Bovine Tuberculosis in Northern Ireland

2017 Annual Report

Department of Agriculture, Environment and Rural Affairs

www.daera-ni.gov.uk

INVESTORS IN PEOPLE

Contents

Executive Summary

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

1. **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).

2. **Removal of reactor animals** - disclosure of disease leads to the compulsory slaughter of reactor animals.

3. **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 application of disease control measures leads to more testing. Combined with increasing the sensitivity of the test by wider application of a more severe interpretation of test readings and removal of additional exposed animals, this leads to the removal of more animals. However, removing infected and exposed animals at an early stage reduces the potential for spread and reduces disease levels in the longer term.

In 2017, annual herd incidence continued to rise steadily to reach a peak of 9.73% in November 2017. Annual herd incidence was 9.61% in December 2017, compared to 7.45% in December 2016.

2017 Surveillance Summary (compared with 2016)*

a. 22,978 herds presented cattle for a TB herd test during 2017 (a reduction of 1.6% compared to 2016). Approximately 1.75 million cattle were bTB tested.

b. 36,627 herd tests were completed during 2017, an increase of 6.6% relative to 2016. The number of risk herd tests also increased in 2017 by 21.9% (14,735 in 2017 compared to 12,092 in 2016).

c. 1237 risk herd tests (8.39%) had reactors during 2017,compared to 885 (7.32%) during 2016.

d. 10,794 individual animal level risk (skin) tests were completed in 2017 compared with 9,187 in 2016 (an increase of 17.5%). There were increased numbers of each of the 4 main test reasons (see **Table 5** and **Table B** in **Annex**).

e. 208 traced cattle were reactors at individual animal trace tests during 2017, compared with 144 during 2016 (an increase of 44.4%). This represented 1.32% of animals tested compared with 1.13% of animals tested during 2016.

* Figures correct at time of writing (July 2018)

f. 3,142,995 animal SICCT tests (at herd and individual animal level) were completed in 2017, which represents an 11.6% increase compared to 2016. The number of animals tested at herd tests was 1,742,312, a 2.5% increase (some animals were tested more than once; hence this figure is lower than the total number of tests completed).

g. 22,256 animals were tested using IFNG, compared to 17,611 in 2016 (an increase of 26.4%). 234 herds were tested using IFNG in 2017, compared to 185 in 2016 (an increase of 26.5%).

> "... there was a widespread increase in both herd and animal incidence during the course of 2017..."

h. 446,388 cattle were slaughtered in NI meat plants during 2017 (including animals imported directly for slaughter) of which 1,749 (0.39%) had bTB suspected at routine slaughter (Lesioned at Routine Slaughter (LRS) and had samples submitted for further laboratory examination. During 2016, 1,676 LRS (0.39% of total slaughtered) were identified from 424,898 cattle slaughtered (including animals imported directly for slaughter).

2017 Disease Summary (compared with 2016)*:

a. The annual herd incidence increased (9.61% in December 2017 compared to with 7.45% in December 2016), as did the annual animal incidence (0.91% in December 2017 compared to 0.70% in December 2016).

b. An increasing level of bTB was observed at herd level in all DVO areas.

c. 15,949 bTB skin test reactor animals were identified in 2017 compared to 11,924 during 2016 (an increase of 33.8%)

d. 1,125 animals were positive to IFNG in 2017, compared to 1,041 in 2016 (an increase of 8.1%), and 795 IFNG-only positive animals were removed compared to 821 in 2016 (a reduction of 3.2%).

e. 2,208 new bTB herd breakdowns were identified during 2017, compared to 1,739 in 2016 (a 26.9% increase).

f. 2.51 bTB confirmed LRS were detected per 1000 animals slaughtered during 2017 compared to 2.45 per 1000 animals slaughtered during 2016 (an increase of 2.4%). This figure does not include animals imported to Northern Ireland directly for slaughter.

g. Specified Programme costs for the 2017 Programme increased by 24.5% to £37,820,712. At the time of writing, co-funding of the 2017 Programme has not been approved pending a desktop audit by the EU of the end of year statistics submitted by the UK. The amount received as co-funding for the 2016 Programme was £5.6 million.

Overall Conclusions

- There was a widespread increase in both herd and animal incidence during the course of 2017. They have followed the same temporal trend.
- This is reflected in an increase in the number of new breakdown herds and in the number of animals removed.
- The number of risk herd tests increased in 2017, as well as the proportion of these in which a reactor was disclosed. This indicates these herds were identified correctly as being at higher risk.
- The number of traced animals that were reactors at individual animal tests increased.
- The number of confirmed LRS per 1,000 cattle slaughtered in NI increased. This reflected both an increased number of LRS and an increase in the rate of bTB confirmation in LRS by laboratory testing. The increase was marginal relative to the increase in bTB test reactors suggesting animals are being removed by a test which is showing improved sensitivity.

1. Introduction

1.1 This report provides a descriptive overview of the key disease control components of our bTB Eradication Programme (TB Programme), including a summary of the 2017 statistics.

1.2 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 anyone who has 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, 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 detailed and resolved, 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.

> "... 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;

(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.

VSAHG also engaged extensively with stakeholders and interested parties during the Department's public consultation on a range of proposals to work towards the eradication of bTB in Northern Ireland. These were in response to the report produced by the independent TB Strategic Partnership Group (TBSPG) in December 2016. Further information is available in section 5.

In September 2017 the Department announced its intention to deploy a range of additional and enhanced measures to strengthen its bTB Eradication Programme and improve its impact.

The measures, which were rolled out between December 2017 and March 2018 included:

- Further application of severe interpretation of skin tests in breakdown herds;
- The introduction of a further herd test after a breakdown herd is derestricted in certain situations, to reduce the risk of further breakdowns;
- A reactor quality assurance pilot to establish baseline data on bTB skin test reactors; and
- The introduction of an annual biosecurity self-assessment checklist for use by DAERA approved veterinary surgeons (AVSs) and farmers.

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 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 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. The administrative area of each office is sub-divided into "patches", which are managed by a DAERA Veterinary Officer (VO) with support from technical officers. Each TB breakdown has an allocated VO 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 team was established 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.

The team's goal is to ensure that field staff apply a unified approach to implementing the TB Programme.

> "... the team's goal is to ensure that field staff apply a unified approach to implementing the TB Programme ..."

Outputs during 2017

- Animal Health and Welfare Inspectors (AHWI): training.
- Disease investigation form reworked and updated.
- Development of a draft telephony script to help staff to deal with TB queries.

- Production of monthly heat maps showing confirmed bTB breakdowns to enable staff to see disease spread over an area.
- Monitoring of the reallocation of TB herd tests from DAERA Testing Officers to ensure tests could be arranged with sufficient notice.
- Engagement with the Northern Ireland Food and Animal Information System (NIFAIS) team which is working on the development of the System to replace APHIS.
- Engagement with TB Programme regarding Programme enhancements.
- Review of certain TB Staff Instructions (SI) to provide clarity and improve effectiveness.

The following training events were arranged and delivered by TBIT during 2017

VO Training (9 and 29 Nov 2017)
This training included an overview from the Deputy Chief Veterinary Officer (DCVO), and a presentation on integration of cattle and badger control measures for eradication of bTB. Other topics covered included an update on bTB epidemiology, IFNG, new Programme measures, the TB Counter Fraud plan and managing stressful situations.

TB Investigation AHWI Training (17 Nov 2017)
This training covered routine bTB breakdown procedures, the TB Disease Investigation form and SI, processes involved and an overview of mapping.

DAERA TB Testing Officers Training (19 and 22 Sept 2017)
This training included an introduction by the DCVO and covered the TB Strategic Partnership Group (TBSPG), TB Testing Contract, bTB epidemiology update, welfare, line management, compulsory BVD eradication scheme, TB Fraud, conflict resolution, safer cattle handling, enforcement, epizootic disease, and witness statement writing as well as Programme changes.

Figure 1 shows the main DAERA branches and delivery partners involved in the delivery of the TB Programme.

Figure 2 is a map showing the areas covered by the 10 DVOs. 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

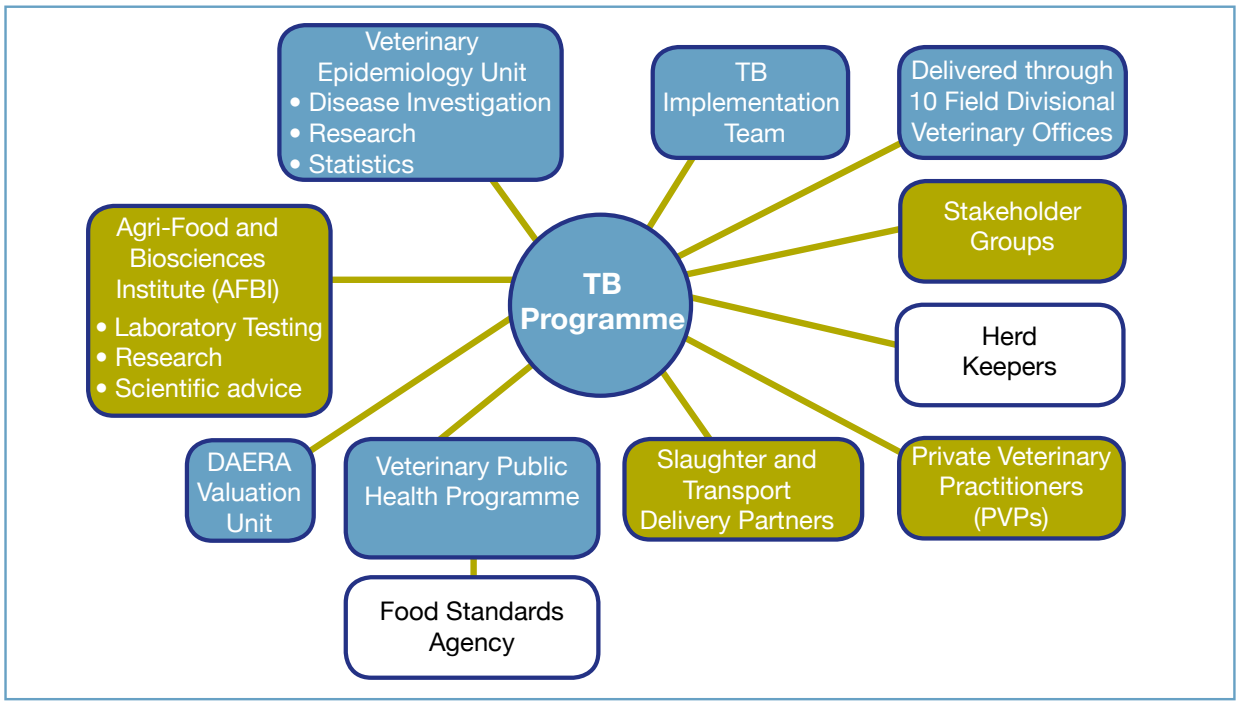
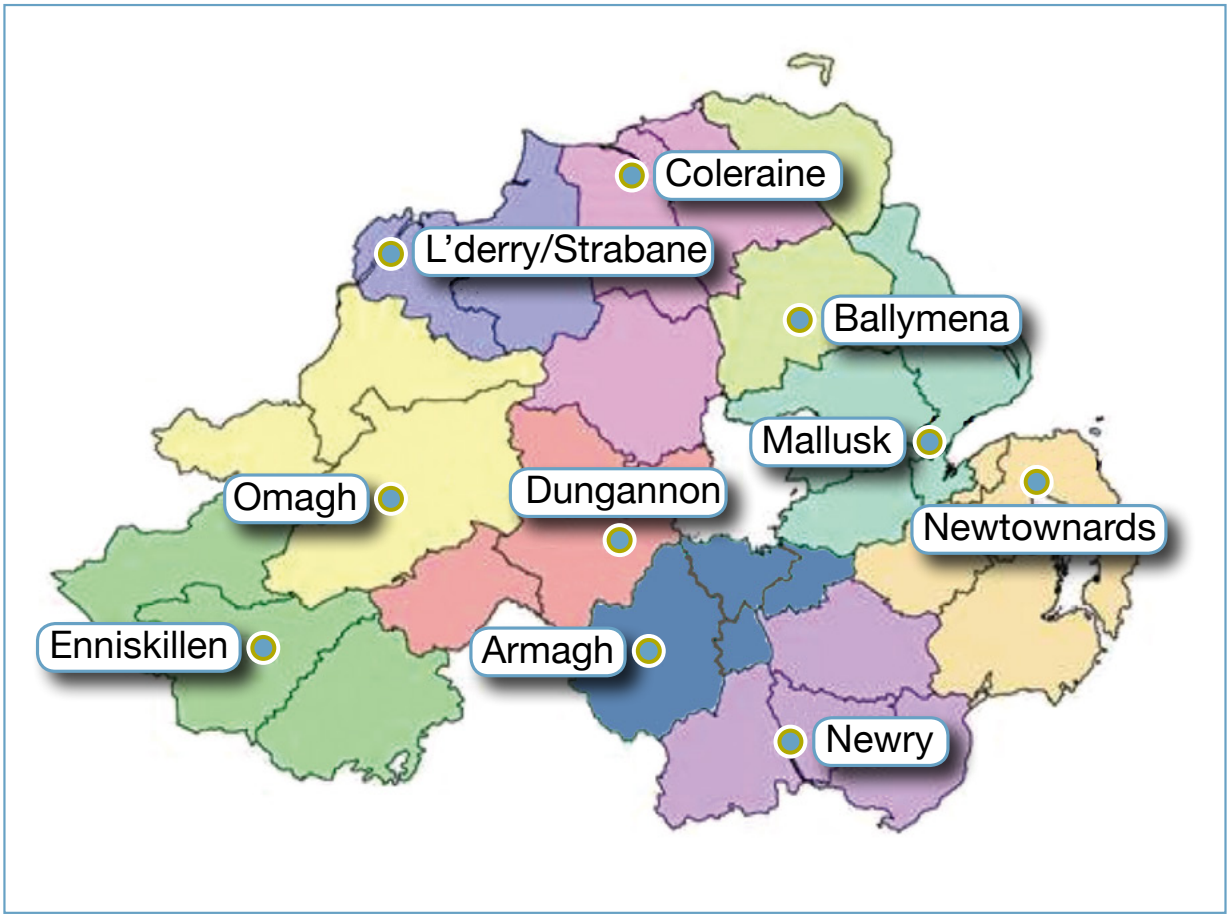


Figure 2: Divisional Veterinary Office (DVO) Locations and Areas Covered



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 December 2016, the group published its Strategy to Eradicate Bovine Tuberculosis from Northern Ireland.

The overall aim of the Strategy is to eradicate bTB in cattle but the Department recognises that there will be no quick fix, and that eradication is likely to take 30-40 years.

> "... a fresh and integrated approach to allow Northern Ireland to achieve eradication ..."

Following legal advice, DAERA launched a public consultation on its response to the TBSPG Strategy in November 2017. The consultation 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 BovineTB Eradication Strategy NI

The Department's response covered 33 proposals under six thematic headings; (1) A New Approach to Management, Oversight and Partnership Working, (2) Tools and Processes, (3) Wildlife, (4) Preventing Disease - Herd Health Management, (5) Finance and Funding, and (6) Research. These themes are all interrelated and do not stand alone. The Department believes that action is required across all of the themes to secure a fresh and integrated approach to allow Northern Ireland to achieve eradication.

International experience has shown that the eradication of bTB can only be achieved by simultaneously addressing all the factors that meaningfully contribute to the persistence and spread of the disease in infected animal populations. The Department considers that its response to the TBSPG Strategy represents a complete package of actions which would lead not only to disease eradication in the cattle population but would also contribute to the health of the badger population.

The consultation responses will be analysed by Departmental officials and this analysis will assist in the provision of advice to a Minister, once in post. Budget availability will also be required to underpin any accepted recommendations.

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Reactor Quality Assurance (RQA) Trial

A RQA Trial commenced in November 2017, in selected eligible herds in Newry, Newtownards and Enniskillen Divisional areas. It involves the assessment and blood sampling of around 1,000 TB skin test reactor animals and will provide data on bTB skin test reaction regression, the IFNG response in reactors and allow a survey of compliance with certain testing procedures. The data will be analysed by the Veterinary Epidemiology Unit and 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

> "... bTB Eradication Programme is vital in safeguarding export-dependent livestock & livestock products industry ..."

DAERA has an EU Commission approved bTB Eradication Programme, ensuring compliance with the EU Trade Directive 64/432/EEC (as amended). Importantly, 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 export-dependent livestock & livestock products industry (worth in excess of £1,000 million per annum). Through the implementation and delivery of the Programme, in the region of 89% of herds are free to access international markets at any one time. EU Commission approval also secures some £5 million per year of EU co-funding. The approved bTB Eradication Programme for 2017 is available at 2017 TB Eradication Plan (UK).

6.1 This 2017 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.

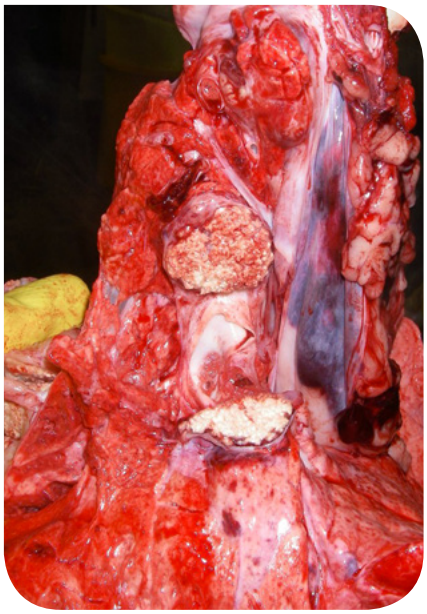
6.2 Disease Surveillance

Our disease surveillance is based on two distinct elements:

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

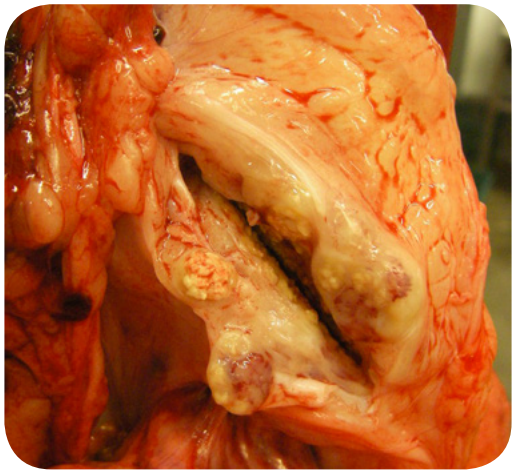
All animals slaughtered for human consumption are subject to PME, primarily for public health assurance. Carcasses are examined for visible signs of bTB infection,

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.



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

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

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 2017, this target was achieved for 90.58% of reactors (compared with 92.9% of reactors during 2016). DAERA attributes this slippage to the increased number of both reactor and 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 and are in the process of developing the new TB Slaughter and Haulage Contract to achieve better public service contract arrangements.

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 ..."

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 postmortem 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 postmortem.

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 29** page 48). The strain typing data are made available to the DAERA VOs 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 are no longer considered to be infected. 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 move animals directly to another farm (except in very exceptional animal welfare circumstances following disease risk assessment), or to export.

"... purpose is to prevent spread from the breakdown herd, to identify where infection may have come from, or spread to, and to remove it ..."

6.4.2 In conducting the risk assessment the VO:

- 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 Cattle herds that are considered to be at increased risk of infection 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.

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 measures leads to the removal of an increased number of animals, which in turn leads temporarily to an increased animal incidence. However, 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.

> “... the sensitivity of the skin test can be increased by the wider application of a more severe interpretation of test readings ...”

7. TB Contract

The Contract for the Provision of Bovine Tuberculosis Testing, its 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).

