



Animal &
Plant Health
Agency

Year-end descriptive epidemiology report: Bovine TB in the Edge Area of England

County: Buckinghamshire

Year-end report for: 2019

TB Edge Area - BUCKINGHAMSHIRE



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Executive summary

Reporting area

Buckinghamshire is part of the Edge Area that was established in 2013. The following year, the bovine tuberculosis (TB) surveillance strategy for this area was incorporated into the Government's strategy to achieve Officially Tuberculosis Free (OTF) status for England by 2038. The Edge Area has an overall moderate but recently rising incidence of infected herds with substantial variability from county to county. This end of year report describes bovine TB in Buckinghamshire.

Local cattle industry

Buckinghamshire is predominantly a beef rearing county with a large proportion of small farms (fewer than 50 cattle). Many farms purchase cattle from local markets particularly Thame Market in Oxfordshire (Edge Area county), near the Buckinghamshire border, channelling cattle into the county from the Edge Area and Low Risk Area (LRA), but also from the High Risk Area (HRA) counties with more abundant cattle.

New incidents of TB

Most TB incidents were in the north-west of Buckinghamshire where there is the highest density of both cattle and cattle holdings. There were no clusters or emerging endemic areas that became apparent during 2019. Annual incidence rate of TB (incidents per 100 herd-years at risk) reduced slightly from 6.9 in 2018 to 6.1 in 2019, but the number of Officially Bovine Tuberculosis Free Status Withdrawn (OTF-W) incidents increased from six in 2018 to 12 in 2019. However the total number of new incidents in 2019 (27) was lower than in 2018 (31). Despite this reduction, there were still more TB incidents in 2019 than in 2016 and earlier years.

Suspected sources and risk pathways for TB infection

The main risk pathway for introducing TB into this county remained the purchase of cattle with undisclosed infection from other Edge Area counties and the High Risk Area of England (HRA).

Details of the methodology used to calculate the weighted contribution of the different suspected sources of *M. bovis* infection for all new incidents can be found in the main body of the report and in the [Explanatory Supplement to the 2019 bovine TB epidemiology reports](#).

Disclosing tests

Routine herd surveillance tests disclosed 33.3% of new incidents with the remainder being disclosed by enhanced surveillance tests (six and 12 month post incident testing and radial testing). Only one incident was disclosed at a pre-movement test.

Reactor numbers

A total of 170 reactor cattle were detected during 2019, of which 75 were reactors to the skin test and 95 positive to the interferon gamma (IFN- γ) test. This was 113 fewer reactor cattle than in 2018, partly explained by the decrease in number of TB incidents from 31 in 2018 to 27 in 2019.

Risks to the reporting area

Oxfordshire is the Edge Area county that presents the greatest risk of TB spread into Buckinghamshire. The risk is two-fold: via cattle movements including those involving Thame Market (located on the Buckinghamshire border) and via TB infected wildlife (believed to be present in Oxfordshire). The movement of a TB 'endemic infection front' from the HRA into Oxfordshire has continued eastwards since the early 2000's and now appears to have reached the border with Buckinghamshire.

Risks posed by the reporting area

Although in 2018 there was no clear evidence that cattle incidents were occurring because of any spread of endemic infection, one incident in 2019 which was linked to a cluster on the border in Oxfordshire suggests that this situation is starting to change. Buckinghamshire represents a low risk of TB infection to the LRA.

Forward look

Buckinghamshire has not achieved its target of a <2% OTF-W herd incidence by 2019. However, if the practice of purchasing cattle from herds with undisclosed TB infection can be changed, Buckinghamshire could be on track to achieve the target of <1% OTF-W herd incidence by 2025, but this is conditional on the introduction of effective wildlife interventions to prevent spread from Oxfordshire.

Introduction

This report describes the level of bovine tuberculosis in cattle herds in Buckinghamshire in 2019. Bovine TB is caused by the bacterium *Mycobacterium bovis* (*M. bovis*), and will subsequently be referred to as TB. This report explores the frequency and geographical distribution of TB in cattle herds. It examines what is likely to be driving TB in Buckinghamshire, and the risks the disease in this county may pose to neighbouring cattle. Although other sources may refer to TB 'breakdown(s)', this report will use the term 'incident(s)' throughout. This report is intended for individuals involved in the control of TB, both in the local area and nationally. This includes, but is not limited to: farmers, veterinarians, policy makers and the scientific community.

In 2014 the Government published its Strategy to achieve Officially TB Free (OTF) status for England by 2038. A key action was to recognise the different levels of TB in different parts of the country and to vary the approach to control accordingly. To this end three management areas were established (refer to Appendix 1). Buckinghamshire forms part of the Edge Area. Overall, the Edge Area has a moderate but recently rising incidence of infected herds with substantial variability from county to county. Control efforts are seeking to slow down and reverse geographic spread, and to reduce the incidence rate. The aim is to obtain OTF status for the Edge Area as soon as possible.

Changes to the Edge Area in 2018

On 1 January 2018 the Edge Area boundary was expanded westwards to absorb the former High Risk Area (HRA) parts of the five previously split counties. Cheshire, Derbyshire, Warwickshire, Oxfordshire and East Sussex all moved fully into the Edge Area. Furthermore, the routine TB testing frequency of herds in the counties in the west of the Edge Area adjoining the HRA (or parts thereof) was increased from annual to six-monthly. The respective descriptive TB epidemiology reports for those five counties of the Edge Area, will focus on the whole county and key differences between the old and new parts will be highlighted where relevant.

The changes of January 2018 to the Edge Area boundary did not affect the county of Buckinghamshire. However, at that time Defra introduced radial skin testing of herds located within a 3km radius of a new OTF-W incident to enhance the cattle TB surveillance regime in Buckinghamshire and all the other parts of the Edge Area that remained on annual testing.

Cattle industry

Herd types

There is a large proportion of small cattle farms (fewer than 50 cattle) in Buckinghamshire (Figure 1) that are less likely to purchase cattle in high numbers. This results in fewer incidents being disclosed on such premises. Buckinghamshire is predominantly a beef county with finishing units being the most common type of enterprise. A common practice is to house the cattle in barns during the winter months (October to March) and put them out to grass for the remainder of the year.

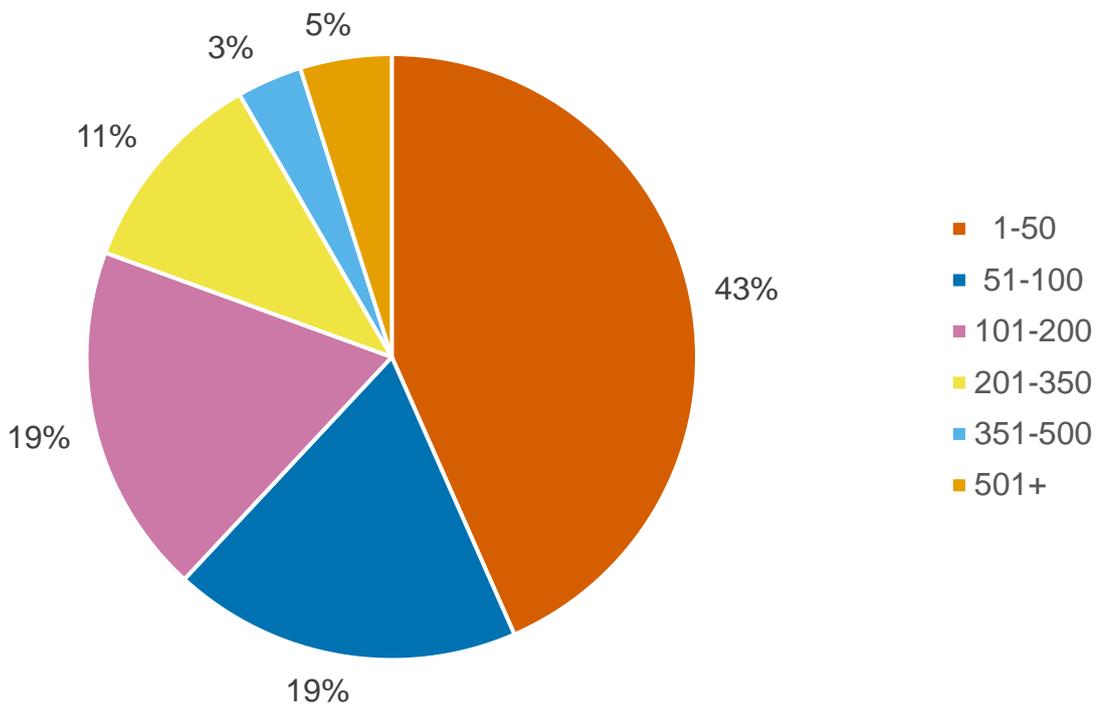


Figure 1: Proportion of cattle holdings by herd size in Buckinghamshire in 2019 (n=433).

