Bovine Tuberculosis in Northern Ireland

2015 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 eradication Programme, namely:

1. Disease surveillance - abattoir surveillance through post mortem examination (PME) of all slaughtered animals and live animal surveillance using the single intradermal comparative cervical tuberculin test (SICCT - skin test) augmented by the interferon gamma blood test (IFNG).

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, which are applied as soon as disease is suspected to prevent further spread and also following investigations to indicate where disease may have come from, or spread to. Herds or animals that are considered to be at increased risk are subject to additional testing and movement controls, if applicable.

> "...the sensitivity of the test can be increased by wider application of a more severe interpretation..."

The application of measures to control disease leads to more testing. In addition, the sensitivity of the test can be increased by wider application of a more severe interpretation of test readings and additional exposed animals can be removed, whether or not they have given a positive response to the skin test. 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 the removal of infected and exposed animals at an early stage reduces the potential for spread and subsequently results in a reduction in disease levels.

During 2015 disease levels rose steadily from the start of the year and at the end of the year the herd incidence was 7.15%, compared to 6.03% in 2014.

2015 Surveillance Summary (compared with 2014)*;

During 2015 approximately 1.65 million cattle in NI were bTB tested in 23,980 herds.

a. There was an overall increase of 6.1% in the number of herd tests completed during 2015 (34,110 compared with 32,164). The number of risk herd tests also increased in 2015 by 12.8% (from 10,199 to 11,506).

b. There was an increase of 14.2% in the number of individual animal level risk (skin) tests completed (9,610 compared with 8,414).

c. The total number of animal tests in 2015 was 2,322,451, which represents a 6.8% decrease from the previous year. The number of animals tested was 1,652,601, a 2.8% increase (some animals were tested more than once; hence this figure is lower than the total number of tests completed).

d. There was a 6.6% decrease in the number of animals that were tested using IFNG (15,873 compared to 16,991) and a 3.8% decrease in the number of herds that were tested using IFNG (177 compared with 184).

e. In 2015 there were 413,383 cattle slaughtered in NI meat plants (including animals imported for direct slaughter) of which 1,459 (0.35%) had bTB suspected at routine slaughter (Lesioned at routine slaughter (LRS)) and had samples submitted for further laboratory examination. During 2014, 1,088 LRS (0.26% of total slaughtered) were identified from 418,044 cattle (including animals imported for direct slaughter)

*Figures correct at time of writing.

2015 Disease Summary (compared with 2014)*;

a. The annual herd incidence increased (7.15% compared with 6.03%), as did the annual animal incidence (0.66% compared with 0.55%).

b. An increasing level of bTB was observed at herd level in 9 of the 10 DVO areas.

c. The number of bTB skin test reactor animals identified (11,004) was 24.5% higher (8,838).

d. There was a 3.2% decrease in the number of animals that were positive to IFNG (1,222 compared with 1,262). There was a 14.1% decrease in the number of IFNG positive animals that were not also positive to the skin test (902 compared with 1,050).

e. In 2015, the number of new bTB herd breakdowns was 20.8% higher (1,688 compared with 1,397).

f. The number of bTB confirmed LRS per 1000 animals slaughtered increased in 2015 by 27.4% compared with 2014. This figure does not include animals imported to Northern Ireland directly for slaughter.

g. Specified Programme costs amounted to £28,494,059, a 6.68% increase. Co-funding of the 2015 Programme was approved by the European Commission and has been agreed at the time of writing. The amount received as co-funding for the 2014 Programme was £3.98 million.

*Figures correct at time of writing.

Overall Conclusions

- There was a widespread increase in the level of bTB during the course of 2015. Ballymena was the only DVO area that showed a decrease in both herd and animal incidence.
- The animal and herd incidence 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 as well as the proportion in which a reactor was disclosed. This indicates these herds were correctly identified as being at higher risk.
- The number of traced animals that were reactors at individual animal tests increased.
- The number of LRS per 1,000 cattle slaughtered in NI increased, as did the number of these that were bTB positive.
- In conclusion there was a widespread increase in the level of infection at herd and animal level. An increased burden of infection was reflected in the increase in the confirmed LRS rate.

1. Introduction

1.1 This report provides a descriptive overview of the key disease control components of our bTB Eradication Programme (bTB Programme), including a summary of the 2015 statistics.

1.2 Detailed bTB statistics for NI are published each month on the DAERA web site 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 We hope 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. To eradicate bTB in cattle will require the use of a range of measures aimed at addressing the infection in cattle and preventing its spread from wildlife. It is accepted that there is no simple cost-effective solution or 'quick fix'.

> "...Bovine TB is a very complex, multifactorial and challenging disease..."

3. DAERA Goals

The progressive reduction and eradication of bTB from the national cattle herd, based on regular and targeted testing of cattle herds, slaughter of test positive animals and movement controls, supplemented by surveillance at routine slaughter of cattle.

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.

> "...the eradication of bTB in cattle... cannot be achieved without constructive co-operation between government, industry stakeholders and individual farmers."

3.1 Our immediate goals are to:

(a) maintain trade; and

(b) produce more effective and efficient ways of reducing transmission of bTB between cattle and to/from 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 is also responsible for bTB Programme implementation. DAERA continues to work in partnership with its science provider, AFBI, to identify knowledge gaps and to explore research and development options 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. A group, the TB Strategic Partnership Group, which operates independently of DAERA was established in Autumn 2014 and tasked to develop a long-term strategy for the eradication of bTB in cattle, and a related implementation action plan. This group continued its work throughout 2015 gathering evidence and advice from a wide range of interested parties. In June 2015 the Group published its interim report (TBSPG Interim Report-June 2015) and its final report is expected by the end of 2016.

4.2 During the year a number of actions have been taken to strengthen the programme

- Additional tracing and testing of herds through which reactors and confirmed LRS animals passed before they disclosed infection.
- TB staff instructions have been updated.
- Measures to improve biosecurity awareness among herd keepers and Approved Veterinary Surgeons (AVSs).

- A TB Biosecurity Leaflet.
- A web based bTB biosecurity training module for AVSs (tb bio-exclusion webinar).
- Training to enable VOs to give specific advice to herd keepers on practical measures to reduce the risk of bTB from wildlife.

- New written advice on the isolation of individual animals; the use of milk for human consumption; feeding of milk to calves and public health risks has been given to herd keepers on disclosure of reactor or inconclusive reactor animals.
- Changes have been implemented to increase the number of samples submitted from animals with bTB-like lesions at routine slaughter.
- Close involvement in the development of the new Northern Ireland Food and Animal Information System (NIFAIS) computer system which will be phased in to replace the current APHIS system from April 2017, although disease control aspects will only become operational in early 2018.
- Good progress was made on the development of a new TB Testing Services Contract to help ensure consistent high quality TB testing is delivered at a cost which represents good value for money. The contract was implemented from April 2016.

Programme Implementation

4.3 The delivery of the bTB 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 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 TB Testing.

✓ Management of contracts with private sector partners.

✓ Training of staff and delivery partners.

✓ Engagement with stakeholders.

✓ Liaison with external public health agencies, including the Health Service Consultants in Communicable Diseases, Health and Safety Executive and Public Health Authorities.

✓ Counter-fraud measures.

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

✓ Veterinary surgeons, which are either DAERA employees or DAERA-approved veterinary surgeons (AVSs), who carry out all "on farm" bTB skin tests.

✓ Agri-Food and Biosciences Institute (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).

✓ Animal identity, testing and movement are recorded and controlled through the Animal and Public Health Information System (APHIS) database. This includes 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 bTB Programme in NI. There are ten Divisional Veterinary Offices (DVOs), incorporated in DAERA Direct Offices, and the administrative area of each office is sub-divided into "patches", each of which is managed by a DAERA Veterinary Officer (VO) supported by a team of technical officers. Each bTB breakdown therefore has an allocated VO who manages the disease control measures necessary to prevent further spread of bovine TB and to reinstate the herd's disease free status.

✓ Close engagement between the Patch VO and the farmer whose herd has become a new TB breakdown herd works to mutual benefit; it ensures the farmer has a point of contact to help address problems and concerns and also assists DAERA to ensure that the potential for further spread of disease has been addressed.

4.5 A TB Implementation Team (TBIT) was set up in 2013 to oversee the delivery of the Programme.

Figure 1 shows the main DAERA branches and delivery partners that are involved in the delivery of the bTB 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 individual herd keepers play in the development and delivery of the bTB Programme through their cooperation and compliance, and also the contributions of industry stakeholders.

Figure 1: bTB Programme - Main DAERA Branches and Delivery Partners

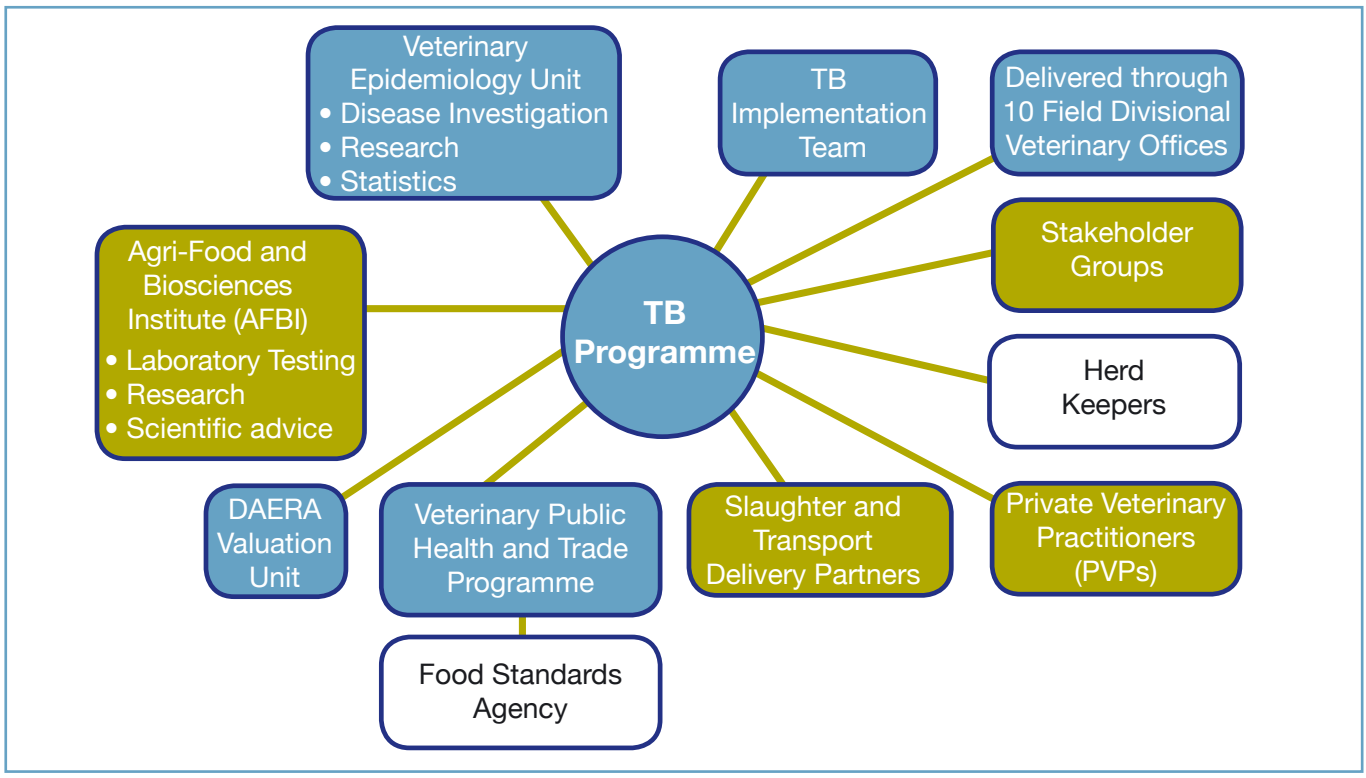
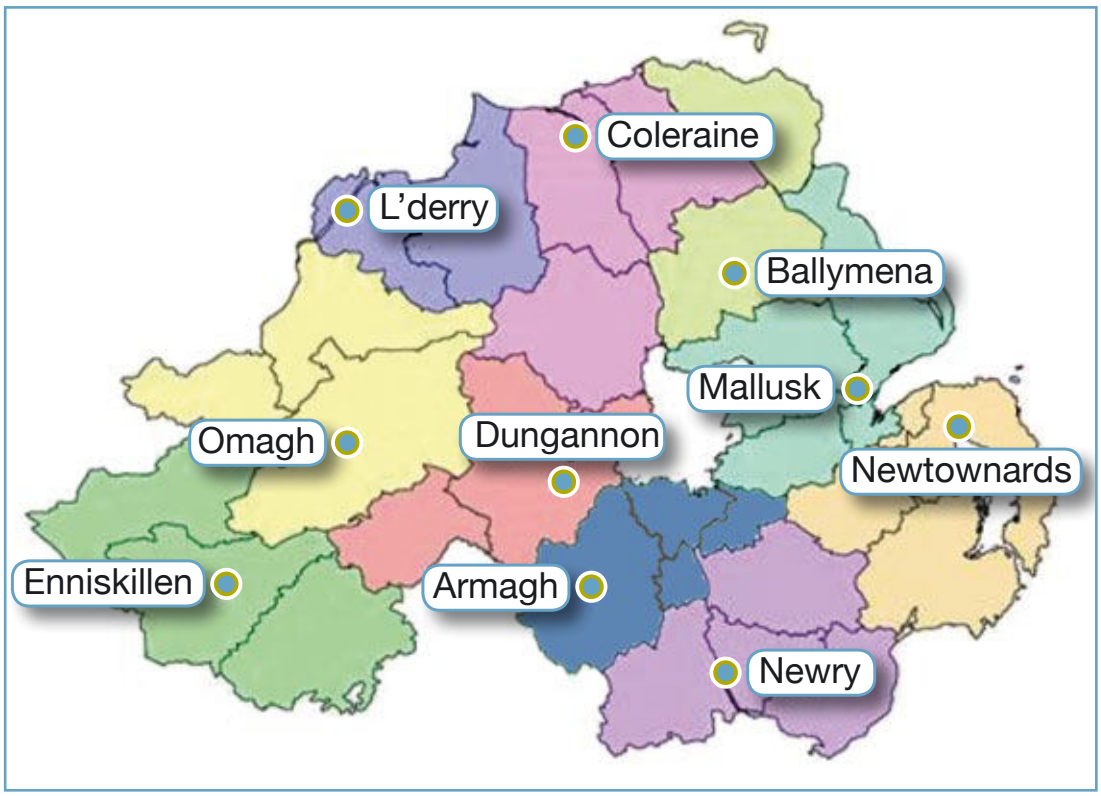


Figure 2: Divisional Veterinary Office (DVO) Locations and Areas Covered



5. The bTB Eradication Programme

DAERA has an EU Commission approved bTB eradication Programme, ensuring compliance with the EU Trade Directive 64/432/EEC (as amended). Importantly, Programme controls reduce the risk of spread to humans and clinical disease in cattle. EU approval of our bTB eradication Programme is vital in safeguarding our export-dependent livestock, and livestock products, industry (worth in excess of £1,000 million per annum). Through the implementation and delivery of the Programme, over 90% of our 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 2015 is available at 2015 Eradication Plan for Bovine Tuberculosis United Kingdom.

> "...Through the implementation and delivery of the Programme, over 90% of our herds are free to access international markets at any one time..."

5.1 In June 2015 the Programme was audited by the Commission's Food and Veterinary Office (FVO) to assess the level of implementation of the approved Eradication Programme. The FVO identified a number of strengths as well as some factors holding back the progress in the eradication of the disease and work to implement the FVO recommendations started immediately. The Audit report and the action plan arising from it can be found at FVO 2015 Report.

5.2 This 2015 Annual Report is based around the key disease control components of the Programme. It describes them, quantifies their delivery and the resultant outcomes. The key components are:

- Disease surveillance;
- Removal of reactor animals;
- Veterinary risk assessment and application of appropriate disease controls.

5.4 Disease Surveillance

Our disease surveillance is based on two distinct elements:

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

All animals slaughtered for human consumption are subject to PME, primarily for public health assurance. This looks 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 carcase or the entire carcase 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 bTB

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 within the cattle population as they represent an important independent sampling system outside live animal surveillance.

5.4.2 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 they are also skin test positive

5.5 Removal of Reactor Animals

5.5.1 Disclosure of disease as described in section 5.4.2, 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 2015, this target was met for 96% of reactors.

5.5.2 Reactor animals, compulsorily removed by DAERA, are subject to PME, which along with further laboratory diagnostic work on samples, provides further information to the Programme.

A crucial point to emphasise is that the 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 that may precede development of visible lesions therefore infected and reactive animals may not have had time to form a lesion, or the lesion may not have been visible to the inspector conducting the post-mortem.

> "...the absence of visible lesions at slaughter does not mean that the animal was not infected..."

5.5.3 The Programme includes the use of *M. bovis* strain typing, a high-resolution DNA fingerprinting method, which allows the identification of genetically distinct *M. bovis* strains. Currently, all visibly lesioned reactors are cultured in addition to animals cultured for statutory confirmation of disease and, when *M. bovis* is isolated, it is strain typed by AFBI. 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 28 page 43). 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.

5.6 Veterinary Risk Assessment and Application of Disease Controls

5.6.1 Controls are applied as soon as the disease is suspected. Their purpose is to prevent spread from the breakdown herd, to indicate 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 they 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. This is to

prevent disease spread to other herds. In conducting the risk assessment the VO:

1) considers which herds the infected animals came from, or passed through, before they entered the breakdown herd;

2) checks what animals have moved from the breakdown herd between the estimated date of infection and the date restrictions were applied, and

3) investigates possible direct and indirect contacts with livestock in other herds.

5.6.2 Cattle herds that are considered to be at increased risk of infection are subject to additional testing. This may be because their animals have been in close proximity to animals in the breakdown herd e.g. grazing in neighbouring fields, or because animals from the breakdown herd had moved into the herd before the breakdown was detected or because 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 levels of disease risk have a direct influence on the volume of testing that is required to control the disease.

5.6.3 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.

5.7 Measuring Disease Levels

We use different measures to monitor levels of disease.

5.7.1 The primary one is a calculation of bTB incidence. It is used both at herd level and at animal level. In our routine statistics we use the 12 month moving average data because they give the clearest indication of long term trends.

