funds analysis and other types of data gathering and assessment outside of the shared research budget. This work is also referred to in this annex where relevant to the Godfray Review.

Strategic overview of the Defra bTB research portfolio

4. Defra's research portfolio can be divided into five blocks (Figure 1) based on the aspects of the epidemic they address, although there is considerable overlap and interdependency.

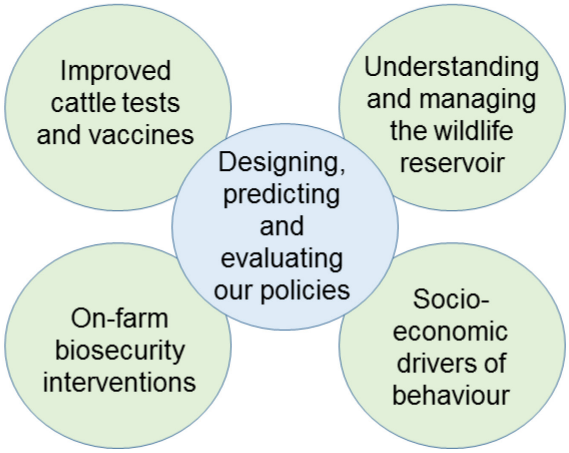


Figure 1: Defra's five research blocks

Developing a deployable cattle vaccine and improving diagnostics (Lead centre: APHA Weybridge)

5. Defra's diagnostics research block aims to support this goal by improving the main diagnostic test used, combined with encouraging and supporting the development of improved diagnostics technologies.

6. Closely related to the research on diagnostics is the associated work on the DIVA test which in turn is an integral part of the cattle vaccine research programme as a whole. In October 2019, APHA applied to the VMD for ATCs for the vaccine and for the DIVA test. If the applications are successful, these would provide the regulatory framework to allow field trials of the vaccine and the DIVA test to begin in 2020.

7. Defra has invested over £40 million in the development of a cattle bTB vaccine together with associated DIVA tests. Research into vaccines and associated diagnostics accounts for around 80% of Defra research funding.

Understanding and managing the wildlife reservoir (Lead centre: APHA Woodchester Park)

8. This research block considers: the ecology, epidemiology, pathology and prevalence of disease in the main wildlife reservoir, badgers, together with other relevant species such as deer and wild boar. It also develops and assesses a range of different policy interventions to address the wildlife reservoir of disease.

Therefore this area can encompass a wide range of other scientific disciplines depending on the specific topic.

Understanding and preventing transmission on-farm (Lead centre: APHA Woodchester Park)

9. This research block focuses on gathering evidence about practical measures farmers can take to prevent infection entering their farms and to reduce the spread of infection in the event their herds become infected. This includes, reducing cattle-wildlife contact, reducing the risk of buying-in infected cattle and preventing on-farm infection. Such evidence will improve and reinforce our goals to extend and enhance collaboration between government and industry.

10. The evidence generated in this research block will feed directly into the drive to assist vets in advising farmers in how to mitigate cost-effectively the risk and impact of bTB in their herds.

Socio-economic drivers of farmer decision-making (Lead centre: Cardiff University)

11. This research block goes beyond the ’what‘ of farmer behaviour to understand the ‘why’ of their decision-making. This is key as we seek to influence farmer behaviour rather than relying on compulsory government regulation. This includes purchasing decisions, investment in biosecurity and attitudes to different types of wildlife control.

Improving tools and skills in design, prediction and quantitative evaluation of policies (Lead centre: APHA Weybridge)

12. This area of research draws together knowledge from each of the blocks already mentioned and combines them with field epidemiological data and expertise to understand and define the drivers of the epidemic. This allows us to improve policy design and then quantitatively estimate the impact of proposed policies and assess the outcomes of existing policies.

13. To strengthen this aspect of our portfolio we will need to develop and deploy our existing epidemiological models: the TB Modelling Initiative (TBMI) the Bovine Tuberculosis Model for England and Wales (BOTMEW) and the badger-cattle spatial model. These models allow synthesis of the different data-streams to inform cost: benefit analyses.

14. Whole Genome Sequencing (WGS) is an example of an emerging technology which is strengthening our understanding of the epidemic and may shed light on the relative roles of badgers and cattle in different parts of England (see Chapter 4).

