

Research and development to support the control and eradication of bovine TB

Introduction

- 1. As part of an evidence-based profession, veterinary surgeons across all sectors and settings believe animal health and welfare policies should be underpinned by the best available scientific evidence.
- 2. Veterinary researchers are advancing scientific understanding of bovine TB (bTB) in a way which supports the work of vets across the profession. This includes:
 - Farm vets who treat livestock, carry out surveillance, promote good biosecurity and advise their clients on preventive healthcare.
 - State veterinarians in field offices who undertake risk assessments, outbreak investigations and notifiable disease control, and those in the UK network of surveillance laboratories carrying out postmortem examinations and other surveillance activities.
 - Government vets providing veterinary expertise to inform public policymaking.
 - Official veterinarians in abattoirs who undertake disease surveillance as part of postmortem examinations.
 - Vets who research the disease and its epidemiology in wildlife and support controls in the wildlife population.
- 3. BVA is the representative body for the whole veterinary profession and has considered the research priorities for the profession which are explored below.

New evidence

- 4. New evidence is vital to furthering the understanding of bTB and maximising efforts to control and eradicate it. The Government has provided considerable support for bTB research and development (R&D). The Department for Environment, Food & Rural Affairs (Defra) holds a bTB research and development portfolio which can be divided into five blocks based on the aspects of the epidemic they address, although there is considerable overlap and interdependency:¹
 - Improved cattle tests and vaccines
 - Designing, predicting and evaluating policies
 - Understanding and managing the wildlife reservoir
 - On-farm biosecurity interventions
 - Socio-economic drivers of behaviour
- 5. Previously, Defra published a Bovine Tuberculosis Evidence Plan 2013/14 2017/18.² This provided a portfolio of projects to increase understanding of the disease epidemic and to support the development of new tools such as vaccination and diagnostics. Defra should build upon this approach and develop a new strategy for bTB R&D. When developing a new bTB R&D strategy, all relevant stakeholders and disciplines must be engaged.

¹TB hub Bovine TB research and development https://tbhub.co.uk/preventing-tb-breakdowns/about-bovine-tb/bovine-tb-research-and-development/

² https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/221077/pb13909-evidenceplan-bovine-tuberculosis.pdf

Funding

- 6. Defra³ and the Department of Agriculture, Environment and Rural Affairs (DAERA) fund bTB research to inform policy and provide tools to fight the epidemic. Maintaining this funding is important. Therefore, we welcome that Defra has recognised that it needs to increase the output of its research programme.⁴
- 7. bTB research covers a wide range of areas and gives broad opportunities for the UK's world-leading universities and innovative life sciences and biotech industry to deliver innovative solutions. For example, the benefit of a validated bTB DIVA test for cattle may start in the UK but could be exported around the world. Therefore, we welcome a diversification and expansion in the range of funders supporting bTB research. This broader funding recognises that tackling this one disease will have wider benefits.
- 8. The veterinary profession should engage with funding bodies such as UK Research and Innovation (UKRI) to ensure they understand the wider opportunities offered by research on this topic. UKRI directs research and innovation funding in the UK. There are nine bodies in UKRI, comprising the seven research councils and two additional bodies, Innovate UK and Research England.
- 9. Working in partnership with universities, research organisations, businesses, charities, and government, the UKRI mission is to foster research and development within the United Kingdom and create a positive "impact" "push the frontiers of human knowledge and understanding", "deliver economic impact" and "create social and cultural impact". Bovine TB is interwoven with many social, economic, and environmental harms. Therefore, research on this disease could deliver wider economic, social, and environmental benefits which would align with the mission of UKRI.
- 10. We understand that there is a need to prioritise funding to maximise limited resources and deliver outcomes. Research is also highly competitive, and prioritisation should ensure that the best scientists and researchers have certainty about resources to complete their work. Therefore, there is a need to provide a strategic prioritisation of research areas to ensure funding is allocated to where it will deliver a long-term impact.
- 11. Even within the veterinary profession there will be different priorities for the allocation of bTB funding. However, it is important for the profession to distil our priorities that can be shared clearly with funders. BVA brought together a working group which included a diverse range of vets from cattle practice, other areas of large animal work, public health, wildlife practice, zoo medicine and government veterinary work. Annex A to this document illustrates the veterinary profession's priorities for research funding which have been agreed by this working group.