5.7.2 There is a continuum of infection levels across Northern Ireland. Although there are no defined regional differences, certain DVO areas tend to have higher levels of the disease and others tend towards a lower incidence. 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. Disease levels therefore fluctuate locally and, if there is significant spread, a rise may be observed locally or further afield. In this situation the Programme controls are, essentially, those previously described but their intensity and the scale of their application can be adjusted to match the existing disease risk.

5.7.3 Controls can be applied on an area risk basis, rather than on an individual farm basis. In the face of increasing levels of disease the sensitivity of the skin test can be increased by the wider application of a more severe interpretation of test readings and additional exposed animals can be removed, as partial or complete herd depopulations, whether or not they have given a positive response to the skin test. 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 the removal of infected and exposed animals at an early stage reduces the potential for spread and subsequently results in a reduction in disease levels.

6. 2015 Disease Summary

6.1 During 2015 approximately 1.65 million cattle were bTB tested in NI, in 23,980 herds. There was an increase in the annual herd incidence to 7.15%, and an increase in the annual animal incidence to 0.66%. (compared 6.03% and 0.55%, respectively during 2014).

6.2 At herd level, increased bTB incidence was observed in 9 of the 10 DVO areas, and only 2 DVO areas showed a decrease in animal level incidence.

6.3 The number of bTB skin test reactor animals identified during 2015 (11,004) was 24.5% higher than the number identified during 2014 (8,838).

6.4 The number of confirmed bTB positive Lesion at Routine Slaughter animals (LRS) increased in 2015 by 26.3% compared with 2014 (870 compared with 689). This figure does not include animals imported to NI directly for slaughter.

6.5 There was a 3.2% decrease in the number of animals that were positive to IFNG compared with 2014 (1,222 compared with 1,262). There was a 14.1% decrease in the number of IFNG positive, skin test non positive cattle relative to 2014 (902 compared with 1,050).

6.6 The number of new bTB herd breakdowns was 20.8% higher compared to 2014 (1,688 compared with 1,397).

7. Disease Levels

Historic Trends (Updated for 2015)

7.1 Looking at the annual bTB herd incidence (i.e. the incidence for each calendar year (**FIGURE 3**)), there was a rising trend in disease levels through the mid to late 1990s which continued into the early 2000s. The annual herd incidence in 1995 was 4.07%, and it rose to 9.92% in 2002 after which it fell 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 took place in 2011 and this continued until 2012 when the annual herd incidence reached 7.34%. In 2015, the annual bTB herd incidence was 7.15%, a rise of 1.12% from 2014 (6.03%). The annual animal bTB incidence in 2015 was 0.66%, an increase of 0.11% from 2014 (0.55%).

Figure 3: bTB herd and animal incidence from 1995 to 2015

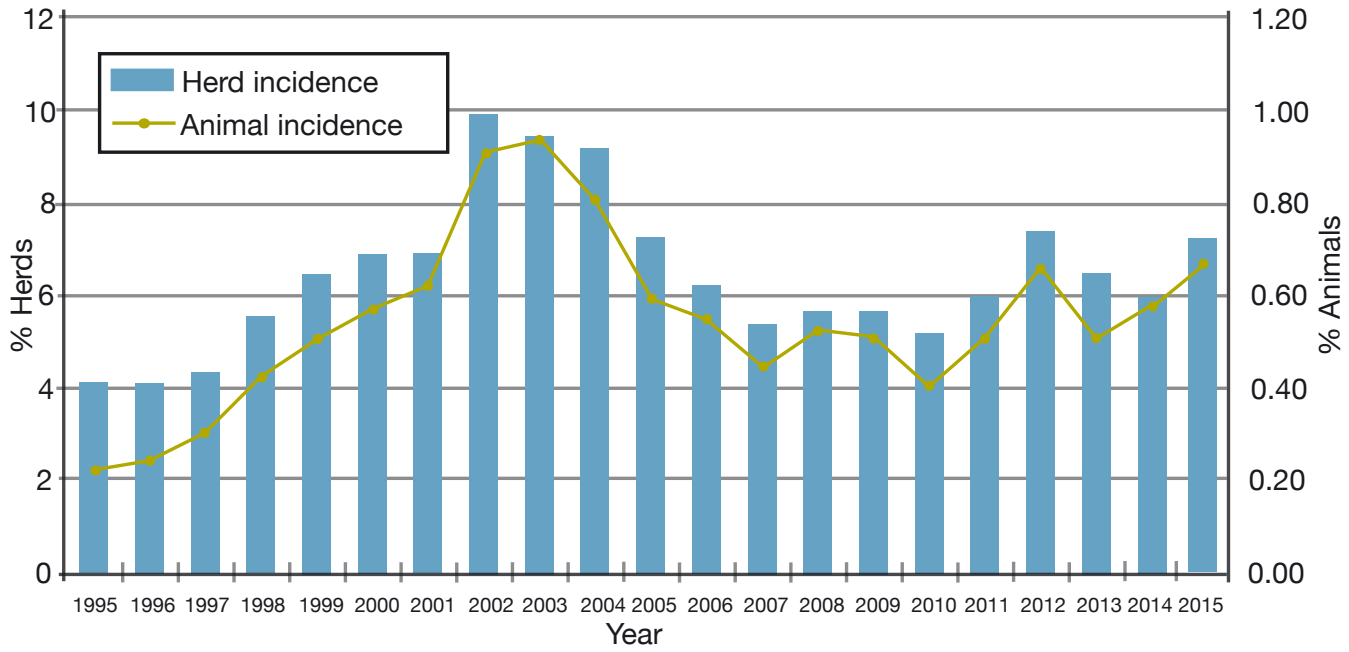
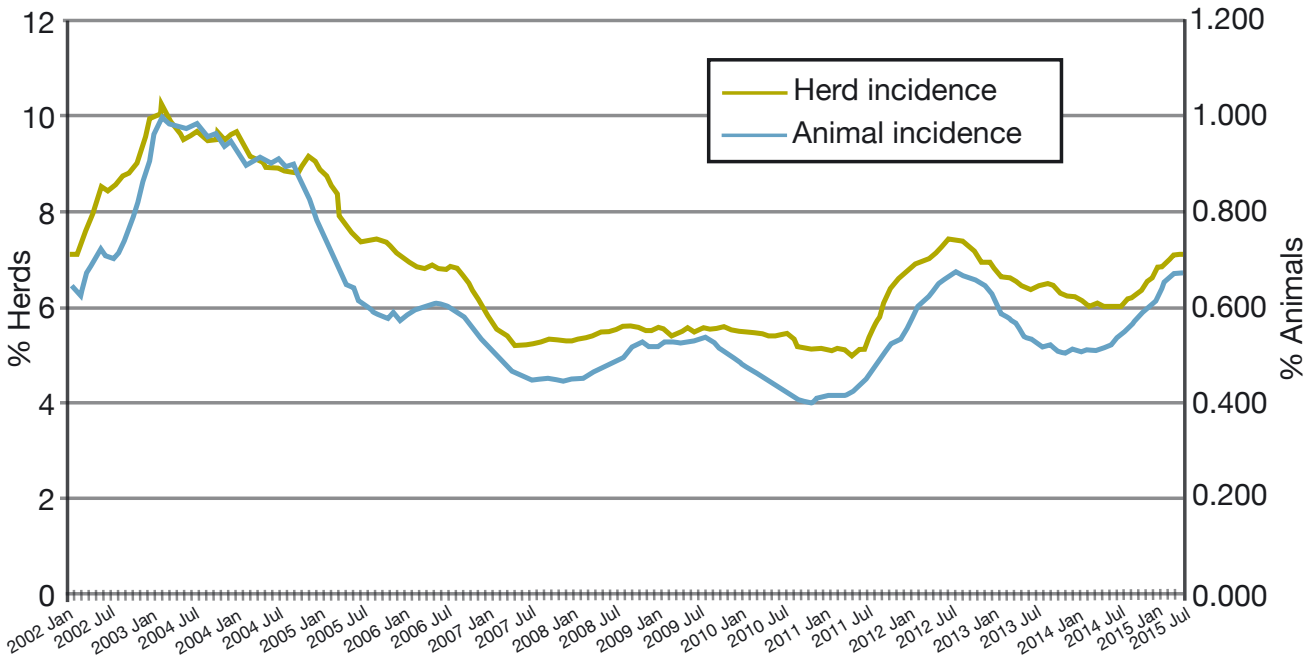


Figure 4 provides more detail of the monthly rises and falls in incidence levels throughout the years. A peak in herd incidence of 10.21% occurred in February 2003. In August 2011, the 12 month bTB herd incidence was 4.99% and after this it started to rise, reaching its latest peak of 7.46% in October 2012. The downward trend that followed that peak started to level out at the end of 2014 and then there was a steady rise in herd incidence which levelled off towards the end of the year. The animal incidence has also followed this pattern although its rise started earlier.

Figure 4: 12 Month Moving Average bTB Herd and Animal Incidence from January 2002 to December 2015



2015 Herd Incidence

7.2 As mentioned previously, the herd incidence for 2015 was 7.15% and an increase was observed in 9 of the 10 DVO areas. Ballymena DVO area, which had the highest incidence in 2013, continued its downward trend, and now has the second lowest incidence. Armagh, Dungannon and Londonderry DVO areas showed the most significant increases in herd incidence levels (**Figures 5 & 6, Tables 1 & 2**). Londonderry DVO area is normally one of the lowest incidence areas but its incidence almost doubled in 2015 due to a cluster of outbreaks in the Magilligan area. The incidence in Coleraine DVO area has risen steadily over the last few years with infection currently focused in the Aghadowey area.

In the last quarter of 2015, the herd incidence started to fall in Coleraine DVO area, and levelled off in Londonderry DVO area, but given the level of infection, particularly in Coleraine DVO area, it will be some time before we can be sure that the trend has reversed.

Figure 5: Annual bTB Herd Incidence by DVO Area (Northern Region)

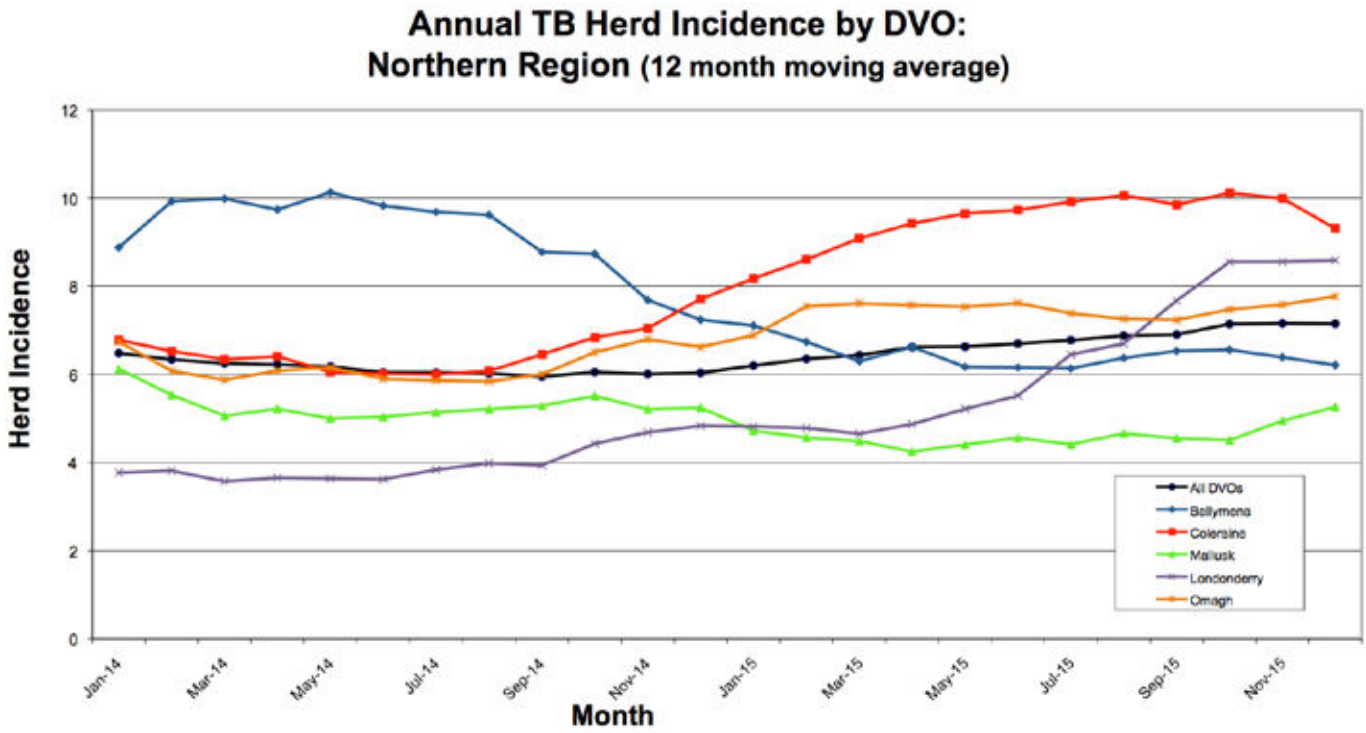


Table 1: Annual bTB Herd Incidence by DVO Area (Northern Region) 2014 and 2015

Herd incidence	N. Ireland	Ballymena	Coleraine	Mallusk	L'derry	Omagh
2015	7.15	6.21	9.31	5.26	8.59	7.77
2014	6.03	7.24	7.71	5.24	4.83	6.62
Difference	1.12	-1.03	1.60	0.02	3.76	1.15
% Change	19	-14	21	0.4	78	17

Figure 6: Annual bTB Herd Incidence by DVO Area (Southern Region) 2014 and 2015

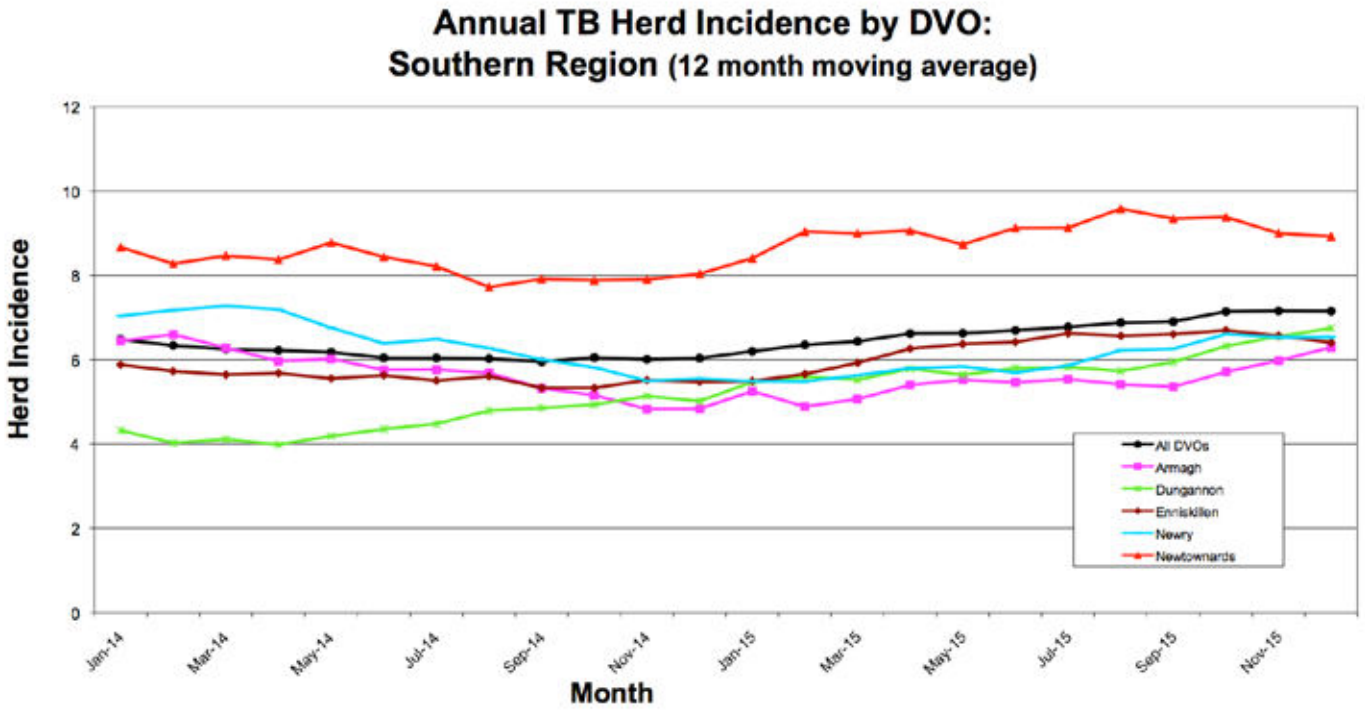


Table 2: Annual bTB Incidence by DVO Area (Southern Region) 2014 and 2015

Herd incidence	N. Ireland	Armagh	Dungannon	Enniskillen	Newry	Newtownards
2015	7.15	6.29	6.75	6.41	6.54	8.92
2014	6.03	4.84	5.02	5.48	5.55	8.03
Difference	1.12	1.46	1.73	0.93	0.99	0.89
% Change	19	30	34	17	18	11

Animal Incidence

7.3 The annual animal incidence increased to 0.66% in 2015, following a rising trend throughout the year until levelling off towards the end of the year.

7.4 All DVO areas except Ballymena and Enniskillen showed an increase in animal incidence over 2015. The highest proportional increases were in Dungannon and Mallusk. Newtownards, Newry and Omagh had the highest animal incidence in 2015 (**FIGURES 7 & 8, Tables 3 & 4**). Mallusk still had the lowest animal incidence despite having the highest proportional increase in animal incidence.

