Year End Descriptive Epidemiology Report: Bovine bTB Epidemic in the England Edge Area

Regional Office: Midlands
County: Derbyshire (part county)

Year-end report for 2016

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1. Executive Summary

a. The ‘Edge Area' was established in 2013 and was later incorporated into the Government’s strategy to achieve Officially Bovine Tuberculosis Free (OTF) status for England by 2038. It has a low but recently rising incidence of infected farms. This end of year report describes the bovine tuberculosis (bTB) epidemic in the Edge Area of Derbyshire, one of the 5 counties with split status straddling the High Risk and Edge Areas of England.

b. Level of bTB. The incidence of bTB has almost halved from 7% seen in 2015 in to 4% and reflects a return to the level seen in 2014. The high level in 2015 is considered an anomaly, attributed to railway works causing unusual disturbance to badgers.

c. New breakdowns of bTB. The number of breakdowns in 2016 decreased from 26 in 2015 to 14. A decrease was seen in both OTFW and OTFS breakdowns.

d. Disclosing tests. Over half of the OTFS breakdowns were disclosed at an IR retest, with two of the five animals having had simultaneous reactions to both avian and bovine tuberculin at the previous test. However, this was not mirrored in OTFW breakdowns which were all disclosed at their initial test. Additionally, just under a third of breakdowns in the Derbyshire Edge in 2016 were disclosed by radial testing while none were disclosed by slaughterhouse surveillance.

e. Risk pathways for bTB infection. The infection source for half of the 14 new cases in the Derbyshire Edge Area in 2016 was attributed to wildlife, specifically badgers, with six other cases being attributed to an undetermined source and 1 case being attributed to recrudescence of a previous infection. A badger infection source was the most common source attributed to dairy herd breakdowns, and sources for beef suckler herds were equally split between either a likely badger source or sources that could not be determined.

f. Impact of bTB: reactor numbers. In Derbyshire 65% of reactors removed were disclosed by the supplementary interferon-gamma (IFNg) blood test.

g. Cluster – Northwest Derbyshire. The area of the northwest Derbyshire cluster in 2015 had a greatly reduced number of breakdowns in 2016 (both OTFS and OTFW). However, there was one new OTFW breakdown of genotype 25:a in the area. This suggests that disease still persists in this area, with some evidence of possible spread further north.

h. Cases in other species. There have been no laboratory confirmed isolations of M. bovis in other species in the Derbyshire Edge Area. Submission rates are extremely low in other domestic species. There is no systematic surveillance that would reveal such infection in badgers and other wildlife.

i. Changes in the Epidemic. Despite the decrease in breakdown numbers, there are still signs of developing endemic infection in the Northwest Derbyshire Edge Area. Industry stakeholders have been relatively inactive in Derbyshire over the last year, with no meetings of the Derbyshire bTB group. A new, national, industry led health certification scheme could help publicise incentives for farmers to practice risk based trading.

j. Risks to the LRA and from the HRA. Remain unchanged from the 2015 year-end report.
k. **Forward look.** Emphasis on risk-based trading, making herd/holding data available more widely to encourage industry ownership of disease control.

## 2. Introduction

A key action in the implementation of the Government’s objective to achieve Officially Bovine Tuberculosis Free (OTF) status for England by 2038 was to recognise the different levels of bTB in different parts of the country and varying the approach to control accordingly. To this end three management regions or zones have been established. This report describes the epidemiology of bTB in Derbyshire (Midlands) which forms part of the ‘Edge’ area. (see Appendix 1). This area has a low, but recently rising incidence of infected farms and control efforts are seeking to slow down and reverse geographic spread, and reduce the incidence rate, with the aim of obtaining OTF status for this area as soon as possible.

## 3. Cattle industry in the Edge Area of Derbyshire

![Figure 1. Proportion and number of premises in the Derbyshire Edge Area with the number of cattle per premises shown (n=1699, data in Appendix 2)](image)

**Herd Types**

Beef herds (suckler and fattening) are the predominant herd type in the Derbyshire Edge, with beef suckler herds being almost equivalent in number to beef fattening herds. Both the fattening and suckler herds can exist as very small units comprising fewer than ten animals, but with the range for suckler herds extending up to 500 animals, and with some fattening herds comprising over 1000 animals.

Dairy herds are far less common: a few large dairy herds are situated in South Derbyshire, but most dairy herds are medium to large in size (100 - 1000 animals).
There is a predominance of mainly small herds of up to 50 cattle in the Derbyshire Edge Area as shown in the pie chart at Figure 1, and it would be reasonable to assume that the majority of these are beef fatteners or beef sucklers.

**Markets**

There are no auction markets in the Derbyshire EA, the nearest being Bakewell Market which is located in the Derbyshire HRA. Other markets utilised by farmers in this area are HRA: Leek (Staffordshire), Chelford (Cheshire) and Edge Area: Newark (Nottinghamshire).