Defra research projects supporting this response to the Godfray Review

Developing a deployable cattle vaccine and DIVA test

Cattle vaccine and DIVA test field trials

15. Chapter 2 provides further details of the progress to date and planned next steps.

DIVA skin test (Project SE3304, 2017-19)

16. To enable BCG vaccination to be used alongside conventional test and slaughter policy, a BCG-compatible DIVA test is required. Over the course of this and predecessor projects, DIVA skin test reagents capable of distinguishing BCG vaccinated-uninfected from BCG vaccinated-infected cattle have been developed.

17. The final stage of this project is providing data, compiling and submitting a dossier to the VMD for an ATC application, a prerequisite for field trials.

DIVA skin test data gaps (Project SE3312b, 2019-21)

18. DIVA tests are a critical tool in deploying BCG vaccination in cattle. A data gap analysis undertaken with independent scientific experts has highlighted some uncertainties in the test's sensitivity in detecting bTB-infected animals that have been vaccinated. This project is addressing this data gap and aims to provide critical data and assurance before we can proceed to field trial implementation.

Improving diagnostics, surveillance and epidemiology

Tuberculin Replacement Test (TRT) - Further Development (Project SE3318, 2019-21)

19. The tuberculins used in skin testing and interferon-gamma testing are relatively crude bacterial extracts containing many different proteins and there can be variation between batches. They also require biocontainment level 3 facilities for production and testing.

20. It would be preferable to develop an alternative version of the skin test that uses fixed amounts of a defined number of antigens, which would have similar immunological properties to tuberculin, but without the inherent variation and potential cross-reactivity with mycobacteria other than M. bovis. These would be

easier to manufacture and standardize, and may perform better in animals infected with other mycobacteria. This project is additional to the DIVA test in that this test contains additional antigens which further improve test performance, but will be used as a primary diagnosis tool in the absence of vaccination.

21. This project aims to fill knowledge gaps to bring the TRT to a position ready for field trials, with a potential product to market within six years.

M. bovis detection enhancement for surveillance (Project SE3316, 2019-20)

22. Identifying M. bovis bacteria in samples taken at slaughter is a key part of the surveillance system. Three separate approaches are being investigated at APHA to improve the speed, cost and sensitivity of routine surveillance methods used for detecting and identifying M. bovis in submitted samples:

    a. Validation of a nested polymerase chain reaction (PCR) technique for rapid and sensitive detection of M. bovis direct from tissue/faeces.

    b. Enhancing the media to increase the sensitivity of detection of M. bovis in culture methods. Culture is currently the ‘gold standard’ of surveillance.

    c. Purify deoxyribonucleic acid (DNA) direct from tissue to allow Whole Genome Sequencing (WGS) without performing a culture step first.

23. These projects could bring significant improvements and the second and third approaches could also increase the provision of samples for Whole Genome Sequencing.

OIE New bovine tuberculin international standard (Project SE3312a, 2019-21)

24. Currently, the use of tuberculins (purified protein derivatives – PPD) of known, sufficient and stable potency is the cornerstone of the UK eradication programme, and a standardised tuberculin potency assay is a critical component underlying this policy.

25. Due to critically low (less than five years) stocks of the International Standard of bovine tuberculin (PPD-B) the OIE has developed a proposal for the evaluation and calibration of a replacement standard, providing for global requirements over the next twenty years.

26. APHA, as an OIE international reference laboratory for bTB, is the lead coordinator of the cattle experiments being performed in twelve countries, together with

participation or matched funding from a number of other national and international reference laboratories.

Cattle Diagnostic test development funding (Project SE3320, Tender 2019)

27. To stimulate the development of novel diagnostics in cattle we will provide a number of small grants via a call for pump-priming development funding focused on novel, disruptive approaches or technologies, directly applicable to cattle diagnostics.

Cattle Diagnostic test validation funding (Project SE3321, Tender 2019)

28. We are also providing funding for the validation of novel cattle diagnostics and provision of validated, blinded samples to assist with this work.

Validation of serology tests for deer and pigs (Project SE3315, 2019-20).

29. There is an increasing need for a robust and reliable test to determine the official TB status of deer and pig herds placed under movement restrictions after identification of infected animals. This project will evaluate ante-mortem serological diagnostic tests for TB in pigs and deer under GB conditions and builds upon preliminary work carried out by APHA with the deer and pig industries.