Markets

Many farms purchase cattle through Thame Market in Oxfordshire near the border with Buckinghamshire, channelling cattle into the county mainly from the Edge Area and LRA. However, a small proportion of cattle are also purchased from markets within the HRA of England and Wales.

Approved Finishing Units

One new Approved Finishing Unit (AFU) was approved in Buckinghamshire during 2019, which makes a total of seven AFUs in the county.

Descriptive epidemiology of TB

Temporal TB trends

Three measures are used to explore the level of TB in this report.

1. The number of new herd incidents that were disclosed in each year.
2. The annual herd incidence rate, reported as the number of new incidents per 100 herd-years at risk (100 HYR). This is the number of new TB incidents detected in the year, divided by the time those herds were at risk of contracting TB. The 100 HYR incidence rate is used in this report as it accounts for different intervals between herd tests that other incidence measures do not (such as new TB incidents per number of herds or tests).
3. The annual end of year herd prevalence. This is the number of herds under restriction due to a TB incident, divided by the number of active herds at the same point in time. Prevalence provides a snapshot of the burden of TB on the local cattle industry.

All three measures include Officially Tuberculosis Free Status Withdrawn (OTF-W) incidents, and Officially Tuberculosis Free Status Suspended (OTF-S) incidents. OTF-W incidents are those in which at least one animal was identified with typical lesions of TB at post mortem (PM) inspection, and/or positive for *M. bovis* on culture from tissue samples. OTF-S incidents are those with one or more reactors to the Single Intradermal Comparative Cervical Tuberculin (SICCT) skin test, but without full confirmation of *M. bovis* infection by PM inspection or bacterial culture. TB incidents in non-grazing AFUs are not included in the prevalence and incidence calculations in this report due to the limited epidemiological impact of these cases. Furthermore, herds restricted because of an overdue test rather than a TB incident are also excluded from calculations. Measures of incidence and prevalence in this report may be lower than those reported in the official TB statistics.

Similar to 2018, the number of new TB incidents and annual herd incidence rate in Buckinghamshire slightly decreased in 2019 following the marked increase in incidents noted during 2017. Prior to this, the county had a period of relative stability (2013-2016). As shown in Figure 2 the total number of incidents reduced to 27 from 31 in 2018, although this is higher than 2016 (14). The number of OTF-W incidents increased from 6 in 2018, to 12 in 2019, but the number of OTF-S incidents reduced from 25 in 2018 to 15 in 2019.

A similar trend can be seen in Figure 3, where there is a jump in incidence (incidents per 100 herd-years at risk) from 2.8 in 2016 to 7.6 in 2017, which has then reduced in 2018 (6.9) and again in 2019 (6.1).

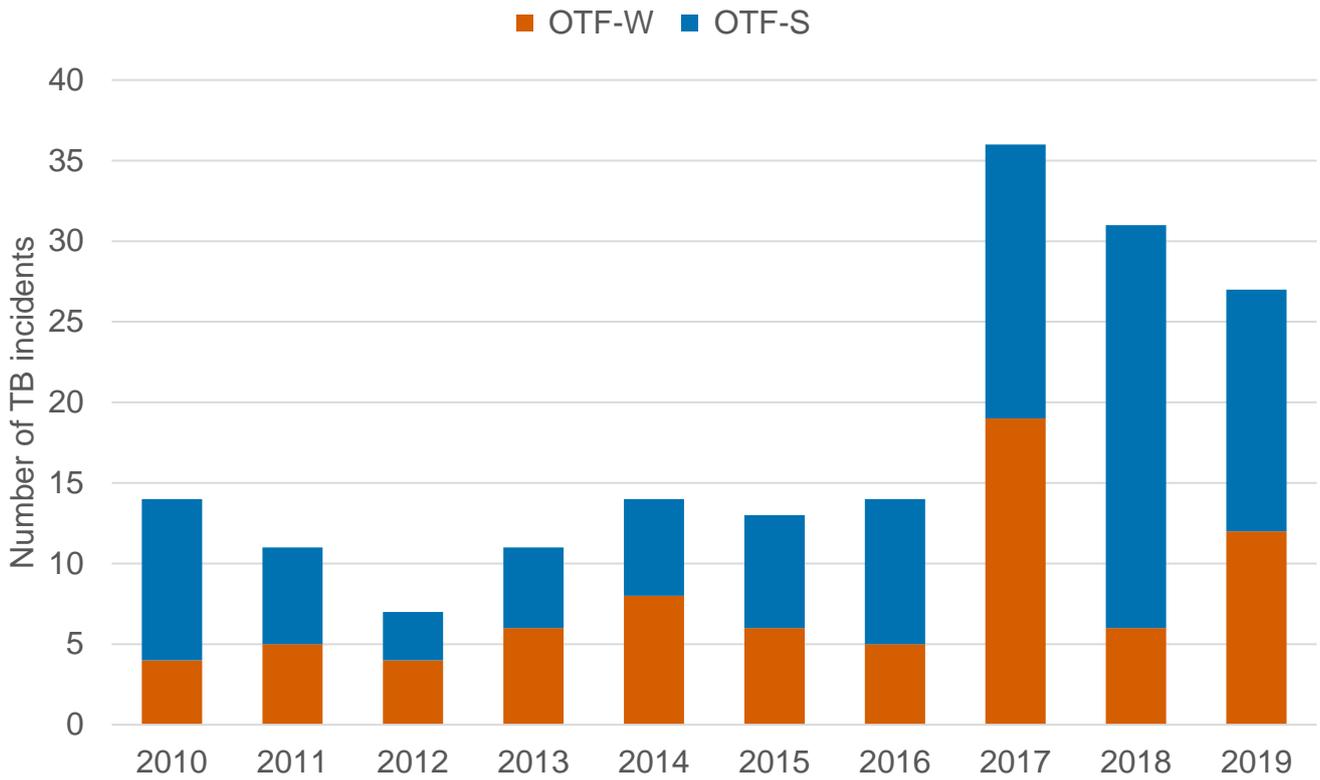


Figure 2: Annual number of new TB incidents in Buckinghamshire, 2010 to 2019.