This facilitates the flow of cattle from the High Risk Area to the Edge Area, potentially providing opportunity for spread of bTB from the HRA into the Midlands Edge. Some of these markets operate Pre-movement Testing Exempt sales and Approved Slaughter Gatherings which are subject to licensing controls. This is likely to mitigate risk of spread of bTB by cattle moving through these gatherings as only movement directly or indirectly to slaughter is allowed from these gatherings.

**Approved and Exempt Finishing Units**

The number of Approved Finishing Units (two) has increased from 2015 (one). Both are non-grazing and if correctly operated are not considered a risk for introduction or spread of bTB into the surrounding areas.

**Common Land**

There are some small areas of common land in the Derbyshire Edge, with low numbers of cattle grazed and no significant co-grazing by more than one herd, so spread of bTB related to common land is unlikely in this area.

See Appendix 2 for a fuller report on the cattle industry in the Edge Area of the Midlands.

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4. **Overview of the bTB epidemic in the Edge Area of Derbyshire**

**History of bTB in the Edge Area of Derbyshire**

There has been an increase in the number of infected herds in the Derbyshire Edge Area as shown in Figure 2. Prior to 2013, the majority of parishes in the current Edge Area counties were subject to two, three, or four-yearly testing with, in many cases, exemptions from testing for non-breeding cattle. The implementation in January 2013 of annual whole herd testing for all cattle herds in the newly-established Edge Area counties resulted in an overall increase in testing frequency, with few exemptions from testing applicable. This explains in part the rise in the number of new breakdowns from 2013, as more herds were tested per annum than in previous years with the expectation that more disease would be disclosed as a result. There is an ongoing element of seasonality in the disclosure rate with a general reduction over the summer months, which may be partially explained by a reduced testing rate at this time of year. The number of breakdowns reached a peak of 26 in 2015, but have almost halved in 2016, returning to a similar level as seen in 2013 and 2014.

The source of a significant number of cases in the 2015 spike have been attributed to badgers, and this is thought to be directly linked to major works undertaken on the main Sheffield to Manchester railway line during 2014 and 2015. Anecdotal evidence suggests that there may have
been perturbation of badgers located near to the line which may have changed the usual pattern of contact between badgers and cattle in the locality. The reasons for the decrease in 2016 are not clear.

![Figure 2. Epidemic curve of new bTB cases in the Derbyshire Edge from 2006 to 2016](image)

Geographical distribution of bTB cases (new and ongoing) in the Edge Area of Derbyshire

The geographical distribution of all bTB incidents new in 2016 and any pre-2016 OTFW bTB incidents still ongoing at the end of the report period is shown at Figure 3 overlaid on a map showing the cattle holding density for the Midlands Edge Area.

The occurrence and distribution of cases in the second half of 2016 in Derbyshire continued with the majority of cases occurring in the northwest of the Edge Area, including four of the OTFW incidents. The distribution is similar to that of 2015, however with far fewer cases in the northeast of the Edge Area. Overall, there was a decrease in the number of incidents in the Derbyshire Edge Area in 2016 compared with 2015.
Figure 3. Geographical distribution of all bTB incidents new in 2016 and any pre-2016 OTFW bTB incidents still ongoing at the end of the report period overlaid on a cattle holding density map, with a cattle density map for the area inset (NB only breakdowns which occurred within the Edge Area outlined in red are shown)
2016 saw a marked decrease in the number of breakdowns in Derbyshire compared to 2015, dropping to levels below that of 2014. As shown in Figure 4, numbers of OTFW breakdowns decreased by more than 50% from eleven to five between 2015 and 2016. This decrease was mirrored to a degree in the OTFS breakdowns, with the number reducing by over a third.

![Figure 4. Number of fully confirmed (OTFW) and strongly suspected (OTFS) breakdowns in the Derbyshire Edge from 2014 to 2016](image)

The breakdowns were differentiated into sectors, as shown in Figure 5. Beef suckler herds accounted for 71% of breakdowns, however of these only 20% of them were OTFW. This is a significant contrast to that seen in dairy herds, which accounted for only around 29% of total breakdowns but 60% of OTFW breakdowns.

The general distribution of breakdowns partly reflects the distribution of cattle herd types in Derbyshire, with the Edge area containing a higher percentage of beef herds than dairy.

![Figure 5. Number of fully confirmed (OTFW) and suspected (OTFS) breakdowns by sector in the Derbyshire Edge Area](image)
The epidemic curve in Figure 6 shows a peak in breakdowns disclosed in both June and July of 2016, with three breakdowns being disclosed in each month. This bears no particular resemblance to the curve for 2015, in which February and September were the peak months for disclosing breakdowns, with five breakdowns disclosed in each of these months. No data is available to show the distribution of whole herd tests throughout the year and whether these epidemic curves are proportional to this.

Figure 6. Epidemic curve showing the distribution of new breakdowns per month for January 2015 to December 2016.