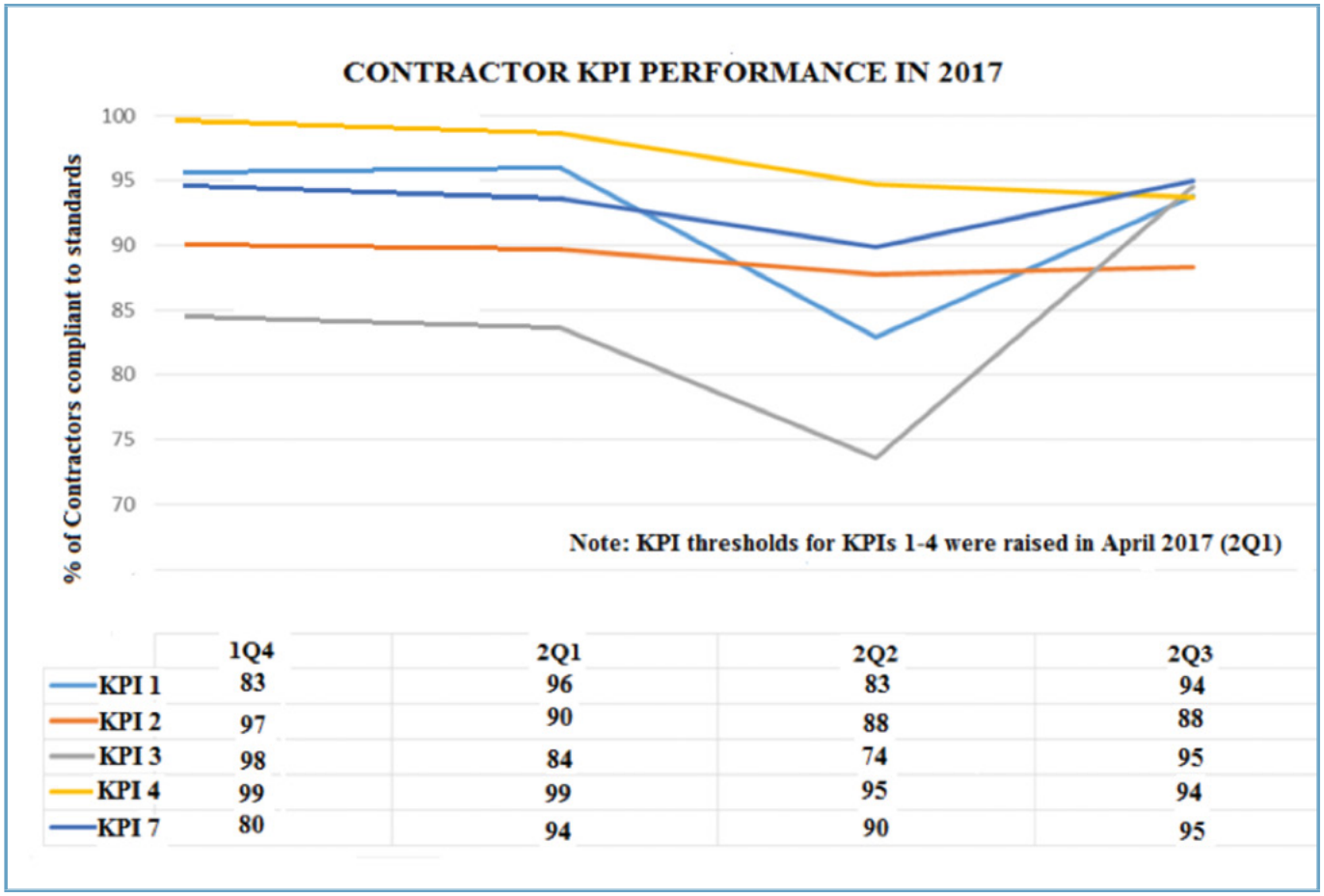
Delivery of TB testing services by Contractors is measured against Key Performance Indicators (KPIs) covering notification of testing arrangements; submission of test results; TB testing performance; and certification. The KPI thresholds, below which Contractors are deemed to be underperforming, were 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 as shown in the **Table 1** below.

Table1: Thresholds for TB Contract KPIs 1-4 and 7

KPI	Area of Compliance	Threshold in 2016	Threshold from April 2017
KPI 1	Test appointments to be notified to DAERA by Wednesday 5pm of the week preceding.	80%	90%
KPI 2	Test reports with Positive Reactor animals to be notified to DAERA within 1 working day.	85%	90%
KPI 3	Test reports with inconclusive animals to be notified to DAERA within 2 working days.	80%	90%
KPI 4	Test reports with only negative animals to be notified to DAERA within 5 working days.	80%	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%

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 2017 to December 2017.

Figure 3: Contractor KPI performance in 2017



	1Q4	2Q1	2Q2	2Q3
KPI 1	83	96	83	94
KPI 2	97	90	88	88
KPI 3	98	84	74	95
KPI 4	99	99	95	94
KPI 7	80	94	90	95

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.

> “... it provides veterinarians and herd keepers with a tool to aid discussion of biosecurity and herd health ...”

8. 2017 Disease Summary

> "... at herd level, increased bTB incidence was observed in all DVO areas ..."

8.1 22,978 herds presented cattle for a TB herd test during 2017 (a reduction of 1.6% compared to 2016). Approximately 1.75 Million cattle were bTB tested.

8.2 The annual herd incidence increased (9.61% in December 2017 compared to with 7.45% in December 2016), as did the annual animal incidence (0.91% in December 2017 compared to 0.70% in December 2016).

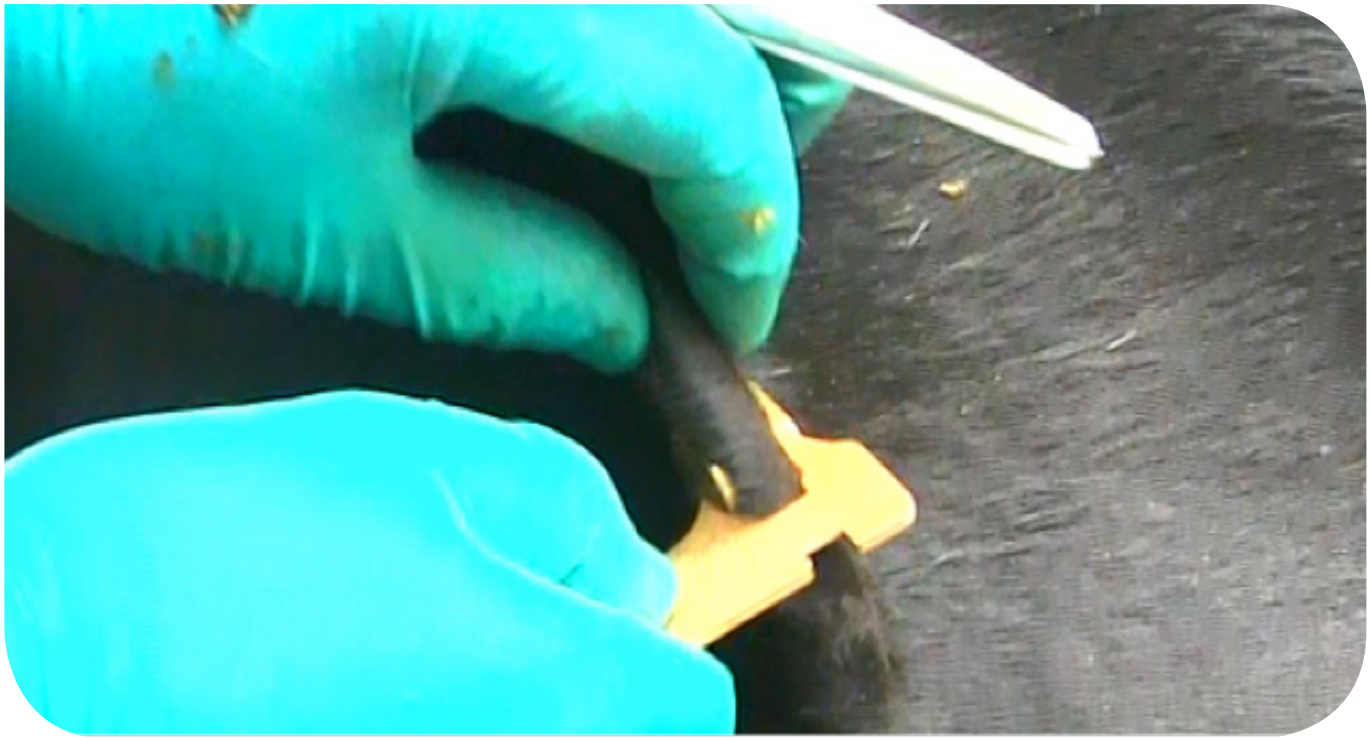
8.3 At herd level, increased bTB incidence was observed in all DVO areas.

8.4 15,949 bTB skin test reactor animals were identified in 2017 compared to 11,924 during 2016 (an increase of 33.8%).

8.5 2.51 bTB confirmed LRS were detected per 1000 animals slaughtered during 2017 compared to 2.45 per 1000 animals slaughtered during 2016 (an increase of 2.4%). This figure does not include animals imported to Northern Ireland directly for slaughter.

8.6 1,125 animals were positive to IFNG in 2017, compared to 1,041 in 2016 (an increase of 8.1%), and 795 IFNG-only positive animals were removed compared to 821 in 2016 (a reduction of 3.2%).

8.7 2,208 new bTB herd breakdowns were identified during 2017, compared to 1,739 in 2016 (a 26.9% increase).



9. Disease Levels

Historic Trends (Updated for 2017)

9.1 There was a rising trend in annual bTB herd incidence (i.e. the incidence for each calendar year **(Figure 4)**) through the mid to late 1990s which continued into the early 2000s. The annual herd incidence in 1995 was 4.07%, rising to 9.92% in 2002 then falling to 5.35% in 2007. Over the years 2007-2010, herd incidence remained relatively level and in 2010 the annual incidence was 5.12%, its lowest level since 1998. A sharp rise occurred in 2011 and this continued until 2012 when the annual herd incidence reached 7.34%. In 2013/14 the herd incidence fell, but rose again in 2015/16. The annual animal incidence followed the same trend as herd incidence except in 2014. In 2017 the end of year annual TB herd incidence was 9.61% and the end of year annual TB animal incidence was 0.91%.

Figure 4: bTB herd and animal incidence from 1995 to 2017

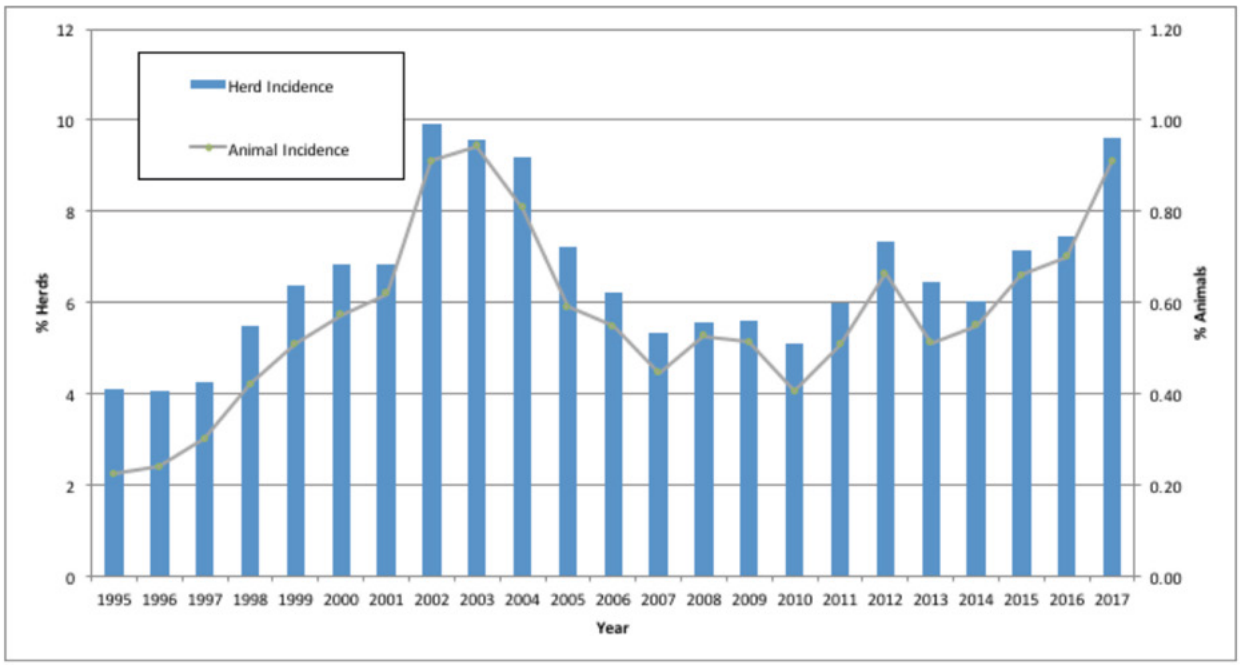
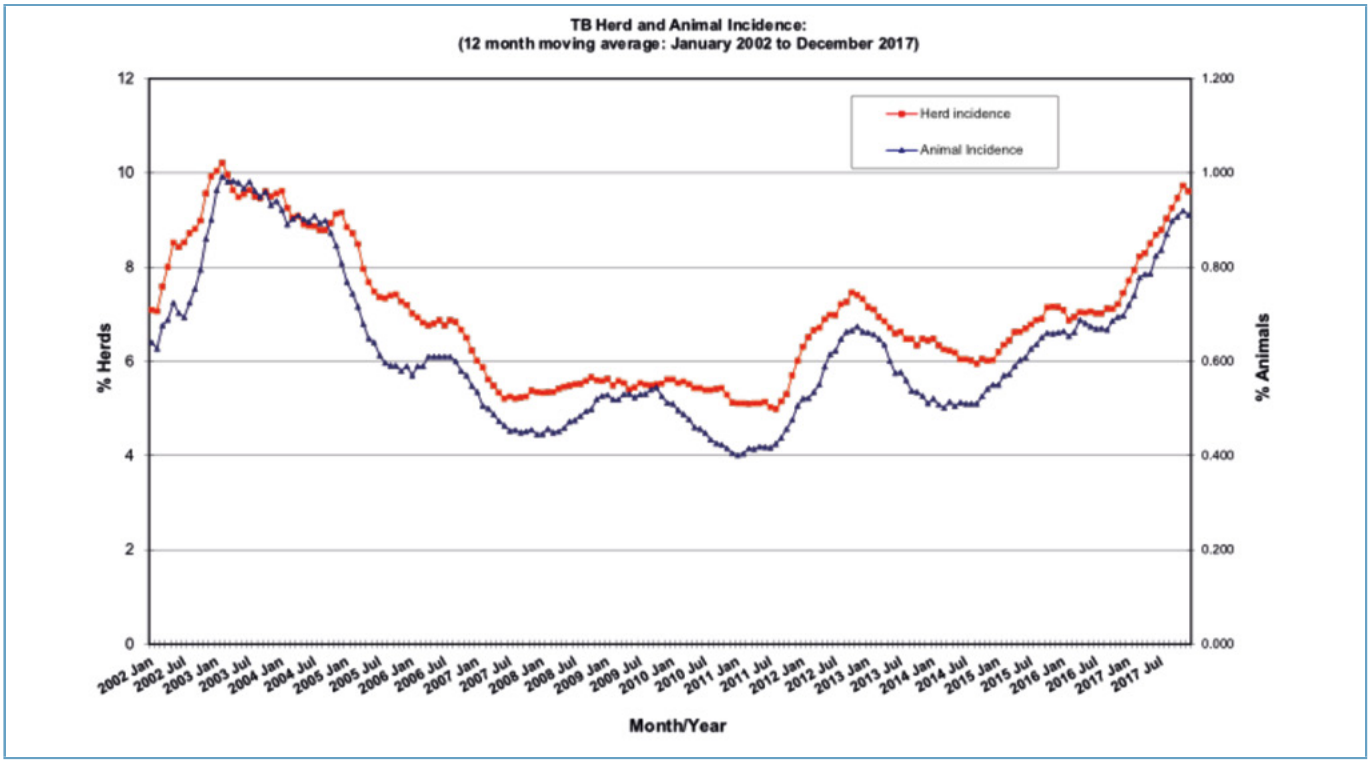


Figure 5 provides further detail of the monthly rises and falls in incidence levels since 2002. A peak in herd incidence of 10.21% occurred in February 2003. In August 2011, the 12 month bTB herd incidence was 4.99%. It then increased, reaching a peak of 7.46% in October 2012.

The downward trend that followed that peak started to level out at the end of 2014 followed by a steady rise in herd incidence which stabilised towards the end of 2015. Animal incidence also followed this pattern although its rise started earlier. In 2017 both herd and animal incidence increased steadily to 9.61% and 0.91% respectively by December 2017.

Figure 5: 12 Month Moving Average bTB Herd and Animal Incidence from January 2002 to December 2017



2017 Herd Incidence

9.2 As mentioned previously, the herd incidence for 2017 was 9.61% and an increase was observed in all DVO areas. Ballymena, Newry and Mallusk DVO areas showed the most significant increases in herd incidence levels (**Figures 6 and 7**).

Figure 6: Annual bTB Herd Incidence by DVO Area (Northern Region) 2017

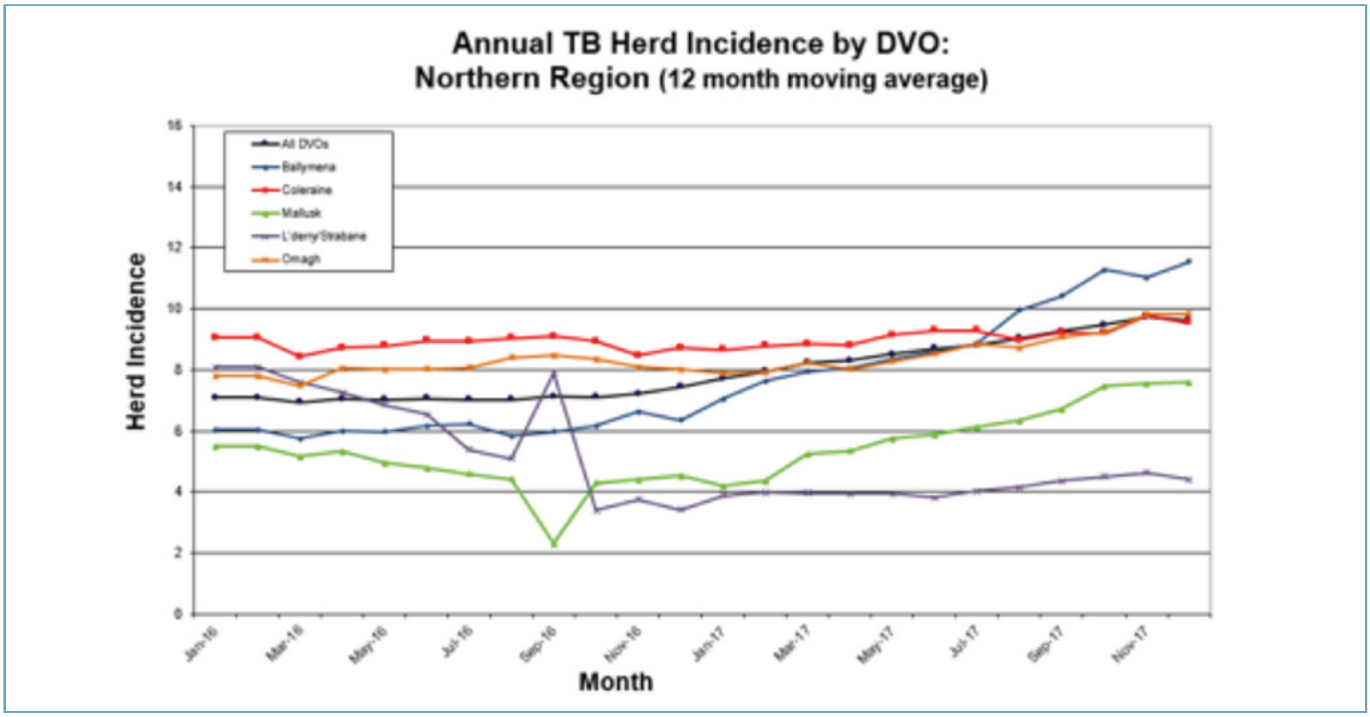
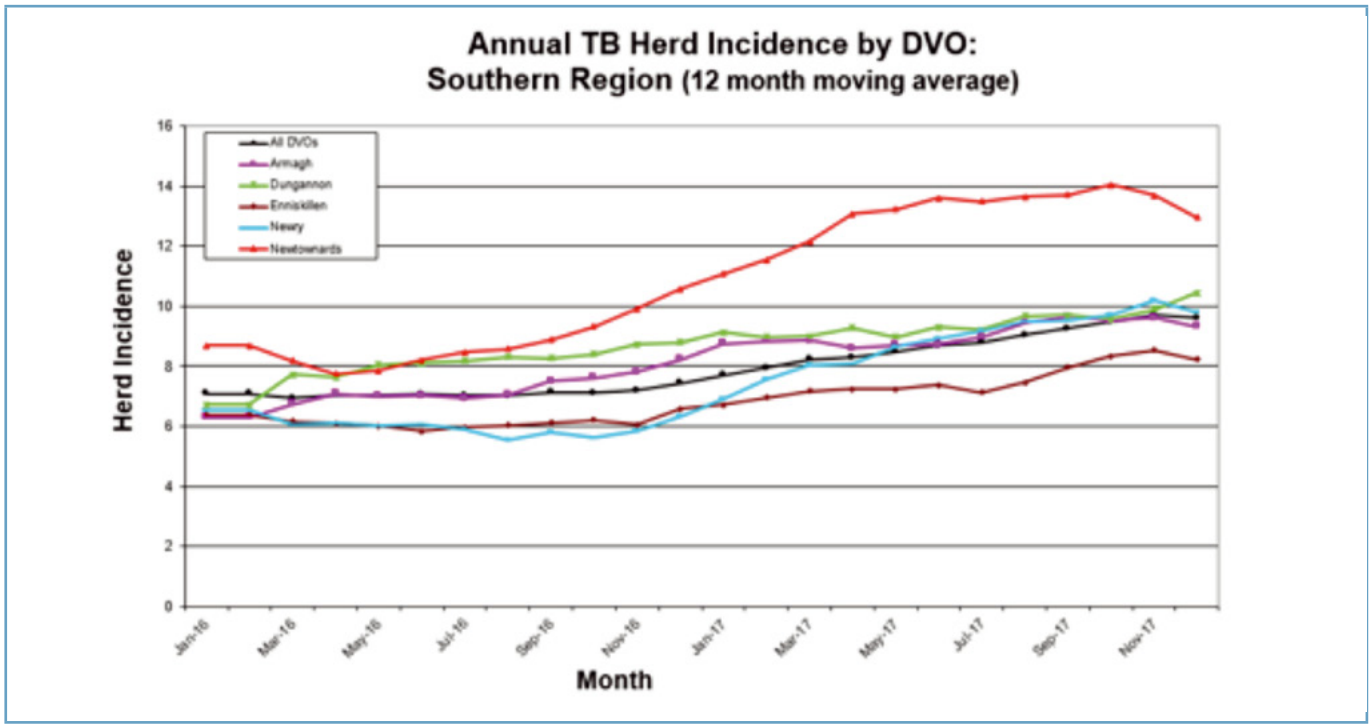


Figure 7: Annual bTB Herd Incidence by DVO Area (Southern Region) 2017



Animal Incidence

9.3 The annual animal incidence increased to 0.91% in December 2017. An increase was observed in 8 DVO areas relative to 2016. A reduction was observed in Omagh DVO area. No change was observed in Londonderry/Strabane DVO area.