30. Validated antibody tests for these species could be important in several ways:

    a. Provide evidence in statutory use for exit from TB restrictions alongside the tuberculin skin test and post-mortem surveillance.

    b. Be developed for pre-/post- movement testing for enhanced disease control.

    c. Provide additional evidence of TB free status in animals intended for international trade.

Development and testing of Operational Models of Bovine Tuberculosis in British Cattle and Badgers (Projects SE3290, SE3292 and SE3296)

31. These projects developed the TBMI model. They bring together the foremost experts on TB modelling within the UK to produce an operational modelling framework of bTB transmission and control. These projects use the best available bTB epidemiology evidence, emphasizing robustness over complexity, to develop a long term, viable, TB modelling framework. It is currently being finalised for routine use within APHA's Department of Epidemiological Sciences.

Other research work

32. Defra funds the following research outside of the Great Britain (GB) research budget:

    a. BOTMEW: This modelling approach complements that of TBMI and provides another way of estimating the impacts of potential policies.

    b. Epidemiology reports: APHA publishes a comprehensive set of annual reports which contain data and analysis of many aspects of the epidemic both at national, regional and county level.

    c. WGS: WGS is an improvement over the current genotyping system and is starting to be deployed to investigate individual breakdowns as well as assess transmission patterns across GB (see Chapter 4).

Incentivising industry behaviours to prevent the spread of bTB

Detection of M. bovis in cattle faeces (Project SE3313, 2019-20)

33. The possible risk that TB could be spread at significant levels though the application of slurry on agricultural land is a high profile issue and evidence is required to inform policy development. Working with the Northern Ireland Department of Agriculture, Environment and Rural Affairs (DAERA) and the Department of Agriculture, Food and the Marine (DAFM) in Ireland, Defra has funded a study to gather evidence regarding the prevalence and persistence of viable M. bovis in slurry and similar matrices.

M. bovis detection in cattle aerosols (Project SE3314, 2019-21)

34. M. bovis is believed to be transmitted between cattle primarily by the aerosol route. New techniques developed in the human TB research arena have recently provided valuable knowledge regarding the amount of bacteria exhaled by infected people (10 million bacteria per hour). Working in collaboration with researchers in the UK (Leicester University) and DAFM in Ireland, APHA is collecting and analysing exhaled breath samples in a pilot study to develop this technique for cattle. Considering outputs from this project together with the data from the work on M. bovis detection in faeces, we aim to provide stronger evidence of potential transmission routes (cattle to cattle aerosol; fomites on pasture to badgers; and badger to badger aerosol) to further understand bTB transmission pathways and inform policy development.

Improve test for statutory evaluation of TB disinfectant efficacy (Project SE3317, 2019-23)

35. Recent testing has shown that the disinfectants most commonly used on livestock farms are effective against M. bovis, Project SE3307 identified that Mycobacterium fortuitum is not a suitable surrogate for M. bovis in the statutory approval tests undertaken before the official approval of disinfectants. Thus a new test for approved disinfectants needs to be developed and validated. While not explicitly referred to in the Godfray Review, the cleansing and disinfection of infected premises is an essential part of breakdown management and clearly falls under improving biosecurity.

Enhanced resistance to TB through genetic selection of beef cattle (Project SE3308, 2017-19)

36. Defra is co-funding a project with the AHDB to analyse data from beef cattle combined with bTB testing data to identify more resistant cattle in a similar manner to the TB Advantage trait that has been developed for dairy breeds.

Understanding cattle movements / Responsible cattle movements (Project SE3319, 2019)

37. Primary research to better understand how bTB fits into purchasers' decision-making when buying cattle. This study will be interview based and investigate social and economic factors. These will be used to inform policy on responsible cattle movements.

Compensation versus insurance. Understanding farmer attitudes and drivers (Project SE3322, Tender 2019)

38. Primary research to develop an evidence base on the role that potential changes in compensation or the introduction of insurance markets could have upon farmer incentives and behavior in tackling bTB. The presence of either compensation and/or insurance has scope to introduce perverse incentives. If compensation does not change behaviour then it represents only a transfer from the Exchequer to farmers and may not provide high economic value for money.

Economic cost of a TB breakdown (Project SE3139, 2018-9)

39. Although farmers receive direct compensation for cattle slaughtered for bTB control reasons, there are other direct and indirect costs associated with a bTB breakdown (e.g. reduced trading, increased testing, housing costs, loss of productivity). This

project seeks to gather more up to date evidence on these costs to help inform a number of policy areas.

