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

Warwickshire (part county)
Year-end report for 2017
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APPENDICES
1. Executive Summary

a. Introduction. 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. This annual report describes the bovine tuberculosis (bTB) epidemic in Warwickshire, one of five counties straddling the Edge and High Risk Areas between 2013 and 2017 and fully included in the Edge Area from 1st January 2018.


c. Overview of the bTB epidemic.
   I. History of TB in Warwickshire Edge Area. Historically low levels of disease, with purchase infected cattle from the High Risk Area of England (HRA), including Warwickshire HRA, being the main risk identified.
   II. Geographical distribution. Breakdowns spread throughout the Edge Area section of the county, with no obvious clustering but higher concentration of breakdowns in the south and west parts near the borders with Warwickshire HRA and Oxfordshire.

d. Descriptive epidemiology of bTB in Warwickshire Edge Area.
   I. Level of bovine TB: the incidence increased from 2014 to 2015, remaining constant from 2015 to 2016 and decreasing in 2017.
   II. New cases of bovine TB: In 2016, the total number of TB breakdowns dropped by 7% compared with 2015, with the number of confirmed (OTFW) cases increasing by 10% from 2015 to 2016 and suspected (OTFS) cases decreasing by 50%. In 2017 the total number (n=20) of breakdowns (excluding four cases in housed Approved Finishing Units (AFU)) dropped by 13% compared with 2016. OTFW cases decreased by 23.3% (four cases) and OTFS breakdowns increased by 20% (1 case). The AFU cases have been excluded from the calculations in the report.
   III. Disclosing test: Routine annual surveillance testing (WHT) detected most of the OTFW breakdowns (36%) . However, there were two slaughterhouse cases (14% of OTFW) in the county, in addition to the four slaughterhouse cases disclosed in housed AFUs. All the OTFS breakdowns were disclosed by WHT in contrast to 2016 where 67% of OTFS cases where disclosed by “other” types of test.
   IV. Risk pathways for bovine TB infection: The source of infection does not differ from 2016 in OTFW breakdowns, but has changed for OTFS breakdowns with wildlife increasingly implicated as a source of disease. In OTFW and OTFS breakdowns, wildlife was identified as the main source of infection, with purchased cattle from HRA being the second main source of infection identified.
   V. Cases in other species: There have been no laboratory-confirmed isolations of M. bovis in wild animals such as badgers, deer or boar carcasses in 2017. However, there are some cattle breakdowns where the source of infection was most likely to have been wildlife, with badgers and deer possibly implicated. The Defra-funded Edge Area badger found-dead survey report is not available at the time of writing.
   VI. Detection of cases: Majority of the cases in 2017 were detected by active surveillance and there was 14% of breakdowns (two) detected as slaughterhouse cases (as well as four slaughterhouse cases in AFUs).
   VII. Impact of bovine TB: reactor numbers. In 2017 the total number of reactors dropped in relation to the previous year and contrary to 2016 the number of interferon-gamma test positive animals was higher than the number of skin test reactors.

Key drivers of the bovine TB epidemic: The pattern and distribution of new breakdowns in 2017 suggest a continuing risk of infection coming from the HRA in Warwickshire and from the
Edge Area of North Oxfordshire. It also could be indicative of the emergence of endemic disease in the south of the Warwickshire Edge Area.

e. **Risks to the Low Risk Area and from the High Risk Area.** Remain unchanged from the 2016 year end report.

f. **Forward look.** Emphasis on risk-based trading, making herd/holding data available more widely to encourage industry ownership of disease control. Enhancement of wildlife control measures needed.

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 TB 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 bovine TB (bTB) in the section of Warwickshire which formed part of the Edge Area until the end of 2017 (see Appendix 1). This area has a low but recently rising incidence of infected herds 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 Warwickshire**

**Herd Types**

Although dairy herds continue to exist in significant numbers (30.2%), there is a predominance of beef cattle (65.3%), with fattening herds being the main herd type. As shown in Figure 1 and the data table in Appendix 2, there is a predominance of mainly small herds of up to 50 cattle in the county, and it would be reasonable to assume that the majority of these are beef cattle.

![Figure 1: Number of Warwickshire Edge holdings according to herd size](image)

**Markets**

There is one livestock auction market in the Warwickshire Edge Area – Rugby Farmers Mart.