Figure 7 shows an epidemic curve for 2016 where breakdowns are differentiated into OTFS and OTFW status. In the Derbyshire Edge Area, radial testing occurs following withdrawal of OTF status unless exempted by the farm’s APHA case veterinarian. The green lines on Figure 7 indicate breakdowns that have been disclosed by radial testing triggered by a breakdown in 2016. There are two further breakdowns disclosed by RAD6 tests, triggered by OTFW breakdowns in 2015, which are not highlighted on this graph.

Figure 7. Epidemic curve showing the distribution of new fully confirmed (OTFW) and suspected (OTFS) breakdowns per month for January 2016 to December 2016.
Figure 8 shows the number of reactors which were disclosed at an inconclusive reactor (IR) retest as a 2xIR. Over 55% of OTFS breakdowns were disclosed at an IR retest. This shows that the requirement to isolate inconclusive reactors prior to retest should be adhered to, as they are a potential infection risk to the rest of the herd. However, no OTFW breakdowns were disclosed at an IR retest, which means that none of the 2xIR animals had visible lesions. This makes it less likely that any of the IRs occurred due to anergy. Out of the five IRs, three were adult cattle over two years of age with an established testing history. The other two were under two years of age and had been tested a maximum of once prior to being disclosed as an IR. Of the three adult cattle, two had had a simultaneous reactions to both avian and bovine tuberculin at the previous test.

![Bar chart showing number of breakdowns for reactors at IR retest and initial skin test.]

Figure 8. Number of breakdowns new in the detected as reactors at an IR retest and those detected as reactors at the initial skin test.

**Cluster – Northwest Derbyshire**

Figures 9 and 10 show breakdowns in 2015 and 2016 respectively, in the area that was identified as a cluster in 2015. As can be seen, the number of both new OTFW and new OTFS breakdowns has reduced significantly. However, several new breakdowns have still occurred and also been attributed to a wildlife origin. This suggests that while the control measures have prevented the spike from continuing, there is still a degree of disease persisting in the area.

As can be seen to the North of this area, several new breakdowns occurred in 2016 that were attributed to wildlife, two of which were OTFW and of genotype 25:a. While there was a breakdown of this genotype in 2015, this was on an exempt finishing unit (EFU) without grazing. It was made exempt from radial testing following a veterinary risk assessment. As such, the likelihood that the 2016 breakdowns are secondary to this one is unlikely. This could suggest that the infection has spread further north.

5. Descriptive epidemiology of bTB in in the Edge Area of Derbyshire

Level of bTB

Incidence

The incidence of bTB breakdowns in Derbyshire was calculated for 2014-2016 and these are shown in Figure 11 below. The Figures from previous years have changed slightly to allow better comparison with the 2016 Figure. This is due to the increase in testing as a result of more six-monthly and radial testing in the Derbyshire Edge, and so the incidence calculation has been amended to ensure reporting of an annual incidence based on unique herds tested rather than number of herd tests.

As Figure 11 shows, the near doubling of incidence between 2014 and 2015 has not continued into 2016, with a reduction to an incidence that is only mildly higher than the 2014 incidence. This supports the conclusions from the 2015 report that the cluster in the Northwest Derbyshire Edge Area was due to a disturbance in the local badger population; as this was a one-time event that has not led to a sustained increase in incidence. Additionally, it suggests that the measures used have helped control the outbreak and prevented lateral spread from these breakdowns.

The Derbyshire Edge Area had a slightly higher incidence in 2016 than in 2014, despite an overall decrease in the number of breakdowns. This is due to a decrease in number of herds in the Edge
Area. This decrease was seen in both 2015 and 2016 and can be explained by the fact that the trend in farms that practice grazing in Less Favoured Areas (LFAs) has seen a general decrease between 2014 and 2015. This fits in with the demographic of a proportion of the Derbyshire Edge Area, which features a large amount of grazing in LFAs, and often consists of small herds, usually of beef animals, which may be grazed alongside sheep as a main enterprise. While the number of beef cattle nationally has increased, the net margins of production nationally are negative. Small herds, such as those found in the Derbyshire Edge area, are more likely to be unable to withstand this and would result in the reduced number of herds.

![Figure 1](image.png)

**Figure 11.** Incidence for 2014 to 2016 calculated for all new breakdowns (OTFS and OTFW) in the reporting period as a percentage of unique OTF cattle herds tested in the reporting period

*Duration of bTB restrictions*

The average length of time a herd remained under restriction because of a bTB breakdown in the Derbyshire Edge Area in 2016, as shown in Figure 13, was 5.5 months, with OTFW herds having an average restriction time of 6.7 months, compared to 4.6 months for OTFS herds. The median restriction duration for the same categories shows that OTFW herds tend to be restricted longer than OTFS herds.
Figure 13. Mean and median duration of bTB restrictions in infected herds where the breakdown resolved in 2016

There were 26 breakdowns ongoing in 2016, 12 of which had started in 2015. Of the 26, 21 had resolved by the end of the reporting period, the remaining five breakdowns being of less than six months duration at the end of the reporting period.

There were no persistent breakdowns (>18 months restriction) in herds in Derbyshire in 2016.