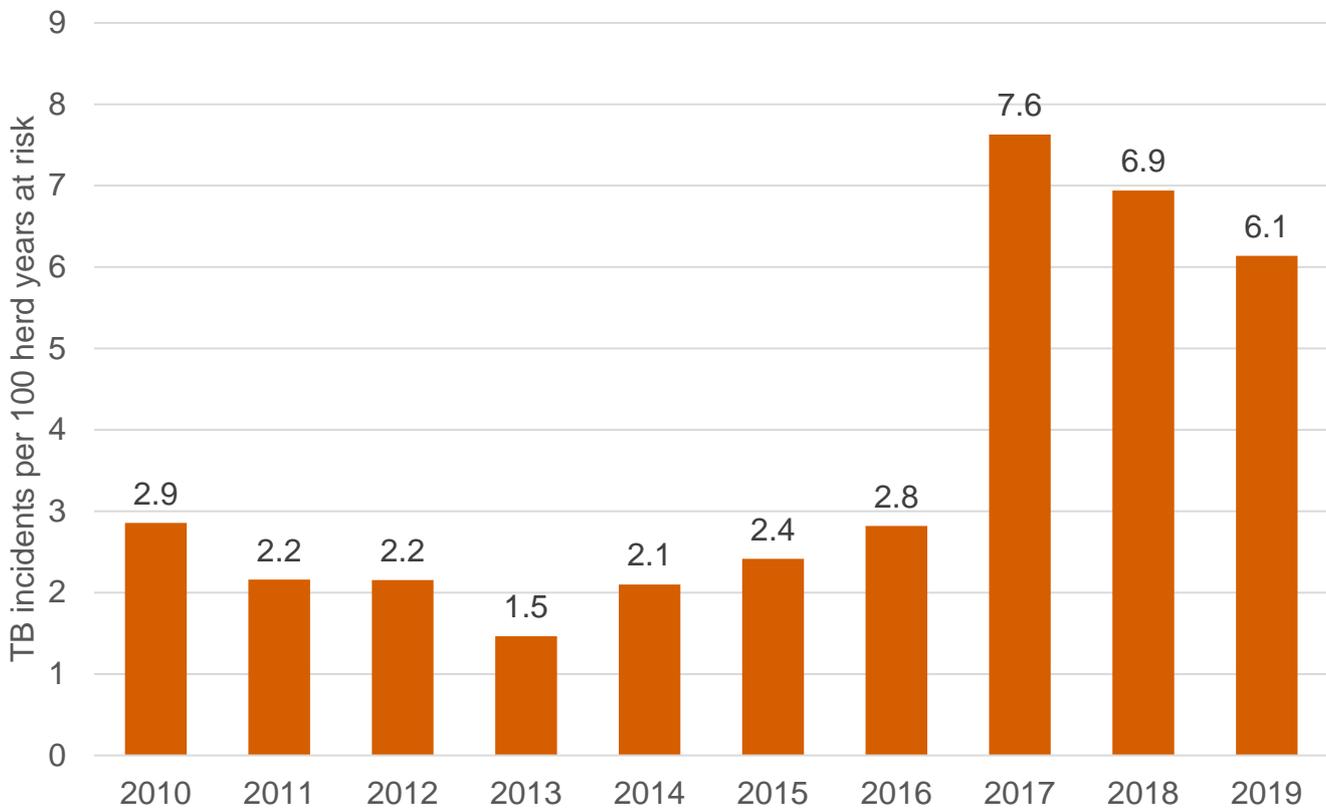


Figure 3: Annual herd incidence rate (per 100 herd-years at risk) for all new incidents (OTF-W and OTF-S) in Buckinghamshire, 2010 to 2019.

In 2019 the herd prevalence has dropped marginally in line with decreased incidence from 3.89% in 2018 to 3.75% in 2019 (Figure 4).

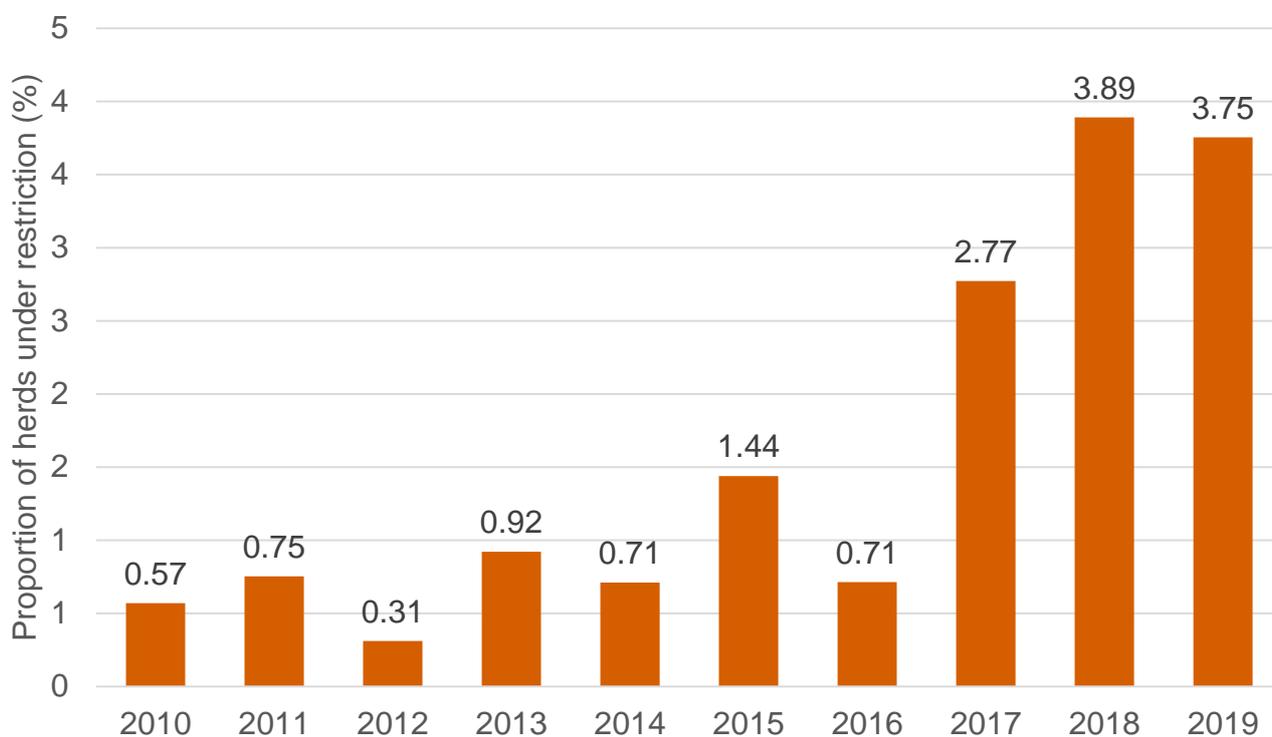


Figure 4: Annual end of year TB herd prevalence in Buckinghamshire, 2010 to 2019.

Geographical distribution of TB incidents

As shown in Figure 5, Buckinghamshire has an incidence rate (incidents per 100 herd-years at risk) of 6.1 which is below the average for the Edge Area (9.9) and the HRA (16.9). The incidence in Buckinghamshire is similar to the neighbouring Edge Area county of Northamptonshire (6.5). Buckinghamshire is much lower than its other neighbouring Edge Area counties of Oxfordshire (23.8), and Berkshire (16.4).