Evolving the strategy for preventing the spread of TB from wildlife

Badger Oral Vaccine (Ongoing Project SE3247)

40. After 10 years of significant investment (£18.5 million) Defra, the Scottish Government, and the Welsh Government have discontinued further work into developing an oral badger vaccine. Unfortunately, research has failed to identify a suitable candidate vaccine that provides protection when ingested by badgers in a bait formulation. Although oral vaccination can work when administered manually to anaesthetised badgers, it is uncertain whether an effective bait-vaccine combination can be identified. Additionally, even manual vaccination required a very large dose (one hundred times that of injectable BadgerBCG vaccine) calling into question whether this approach could ever be cost-effective.

41. Independent scientific advice recommended a back-to-basics approach, realistically indicating that at least ten more years' research would be needed. Defra and the devolved administrations also considered the Godfray Review's advice that oral badger vaccines are not a promising avenue of research and that more emphasis should be placed on extending use of the currently available vaccine, injectable BadgerBCG.

42. In light of these results and advice, an oral badger vaccine is no longer considered an effective approach, and the limited research budget is being more effectively used pursuing research in areas where greater strides can be made in combatting disease.

Farmer attitudes: cattle and wildlife vaccination (Project SE3033, Tender 2019)

43. There is limited evidence related to farmer attitudes towards cattle and wildlife vaccination; existing evidence is not always bTB focused. Although previous

studies[28] [29] [30] [31] have been carried out, there has been little recent research on farmer attitudes towards cattle and wildlife vaccination. Social research, using qualitative methods, will be used to update the evidence, based on use of in-depth interviews and focus groups. As with similar studies, the main focus of interviews will be conducted with a representative selection of farmers, and may be supplemented by similar research involving vets and other industry experts.

Surveillance of TB in cattle herds exposed to badger control in England: monitoring effects of the current badger control policy on cattle breakdowns (Ongoing Project SE3131)

44. Defra provides core funding resources to APHA to perform priority epidemiological analyses to monitor any changes in the incidence of TB in cattle in those areas licensed for badger control. This work has been continuously undertaken since the start of badger culling activities.

Other research work

45. Defra funds the following research outside of the GB research budget:

    a. Surveillance of TB prevalence in badgers: Defra is currently trialling serology testing of culled badgers in order to develop a cheap and rapid way of assessing changes in prevalence to help inform exit strategies from culling.

    b. Woodchester Park: Defra continues to support the long-running study of badgers by APHA at Woodchester Park in Gloucestershire which provides world-leading scientific information on the ecology of badgers and how TB affects them as well as fostering and maintaining expertise in badger field-craft.

[28] Enticott, G. and others (2012) Farmers' confidence in vaccinating badgers against bovine tuberculosis. Veterinary Record 170 (8): 204.
[29] Maye, D and others (2013) Assessing farmer confidence in badger vaccination: some findings from a survey of cattle farmers in England. Journal of Rural and Community Development, 8(3), 49-64.
[30] Bennett R. and Cooke R. (2005) Control of bovine TB: preferences of farmers who have suffered a TB breakdown. Veterinary Record,156, 143-145.
[31] Bennett R. and Balcombe K. (2012) Farmers' willingness to pay for a tuberculosis cattle vaccine. Journal of Agricultural Economics, 63, 408-424.

Annex 4 – England bTB quarterly overview – Twelve-month period ending 30 June 2019

Figure 1 : Herd Incidence
New herd incidents per 100 herd years at risk of infection