Risk pathways for bTB infection

Figure 14 shows the likely source for new breakdowns in the Derbyshire Edge area. As can be seen, Northwest Derbyshire has a relatively high number of breakdowns attributed to wildlife. This is consistent with the pattern seen in 2015.
For each breakdown, both OTFS and OTFW, the likely infection source was considered. The infection sources can be broken up into several broad groups – wildlife, local cattle (residual infection within herds or contiguous spread), cattle movement (purchased animals, shows etc.) and undetermined.
It can be seen in Figure 15 that the number of cases attributed to wildlife and those for which a source was unable to be determined are roughly equivalent (seven and six respectively). No breakdowns were attributed to cattle movement, down from 4 OTFW breakdowns being attributed to a purchased source in 2015. One OTFW breakdown in 2016 was thought to be a residual infection, as the herd had been OTFW in 2014 with genotype 17:a. The 2016 breakdown was of the same genotype, which is one that does not commonly occur in the rest of the county or neighbouring counties. The original 2014 breakdown originated from cattle that were bought in from a Cumbrian dispersal sale in 2014. It is of concern that there has been recrudescence in this herd, as the cattle from the sale were removed as direct contacts to minimise the time they were on farm, and the holding underwent gamma interferon testing and a check test at severe interpretation, in order to increase the sensitivity of the test and to optimise the detection of infected animals at an early stage.

Of the OTFW cases in the Derbyshire Edge area, 80% were attributed to wildlife, specifically badgers. This proportion is significantly higher than 2015, when only 45% of cases were attributed to wildlife, however in terms of actual numbers there has still been a decrease in OTFW breakdowns of a wildlife origin (4 in 2016 compared to 5 in 2015).

67% of OTFS cases had no determined origin. This can be due to several factors. The first is that in some breakdowns, there may be several possible routes of infection however none of them are deemed to be likely. Alternatively, there may be no identifiable source of infection present and a purchased origin can be ruled out. In either of these cases, if a breakdown concludes after only 1 reactor with no visible lesions then it can be difficult to attribute the breakdown to one particular source, particularly as no culturing will have occurred and consequentially there will be no genotyping performed to help inform the decision.

![Figure 15. Origin of infection for breakdowns new in the reporting period by county](image)
As Figure 16 shows, 50% of the breakdowns in both beef suckler herds and in dairy herds were thought to originate from a wildlife source. The remaining breakdowns in beef suckler herds were of an undetermined origin, which will have been for the reasons previously mentioned.

This differs considerably from findings at a Midlands regional level in the Edge Areas, which show that suckler herds had more breakdowns that were attributable to a purchased origin. It is possible that this is due to the regional differences and the farming practices in Derbyshire, with relatively small numbers of cattle being bought in by suckler herds as the herds themselves are smaller.

Only one of the breakdowns in a dairy herd was undetermined. The other was attributed to a residual infection within the herd as previously mentioned.

It can be seen in Figure 17 that the largest number of breakdowns occurred in the 0-50 herd size group. This reflects the distribution of herd sizes in Derbyshire as a county, with 51% of herds having between 0-50 cattle present (the median herd size is 48).

Taking the size distribution of herds into account, the biggest abnormality would be herds between 101-200 cattle. This demographic accounts for only around 16% of the herds in Derbyshire, yet accounts for over 28% of the breakdowns. This occurrence seems to be in line with some research conducted into the epidemiology of bTB, which suggests that a larger herd size can be a risk factor for bTB. However, the Derbyshire Edge has a small dataset and it is possible to overanalyse these differences.
Figure 17. Origin of infection for breakdowns new in the reporting period by herd size

Role of other species

**Badgers and other wildlife**

APHA laboratories have not confirmed any isolations of *M. bovis* in wild animals such as badgers, wild deer or wild boar carcases in 2016 in the Derbyshire Edge Area.

There is a Defra-funded Badger Edge Vaccination Scheme (BEVS) project in the north west Derbyshire Edge Area which is currently on hold due to lack of availability of BCG vaccine.

It is envisaged that vaccination will recommence in summer 2018, providing vaccine can be secured.

There is continuing anecdotal evidence to suggest that there is infection creep from the adjoining High Risk Area of Derbyshire and Edge Area of Cheshire. The recent privately-funded Stockport (Greater Manchester) found dead badger survey also indicates that infection is present in badgers near Stockport, close to the Derbyshire Edge Area where breakdowns with a badger source have been identified.

**Other domestic species:**

There have been no laboratory confirmed isolations of *M. bovis* in domestic non-bovine farm animals (camelids, goats, sheep, and pigs), pets, zoo animal collections, captive (farmed/park) deer holdings and captive wild boar farms in the Derbyshire Edge Area in 2016.
Detection of cases

The chart in Figure 18 shows the proportion of breakdowns that were disclosed by different surveillance types. Most notable for the Derbyshire Edge Area is the impact of radial testing. As can be seen in Figure 18, just under a third of breakdowns were disclosed at a radial test (either initial or after 6 months). This means that breakdowns are being disclosed earlier than they would be if there was just a reliance on annual surveillance testing, thus helping minimise the opportunity for the spread of bTB. It is worth noting that none of the cases detected by radial testing were directly linked via cattle-to-cattle contact with the index case, but were thought to potentially be linked by a wildlife source.