9.4 Enniskillen and Newry had the highest annual animal incidence (1.45% and 1.32% respectively) in December 2017, while Londonderry/Strabane had the lowest animal incidence (0.24%) (**Figures 8 and 9**).

Figure 8: Annual bTB Animal Incidence by DVO Area (Northern Region) 2016 and 2017

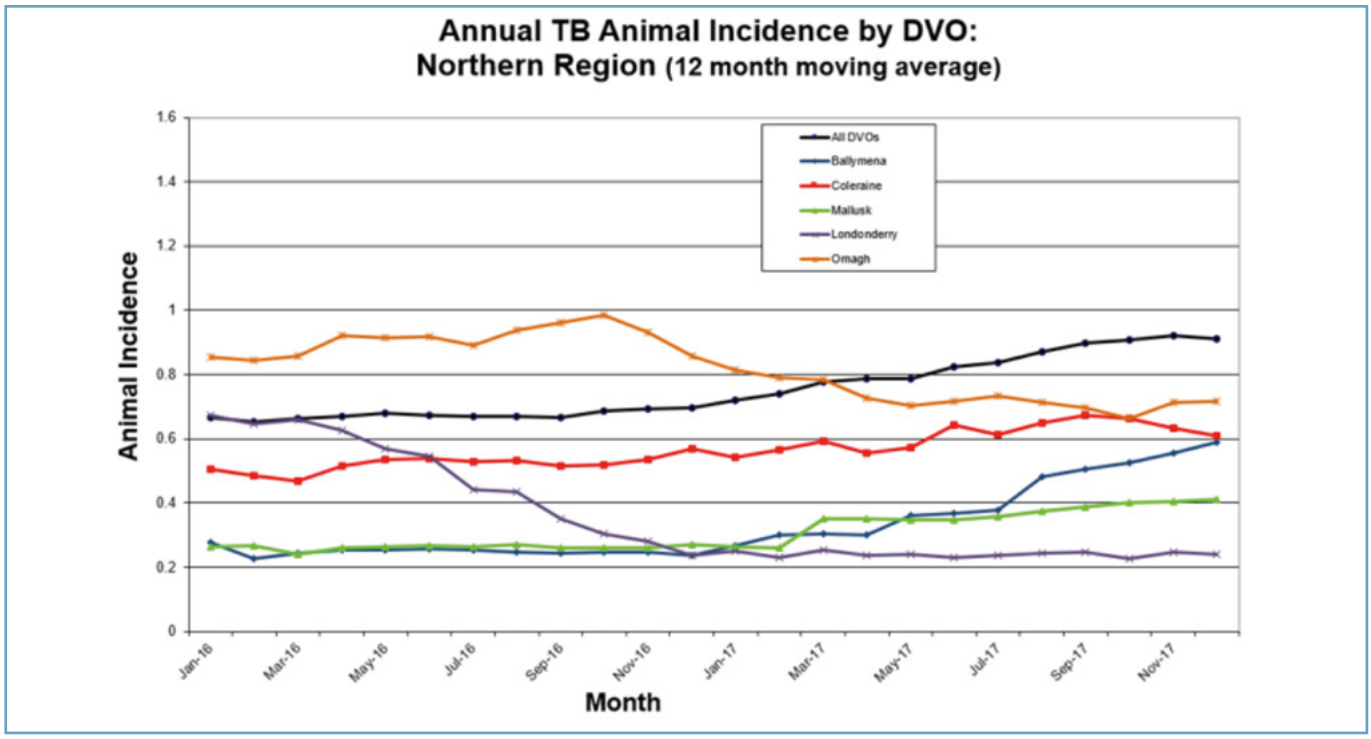
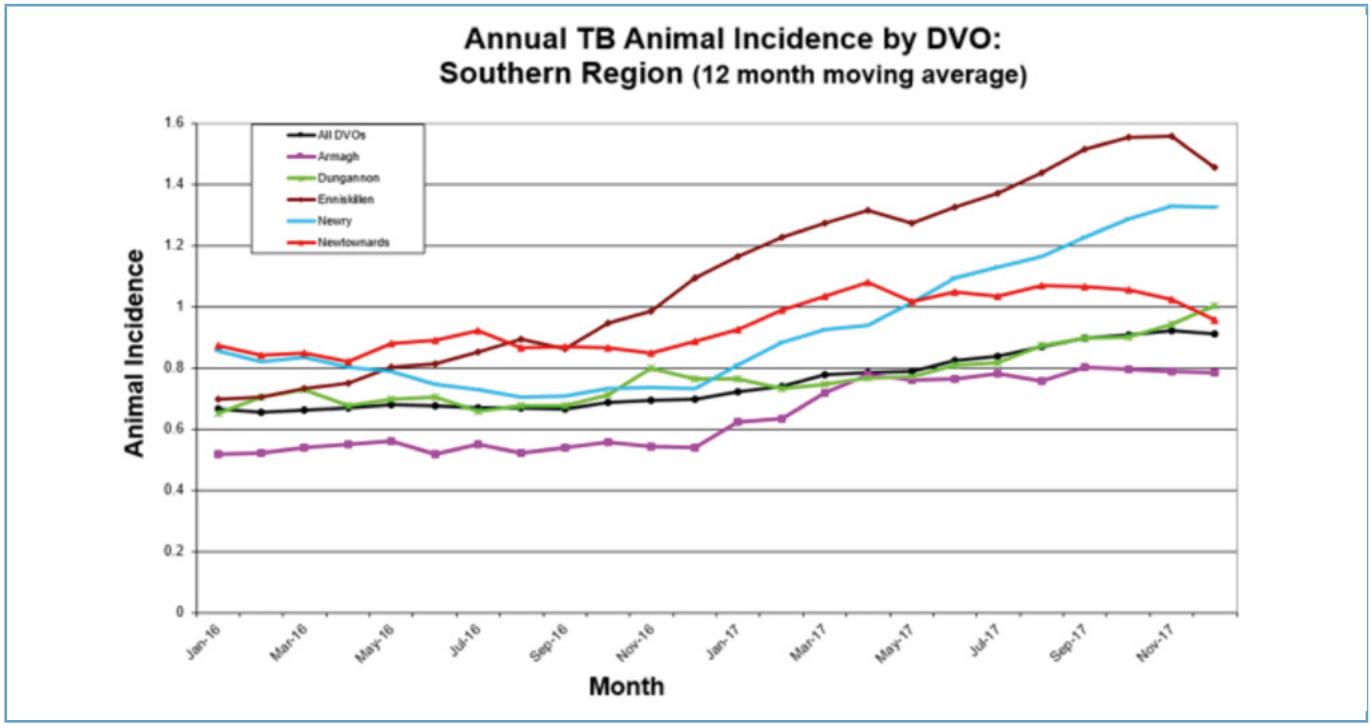


Figure 9: Annual bTB Animal Incidence by DVO Area (Southern Region) 2016 and 2017



10. Surveillance Outputs

> "... 446,388 cattle were slaughtered in NI meat plants during 2017 of which 1,749 had bTB suspected at routine slaughter ..."

Post Mortem Examination (PME)

10.1 446,388 cattle were slaughtered in NI meat plants during 2017 (including animals imported directly for slaughter) of which 1,749 (0.39%) 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 2016 and 2017, 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 2017, a further 25 LRS were identified in cattle exported from NI to Great Britain or the Republic of Ireland (ROI) directly to slaughter (19 during 2016).

Table 2: Numbers of Cattle Slaughtered and Numbers of LRS (Confirmed and unconfirmed) for 2016 and 2017

Year	Animals slaughtered	LRS (Number per 1000 animals slaughtered)	Animals slaughtered excluding direct imports	LRS excluding direct imports (Number per 1000 animals slaughtered)
2016	424,898	1,676 (3.94)	411,469	1,635 (3.97)
2017	446,388	1,749 (3.92)	428,398	1,703 (3.98)

Skin Test - Herd Level Tests

10.2 22,978 herds presented cattle at a bTB herd test in 2017. A total of 36,627 herd tests were carried out in 2017 compared with 34,350 in 2016 (**Table 3**), an increase of 6.63%. 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 2016 and 2017 (By Test Category)

Herd Test Reason	Herd tests completed in 2016	Herd tests completed in 2017	% Change
Restricted	6,843	8,246	+20.5%
Risk	12,092	14,735	+21.9%
Routine	15,415	13,646	-11.5%
Total herd tests	34,350	36,627	+6.6%

10.3 The distribution of tests varies in each DVO area and is a function of the number of herds, the disease levels and the predominant disease risk factors in each area (see **Table 4** and **Figures 10 and 11** below). Newry, Enniskillen and Omagh are the DVO areas with the highest number of herds that are eligible for testing, each with over 3,000 herds. Londonderry/Strabane, Mallusk and Ballymena DVO areas have the lowest numbers.

Table 4: bTB Herd Tests completed in 2017 (per test category by DVO area)

DVO	Routine Tests	Restricted Tests	Risk Tests	Total Tests
Armagh	1,300	920	1,484	3,704
Ballymena	864	466	885	2,215
Coleraine	1,426	929	1,807	4,162
Dungannon	1,726	1,108	1,643	4,477
Enniskillen	1,749	773	2,086	4,608
Mallusk	1,192	410	615	2,217
L'Derry/Strabane	691	168	275	1,134
Newry	2,115	1,454	2,476	6,045
Newtownards	961	1,077	1,414	3,452
Omagh	1,622	941	2,050	4,613
Total	13,646	8,246	14,735	36,627

Figure 10: % of the NI Total bTB Herd Tests Completed by DVO Area in 2016 and 2017

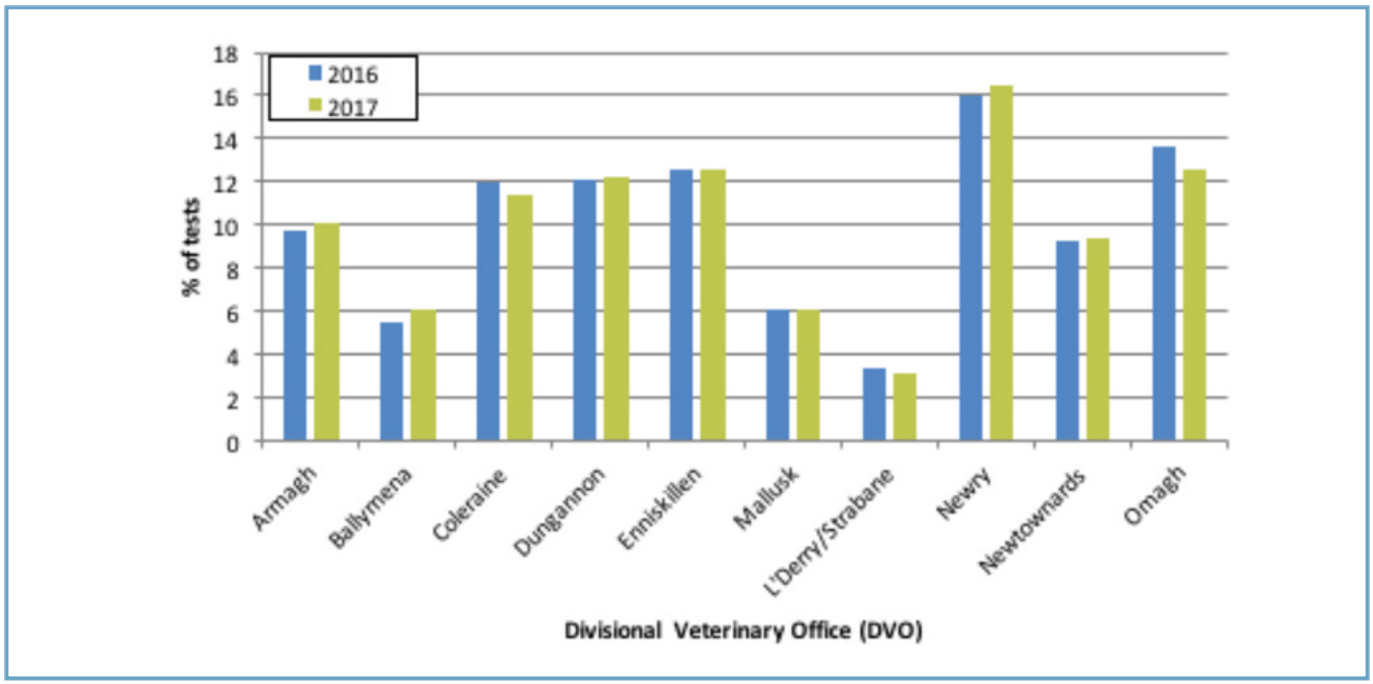
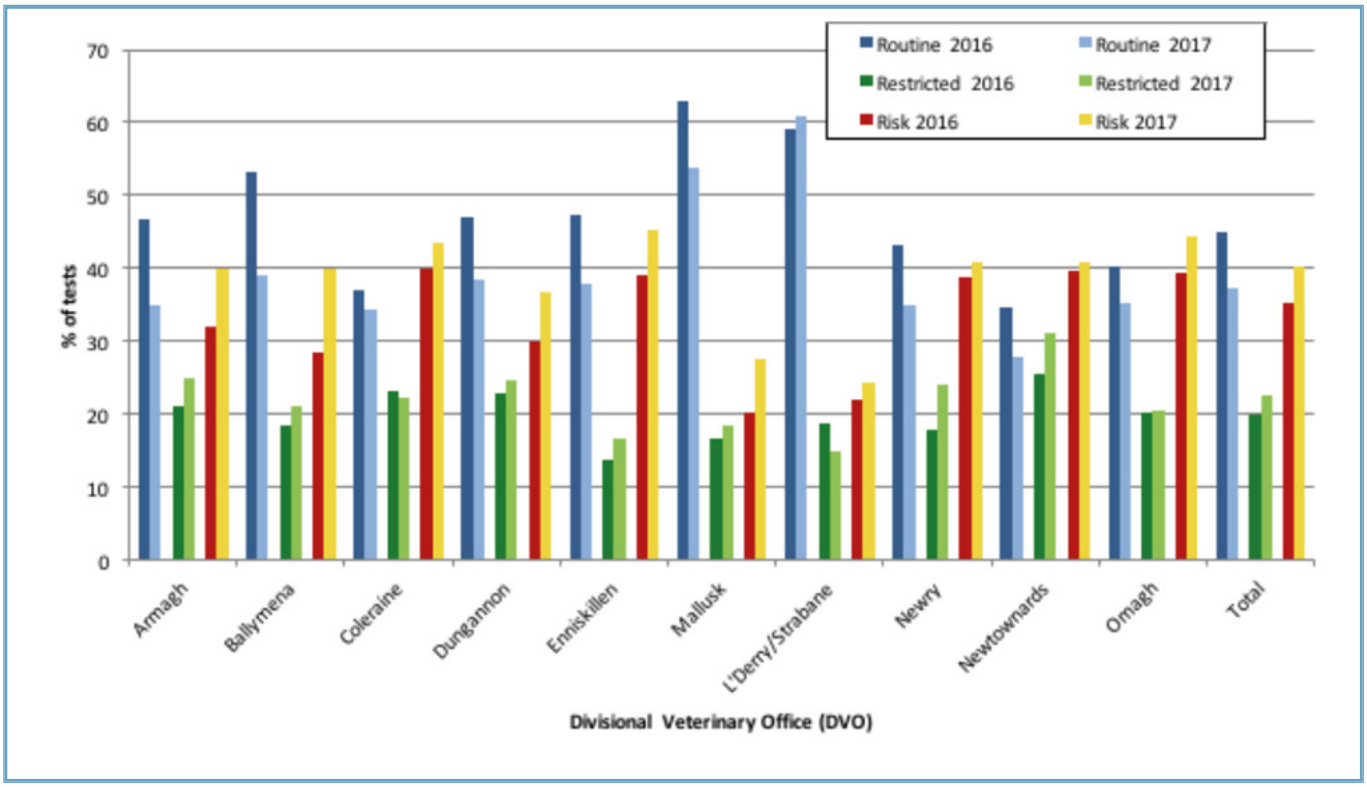


Figure 11: % of bTB Herd Test Categories within each DVO Area and in Northern Ireland in 2016 and 2017



10.4 There was an overall increase in the volume of restricted and risk herd tests both numerically and proportionally, as one would expect as a consequence of the increase in herd incidence. For a detailed comparison of the number and percentage of each test category by DVO area (see **Tables A** and **C** in **Annex**). The number of herd level trace tests due to a recent skin test reactor or routine slaughter case from an OTW breakdown having previously passed through the herd increased by 14.5% during 2017, relative to 2016. The number of herd level trace tests following the death, slaughter or export of an animal subsequently traced from an OTW breakdown increased by 32% during 2017, relative to 2016. The number of herd level tests due to higher risk posed by proximity to a diseased herd increased by 29.4% during 2017, relative to 2016. The number of 6 month post derestriction tests reduced by 6.2% during 2017, relative to 2016, probably due to these being superseded in certain herds by higher priority trace or local risk testing.

Skin Test - Individual Animal Level Risk Tests

10.5 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 5**). 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.

10,794 individual risk animal tests (CTTs, CTS, CTQs and RIs) were completed in 2017, compared with 9,187 in 2016 (an increase of 17.5%).

Table 5: Individual Animal Level Risk bTB Tests completed in 2016 and 2017

Test reason*	Tests completed during 2016 (cattle >0)	Tests completed during 2017 (cattle >0)	% Change
Inconclusive retest (RI)	1,573	1,769	+12.5%
Check Test Trace (CTT)	6,250	7,488	+19.8%
Check Test Query (CTQ)	1,024	1,127	+10.1%
Check Test Status (CTS)	340	410	+20.6%
Total	9,187	10,794	+17.5%

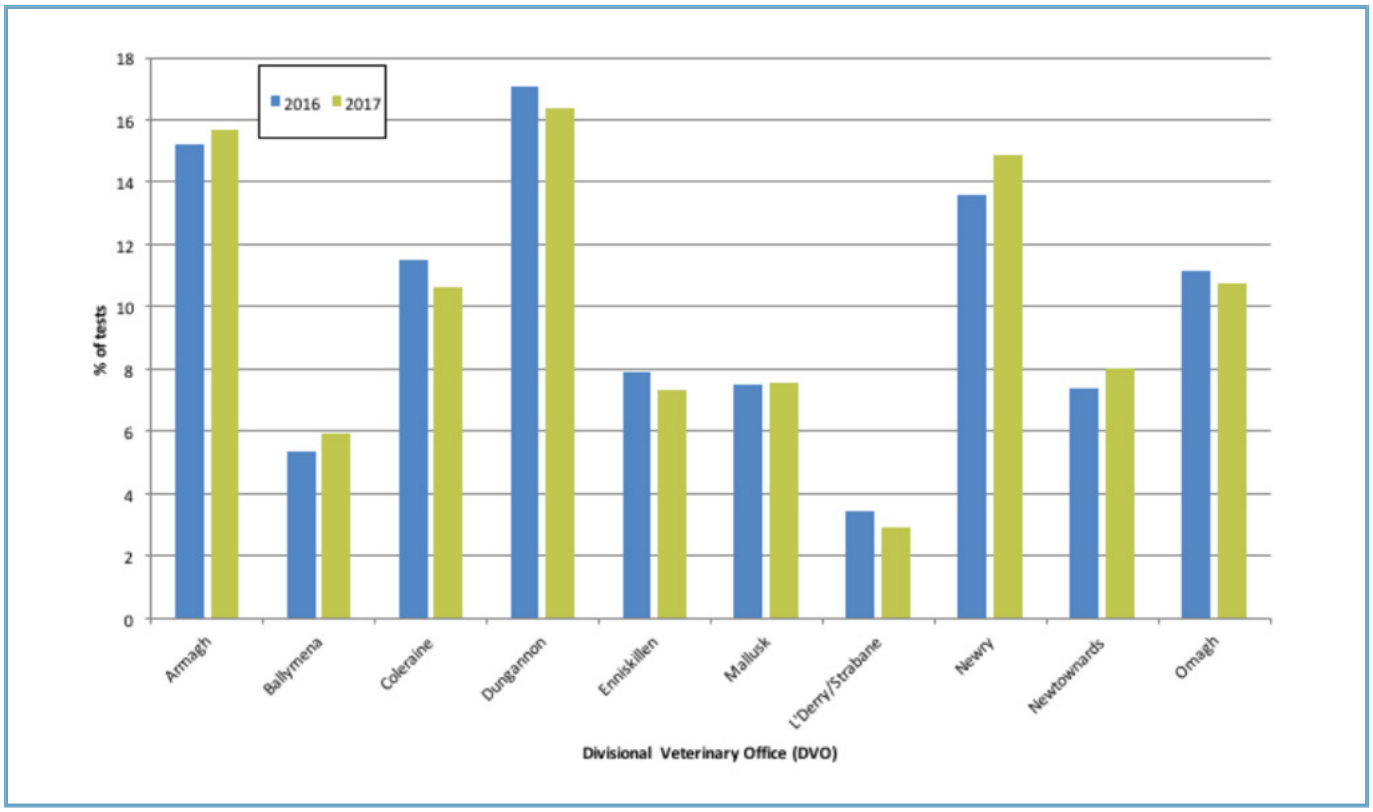
*Description of the test reasons can be found in the glossary.