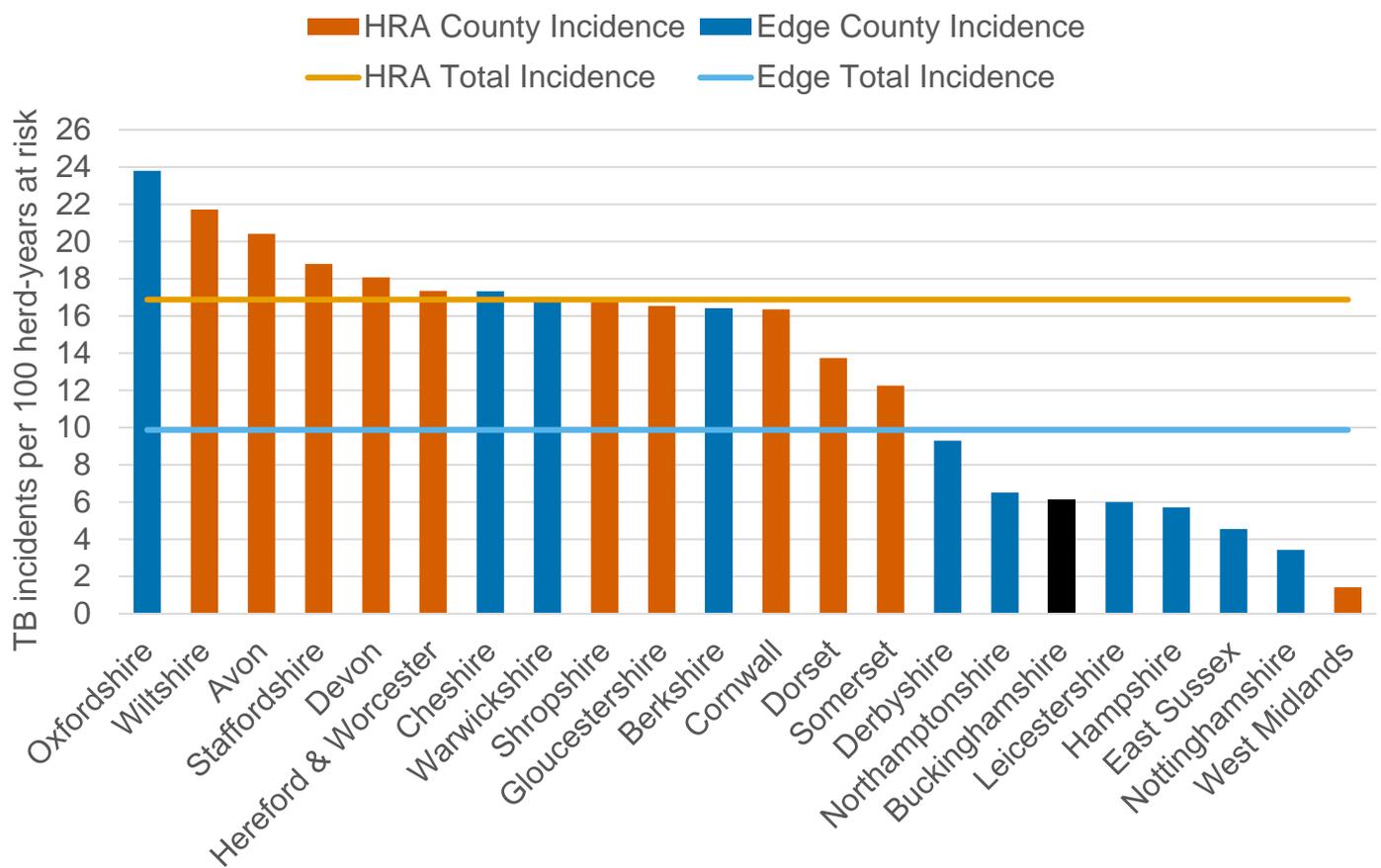


Figure 5: Incidence rate (per 100 herd-years at risk) for all new incidents (OTF-W and OTF-S) in 2019, by HRA and Edge Area County.

A significant number of new TB incidents were in north-west Buckinghamshire where there is the highest density of both cattle and cattle holdings (Figure 6). The geographical distribution of TB incidents is similar to 2018, but the total number of new TB incidents reduced from 31 to 27. Between 2018 and 2019 the proportion of OTF-W incidents increased from 19% to 44%.

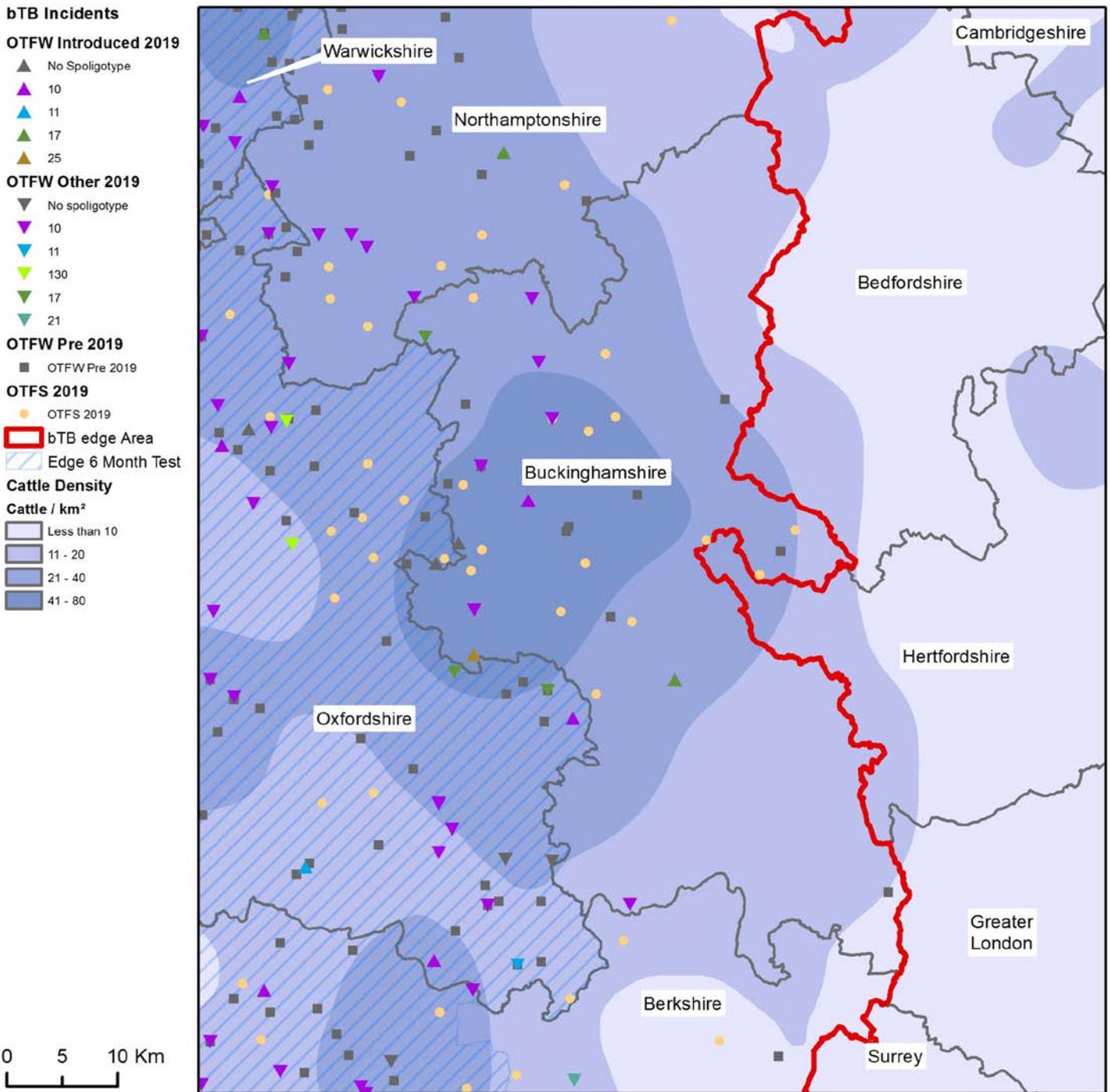


Figure 6: Location of cattle holdings in Buckinghamshire with new TB incidents (OTF-W and OTF-S) in 2019 and cattle holdings with pre-2019 OTF-W incidents that are still ongoing at the beginning of 2019, overlaid on a cattle density map. To note, 'OTF-W Introduced 2019' refers to OTF-W incidents in which introduction of infection through cattle movements was the most likely source identified.

During 2019, only one genotype of *M. bovis* (10:a) was detected in Buckinghamshire where a wildlife source was attributed to an OTF-W incident (Figure 7). The nearest area with TB infection in wildlife is an area of 10:a infection in the neighbouring county of Oxfordshire. Anecdotally, the population and activity of both badgers and deer on farms in Buckinghamshire is high and has increased in recent

years. Spread of endemic TB from the west must be prevented in order to achieve OTF status for Buckinghamshire.

