Bovine Tuberculosis in Northern Ireland

2018 Annual Report

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Department of
Agriculture, Environment and Rural Affairs
www.daera-ni.gov.uk

INVESTORS IN PEOPLE

Contents

Cover photo: M. bovis culture - photo courtesy of AFBI.

1. Introduction

1.1 This summary report is based around the key disease control components of the Northern Ireland Bovine Tuberculosis (bTB) eradication Programme, namely:

- **Disease surveillance -** Post mortem examination (PME) of all slaughtered animals (passive surveillance) and use of the single intradermal comparative cervical tuberculin test (SICCT - skin test) in all herds and the interferon gamma blood test (IFNG) in selected herds (active surveillance).
- **Removal of reactor animals -** disclosure of disease leads to the compulsory slaughter of reactor animals.
- **Veterinary risk assessment and application of appropriate disease controls -** Herds or animals that are considered to be at increased risk are subject to additional testing and movement controls, if applicable, to prevent further spread.

The overall purpose of these measures is to identify infection at an early stage, remove it promptly and prevent further spread.

1.2 The report includes a summary of the 2018 statistics. Detailed bTB statistics for NI are published monthly on the DAERA website and the purpose of this report is to add context to these statistics.

1.3 Whilst this is not designed to be a detailed technical report, it provides the background to key Programme measures and quantifies the outcomes of their application.

1.4 This report will be of value to those with an interest in the control and eradication of bTB.

2. The Disease

2.1 Bovine tuberculosis (bTB) is an infectious disease of cattle. It is mainly caused by the bacterium *Mycobacterium bovis (M. bovis)* which can also infect and cause disease in many other mammals including humans, deer, goats, camelids, pigs, cats, dogs and badgers. In cattle, it is mainly a respiratory disease but clinical signs are now rare. TB in humans is usually caused by a very closely related infectious agent, *Mycobacterium tuberculosis*, but may also be caused by *M. bovis*.

2.2 Bovine TB is a very complex, multifactorial and challenging disease that has proven difficult to eradicate worldwide. This is due to the characteristics of the disease itself; the difficulties in diagnosis; the existence of reservoirs of infection in other species; and the nature of the local farming industry, e.g. fragmented holdings and a large number of cattle movements. It has an adverse impact on those farm businesses affected due to the interruption to market access and the additional disease control measures that are required. It is widely regarded as the most difficult animal disease problem currently facing government, the veterinary profession and the farming industry in these islands.

2.3 Eradicating bTB in cattle will require the disease pathways in each outbreak to be investigated, and the implementation of preventative measures to break the cycle of infection. It is accepted that there is no simple cost-effective solution or “quick fix”.

3. DAERA Goals

DAERA's ultimate goal is the eradication of bTB in cattle, but it is important to highlight that this goal cannot be achieved without constructive co-operation between government, industry stakeholders and individual farmers.

3.1 Our immediate goals are to:

(a) maintain EU approval for trade, and ensure that bTB incidence does not impair our ability to develop trade deals with other countries in the event of Brexit;

(b) reduce the transmission of disease between cattle, and therefore the number of reactor animals;

(c) produce more effective and efficient ways of reducing the transmission of bTB between cattle and wildlife.

4. Policy Development and Programme Implementation

4.1 Policy Development and Stakeholder Engagement

Veterinary Service Animal Health Group (VSAHG) is responsible for the development of bTB policy and for TB Programme implementation. DAERA continues to work in partnership with its science provider, the Agri-food and Biosciences Institute (AFBI), to identify knowledge gaps and to explore options for research and development to complement current work. Stakeholder engagement is conducted via the Animal Health and Welfare Stakeholder Forum and the TB Stakeholder Working Group with membership from industry, veterinary and environmental organisations.

During 2018, DAERA officials continued to work on the development of a new TB Eradication Strategy for Northern Ireland with a view to making recommendations to a future Minister, once in post. The consultation on the Department's response to the independent TB Strategic Partnership Group's (TBSPG) recommendations for the eradication of bTB closed on 5 February 2018 with over 200 responses received. Information on the TBSPG Strategy, subsequent consultation and summary of responses can be found on the following webpage: TBSPG Bovine TB Eradication Strategy NI

In May 2018, the Department proceeded with the TBSPG recommendation to establish a TB Eradication Partnership (TBEP) , an independent group to advise the Department and a future Minister on the strategic direction of the eradication programme.

Programme Implementation

4.2 The delivery of the TB Programme involves a wide range of activities, including:

- ✓ Animal registration and movement control.
- ✓ Disease surveillance, post-mortem inspection of all carcasses at abattoirs and annual (at least) bTB testing on all cattle farms.
- ✓ Disease investigations and mapping, and application of disease controls.

- ✓ Provision of advice on biosecurity and disease control, especially to breakdown herds and their neighbours.
- ✓ Epidemiological assessment and advice.
- ✓ Monitoring of Programme delivery.
- ✓ Export and import tracing and notifications.
- ✓ Valuation and removal of reactors to slaughter.
- ✓ Compensation payments.
- ✓ Quality assurance of bTB Testing.
- ✓ Management of contracts with private sector partners.
- ✓ Training of staff and delivery partners.
- ✓ Engagement with stakeholders.
- ✓ Liaison with the Agri-Food and Bioscience Institute (AFBI).
- ✓ Liaison with external public health agencies, including the Health Service Consultants in Communicable Diseases, Health and Safety Executive and Public Health Authorities.
- ✓ Enforcement and counter-fraud measures.
- ✓ Application of assessment for Cross Compliance deductions.

4.3 Programme delivery also requires a wide range of personnel and expertise including:

- ✓ Veterinary surgeons, either DAERA employees or AVSs, who carry out all “on farm” bTB skin tests.
- ✓ AFBI Veterinary Sciences Division not only carry out the laboratory testing necessary for the confirmation of the disease but also serve as the primary provider of bTB research and scientific advice for DAERA. A pivotal input to the epidemiological advice on bTB is also provided by DAERA’s Veterinary Epidemiology Unit (VEU).
- ✓ VSAHG-Northern Ireland Food and Animal Information System (NIFAIS) Support Unit oversees the development and maintenance of the current Animal and Public Health Information System (APHIS) database, through which animal identity, testing and movement are controlled. The System also holds post mortem results, mainly from abattoirs, and laboratory test results from AFBI. Controlled access to relevant data is provided to various users including farmers, markets, food business operators and private veterinary practitioners.
- ✓ VSAHG is responsible for the integrated delivery of the TB Programme in NI. There are ten Divisional Veterinary Offices (DVOs), incorporated in DAERA Direct Offices. (**Figure 2**) The administrative area of each office is sub-divided into “patches”,

which are managed by DAERA Vets with support from technical officers. Each TB breakdown has an allocated DAERA Vet managing the disease control measures necessary to prevent further spread of bTB and to reinstate the herd's disease free status. Close engagement between DAERA staff and the farmer whose herd has become a new TB breakdown works to mutual benefit; it ensures the farmer has a point of contact to help address problems and concerns and it assists DAERA in ensuring that appropriate advice is given to prevent further spread of disease.

4.4 TB Implementation Team (TBIT)

The role of this team in 2018 was to oversee the day to day field implementation of the TB Programme, with TB Policy and TB Programme staff in VSAHG HQ retaining responsibility for policy and staff instructions, providing an interface between policy and implementation, thereby ensuring a consistent approach to implementing the TB Programme.

4.5 DAERA Programme Delivery Structure 2018

Although this section describes the Programme, and its delivery from a DAERA perspective, we must acknowledge the vitally important role that herd keepers play in the development and delivery of the TB Programme through their cooperation and compliance, and also the contributions of industry stakeholders.

Figure 1: TB Programme - Main DAERA Branches and Delivery Partners 2018

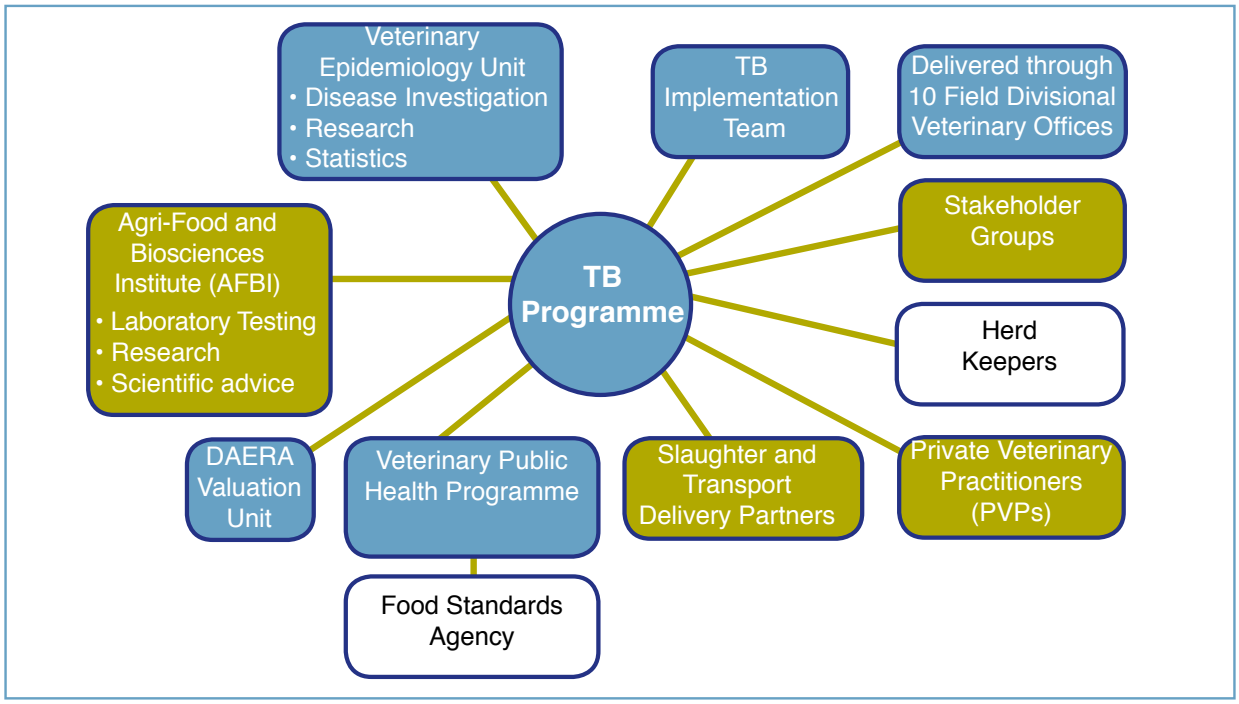
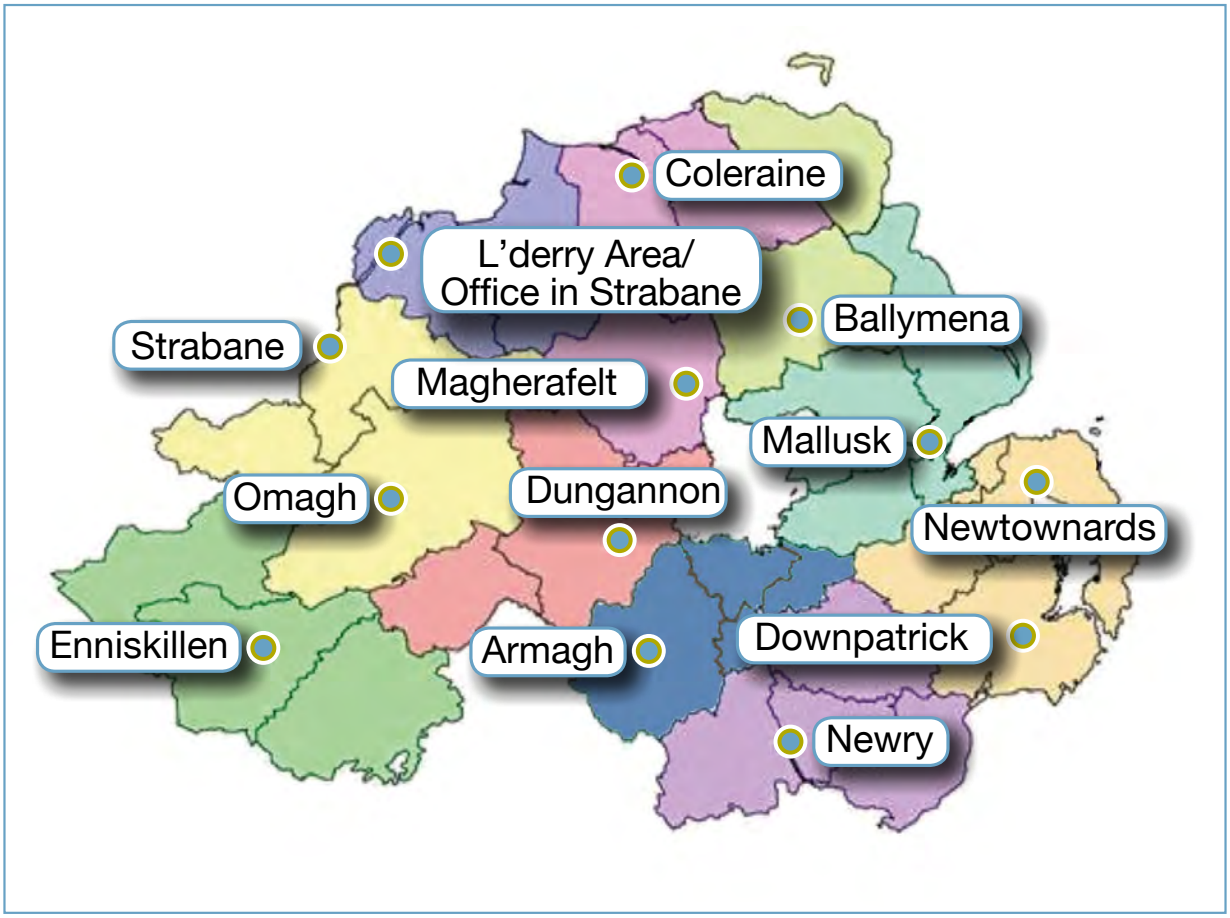