10.6 The number of individual animal level risk tests in each DVO area (see **Table 6** and **Figure 12** and **Table B** in **ANNEX**) varies widely and is dependent on the number of herds and animals, the level of disease, the areas from which farmers purchase their stock and other disease risk factors. Dungannon was the DVO area with the highest proportion of individual animal level risk tests. Most check tests of animal(s) forward traced from a breakdown herd (CTTs and CTQs) were also carried out in this DVO area which may be an indication of the pattern of movement of animals to this area from higher incidence areas.

Table 6: Individual Animal Level Risk Tests completed in each DVO area in 2017

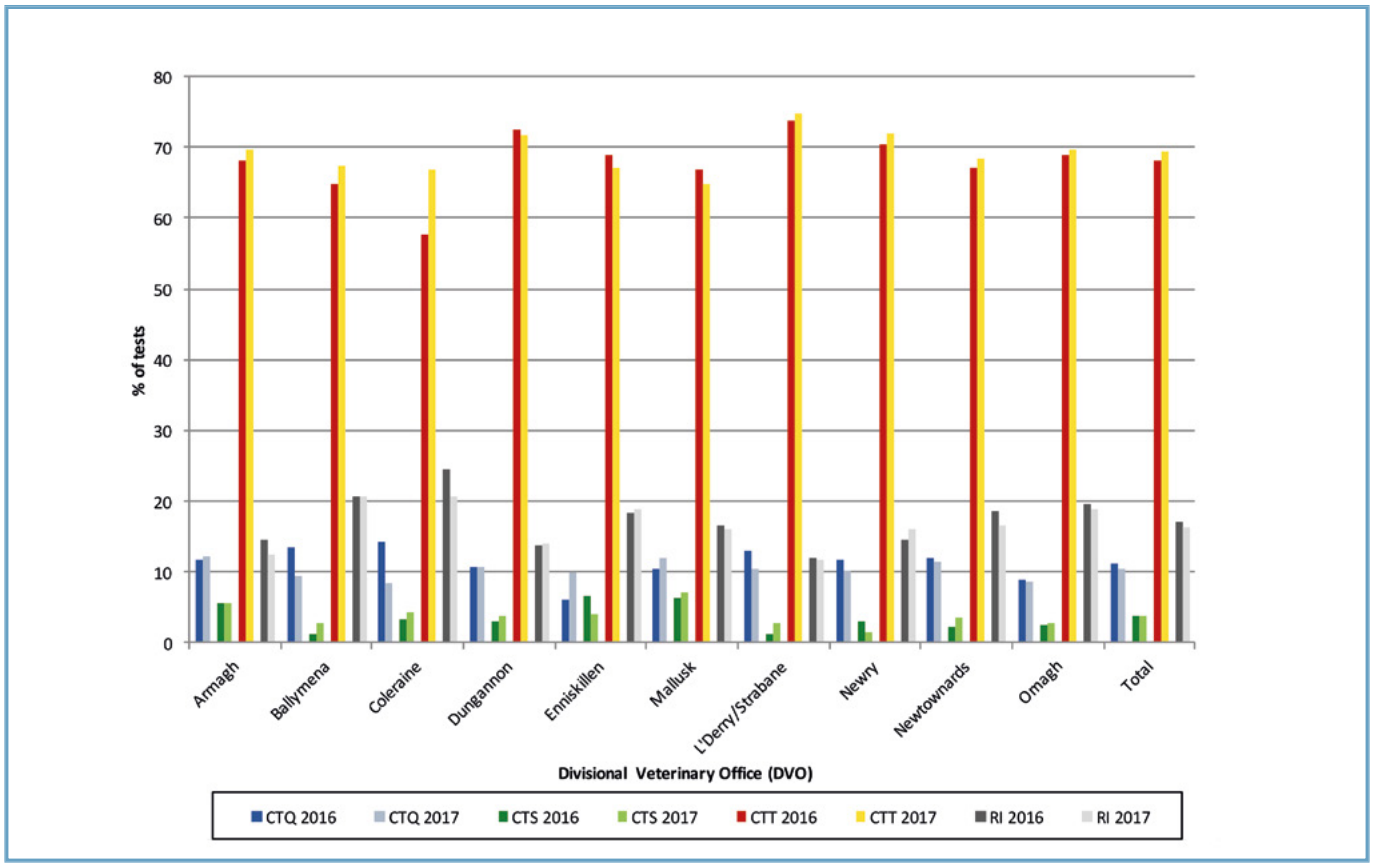
DVO	CTQ	CTS	CTT	RI	Total
Armagh	208	93	1,176	213	1,690
Ballymena	60	17	430	132	639
Coleraine	95	48	765	237	1,145
Dungannon	188	65	1,265	248	1,766
Enniskillen	79	32	530	149	790
Mallusk	97	58	530	132	817
L'Derry/Strabane	33	9	235	37	314
Newry	165	26	1,153	258	1,602
Newtownards	100	31	595	143	869
Omagh	102	31	809	220	1,162
Total	1,127	410	7,488	1,769	10,794

Figure 12: % of NI Individual Animal Level Risk bTB Tests* Completed in 2016 and 2017 (by DVO area)



** CTT, CTQ, RI1, CTS*

Figure 13: % contribution by test reason of Individual Animal Level Risk bTB Tests within each DVO area in 2016 and 2017



Skin Test - Animals Tested

10.7 The total number of animal tests (at herd and individual animal level) during 2017 was 3,142,995, which represents an 11.6% increase compared with 2016. The number of animals tested at herd tests in 2017 was 1,742,312, a 2.5% increase on the previous year (**Table 7**). 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 7** and **8**) 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 7 and 8 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 10.5**).

Table 7: Total Animals Tested for bTB and Total Animal Tests in Herd Tests in 2016 and 2017

Test Category	2016	2017	% Change
Total animal tests	2,783,283	3,110,198	+11.7%
Total animals tested	1,699,401	1,742,312	+2.5%
Total animals with a restricted herd test	563,476	666,772	+18.3%
Total animals with a risk herd test	765,139	904,086	+18.2%
Total animals with a routine herd test	741,101	625,244	-15.6%

Table 8: Animals bTB Tested in Individual Animal Level Risk Tests in 2016 and 2017

Test Reason	2016	2017	% Change
Check Test Trace (CTT)	11,868	13,793	+16.2%
Check Test Status (CTS)	913	885	-3.1%
Check Test Query (CTQ)	1,789	1,959	+9.5%
Inconclusive retest (RI)	2,690	3,097	+15.1%

Interferon Gamma Blood Testing

10.8 Since July 2004, IFNG has been used alongside the skin test in bTB breakdowns where certain criteria for selection are met for the purpose of identifying, and thereby providing the opportunity to remove, infected animals 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.

> "... IFNG has been used alongside the skin test in bTB breakdowns to remove infected animals that have not been identified by the skin test ..."

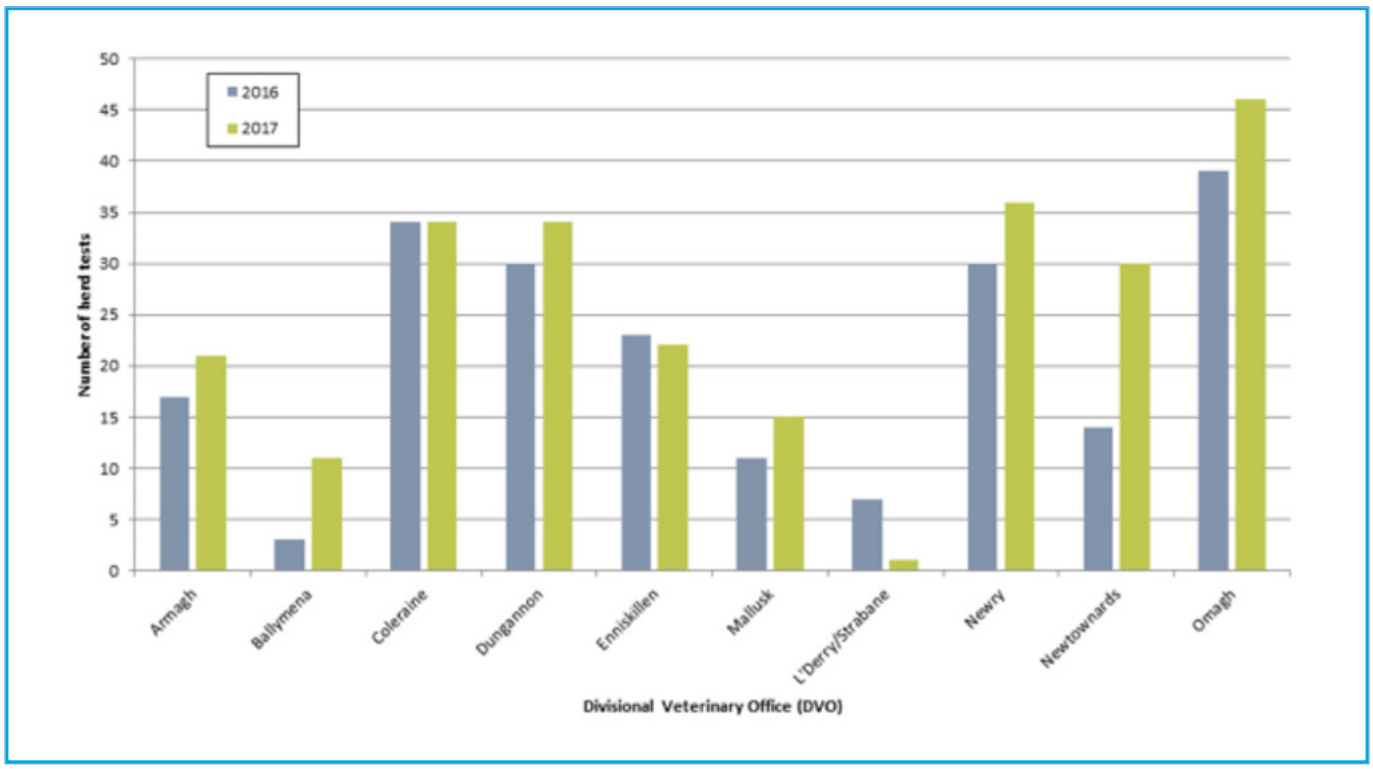
10.9 The number of IFNG samples taken during the year is dependent on disease levels, the number and the size of eligible herds, and resource availability. In 2017/18 IFNG capacity was increased from 18,000 samples to 23,000 samples, enabling more herds and more animals to be tested using IFNG in 2017 compared to 2016 (**Table 9**).

Table 9: IFNG Tests and Animals Tested in 2016 and 2017

	2016	2017	% Change
N° of Herds IFNG Tested	185	234	+26.5%
N° of IFNG Herd Tests	208	250	+20.2%
N° of animals IFNG tested	17,611	22,256	+26.4%

10.10 The number of herds tested using IFNG by DVO area, is shown in **Figure 14**. IFNG is a complex and expensive test, and the high cost and strict sampling conditions limit the number of animals that can be tested.

Figure 14: IFNG Herd Tests 2016 and 2017 (by DVO area)



11. Surveillance Outcomes

> "... a combination of improved post mortem surveillance in recent years and a real increase in disease burden ..."

Post Mortem Examination (PME)

11.1 In 2017, 1,703 animals were found with TB-like lesions at routine slaughter (this figure does not include animals directly imported for slaughter), (an increase of 4.2%). Of these, 1,074 (63.1%) were confirmed as TB positive by histology and/or bacteriology (**Table 10**), an increase of 6.7% on the number confirmed in 2016. The number of confirmed LRS animals per 1000 animals slaughtered (excluding direct slaughter imports) increased by 2.4%.

In 2017, 656 herds were restricted as a result of finding TB-like lesions at routine slaughter, compared to 703 herds in 2016. (This includes cases where laboratory testing provided an alternative diagnosis e.g. actinobacillosis).

In 2017, 409 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 421 TB breakdowns in 2016.

During 2017, in 287 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 297 herds that were similarly affected in 2016.

The increased disease detection at animal level is considered to be due to a combination of improved post mortem surveillance in recent years and a real increase in disease burden.

Table 10: LRS Animals and Confirmed LRS* Animals in 2016 and 2017

Year	LRS	Confirmed LRS	LRS excluding direct imports	Confirmed LRS excluding direct imports (%)	bTB confirmed LRS per 1000 animals slaughtered excluding direct imports
2016	1,676	1,025 (61.2)	1,635	1,007 (61.6)	2.45
2017	1,749	1,098 (62.8)	1,703	1,074 (63.1)	2.51
% change	+4.4%	+7.1%	+4.2%	+6.7%	+2.4%

*Histology and/or bacteriology positive.

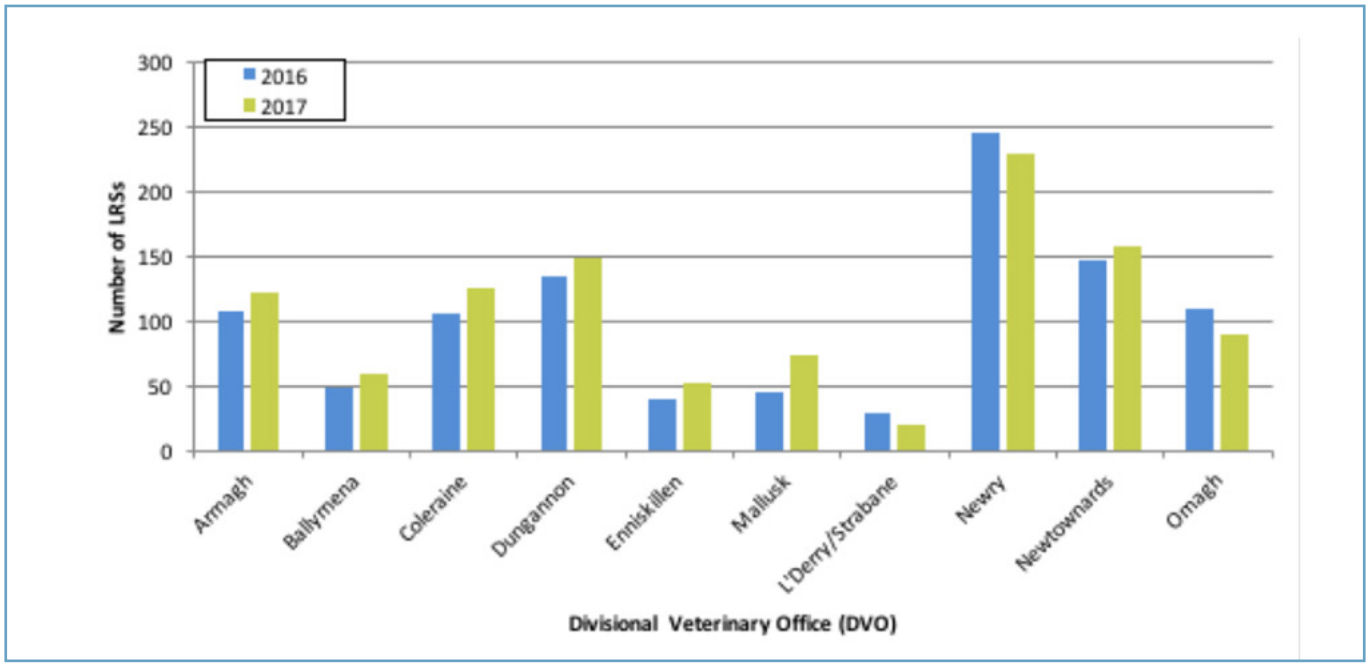
11.2 The distribution of confirmed LRS animals across the DVO areas is shown in **Figure 15**. The DVO area attributed to each LRS is the one where the herd that presented the animal for slaughter is located. Although Enniskillen was the DVO

area with the highest bTB animal incidence during 2017 (1.45 %), Newry DVO had the highest number of confirmed LRS (229 in 2017). This difference could be explained by type of farming practice, and animal density in those DVO areas. The animals may have been infected in previous herds located in different DVO areas. This explains the lack of association in some DVO areas between animal incidence (**Figure 8** and **Figure 9**) and location of the presenting herd of the LRS (**Figure 15**).

A VEU study on LRS during 2011-2013 in NI showed that the likelihood of an animal being an LRS was associated with;

- The herd incidence of the area (patch) from which the animal was moved to slaughter, when the patch incidence was greater than 9%;
- Whether the animal was purchased or homebred (purchased animals were more likely to be LRS);
- The age of the animal at slaughter (the likelihood of being LRS increased as the animal got older); and
- The time the presenting herd was free of bTB (relative to restricted herds). There were significantly more LRS found from herds that did not have bTB in the previous 2-3 years. However, there was no statistical difference between restricted herds and herds that were clear of bTB for less than two years or more than three years.

Figure 15: Confirmed LRS by DVO area of Origin in 2016 and 2017*



**The DVO area of origin is the DVO area of the herd that presented the LRS animal for slaughter.*

Skin Test

11.3 15,949 bTB skin test reactor animals were identified in 2017 compared to 11,924 during 2016 (an increase of 33.8%) (**Table 11**).

Table 11: Total bTB Reactors and Negative in Contacts (NICs) in 2016 and 2017

Year	Reactors	NICs	Total
2016	11,924	579	12,503
2017	15,949	891	16,840
% change	+33.8%	+53.9%	+34.7%

11.4 891 NICs were removed during 2017, compared with 579 during 2016 (an increase of 53.9%) (**Table 11** and **12**).

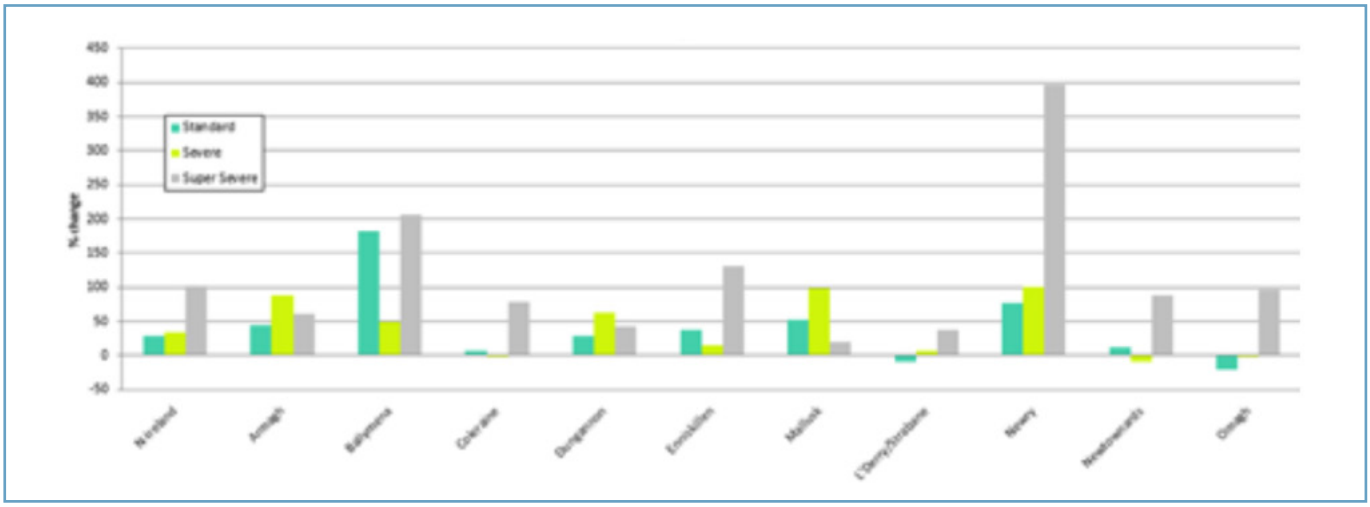
Table 12: Negative in Contacts (NICs) in 2016 and 2017 (by DVO area)

	2016		2017	
	NICs	Herds	NICs	Herds
Armagh	37	11	92	12
Ballymena	11	3	14	5
Coleraine	78	15	189	16
Dungannon	24	8	43	15
Enniskillen	105	24	83	18
Mallusk	8	2	50	12
L'Derry/Strabane	57	3	1	1
Newry	17	9	242	30
Newtownards	63	14	74	18
Omagh	179	36	103	32
Total	579	126	891	159

11.5 Of the reactors, 79% were removed under standard interpretation of skin test results. The rest were removed using more rigorous interpretations of the skin test readings, severe (13.1%) or super severe (7.9%) 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.