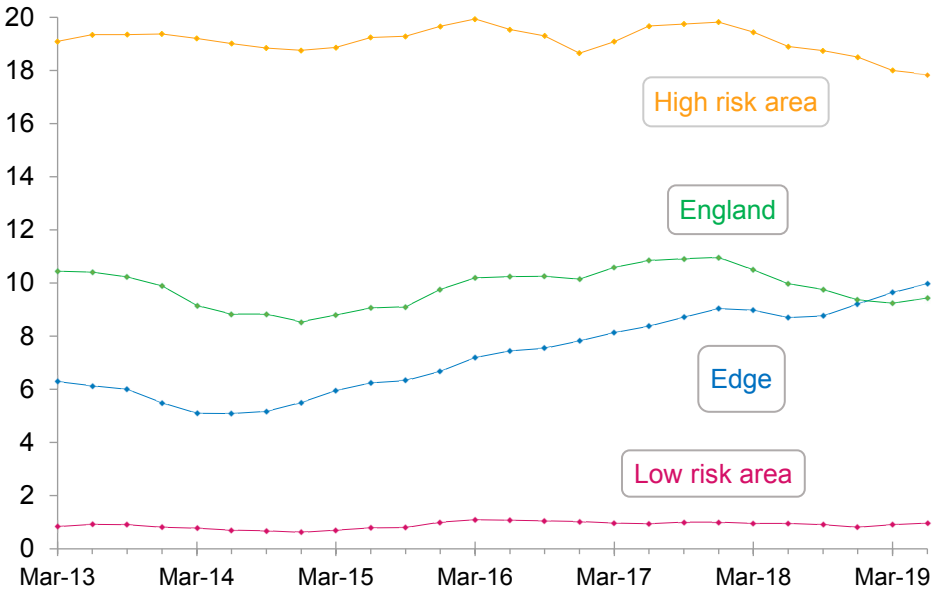
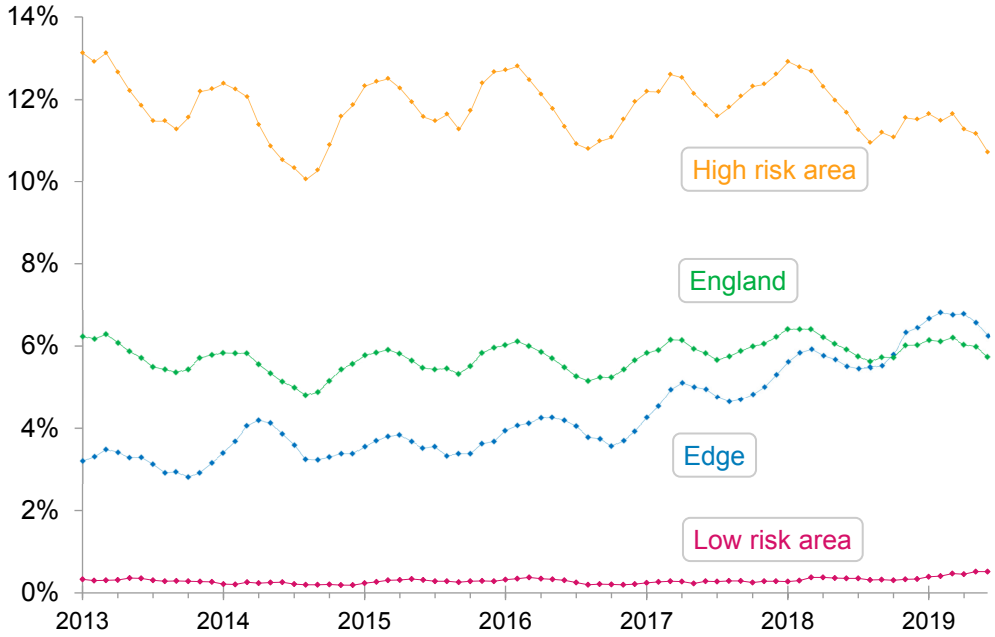


Figure 2 : Herd prevalence
Disease restricted herds as a percentage of registered herds



Source: Bovine TB statistics www.gov.uk/government/collections/bovine-tb

Annex 5 – Additional measures introduced since 2014

2014

In the Edge Area: introduced radial testing of all herds within 3km of a lesion/culture positive bTB breakdown herd in the Cheshire and Derbyshire Edge Area. www.gov.uk/government/publications/bovine-tb-information-note-tb-control-measures-the-edge-area-strategy

In the Edge Area: introduced mandatory parallel interferon-gamma testing for lesion/culture positive (OTFW) bTB breakdown herds (discretionary for other (OTFS) breakdown herds). www.gov.uk/government/publications/bovine-tb-information-note-tb-control-measures-the-edge-area-strategy

Introduced reduced Common Agricultural Policy (CAP) Scheme payments for overdue bTB surveillance or 'check' tests. www.gov.uk/government/publications/bovine-tb-information-note-strengthening-cross-compliance-tb-controls