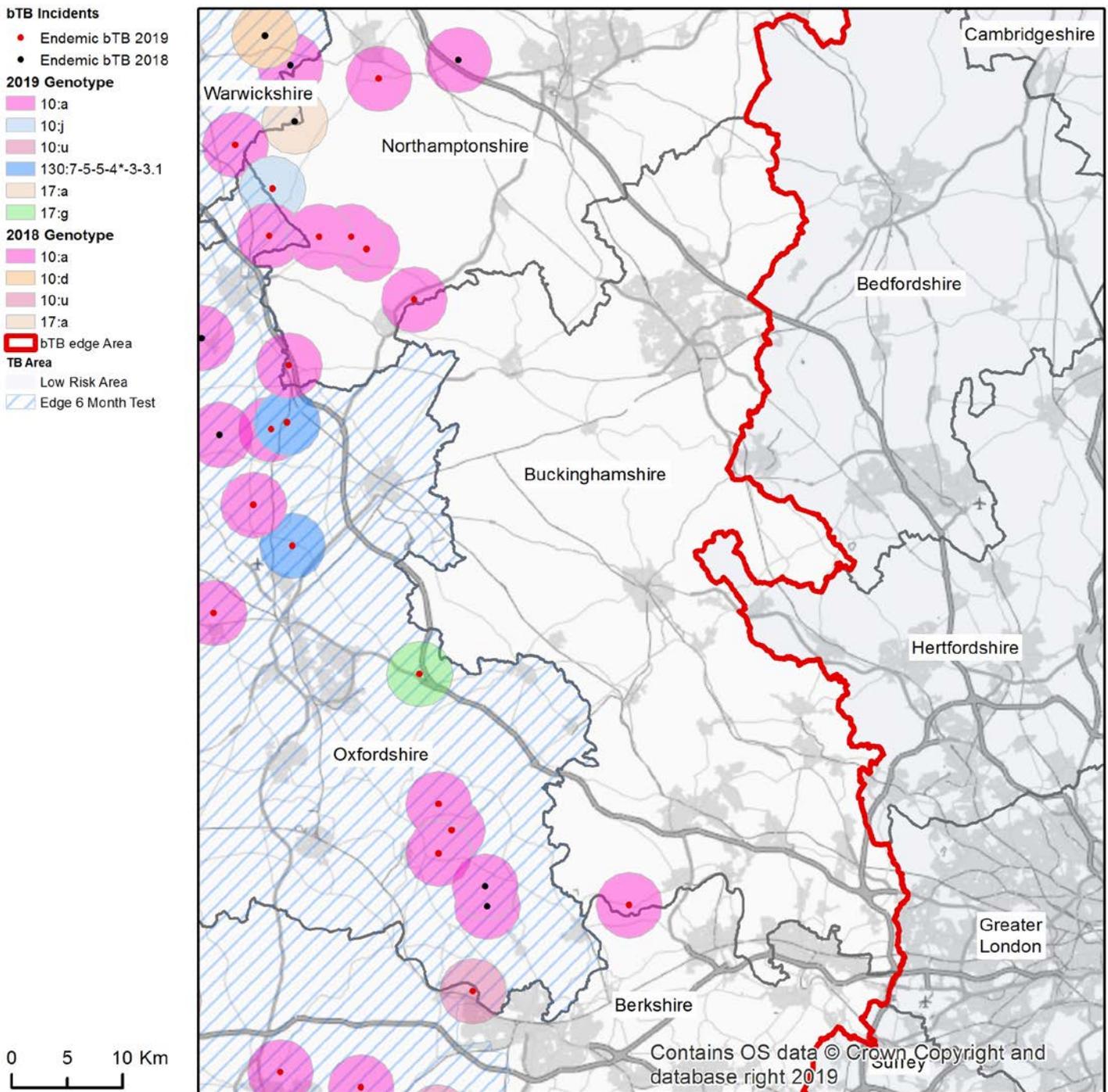


Figure 7: Genotypes of *M. bovis* detected in Buckinghamshire in 2018 and 2019, where a wildlife source was attributed with a 75% certainty or above, as an indication of endemic infection within local wildlife populations (OTF-W incidents only).

As in previous years, the purchase of undisclosed infected cattle remains the highest driver for the spread of TB within Buckinghamshire (Figure 8). In 2018, local cattle (residual and contiguous) and wildlife were recorded as potential sources of infection in around 20% of new incidents, but the

supporting evidence had low level of certainty. In 2019, a wildlife source (infected deer or badgers) was suspected for one incident linked to a cluster near Henley-on-Thames in Oxfordshire, a conclusion supported by Whole Genome Sequence analysis. This is a suckler herd with cattle being kept over two counties, Buckinghamshire and Oxfordshire including grazing within the Henley-on-Thames cluster area.

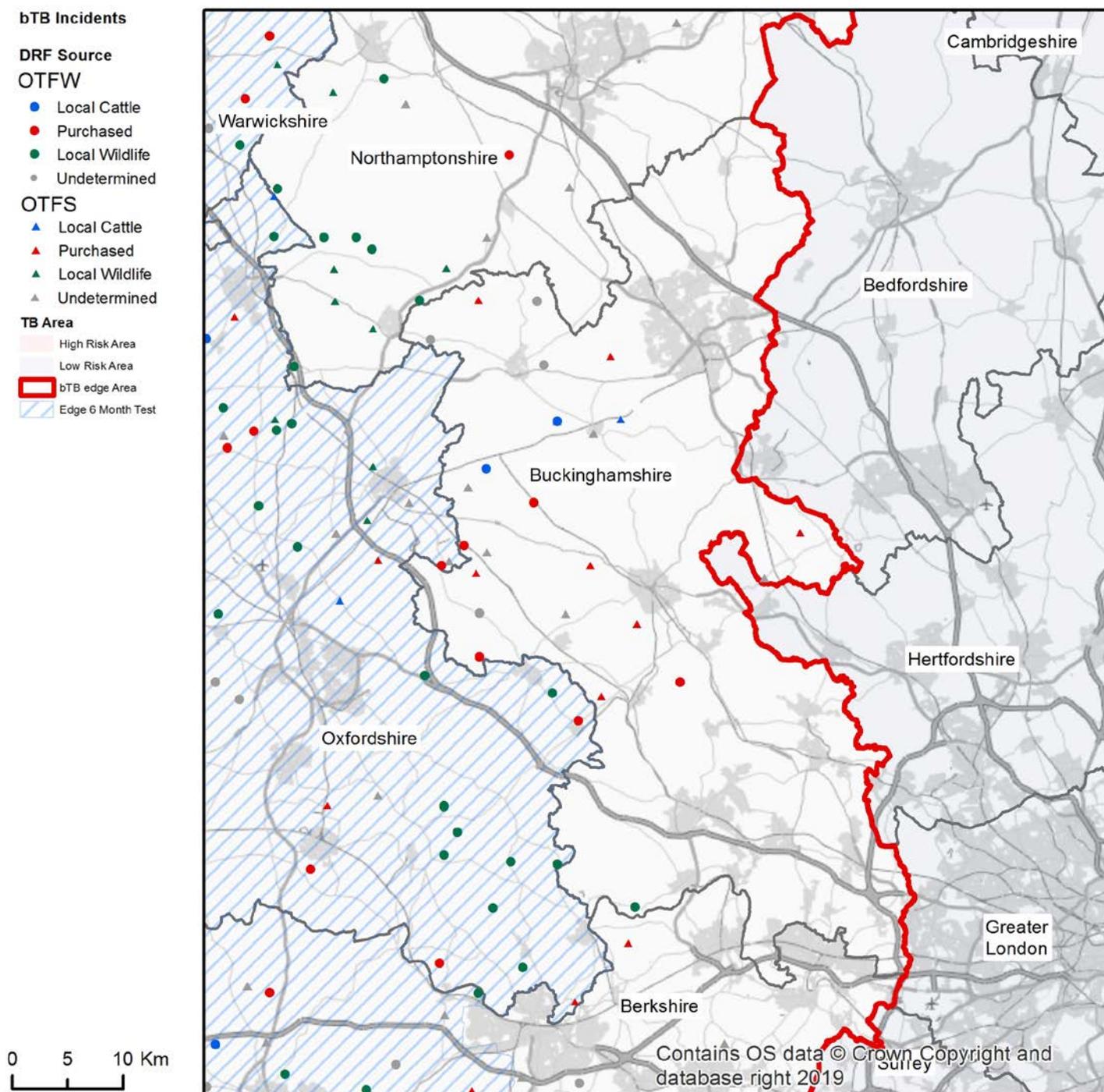


Figure 8: Map of the source of infection pathway recorded with the highest level of certainty for all TB incidents (OTF-W and OTF-S) in Buckinghamshire, and its adjoining Edge Area counties, which started in 2019.

Other characteristics of TB incidents

Incidents by herd types

Out of the 12 new OTF-W incidents in 2019, four were on beef suckler units, five on beef fattening units and three were on dairy farms. The OTF-S incidents occurred on both beef and dairy farms. Only four new incidents occurred on small farms (fewer than 50 cattle) with the remainder spread evenly across the medium and larger herd sizes (Figure 9).