> "... test sensitivity is therefore increased and infected animals are removed sooner, thereby reducing the potential for spread and future risk ..."

Figure 16: % change in interpretation of TB reactors in 2017 compared to 2016 by DVO



Reactors Disclosed in Herd Tests

11.6 3,644 herd tests disclosed at least one skin test reactor (positive herd test) in 2017 compared to 2,720 during 2016 (an increase of 34%) (See **Table 13**). The highest percentage increase in the number of positive herd tests was observed in the risk herd test category with an increase of 39.8%.

Table 13: bTB Herd Tests with Reactors in 2016 and 2017

Herd Test Category	2016 Herds tests with reactor(s)	2017 Herds tests with reactor(s)	% Change
Restricted	1,390	1,882	+35.4%
Risk	885	1,237	+39.8%
Routine	445	525	+18.0%
Total	2,720	3,644	+34.0%

11.7 The DVO area that disclosed the highest proportion of all the positive herd tests in 2017 was Newry (**Figure 17**).

Figure 17: % Contribution by each DVO area of all Herd Tests with Reactor(s) in NI, in 2016 and 2017

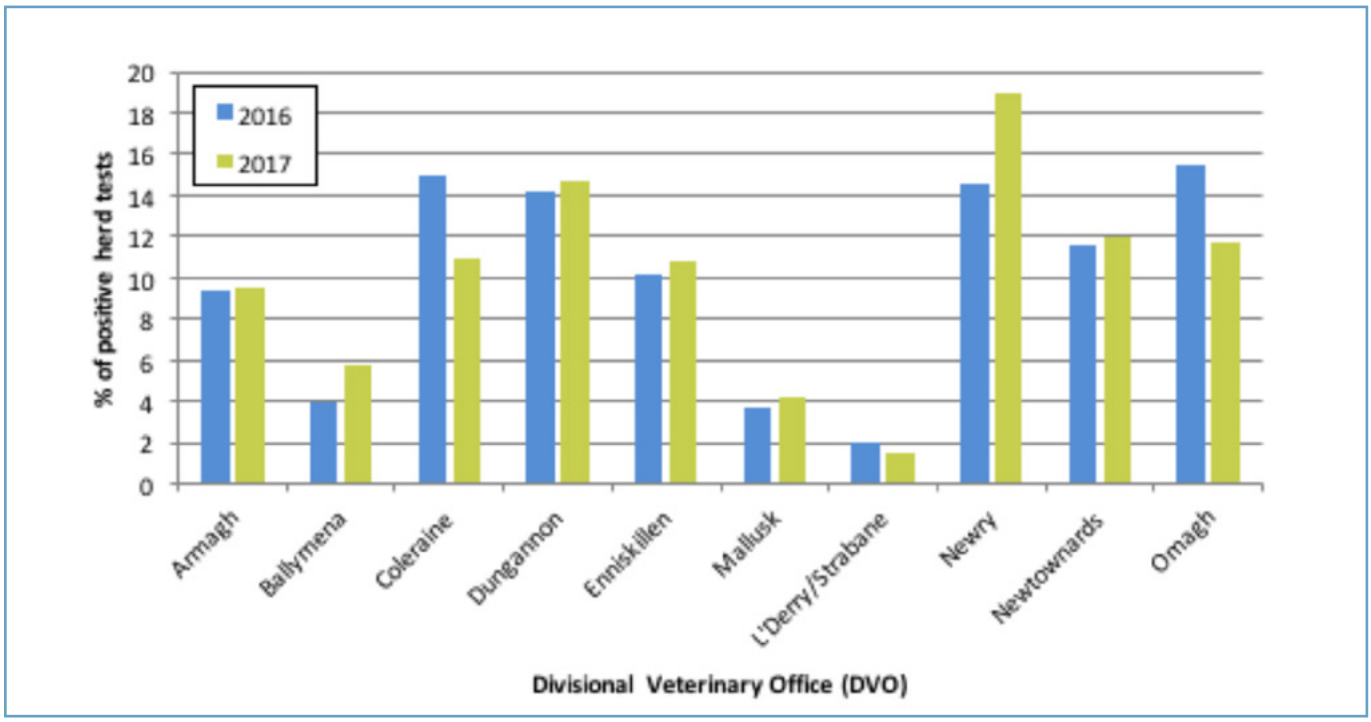


Figure 18 shows the percentage change in herd tests with reactors between 2016 and 2017 across the DVO areas with Ballymena showing the greatest increase. **Figures 19** and **20** show the moving average of the percentage of herds with reactors in the Northern and Southern Regions during 2016 and 2017.

Figure 18: % change of herd tests positive in 2017 compared to 2016 by DVO area

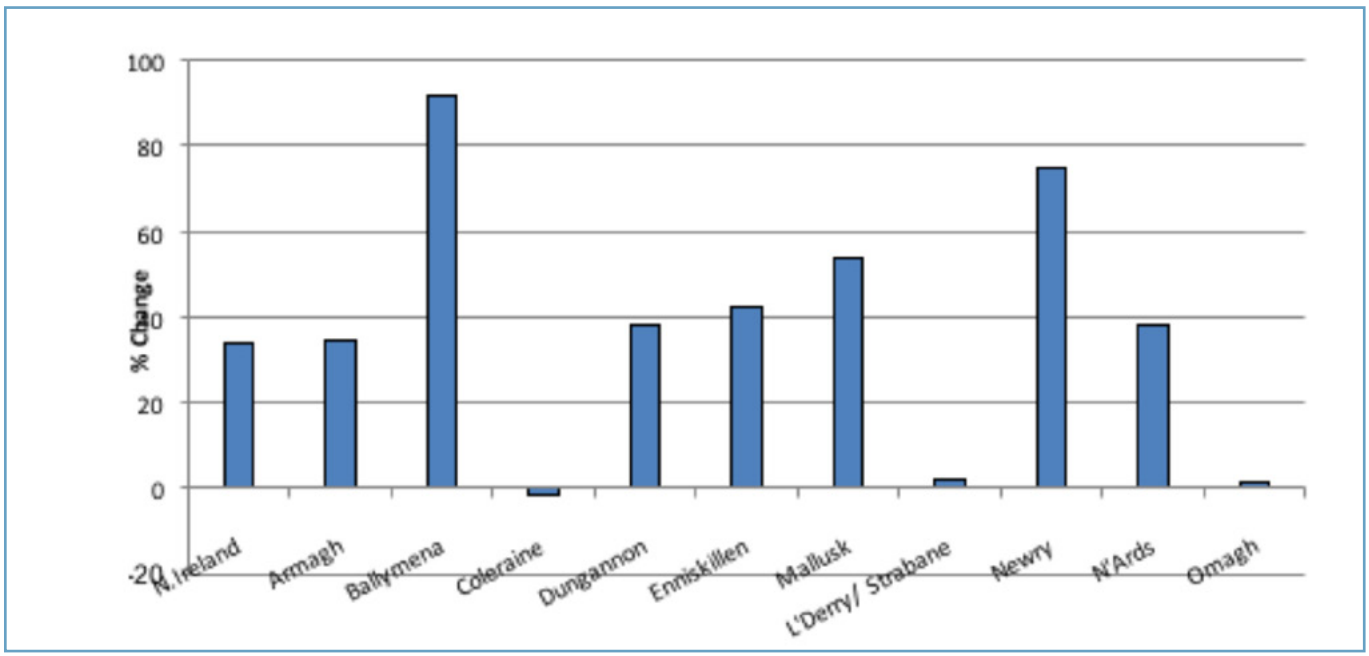


Figure 19: % positive herd tests by DVO (2016-2017): Northern Region (6 month moving average)

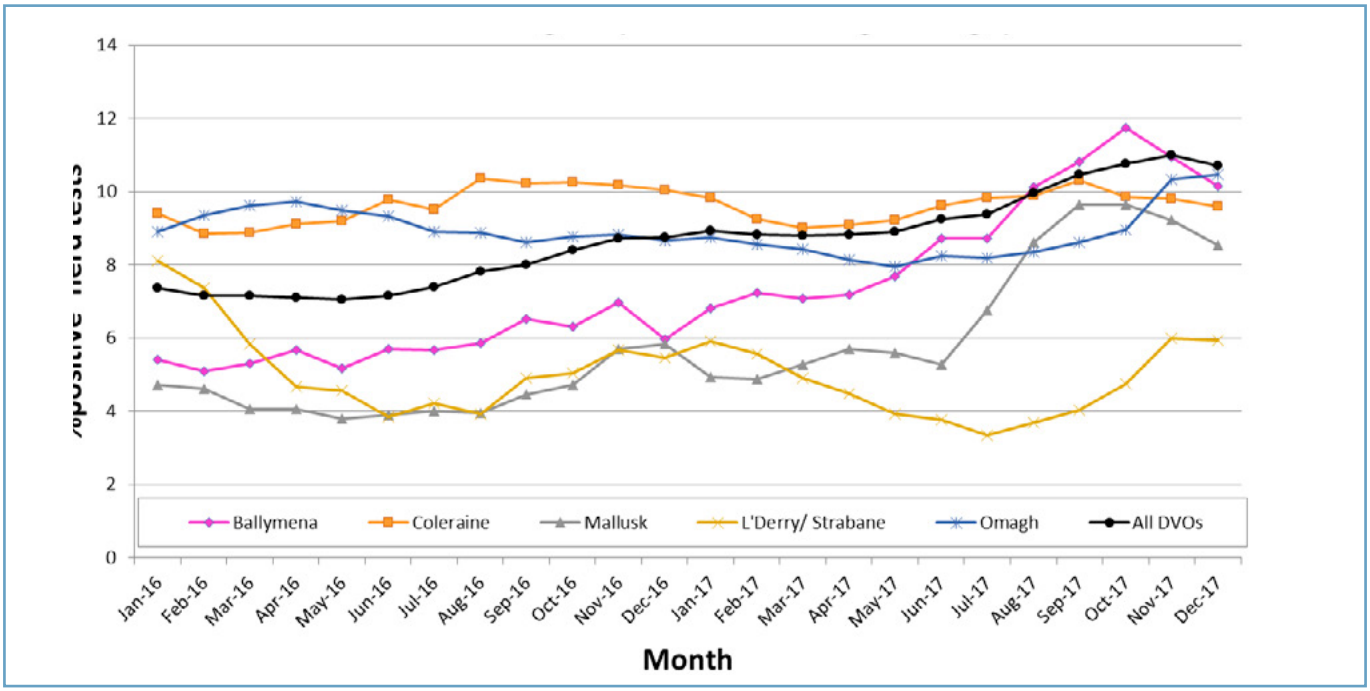
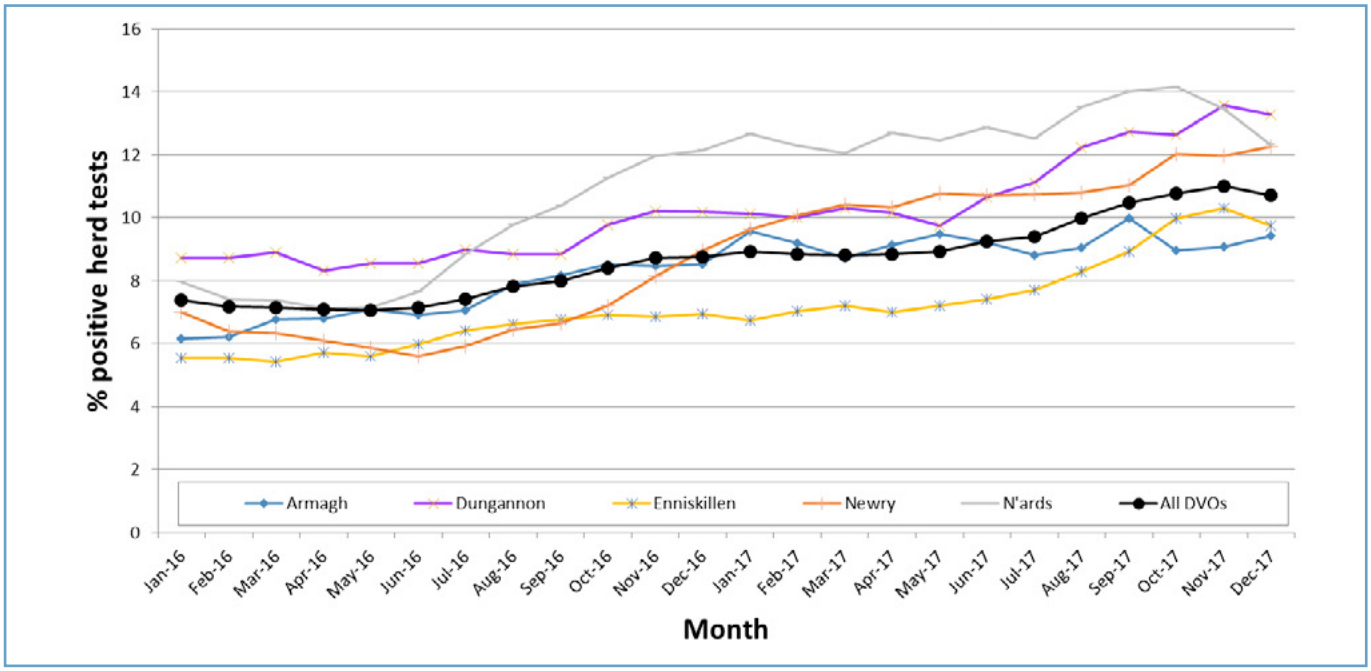
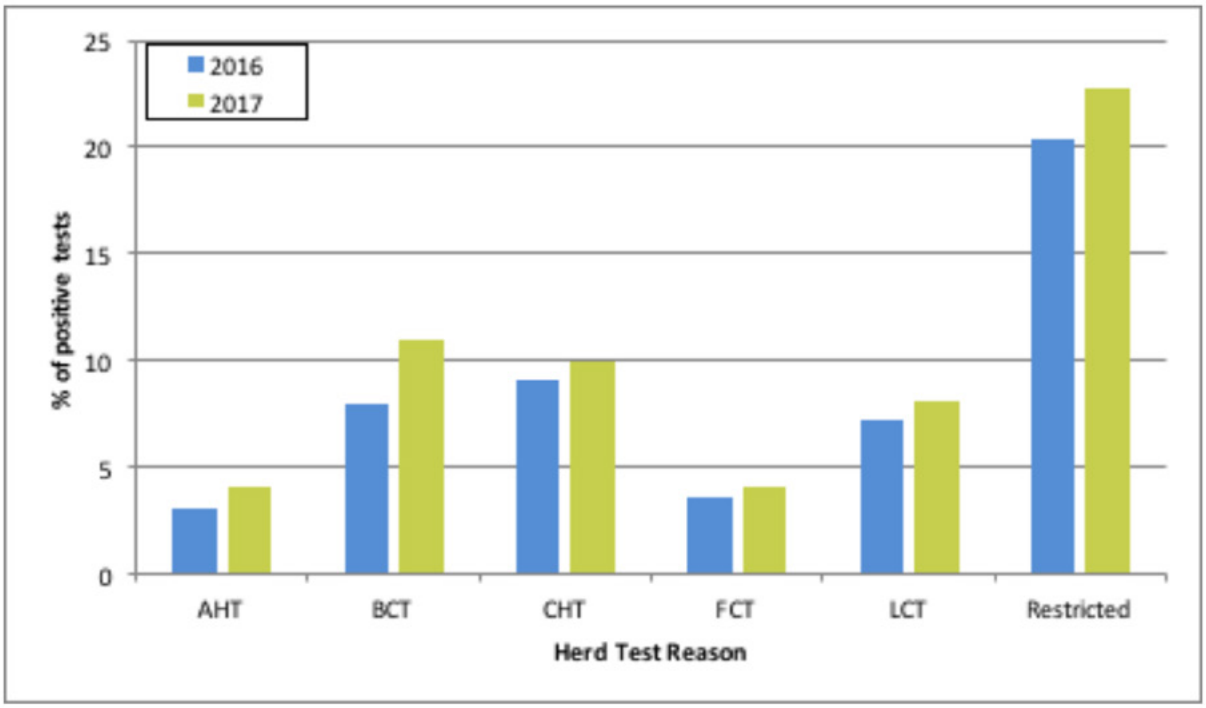


Figure 20: % positive herd tests by DVO (2016-2017): Southern Region (6 month moving average)



11.8 **Figure 21** shows the percentages of herd tests that disclosed reactor animal(s) for each test reason (see glossary for definitions). The percentage of positive herd tests increased for all herd test reasons during 2017 relative to 2016. Compared with the rate detected in Annual Herd Tests (AHT), the lowest risk category of test, the other test reasons, except FCT, had a higher % of tests with reactors which supports the assessment that the herds were at a higher disease risk.

Figure 21: % of bTB Herd Tests with reactors by Test Reason for 2016 and 2017



Reactors Disclosed at Individual Animal Level Risk bTB Tests

11.9 In 2017, there was an increase of 12.5% (**Tables 14** and **15**) in the number of individual animal tests in which a reactor was disclosed (622 in 2017 compared to 553 in 2016).

Table 14: 12 month comparison of the number of individual tests positive in 2016 and 2017

Number Individual test positive	N. Ireland
2017	622
2016	553
% change	12.5%

Table 15: Individual Animal Risk bTB Tests with Reactors 2016 and 2017 (by Test Reason)

Test Reason	2016	2017	% Change
Check Test Query (CTQ)	5	9	+80.0%
Check Test Status (CTS)	6	10	+66.7%
Check Test Trace (CTT)	124	176	+41.9%
Inconclusive retest (RI)	418	427	+2.2%
Total	553	622	+12.5%

11.10 The proportion of Individual Animal risk bTB tests that were positive reduced from 6.02% (of 9,187) in 2016 to 5.76% (of 10,794) in 2017 (**Table 15, figures 22, 23** and **24**).