Additionally, no breakdowns were disclosed by slaughterhouse surveillance. This could be taken as an indication that the testing interval and other control measures used are appropriate for the area, as no animals in an OTF herd have been found to be infected without having reacted to a skin test.

Figure 18. Frequency of breakdown disclosure by different surveillance methods
**Burden of bTB**

The number of reactors disclosed by different test types in breakdowns in 2016 in Figure 19 shows that 65% of reactors were identified by the gamma interferon test in Derbyshire in 2016. This is a greater proportion than in 2015, where only around 44% of reactors were detected by the gamma interferon test.

In fact, 2016 yielded a higher number of reactors removed in total, with an increase of around 10% on 2015’s numbers, from 79 to 88.

![Figure 19. Number of reactors removed in each county showing the numbers detected by skin test and gamma test in new and ongoing breakdowns in 2015 and 2016.](image)

This increase in reactors in 2016 despite the decrease in breakdowns has resulted in a far greater number of reactors per breakdown compared with 2015, as can be seen in Figure 20. This perceived increase in reactors is not simply due to the reduced breakdown numbers, as it also reflected in the number of reactors per 1000 animal tests with an increase of around 40%. It is possible that this is due to a delay in detection of infected animals. However, with the lack of any slaughterhouse cases previously mentioned, it is also possible that with the gamma interferon test being applied within the Derbyshire Edge Area there has been effective removal of infected animals that otherwise may have remained undetected within the herd.
The doubling of the number of reactors per breakdown in 2016 does not take into account the possible differences in herd size – the number of reactors per 1000 animal tests has shown a less marked increase from 1.76 to 2.49 reactors per 1000 animals tested, suggesting that there may have been more larger herds affected in 2016 than in 2015.

The general impact of bTB upon farming businesses has been discussed in previous reports (2015 year-end report for the Midlands Edge Area).

**Key drivers of the bTB epidemic**

*Infected badgers*

The number of breakdowns has reduced compared to 2015, with fewer OTFW cases, but the endemic spread in the Northwest Edge continues to be evident in the distribution of cases: infected badgers continue to be considered as a significant source of infection for cattle in the Derbyshire Edge Area, with 50% of breakdowns new in 2016 being attributed to a badger source in both dairy and beef herds of fewer than 200 cattle. This is particularly the case in the North West Edge Area, as detailed earlier in this report and previous year-end reports.
The impact of the suspended Defra-funded Badger Edge Vaccination Scheme (BEVS) project is not known - it is on pause due to a moratorium, recommended by Public Health England, on purchases of vaccine for badgers. However, Derbyshire Wildlife Trust (a BEVS participant) has secured human BCG in ampoules from Intervax. Derbyshire Wildlife Trust has cleared its use with the Veterinary Medicines Directorate (VMD) and is compiling a training package to allow it to train lay vaccinators to use the stock. The details of the training package are being discussed with APHA who, in accordance with legislation, will need to approve its content before training may commence.

To prepare for the launch of a new grant scheme in the Edge Area (BEVS 2) in summer 2017, a stakeholder workshop was held in April 2017, attended by wildlife trusts, badger groups, industry representatives and APHA. The workshop provided an opportunity for constructive engagement and to discuss the design of BEVS 2. It is envisaged that vaccination will begin in the Edge in summer 2018 providing vaccine can be secured.

**Cattle movement**

There were no breakdowns attributed to the inward movement of cattle in 2016. This is different from previous years and is unlikely to be due to any change in cattle movement practices in this area. There is still a significant risk of transmission from the inward movement of cattle to holdings in the Edge Area. A new, industry led scheme set up nationally by the Cattle Health Certification Scheme (CHeCS) has been established in 2016 to try to encourage farmers to minimise risk when buying cattle. The new Farm Level bTB reports have proven useful and of interest to farmers.

The source of 40% of breakdowns was undetermined in 2016 either because of a lack of information to support a specific transmission pathway or because there may have been more than one source of infection and it had not been possible to differentiate between the sources because of a lack of supporting information.

6. **Summary of risks to the Low Risk Area (LRA) and any mitigating factors**

The risks to the LRA is unchanged from those detailed in the 2015 year-end Midlands Edge area report. These are that the narrow expanse of the North Derbyshire Edge Area continues to pose a potential risk to the Low Risk Area county of South Yorkshire in particular, which is a high cattle density county with many large dairy herds. However, lack of suitable badger habitat and radial testing around fully confirmed (OTF-W) incidents provides some mitigation against wildlife spread.

In addition, the northernmost extent of the Derbyshire Edge is sparsely populated by cattle limiting the potential for cattle-to-cattle spread. Conversely, the finding of infected badgers in the LRA of Greater Manchester suggests that there may be disease pressure from the north west Derbyshire Edge (as well as from Cheshire).
Summary of the risk to the Edge Area from the HRA

The summary of risks to the Derbyshire Edge is unchanged from those detailed in the 2015 year end Midlands Edge area report, namely the risk of an advancing endemic front of infection from the HRA part of Derbyshire.