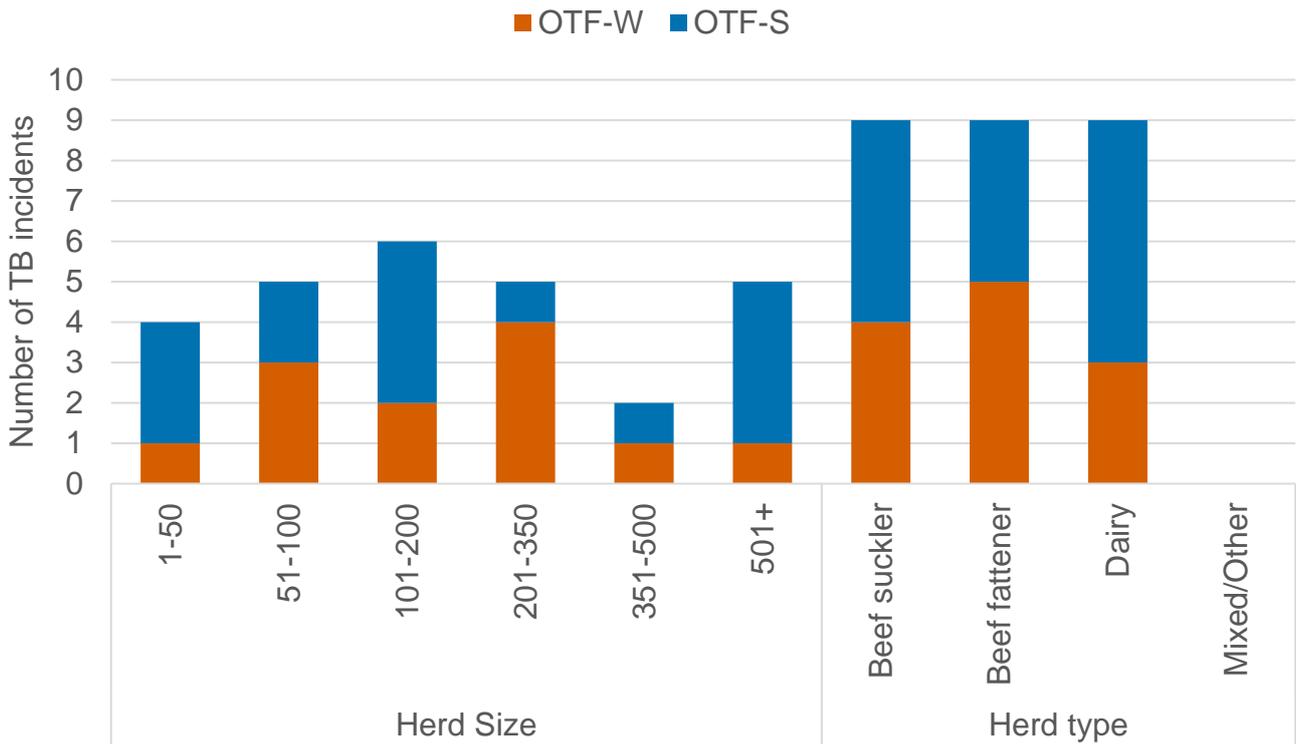


Figure 9: Number of new TB incidents (OTF-W and OTF-S) in Buckinghamshire in 2019, by cattle herd size and type.

Incidents by month of disclosure

The seasonality of disclosure of incidents reflects the higher rate of testing carried out in autumn and winter rather than a seasonality resulting from exposure at grazing, with fewer new incidents during the summer months (Figure 10). Most beef herds purchase cattle in autumn that get tested the following autumn/winter.

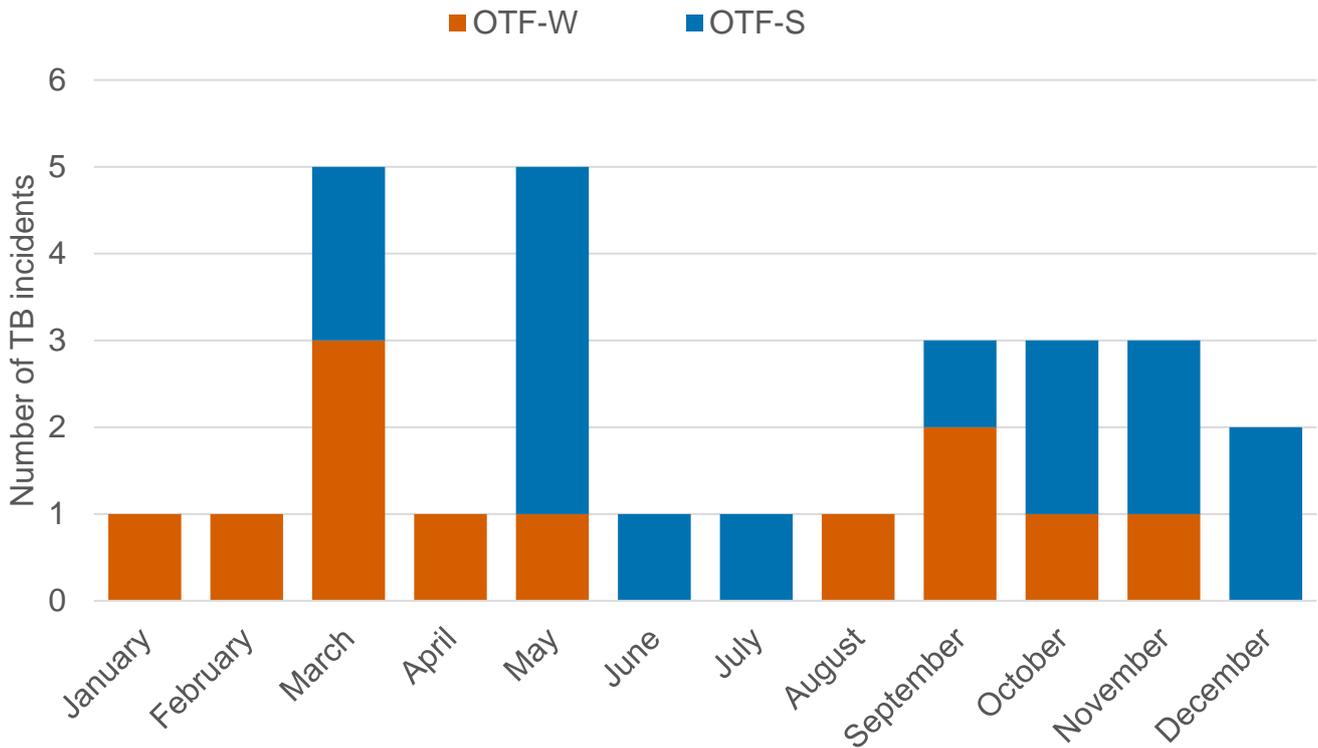


Figure 10: Number of new TB incidents (OTF-W and OTF-S) in Buckinghamshire in 2019, by month of disclosure.

Genotypes of *M. bovis* isolated

In 2019, genotypes of *M. bovis* were identified for 10 of the 12 OTF-W incidents in Buckinghamshire, including a novel genotype (Figure 11). This was an increase from 2018 when only three genotypes and one spoligotype of *M. bovis* were identified in the six OTF-W incidents. There was also no evidence of a continuation of the genotype 17:b cluster of incidents, identified north of Aylesbury, during 2017.

The genotypes of *M. bovis* identified in 2019 were 10:a (seven), 17:a (one), 17:e (one), 25:b (one) and one new type (nt:7-5-5-4*-3-3.1). These incidents are attributable to the purchase of cattle mainly from the Edge Area, with only one purchase from the HRA. A small number of incidents were attributed to residual infection in the herd, contiguous contact over the fence with infected cattle and infected wildlife.

Genotype information was not available for one OTF-W incident because the culture was negative for *M. bovis*. Purchase of infected cattle was considered the most likely source.