Figure 7: Annual bTB Animal Incidence by DVO Area (Northern Region) 2014 and 2015

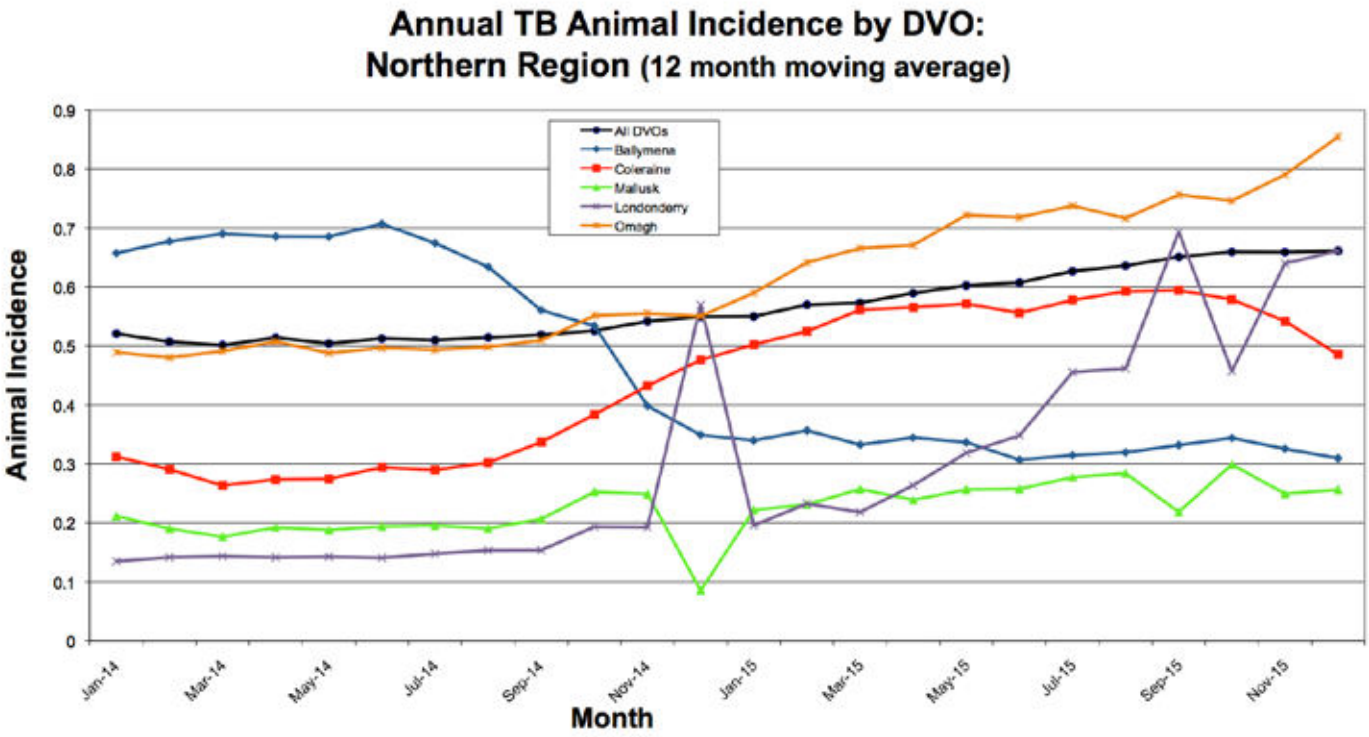


Table 3: Annual bTB Animal Incidence by DVO Area (Northern Region) 2014 and 2015

Herd incidence	N. Ireland	Ballymena	Coleraine	Mallusk	L'derry	Omagh
2015	0.66	0.31	0.49	0.26	0.66	0.85
2014	0.55	0.35	0.48	0.09	0.57	0.55
Difference	0.11	-0.04	0.01	0.17	0.09	0.3
% Change	20	-11	2	200	16	55

Figure 8: Annual bTB Animal Incidence by DVO Area (Southern Region) 2014 and 2015

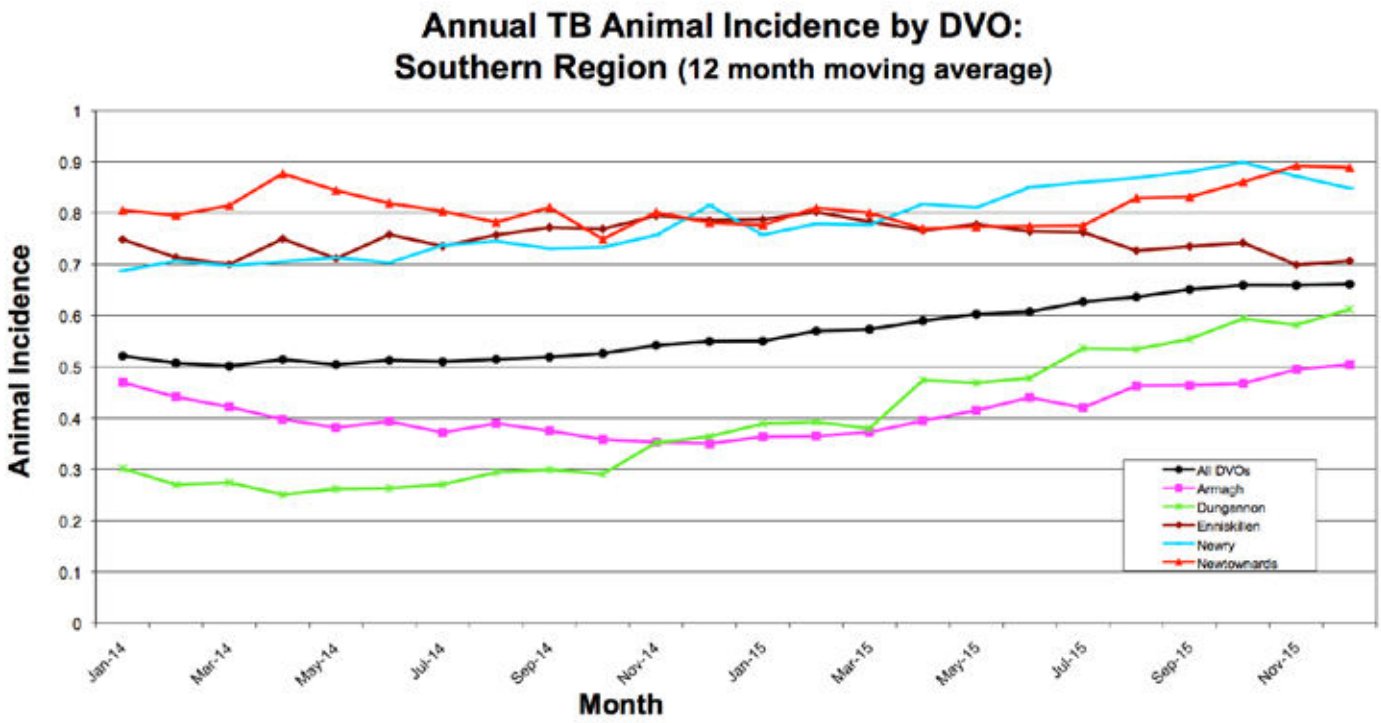


Table 4: Annual bTB Animal Incidence by DVO Area (Southern Region) 2014 and 2015

Herd incidence	N. Ireland	Armagh	Dungannon	Enniskillen	Newry	Newtownards
2015	0.66	0.5	0.61	0.71	0.85	0.89
2014	0.55	0.35	0.36	0.79	0.82	0.78
Difference	0.11	0.15	0.25	-0.08	0.03	0.11
% Change	20	44	68	-10	4	14

8. Surveillance Outputs

Post Mortem Examination (PME)

8.1 There were a total of 413,383 cattle slaughtered in NI during 2015 of which 1,459 (0.35%) were found to have Lesions at Routine Slaughter (LRS) from which samples were submitted for further laboratory examination. (**TABLE 5**) below shows the overall figures for cattle slaughtered during 2014 and 2015 with and without animals that were imported for direct slaughter. These 'direct imports' were not resident in NI herds, and therefore did not contribute to our disease profile. During 2015, a further 26 LRS were identified in cattle exported from NI to Great Britain or the Republic of Ireland (ROI) directly to slaughter (36 during 2014).

Table 5: Numbers of Cattle Slaughtered and Numbers of LRS (Confirmed and unconfirmed) for 2014 and 2015

Year	Animals slaughtered	LRS (Number per 1000 animals slaughtered)	Animals slaughtered excluding direct imports	LRS excluding direct imports (Number per 1000 animals slaughtered)
2014	418,044	1,088 (2.60)	387,053	1,044 (2.70)
2015	413,383	1,459 (3.53)	383,544	1,362 (3.55)

Skin Test - Herd Level Tests

8.2 The number of herds that completed a herd test in 2015 was 23,980. A total of 34,110 herd tests were carried out in 2015 compared with 32,164 in 2014 (**TABLE 6**), an increase of 6.0%. There were more herd tests than herds because a proportion of herds were tested more than once during the year.

Table 6: bTB Herd Tests Completed 2014 - 2015 (By Test Category)

Herd Test Reason	Herd tests completed in 2014	Herd tests completed in 2015	% Difference in test numbers between 2014 and 2015 (%)
Restricted	5,494	6,391	16.3
Risk	10,199	11,506	12.8
Routine	16,471	16,213	-1.6
Total herd tests	32,164	34,110	6.0

8.3 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 the area (see **TABLE 7** and **FIGURES 9 and 10** 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, Mallusk and Ballymena DVO areas have the lowest numbers.

Table 7: Number of bTB Herd Tests in 2015 (per category by DVO area)

DVO	Routine Tests	Restricted Tests	Risk Tests	Total Tests
Armagh	1,567	573	1,126	3,266
Ballymena	980	354	612	1,946
Coleraine	1,729	942	1,309	3,980
Dungannon	2,165	679	1,065	3,909
Enniskillen	1,996	705	1,861	4,562
Mallusk	1,320	355	439	2,114
L'Derry	709	214	258	1,181
Newry	2,544	973	1,931	5,448
Newtownards	1,129	754	1,315	3,198
Omagh	2,074	842	1,590	4,506
Total	16,213	6,391	11,506	34,110

Figure 9: Percentage of the NI Total bTB Herd Tests Completed by DVO Area in 2014 - 2015

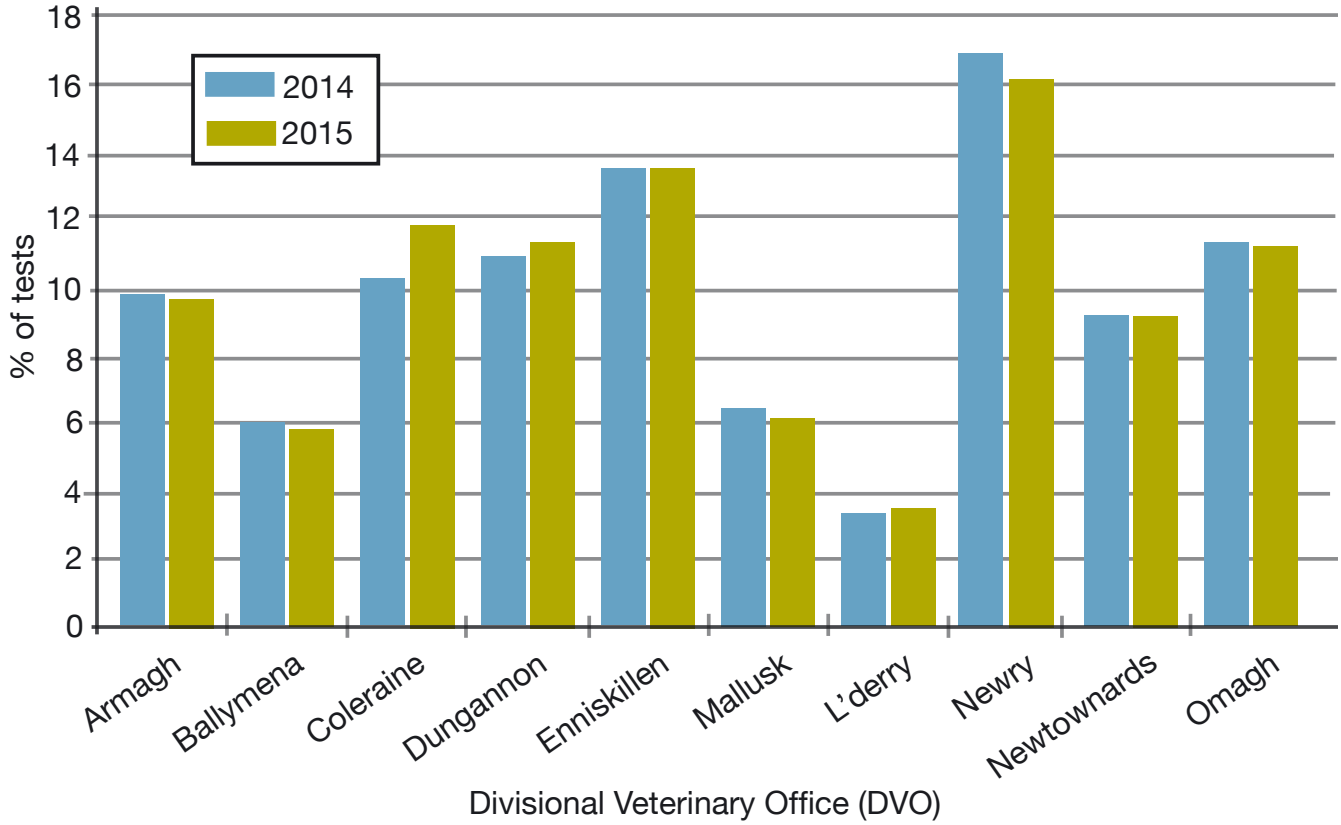
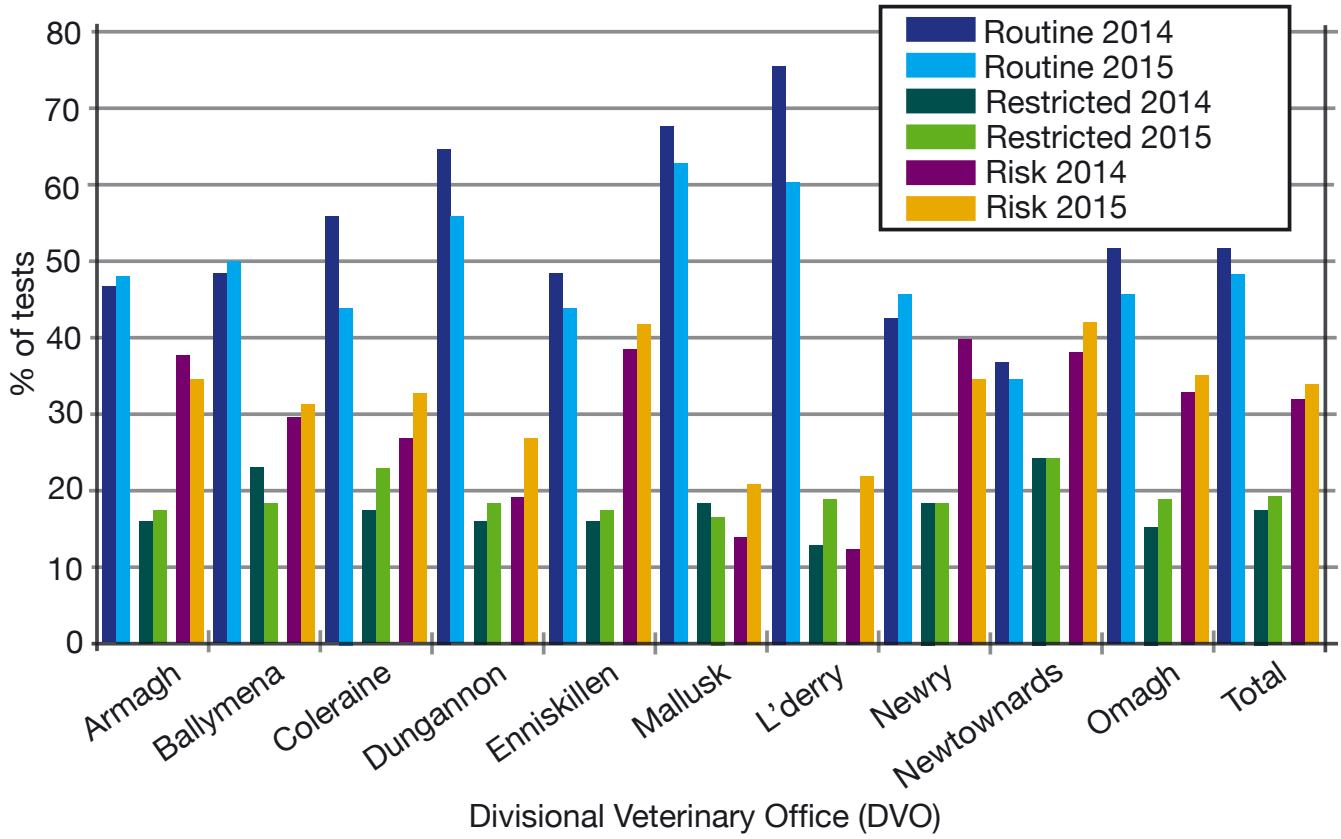


Figure 10: Percentage of bTB Herd Test Categories within each DVO Area in 2014 and 2015



8.4 Overall there was an 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 **TABLE A** in **ANNEX**.

Skin Test - Individual Animal Level Risk Tests

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 8**). 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.

The overall number of individual risk animal tests (CTTs, CTS, CTQs and RIs) completed in 2015 was 9,610, compared with 8,414 in 2014, an increase of 14.2%.