Figure 2: Divisional Veterinary Office (DVO) Locations and Areas Covered



Office addresses and contact details can be found at:
www.daera-ni.gov.uk/contacts/daera-direct-regional-offices

5. The bTB Eradication Strategy for Northern Ireland

The TB Strategic Partnership Group (TBSPG) was established as an independent high-level advisory group tasked to act in the public interest in developing a long-term strategy for the eradication of bTB in cattle, and a related implementation action plan.

In late 2017, the Department consulted on its response to TBSPG's recommendations, covering six key thematic areas:

- Governance and partnership working, including culture change;
- Tools and processes, including improvements to the bTB programme;
- Herd Health, better biosecurity and reducing risk;
- The role of wildlife as a reservoir of bTB infection;
- Financing the bTB programme and balancing costs; and
- The role of Research.

These themes are interrelated and do not stand alone. Action is required across all of them to secure a fresh and integrated approach to achieve eradication in infected animal populations. During 2018 the consultation responses were analysed by Departmental officials. This strategy proposal will be progressed in 2019 and will assist in the provision of advice to a Minister, once in post. Budget availability will also be required to underpin any accepted recommendations. Proposals that can be implemented in the absence of a Minister will be progressed where possible. In 2018, DAERA established a TB Eradication Partnership (TBEP) to provide independent advice on the implementation of the TB Eradication Strategy in Northern Ireland. A TBSPG recommendation, TBEP consists of members from the farming industry, veterinary and scientists. Positions intended for wildlife and food processing representatives are currently unfilled but a further attempt to appoint these representatives is forthcoming.

Reactor Quality Assurance (RQA) Trial

The field sampling of the RQA Trial, commenced in November 2017 in selected eligible herds in Newry, Newtownards and Enniskillen Divisional areas, has been completed. It involved the clinical assessment and blood sampling of around 1,000 TB skin test reactor animals. The trial provides data on bTB skin test reaction regression and the IFNG response in reactors and will allow a survey of compliance with certain testing procedures. The data is currently being analysed by the Veterinary Epidemiology Unit and the results will be used to inform policy development in this area.

This aligns closely with the **TBSPG recommendation**:

We recommend that DAERA develops a preliminary field trial and associated research to help establish counter measures to prevent occurrences of cattle being presented as reactors for slaughter which have not given a natural response to the injection of tuberculin.

6. The bTB Eradication Programme

DAERA has an EU Commission approved bTB Eradication Programme, ensuring compliance with the EU Trade Directive 64/432/EEC (as amended). Programme controls reduce the risk of spread to humans and clinical disease in cattle. EU approval of the bTB Eradication Programme is vital in safeguarding the export-dependent livestock & livestock products industry (worth around £1.79 billion in 2018). Through the implementation and delivery of the Programme, approximately 89% of all herds are free to access international markets at any one time. EU Commission approval also secures some £4-5 million per year of EU co-funding.

6.1 This 2018 Annual Report is based around the key disease control components of the Programme:

> Disease surveillance;

> Removal of reactor animals;

> Veterinary risk assessment and application of appropriate disease controls.

6.2 Disease Surveillance

Our disease surveillance is based on two distinct elements:

6.2.1 Post-mortem examination (PME) of all slaughtered animals

All animals slaughtered for human consumption are subject to PME, primarily for public health assurance. Carcasses are examined for visible signs of bTB infection, amongst other things. Disclosure of visible signs (or lesions) at PME will, subject to veterinary risk assessment, result in the exclusion of either the infected part of the carcass or the entire carcass from human consumption. It will also trigger the application of disease control measures to the herd presenting the animal.

When suspected visible signs are seen in skin test negative animals that have not been compulsorily slaughtered under the TB Programme, the animal is said to have a “Lesion at Routine Slaughter” (LRS).

The finding of bTB - like lesions (granulomas) at routine slaughter alone is not definitive because similar lesions may be caused by other diseases or conditions. Therefore, samples are taken for further laboratory examination.

Appropriate disease control measures, such as movement restrictions and increased frequency of testing, are applied to the relevant herds. The number and distribution of LRS animals can be an indication of the underlying disease levels and trends in the cattle population as they represent an important independent sampling system outside live animal surveillance.

6.2.2 Live Animal Surveillance

This is based primarily on the single intradermal comparative cervical tuberculin test (SICCT), as approved by the EU. This is usually referred to as the “skin test”. All cattle herds must be tested annually, as a minimum requirement, but some are tested more frequently if they are considered at increased risk of infection following veterinary risk assessment of a disease incident. An animal that gives a positive response to the skin test is called a ‘reactor’ and the herd in which reactors are found is referred to as a ‘TB Breakdown Herd’ because a positive skin test is considered indicative of infection in a herd.

The other live animal surveillance diagnostic method employed by the Programme is the interferon gamma (IFNG) blood test, which is used in conjunction with the skin test to improve diagnosis of bTB in certain situations. Use of the IFNG is voluntary and it is not compulsory for farmers to give up any IFNG positives that are detected, unless the animal is also skin test positive. DAERA policy is to offer IFNG testing in selected TB breakdown herds eligible under defined criteria. The IFNG test is approved in EU legislation for use in parallel with skin test.

The IFNG test can:

- Detect infected animals at an earlier stage than the skin test, and,
- Pick up some animals which are infected but do not show as a 'reactor' at the skin test.

The aim is to remove these animals from the herd as early as possible.

DAERA will offer to value and slaughter the animals which are not skin test reactors, but are IFNG test positive. Valuation is 100% of the market value, the same as for skin test reactors. The only difference is, if the herd keeper cannot agree a valuation with the DAERA Valuer, then the animal will remain on farm – there is no option for Independent Valuation.

Results from experimental and natural infection of cattle with *M. bovis* indicate that the IFNG test can detect a cell-mediated immunological response to infection as early as two weeks post-infection, and earlier than the skin test, therefore not many skin test negative animals removed as IFNG test positives have visible TB lesions at slaughter. In 2018 13.8% of skin test negative IFNG positive animals were visibly lesioned. Absence of a visible lesion does not mean that no infection was present, and we know from data collected that IFNG positive animals retained are significantly more likely to become reactors in the future.

If no skin reactors are found at the parallel test, and no TB lesions are found in any blood test positive animals slaughtered, the herd test will be counted as a clear test and therefore will not affect the number of herd tests to be done or the length of time that the herd remains under movement restrictions.

6.3 Removal of Reactor Animals

6.3.1 Disclosure of disease leads to the compulsory slaughter of reactor animals, with compensation paid at full market value. DAERA aims to remove reactor animals within 15 working days of completion of the positive test. During 2018, this target was achieved for 89.97% of reactors (compared with 90.58% of reactors during 2017). DAERA attributes this slippage to the increased number of Negative in Contact animals, and consequential resource challenges to value animals and achieve removal. In response to these challenges, DAERA has appointed additional Valuation staff (see 6.4.4).

6.3.2 Reactor animals, compulsorily removed by DAERA are subject to PME, which along with further laboratory diagnostic work on samples, provides additional information to the Programme. Absence of visible lesions at slaughter does not mean that the animal was not infected. The diagnostic test is based on an immunological response to infection which precedes development of visible lesions. Therefore infected and reactive animals may not have had time to form a lesion. Alternatively the lesion may not have been visible to the inspector conducting the post-mortem because it was too small to detect, was present in an area of the carcass which is not routinely examined, or simply because meat inspection is not a forensic post-mortem.

6.3.3 The Programme includes the use of *M. bovis* strain typing, a high-resolution DNA fingerprinting method that allows the identification of genetically distinct *M. bovis* strains. DAERA considers itself well placed to avail of any future Whole Genome Sequencing and development in relation to using strain type data to accurately determine epidemiological pathways. Currently, all visibly lesioned reactors are cultured in addition to animals cultured for statutory confirmation of disease. When *M. bovis* is isolated, it is strain typed. The multiple strains of *M. bovis* show a striking degree of geographical localisation, which can be exploited to inform on potential disease source and spread (see **Figure 10** page 28). The strain typing data are made available to the DAERA Vets and are used to retrospectively inform outbreak investigations, and for research into bTB epidemiology and *M. bovis* evolution.