Multi-disciplinary approach

- **12.** bTB is a complex challenge, requiring a multifaceted response that capitalises on the wider expertise of multiple disciplines.
- 13. The One Health concept recognises the health of humans, domestic and wild animals, plants and the wider environment (including ecosystems) are closely linked and interdependent. The approach mobilises multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development.⁵
- 14. Opening the space for wider consideration of this one disease, will offer opportunities for all disciplines to further their understanding of other diseases in humans, livestock, wild animals and the environment. There are numerous examples of the findings from veterinary research leading to new developments in human health. For example, the first vaccine against a cancer-causing virus was against a chicken disease Marek's disease.⁶
- 15. The importance of epidemiology is impossible to overstate. As a discipline, it is central to the understanding of bTB transmission and how it is influenced by different interventions and controls. The evidence provided by epidemiological research underpins the design and delivery of bTB policy. Therefore, the Government and other funders should support further research into the epidemiology of bTB, to fill gaps in our understanding of the disease.
- 16. Greater application of social science, including economics, should also form a central aspect of the bTB control and eradication programmes. Research in the social sciences provides insight into farmers' decision-making

³ Defra holds a non-devolved bTB R&D budget on behalf of the three administrations in Great Britain (GB) – Defra, Welsh Government and Scottish Government.

⁴ Next steps for the strategy for achieving bovine tuberculosis free status for England. The government's response to the strategy review, 2018 March 2020 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/870414/bovine-tb-strategy-reviewgovernment-response.pdf

⁵ https://www.bva.co.uk/media/3145/bva_one_health_in_action_report_nov_2019.pdf

⁶ https://www.rcvs.org.uk/document-library/the-impact-of-veterinary-research-brochure/

regarding cattle purchasing, the application of biosecurity measures on farm and how decisions that promote disease control can be incentivised.

- 17. The prominence of social science research within animal health policy design is growing both in the UK and internationally. UK veterinary schools have undertaken interdisciplinary research using social science which has been used to develop interventions to address important issues such as antimicrobial resistance (AMR). For example, AMR research at Bristol Veterinary School is promoted and facilitated by the AMR Force. The AMR Force promotes close collaboration between veterinary researchers and other disciplines including social science. This approach has supported the development of Arwain Vet Cymru Wales which has led the way in promoting best practice prescribing of antimicrobials.⁷
- 18. Internationally, there has been growing collaboration across disciplines. The International Society for Economics and Social Sciences of Animal Health (ISESSAH) was formed in 2017. ISESSAH aims to improve animal health and welfare policies, programme and projects through more nuanced use of concepts and tools available in economics and social science disciplines. The 16th International Symposium of Veterinary Epidemiology and Economics (IVSEE)was held in 2022. ISVEE is a large gathering of students, researchers, and policymakers from different areas of expertise, where information is exchanged to advance the fields of veterinary epidemiology and economics and ultimately move towards a healthier world. UK participation at ISVEE has been significant since the first symposium was held in 1976 in Reading.
- 19. Wherever possible evidence should underpin every step of an intervention. Before an intervention begins, epidemiological models are useful for policy design and testing assumptions. However, all models make assumptions, and it is important for policymakers to be cautious when drawing firm conclusions. We also support the use of economic assessments alongside and integrated with an epidemiological model. This is because an economic assessment can consider wider issues which would fall outside an epidemiological model. This can include an assessment of logistics or a determination of value for money.
- 20. Ongoing monitoring of policy interventions is vital to gain an understanding of the actual effect. Monitoring also allows measures to be paused quickly if the effect is counter to that modelled. Evaluation of policy interventions is vital to ensure lessons are learned and embedded in future inventions. This process, in turn, will help to identify areas where further research is needed.

Dissemination of evidence

- 21. Getting new research and best practice into the hands of practising vets is crucial. Evidence-based veterinary medicine is key to the delivery of modern veterinary medicine. It means veterinary surgeons making clinical decisions according to their professional judgement, based on the best available evidence at the time.⁸
- 22. The process of implementing evidence-based interventions on the ground can be challenging. There is a need to close the evidence-to-practice gap (the time it takes for evidence to be put into practice).⁹ Those commissioning and undertaking research need to consider what information is useful to vets and their clients, and how that information is presented to encourage the application of research findings into practice.
- 23. Furthermore, researchers, including those within government, should consider how best to share information to ensure an accurate reflection reaches all audiences. For example, we welcome the publication of metadata (also called the data dictionary) alongside any new publication. Metadata is the data about the data. This can include a collection of names, definitions, and attributes about data elements that are being used or captured in a database, information system, or part of a research project.