Table 8: Individual Animal Level Risk bTB Tests completed in 2014 – 2015

Test reason *	Tests completed during 2014 (cattle >0)	Tests completed during 2015 (cattle >0)	Difference between years 2014 & 2015 (%)
Inconclusive retest (RI)	1,798	1,753	-2.5
Check Test Trace (CTT)	5,449	6,407	17.6
Check Test Query(CTQ)	761	1,051	38.1
Check Test Status(CTS)	406	399	-1.7
Total	8,414	9,610	14.2

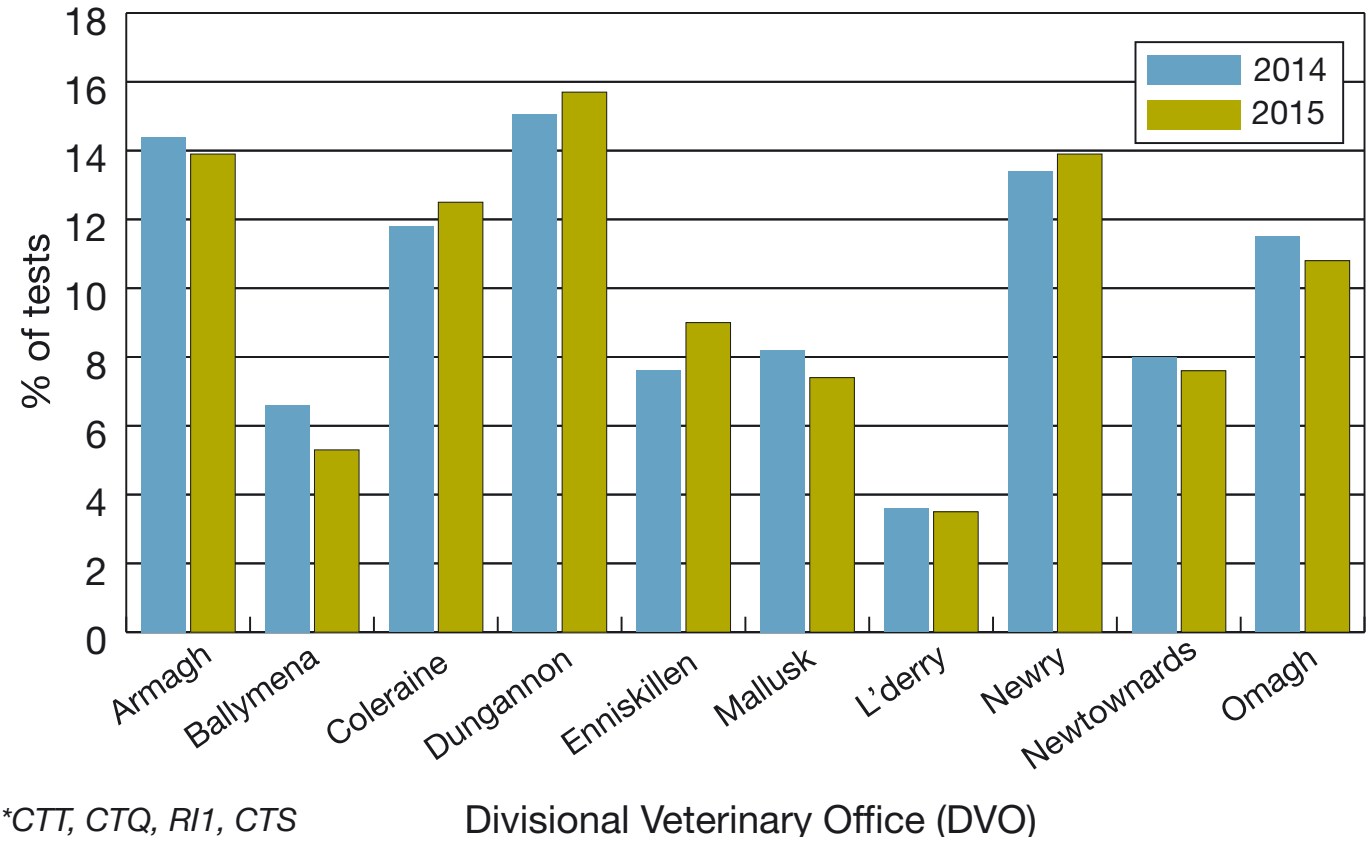
*Description of the test reasons can be found in the glossary.

8.5 The number of individual animal level risk tests in each DVO area (see **TABLE 9** and **FIGURE 11** on page 25 and **TABLE B** in the 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 tested in this DVO area which may be an indication of the pattern of movement of animals into, and within, this area from higher incidence areas.

Table 9: Number of Individual Animal Level Risk Tests in each DVO area in 2015

DVO	CTQ	CTS	CTT	RI	Total
Armagh	148	60	951	205	1,364
Ballymena	51	7	327	143	528
Coleraine	114	36	753	299	1,202
Dungannon	165	63	1,063	217	1,508
Enniskillen	85	58	546	188	877
Mallusk	76	52	463	125	716
L'Derry	43	9	240	48	340
Newry	168	50	932	187	1,337
Newtownards	76	25	467	141	709
Omagh	125	39	665	200	1,029
Total	1,051	399	6,407	1,753	9,610

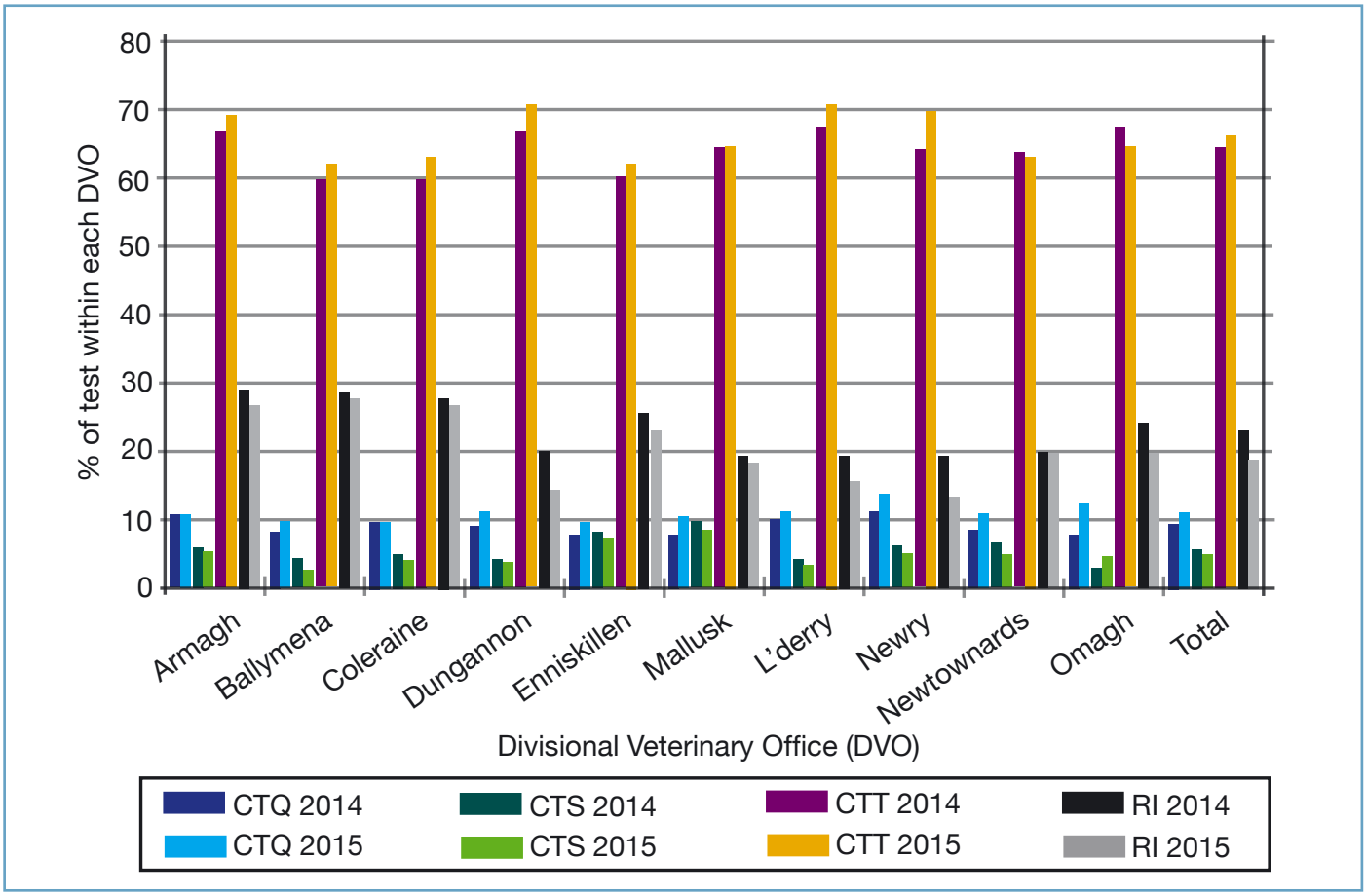
Figure 11: Percentage of Individual Animal Level Risk bTB Tests* Completed in NI 2014-2015 (by DVO area)



*CTT, CTQ, RI1, CTS

8.6 The increase in the number of individual risk animal tests was due to a marked increase in the number of tracing tests (CTT and CTQ) in all DVO areas due to the increased number of new herd breakdowns requiring forward tracing.

Figure 12: The Percentage contribution by test reason of Individual Animal Level Risk bTB Tests within each DVO area in 2014 and 2015



Skin Test - Animals Tested

8.7 The total number of animal tests during 2015 was 2,322,451, which represents a 6.8% decrease compared with 2014 (**TABLE 10**). The number of animals tested was 1,652,601, a 2.8% increase on the previous year. 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 within the same year. The pattern of testing (**TABLES 10 and 11**) 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.

Table 10: Total Animals Tested for bTB and Total Animal Tests* in Herd Tests (2014 - 2015)

Test Category	2014	2015	Difference 2014 v 2015 (%)
Total animal tests	2,491,111	2,322,451	-6.78
Total animals tested*	1,607,823	1,652,601	2.8
Total animals with a restricted herd test	462,545	515,064	11.3
Total animals with a risk herd test	637,662	735,498	15.3
Total animals with routine herd test	507,616	402,039	-20.8

* Excluding private individual tests.

Table 11: Number of Animals bTB Tested in Individual Animal Level Risk Tests (2014 - 2015)

Test Reason	2014	2015	Difference 2014 v 2015 (%)
Check Test Trace (CTT)	9,659	11,575	20
Check Test Status (CTS)	1,190	1,085	-9
Check Test Query (CTQ)	1,701	2,008	18
Inconclusive retest (RI)	3,098	3,081	-1
Total	15,648	17,749	13

Interferon Gamma Blood Testing

8.8 Since July 2004, IFNG has been used in bTB breakdowns, where certain criteria for selection are met, with the purpose of identifying, and thereby providing the opportunity to remove, infected animals that have not been identified by the skin test.

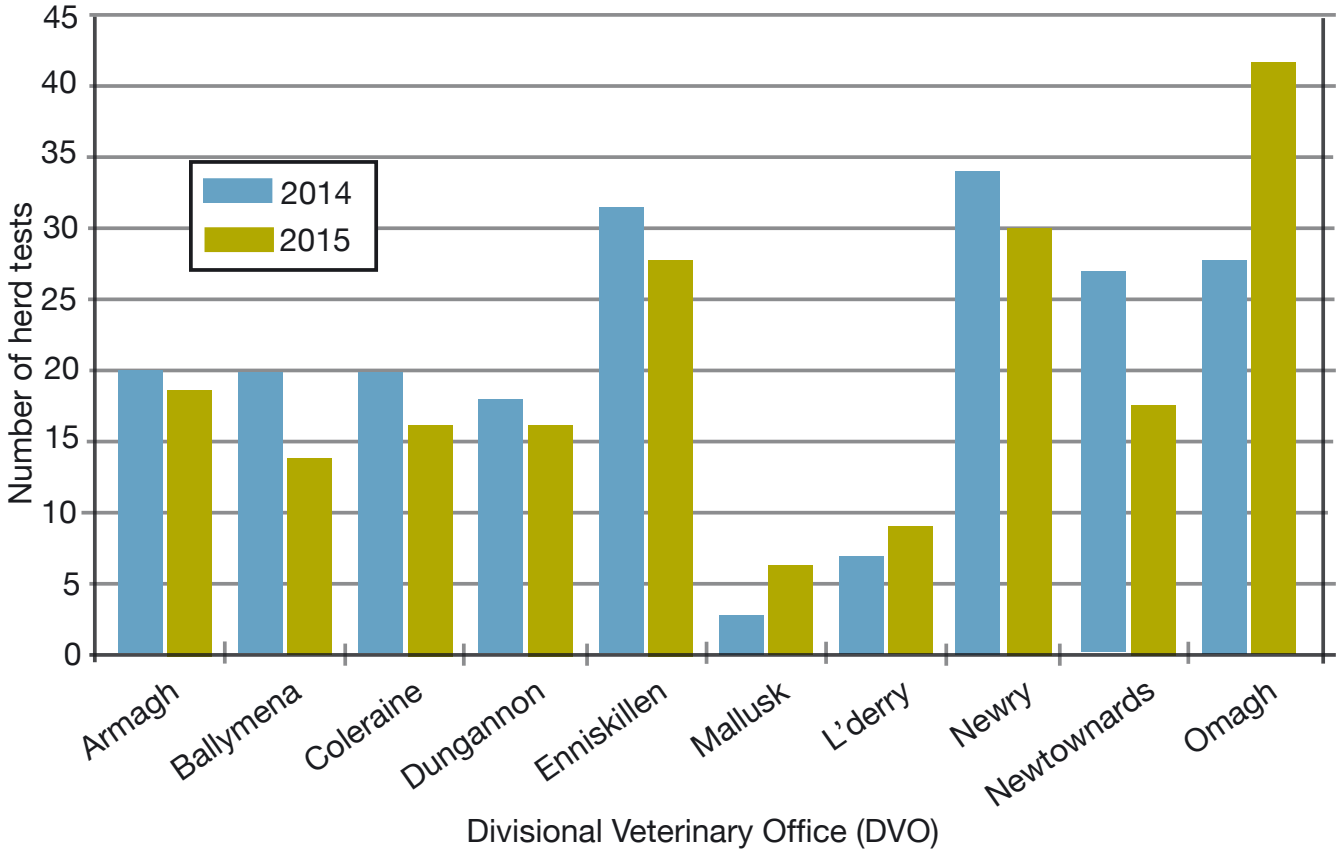
8.9 The number of IFNG samples taken during the year is dependent on the disease levels, the number and the size of eligible herds and resource availability. There were fewer herds and fewer animals tested using IFNG in 2015 compared with the previous year (**TABLE 12**).

Table 12: IFNG Tests and Animals Tested (2014 - 2015)

	2014	2015	% difference 2014 v 2015
N° of Herds IFNG Tested	184	177	-3.8%
N° of IFNG Herd Tests	208	198	-4.8%
N° of animals IFNG tested	16,991	15,873	-6.6%

8.10 The number of herds tested using IFNG by DVO area is shown in **FIGURE 13**. IFNG is a complex and expensive test and the high cost and strict sampling conditions limit the number of animals which can be tested.

Figure 13: Numbers of Herd Tests with an IFNG Test 2014-2015 (by DVO area)



9. Surveillance Outcomes

PME

9.1 In 2015, 1,362 animals were found with TB-like lesions at routine slaughter (this figure does not include animals imported for direct slaughter), 30.5% more than in 2014. Of these, 870 (63.9%) were confirmed as TB positive by histology and/or bacteriology (**TABLE 13**), a 26.3% increase on the previous year. The number of confirmed LRS animals per 1000 animals slaughtered (excluding direct slaughter imports) increased by 27.4%.

In 2015, 590 herds were restricted as a result of finding TB-like lesions at routine slaughter, compared to 467 herds in 2014. (This includes cases where laboratory testing provided an alternative diagnosis e.g. actinobacillosis).

In 2015, 359 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 315 TB breakdowns in 2014

During 2015, in 207 herds a TB-like lesion at routine slaughter triggered a breakdown where 1 or more reactor animals were disclosed at the resulting skin test. 176 herds were similarly affected in 2014.

The figures indicate that underlying disease levels have risen along with live animal surveillance incidence rates. In other words the increased disease detection at live animal surveillance is not simply an outcome of improved surveillance; there has been a real increase in disease burden.

Table 13: Number of LRS Animals and Confirmed LRS* Animals in 2014 and 2015

Year	N° of LRS	N° of confirmed LRS (%)	N° of LRS excluding direct imports	N° of confirmed LRS excluding direct imports (%)	bTB confirmed LRS per 1000 animals slaughtered excluding direct imports (%)
2014	1,088	715 (65.7)	1,044	689 (66.0)	1.8
2015	1,459	935 (64.1)	1,362	870 (63.9)	2.3
% change 2014 v 2015	34.1	30.8	30.5	26.3	27.4

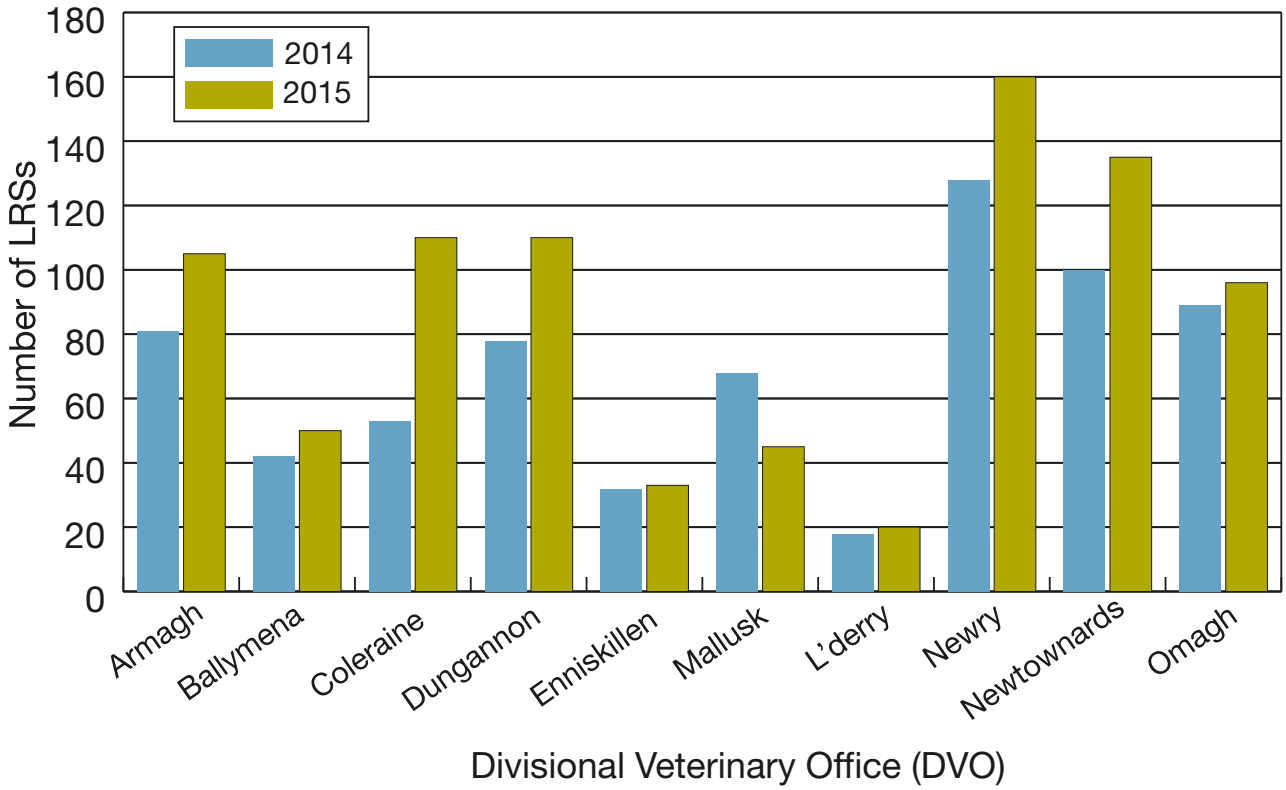
*Histology and/or bacteriology positive

9.2 The distribution of LRS animals across the 10 DVO areas is shown in **FIGURE 14**. The DVO area considered for each LRS is the one where the herd that presented the animal to slaughter is located. Newtownards was the DVO area with the highest bTB animal incidence during 2015 (0.89%) while Newry DVO the highest number of LRS (161). Enniskillen DVO area had relatively high bTB animal incidence (0.70%) but relatively low numbers of LRS (33), in direct contrast to the situation in Dungannon DVO area (0.61% animal incidence and 111 LRSs). This difference could be explained by both animal movements 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 7 & FIGURE 8**) and location of the presenting herd of the LRS (**FIGURE 14**).