**Approved Finishing Units**
There are 11 Approved Finishing Units (AFU). These units are all non-grazing (as required in the Edge Area) 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 Warwickshire Edge Area, 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.

4. **Overview of the TB epidemic in the Edge Area of Warwickshire**

   **a. History of TB in the Edge Area of Warwickshire**

   There has been a fluctuating pattern of new breakdowns with a rising plane from 2013 until 2015. This is not explained by any alteration in testing frequency as the whole county of Warwickshire was pre-emptively selected for annual testing some years prior to the formation of the Edge Area in 2013. The pattern changed in 2016 with a decrease in the number of breakdowns followed by a 16% decrease in 2017.

   **b. Geographical distribution of bovine TB cases (new and ongoing) in the Edge Area of Warwickshire**

   The geographical distribution of all new TB incidents in 2017 and any pre-2017 OTFW breakdowns still ongoing at the end of the report period is shown in Figure 2 overlaid on a map showing the cattle holding density for the Midlands Edge Area. Highest cattle densities are in the north and south of the Warwickshire Edge Area and TB breakdowns are concentrated in these two areas. The geographic distribution and occurrence of TB breakdowns in 2017 follows the same general pattern as the equivalent periods in 2016. The TB breakdowns are concentrated in the west and south of Warwickshire, however there has been a slight reduction in the total number of TB breakdowns in 2017 compared to 2016. In 2017 the number of OTFW breakdowns decreased slightly and the number of OTFS breakdowns remained the same, compared to 2016. Finally the number of OTFW breakdowns in the south west of the Warwickshire Edge Area in 2016 and 2017 increased compared with 2015.

   Figure 2 shows the genotypes of *M.bovis* isolated from TB breakdown herds in the Midlands Edge Area. Spoligotype 10 was found in the majority of culture-positive (OTFW) TB breakdown herds spread across the Edge Area of Warwickshire. Spoligotype 25 was disclosed in two breakdowns in the south west part of the Edge Area of Warwickshire and one case with spoligotype 9 of introduced cattle origin was disclosed in the north of the Warwickshire Edge Area.
Figure 2: Geographical distribution of all new TB breakdowns (OTFS and OTFW) in 2017 and any pre-2017 OTFW TB breakdowns 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 shown)
New cases of bovine TB:

Figure 3 shows the number of OTFW (14) and OTFS (six) breakdowns in 2017 compared with the number in 2016. In 2017 the number of OTFW breakdowns slightly decreased and the number of OTFS breakdowns remained approximately the same compared with 2016. In addition, there were four confirmed slaughterhouse cases in AFUs which have not been taken into account when calculating and analysing the total number of breakdowns as they occurred in biosecure units with no cattle access to grazing.

Figure 3: Number of confirmed (OTFW) and suspected (OTFS) breakdowns in the Warwickshire Edge in 2016 and 2017

Figure 4 shows the number of TB breakdowns by herd type. Beef herds accounted for 80% of the TB breakdowns and dairy herds for 20%. Half of all breakdowns were in beef suckler herds. Most (83%) of the OTFS breakdowns occurred in beef suckler herds. The predominance of beef herds with TB breakdowns is partly a reflection of the fact that beef cattle are the predominant herd type in Warwickshire.

Figure 4: Number of confirmed (OTFW) and suspected (OTFS) breakdowns by herd type in the Warwickshire Edge Area in 2017

The epidemic curve in Figure 5 shows a peak in breakdowns disclosed in March (four) and December (four), with a smaller peak in October (three) during 2017. In 2016 the peaks were in January (six) and
April (five). These peaks are a likely reflection of most routine surveillance testing being done during the winter months.

**Figure 5: Epidemic curve showing the distribution of new breakdowns per month in 2017**

Breakdowns were most numerous in herds containing between 0-50, 101-200 and 201-350 cattle, as shown in Figure 6. However, herds with more than 500 cattle were more frequently affected (13.3% of herds) compared to herds with 0-50 cattle (2.5%). Large herds with more than 500 cattle are more likely to have more frequent cattle movements and fragmented holdings.

**Figure 6: Number of breakdowns in Edge Area of Warwickshire by herd size**
5. Descriptive epidemiology of bovine TB in the Edge Area of Warwickshire

a. Level of bovine TB

Incidence

The incidence of bTB breakdowns in Warwickshire was calculated for 2014 - 2017. The figures from previous years have changed slightly to allow better comparison with the 2017 figure. This is due to the increase in testing as a result of more six monthly and contiguous testing in the Warwickshire Edge Area, 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.