Introduced an enhanced approach for dealing with persistent bTB breakdowns. http://apha.defra.gov.uk/documents/ov/Briefing-Note-0214.pdf

Introduced legal powers to remove cattle which are unable to be tested for bTB. www.legislation.gov.uk/uksi/2014/2383/contents

Tightened pre-movement testing rules by removing exemption for movements to and from common land. www.gov.uk/government/publications/bovine-tb-information-note-changes-to-tb-cattle-movement-controls

Tightened pre-movement testing rules by removing remaining exemption for cattle moved between holdings that are part of the same Sole Occupancy Authority (SOA). www.gov.uk/government/publications/bovine-tb-information-note-changes-to-tb-cattle-movement-controls-exemptions

Stopped the practice of de-restricting parts of some TB-restricted (non-OTF) holdings. www.gov.uk/government/publications/bovine-tb-information-note-ending-the-practice-of-de-restricting-parts-of-tb-restricted-holdings

Introduced legal powers to enable Defra to share TB breakdown location details. www.legislation.gov.uk/uksi/2014/2383/contents

Tightened rules for bTB Isolation Units - must be on a separate holding (CPH) number to the main herd.

Introduced new regulations on TB testing and statutory compensation for deer and camelids under the Tuberculosis (Deer and Camelid) (England) Order 2014 and the Tuberculosis (Deer and Camelid) Slaughter and Compensation (England) Order 2014. www.legislation.gov.uk/uksi/2014/2337/contents

www.legislation.gov.uk/uksi/2014/2338/contents

Launched the Badger Edge Vaccination Scheme (BEVS). www.gov.uk/guidance/the-badger-edge-vaccination-scheme-how-to-apply-for-funding

Published the joint government-industry Bovine TB Biosecurity Action Plan. www.gov.uk/government/publications/cattle-biosecurity-action-plan-for-improving-herd-resilience-to-bovine-tb

Licensed and authorised badger culling in Areas 1 and 2. www.gov.uk/government/collections/bovine-tb-controlling-the-risk-of-bovine-tb-from-badgers

2015

Extended reduced CAP Scheme payments (cross-compliance penalties) for overdue bTB tests to include all types of TB tests with very few exceptions. www.gov.uk/government/publications/bovine-tb-information-note-tb-testing-changes-for-cross-compliance-penalties-and-surveillance-tests

In the Edge Area of Cheshire: replaced annual surveillance testing and targeted radial testing of all herds within 3km of a lesion/culture positive bTB breakdown herd with six-monthly surveillance testing. www.gov.uk/government/publications/bovine-tb-information-note-tb-testing-changes-for-cross-compliance-penalties-and-surveillance-tests

APHA awarded contracts for TB testing and other veterinary services in England. www.gov.uk/government/news/apha-awards-contracts-for-tb-testing-and-other-veterinary-services-in-england

Launched a new interactive mapping tool providing up to date information to cattle keepers on bTB incidents in England (and Wales from 2016).
www.IbTB.co.uk

Publication of regular Low Risk and Edge Areas field epidemiology reports on www.gov.uk to inform better decisions when trading cattle.

Introduced improved IT data capture system for epidemiological investigation outcomes to support targeted enhancement of more sensitive testing regimes in the HRA.

Promoted new guidance to cattle farmers (agreed with key industry groups) on how to protect their herd from bTB through implementing improved bio-security on farm – the Five Point Plan. https://tbhub.co.uk/biosecurity/protect-your-herd-from-tb/

Introduced a single web-based hub for bTB information and advice on best practice bio-security and trading. Aimed at cattle keepers and vets. Delivered by industry groups, supported by Defra. https://tbhub.co.uk/

Updated government criteria for badger culling licence applications. www.gov.uk/government/publications/guidance-to-natural-england-preventing-spread-of-bovine-tb

Funded bespoke veterinary advice for farmers in licensed badger cull Areas 1 and 2 to reduce the risk of bTB on farms. www.gov.uk/government/news/tb-advice-for-farmers-in-badger-cull-areas

Licensed and authorised badger culling in Area 3 alongside Areas 1 and 2. www.gov.uk/government/collections/bovine-tb-controlling-the-risk-of-bovine-tb-from-badgers

2016

Dairy UK launched a new ‘TB advantage’ genetic indexing system for dairy bulls, to help dairy farmers breed cows with improved resistance to TB. First bTB breeding index for cattle in the

world. http://dairy.ahdb.org.uk/technical-information/breeding-genetics/tb-advantage/