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

- 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 3 years.

Figure 14: Number of Confirmed LRS by DVO area of Origin (2014 and 2015*)



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

Skin Test

9.3 In relation to the bTB skin test, there was a 24.4% increase in the number of bTB skin test reactors in 2015 compared with 2014; (**TABLE 14**).

Table 14: Total Number of bTB Reactors and Negative in Contacts (NICs) 2014 - 2015

Year	N° of reactors	N° of NICs	Total
2014	8,838	1,060	9,898
2015	11,004	755	11,759
% change 2014 v 2015	24.5	-28.8	18.8

9.4 The number of Negative-In-Contacts (NICs) decreased by 28.8% (**TABLE 14 and 15**).

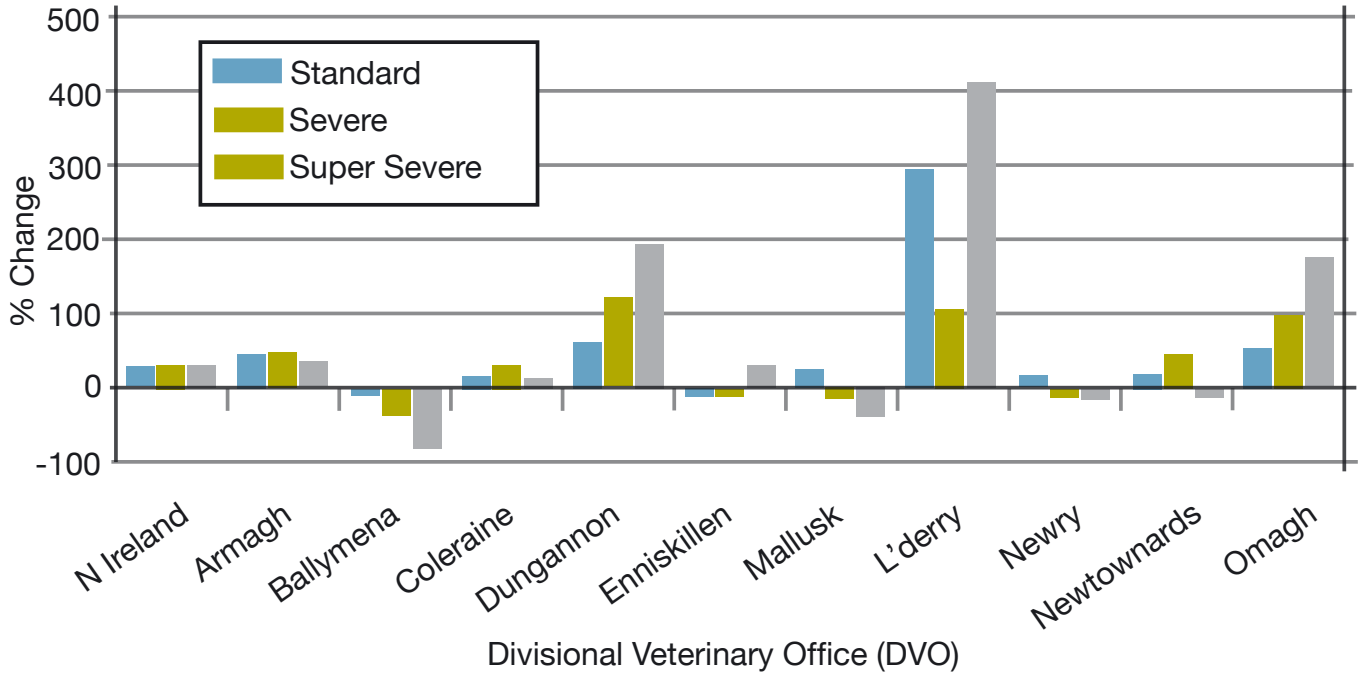
Table 15: Number of Negative in Contacts (NICS) in 2014 and 2015 (by DVO area)

	2014		2015	
	N. NICs	N. Herds	N. NICs	N. Herds
Armagh	40	8	59	14
Ballymena	10	3	10	7
Coleraine	100	20	23	10
Dungannon	227	7	62	5
Enniskillen	93	27	37	22
Mallusk	29	9	45	5
L'Derry	9	2	9	2
Newry	201	15	73	9
Newtownards	35	12	95	16
Omagh	316	47	342	41
Total	1060	150	755	131

9.5 Of the reactors, 82.2% were removed under standard interpretation of skin test results. The rest were removed using more rigorous interpretations of the skin test readings, called severe (12.3%) or super severe (5.5%) 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 reducing future risk. A VEU study reported that during a breakdown, animals that are positive on severe interpretation are 8 times more likely to subsequently become reactors than animals that tested negative in the same herd tests.

Dungannon and Londonderry DVO areas had the greatest percentage change in the proportions of reactors removed using severe and super severe interpretation, a reflection in the increase in disease levels in the two areas (**Figure 15**).

Figure 15: % change in interpretation of TB reactors in 2015 compared to 2014 by DVO



Reactors Disclosed in Herd Tests

9.6 The number of herd tests that disclosed at least one skin test reactor (positive herd test) increased by 22.3% in 2015 (See **TABLE 16**), with the highest numerical increase found at Restricted herd tests. There was an increase in the proportion of restricted herd tests (19.7% cf 18.3%) and a decrease in the proportion of risk herd tests (6.3 cf 6.6) and routine herd tests (2.3 cf 2.8) that disclosed at least one reactor.

Table 16: bTB Herd Tests with Reactors 2014-2015

Herd Test Category	2014 Herd tests with reactor(s)	2015 Herd tests with reactor(s)	Difference 2014 v 2015(%)
Restricted	1,003	1,257	25.3
Risk	641	761	18.8
Routine	377	453	20.2
Total herd tests with reactor disclosure	2,021	2,471	22.3

9.7 The DVO area that disclosed the highest proportion of all the positive herd tests in 2015 was Newry (**FIGURE 16**). Although Newtownards DVO area has the highest herd incidence there are fewer herds in the DVO area, therefore it contributes a lower proportion of the overall number of positive herd tests.

Figure 16: Percentage Contribution by each DVO area of all Herd Tests with Reactor(s) in NI, (2014 - 2015)

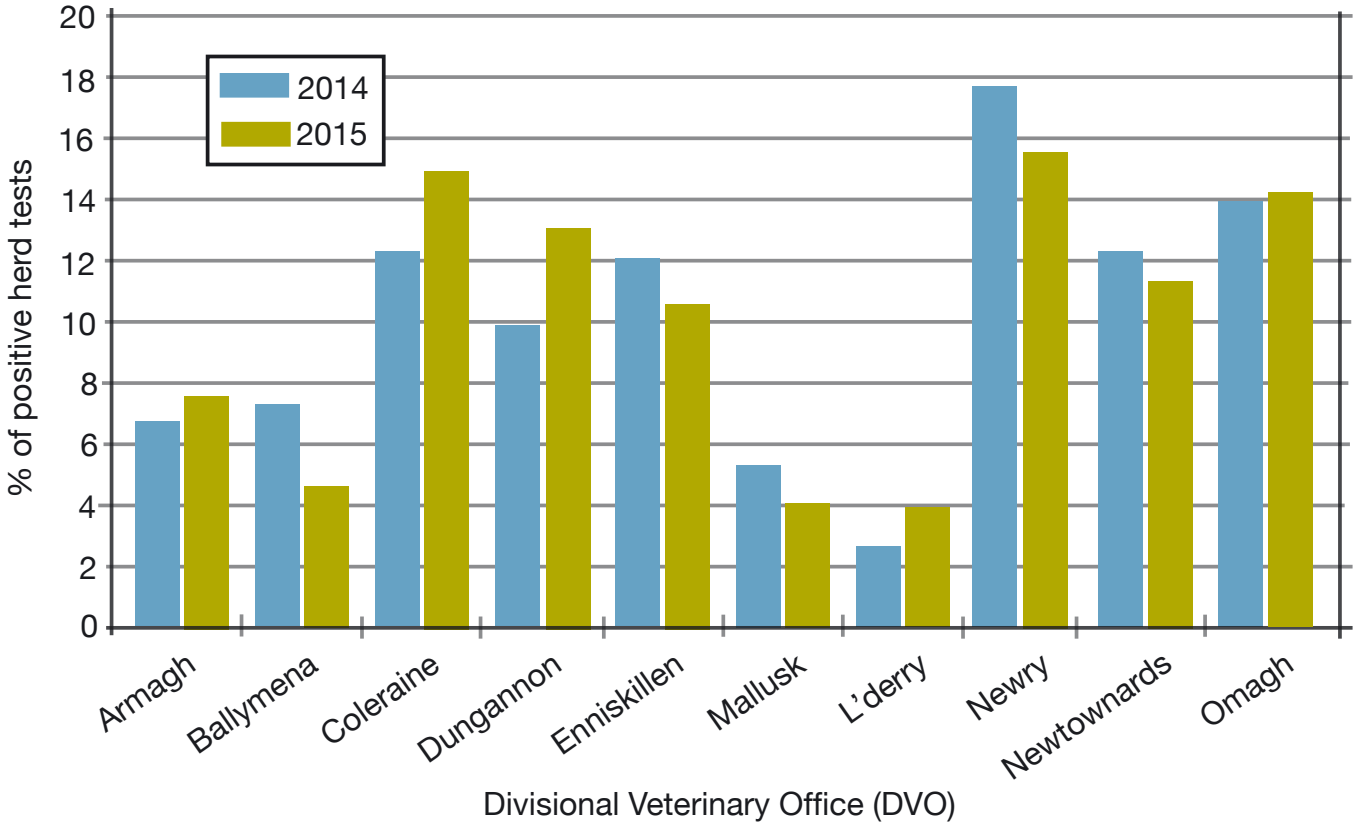


Figure 17 shows the percentage change in herd tests with reactors between 2014 and 2015 across the DVO areas with Londonderry showing the greatest increase. **Figure 18 and 19** show the moving average of the % of herds with reactors in the Northern and Southern Regions during 2014 and 2015.

Figure 17: % change of herd tests positive in 2015 compared to 2014 by DVO area

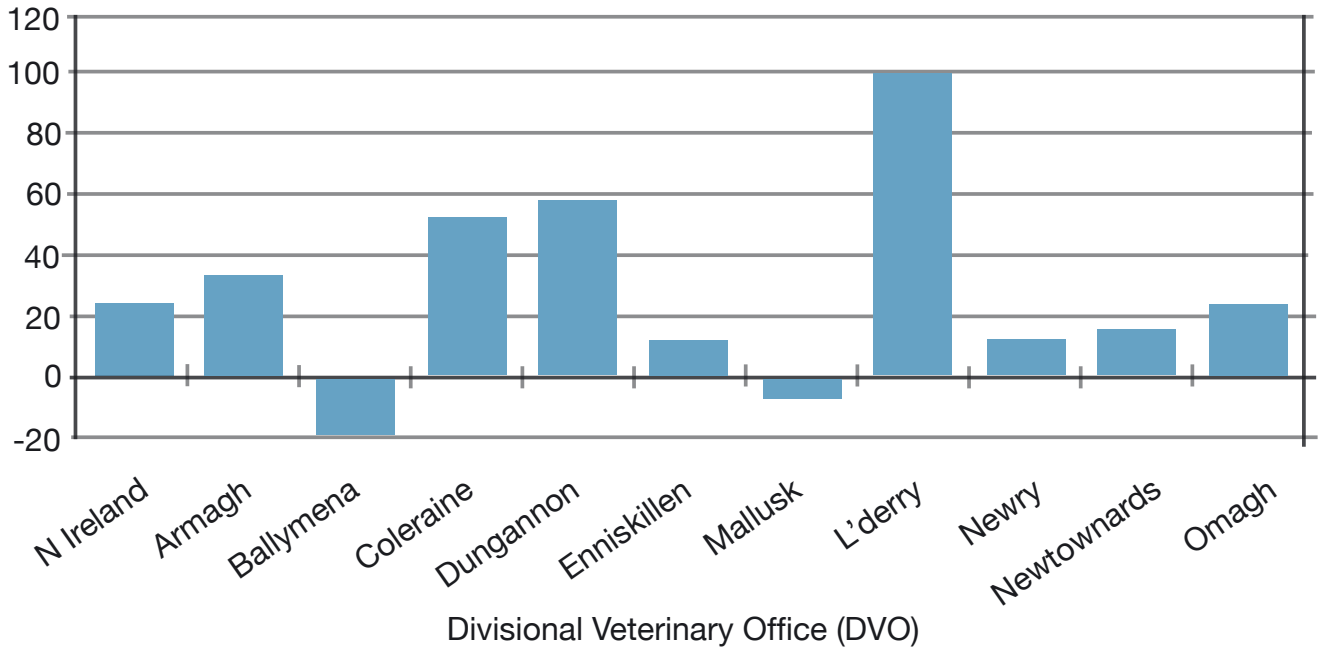


Figure 18: % change of herd tests positive in 2015 compared to 2014 by DVO area (Northern Region)

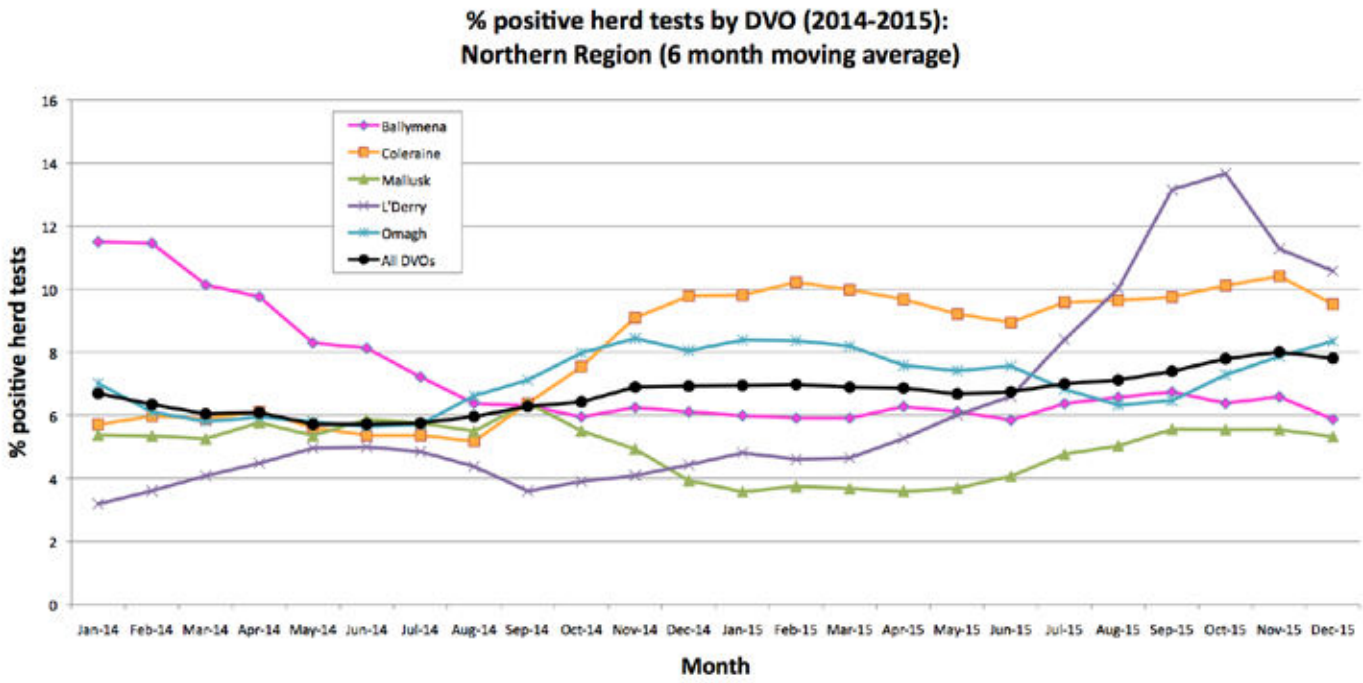
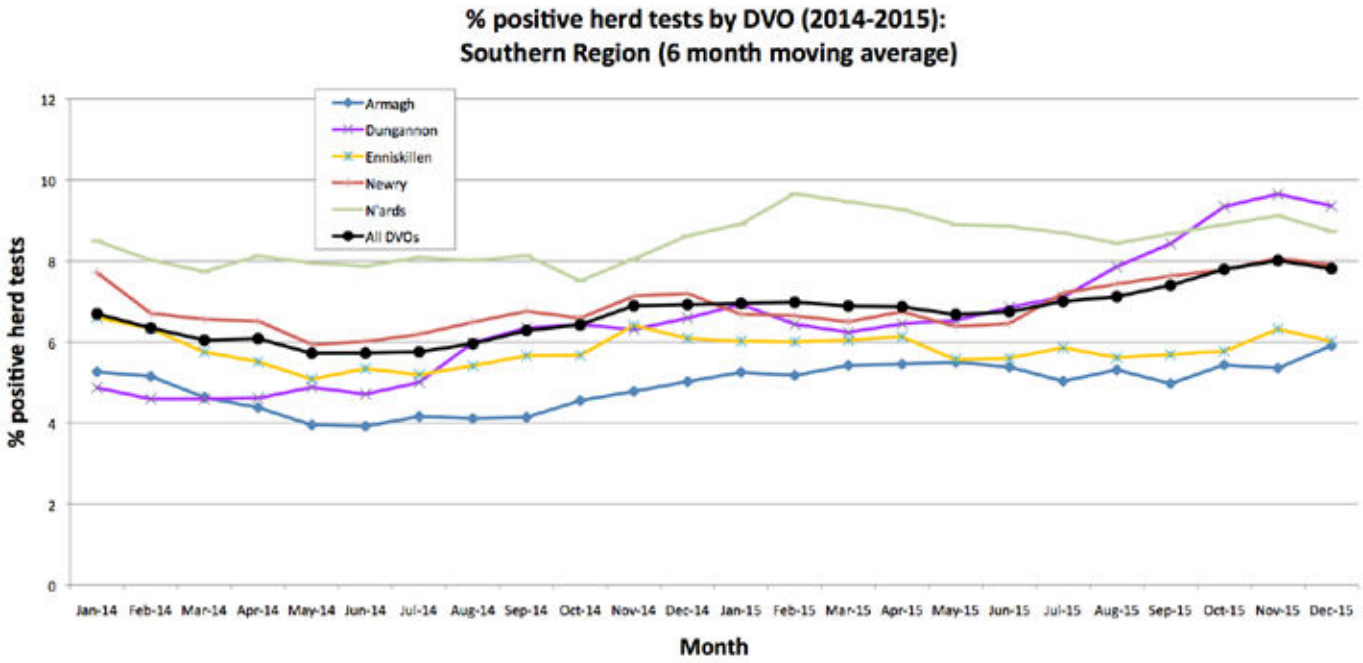
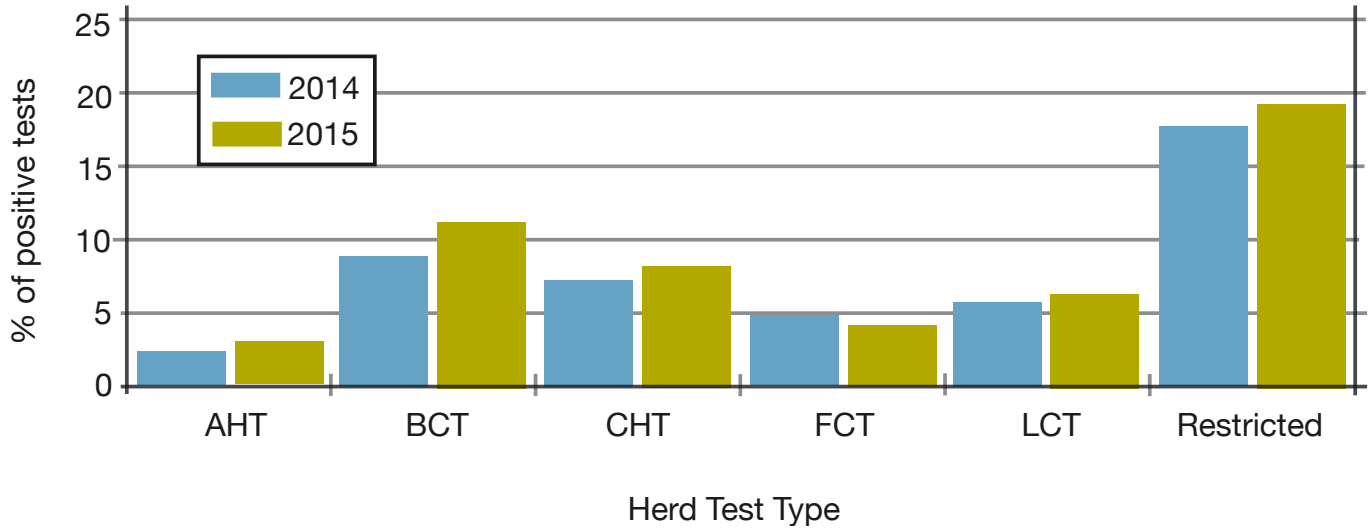