7. Assessment of effectiveness of controls and forward look

Radial testing in the Derbyshire Edge has been successful in identifying disease within 3 km of a fully confirmed breakdown, but it is considered that there is a common badger source rather than lateral spread from cattle.

Parallel gamma interferon testing has been useful in removing infected cattle, some of which have been undetected by the skin test. This has been effective in reducing within herd and lateral spread, but other measures are still required to address the sources and pathways of infection to prevent recurrence or introduction of new infection once testing and slaughter has removed disease.

Serial gamma testing has been utilised to identify some instances of fraudulent behaviour (tampering with the bTB skin test to create ‘reactors’) and has resulted in the resolution of cases which had erroneously appeared to have disease persistence.

The increased efforts by APHA and Defra to engage with the cattle industry and stakeholders to raise awareness and share information (disease information and farmers’ own data) is welcome.

The introduction of licensed badger control measures – vaccination and culling – have helped to reassure the cattle industry that there is an official holistic approach to bTB control, and that should help to encourage industry to accept their own disease control responsibilities.

Although the Derbyshire Edge has a declining incidence in 2016, as a part-Edge county it is not currently a candidate for achieving OTF status in the near future.
8. Appendices

Appendix 1: Overview of risk and surveillance areas of England and Edge Area objectives and controls

Figure A1: Bovine bTB risk and surveillance areas of England (effective since January 2013) as set out in the strategy for achieving Officially Bovine Tuberculosis Free status for England

1.1 Policy objectives for the Edge Area:

- **Short to medium term:**
  - slow down geographic spread
  - maintain crude herd incidence of OTFW breakdowns <2% overall by 2019
  - begin to reduce the incidence rate

- **Longer term:**
  - reduce geographic spread of bTB and push the Edge Area boundaries westward
  - reduce OTFW herd incidence to <1% by 2025
attain OTF status (incidence of indigenous OTFW herd breakdowns <0.1) for the lowest incidence counties in the Edge Area.

1.2 Key Control Measures

Surveillance

- enhanced herd test coverage (annual)
- extend targeted surveillance to 3 km around new OTFW breakdowns in Derbyshire (radial testing), with six month follow-up
- survey of badgers found dead in the Edge Area

Management of cases (‘breakdowns’)

- increased sensitivity of breakdown herd testing:
  - OTFS breakdowns to pass two short interval tests at severe interpretation to regain OTF status
  - mandatory IFN-g parallel testing in OTFW
- enhanced epidemiological investigation and data analysis
- information sharing - location of breakdown herds

Appendix 2: Cattle industry in the Edge Area (EA) of Derbyshire

The cattle industry in the northern Edge Area of this county comprises principally beef suckler herds, the terrain and altitude making it less favourable for dairy herds. The cattle herds tend to be co-located with sheep flocks. Most suckled calves are sold as stores, usually through local markets, although some are finished on the holding of birth. The eastern EA contains large intensive finishing units, with dairy predominating in the south EA.

There are no auction markets in the Derbyshire EA, but Bakewell Market is located nearby in the Derbyshire HRA.

There are 2 Approved Finishing Units (AFUs) registered in the Derbyshire Edge Area.

Table A2.1. Number of cattle premises by size band in the Edge Area of the region at 1 January 2015 (RADAR Cattle book 2008 or most current update)

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Table A2.2. Cattle purpose

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**Figure A2. Cattle purpose**
Appendix 3: Summary of the Edge Area regional headline cattle bTB statistics

Table A3.1. Table of new breakdowns over time: by month in 2016, and by year from 2006 to 2016, to support epidemic curve presented in Section 4a.

<table>
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<tr>
<th>Year</th>
<th>Number of new breakdowns</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>5</td>
</tr>
<tr>
<td>2007</td>
<td>2</td>
</tr>
<tr>
<td>2008</td>
<td>1</td>
</tr>
<tr>
<td>2009</td>
<td>9</td>
</tr>
<tr>
<td>2010</td>
<td>6</td>
</tr>
<tr>
<td>2011</td>
<td>10</td>
</tr>
<tr>
<td>2012</td>
<td>8</td>
</tr>
<tr>
<td>2013</td>
<td>13</td>
</tr>
<tr>
<td>2014</td>
<td>16</td>
</tr>
<tr>
<td>2015</td>
<td>26</td>
</tr>
<tr>
<td>2016</td>
<td>14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2016</th>
<th>Derbyshire</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>2</td>
</tr>
<tr>
<td>February</td>
<td>1</td>
</tr>
<tr>
<td>March</td>
<td>0</td>
</tr>
<tr>
<td>April</td>
<td>2</td>
</tr>
<tr>
<td>May</td>
<td>0</td>
</tr>
<tr>
<td>June</td>
<td>3</td>
</tr>
<tr>
<td>July</td>
<td>3</td>
</tr>
<tr>
<td>August</td>
<td>1</td>
</tr>
<tr>
<td>September</td>
<td>0</td>
</tr>
<tr>
<td>October</td>
<td>0</td>
</tr>
<tr>
<td>November</td>
<td>2</td>
</tr>
<tr>
<td>December</td>
<td>0</td>
</tr>
</tbody>
</table>
### Table A3.2. Herd-level statistics