6.4 Veterinary Risk Assessment and Application of Disease Controls

6.4.1 Controls are applied as soon as the disease is suspected. Their purpose is to prevent spread from the breakdown herd, to identify where infection may have come from, or spread to, and to remove it. Disclosure of infection leads to the immediate restriction of the movement of cattle from affected herds until the herds have had two consecutive clear herd tests, the first carried out no less than 60 days and the second no less than 120 days after the removal of the last positive reactor. When a herd is declared as a breakdown herd, only routine movements directly to slaughter in NI are permitted. Breakdown herds are unable to access live markets to sell stock, to move animals directly to another farm (except in very exceptional animal welfare circumstances following disease risk assessment), or to export. In some herds if the breakdown is severe, or if testing is overdue, there may also be restrictions on the purchase of animals.

6.4.2 In conducting the risk assessment the DAERA Vet:

- considers which herds the infected animals came from, or passed through, before they entered the breakdown herd;
- checks what animals have moved from the breakdown herd between the estimated date of infection and the date restrictions were applied, and
- investigates possible direct and indirect contacts with livestock in other herds.

6.4.3 Any other cattle herds that are considered to be at increased risk of infection from the breakdown herd are subject to additional testing. This may be because (i) their animals have been in close proximity to animals in the breakdown herd e.g. grazing on farms which have neighbouring fields; (ii) animals from the breakdown herd had moved into the herd before the breakdown was detected or (iii) the reactor animals had moved from the herd into the

breakdown herd. Some individual animals are also tested following a veterinary risk assessment. Therefore the level of disease risk has a direct influence on the volume of testing that is required to control the disease.

6.4.4 To further control disease, primarily within the breakdown herd itself, the risk assessment may lead to the removal of animals that are considered to be at increased risk due to the extent of their exposure to infected animals, even if they do not give a positive skin test result. These animals are called “Negative in Contacts” (NICs). IFNG may also be used to support the control of disease in a breakdown herd (see 6.2.2 and 10.5).

Further information about what happens when a herd becomes a bTB breakdown can be found in the TB in your Herd Booklet which is provided to all keepers of breakdown herds.

6.5 Measuring Disease Levels

6.5.1 We use different measures to monitor levels of disease.

6.5.2 The primary measure is a calculation of bTB incidence. It is used both at herd level and at animal level. We use the 12 month moving average data in our routine statistics because these give the clearest indication of long term trends, as they reflect that skin test sensitivity is less than ideal and factor in the number of tests completed in the period.

6.5.3 Certain DVO areas tend to have higher levels of the disease and others tend towards a lower incidence. These are artificial geographical boundaries and TB is not restricted to a simple analysis on that basis. The disease tends to cluster locally and, depending on how long and in which animal population infection has been established, it may take some time before the Programme controls take effect. Controls may be applied on an area risk basis, rather than on an individual farm basis. However due to the nature of farming in NI, with conacre a common feature, disease can be dispersed over a large area. Therefore it is difficult to designate High Risk Areas or to introduce specific control strategies for particular hot spots of infection. Tools are being developed to facilitate these assessments in future.

6.5.4 In the face of increasing levels of disease, the sensitivity of the skin test has been increased by the wider application of a more severe interpretation of test readings. Additional NICs have been removed, and options for partial or total herd depopulation have been applied. Application of these increased measures in 2018 was expected to lead to an increased animal incidence. However this did not materialise and reactor numbers were 3.9% lower in 2018 compared to 2017. Removing infected and exposed animals at an early stage reduces the potential for spread and reduces disease levels in the longer term. Paradoxically, increasing the sensitivity of testing reduces its specificity. Therefore, it is possible DAERA has removed an increased number of animals not infected with *M. bovis*, but showing false positive reaction. This is an inherent feature of a biological testing regime, but it is necessary for DAERA to accept this risk at this time.

7. TB Contract

The Contract for the Provision of Bovine Tuberculosis Testing, it's Associated Services and Bio-security Advice (the TB Contract), which was introduced in April 2016, requires Private Veterinary Practices (the Contractors) to deliver TB testing at a standard set by DAERA. Under the TB Contract, veterinarians employed by Contractors who carry out TB testing on behalf of DAERA are termed Approved Veterinary Surgeons (AVSs).

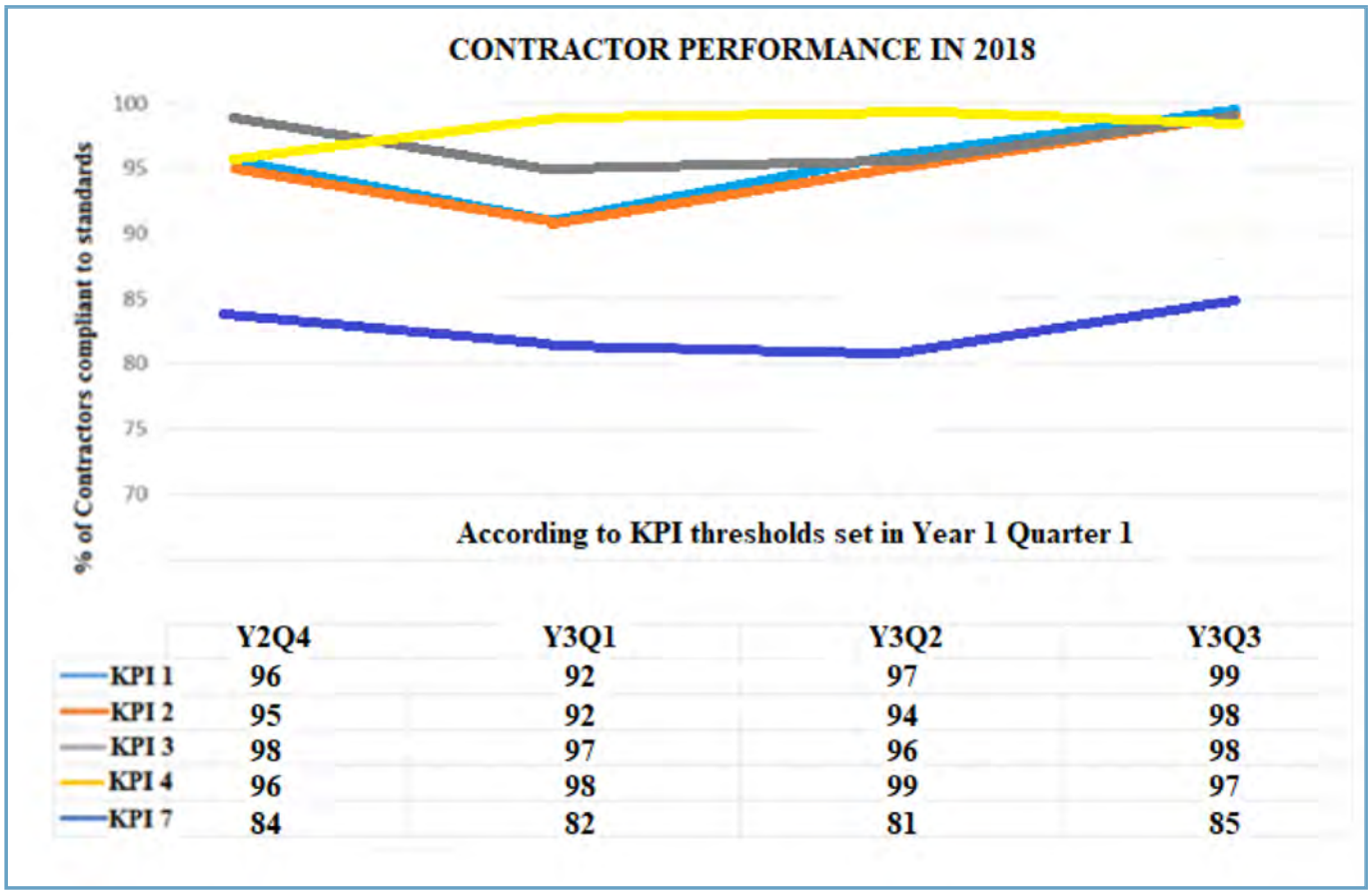
Delivery of TB testing services by Contractors is measured against Key Performance Indicators (KPIs) covering notification of testing arrangements, submission of test results, TB testing performance, and certification. The KPI thresholds were set at the start of the contract and the thresholds for KPIs 1, 2, 3, and 4, which relate to organisation of tests and submission of test results, were raised in April 2017 and April 2018 as shown in the **Table 1** below.

Table 1: Thresholds for TB Contract KPIs 1-4 and 7

KPI	Area of Compliance	Threshold in 2016	Threshold from April 2017	Threshold from April 2018
KPI 1	Test appointments to be notified to DAERA by Wednesday 5pm of the week preceding.	80%	90%	90%
KPI 2	Test reports with Positive Reactor animals to be notified to DAERA within 1 working day.	85%	90%	95%
KPI 3	Test reports with inconclusive animals to be notified to DAERA within 2 working days.	80%	90%	90%
KPI 4	Test reports with only negative animals to be notified to DAERA within 5 working days.	80%	90%	90%
KPI 7	Test results and findings returned correctly via e-PVP such that it is unnecessary for the Contractor to ask the Authority to reopen the test for correction.	100%	100%	100%

The graph below **(Figure 3)** shows Contractor KPI performance for Year 1 Quarter 4 of the TB Contract to Year 2 Quarter 3 of the TB Contract i.e. January 2018 to December 2018.

Figure 3: Contractor KPI performance in 2018



	Y2Q4	Y3Q1	Y3Q2	Y3Q3
KPI 1	96	92	97	99
KPI 2	95	92	94	98
KPI 3	98	97	96	98
KPI 4	96	98	99	97
KPI 7	84	82	81	85

A biosecurity questionnaire was developed and introduced in 2017. The questionnaire is to be completed by AVSs at one herd test per herd keeper per year. The questionnaire is not specific for TB. It provides veterinarians and herd keepers with a tool to aid discussion of biosecurity and herd health.

8. 2018 Disease Summary

In 2018:

- Approximately 22,656 herds (1.74 million cattle) were skin tested. Approximately 3.25m animal tests were carried out, a 4.5% increase from 2017. This increase can be at least partially attributed to new measures introduced in March 2018.
- There were 15,329 tuberculin skin test reactors, a 3.9% decrease from 2017 (15,949 reactors).
- There were 2088 new TB reactor herds, a 5.4% decrease from 2017 (2208 herds).
- 3,490 herds were under movement restriction at the end of December 2018 due to a TB breakdown or overdue test, representing 11.6% of all herds. 3,617 herds (12.2%) were similarly affected at the end of December 2017.
- Approximately 23,400 animals were IFNG tested, with 625 removed solely based on IFNG results, compared with 22,256 animals tested and 677 removed solely based on IFNG results in 2017.
- 999 animals were removed as NICs, compared with 891 during 2017.