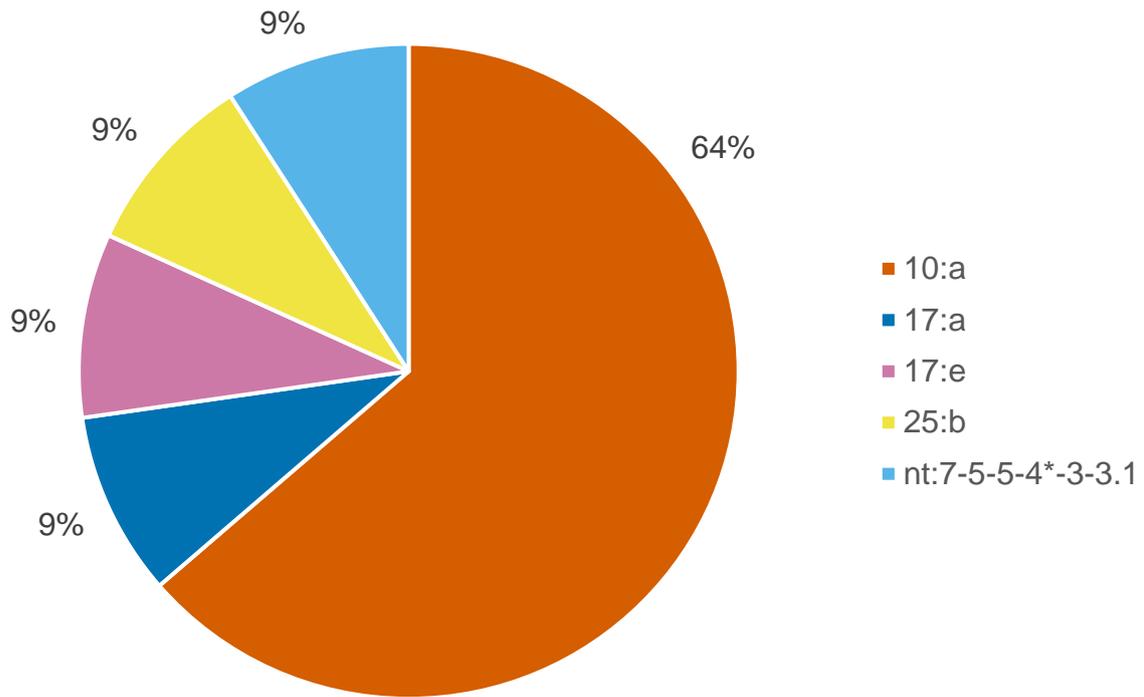


Figure 11: Genotypes of *M. bovis* identified in herds with OTF-W incidents in Buckinghamshire in 2019 (n=11).

Duration of incidents

The mean length of OTF-W incidents was 350 days and the median 286 days (Figure 12). This compares with a mean length of 278 days and a median of 177 days for OTF-S incidents. These figures illustrate that incidents with lesions typical of TB detected at post-mortem and/or culture confirmation of *M. bovis* take longer to resolve than those without detectable lesions. No incidents became persistent (greater than 18 months duration) during 2019.

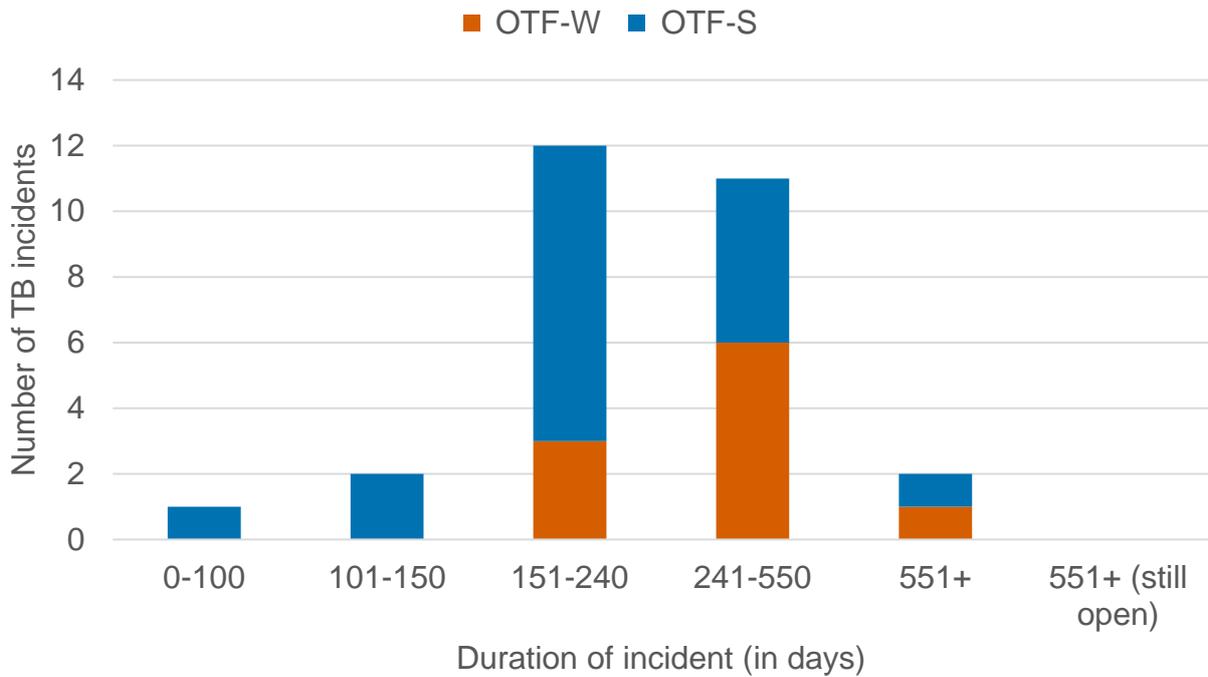


Figure 12: Duration of all TB incidents (OTF-W and OTF-S) that ended in 2019, and the number of persistent TB incidents (551+ days) that were unresolved at the end of 2019 in Buckinghamshire. Note that Approved Finishing Units (AFUs) have been excluded.

Suspected sources, risk pathways and key drivers for TB infection

It can be challenging to retrospectively establish the route of infection for a TB incident herd. The Animal and Plant Health Agency (APHA) aims to complete an epidemiological assessment for all TB incidents in the Edge Area (both OTF-W and OTF-S). This includes a thorough on-farm investigation and scrutiny of routinely collected data; such as cattle movement records, and the results of molecular analyses where available.

During the assessment up to three risk pathways of infection are selected for each herd. Each risk pathway is given a score that reflects the likelihood of that pathway bringing TB into the herd. The score assigned has been updated this year to reflect developing understanding of how likelihood is being assessed in practice. It is recorded as either definite (score 8), most likely (score 6), likely (score 4) or possible (score 1). The source(s) for each incident are weighted by the certainty ascribed. Any combination of definite, most likely, likely or possible sources can contribute towards the overall picture for possible routes of introduction in to a herd. If the overall score for a herd is less than six, then the score is made up to six using the 'Other/Unknown Source' option. Buffering up to six in this way helps to reflect the uncertainty in assessments where only 'likely' or 'possible' sources are identified.

The weight of infection outputs in Appendix 4 are produced by combining the data from multiple herds and providing the proportion of pathways in which each source was identified, weighted by certainty that each source caused the introduction of TB. The outputs do not show the proportion of

herds where each pathway was identified (this is skewed by the certainty calculation). Genotyping of *M. bovis* isolates can be a powerful tool in identifying a likely source of infection, however genotypes are not determined for OTF-S herds. The inclusion of OTF-S herds in these calculations increase the uncertainty in the outputs. As a result, the relative proportions of each risk pathway is very approximate and only broad generalisations should be made from these data. A more detailed description of this methodology is provided in the Explanatory Supplement for 2019 (<https://www.gov.uk/government/publications/bovine-tb-epidemiology-and-surveillance-in-great-britain-2019>).

Key drivers of infection

The key drivers of the TB epidemic in Buckinghamshire in 2019 were as follows:

- Cattle movements onto farms from higher risk or higher incidence areas
- Cattle movements between different premises of the same holding

Purchase of cattle with undetected infection remained the highest driver of the TB epidemic in Buckinghamshire and was likely responsible for at least half of the 27 new incidents in 2019. These purchased cattle originated in similar proportions from both the HRA and Edge Area (markets, dealers and direct from farms) as was reported for 2018.

Another key driver is the movement of cattle under the same ownership, between two counties when land is used for grazing. Movement of cattle between Temporary Land Associations (TLAs) and main premises do not require statutory pre-movement testing which can contribute to the risk of bringing TB infection from higher incidence areas.

For three of the 12 OTF-W incidents, genotype or spoligotype enabled confirmation that there was a clear epidemiological link with a historic incident on the origin farm.

Buckinghamshire has a large beef finishing component. These farms are dependent on frequent purchases of cattle from both high cattle density and higher TB risk areas which results in the potential spread of TB from the west of the country. Moving these finishing cattle to non-grazing AFUs reduces the risk considerably by preventing exposure of any undetected TB infected cattle to cattle on other farms and wildlife.

Infection by direct or indirect contact with TB infected badgers was considered likely for one incident and possible for a number of others. There is currently no proven reservoir of TB in wildlife in Buckinghamshire. However for incidents close to the Oxfordshire border which had weak epidemiological links to purchased/residual infection, TB infected badgers as a source of infection could not be ruled out.