Introduced an optional private interferon-gamma testing facility to improve detection of infected cattle not eligible for a government-funded test, in prescribed circumstances and subject to APHA approval. www.gov.uk/government/news/apha-offers-private-blood-testing-to-help-diagnose-tb-in-cattle

Phased out SOAs and Cattle Tracing System Links between summer 2016 and summer 2017 and reviewed controls on cattle movements within a 10-mile radius of home premises ('CPH England' project). www.gov.uk/government/publications/livestock-movements-simpler-rules-from-2016-to-2017

Provision of bTB herd reports to new breakdowns in the High Risk and Edge Area of England http://apha.defra.gov.uk/documents/ov/Briefing-Note-1416.pdf

Launched a private herd accreditation scheme for bovine TB in November 2016 under the Cattle Health Certification Standards body (CHeCS). This is similar to schemes for diseases such as BVD, IBR and Johne's Disease and it is aligned with other farm biosecurity policies for bTB promoted by Defra.
www.checs.co.uk/bovine-tb-herd-accreditation/

In the HRA: introduced requirement for two consecutive clear short interval tests at severe interpretation by default for all bTB breakdown herds before they can regain OTF status. www.gov.uk/government/publications/bovine-tb-information-note-0216-resolving-tb-breakdowns-in-the-high-risk-area

In the HRA: licensed and authorised badger culling in Areas 4-10 alongside Areas 1-3.
www.gov.uk/government/collections/bovine-tb-controlling-the-risk-of-bovine-tb-from-badgers

In the LRA: introduced mandatory post-movement testing of cattle entering the LRA from herds in other parts of England and Wales.
www.legislation.gov.uk/uksi/2016/347/contents

In the LRA: voluntary pre-sale TB check testing scheme pilot for cattle keepers in the LRA whose herds are tested every four years and who are planning to sell all or part of their herd.

2017

Increased the sensitivity of skin testing of cattle traced from lesion/culture positive bTB breakdown herds by applying the severe interpretation of the SICCT test.

Tightened rules for licensed movements of cattle between two bTB breakdown herds.

Harmonised the timing of short interval skin tests in bTB breakdown herds, so that tests are scheduled at least 60 days from the date of reactor removal, rather than the date of detection.

In the HRA: Introduced mandatory IFN-gamma parallel testing of OTFW breakdown herds in the HRA under three scenarios:

a. Criterion 1: The APHA veterinary investigation concludes that the most likely transmission route for the affected herd was contact with infected cattle and measures are in place to prevent further spread of disease from this source.
b. Criterion 2: The positive herd is located in one of the areas where at least two seasons of effective licensed badger population control have been completed).
c. Criterion 3: There is clear evidence that repeated skin testing of the herd has failed to resolve a TB breakdown.

http://ahvla.defra.gov.uk/documents/ov/Briefing-Note-0917.pdf

Updated government criteria for badger culling licence applications. www.gov.uk/government/publications/guidance-to-natural-england-preventing-spread-of-bovine-tb

Revocation of Approved Finishing Units with grazing in licensed badger culling areas that have completed their first culling season.

In the HRA: licensed and authorised badger culling in Areas 12-21 alongside Areas 1-10 (Supplementary in Areas 1-2).

In the Edge Area: licensed and authorised badger culling started in Area 11. www.gov.uk/government/collections/bovine-tb-controlling-the-risk-of-bovine-tb-from-badgers

Launched the bTB Advisory Service to provide bespoke advice to cattle farmers in the High Risk and Edge Areas of England on measures that can reduce the risk of bTB incidents. The service, funded via the RDPE, provides on-farm advice visits and one-to-one advisory sessions (by telephone or drop-in service).
www.tbas.org.uk

Introduced lifetime movement restriction of inconclusive reactor animals that are retested with negative results in the HRA, Edge Area and in bTB breakdown herds in the LRA.