Lesions at routine slaughter in 2018 (figures exclude animals imported for direct slaughter):

- 1,826 animals were found with TB-like lesions at routine slaughter (0.41% of animals slaughtered). 1,095 of these (60%) were confirmed as TB by histology and/or bacteriology. This compares with 1,703 animals found with TB-like lesions at routine slaughter in 2017 (0.40% of animals slaughtered) of which 1,074 (63.1%) were confirmed.
- 370 TB breakdowns were triggered by an animal found with TB-like lesions at routine slaughter which was subsequently confirmed by histology and/or bacteriology, compared to 409 TB breakdowns in 2017.
- 644 herds were restricted as a result of finding TB-like lesions at routine slaughter, compared to 656 herds in 2017. (This includes cases where laboratory testing gave an alternative diagnosis e.g. actinobacillosis.)
- In 247 herds a TB-like lesion at routine slaughter triggered a breakdown where 1 or more reactor animals were disclosed at the resulting skin test. 287 herds were similarly affected in 2017.

TB confirmation:

- TB was confirmed in 2,380 herds in the 12 months to the end of December 2018, a 4.57% decrease compared to the previous 12 months (2,494).
- TB was confirmed in 6,481 animals in the 12 months to the end of December 2018, an 8.2% decrease compared to the previous 12 months (7,058).

Official bovine TB (bTB) statistics for N. Ireland are published monthly and are available online at www.daera-ni.gov.uk/articles/tuberculosis-statistics-northern-ireland.

9. Disease Levels

Historic Trends

Herd incidence (defined as the number of new reactor herds during the past 12 months as a proportion of the herds which have presented cattle for a TB test during the same period) was relatively level from 2007 to 2010 followed by a sustained rise during 2011-2012, peaking at 7.46% in October 2012. Herd incidence then steadily declined to a low of 5.95% in September 2014, followed by another rise which was particularly steep throughout 2017, to 9.73% in November 2017. More recently the trend has been downward, reaching 9.22% in December 2018.

Changes in annual animal incidence show a similar trend, as shown in Figures 4 and 5.

Figure 4: bTB herd and animal incidence from 1995 to 2018

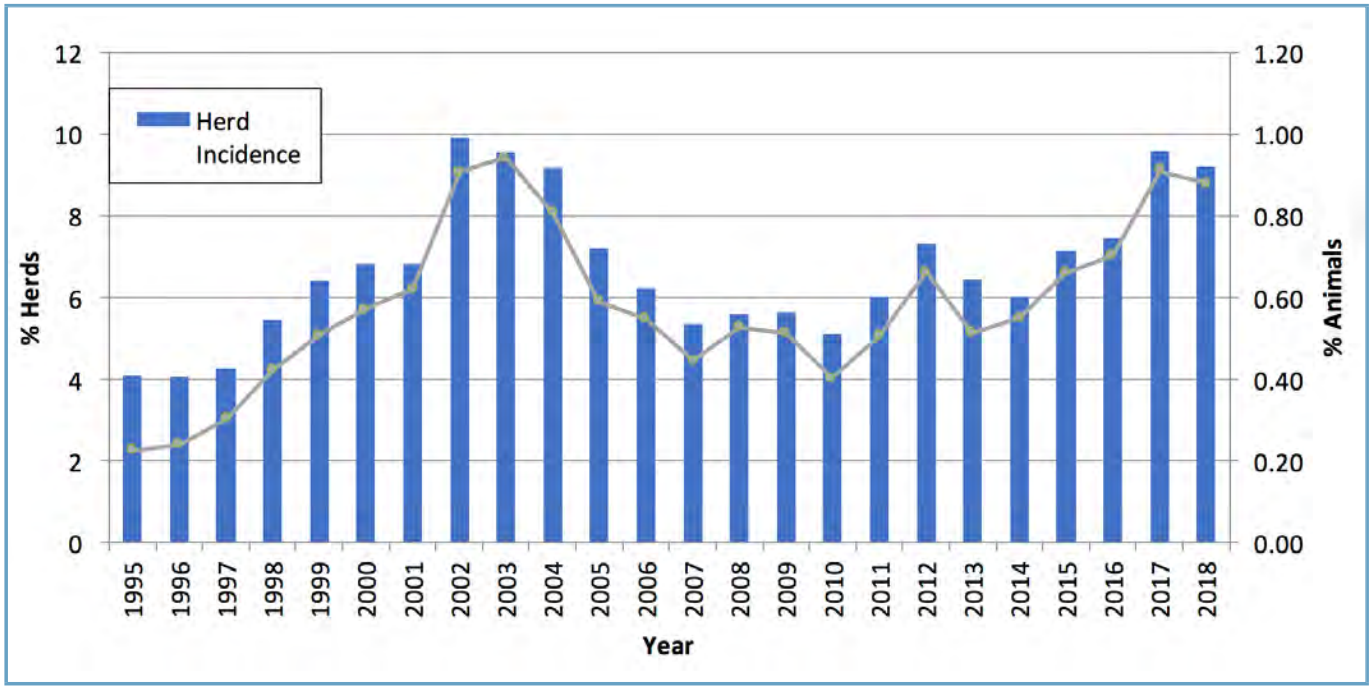
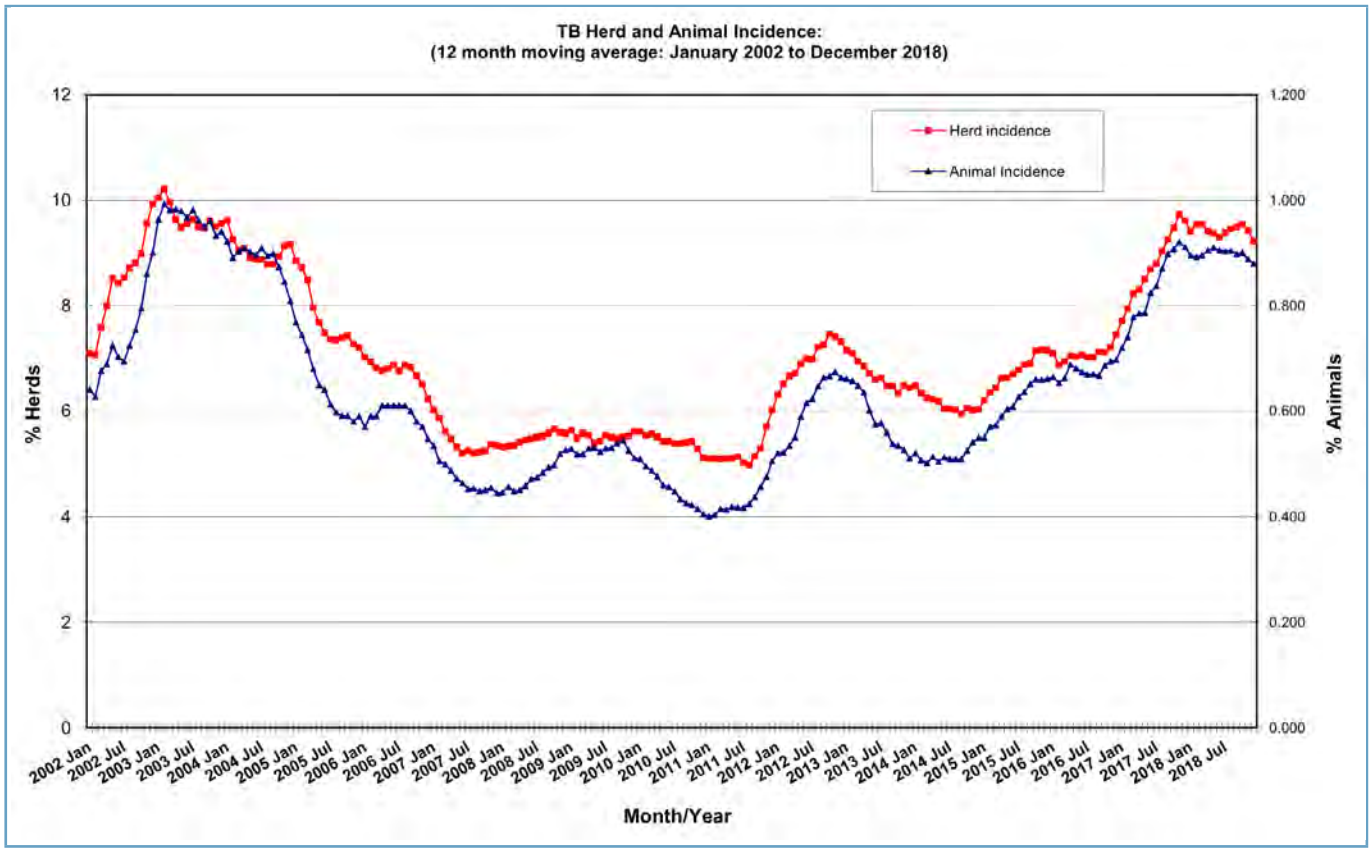


Figure 5: 1 2 Month Moving Average bTB Herd and Animal Incidence from January 2002 to December 2018



10. Surveillance Outputs

Post Mortem Examination (PME)

10.1 452,959 cattle were slaughtered in NI meat plants during 2018 (including animals imported directly for slaughter) of which 1,857 (4.1%) had bTB suspected at routine slaughter - Lesioned at Routine Slaughter (LRS) - and had samples submitted for further laboratory examination. **Table 2** below shows the overall figures for cattle slaughtered during 2017 - 2018 both with and without animals that were directly imported for slaughter. These 'direct imports' were not resident in NI herds, and therefore did not contribute to the local disease profile. During 2018, a further 28 LRS were identified in cattle exported from NI to Great Britain or the Republic of Ireland (ROI) directly to slaughter (25 during 2017).

Table 2: Numbers of Cattle Slaughtered and Numbers of LRS (Confirmed and unconfirmed) for 2017 and 2018

Year	Animals slaughtered	LRS (Number per 1000 animals slaughtered)	Animals slaughtered excluding direct imports	LRS excluding direct imports (Number per 1000 animals slaughtered)
2017	446,388	1,749 (3.92)	428,398	1,703 (3.98)
2018	452,959	1,857 (4.10)	440,236	1,826 (4.15)

Skin Test - Herd Level Tests

10.2 22,656 herds presented cattle at a bTB herd test in 2018 A total of 38,354 herd tests were carried out in 2018 compared with 36,627 in 2017 (**Table 3**), an increase of 4.7%. There were more herd tests than herds because a proportion of herds were tested more than once during the year.

Table 3: bTB Herd Tests Completed in 2017 and 2018 (By Test Category)

Herd Test Reason	Herd tests completed in 2017	Herd tests completed in 2018	% Difference in test numbers between 2016 and 2017 (%)
Restricted	8,246	8,715	5.7%
Risk	14,735	18,326	24.4%
Routine	13,646	11,313	-17.1%
Total herd tests	36,627	38,354	4.7%

Skin Test - Individual Animal Level Risk Tests

10.3 There are many and varied reasons for allocating individual animal tests. For the purpose of this report the test reasons included are those allocated as a result of the disease surveillance and risk assessment processes (**Table 4**). Other individual animal level tests, such as PCTs, PNAs and PNTs (see definitions in the glossary of terms) are paid for by farmers. PCTs are required prior to certain animal movements and pre- export. PNAs and PNTs are imposed by the Programme when an animal has moved from a restricted herd in contravention of a notice prohibiting movement of animals to other herds, or when an animal has not been tested in the previous 15 months respectively.

10,347 individual risk animal tests (CTTs, CTS, CTQs and RIs) were completed in 2018, compared with 10,794 in 2017 (a decrease of 4.1%).