Figure 19: % change of herd tests positive in 2015 compared to 2014 by DVO area (Southern Region)



9.8 **Figure 20** shows the percentages of herd tests that disclosed reactor animal(s) for each test reason (see glossary for definitions). Compared with the rate detected in Annual Herd Tests (AHT), the lowest risk category of test, all of the other test reasons had a higher breakdown rate which supports the assessment that the herds were at a higher disease risk.

Figure 20: % of bTB herd tests with reactors by test reason for 2014 and 2015



Reactors Disclosed at Individual Animal Level Risk bTB Tests

9.9 In 2015 there was an increase of 23.4% (**Tables 17 and 18, Figures 21 and 22**) in the number of individual animal tests in which a reactor was disclosed (554 in 2015 against 449 in 2014). The proportion of tests that were positive also increased from 5.3% to 5.75%. Also, the number of reactors disclosed at Individual Animal tests (**Figures 23 and 24**) has increased by 36.8% (from 557 in 2014 to 762 in 2015, with the increase in disclosure at CTTs being the highest (69.3%) (**TABLE 18**). This shows that the tracing procedures lead to the earlier detection of infected animals based on epidemiological risk assessment. Overall, Coleraine DVO area contributed the largest proportion of positive individual animal risk tests, while Enniskillen DVO area had the highest increase in that proportion (**FIGURE 23**).

Table 17: 12 month comparison of the number of individual tests positive 2014-2015

Nr Individual tests Positive	N-Ireland
2015	554
2014	449
Difference	105
% Change	23.4

Table 18: Individual Animal Risk bTB Tests with Reactors 2014 and 2015 (by Test Reason)

Test Reason	2014	2015	% difference 2014 v 2015
Check Test Query(CTQ)	5	3	-40.0
Check Test Status (CTS)	11	13	18.2
Check Test Trace(CTT)	88	149	69.3
Inconclusive retest (RI1)	345	389	12.7
Totals	449	554	23.4

Figure 21: % positive individual tests by DVO area 2014-2015 Northern Region

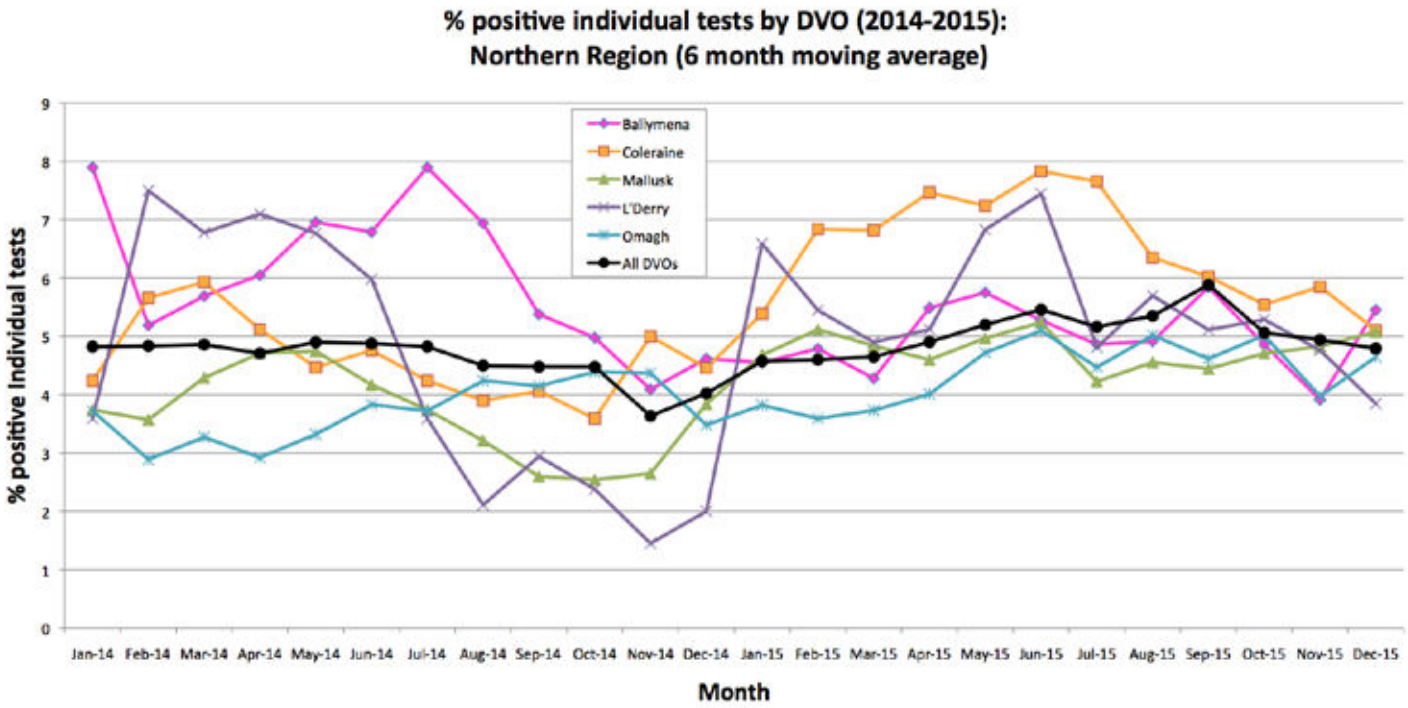


Figure 22: % positive individual tests by DVO area 2014-2015 Southern Region

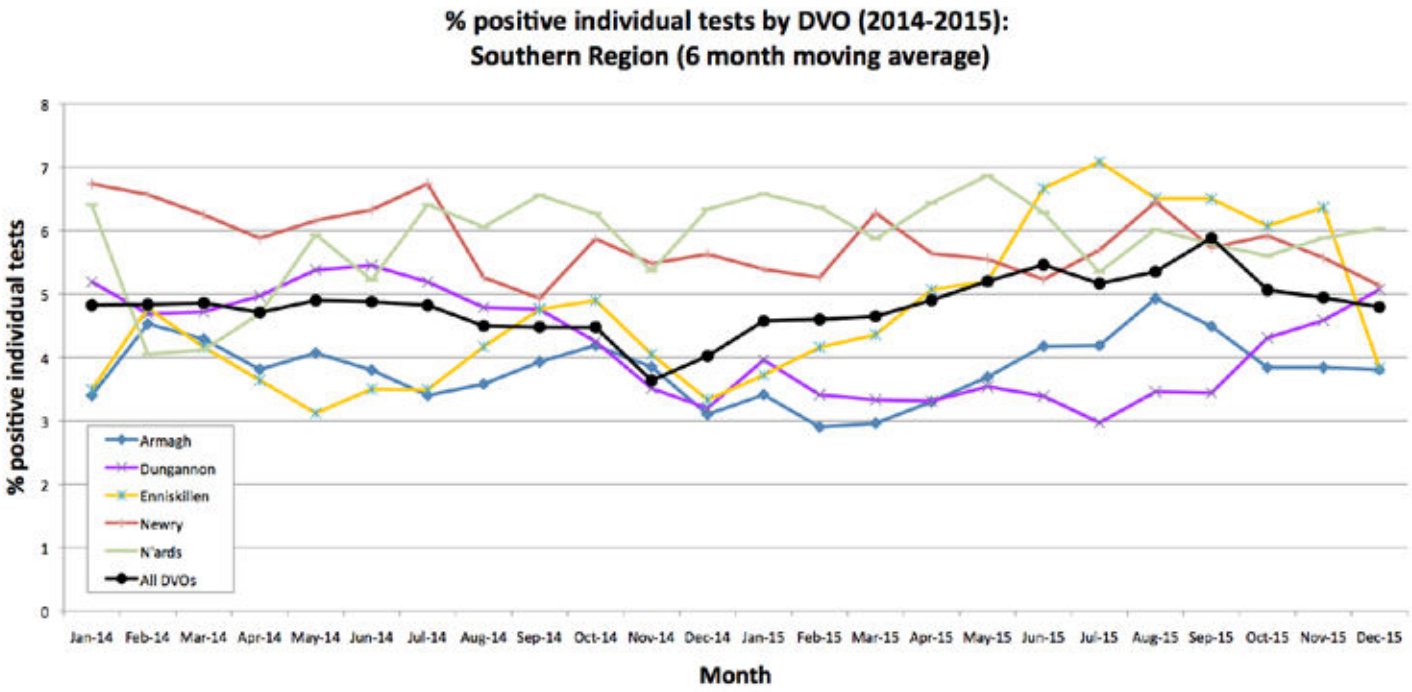


Figure 23: Percentage of all Positive Individual Animal Level Risk bTB Tests 2014 and 2015 (by DVO area)

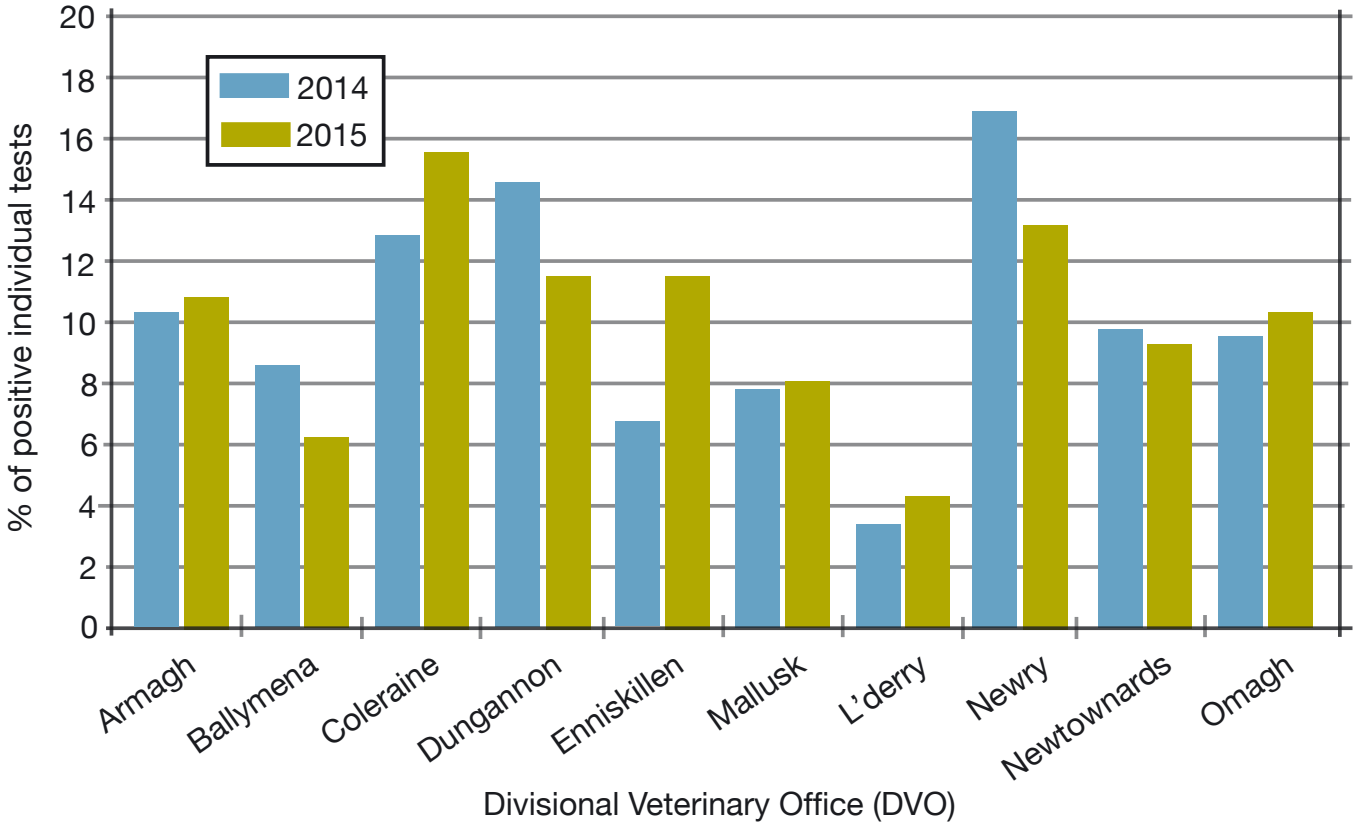
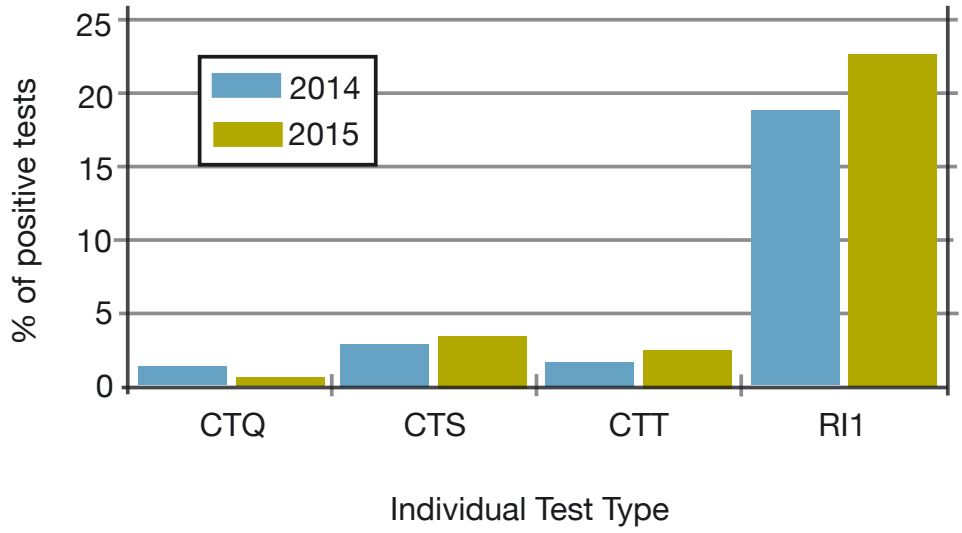


Figure 24: Individual Animal Level Risk bTB Test Reactor Disclosure Rate for 2014 and 2015 (by Test Reason)



Skin Test Reactor Confirmation Rate

9.10 The confirmation rate (see glossary) for skin test reactor animals during 2015 was 4.2% lower than during 2014 (**TABLE 19**). Overall the number of reactors increased by 24.5% (from 8,838 in 2014 to 10,004 in 2015), and the number of confirmed reactors increased by 22% (from 4,346 in 2014 to 5,304 in 2015). A positive culture result is definitive evidence of infection. However from a bTB 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 post mortem inspection or is positive by histological examination or by culture. 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 more than 5 unconfirmed reactors or 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 e.g. use of more severe interpretations of SICCT, two clear whole herd tests required post removal of reactors, disease tracing, lateral check testing, than would be indicated by positive culture alone.