The incidence level increased by 1% from 2014 (5.9%) to 2015 (6.9%) and remained steady from 2015 to 2016 (6.9%). The incidence level decreased by 0.9% in 2017 to 6.0% compared with the 2016 level. The four breakdowns in AFUs have been excluded from the 2017 calculations.

![Figure 7: Incidence for 2014 to 2017 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]

b. Risk pathways for bTB infection

Figure 8 shows the the likely source and, where known, the genotype of *M. bovis* for new breakdowns in 2017 in the Warwickshire Edge Area.
Figure 8: All breakdowns new in 2017 with origin and genotype where known.
In 2015, the main source of infection for both OTFS and OTFW breakdowns was purchased cattle. In 2016, the source of infection for 46% of OTFS and OTFW breakdowns was wildlife.

In 2017, wildlife was identified as the main source of infection for OTFW breakdowns with 71.4% attributed to this type of source (Figure 9). The majority of the wildlife infection has been attributed to badgers but there were two cases where wild deer (one) and stray park deer (one) may have shared this role with badgers. The breakdown where stray park deer were likely to be involved was relatively near to a local deer park.

Similarly, the origin of infection for 2017 OTFS breakdowns was mainly local, with badgers playing the main role and in two of these TB cases this role was also shared with wild deer. There were two breakdowns where the source of infection was unclear – as likely to have been purchased cattle as badgers.

Figure 9 also shows that wildlife was considered to be the origin of infection in all OTFW beef suckler herds as well as in all OTFW dairy herds. However, a purchased source (cattle movement) was most common in beef fattener herds: this is likely to be due to more regular cattle movements from the HRA into fattening herds.

![Figure 9: Origin of infection for new breakdowns in 2017 by herd type](image)

Figure 10 shows the origin of infection depending on the herd size. Wildlife infection was an identified source for all sizes of herd. Purchased cattle as a source of infection applied to most sizes of herd apart from herds with more than 350 cattle. The relationship between herd size and routes of infection is not easy to analyse with the small number of herds in this dataset.
In 2015 the total number of recurrent breakdowns (OTFS and OTFW) which had experienced an OTFW breakdown in the preceding three years was highest in Warwickshire (23%) compared to the other counties in the Midlands Edge Area. The recurrence rate dropped slightly in 2016 to 17%.

In 2015 five cases were associated with another primary TB breakdown new in 2015. The sources of infection were definitely purchased with no evidence of local spread. There was one persistent breakdown in Warwickshire in 2015 which concluded in March 2016. In 2016 there were two breakdowns with a purchased source of infection which were considered secondary to a primary breakdown in other areas (genotype 17:a).

In 2017 there were only two recurrent breakdowns which had experienced an OTFW breakdown in the previous three years, reducing the recurrence even further from 17% in 2016 to 10% in 2017. Both recurrent breakdowns’ source was likely to be wildlife, with genotype 10:a being identified. The previous breakdowns identified in both those herds were also associated with local wildlife and the identification of genotype 10:7-6-4*-3-3.1 which is closely related (and possibly a mutation and a precursor of) genotype 10:a.

There were some breakdowns with the genotype 10:7-5-6-4*-3-3.1 in 2015. These breakdowns concluded during 2016 and no further TB breakdowns appeared in 2016 with this genotype. Also, genotype 10:a was isolated again in some breakdowns in 2016. There were four breakdowns with this genotype in 2016, two of those occurring in the same geographical area in the south of Warwickshire. These breakdowns are near the boundary with Warwickshire HRA and Oxfordshire. In this case infected wildlife could have been the source of infection for these cattle breakdowns.

Also in 2016 genotype 17:a appeared in three cases in south Warwickshire near to the HRA in Warwickshire and Oxfordshire. The source of infection may have been purchased cattle or wildlife. The fourth case was definitely purchased.