Table 4: Individual Animal Level Risk bTB Tests completed in 2017 and 2018

Test reason*	Tests completed during 2017 (cattle >0)	Tests completed during 2018 (cattle >0)	Difference between years 2017 and 2018 (%)
Inconclusive retest (RI)	1,769	1,334	-24.6%
Check Test Trace (CTT)	7,488	7,772	3.8%
Check Test Query (CTQ)	1,127	788	-30.1%
Check Test Status (CTS)	410	453	10.5%
Total	10,794	10,347	-4.1%

*Description of the test reasons can be found in the glossary.

Skin Test - Animals Tested

10.4 The total number of animal tests (at herd and individual animal level) during 2018 was 3,250,444, which represents a 4.5% increase compared with 2017. The number of animals tested at herd tests in 2018 was 1,738,571, a 0.2% decrease on the previous year (**Table 5**). The number of animal tests is higher than the number of animals tested due to some of the animals being tested two or more times in the same year. The pattern of testing (**Tables 5** and **6**) generally reflects that described previously but it is worth reiterating that given the level of disease risk it was important that a strict approach to assessment of risk was maintained. Note: The in-year total number of animal tests differs from the totals of **Tables 5** and **6** because a number of animals were tested at individual animal tests, other than those allocated as a result of the disease surveillance and risk assessment processes (**Reference paragraph 10.3**).

Table 5: Total Animals Tested for bTB and Total Animal Tests in Herd Tests in 2017 and 2018

Test Category	2017	2018	Difference 2017 and 2018 (%)
Total animal tests	3,110,198	3,250,444	4.5%
Total animals tested	1,742,312	1,738,571	-0.2%
Total animals with a restricted herd test	666,772	723,245	8.5%
Total animals with a risk herd test	904,086	1,038,909	14.9%
Total animals with a routine herd test	625,244	458,481	-26.7%

Table 6: Animals bTB Tested in Individual Animal Level Risk Tests in 2017 and 2018

Test Reason	2017	2018	% Change
Check Test Trace (CTT)	13,793	14,489	5.0%
Check Test Status (CTS)	885	1,046	18.2%
Check Test Query (CTQ)	1,959	1,610	-17.8%
Inconclusive retest (RI)	3,097	2,157	-30.4%

Interferon Gamma Blood Testing

10.5 Since July 2004, IFNG has been used alongside the skin test in bTB breakdowns where certain designated criteria for selection are met. The purpose of this is to identify and thereby provide the opportunity to remove infected animals in high risk herds that have not been identified by the skin test. In February 2016 significant changes, related to both the selection of animals and the laboratory testing procedures, were introduced in order to improve value for money, and to optimise the use of IFNG.

10.6 The number of IFNG samples taken during the year is dependent on disease levels, the number and the size of eligible herds, and resource availability. In 2018 IFNG capacity was maintained at approx. 23000 samples (previously increased from 18,000 in 2016 to 23,000 in 2017) although the available resource was used in more herds. (**Table 7**).

The TBSPG has recommended the expansion of IFNG testing and this will be part of the ongoing strategy for TB eradication.

Table 7: IFNG Tests and Animals Tested in 2017 and 2018

	2017	2018	% Change
N° of Herds IFNG Tested	234	263	+12
N° of IFNG Herd Tests	250	248	-0.8%
N° of animals IFNG tested	22,256	23,454	+5.4%

11. Surveillance Outcomes

Post Mortem Examination (PME)

11.1 In 2018, 1,826 animals were found with TB-like lesions at routine slaughter (this figure does not include animals directly imported for slaughter), (an increase of 7.2%). Of these, 1,095 (60.0%) were confirmed as TB positive by histology and/or bacteriology (**Table 8**), an increase of 2.0% on the number confirmed in 2017. The number of confirmed LRS animals per 1000 animals slaughtered (excluding direct slaughter imports) decreased by 0.8%.

In 2018, 644 herds were restricted as a result of finding TB-like lesions at routine slaughter, compared to 656 herds in 2017. (This includes cases where laboratory testing provided an alternative diagnosis e.g. actinobacillosis).

In 2018, 370 TB breakdowns were triggered by an animal found with TB-like lesions at routine slaughter which was subsequently confirmed by histology and/or bacteriology, compared to 409 TB breakdowns in 2017.

During 2018, in 247 herds a TB-like lesion at routine slaughter triggered a breakdown where one or more reactor animals were disclosed at the resulting skin test. This compares to 287 herds that were similarly affected in 2017.

Table 8: LRS Animals and Confirmed LRS* Animals in 2017 and 2018

Year	Number of LRS	Number of confirmed LRS	Number of LRS excluding direct imports	Number of confirmed LRS excluding direct imports (%)	bTB confirmed LRS per 1000 animals slaughtered excluding direct imports (%)
2017	1,749	1,098 (62.8%)	1,703	1,074 (63.1%)	2.51%
2018	1,857	1,114 (60.0%)	1,826	1,095 (60.0%)	2.49%
% change 2017 v 2018	6.2%	1.5%	7.2%	2.0%	-0.8%

*Histology and/or bacteriology positive.

Skin Test

11.2 15,329 bTB skin test reactor animals were identified in 2018 compared to 15,949 during 2017 (a decrease of 3.9%) (**Table 9**).

Table 9: Total bTB Reactors and Negative in Contacts (NICs) in 2017 and 2018

Year	Reactors	NICs	Total
2017	15,949	891	16,840
2018	15,329	999	16,328
% change	-3.9%	12.1%	-3.0%

11.3 999 NICs were removed during 2018, compared with 891 during 2017 (an increase of 12.1%) (**Table 9**).

11.4 Of the 15,329 reactors, 72.95% were removed under standard interpretation of skin test results. The rest were removed using more rigorous interpretations of the skin test readings, severe (24.95%) or super severe (2.10%) interpretation, used in TB breakdown herds to increase the capability of the test to disclose infected animals. Test sensitivity is therefore increased and infected animals are removed sooner, thereby reducing the potential for spread and future risk. A VEU study reported that during a TB breakdown, animals that are only positive on severe interpretation are 8 times more likely to subsequently become reactors than animals that tested negative in the same herd tests.

Reactors Disclosed in Herd Tests

11.5 3 ,605 herd tests disclosed at least one skin test reactor (positive herd test) in 2018 compared to 3,644 during 2017 (a decrease of 1.1%) (See **Table 10**). The highest percentage increase in the number of positive herd tests was observed in the risk herd test category with an increase of 5.7%.

Table 10: bTB Herd Tests with Reactors in 2017 and 2018

Herd Test Category	2017 Herds tests with reactor(s)	2018 Herds tests with reactor(s)	% difference 2017 v 2018
Restricted	1,882	1,903	1.1%
Risk	1,237	1,307	5.7%
Routine	525	395	-24.8%
Total	3,644	3,605	-1.1%

Reactors Disclosed at Individual Animal Level Risk bTB Tests

11.6 In 2018, there was a decrease of 17.4% (**Tables 11** and **12**) in the number of individual animal level tests in which at least one reactor was disclosed (514 in 2018 compared to 622 in 2017).

Table 11: 12 month comparison of the number of Individual Animal Level Tests with Positive Animal/s in 2017 and 2018

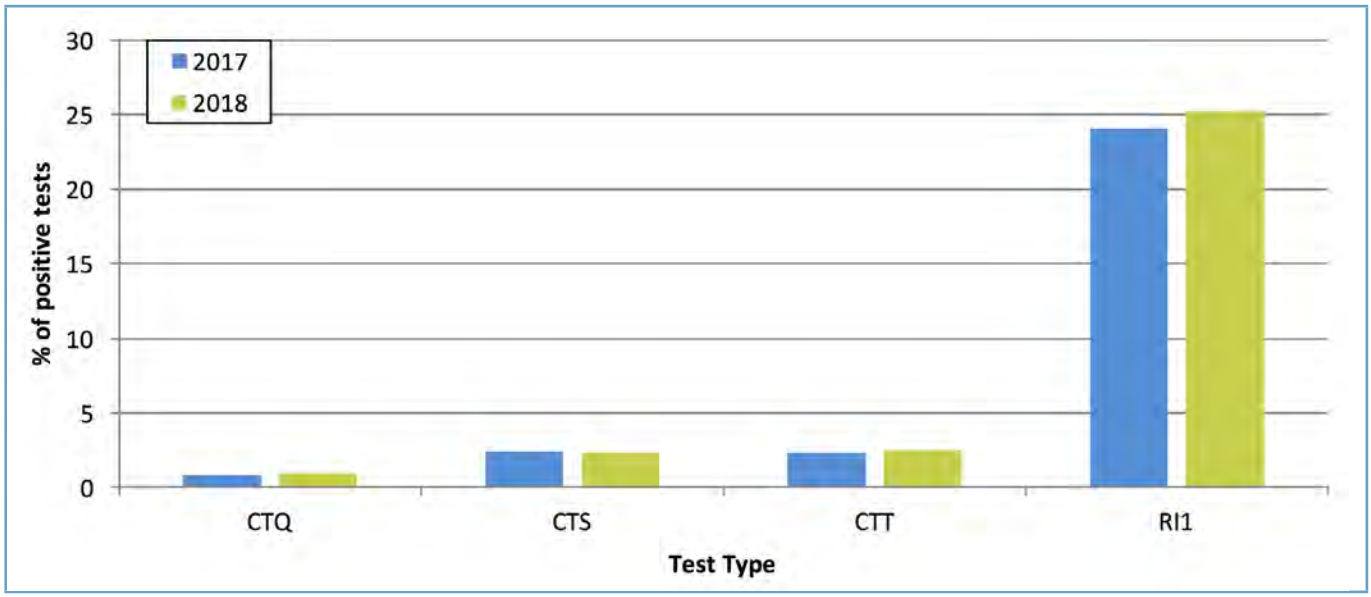
Number Individual test positive	N. Ireland
2017	622
2018	514
Difference	108
% change	-17.4%

Table 12: Individual Animal Level Tests with Reactor/s 2017 and 2018 (by test reason)

Test Reason	2017	2018	% difference 2017 v 2018
Check Test Query (CTQ)	9	7	-22.2%
Check Test Status (CTS)	10	9	-10.0%
Check Test Trace (CTT)	176	162	-8.0%
Inconclusive retest (RI)	427	336	-21.3%
Total	622	514	-17.4%

11.7 The proportion of Individual Animal Level risk bTB tests that had at least one positive animal decreased from 5.76% (622 out of 10,794) in 2017 to 4.97% (514 out of 10,347) in 2018. (**Table 12**, **figure 6**).

Figure 6: Reactor Disclosure Rate at Individual Animal Level Risk bTB Tests for 2017 and 2018 (by Test Reason)



11.8 651 reactors were disclosed at Individual Animal tests in 2018 compared to 774 in 2017 (a decrease of 15.9%) (**Table 13**).