<table>
<thead>
<tr>
<th>Herd-level statistics</th>
<th>Derbyshire</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>09</td>
</tr>
<tr>
<td>a. Total number of cattle herds live on Sam at the end of the reporting period</td>
<td>487</td>
</tr>
<tr>
<td>b. Total number of herd tests carried out in the period</td>
<td>625</td>
</tr>
<tr>
<td>c. Total number of OTF cattle herds bTB tested during the period for any reason</td>
<td>346</td>
</tr>
<tr>
<td>d. Total number of OTF cattle herds at the end of the report period (i.e. herds not under any type of bTB02 restrictions)</td>
<td>473</td>
</tr>
<tr>
<td>e. Total number of cattle herds that were not under restrictions due to an ongoing bTB breakdown at the end of the report period</td>
<td>482</td>
</tr>
<tr>
<td>f. Total number of new bTB breakdowns detected in cattle herds during the report period</td>
<td>14</td>
</tr>
<tr>
<td>- OTF status suspended (OTF-S)</td>
<td>9</td>
</tr>
<tr>
<td>- OTF status withdrawn (OTF-W)</td>
<td>5</td>
</tr>
<tr>
<td>g. Of the OTF-W herd breakdowns:</td>
<td></td>
</tr>
<tr>
<td>- How many can be considered the result of movement, purchase or contact from/with an existing breakdown based on current evidence?</td>
<td>1</td>
</tr>
<tr>
<td>- New OTFW breakdowns triggered by skin test reactors or 2xIRs at routine herd tests</td>
<td>2</td>
</tr>
<tr>
<td>- New OTFW breakdowns triggered by skin test reactors or 2xIRs at other bTB test types (forward and back-tracings, contiguous, check tests, etc.)</td>
<td>3</td>
</tr>
<tr>
<td>- New OTFW breakdowns first detected through routine slaughterhouse bTB surveillance</td>
<td>0</td>
</tr>
<tr>
<td>h. Number of new breakdowns revealed by enhanced bTB surveillance (radial testing) conducted around those OTFW herds (may not be applicable to every county in the Edge Area)</td>
<td>4</td>
</tr>
</tbody>
</table>
### Herd-level statistics

<table>
<thead>
<tr>
<th>Derbyshire</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTF-S</td>
</tr>
<tr>
<td>OTF-W</td>
</tr>
</tbody>
</table>

**i.** Number of OTF-W herds still open at the end of the period (including any ongoing OTF-W breakdowns that began in a previous quarter)

**j.** New confirmed (positive *M. bovis* culture) incidents in non-bovine species detected during the report period (indicate host species involved)

### Table A3.3. Animal-level statistics (cattle)

<table>
<thead>
<tr>
<th>Derbyshire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal-level statistics (cattle)</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Total number of cattle tested in the period (animal tests)</td>
<td>35326</td>
</tr>
<tr>
<td>b. Reactors detected:</td>
<td>88</td>
</tr>
<tr>
<td>• tuberculin skin test</td>
<td>31</td>
</tr>
<tr>
<td>• additional IFN-gamma blood test reactors (skin-test negative or IR animals)</td>
<td>57</td>
</tr>
<tr>
<td>c. Reactors per breakdown</td>
<td>6</td>
</tr>
<tr>
<td>d. Reactors per 1000 animal tests</td>
<td>2.49</td>
</tr>
<tr>
<td>e. Additional animals identified for slaughter for bTB control reasons (DCs, including any first-time IRs)</td>
<td>0</td>
</tr>
<tr>
<td>f. SLH cases (tuberculous carcasses) reported by FSA</td>
<td>0</td>
</tr>
<tr>
<td>g. SLH cases confirmed by culture of <em>M. bovis</em></td>
<td>0</td>
</tr>
</tbody>
</table>
Figure A3. Reactor and slaughterhouse case density – All TB breakdowns (1-1/2016-31/12/2016)
Appendix 4: Suspected sources of *M. bovis* infection for all the new OTF-W breakdowns identified in the report period

Table A4. Suspected sources of *M. bovis* infection for all the new OTF-W breakdowns identified in the report period