As shown in Figure 1, genotype 10:a was identified in 71% (ten) of the new OTFW breakdowns in 2017. The homorange of this genotype includes Warwickshire. In eight of these breakdowns local wildlife was considered to be the most likely source of infection. In the other two breakdowns the most likely source of infection was considered to be purchased cattle from other farms in Warwickshire and Northamptonshire which had genotype 10:a disclosed in previous breakdowns.
Genotype 10:7-5-6-4*-3-3.1 was disclosed in one breakdown in south east Warwickshire close to the Northamptonshire border. This genotype had also been disclosed in other herds in Northamptonshire and Oxfordshire near the Warwickshire border and all these three farms showed strong presence of wild and stray park deer (due to the proximity of Shuckburgh and Charlecote Parks) as well as badgers. Wildlife, in particular deer and stray park deer, was considered to be the most likely source of infection for this breakdown.

Genotype 25:a was disclosed in two breakdowns. The source of infection for one breakdown was purchase of cattle from the HRA and the other breakdown most likely sources of infection were linked to wild deer and/or sharing of equipment with other farms.

Genotype 9:c appeared in one breakdown and was attributed to purchase of cattle from the HRA.

![Bar chart showing genotypes identified in new breakdowns in 2017](image)

**Figure 11: Genotypes identified in new breakdowns in 2017**

c. Role of other species

a. Badgers and other wildlife
There have been no laboratory confirmed isolations of *M. bovis* in wild animals such as badgers, wild deer or wild boar carcasses in 2017. However, there are some breakdowns where wildlife is likely to be the origin of disease either from badgers or wild deer. The Defra-funded Edge Area found-dead badger survey will provide some limited information about the prevalence of *M. bovis* in badgers in Warwickshire – the results for this are not available at the time of writing.

b. Other domestic species
There have been no laboratory confirmed isolations of *M. bovis* in domestic non-bovine farm animals (camelids, goats, sheep, pigs), pets, zoo animal collections, captive (farmed/park) deer holdings and captive wild boar farms in 2017.

d. Detection of cases

Figure 12 shows the proportion of breakdowns which were disclosed by different TB surveillance types in 2017. Enhanced surveillance tests - 12 month post-breakdown (12M), pre-movement (PRMT), tracing (TR), and private tests - detected most of the breakdowns in OTFW cases (50%). This clearly highlights the importance of enhanced surveillance testing in disclosing disease and reducing spread to other herds.
There were two slaughterhouse cases (14% of OTFW), in addition to the four slaughterhouse cases disclosed in the AFUs.

For OTFS breakdowns, the routine annual surveillance test (WHT) was responsible for the disclosure of 100% of those breakdowns.

![Figure 12: Frequency of breakdown disclosure by different surveillance methods in 2017](image)

In 2015 enhanced surveillance testing disclosed almost half of all breakdowns. Six out of thirteen of those tests were 6M tests, which are carried out 6 to 8 months after resolution of a breakdown and revocation of cattle movement restrictions.

In 2016 the WHT as well as other tests disclosed 80% of the breakdowns. Four of ten enhanced surveillance tests were 6M tests, indicating a slight decrease in recurrence of disease compared to 2015.

In 2017 there were no breakdowns disclosed by a 6M test but three were disclosed by 12M tests. It is significant that the pre-movement test disclosed two breakdowns.

In the case of the single OTFS breakdown, the reactor was non-visibly lesioned (NVL) as were the six reactors disclosed later during breakdown testing of that herd. All the reactors were homebred and disease is likely to have been of local origin: badger infection or residual disease in the herd. The majority of the four OTFW breakdowns were followed by further disclosure of skin reactors or/and positive gamma interferon test results.
e. Burden of bovine TB

Figure 14 shows the total number of skin test reactors and interferon-gamma test reactors disclosed in 2016 and 2017. In 2016 the total number of reactors dropped in comparison to 2015 and the number of skin test reactors was higher than the number of interferon-gamma test reactors. In 2017 the total number of reactors disclosed was the same as in 2016. However there was an almost 50% reduction in the number of skin test reactors disclosed in 2017 compared to 2016 and a significant increase in the number of interferon-gamma reactors. The increase in the number of interferon-gamma reactors in 2017 compared with the number of 2017 skin test and 2016 interferon-gamma test reactors may be due to the increasing burden of endemic disease in the Edge Area of Warwickshire as well as the increased test sensitivity provided by the interferon-gamma test. This allows disclosure of infected cattle earlier compared with the intradermal test and so contributes to the earlier removal of reactors and prevention of further spread of disease within and beyond these herds.