Table 13: Number of reactor animals disclosed at Individual Animal Level Risk bTB Test in 2017 and 2018 (by Test Reason)

Test Reason	Number of reactors in 2017	Number of reactors in 2018	% difference 2017 v 2018
Check Test Query (CTQ)	9	8	-11.1%
Check Test Status (CTS)	11	21	90.9%
Check Test Trace (CTT)	199	188	-5.5%
Inconclusive retest (RI)	555	434	-21.8%
Total	774	651	-15.9%

Skin Test Reactor Confirmation Rate

11.9 15,329 bTB skin test reactor animals were identified in 2018 compared to 15,949 during 2017 (a decrease of 3.9%). 6,481 confirmed reactors were disclosed in 2018 compared to 7,058 in 2017 (a decrease of 8.2%). A positive culture result is definitive evidence of infection. However from a TB Programme perspective a reactor animal is considered to be confirmed if, in addition to being positive to the skin test, it has bTB like lesions at PME or is positive by histological examination or by culture. The confirmation rate (see glossary) for skin test reactor animals during 2018 was 42.3%, which was slightly lower than during 2017 (**Table 14**).

During breakdowns, where no reactors show visible lesions at slaughter, and bTB has not previously been confirmed, samples from up to 5 reactors per test are submitted for laboratory testing. From a breakdown herd perspective, a herd has its Officially Tuberculosis Free status withdrawn (OTW) if infection is confirmed in a reactor or LRS, if there are 2 or more unconfirmed reactors or more than 5 unconfirmed LRS during the course of a breakdown, or if otherwise indicated by a veterinary risk assessment. Thus, in Programme terms, more herds and animals are treated as confirmed and have appropriate control measures promptly applied, than would be indicated by positive culture alone. Control measures include severe interpretation of the skin test, two clear whole herd tests required post removal of reactors, disease tracing and lateral check testing.

.Table 14: bTB Reactors and Confirmed Reactors in 2017 and 2018

Year	Number of Reactors	Number (%) of confirmed Reactors
2017	15,949	7,058 (44.3%)
2018	15,329	6,481 (42.3%)
% change 2017 v 2018	-3.9%	-8.2%

11.10 It is important to re-emphasise that failure to confirm infection does not mean that the animal was not infected (the sensitivities of the confirmatory tests; post-mortem inspection, histology and culture, are not 100% and therefore false negative results will occur). Published[1] figures reinforce that the skin test is 99.98% accurate in identifying TB-free animals and is our primary diagnostic tool. Therefore the fact that an animal is a reactor to the skin test means that it is highly likely to be infected, whether or not this is subsequently confirmed after removal. Recent research has also shown that number of reactors and not confirmation is predictive of future herd breakdown risk.[2,3,4]

11.11 The 2018 figures for IFNG tests are summarised in **Table 15**. Of the 832 animals offered voluntary slaughter, 625 (75.1%) were removed, compared to 795 (85.2%) removed in 2017. 13.8% of the voluntarily slaughtered IFNG-only positive animals had TB confirmed at slaughter. (8.7% in 2017). These are TB infected animals that would have been retained in herds if the IFNG testing had not been completed.

Table 15: IFNG test results in 2018

	2018
Number of animals IFNG tested	23,454
% of the animals IFNG tested with valid results which were IFNG positive and skin test negative	3.6%
Number offered voluntary removal	832
Number voluntarily removed	625 (75.1%)
IFNG positive and skin test negative animals with TB confirmed at slaughter	86/625 (13.8%)
IFNG herd tests	263
Average number of animals per IFNG herd test (not including associated herds)	89

12. New Herd Breakdowns

12.1 Herds with at least one reactor animal where the herd had no other reactor animals during the previous 12 months are defined as new bTB herd breakdowns. 2,088 new bTB herd breakdowns were identified during 2018, compared to 2.208 in 2017 (a 5.4% decrease) (**Table 16**). Most DVO areas had a decreased number of new bTB herd breakdowns during 2018.

Table 16: New bTB Breakdown Herds in 2017 and 2018

Year	Armagh	Ballymena	Coleraine	Dungannon	Enniskillen	Mallusk	L'Derry/ Strabane	Newry	N'Ards	Omagh	Totals
2017	214	158	239	292	246	120	39	365	245	290	2,208
2018	191	147	286	264	262	96	53	302	246	241	2,088
% change 2017 v 2018	-10.7%	-7.0%	19.7%	-9.6%	6.5%	-20%	35.9%	-17.3%	0.4%	-16.9%	-5.4%

12.2 **Figure 7** shows the density of herds with reactors per km^2 in 2018 in NI. This information was requested by private veterinary practitioners to increase awareness of the distribution of infection in their locality.

Figure 7: Density of Herds with bTB Reactors in 2018

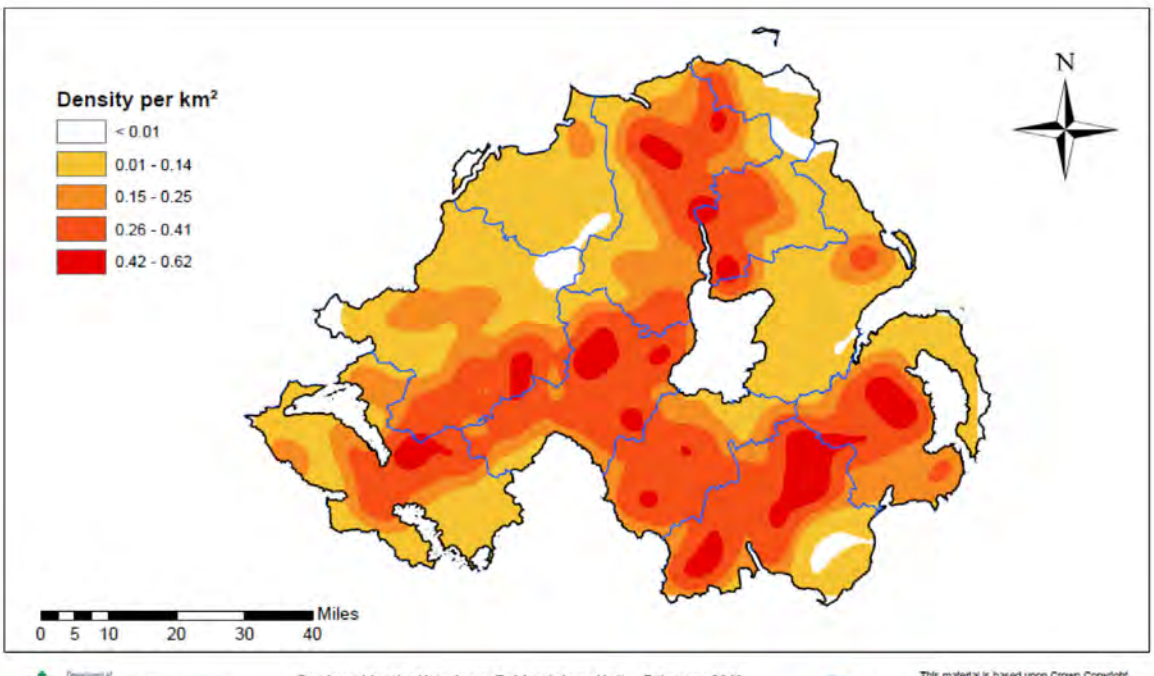
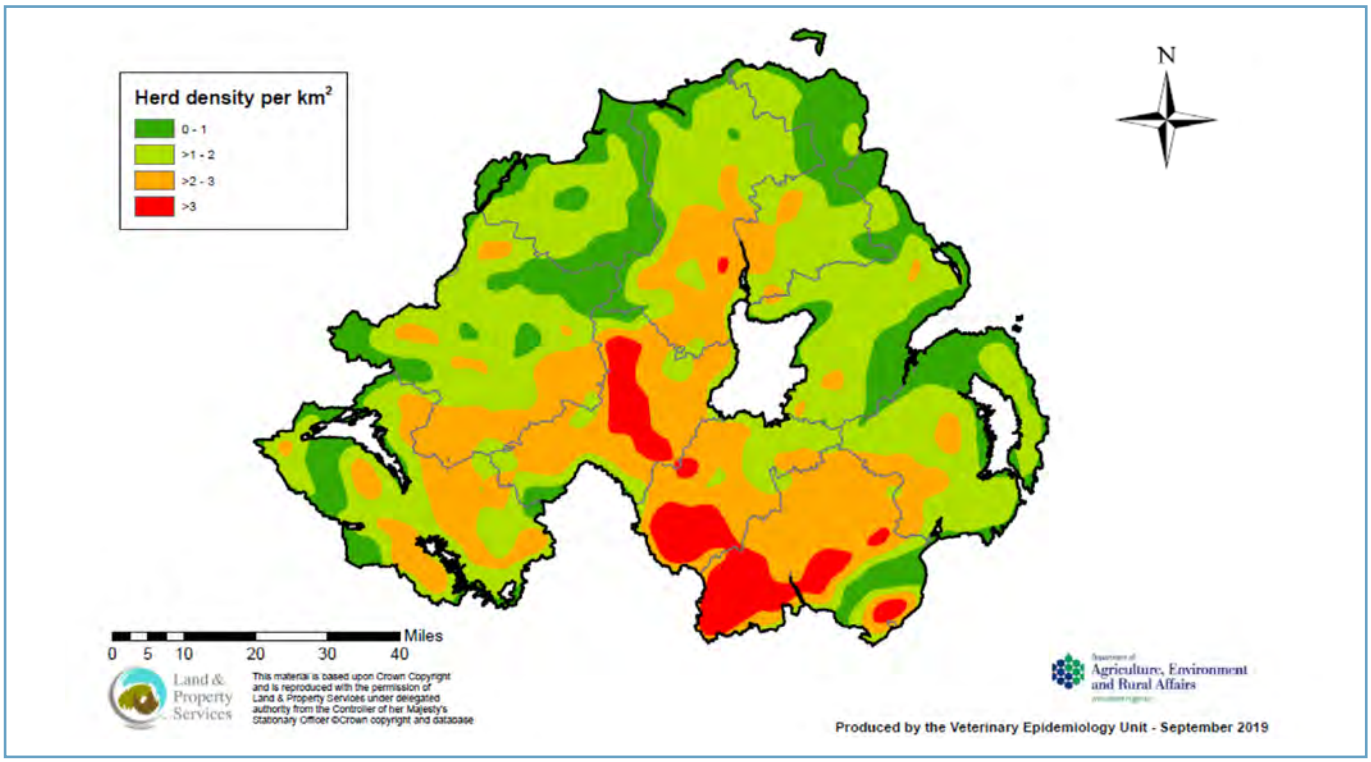


Figure 8 shows cattle herd density across NI and when compared with **Figure 7** there is a visual association between the two.

Figure 8: Operational cattle herd density in NI (May 2019)



M. bovis Strain Types

Figure 9 shows the distribution of the most prevalent bTB strain types found in bTB confirmed cases in 2018. 102 *M. bovis* strain types were isolated during 2018 with the top 10 accounting for 84% of the isolates. 105 *M. bovis* strain types were isolated during 2017 with the top 10 accounting for 83% of culture confirmed isolates. 69 strain types were common to both years (accounting for 66% of confirmed strain types in 2017 and 68% of confirmed strain types in 2018). The remaining ~30% strains are a combination of:

a) New daughters generated by mutations of existing strains.

b) Newly imported strains (from GB, ROI or EU).

c) Re-occurrence of strains that appeared fleetingly in previous years.