Figure 22: % positive individual tests by DVO area 2016-2017 Northern Region (6 month moving average)

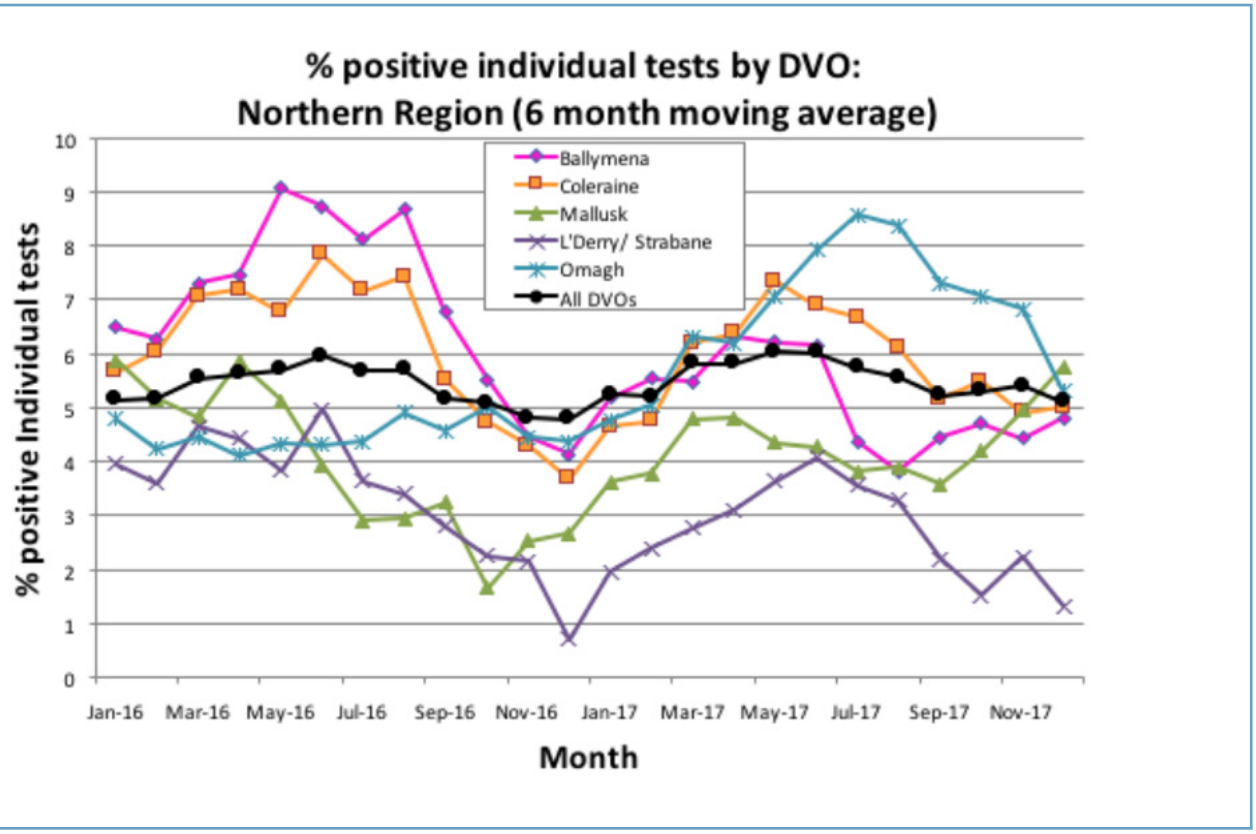


Figure 23: % positive individual tests by DVO area 2016-2017 Southern Region

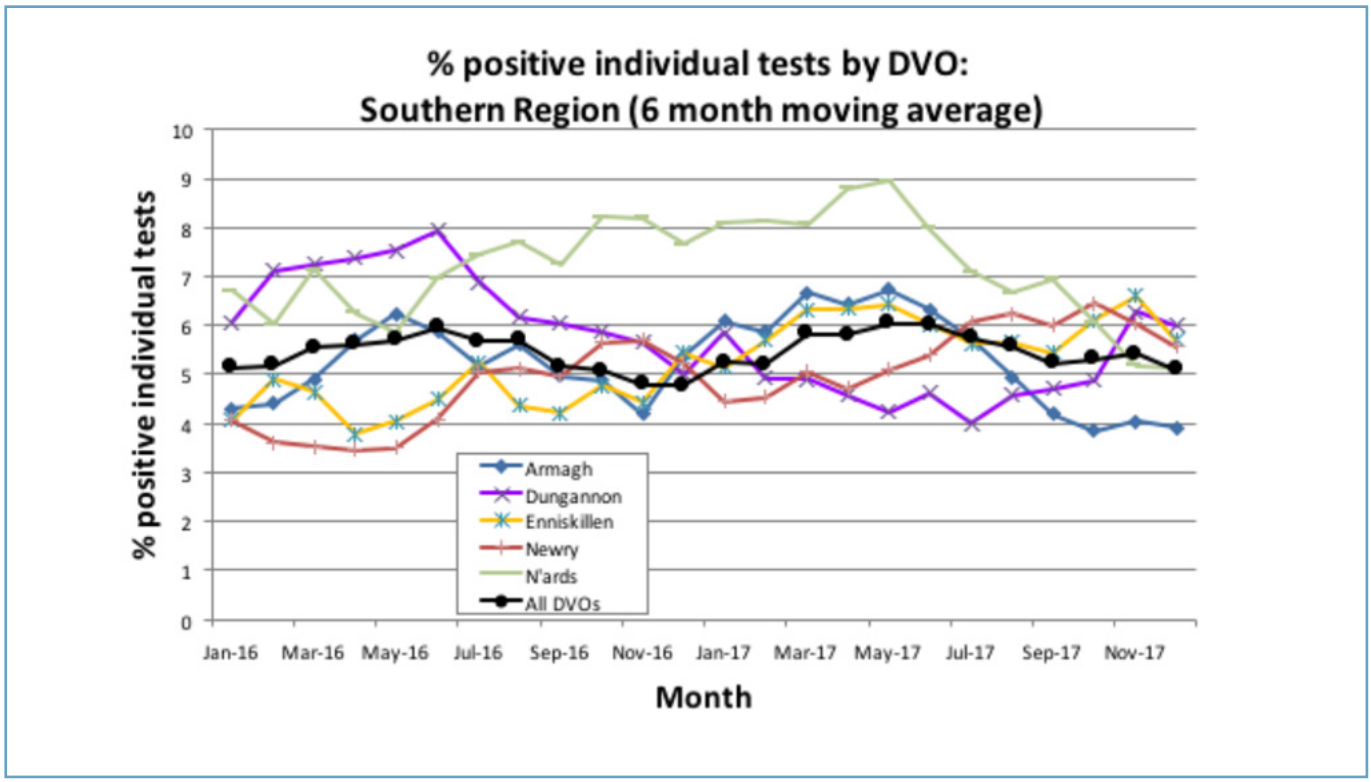
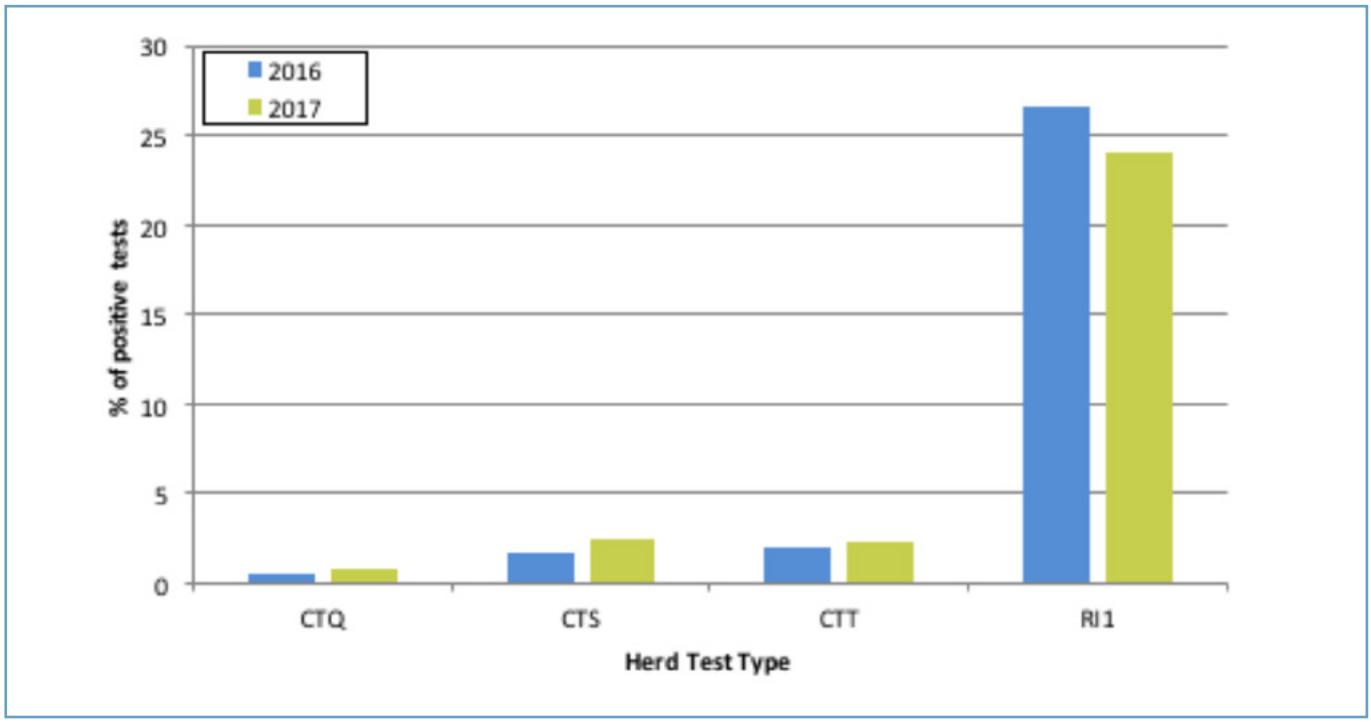


Figure 24: Reactor Disclosure Rate at Individual Animal Level Risk bTB Tests for 2016 and 2017 (by Test Reason)



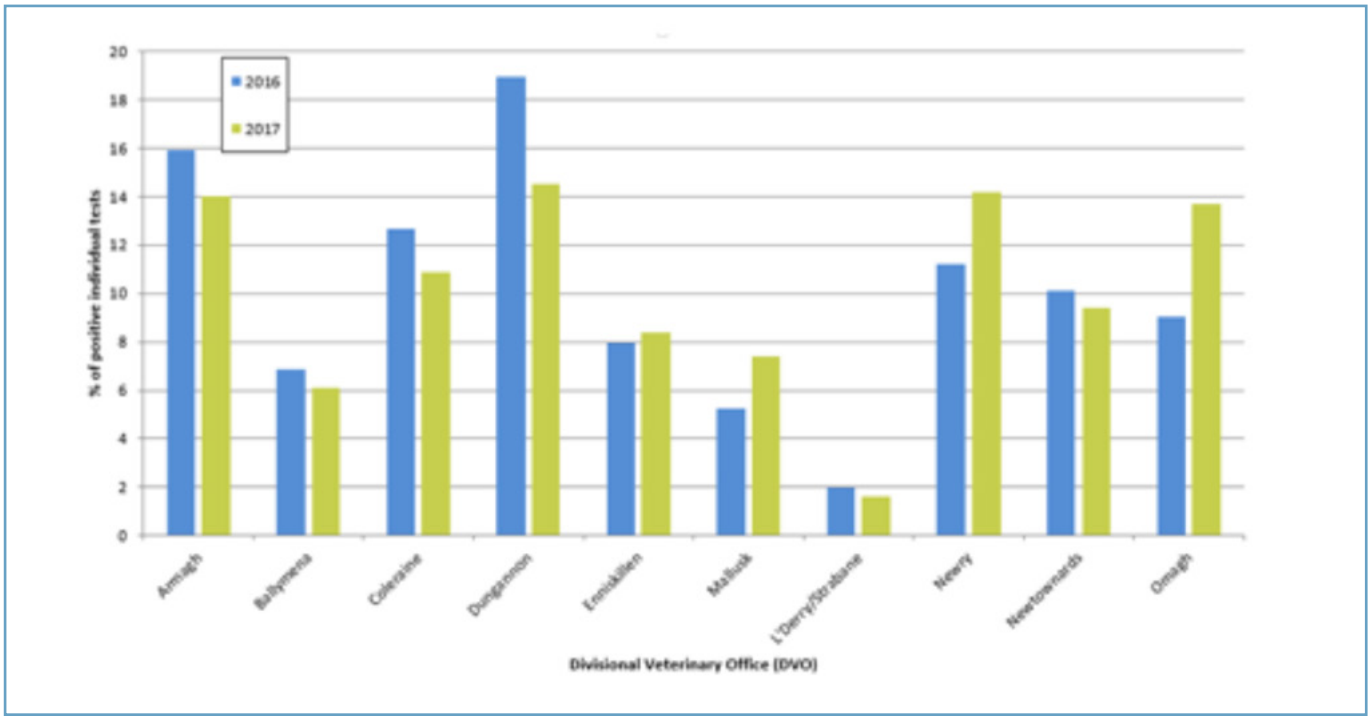
11.11 774 reactors were disclosed at Individual Animal tests in 2017 compared to 674 in 2016 (an increase of 14.8%) (**Table 16**).

Table 16: Reactors disclosed at Individual Animal Level Risk bTB Test in 2016 and 2017 (by Test Reason)

Test Reason	Reactors in 2016	Reactors in 2017	% Change
Check Test Query (CTQ)	5	9	+80%
Check Test Status (CTS)	7	11	+57.1%
Check Test Trace (CTT)	139	199	+43.2%
Inconclusive retest (RI)	523	555	+6.1%
Total	674	774	+14.8%

11.11 The % of all positive individual animal risk bTB tests contributed by each DVO area approximates to the % completed within each DVO area, with variations attributable to local disease levels and to the nature of the bTB breakdowns from which cattle were traced to the area (**Figure 25**).

Figure 25: % of all Positive Individual Animal Level Risk bTB Tests in 2016 and 2017 (by DVO area)



Skin Test Reactor Confirmation Rate

11.12 15,949 bTB skin test reactor animals were identified in 2017 compared to 11,924 during 2016 (an increase of 33.8%). 7,058 confirmed reactors were disclosed in 2017 compared to 5,339 in 2016 (an increase of 32.2%). 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 2017 was 44.3%, which was slightly lower than during 2016 (**Table 17**).

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 17: bTB Reactors and Confirmed Reactors in 2016 and 2017

Year	Reactors	Confirmed Reactors (%of total)
2016	11,923	5,339 (44.8)
2017	15,949	7,058 (44.3)
% Change	+33.8%	+32.2%

11.13 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]

> "... 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 ..."

11.14 The number of animals IFNG tested during 2017 increased by 26.4% compared to 2016 (**Table 18**). 8.1% more animals tested positive in 2017, all of which were either compulsorily removed as skin reactors (or negative in-contacts), or were offered voluntary slaughter as IFNG-only positive. The number offered voluntary slaughter fell by 3.2% despite an increase in the overall number of IFNG positives. This is most likely due to more of the IFNG positives being considered skin reactors as a result of increased use of 'severe interpretation' of the skin test in 2017.

Of the 795 animals offered voluntary slaughter, 677 (85.2%) were removed, compared to 719 (87.6%) removed in 2016. 25.7% of all the IFNG positive animals slaughtered had TB confirmed (23.2% in 2016) and, 8.7% of the voluntarily slaughtered IFNG-only positive animals had TB confirmed (9.5% in 2016).

Table 18: IFNG Positives in 2016 and 2017

Year	2016	2017	% Change
Animals sampled	17,611	22,256	+26.4%
IFNG positive Animals (%*)	1,041 (6.0%)	1,125 (5.1%)	+8.1%
IFNG-only positive Animals offered voluntary slaughter	821	795	-3.2%
IFNG-only positive Animals voluntarily slaughtered	719	677	-5.8%

*Only animals with valid IFNG and skin test results are included (17,354 animals in 2016 and 22,169 animals in 2017).

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. 2,208 new bTB herd breakdowns were identified during 2017, compared to 1,739 in 2016 (a 26.9% increase) (**Table 19**). All DVO areas had an increased number of new bTB herd breakdowns during 2017.

Table 19: New bTB Breakdown Herds in 2016 and 2017

Year	Armagh	Ballymena	Coleraine	Dungannon	Enniskillen	Mallusk	L'Derry/ Strabane	Newry	N'Ards	Omagh	Totals
2016	189	88	223	250	201	73	30	238	205	242	1,739
2017	214	158	239	292	246	120	39	365	245	290	2,208
% change	+13.2%	+79.5%	+7.2%	+16.8%	+22.4%	+64.4%	+30.0%	+53.4%	+19.5%	+19.8%	+27.0%

12.2 **Figure 26** shows the density of herds with reactors per km^2 in 2017 in NI. This information was requested by private veterinary practitioners to increase awareness of the distribution of infection in their locality. (2016 map in **Figure A** in the **Annex**)

Figure 26: Density of Herds with bTB Reactors in 2017

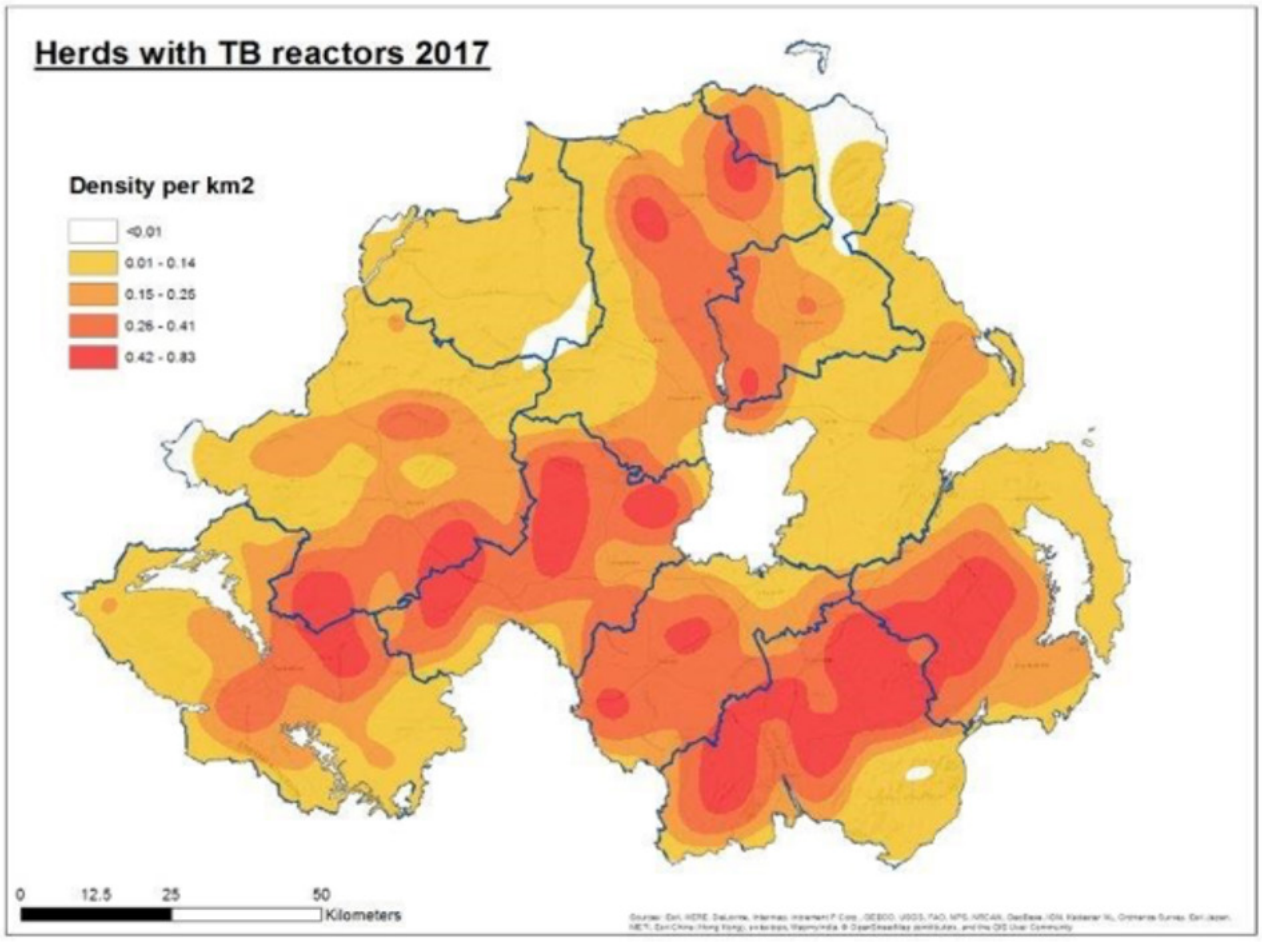
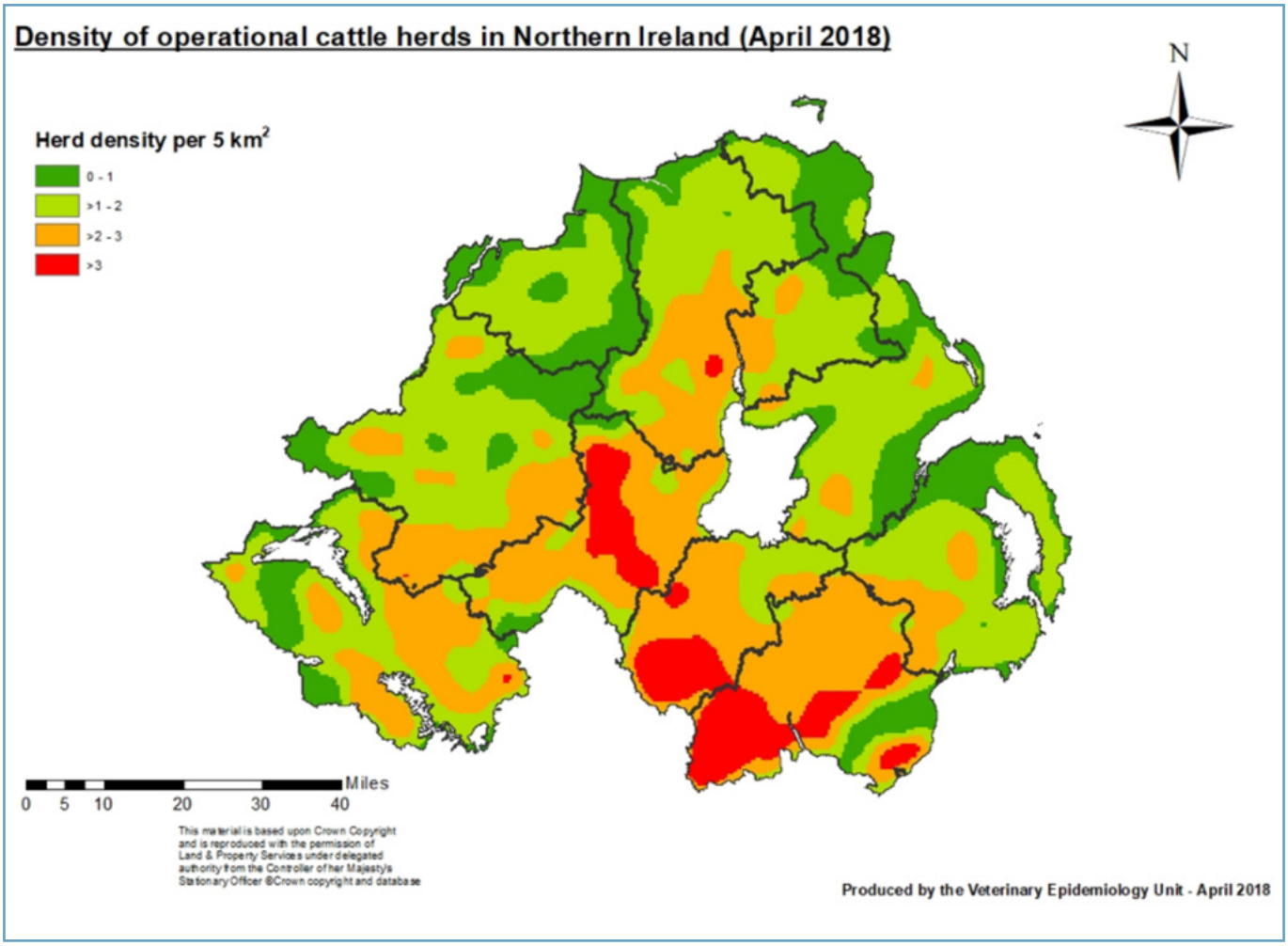