<table>
<thead>
<tr>
<th>Most likely origin</th>
<th>Derbyshire</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prov.</td>
</tr>
<tr>
<td>Introduction (e.g. purchase) of infected animal(s)</td>
<td>0</td>
</tr>
<tr>
<td>Local - lateral spread from neighbouring holdings</td>
<td>0</td>
</tr>
<tr>
<td>• exposure to infected wildlife</td>
<td>4</td>
</tr>
<tr>
<td>• other farmed species</td>
<td>0</td>
</tr>
<tr>
<td>• recrudescence of residual infection from a previous bTB breakdown</td>
<td>0</td>
</tr>
<tr>
<td>• infected human source</td>
<td>0</td>
</tr>
<tr>
<td>Undetermined/obscure</td>
<td>0</td>
</tr>
<tr>
<td>Other (explain)</td>
<td>0</td>
</tr>
</tbody>
</table>

All new OTF-W bTB breakdowns identified in the Derbyshire Edge Area were categorised using the following risk matrix, according to (a) the probability of them being the result of introduced infection (inward cattle movements) and (b) the strength of evidence that we are dealing with an isolated incident without further propagation from the index farm to neighbouring herds (or vice versa). The corresponding numbers of breakdowns are entered in the relevant boxes. (Greyed-in boxes show introduced breakdowns with no evidence of local spread).

The uncertainties that have resulted in cases being included in the ‘possible’ column or row are primarily because all testing associated with the breakdown has not yet been completed (radial and contiguous testing).
DERBYSHIRE

<table>
<thead>
<tr>
<th>Probability of introduced <em>M. bovis</em> infection</th>
<th>Definite</th>
<th>Likely (no secondary breakdowns detected)</th>
<th>Possible (no secondary breakdowns detected, but dataset incomplete)</th>
<th>Not likely (secondary spread has occurred)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability of isolated, sporadic ('one-off') breakdown, without secondary cattle to cattle spread</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likely</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possible</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not likely</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

OTF-W breakdowns categorised as definite or likely introduced cases with no evidence of local spread shown in greyed-in boxes

Appendix 5: Overview of the bTB Control Programme in this Region of the Edge Area

5.1 Edge Testing Policy
- All Edge Area breakdowns continue to undergo a minimum of two short interval (60 day) tests at severe interpretation.
- No Derbyshire Edge Area OTFW herds have been eligible for exemption from triggering radial bTB surveillance.
- No exemptions have been applied to the deployment of statutory parallel gamma interferon testing in OTFW herds
- There are no existing breakdowns which have become persistent (under bTB2 restriction for more than 18 months because of disease). The longest duration breakdown to resolve in 2016 lasted 11 months.

5.2 Unusual bTB breakdowns
- One bTB breakdown new in 2016 has occurred as a result of recrudescence of infection after a breakdown in 2014 caused by the purchase of infected cattle at a herd dispersal in the Low Risk Area of England (the cattle were not required to have been pre-movement tested). The same genotype as that in the dispersed herd was identified in both breakdowns in the Derbyshire herd.
- No confirmed or suspected cases of zoonotic (human) *M. bovis* infection
• No cases of fraudulent skin test reactors
• There were no breakdowns involving producer-retailers or cheesemakers in 2016

5.3 Other Testing Measures
• Discretionary exemptions from annual routine surveillance whole herd testing have been approved for a small number of beef finishing units. The following criteria are required: all cattle move directly to the abattoir, no births are recorded for that holding, and all cattle are permanently housed or yarded (no grazing). Holdings are required to reapply for an exemption on an annual basis in order to ensure regular review of compliance.

• There are no potential hotspots (i.e. areas of temporarily enhanced bTB surveillance triggered by any new OTFW breakdowns that could not be attributed to purchase of infected cattle since the last negative herd test). There are areas which appear to have endemic infection and the results of the Defra-funded Found Dead Badger Survey should assist in determining presence of *M. bovis* in badgers in that area.

The frequency of overdue tests has diminished following the introduction of cross compliance penalties and movement restrictions on overdue herds.

5.4 Other Control Measures
• OV bTB skin testing quality control audits continue to be carried out by APHA in parallel with those being completed by the Veterinary Delivery Partners who are contracted to provide the statutory bTB skin testing on behalf of APHA
• APHA maintains a presence at the NFU Regional Board meetings, reporting current trends and advising on the bTB Eradication Strategy
• The Derbyshire bTB Group continues to meet on an *ad hoc* basis, although the group has been less active in 2016. Attendees include representatives from local farmers, market operators, private veterinary surgeons, National Trust, Country Land and Business Association (CLA), Local Authority, NFU, APHA and Defra.
• Local Authority liaison is maintained as necessary, especially regarding the enforcement of overdue bTB tests, illegal movements, fraudulent skin test reactors, and with Public Health colleagues regarding open bTB cases or the consumption of unpasteurised milk.
• Vaccination of badgers is in abeyance as previously discussed. Prior to that the Derbyshire Wildlife Trust had been allocated grant funding via the Badger Edge Vaccination Strategy (BEVS) and had been vaccinating badgers in the North Derbyshire Edge Area. Close contact has been maintained with the NFU and APHA in order that vaccination can be targeted appropriately and that farmers are well-informed.

The Animal and Plant Health Agency is an Executive Agency of the Department for Environment, Food and Rural Affairs working to safeguard animal and plant health for the benefit of people, the environment and the economy.