12.3 The 10 most prevalent strain types have changed slightly between 2017 and 2018. Strains 122 and 44 have dropped out of the Top 10 strains and are replaced with strains 9 and 7. Interestingly these two strains were present in the Top 10 in 2016 therefore showing slight fluctuations in strain types over time.

The clustering effect seen with bTB is clearly visible, with most strains staying in the same geographical locations. Some strain types are visible in areas outside their normal cluster, which would suggest spread due to animal movements.

Figure 9: Distribution of the most prevalent bTB strain types in 2018

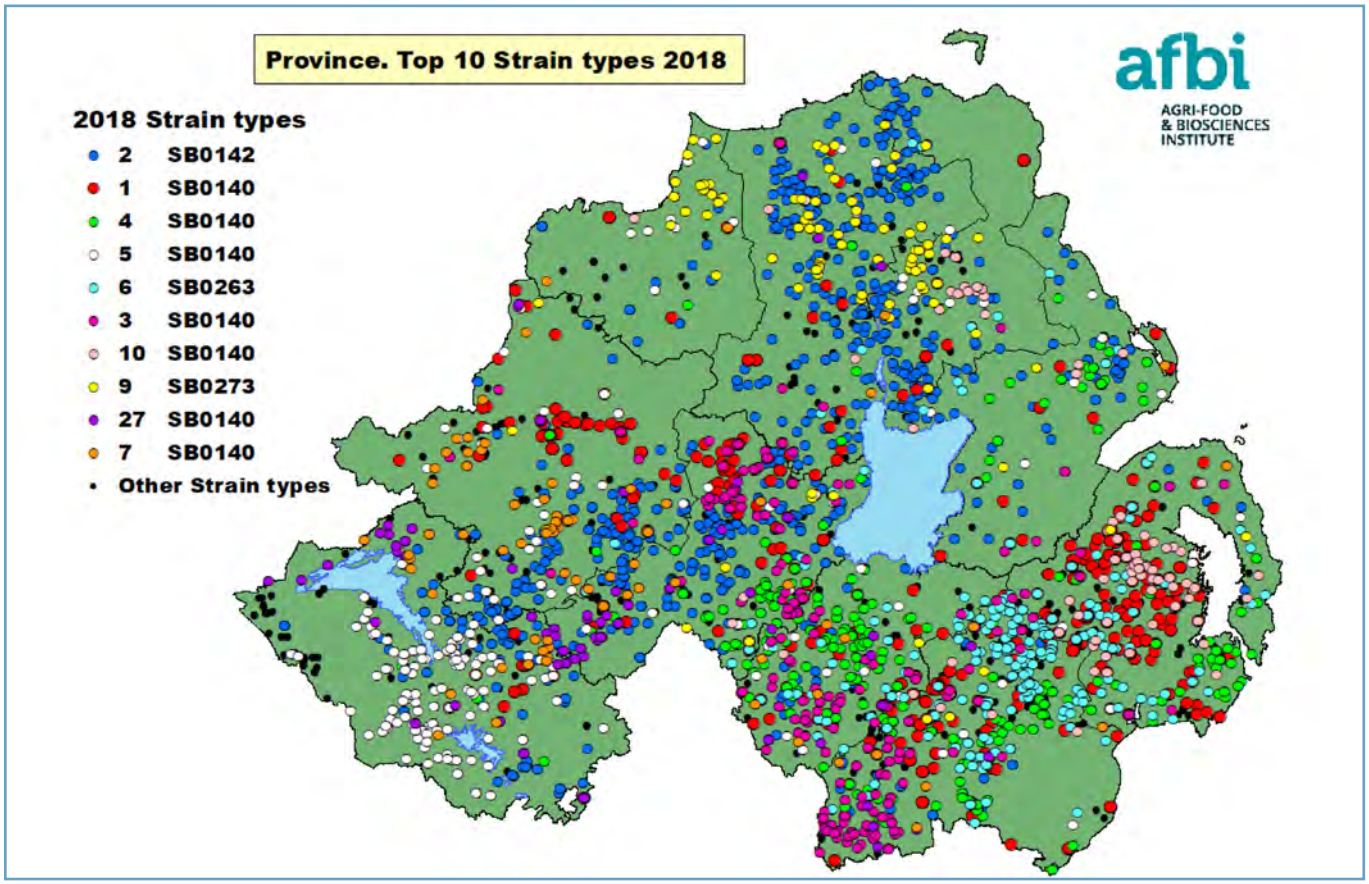
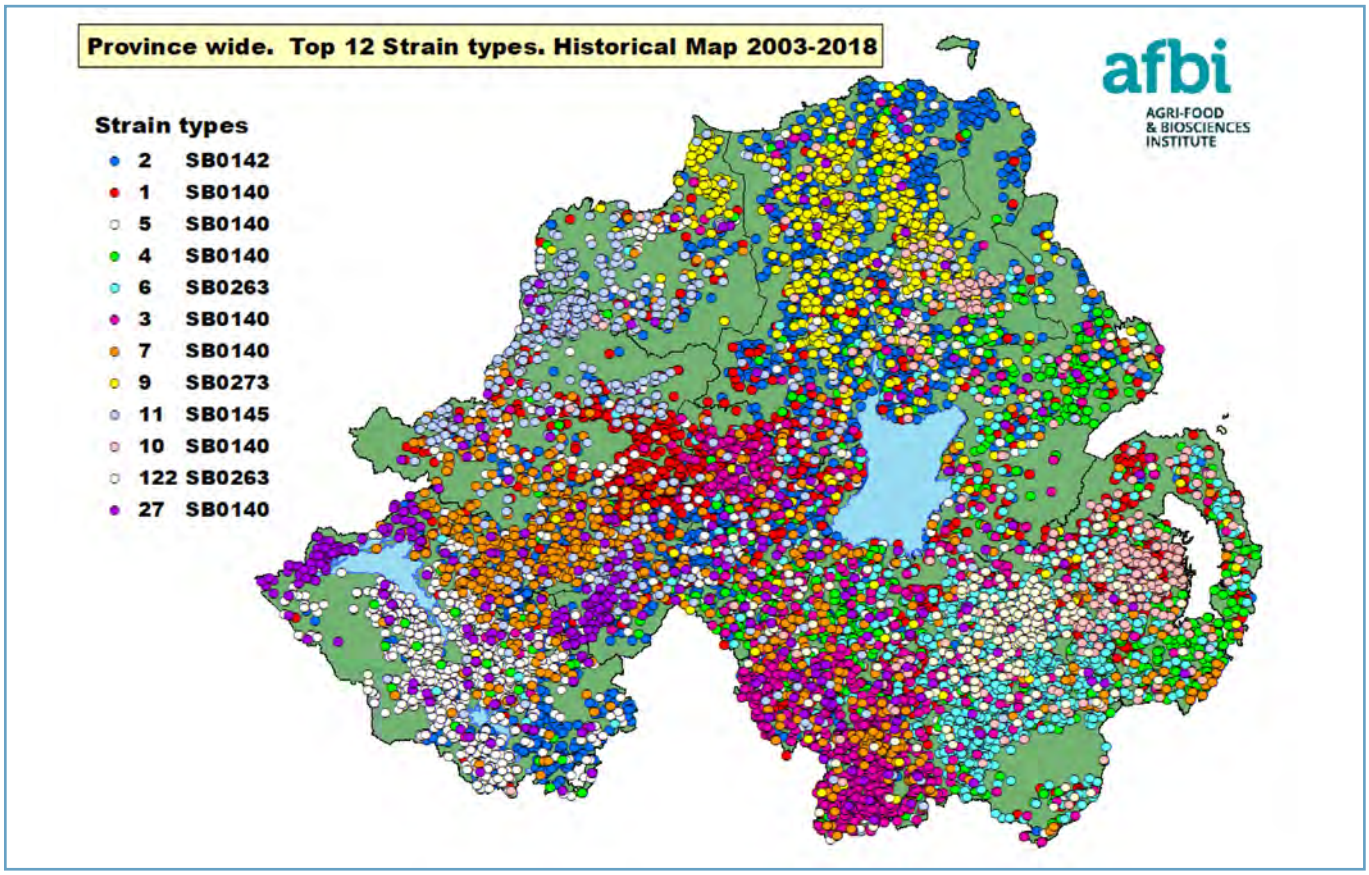


Figure 10: Distribution of the most Prevalent bTB Strain Types in 2003-2018



13. EU Co-funding and Programme Costs

13.1 Since 2010 our Programme has been annually approved for co-funding as part of the overall UK bTB Eradication Plan. An end of year summary of specified Programme costs is submitted annually to the EU Commission. A summary of the costs for 2018 is shown in **Table 17** below.

13.2 The amount of co-funding received by Northern Ireland in 2017 from the EU Commission was £5.75 million. At the time of writing, the NI share of the 2018 co-funding for the UK has yet to be confirmed.

Table 17: Specified Programme Costs for 2018

TB Programme Element	Cost
Compensation for reactors, NICs and voluntarily slaughtered interferon gamma -only positive cattle	23,559,790
Haulier expenses	399,098
PVP Tuberculin testing (excluding travel)	8,510,539
TVO/VOT tuberculin testing (excluding travel)	1,325,035
Tuberculin	724,105
Laboratory analysis for interferon gamma and culture	533,114
Research	721,316
Veterinary and Administrative Staff (excluding TVO/VOT testing)	7,834,971
Salvage monies	-4,766,099
Total	38,841,869

13.3 The specified costs of the Programme for 2018 were £1.021 million higher than 2017.

This is largely due to an increase in expenditure for increased testing with other less significant increases and reductions across the Programme elements.

14. Research and Development

Research needs in Northern Ireland are established and commissioned through a formal evidence and innovation process to ensure well informed and evidence based policy development. Industry stakeholders are involved to help identify and refine TB evidence needs and priorities.

Current projects revolve around two main areas; the development of a better understanding of TB transmission and prevention of the spread of infection between cattle and between cattle and wildlife; and the improvement of diagnostic tests to ensure the early detection and removal of infected animals.