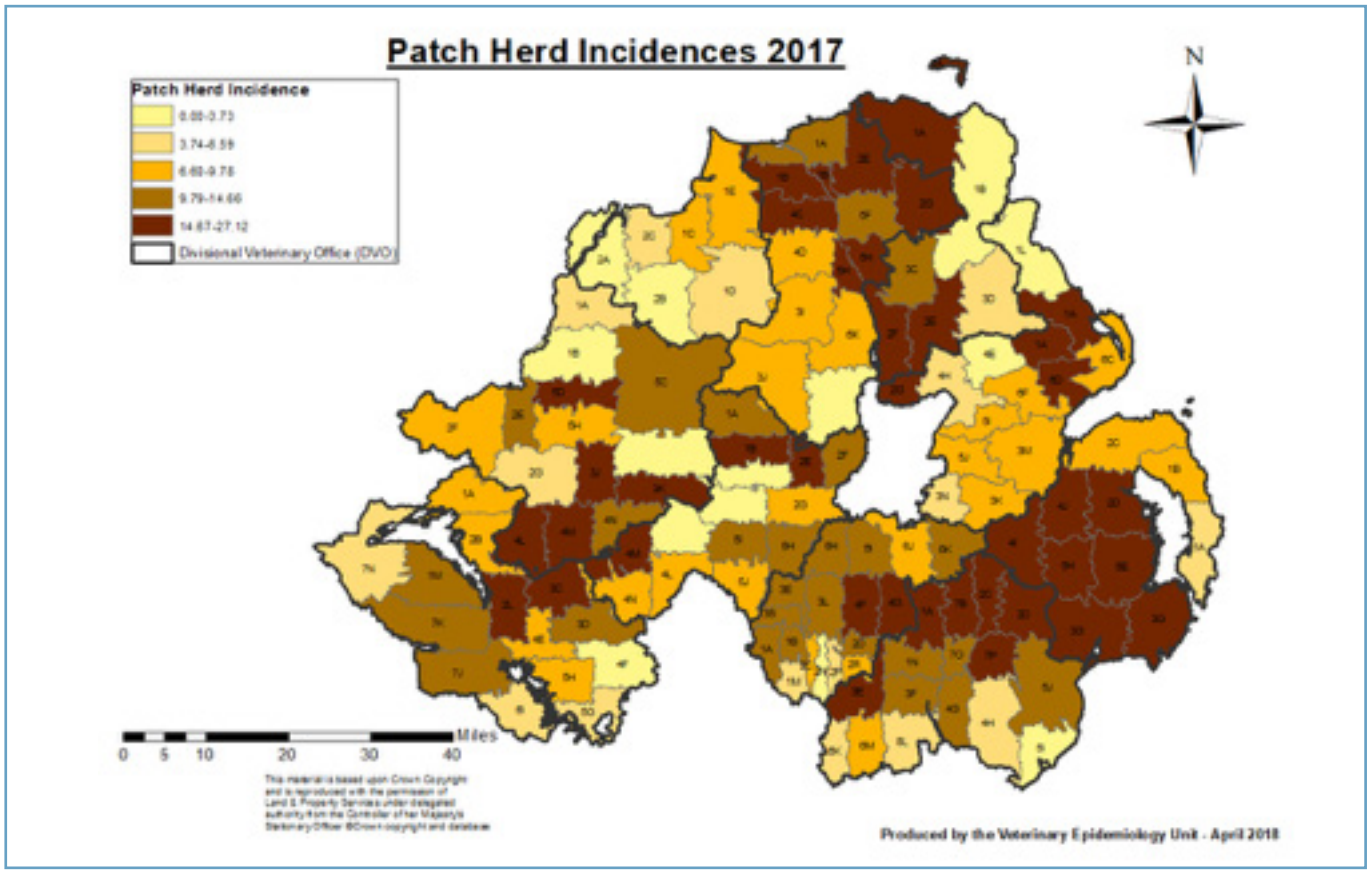
Figure 27 shows cattle herd density across NI and when compared with **Figure 26** there is a visual association between the two.

Figure 27: Operational cattle herd density in NI 2017



Taking into account the number of herds in each area and the number of new herd breakdowns, we have produced a patch bTB incidence map (see glossary of terms for definitions) for 2017 (**Figure 28**). Every DVO area can be seen to have a variation in incidence across its patches.

Figure 28: Patch Incidence in 2017



M. bovis Strain Types

Figure 29 shows the distribution of the most prevalent bTB strain types found in bTB confirmed cases in 2017. 105 *M. bovis* strain types were isolated during 2017 with the top 10 accounting for 83% of the isolates. 102 *M. bovis* strain types were isolated during 2016 with the top 10 accounting for 81.5% of culture confirmed isolates. 63 strain types were common to both years (accounting for 62% of confirmed strain types in 2016 and 60% of confirmed strain types in 2017). The remaining ~40% strains are a combination of:

a) New daughters generated by mutations of existing strains.

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

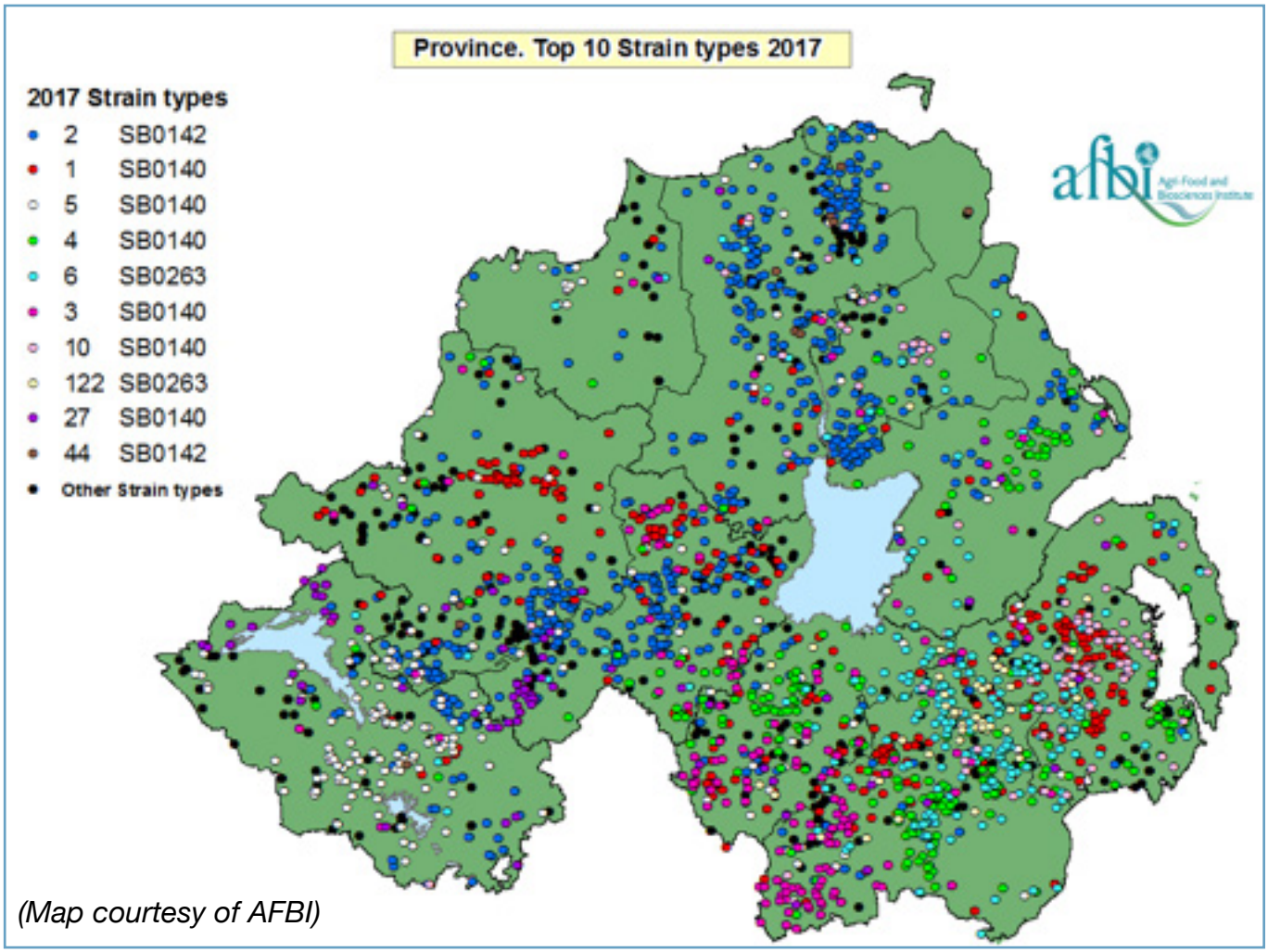
c) Re-occurrence of strains that appeared fleetingly in previous years.

12.3 The 10 most prevalent strain types have changed slightly between 2016 and 2017. Strains 7, 9 & 11 have dropped out of the top 10 strains and are replaced with strains 10, 44 and 122. This is interesting as these three strains are daughter strains of more prevalent strains (strain 10 came from a mutation of strain 1, strain 44 came from a mutation of strain 2 and strain 122 came from a mutation of strain 6). Strain 27 entered the top 10 most prevalent strains in 2016. It seems to be spreading further from its original hotspot near Belleek, to a hotspot near Fivemiletown and to more clusters in Armagh, Omagh and Newry DVOs. It is believed this strain originated in ROI.

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 (Strain types from 2003 to 2017 can be found in **Figure 30** and the most prevalent strain types in 2016 can be found in **Figure B** in the **Annex**.) Strain 10 now has a new, definite cluster in Ballymena and, as stated already, Strain 27 appears to be forming new clusters away from its original hotspot.

"... some strain types are visible in areas outside their normal cluster, which would suggest spread due to animal movements ..."

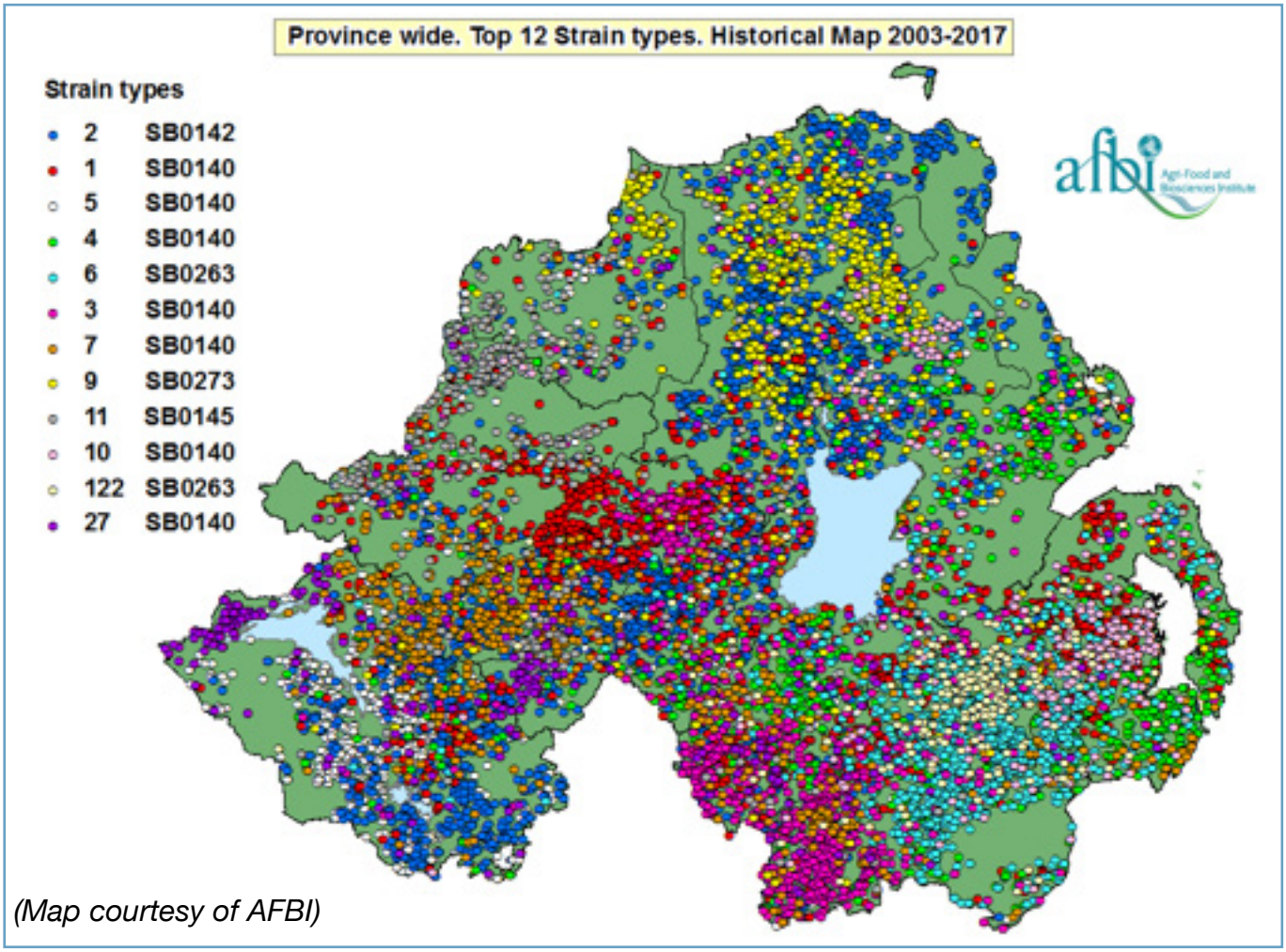
Figure 29: Distribution of the most prevalent bTB strain types in 2017



(Map courtesy of AFBI)

12.4 There has been a slight change to the historical prevalence (2003-2017) in that strain type 49 has been replaced by strain type 122 in the Province wide Top 12 genotypes. Strain type 122 is a "daughter" of strain type 6. Strain type 122 is clustered in Newry and Newtownards DVOs near to the Dromara hills in the same area where strain type 6 occurs (**Figure 30**).

Figure 30: Distribution of the most Prevalent bTB Strain Types in 2003-2017



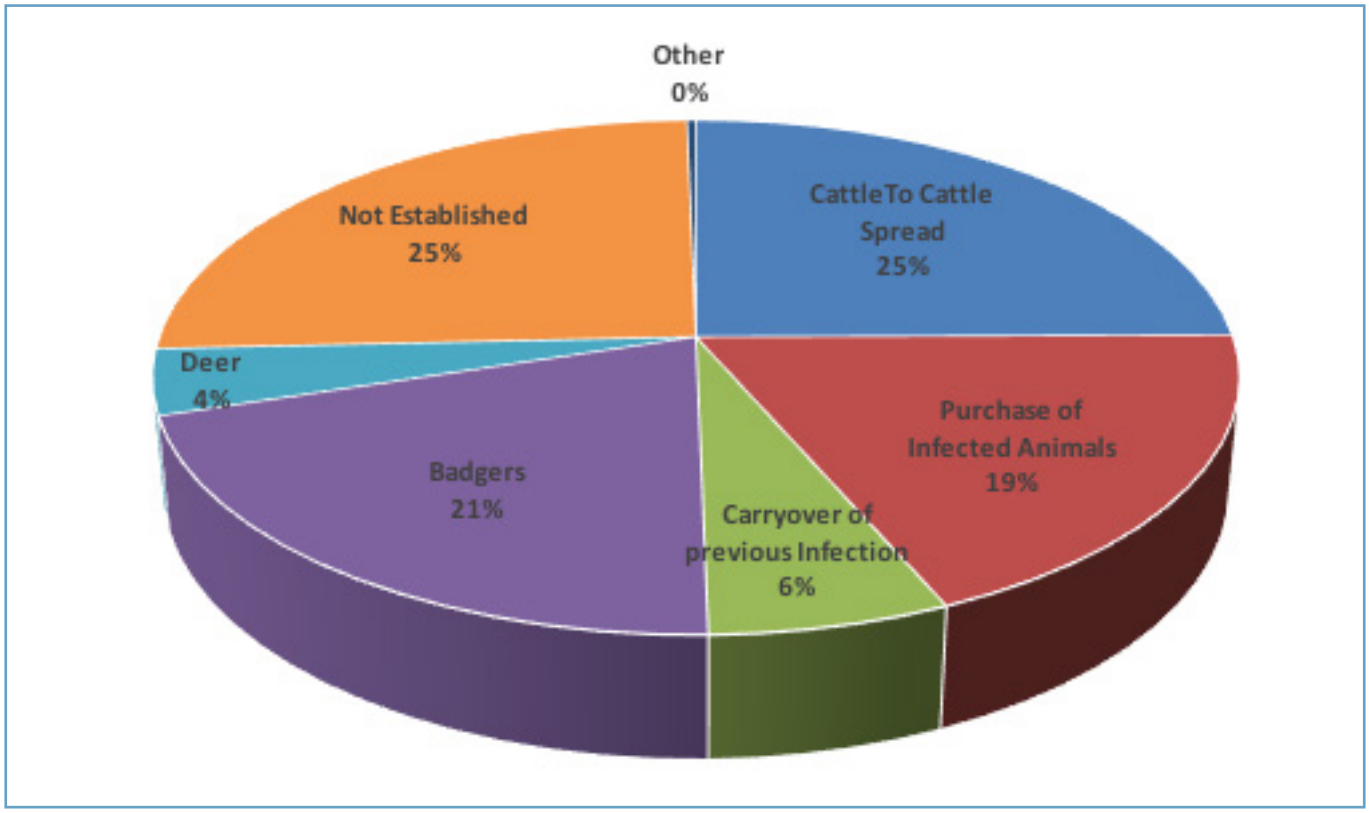
(Map courtesy of AFBI)

13. bTB Investigations

13.1 During the course of the management of a bTB breakdown, and based on the available evidence, the VO records an assessment of the cause of the breakdown.

In many cases it is not possible to determine a single cause with a reasonable degree of certainty and additional information may only come to light months or years after the breakdown has been dealt with because of the chronic and complex nature of the disease. "Not established" includes breakdowns where more than one possible source has been identified. The percentages of the infection sources recorded by the field VOs for OTW breakdowns during 2017 is shown in **Figure 31**.

Figure 31: Infection sources for OTW bTB breakdowns for all DVOS during 2017



13.2 These conclusions correlate with established risk factors for bTB[5,6]. DAERA continues to provide advice on biosecurity measures that farmers can employ to reduce the risk of infection affecting their herd. Advice is given by staff during visits to farms and also through the distribution of leaflets to all herd keepers. Information on the possible causes of a TB breakdown can be found on the DAERA bTB web-pages.

> "... DAERA continues to provide advice on biosecurity measures that farmers can employ to reduce the risk of infection affecting their herd ..."

14. EU Co-funding and Programme Costs

14.1 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 2017 is shown in **Table 20** below.

14.2 The amount of co-funding received from the EU Commission for 2016 was £5.6 million. At the time of writing (July 2018) the 2017 co-funding has not been approved pending a desktop audit by the EU of the end of year statistics submitted by the UK.

Table 20: Specified Programme Costs for 2017

TB Programme Element	Cost
Compensation for reactors, NICs and voluntarily slaughtered interferon gamma -only positive cattle	23,439,899
Haulier expenses	392,240
PVP Tuberculin testing (excluding travel)	7,444,729
TVO/VOT tuberculin testing (excluding travel)	1,431,663
Tuberculin	730,696
Laboratory analysis for interferon gamma and culture	503,260
Research	857,630
Veterinary and Administrative Staff	7,548,492
Salvage monies	-4,527,897
Total	37,820,712

14.3 The specified costs of the Programme for 2017 were £7.45 million higher than 2016.

This is largely due to an increase in expenditure in compensation for reactors, NICs and voluntarily slaughtered IFNG-only positive cattle, with other less significant increases and reductions across the Programme elements.

15. Research and Development

> "... a better understanding of bTB transmission and prevention of spread of the infection between cattle and between cattle and wildlife is still required ..."

15.1 There continue to be significant knowledge gaps in the understanding of bTB transmission between cattle, between wildlife (badgers) and between cattle and wildlife. Therefore, a better understanding of bTB transmission and prevention of spread of the infection between cattle and between cattle and wildlife is still required. Moreover, early detection of infection and removal of infected animals are both key components of any eradication scheme and work on developing new, and improving the use of current, diagnostic tests is another critical area of focus.