Figure 14: Total number of skin test and interferon-gamma test reactors disclosed in 2016 and 2017

As shown in Figure 15, the number of reactors per breakdown has been decreasing since 2015 reaching its lowest level in 2017. The number of reactors per 1000 cattle tested also decreased in
relation to 2015 but has maintained the same value of 3.47% reactors disclosed per 1000 animals tested throughout 2016 and 2017.

![Graph showing number of reactors per breakdown and per 1000 animals tested in 2015-2017]

**Figure 15: Number of reactors detected per breakdown and per 1000 animals tested in 2015 - 2017**

**f. Key drivers of the bovine TB epidemic**

- **Infected badgers**

  The total number of breakdowns (and OTFW breakdowns) has reduced slightly compared to 2016, but the endemic spread into the south west portion of the Edge Area from the HRA of Warwickshire and from the Edge Area of north Oxfordshire continues to be evident in the distribution of cases. Infected badgers and possibly wild and park deer continue to be considered as a significant source of infection for cattle in the Warwickshire Edge Area, with 65% of new breakdowns in 2017 being attributed to a badger source in both dairy and beef herds of all sizes. As reported in previous years, this pattern of breakdowns with badgers as a source of infection could be indicative of the emergence of endemic disease in the south Warwickshire Edge Area.

- **Cattle movement**

  The inward movement of cattle was the source of infection for 15% of new breakdowns in 2017. In 15% of breakdowns (three cases) a purchased cattle source was considered to be as equally likely as other local sources of disease (wildlife, residual and contiguous). This is different from previous years, where inward cattle movement was thought to have been responsible for the source of infection for a greater proportion of the cases. This may be indicative of changes in buying practices or an indication that wildlife sources, particularly badgers, and residual infection in herds are becoming more significant sources of infection. There is some uncertainty around the levels of infection in the badger population and the amount of direct and indirect contact with cattle. There is a continuing risk of transmission from the inward movement of cattle to holdings in the Edge Area. A new, industry led bTB accreditation scheme regulated by the Cattle Health Certification Scheme (CHeCS) was established in 2016 to try to encourage farmers to minimise risk when buying cattle. However, there needs to be improved collaboration with industry, government and private veterinarians to encourage uptake of these schemes. The new Farm Level bTB reports issued during a breakdown have proven useful and of interest to farmers. It would be useful to be able to generate these reports at the request of the farmer or private veterinarian in order for them to be used to inform herd health plans or the CHeCS scheme.

- **Recurrence and persistence**
There were two cases of persistence of infection in 2017, one of which resolved in February 2018. Both were in large (>500 cattle) beef suckler herds with multiple locations, some in the neighbouring HRA county. Badgers were considered to have been the source of infection in one, and in the other recurrence of infection either from incomplete clearing of disease during the previous breakdown or reinfection from the same badger source. There were three cases of recurrent infection, where herds with a new TB breakdown in 2017 had experienced a breakdown in the previous three years. All three cases of recurrent infection were attributed to direct or indirect contact with badgers as the source.

g. County descriptions

The Edge Area of Warwickshire has presented a rising incidence of bTB, with recent plateauing. The infection of local wildlife and local cattle movements further support the establishment of endemic disease in this part of the county. Warwickshire Edge Area will not be a candidate to achieve OTF status in the near future.

6. Summary of risks to the Low Risk Area and any mitigating factors

Warwickshire is not contiguous with any of the LRA counties and so does not pose a risk through infection creep.

Summary of the risks to the Edge Area from the High Risk Area

The summary of risks to the Warwickshire Edge Area is unchanged from those detailed in the 2016 year end report: the advancing endemic front (infection creep) from the High Risk Area parts of Warwickshire.

7. Assessment of effectiveness of controls and forward look

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

Other control measures in the Edge Area that have been implemented in 2017:

- Restriction for life of all IRs that are re-tested with negative results. Those animals can only be moved from the farm where they were first identified as IRs to a slaughterhouse or an AFU. Alternatively, they can be de-restricted if subjected to a private interferon-gamma blood test paid for by the farmer, with negative results.
- Once in a breakdown situation any further testing is carried out at least 60 days post reactor removal rather than 60 days post reactor isolation. This measure ensures that in cases where isolation of reactors is not properly maintained any animals that may have been exposed to infection while the reactor awaits removal will have sufficient time to mount a detectable immune response to the skin test.
- Decoupling of the interferon-gamma test from the skin test, the aim being to apply the interferon-gamma test as soon as a breakdown has been confirmed (by visible lesions or positive culture result) to allow for any exposed/infected animal missed by the skin test to be removed as soon as possible and potentially shorten the duration of the breakdown.
Additional bTB control measures for cattle herds to be implemented from 1st January 2018 in Warwickshire:

- The whole county to be included in the TB Edge Area
- Annual whole herd surveillance testing to be replaced by 6 monthly whole herd surveillance testing
- Interferon-gamma testing to be extended to OTFW breakdowns in the whole county

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, but much needs to be done to make herd- or holding-specific information easily accessible to farmers and the private veterinary practices in order to enable businesses to take ownership of their risks and responsibilities.