Table 19: Numbers of bTB Reactors and Confirmed Reactors (2014 and 2015)

Year	N° of Reactors	N° of confirmed* Reactors (%)
2014	8,838	4,346 (49.2)
2015	11,004	5,304 (48.2)
% change 2014 v 2015	24.5	22

9.11 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 there will be false negative results). Recently 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 (Olea-Popelka et al., 2012: Doyle *et al*., 2014)[2,3]

Fewer animals were IFNG tested during 2015 (**TABLE 20**) and a higher proportion of animals gave a positive result compared to 2014. There was a 14.1% decrease in the number of animals identified as IFNG positive that were not concurrently skin test positive. Neither the use of IFNG, nor the removal of "IFNG positive only" animals is compulsory so not all IFNG positive animals are removed. The animals that are identified as IFNG positive but are not positive to the skin test (STNP) are the ones that we seek to remove as additional potentially infected animals. In 2015, 67.0% of the identified IFNG positive STNP animals were voluntarily presented to DAERA valuation and voluntarily surrendered for slaughter (68.7% in 2014). There was a 16.2% decrease in the number of animals removed compared with the previous year. Overall there was a 30.5% TB confirmation rate in the IFNG positive cattle slaughtered (including those that were skin reactors) compared to 20.9% in 2014. This increased confirmation rate was seen in all quarters of 2015 except in April-June. There was a 9.1% TB confirmation rate in the IFNG positive STNP animals slaughtered during 2015 (55 TB confirmed animals from 604 slaughtered) up from 8.0% in 2014 (58 TB confirmed animals from 721 slaughtered). Analysis has shown that the IFNG positive animals which were left on farm were 2.31 times more likely to become a reactor compared with IFNG negative animals[4].

Table 20: Numbers of IFNG Positives (2014 - 2015)

Year	N° of animals sampled	N° of animals IFNG + (%)	N° of animals IFNG + / STNP (% of IFNG +)	N° of IFNG+/ STNP animals removed
2014	16,991	1,262 (7.7%*)	1,050 (83.2%)	721
2015	15,873	1,222 (8.2%*)	902* (73.8%)	604
% Difference 2014 v 2015	-6.6%	-3.2%	-14.1%	-16.2%

*Only animals with a valid IFNG test result are included (14,916 animals in 2015 and 16,488 animals in 2014).

10. New Herd Breakdowns

10.1 New bTB herd breakdowns are herds with at least one reactor animal where the herd had no other reactor animals during the previous 12 months. The number of new bTB herd breakdowns (**TABLE 21**) was 20.8% higher for 2015 compared with 2014 (1,688 compared with 1,397). Only one of the 10 DVO areas (Ballymena) had a reduced number of new breakdowns during 2015.

Table 21: Number of New bTB Breakdown Herds (2014 - 2015)

Year	DVO Area										New B/D herds
	Armagh	Ballymena	Coleraine	Dungannon	Enniskillen	Mallusk	L'derry	Newry	N'Ards	Omagh	Totals
2014	110	101	192	142	167	85	43	203	152	202	1,397
2015	145	88	243	194	200	75	87	245	173	238	1,688
% change 2014 – 2015	31.8	-12.8	26.5	36.6	19.7	11.7	102.3	20.6	13.8	17.8	20.8

10.2 **Figure 25** shows the density of herds with reactors per Km2 in 2015 in NI. This information was requested by Private Veterinary Practitioners to increase awareness of the distribution of infection in their locality. (2014 map in **FIGURE A** in the Annex).

Figure 25: Density of Herds with bTB Reactors in 2015

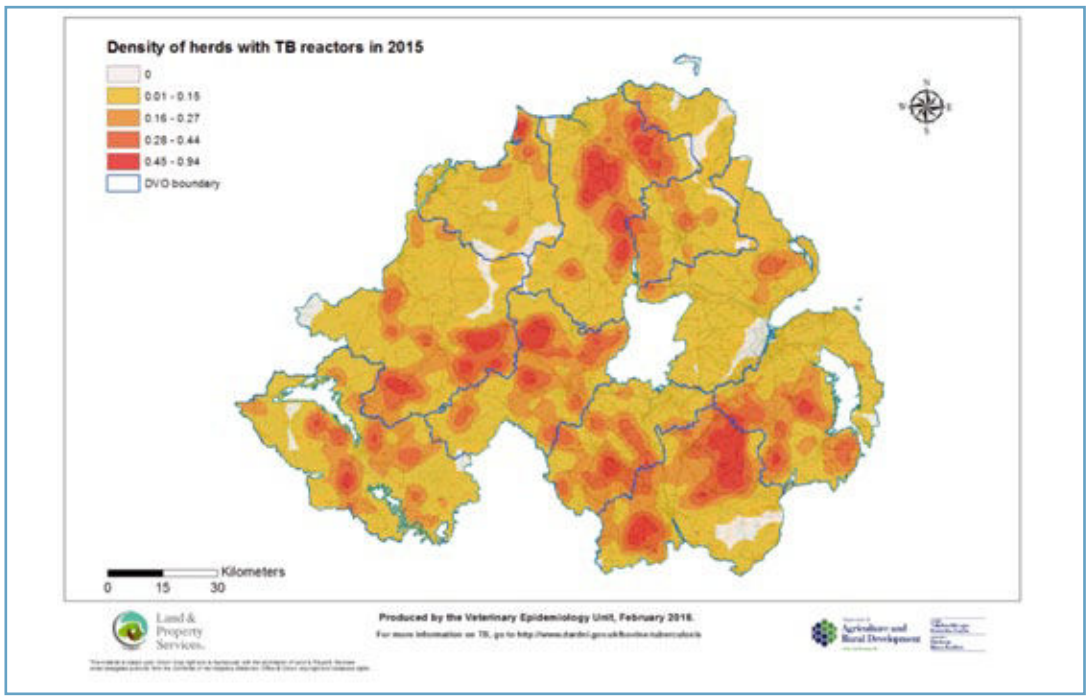
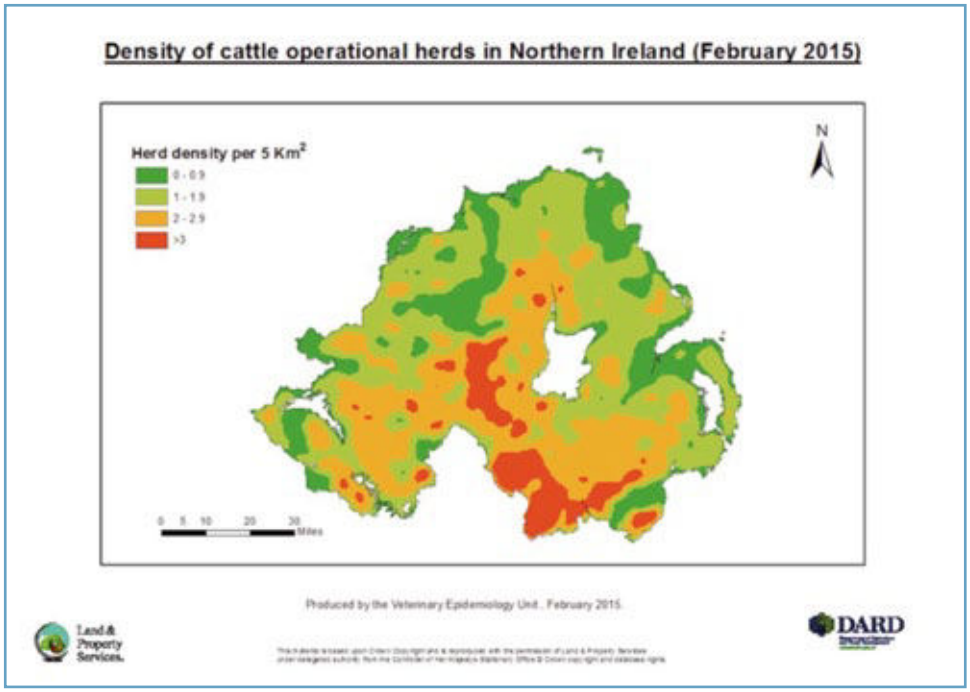


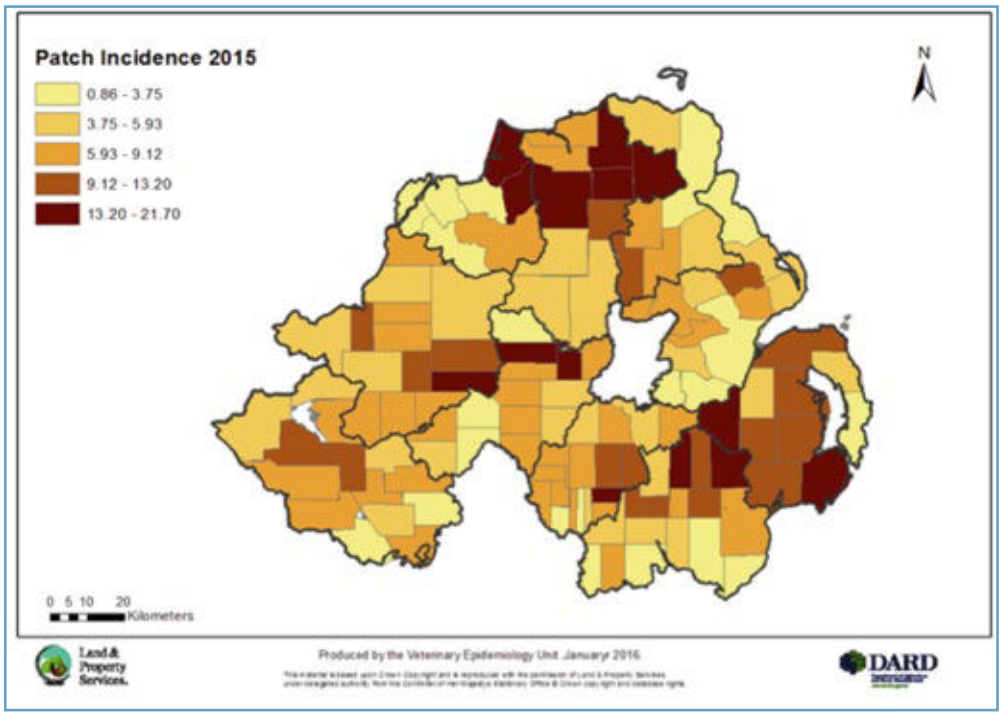
FIGURE 26 shows cattle herd density across NI and when compared with Figure 25 there is an association between the two.

Figure 26: Operational cattle herd density in NI 2015



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 2015 (**FIGURE 27**). Every DVO area can be seen to have a variation in incidence across its patches.

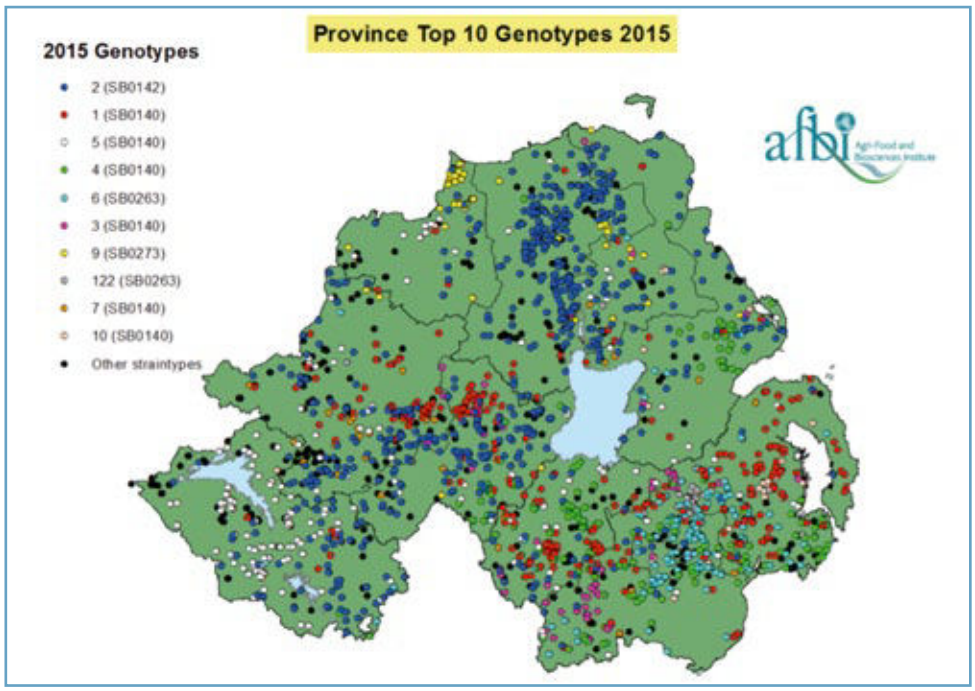
Figure 27: Patch Incidence in 2015



M. bovis Strain Types

10.3 **Figure 28** shows the distribution of the most prevalent bTB strain types found in bTB confirmed cases in 2015. The 10 most prevalent strain types have remained the same, but there were slight changes in the relative prevalence. The clustering effect seen with bTB is visible, and the home ranges of strain types appear unchanged. However, some strain types are visible in areas outside their normal cluster, which would suggest spread due to animal movements (Strain types from 2003 to 2015 can be found in **FIGURE B** and the most prevalent strain types in 2014 can be found in **FIGURE C** (in ANNEX).

Figure 28: Distribution of the most prevalent bTB strain types in 2015

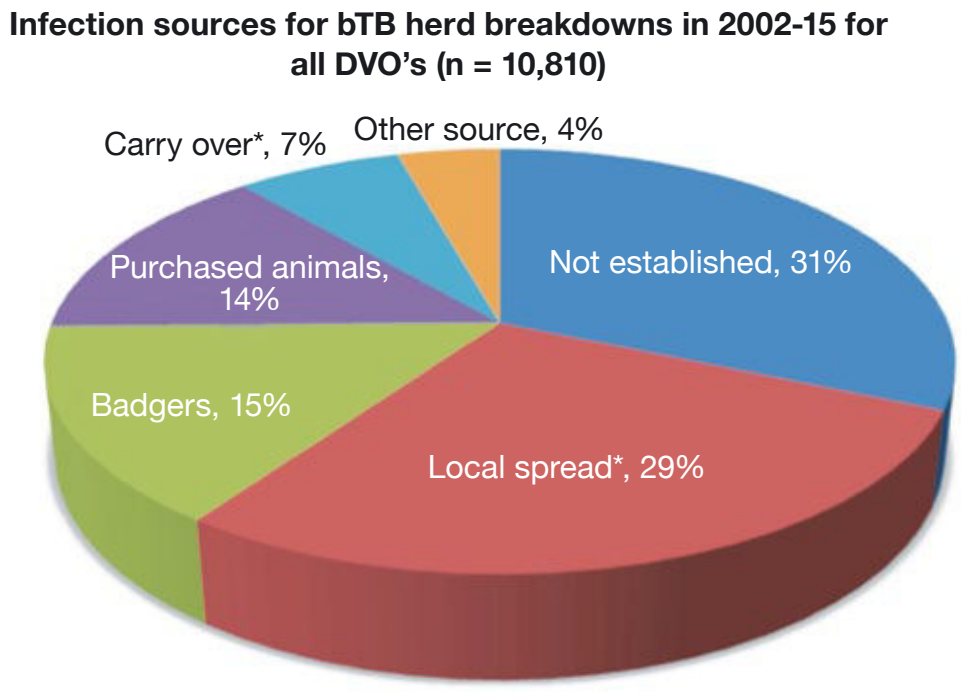


(Map courtesy of AFBI)

11. bTB Investigations

11.1 During the course of the management of a bTB breakdown, and based on the available evidence, the Veterinary Officer (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[5]. The percentages of the infection sources recorded by the field VOs for OTW breakdowns during the period 2002 to 2015 is shown in **Figure 29**.

Figure 29: Infection sources for OTW bTB breakdowns in 2002-15



**Definitions in the glossary*

11.2 These conclusions correlate with established risk factors for bTB (Skuce et al., 2015: Doyle et al., 2014)[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 farmers. Information on the possible causes of a TB breakdown can be found on the DAERA bTB web-pages

12. EU Co-funding and Programme Costs

12.1 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 2015 is shown in **TABLE 22** below.

12.2 The amount of co-funding received from the EU Commission for 2014 was £3.98 million.

At the time of writing the 2015 co-funding has been agreed, but has not yet been received.

Table 22: Specified Programme Costs for 2015

TB Programme Element	Cost
Compensation for reactors, negative in contacts and voluntarily slaughtered interferon gamma positive cattle	**£ 15,450,011**
Haulier expenses	**£323,913**
PVP Tuberculin testing (excluding travel)	**£6,393,423**
TVO/VOT tuberculin testing (excluding travel)	**£1,633,697**
Tuberculin	**£617,293**
Laboratory analysis for interferon gamma and culture	**£657,819**
Research	**£132,865**
Veterinary and Administrative Staff	**£5,808,478**
Salvage monies	**£ -2,523,440**
Total	**£28,494,059**

12.3 The specified costs of the Programme for 2015 were £1,784,772 (6.68%) higher than 2014.

This is largely due to a significant increase in expenditure on compensation for the increased number of reactor animals, with other less significant increases and reductions across the Programme elements.

13. Research and Development

13.1 There is still much that is not known about how bTB spreads, how it can be diagnosed more accurately, and what can be done to prevent its spread within and between cattle herds and wildlife. In 2015, DAERA continued to invest in bTB and wildlife research and studies to build the evidence to help deal effectively with the disease risk factors and reduce bTB further.

> "...there is still much that is not known about how bTB spreads..."

13.2 A number of new projects were commissioned to begin in 2015 and included:

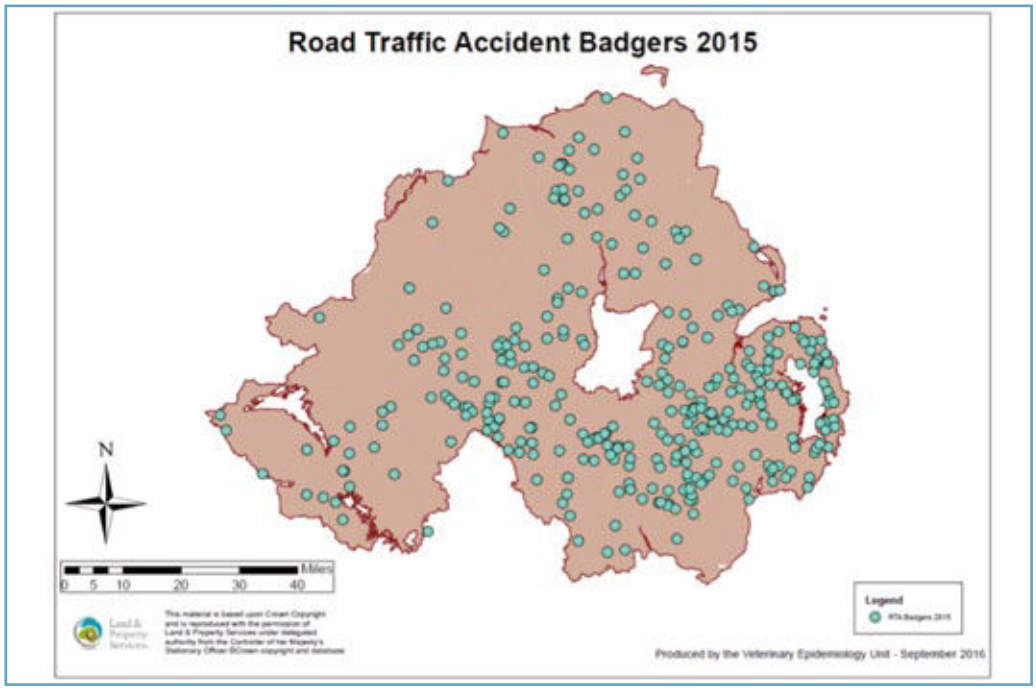
- Investigating bTB transmission dynamics using genome epidemiology
- An evaluation of the role of multiple reactor and chronic breakdown herds in the epidemiology of bTB in Northern Ireland
- Assessment of commercially available serological tests for the detection of cattle infected with bTB
- The role of endemic diseases and other factors in the occurrence of bTB

13.3 Furthermore, DAERA progressed with Year 2 of the Test, Vaccinate or Remove (TVR) Wildlife Intervention Research Project in County Down. Field activities commenced in late June 2015. Land owners were visited to update the Department's TVR land ownership information and to start the initial digging in of cages, although the cages were not set to capture badgers at that point. The actual capture of badgers started on 2 July 2015 in compliance with the conditions of the Northern Ireland Environment Agency (NIEA) licence. Captured badgers were tested for TB using a sett side test, microchipped, examined and had other diagnostic samples taken. Similar to Year 1 of TVR, the field activities were carried out by a dedicated team from VSAHG. The final badger capture was successfully completed on 22 October 2015.