15.2 No new bTB or wildlife research projects were commissioned in 2017. However, the following studies/projects have been in progress during 2017 as part of the DAERA's ongoing portfolio of research on bTB:

- Investigating bTB transmission dynamics using genome epidemiology.
- An evaluation of the role of multiple reactor and chronic breakdown herds in the epidemiology of bTB in NI. (Now complete).
- Use of Resuscitation Promotion Factors to enhance culture of *M. bovis* from clinical tissue. (Now complete)
- Optimisation and enhancement of the IFNG format.
- To improve reliability of genomic prediction for bTB resistance in cattle.
- BTB molecular epidemiology analysis of cattle movements and optimisation of epidemiological investigations.
- The role of endemic diseases and other factors in the occurrence of bTB (Now complete)

15.3 Furthermore, DAERA progressed with Year 4 of the Test, Vaccinate or Remove (TVR) Wildlife Intervention Research Project in County Down. Field activities commenced on 19 June 2017. Co-operation by land owners has continued to be excellent. The actual capture of badgers started on 3 July 2017 to comply with the conditions of the Northern Ireland Environment Agency (NIEA) licence. Captured badgers were tested (using a sett side test), microchipped, examined and had other diagnostic samples taken. As per previous years, the TVR field activities were carried out by a dedicated team from VSAHG. Field work was completed on 19 October 2017.

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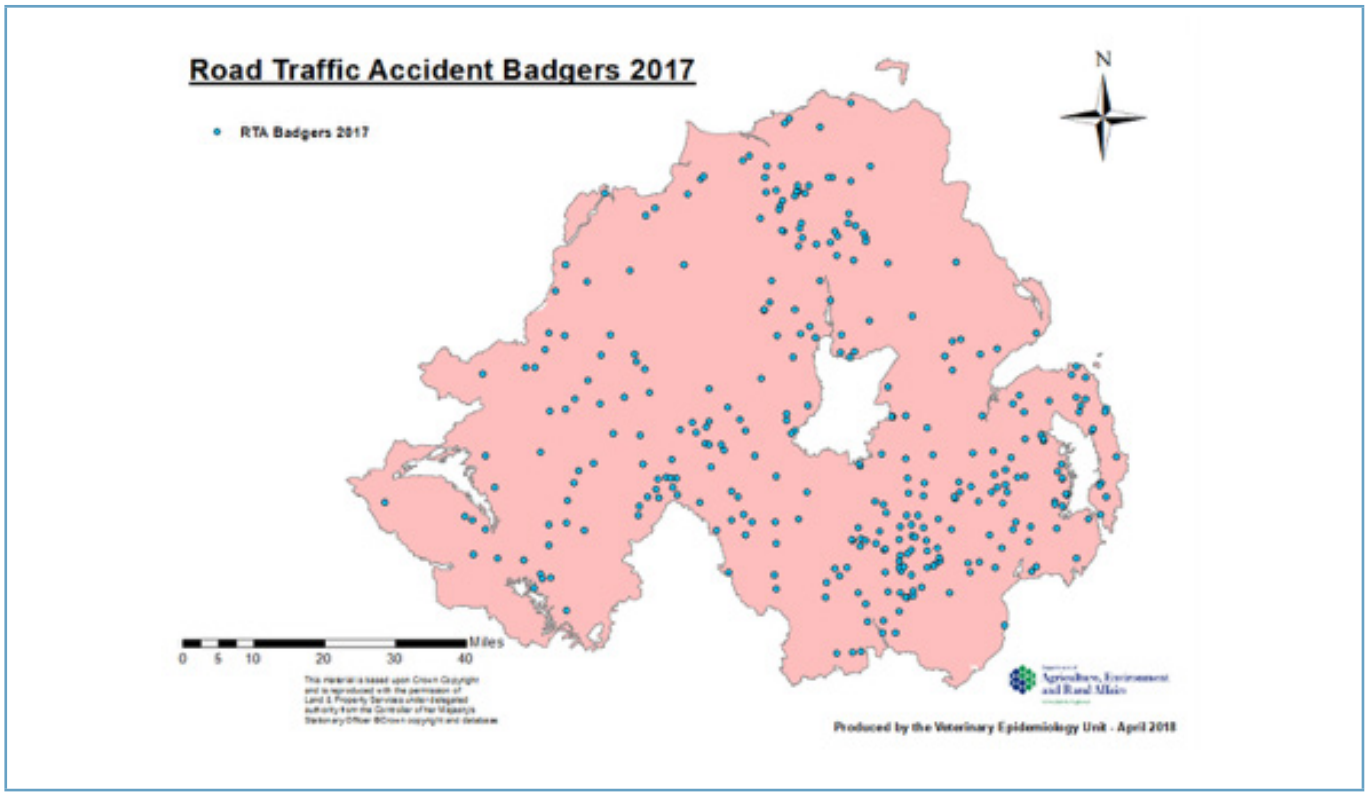
15.4 There were a total of 551 capture events in 2017, with 287 unique badgers being cage trapped. This is the third year that badgers positive to the sett side test were removed; those that tested negative were vaccinated and released.

It is not proposed to disclose the number of test positive badgers removed during the TVR Research Project, as this could potentially undermine the project (and possibly lead to a change in land owner behaviour), and lead to premature, inaccurate or misleading claims about the effect of the TVR approach. A report will be provided, following analysis of the relevant data, once the project has ended. This is anticipated to be in late 2019. The TVR Wildlife Intervention Research Project-year 4 Report (2017) is available on the DAERA website.

15.5 The Badger Road Traffic Accident (RTA) Survey has been ongoing since 1998. During 2017, 363 badgers were submitted and 63 (17.4%), 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. To balance the distribution of submissions, reports from the North West, West and Southern parts of Northern Ireland are very welcome. **Figure 32** shows the location of the RTA badgers collected during 2017.

Figure 32: Location of RTA badgers collected in 2017



16. 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 2017, suspected TB lesions were examined at AFBI from an otter and from two red deer. Both deer were positive for *M.bovis*.

References

1 Goodchild A.V., Downs S.H., Upton P., Wood J.L.N., de la Rua - Domenech R. (2015): Specificity of the comparative skin test for bovine tuberculosis in Great Britain. Veterinary Record 177, 258.

2 Olea-Popelka, F.J., White, P.W., Collins, J.D., O'Keeffe, J., Kelton, D.F., Martin, S.W. (2012): Breakdown severity during a bovine tuberculosis episode as a predictor of future herd breakdowns in Ireland. Preventive Veterinary Medicine 63, 163-172.

3 Doyle, L.P., Gordon, A.W., Abernethy, D.A., Stevens, K. (2014): Bovine tuberculosis in Northern Ireland: Risk factors associated with time from post-outbreak test to subsequent herd breakdown. Preventive Veterinary Medicine 116, 47-55.

4 O'Hagan M.J.H., Stegeman J.A., Doyle L.P., Stringer L.A., Courcier E.A., Menzies F.D. (2018). The impact of the number of tuberculin skin test reactors and infection confirmation on the risk of future bovine tuberculosis incidents; a Northern Ireland perspective. Epidemiology and Infection 1–8. https:// doi.org/10.1017/S0950268818001310.

5 Skuce, R.A., Allen, A.R., McDowell, S.W.J. (2011). Bovine tuberculosis (TB): a review of cattle- to-cattle transmission, risk factors and susceptibility. https://www.daera-ni.gov.uk publications/bovine-tb-review-badger-cattle-transmission

6 Doyle, L.P., Gordon, A.W., Abernethy, D.A., Stevens, K. (2014): Bovine tuberculosis in Northern Ireland: Risk factors associated with time from post-outbreak test to subsequent herd breakdown. Preventive Veterinary Medicine 116, 47-55.

Annex

Table A: bTB Herd Tests Completed in 2016 and 2017 by DVO area (Cattle>0)
(Reference Section 10 Surveillance Outputs paragraph 10.4.)

	Routine		Restricted		Risk		Totals	
DVO	2016	2017	2016	2017	2016	2017	2016	2017
	Nr Tests (%)	Nr Tests (%)	Nr Tests (%)	Nr Tests (%)	Nr Tests (%)	Nr Tests (%)	Nr Tests (%)	Nr Tests (%)
Armagh	1,564 (10.2)	1,300 (9.5)	705 (10.3)	920 (11.2)	1,073 (8.9)	1,484 (10.1)	3,342 (9.7)	3,704 (10.1)
Ballymena	997 (6.5)	864 (6.3)	344 (5.0)	466 (5.7)	532 (4.4)	885 (6.0)	1,873 (5.5)	2,215 (6.0)
Coleraine	1,523 (9.9)	1,426 (10.4)	948 (13.9)	929 (11.3)	1,639 (13.5)	1,807 (12.3)	4,110 (12.0)	4,162 (11.4)
Dungannon	1,952 (12.7)	1,726 (12.6)	943 (13.8)	1,108 (13.4)	1,246 (10.3)	1,643 (11.2)	4,141 (12.1)	4,477 (12.2)
Enniskillen	2,032 (13.2)	1,749 (12.8)	586 (8.6)	773 (9.4)	1,679 (13.9)	2,086 (14.2)	4,297 (12.5)	4,608 (12.6)
Mallusk	1,308 (8.5)	1,192 (8.7)	350 (5.1)	410 (5.0)	420 (3.5)	615 (4.2)	2,078 (6.0)	2,217 (6.1)
L'Derry/ Strabane	685 (4.4)	691 (5.1)	216 (3.2)	168 (2.0)	256 (2.1)	275 (1.9)	1,157 (3.4)	1,134 (3.1)
Newry	2,368 (15.4)	2,115 (15.5)	991 (14.5)	1,454 (17.6)	2,139 (17.7)	2,476 (16.8)	5,498 (16.0)	6,045 (16.5)
N'Ards	1,105 (7.2)	961 (7.0)	813 (11.9)	1,077 (13.1)	1,269 (10.5)	1,414 (9.6)	3,187 (9.3)	3,452 (9.4)
Omagh	1,881 (12.2)	1,622 (11.9)	947 (13.8)	941 (11.4)	1,839 (15.2)	2,050 (13.9)	4,667 (13.6)	4,613 (12.6)
Total	15,415 (100)	13,646 (100))	6,843 (100)	8,246 (100)	12,092 (100)	14,735 (100)	34,350 (100)	36,627 (100)

Figure A: Density of Herds with bTB Reactors in 2016

(Reference Section 12 New Herds Breakdowns Paragraph 12.2)

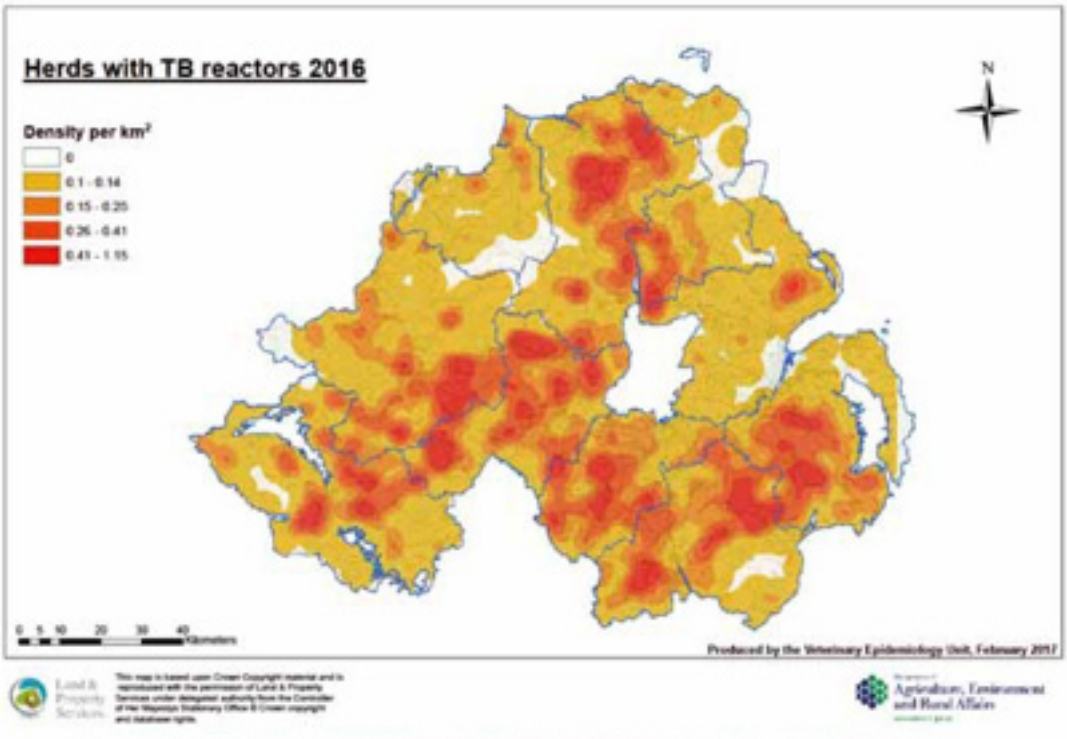
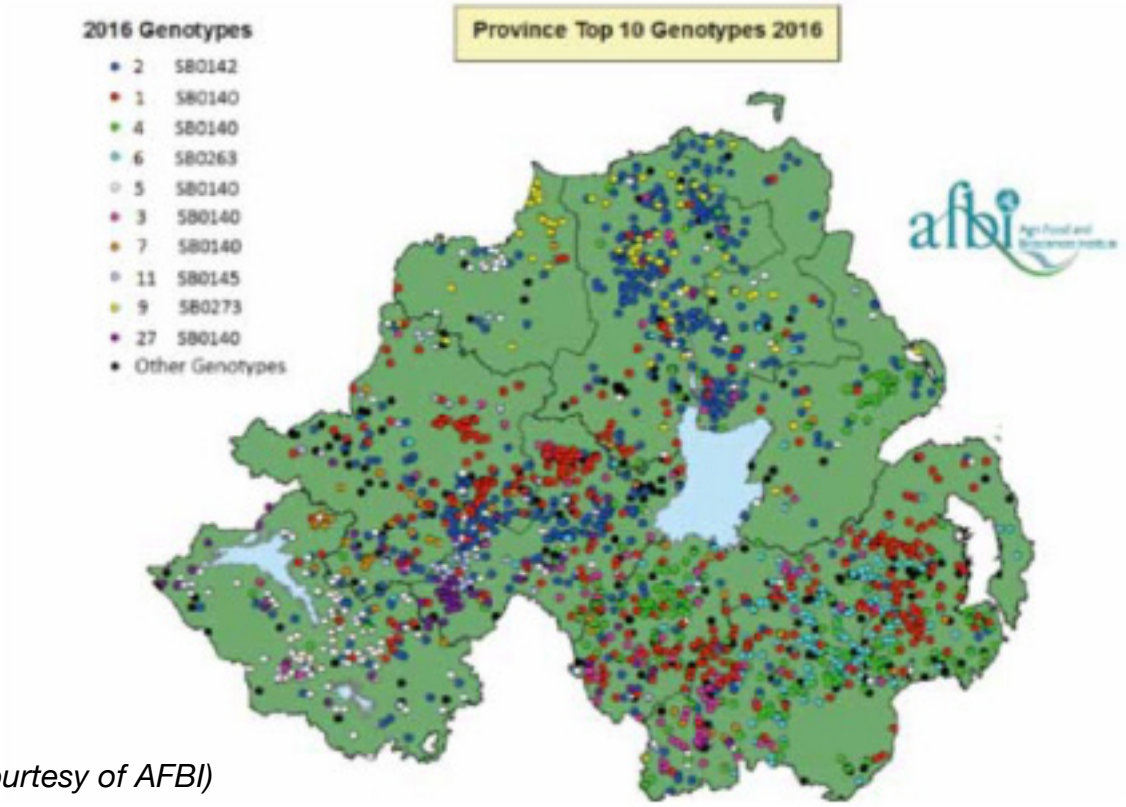


Table B: Total animal level risk bTB tests in 2016 and 2017 by DVO area (Cattle > 0) (Reference section 10 Surveillance Outputs paragraph 10.6)

	CTQ		CTS		CTT		RI1		Total	
DVO	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
	Nr Tests (%)	Nr Tests (%)	Nr Tests (%)	Nr Tests (%)	Nr Tests (%)	Nr Tests (%)	Nr Tests (%)	Nr Tests (%)	Nr Tests (%)	Nr Tests (%)
Armagh	164 (16.0)	208 (18.5)	77 (22.6)	93 (22.7)	952 (15.2)	1,176 (15.7)	204 (13.0)	213 (12.0)	1,397 (15.2)	1,690 (15.7)
Ballymena	66 (6.2)	50 (5.3)	6 (1.8)	17 (4.1)	318 (5.1)	430 (5.7)	101 (6.4)	132 (7.5)	491 (5.3)	639 (5.9)
Coleraine	151 (14.7)	95 (8.4)	35 (10.3)	48 (11.7)	611 (9.8)	765 (10.2)	260 (16.5)	237 (13.4)	1,057 (11.5)	1,145 (10.6)
Dungannon	168 (16.4)	188 (16.7)	46 (13.5)	65 (15.9)	1137 (18.2)	1,265 (16.9)	215 (13.7)	248 (14.0)	1,566 (17.0)	1,766 (16.4)
Enniskillen	45 (4.4)	79 (7.0)	48 (14.1)	32 (7.8)	502 (8.0)	530 (7.1)	133 (8.5)	149 (8.4)	728 (7.9)	790 (7.3)
Mallusk	71 (6.9)	97 (8.6)	44 (12.9)	58 (14.1)	459 (7.3)	530 (7.1)	113 (7.2)	132 (7.5)	687 (7.5)	817 (7.6)
L'Derry/ Strabane	41 (4.0)	33 (2.9)	4 (1.2)	9 (2.2)	232 (3.7)	235 (3.1)	38 (2.4)	37 (2.1)	315 (3.4)	314 (2.9)
Newry	147 (14.4)	165 (14.6)	39 (11.5)	26 (6.3)	880 (14.1)	1,153 (15.4)	181 (11.5)	258 (14.6)	1,247 (13.6)	1,602 (14.8)
N'Ards	81 (7.9)	100 (8.9)	15 (4.4)	31 (7.6)	454 (7.3)	595 (7.9)	126 (8.0)	143 (8.1)	676 (7.4)	869 (8.1)
Omagh	90 (8.8)	102 (9.1)	26 (7.6)	31 (7.6)	705 (11.3)	809 (10.8)	202 (12.8)	220 (12.4)	1,023 (11.1)	1,162 (10.8)
Total	1,024 (100)	1,127 (100)	340 (100)	410 (100)	6,250 (100)	7,488 (100)	1,573 (100)	1,769 (100)	9,187 (100)	10,794 (100)

Figure B: Distribution of the most prevalent bTB strain types in 2016 (Reference section 12 New Herd Breakdowns paragraph 12.3)



(Map courtesy of AFBI)

Table C: Herd level risk bTB tests (cattle >0) in 2016 and 2017 by DVO area

	BCT		CHT		FCT		LCT		Totals	
DVO	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
	Tests (%)	Tests (%)	Tests (%)	Tests (%)	Tests (%)	Tests (%)	Tests (%)	Tests (%)	Tests (%)	Tests (%)
Armagh	82 (7.2)	101 (7.8)	179 (11.9)	165 (11.7)	51 (18.4)	65 (17.7	752 (8.5)	1,141 (10.0)	1,064 (9.1)	1,472 (10.2)
Ballymena	54 (4.8)	92 (7.1)	109 (7.3)	99 (7.0)	12 (14.3)	20 (5.4)	357 (4.0)	673 (5.9)	532 (4.5)	884 (6.1)
Coleraine	94 (8.3)	89 (6.9)	155 (10.3)	147 (10.4)	34 (12.3)	48 (13.1)	1,351 (15.3)	1,521 (13.3)	1,634 (13.9)	1,805 (12.5)
Dungannon	156 (13.8)	170 (13.1)	192 (12.8)	236 (16.7)	33 (11.9)	52 (14.2)	860 (9.7)	1,183 (10.4)	1,241 (10.6)	1,641 (11.3)
Enniskillen	193 (17.0)	251 (19.3)	180 (12.0)	140 (9.9)	21 (7.6)	12 (3.3)	1,283 (14.5)	1,667 (14.5)	1,677 (14.3)	2,070 (14.3)
Mallusk	88 (7.8)	94 (7.2)	108 (7.2)	103 (7.3)	18 (6.5)	16 (4.4)	191 (2.2)	391 (3.4)	405 (3.5)	604 (4.2)
L'Derry/ Strabane	28 (2.5)	33 (2.5)	54 (3.6)	70 (5.0)	7 (2.5)	16 (4.4)	166 (1.9)	154 (1.3)	255 (2.2)	273 (1.9)
Newry	189 (16.7)	191 (14.7)	209 (13.9)	176 (12.5)	64 (23.1)	77 (21.0)	1,665 (18.9)	2,022 (17.7)	2,127 (18.1)	2,466 (17.0)
N'Ards	92 (8.1)	92 (7.1)	131 (8.7)	99 (7.0)	21 (7.6)	23 (6.3)	1,023 (11.6)	1,198 (14.5)	1,267 (10.8)	1,412 (9.7)
Omagh	158 (13.9)	186 (14.3)	185 (12.3)	175 (12.4)	16 (5.8)	38 (10.4)	1,176 (3.3)	1,458 (12.8)	1,535 (13.1)	1,857 (12.8)
Total	1,134 (100)	1,299 (100)	1,502 (100)	1,410 (100)	277 (100)	367 (100)	8,824 (100)	11,418 (100)	11,737 (100)	14,494 (100)

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 blood test.
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.
VO	Veterinary Officer.
12 month moving average incidence	Average incidence over the previous 12 months.

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