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

Although the Edge Area of Warwickshire had a decreased incidence (from 2016 to 2017), this county is not currently a candidate for achieving OTF status in the near future.
Appendix 1: Overview of risk and surveillance areas of England and Edge Area objectives and controls

Figure A1: Bovine TB risk and surveillance areas of England effective since January 2013, as set out in the Government’s Strategy for Achieving Officially Tuberculosis-Free Status for England.

1.1 Policy objectives for the Edge Area:

Short to medium term:

- a. slow down geographic spread
- b. maintain crude herd incidence of OTFW breakdowns <2% overall by 2019
- c. begin to reduce the incidence rate

Longer term:

- d. reduce geographic spread of bTB and push the Edge Area boundaries westward
- e. reduce OTFW herd incidence to <1% by 2025
- f. 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

- a. enhanced herd test coverage (annual)
- b. extend targeted surveillance to 3km around new OTFW breakdowns in Cheshire and Derbyshire (radial testing), with six month follow-up
- c. possible RTA badger survey

Management of cases (‘breakdowns’)

- a. 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
- b. enhanced epidemiological investigation and data analysis
- c. information sharing - location of breakdown herds
Appendix 2: Cattle industry in the Edge Area of the region

There have been no significant changes to the industry compared with 2016 report.

Number of cattle premises by size band in the Edge Area of Warwickshire in 2017

<table>
<thead>
<tr>
<th>Cattle per premises</th>
<th>1-50</th>
<th>51-100</th>
<th>101-200</th>
<th>201-350</th>
<th>351-500</th>
<th>501+</th>
<th>All</th>
<th>Mean</th>
<th>Median</th>
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</thead>
<tbody>
<tr>
<td>Number of premises</td>
<td>282</td>
<td>112</td>
<td>104</td>
<td>60</td>
<td>15</td>
<td>596</td>
<td>107</td>
<td>55</td>
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Cattle/herd purpose: numbers and percentages

<table>
<thead>
<tr>
<th></th>
<th>Beef</th>
<th>Dairy</th>
<th>Dual purpose</th>
<th>Unknown</th>
<th>Total</th>
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<tr>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Cattle</td>
<td>41,562</td>
<td>65.3</td>
<td>19,195</td>
<td>30.2</td>
<td>2,873</td>
</tr>
</tbody>
</table>

Appendix 3: Summary of the Warwickshire Edge Area regional headline cattle TB statistics

Herd-level statistics

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Total number of cattle herds live on Sam at the end of the reporting period</td>
<td>416</td>
<td>409</td>
<td>405</td>
</tr>
<tr>
<td>b. Total number of herd tests carried out in the period</td>
<td>765</td>
<td>624</td>
<td>622</td>
</tr>
<tr>
<td>c. Total number of OTF cattle herds TB tested during the period for any reason</td>
<td>703</td>
<td>347</td>
<td>333</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 TB02 restrictions)</td>
<td>388</td>
<td>383</td>
<td>370</td>
</tr>
<tr>
<td>e. Total number of cattle herds that were not under restrictions due to an ongoing TB breakdown at the end of the report period.</td>
<td>399</td>
<td>397</td>
<td>380</td>
</tr>
<tr>
<td>f. Total number of new TB breakdowns detected in cattle herds during the report period</td>
<td>26</td>
<td>24</td>
<td>24 (4 in AFUs)</td>
</tr>
<tr>
<td>OTF status suspended (OTFS)</td>
<td>14</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>OTF status withdrawn (OTFW)</td>
<td>12</td>
<td>18</td>
<td>18 (4 in AFUs)</td>
</tr>
<tr>
<td>g. Of the OTFW herd breakdowns:</td>
<td></td>
<td></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>8</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>New OTFW breakdowns triggered by skin test reactors or 2xIRs at routine herd tests</td>
<td>5</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>New OTFW breakdowns triggered by skin test reactors or 2xIRs at other TB test types (forward and back-tracings, contiguous, check tests, etc.)</td>
<td>4</td>
<td>7</td>
<td>7</td>
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<tr>
<td>New OTFW breakdowns first detected through routine slaughterhouse TB surveillance</td>
<td>3</td>
<td>4</td>
<td>6</td>
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</tbody>
</table>