Conclusion and list of recommendations

24. Research is vital to support the work of vets across the profession. This is true for the control and eradication of bTB as well as many other challenges facing the profession. Below is a summary of recommendations for government, industry, researchers, and the wider veterinary profession to strengthen the contribution provided by research to the control of bTB.

⁷ http://www.bristol.ac.uk/news/2019/november/arwain-vet-cymru.html

⁸ Evidence-Based Veterinary Medicine Matters: Our Commitment to the Future 19 November 2019 <u>https://knowledge.rcvs.org.uk/document-library/evidence-based-veterinary-medicine-matters/</u>

⁹ https://bmjopen.bmj.com/content/4/6/e005548

- BVA should engage the Government, research institutions and funding bodies with a consolidated view of the veterinary profession's research priorities which are listed in Annex A of this document.
- BVA should help Defra and DAERA to prioritise funding of bTB research through the publication and promotion of this policy document and active engagement through bodies such as the TB Partnership for England.
- Defra should engage with all relevant GB stakeholders and disciplines to develop a new evidence plan. The TB Partnership should provide input from England. The TB Eradication Programme Board should be engaged in Wales. DAERA should undertake a similar process in Northern Ireland.
- Defra and DAERA should continue to prioritise funding of bTB research.
- A wider pool of funding sources should be leveraged to support bTB research. The veterinary profession should engage with organisations such as UK Research and Innovation (UKRI) to ensure they understand the wider opportunities offered by research on bTB.
- bTB research should continue to capitalise on the expertise of multiple disciplines.
- The government should more transparently undertake monitoring and evaluation of policy interventions and ensure BVA are regularly kept informed so that the results can be shared and understood by the wider veterinary profession.
- Researchers, government, industry, and the veterinary profession should develop a process that promotes positive actions and outcomes from research to close the research-to-action.

Annex A: bTB research priorities for the veterinary profession

25. The five bTB research priorities for the veterinary profession are presented below. Please note they are not listed in order of importance.

Areas of Research	Detail
Continued monitoring and evaluation of existing interventions	Proper resourcing of ongoing monitoring is essential and should continue to be a top priority for government.
	Ongoing monitoring of policy interventions is vital to develop our understanding of their effects. Monitoring also allows measures to be paused quickly if the effects are counter to that modelled. Evaluation of policy interventions is also a vital step to ensure lessons are learned and embedded in future inventions. Unless we understand the effect of existing interventions it is not possible to model the effect of novel approaches.
Better understanding of the effects of badger vaccination on the incidence of bTB in cattle.	The effect of badger vaccination on cattle bTB incidence is currently uncertain. However, as vaccination leads to reduced bTB in the badger population it is to be expected that this would eventually have a beneficial effect on bTB in cattle.
	An evidence base is needed to increase the understanding of badger vaccination, in order to design programmes that are appropriate to different epidemiological circumstances across the UK.
Improved understanding of the causes of repeat breakdowns	Certain farms repeatedly experience breakdowns, while other apparently similar farms (same area, same husbandry and similar size) do not. There is a need to better understand the risk factors that lead to this inconsistency.
	Determining these risk factors will require a holistic examination of epidemiological factors, farming systems and farmer behaviours.
Estimate the true costs of bTB breakdowns to farms	There would be a benefit in determining a fuller assessment of the wider cost of a bTB breakdown.
	This could support decision-making at all levels. This would be true at the level of the individual farm by also policy makers and other systems level decision makers.
The development and validation of a cattle vaccine and DIVA test	A validated DIVA test (a test that can differentiate infected and vaccinated cattle) is essential to realising any benefits from cattle vaccination.
	The benefit of vaccination will need to be considered holistically, with an assessment of its effect on animal health, welfare, trade, and the cost necessary to deliver any vaccination programme. Social science should be included within this research to consider the possible effects of a vaccine programme on farmer decision-making.
	The World Organisation for Animal Health (WOAH) recognises that significant progress has been made in the development of DIVA tests and supports the field trials underway in the UK. It envisages that vaccination could be applied in combination with such DIVA tests once these have been fully validated and the legal framework amended accordingly.
	In its meeting of September 2021, the members of the WOAH's Biological Standards Commission agreed that "the BCG vaccination and DIVA skin test approach looks very promising and could provide an alternative to bTB control that could be used in certain countries in certain situations". ¹⁰

¹⁰ <u>https://www.woah.org/en/document/report-of-the-meeting-of-the-oie-biological-standards-commission_september_2021/</u>