2018

In the Edge Area: Edge Area boundaries re-defined. Split HRA/ Edge Area counties of Cheshire, Derbyshire, East Sussex, Oxfordshire and Warwickshire incorporated fully into the Edge Area from 1 January 2018. www.tbhub.co.uk/tb-policy/england/expansion-of-the-edge-area-in-england-and-new-cattle-testing-arrangements/

In the Edge Area: Increased the sensitivity of routine surveillance testing in the Edge Area by (a) replacing annual herd tests with six-monthly herd tests in the higher incidence regions of the Edge Area (Berkshire west, Cheshire, Derbyshire, Oxfordshire and Warwickshire), and (b) supplementing annual tests with radial testing in the rest of the Edge Area (Berkshire east, Buckinghamshire, East Sussex, Hampshire, Leicestershire, Northamptonshire, Nottinghamshire) from 1 January 2018. www.tbhub.co.uk/tb-policy/england/expansion-of-the-edge-area-in-england-and-new-cattle-testing-arrangements/

www.gov.uk/guidance/bovine-tb-testing-intervals-2018

APHA enabled exceptional private use of non-validated or non-Defra approved tests for TB on cattle in England. http://apha.defra.gov.uk/vet-gateway/non-valid-tb-testing/index.htm

Introduced the Tuberculosis (Non-bovine animals) Slaughter and Compensation (England) Order 2017 setting out revised amounts of compensation payable to deer and camelid owners and introduced for the first time specific rates of statutory compensation for other non-bovine farmed species (pigs, sheep and goats) that could be subject to compulsory slaughter for TB control purposes. www.legislation.gov.uk/uksi/2017/1254/contents/made

Updated government criteria for badger culling licence applications. www.gov.uk/government/publications/guidance-to-natural-england-preventing-spread-of-bovine-tb

In the HRA: licensed and authorised badger culling in Areas 22-31 alongside Areas 1-10 and Areas 12-21 (Supplementary in Areas 1-2).

In the Edge Area: licensed and authorised badger culling in Area 11.

In the LRA: licensed and authorised badger culling started in Area 32, a Low Risk Area hotspot. www.gov.uk/government/collections/bovine-tb-controlling-the-risk-of-bovine-tb-from-badgers

Launched the Badger Edge Vaccination Scheme 2 (BEVS2) www.gov.uk/government/publications/badger-edge-vaccination-scheme-2-bevs-2

Introduced changes to compensation paid for cattle compulsorily slaughtered for bTB control:

a. 50% compensation for cattle that cannot be processed for human consumption at a slaughterhouse because of a dirty hide.
b. 50% compensation for animals moved into a bTB breakdown herd that are subsequently removed as bTB reactors or direct contacts before the herd regains OTF status.

www.legislation.gov.uk/uksi/2018/754/made

Introduced a change to private slaughter arrangements for cattle compulsorily removed for bTB control purposes: Defra will pay full compensation if the carcase is condemned by the slaughterhouse operator due to TB.

Published Bovine TB Biosecurity progress report 2018 assessing progress against the 2014 joint government-industry Biosecurity Action Plan and setting out a new action plan for improving biosecurity. www.gov.uk/government/publications/bovine-tb-biosecurity-progress-report-2018

APHA launched pilot to test the use of ATTs in private veterinary practices in England, to carry out tuberculin skin testing of cattle.

2019

Further call for applications under the Badger Edge Vaccination Scheme 2 (BEVS2) www.gov.uk/government/publications/badger-edge-vaccination-scheme-2-bevs-2

In the HRA: licensed and authorised badger culling in Areas 33-43 alongside Areas 1-10, Areas 12-21 and Areas 22-31 (Supplementary in Areas 1-3).
In the Edge Area: licensed and authorised badger culling in Area 11.
In the LRA: licensed and authorised badger culling in Area 32, a Low Risk Area hotspot. www.gov.uk/government/collections/bovine-tb-controlling-the-risk-of-bovine-tb-from-badgers

In the Edge Area: introduced earned recognition in six monthly surveillance testing areas whereby herds that meet a certain criteria are eligible for annual surveillance testing https://tbhub.co.uk/tb-policy/england/annual-surveillance-tb-testing-for-lower-risk-herds-in-the-six-monthly-testing-parts-of-the-edge-area-in-england/

www.gov.uk/guidance/bovine-tb-testing-intervals-2019

In the HRA: introduced Approved Finishing Units (Enhanced) with grazing www.gov.uk/government/publications/approved-finishing-unit-enhanced-with-grazing-for-cattle-application

https://tbhub.co.uk/tb-policy/england/new-type-of-approved-tb-unit-in-england-approved-finishing-unit-enhanced-with-grazing/