13.4 There were a total of 692 capture events, with 341 unique badgers being cage trapped. This is the first 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 after the project has ended and following analysis of the relevant data. This is anticipated to be in late 2019. The TVR Wildlife Intervention Research Project year 2 report-2015 is available on the Department website.

13.5 The Badger Road Traffic Accident (RTA) Survey, a province wide survey, has been ongoing since the mid 1990s. 333 badgers were submitted during 2015, and 47 (14.1%), of these were confirmed *M. bovis* positive. To report RTA badgers To report RTA badgers please phone 028 9076 5333 or 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 30** shows the locations of the RTA badgers collected during 2015.

Figure 30: location of collection of RTA badgers in 2015



More details about the projects and studies, as well as completed reports and literature reviews, are available on the DAERA web site at TB research in Northern Ireland.

14. 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. Neither vaccination nor treatment of non-bovine animals is permitted. During 2015, suspected TB lesions were examined at AFBI from a pig, and three antelopes, an otter and a cat. Only the pig was confirmed *M. bovis* positive.

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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 Lahuerta-Marin et al., 2015: Should they stay, or should they go? Relative future risk of bovine tuberculosis for interferon-gamma test positive cattle left on farms

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.

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

Reference Section 8 Surveillance Outputs paragraph 8.4

Table A: bTB Herd Tests Completed in 2014 and 2015 by DVO area (Cattle>0)

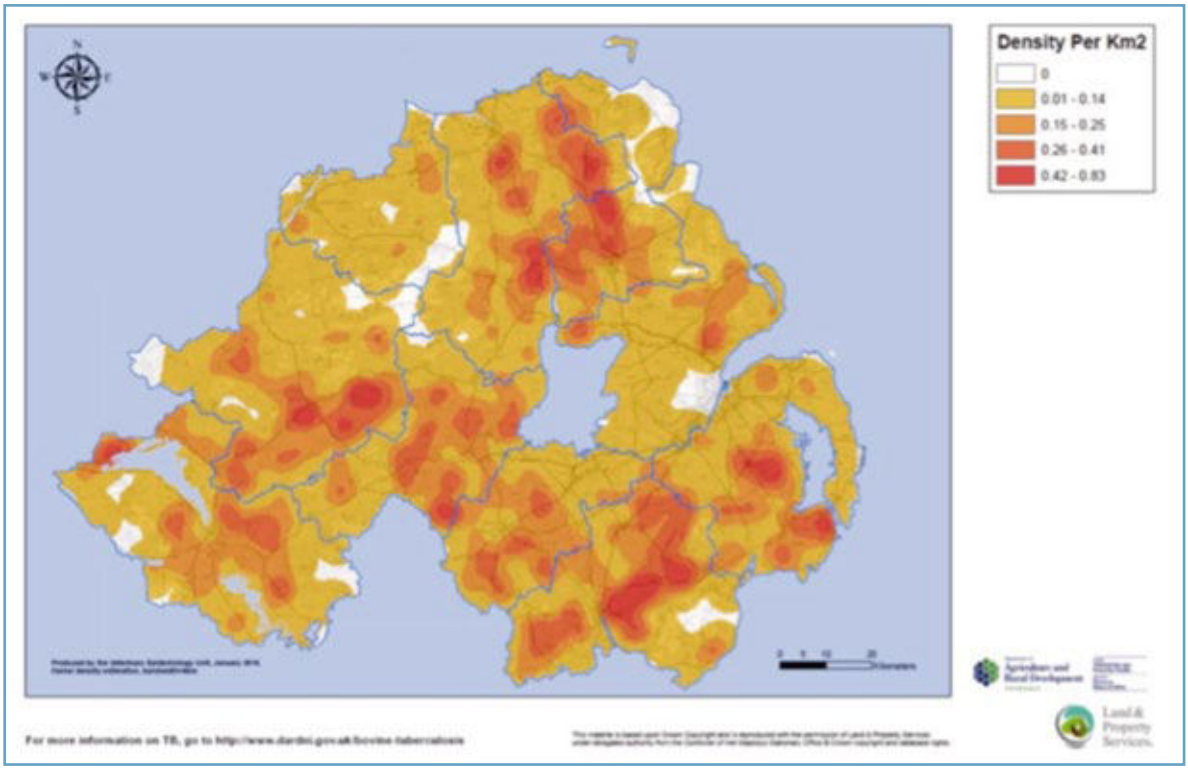
	Routine		Restricted		Risk		Totals	
DVO	2014	2015	2014	2015	2014	2015	2014	2015
	N Test (%)	N Test (%)	N Test (%)	N Test (%)	N Test (%)	N Test (%)	N Test (%)	N Test (%)
Armagh	1483 (9.0)	1567 (9.7)	532 (9.7)	573 (9.0)	1165 (11.4)	1126 (9.8)	3180 (9.9)	3266 (9.6)
Ballymena	944 (5.7)	980 (6.0)	438 (8.0)	354 (5.5)	568 (5.6)	612 (5.3)	1950 (6.1)	1946 (5.7)
Coleraine	1820 (11.0)	1729 (10.7)	541 (9.8)	942 (14.7)	938 (9.2)	1309 (11.4)	3299 (10.3)	3980 (11.7)
Dungannon	2316 (14.1)	2165 (13.4)	567 (10.3)	679 (10.6)	685 (6.7)	1065 (9.3)	3568 (11.1)	3909 (11.5)
Enniskillen	2084 (12.7)	1996 (12.3)	583 (10.6)	705 (11.0)	1638 (16.1)	1861 (16.2)	4305 (13.4)	4562 (13.4)
Mallusk	1372 (8.3)	1320 (8.1)	375 (6.8)	355 (5.6)	319 (3.1)	439 (3.8)	2066 (6.4)	2114 (6.2)
L'Derry	799 (4.9)	709 (4.4)	140 (2.5)	214 (3.3)	140 (1.4)	258 (2.2)	1079 (3.4)	1181 (3.5)
Newry	2293 (13.9)	2544 (15.7)	959 (17.5)	973 (15.2)	2193 (21.5)	1931 (16.8)	5445 (16.9)	5448 (16.0)
Newtownards	1142 (6.9)	1129 (7.0)	699 (12.7)	754 (11.8)	1160 (11.4)	1315 (11.4)	3001 (9.3)	3198 (9.4)
Omagh	2218 (13.5)	2074 (12.8)	660 (12.0)	842 (13.2)	1393 (13.7)	1590 (13.8)	4271 (13.3)	4506 (13.2)
Total	16471 (100)	16213 (100)	5494 (100)	6391 (100)	10199 (100)	11506 (100)	32164 (100)	34110 (100)

Reference to Section 8 Surveillance Outputs paragraph 8.5

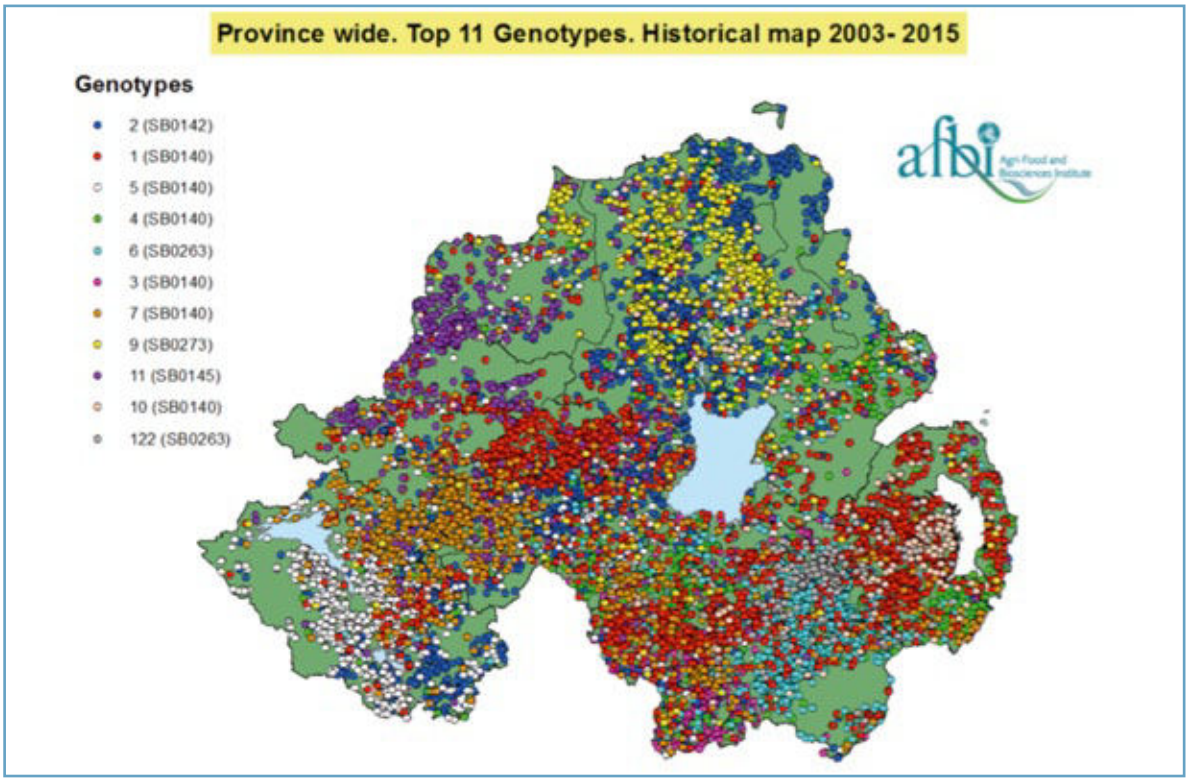
TABLE B: TOTAL ANIMAL LEVEL RISK bTB TESTS IN 2014 AND 2015 BY DVO AREA (Cattle > 0)

	CTQ		CTS		CTT		RI1		Total	
DVO	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
	N Test (%)	N Test (%)	N Test (%)	N Test (%)	N Test (%)	N Test (%)	N Test (%)	N Test (%)	N Test (%)	N Test (%)
Armagh	130 (17.1)	148 (14.1)	59 (14.5)	60 (15.0)	802 (14.7)	951 (14.8)	208 (11.6)	205 (11.7)	1199 (14.3)	1364 (14.2)
Ballymena	48 (6.3)	51 (4.9)	17 (4.2)	7 (1.8)	335 (6.1)	327 (5.1)	155 (8.6)	143 (8.2)	555 (6.6)	528 (5.5)
Coleraine	97 (12.7)	114 (10.8)	38 (9.4)	36 (9.0)	603 (11.1)	753 (11.8)	265 (14.7)	299 (17.1)	1003 (11.9)	1202 (12.5)
Dungannon	114 (15.0)	165 (15.7)	60 (14.8)	63 (15.8)	848 (15.6)	1063 (16.6)	254 (14.1)	217 (12.4)	1276 (15.2)	1508 (15.7)
Enniskillen	45 (5.9)	85 (8.1)	50 (12.3)	58 (14.5)	389 (7.1)	546 (8.5)	159 (8.8)	188 (10.7)	643 (7.6)	877 (9.1)
Mallusk	47 (6.2)	76 (7.2)	66 (16.3)	52 (13.0)	447 (8.2)	463 (7.2)	133 (7.4)	125 (7.1)	693 (8.2)	716 (7.5)
L'Derry	31 (4.1)	43 (4.1)	10 (2.5)	9 (2.3)	203 (3.7)	240 (3.7)	59 (3.3)	48 (2.7)	303 (3.6)	340 (3.5)
Newry	127 (16.7)	168 (16.0)	53 (13.1)	50 (12.5)	737 (13.5)	932 (14.5)	214 (11.9)	187 (10.7)	1131 (13.4)	1337 (13.9)
N'Ards	57 (7.5)	76 (7.2)	34 (8.4)	25 (6.3)	447 (8.2)	467 (7.3)	131 (7.3)	141 (8.0)	669 (8.0)	709 (7.4)
Omagh	65 (8.5)	125 (11.9)	19 (4.7)	39 (9.8)	638 (11.7)	665 (10.4)	220 (12.2)	200 (11.4)	942 (11.2)	1029 (10.7)
Total	761 (100)	1051 (100)	406 (100)	399 (100)	5449 (100)	6407 (100)	1798 (100)	1753 (100)	8414 (100)	9610 (100)

Reference Section 10 New Herd Breakdowns, paragraph 10.3
(Figure A: Density of Herds with bTB Reactors in 2014

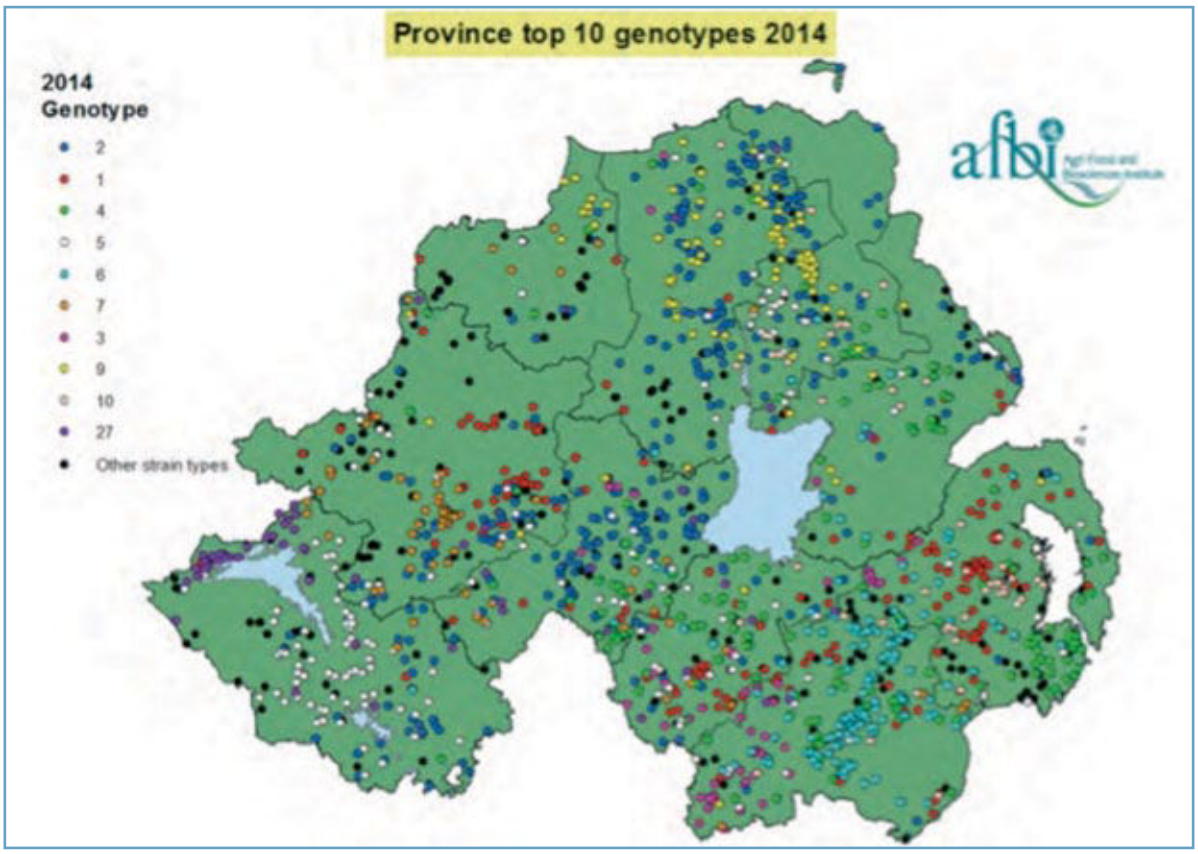


Reference Section 10 New Herd Breakdowns, paragraph 10.4
Figure B: Distribution of the most Prevalent Strain Types in 2003-2015



There has been a slight change to the more historical prevalence in that strain type 122 has replaced strain type 8 in the top 11. Strain type 122 is a “daughter” of strain type 6 and can be seen to cluster mainly in the same area of Newry and Newtownards DVO areas as strain type 6.

Figure C: Distribution of the most Prevalent Strain Types in 2014



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 passed two clear skin tests and the restrictions were lifted, it is suspected that some infected animals remained in the herd 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.
Local spread (source of infection)	Infection in contiguous or nearby herds is suspected to be the cause of the infection in the herd, either by direct contact between animals or indirect contact (e.g. common contractors or machinery shared by both herds).
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.
PVPs	Private Veterinary Practitioners.
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 Tests	**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.

Glossary of Terms

Term	Definition
	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.
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 DARD. 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; **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.
STNP	Skin test non positives: animals with a skin test result other than positive. Therefore, negative and inconclusive animals would be included.
TBINVEST	Database system where the Field Veterinary Officer enters epidemiological information gathered during the investigation of OTW breakdowns.
Test coverage	Percentage of tests due during a certain year that are completed within that year.
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.

Bovine Tuberculosis in Northern Ireland

2015 Annual Report

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