1 In some cases there is minor variation (under 4) between the total number of breakdowns reported in the Year End Descriptive Epidemiology Reports for individual counties and the report on Bovine tuberculosis in England in 2017. These are due to differences in the breakdown case definition, where incidents first detected in late 2016 are included as 2017 breakdowns in the individual county reports; and where incidents occur in epidemiologically linked premises.
h. Number of new breakdowns revealed by enhanced TB surveillance (radial testing) conducted around those OTFW herds (may not be applicable to every county in the Edge Area) | N/A | N/A | N/A
---|---|---|---
 | OTFS | N/A | N/A | N/A
 | OTFW | N/A | N/A | N/A
i. Number of OTFW herds still open at the end of the period (including any ongoing OTFW breakdowns that began in a previous quarter) | 12 | 10 | 6
j. New confirmed (positive *M. bovis* culture) incidents in non-bovine species detected during the report period (indicate host species involved) | 0 | 0 | 0

### Animal-level statistics (cattle)

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
</table>
a. Total number of cattle tested in the period (animal tests) | 51,366 | 48,382 | 43,277 |
b. Reactors detected: | | | |
| • tuberculin skin test | 66 | 89 | 39 |
| • additional IFN-gamma blood test reactors (skin-test negative or IR animals) | 142 | 79 | 111 |
c. Reactors per breakdown | 8 | 7 | 6 |
d. Reactors per 1000 animal tests | 4.05 | 3.47 | 3.47 |
e. Additional animals identified for slaughter for TB control reasons (DCs, including any first-time IRs) | 0 | 1 | 0 |
f. SLH cases (tuberculous carcasses) reported by FSA | 7 | 6 | 14 |
g. SLH cases confirmed by culture of *M. bovis* | 3 | 5 | 9 |
### Appendix 4: Suspected sources of *M. bovis* infection for all the new OTFW breakdowns identified in the report period

<table>
<thead>
<tr>
<th>Most likely origin</th>
<th>Warwickshire Edge Area</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>0</td>
</tr>
<tr>
<td>- other farmed species</td>
<td>0</td>
</tr>
<tr>
<td>- recrudescence of residual infection from a previous TB 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)- There was an OTFW breakdown with genotype 25:a disclosed where the reactor was a homebred animal and source of disease could either be wild deer or sharing of mowing equipment with other farms</td>
<td>0</td>
</tr>
</tbody>
</table>

### Probability of isolated, sporadic ('one-off') breakdown, without secondary cattle to cattle spread

<table>
<thead>
<tr>
<th>Probability of introduced <em>M. bovis</em> infection</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>Definite</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likely</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possible</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Not likely (indigenous infection in the locality)</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 5: Overview of the bTB Control Programme in this Region of the Edge Area

5.1 Edge Testing Policy

- No discretionary measures implemented in OTFS breakdowns
- Mandatory interferon-gamma testing for OTFW breakdowns and discretionary interferon-gamma for OTFS breakdown (see above) disclosed 111 additional reactors
- No exemptions were applied to the deployment of the interferon-gamma blood test in OTFW breakdowns
- No persistently infected herds identified and no recommendations made for enhanced case management

5.2 Unusual bTB breakdowns

- No unusual TB breakdowns identified
- No known confirmed or suspected cases of zoonotic (human) M. bovis infection
- No suspected cases of fraudulent skin test reactors.

5.3 Other Testing Measures

- No other testing measures applied

5.4 Other Control Measures

- Regional meetings held with farmers in the Warwickshire local TB eradication group, led by the NFU
- Defra-funded found-dead badger survey in the Edge Area completed with results pending at the time of writing.
- Badger vaccination project: the four-year projects which Defra funded under the original Badger Edge Vaccination Scheme (BEVS) which started in 2015 were terminated in 2016 due to short supply of the “Badger BCG” vaccine.