Ongoing TB research projects in 2018 include

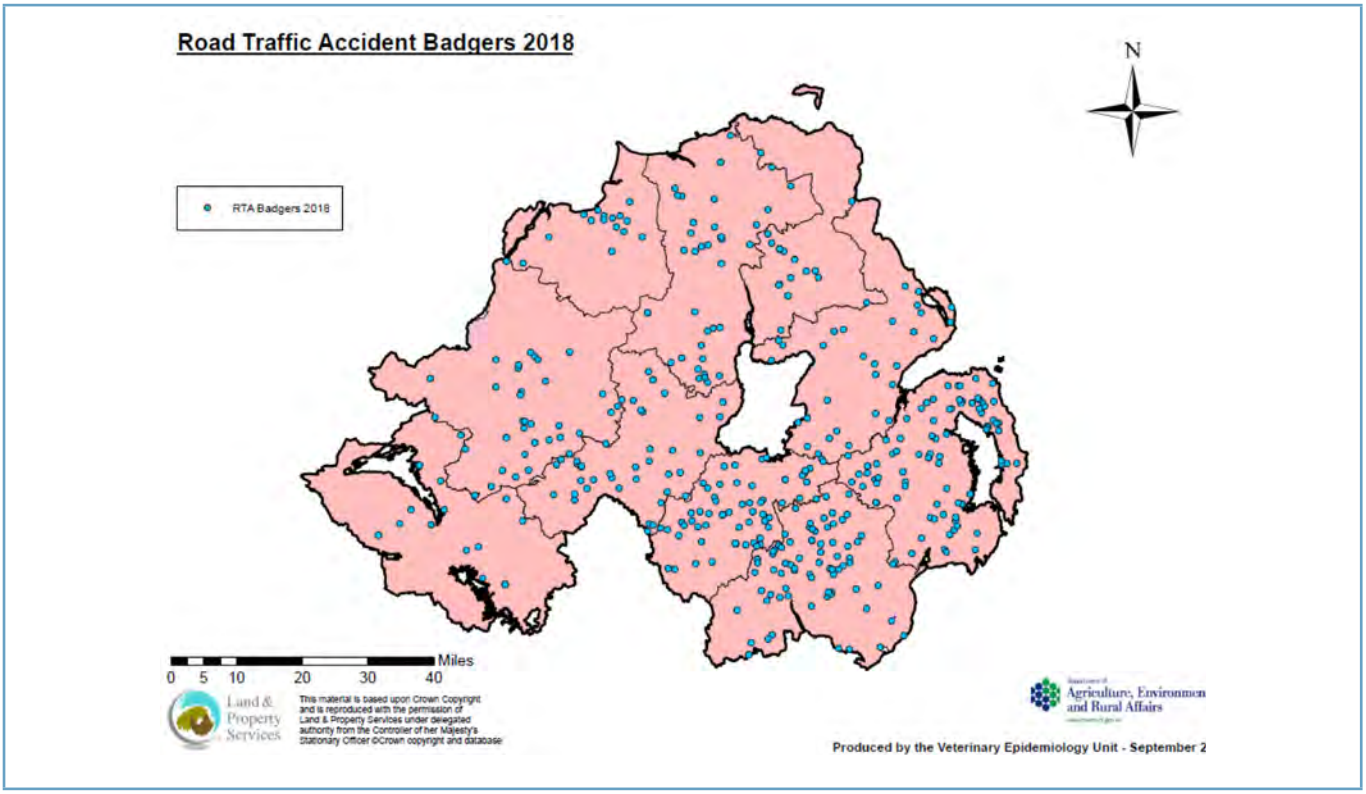
- The badger Road Traffic Accident Survey. This has been on-going since 1998 and the TBSPG recommended its expansion. During 2018 430 badgers were submitted and 71 (16.5%) of these were confirmed *M. bovis* positive. To report RTA badgers please phone 0776 7271431 or send an email to rtabadger@daera-ni.gov.uk.
- The Test, Vaccinate or Remove (TVR) Wildlife Intervention Research Project in Co. Down concluded in October 2018. This research project ran for 5 years (2014 - 2018). During year 1 all captured badgers were sampled, vaccinated, identified and released. This was an essential part of the TVR design to obtain badger ecological data in advance of TB test-positive badgers being removed. From 2015, TB test-negative badgers were vaccinated while TB test-positive badgers were removed. In year 4 of the project, 287 unique badgers were caught and the majority of them were vaccinated. The data accumulated during the five years is being analysed. The summary report of Year 5 of the project is available at www.daera-ni.gov.uk/publications/tvr-wildlife-intervention-research-project-year-5-report-2018.
- Investigating TB transmission dynamics using genome epidemiology.
- Optimisation and enhancement of the test format for the IFNG assay to inform the logistics of further increasing the use of IFNG.
- IFNG assay - performance characterisation.
- Improving the reliability of genomic prediction for TB resistance in cattle.
- BTB molecular epidemiology analysis of cattle movements and optimisation of epidemiological investigations.

A number of further projects are currently being commissioned and are due to commence in 2019.

- Bovine TB: A pilot study to investigate experimental approaches to elucidate *Mycobacterium bovis* survival in the environment.
- FaRTHEr: Farm Fragmentation As a Risk factor for TB in cattle Herds; impacts on Eradication.

- ELITE CLINIC: Exploring Livestock Trade through Cattle purchasing In Northern Ireland implications for bTB Control.
- Assessing the role of deer in the current TB epidemic.
- Bovine TB: Analysis of strain types in NI.
- There are approximately 10 years of data from all VL cattle confirmed with *M. bovis* in NI which has not been fully evaluated. Evaluation of that data is required to contribute to our capacity to understand and control infection at local and regional levels and contribute to policy development.
- Assessing the risk of indirect *M. bovis* transmission through slurry and animal faeces.

Figure 11: Location of RTA badgers collected in 2018



15. bTB in Other Species

DAERA considers the significance of disease confirmation in a non-bovine species in relation to the risk to the bovine population. During 2018, two deer and two domestic cats where confirmed as being infected with bTB.

References

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Glossary of Terms

Term	Definition
AFBI	Agri-Food and Biosciences Institute.
AHT	Annual Herd Test, a routine herd test carried out on a disease free herd to maintain OTF status.
Animal incidence	Number of reactors divided by the number of animals tested over a specified period of time expressed as a percentage (i.e. one animal with multiple tests is only counted once).
APHIS	Animal and Public Health Information System.
AVS	Approved Veterinary Surgeon. Private veterinary practitioner approved under the TB Contract.
bTB	Bovine Tuberculosis.
bTB confirmed	Two or more of the following have a positive result: SICCT (skin test), PME and histology. It can be confirmed on bacteriological culture alone.
Carryover (source of infection)	The herd had infection recently and although it might have completed two clear skin tests and the restrictions were lifted, it is suspected that some residual infection remained in the herd or environment , and this residual infection is the cause of the current breakdown.
Confirmation rate for skin test reactors	A reactor is confirmed either at post-mortem inspection (Visible Lesions) or by laboratory examination i.e. histology and/or bacteriology. The confirmation rate is the number of confirmed reactors out of the total number of skin reactors.
DAERA	Department of Agriculture, Environment and Rural Affairs.
Herd incidence	Number of new herd breakdowns divided by the number of herds with a herd level test over a specified period of time expressed as a percentage (i.e. one herd with multiple tests is only counted once).
IFNG	Interferon Gamma.
LRS	Lesion at Routine Slaughter: Suspect bTB cases identified at post mortem inspection of skin test negative animals slaughtered as part of normal business.

Glossary of Terms

Term	Definition
M. bovis	*Mycobacterium bovis* is the main bacterial agent causing bTB.
New herd breakdown	A herd with at least one reactor animal where the herd had no other reactor animals during the previous 12 months. NB - In DAERA's routine statistics, herds with bTB confirmed from lesions found at routine slaughter, and no subsequent reactors during the breakdown, are not currently included.
NIC	Negative In Contacts (NICs) are animals that are not positive to a diagnostic test, but are removed on the basis of being at increased disease risk due to the extent of their exposure to disease.
OTF	Officially Tuberculosis Free.
OTS	OTF Suspended.
OTW	OTF Withdrawn.
Patch incidence	The percentage of herds at risk in each patch that were bTB infected during that year.
PME	Post Mortem Examination.
Reactor	An animal that gives a positive response to the skin test is called a "reactor".
Reactor removal times	Number of working days between the test revealing the reactor animal and the death of that animal.
Restricted Herd	**RHT, RH1, RH2 where:** **RHT:** Restricted Herd Test, an immediate test/part test where the first reactor is disclosed at an individual animal test or infection is suspected at PME (LRS) and the herd has not been tested in the previous 60 days; also known as a stabilising test. **RH1:** - First Restricted Herd Test carried out at least 60 days after the removal or isolation of any reactor or LRS; or at least 42 days after a clear RHT. **RH2:** - Second Restricted Herd Test carried out at least 42 days (usually 60 days+) after completion of an RH1 without reactors in an OTW breakdown, and at least 120 days after removal or isolation of the last reactor or LRS.

Glossary of Terms

Term	Definition
Risk herd tests	**BCT; CHT; FCT; HRT, ICT; LCT; OHT & SCT** where: **BCT:** Backward Check Test set following risk assessment for herds that a reactor animal or routine slaughter case from an OTW herd passed through prior to being disclosed. **CHT:** Check Herd Test, to be completed 4-6 months after de-restriction for all herds that have been restricted due to a bTB breakdown and have no additional risk factors. **FCT:** Forward Check Test, herd test for herds into which a forward traced animal moved, and the animal cannot be tested due to its slaughter, death or export. **HRT:** High Risk Test, a test allocated to herds considered high risk, but which do not fall into other categories. **ICT:** Inconclusive Check Test, herd test to be completed at least 60 days after voluntary slaughter of an inconclusive animal by the herd keeper. **LCT:** Lateral Check Test, carried out on herds assessed as being at higher disease risk due to proximity to a diseased herd. **OHT:** Overdue Herd Test, an additional herd test that is required to restore OTF status of a herd that has failed to test within prescribed time limits. **SCT:** Status Check Test, a herd test carried out to restore OTF status following suspension/withdrawal due to the presence of cattle whose origins cannot be determined to the satisfaction of DAERA. It may need to be repeated to restore OTF status, at the discretion of the local S/DVO, depending on the particular circumstances.
Risk individual tests	**RI1; CTS & CTT/CTQ**, where: **RI1:** Inconclusive retest, completed on individual animals at least 42 days after an initial inconclusive result. **CTS:** Check Test Status, check test carried out on animal(s) with identity or movement queries or which have missed a bTB test. **CTT/CTQ:** Check Test Trace /Check Test Query, check test of animal(s) forward traced from a breakdown herd. ***Note***: **PCT, PNA** and **PNT** are private tests, described but not included, in the figures presented in this Report. CTI tests are also excluded from the report as they are not a TB Programme requirement:

Glossary of Terms

Term	Definition
	PCT: Private Check Test; pre-movement tests for cattle being exported or moving to an AI Centre or Embryo Transplant clinic; **PNA:** Private Test, Move Not Allowed; automatically set for animals that have moved from an OTS/OTW herd to an OTF herd, or moved from an OTS herd to another OTS herd. This does not apply where the consignor herd is OTS pending clearance of TB skin test IC and OTW has not been applied to the herd for disease reasons in the previous 3 years; **PNT:** Private Test Not Tested for 15 months; unrestricted cattle exceeding a 15 month bTB test interval. **CTI:** Check Test Import allocated for individual or groups of re-imported cattle for Trade Branch purposes. It is completed at least 42 days after any previous pre-export test, and at least 30 days post re-importation to an isolation facility on the farm of origin.
Routine Herd Tests	**AHTs** and **RSTs (defined in glossary)**.
RST	Restocking test, herd test carried out when animals move into a herd that has had no stock for at least 2 years.
Sensitivity	Proportion of infected animals that are correctly detected by the test.
SICCT test	Single Intradermal Comparative Cervical Tuberculin test. Also known as skin test.
Skin test	See SICCT above.
Specificity	Proportion of negative animals that are correctly detected by the test.
VL	Visible lesions: Tuberculosis like lesions identified at post mortem inspection.
VOT/TVO	Veterinary Surgeons employed by DAERA to carry-out TB testing.
12 month moving average incidence	Average incidence over the previous 12 months.

Bovine Tuberculosis in Northern Ireland

2018 Annual Report

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