In 2017, a cluster of five confirmed cases of *M. bovis* genotype 17:b located to the north of Aylesbury, suggested the onset of a possible area of endemic wildlife infection in the county. Whole genome sequences (WGS) were obtained for four out of the five *M. bovis* isolates in this cluster. Three of these were identical and the fourth was only one SNP (single nucleotide polymorphism) different. Although two farms were connected by cattle movements, the WGS data suggested that the others appeared to have shared a common source not related to cattle movements. However, there is no evidence that this potential endemic area has continued or expanded during 2018 and 2019.

Out of the 11 OTF-W incidents in the county with known genotypes in 2019, none had 17:b genotype APHA will continue to monitor this area for further incidents that are genetically related and could point to potential infected wildlife sources in the area.

Sources of infection and risk pathways

Out of the 12 new OTF-W incidents in 2019, six had no previous TB infection history in the herds. Ten incidents have an *M. bovis* genotype or spoligotype available, one has a new type and in one case, *M. bovis* was not cultured. Three incidents were due to the introduction of TB through the purchase of cattle with undisclosed infection from the HRA and Edge Area (Appendix 4) and for one incident a wildlife source was attributed, as discussed previously (Figure 7). In the remaining eight OTF-W incidents, it was possible that TB infection was introduced through the purchase of cattle but the level of uncertainty was high and the possibility of local infection (through wildlife or residual infection) could not be excluded (Figure 13a).

Risk pathways for OTF-S incidents are more difficult to attribute when there is no clear epidemiological link to the purchase of infected cattle. Some residual infection may explain these incidents but in many of these incidents the origin remains unknown. Infected badgers remain as a potential source for farms close to the borders of Oxfordshire or those contiguous to the 2017 Aylesbury cluster of 17:b, but there was no evidence from the 2018 and 2019 data alone to suggest TB infection in badgers is present (Figure 13b).

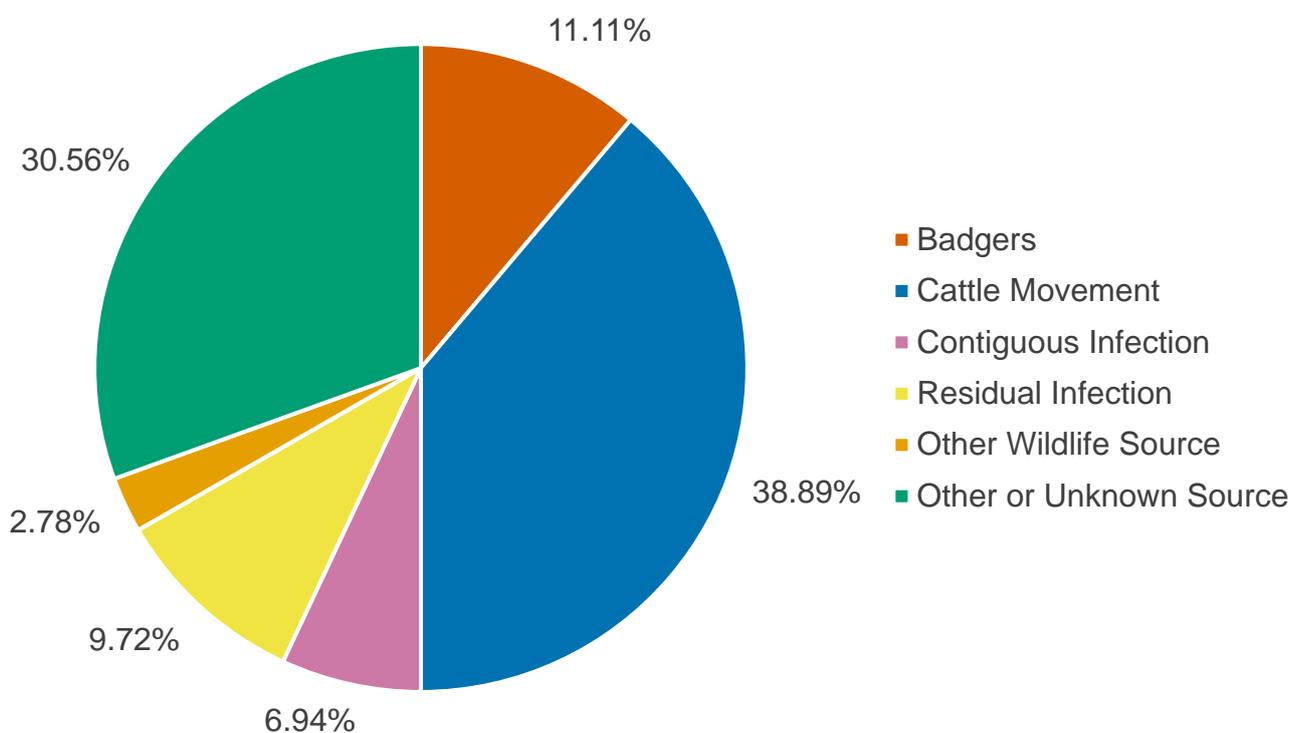


Figure 13a: Summary of the weighted source of infection pathways attributed for OTF-W incidents in Buckinghamshire that started in 2019, that had a completed DRF (12).

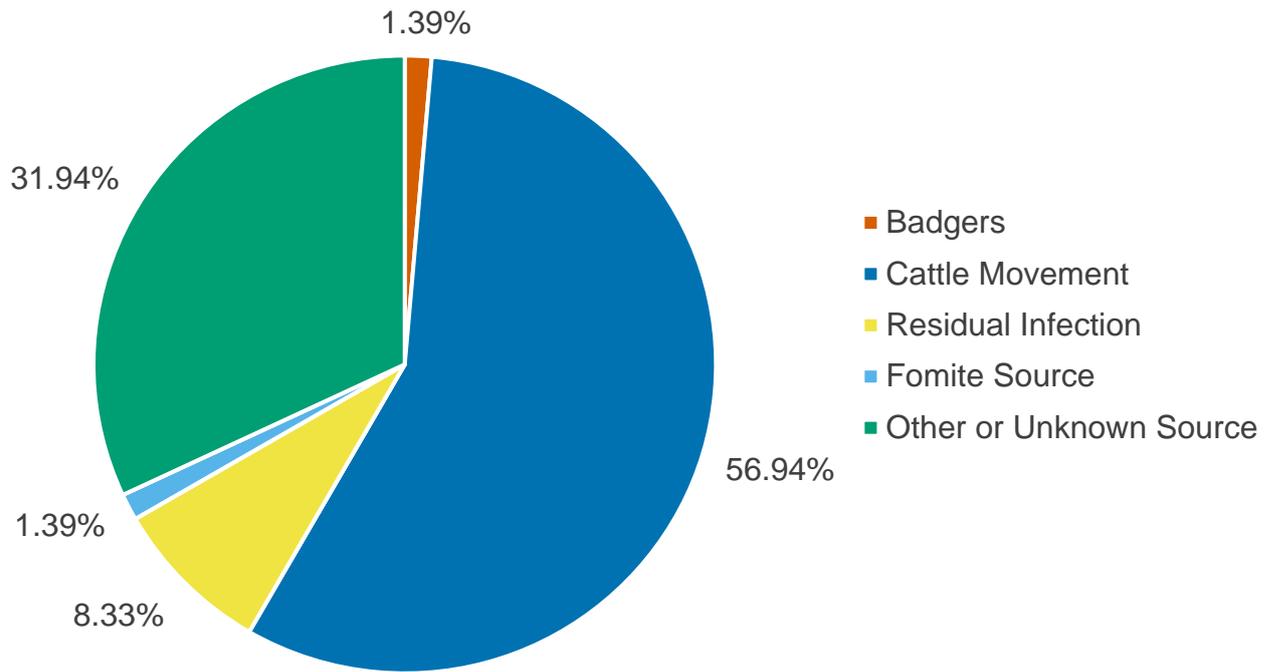


Figure 13b: Summary of the weighted source of infection pathways attributed for OTF-S incidents in Buckinghamshire that started in 2019, that had a completed DRF (12).

Figure 14 shows the source of infection recorded with the highest level of certainty for all TB incidents (OTF-W and OTF-S) in Buckinghamshire. Similar to previous years, the most frequent source attribution of highest level of certainty were movements of infected cattle into all three main types of cattle enterprises. TB infected wildlife was also recorded but with a very low level of certainty for one beef suckler unit.

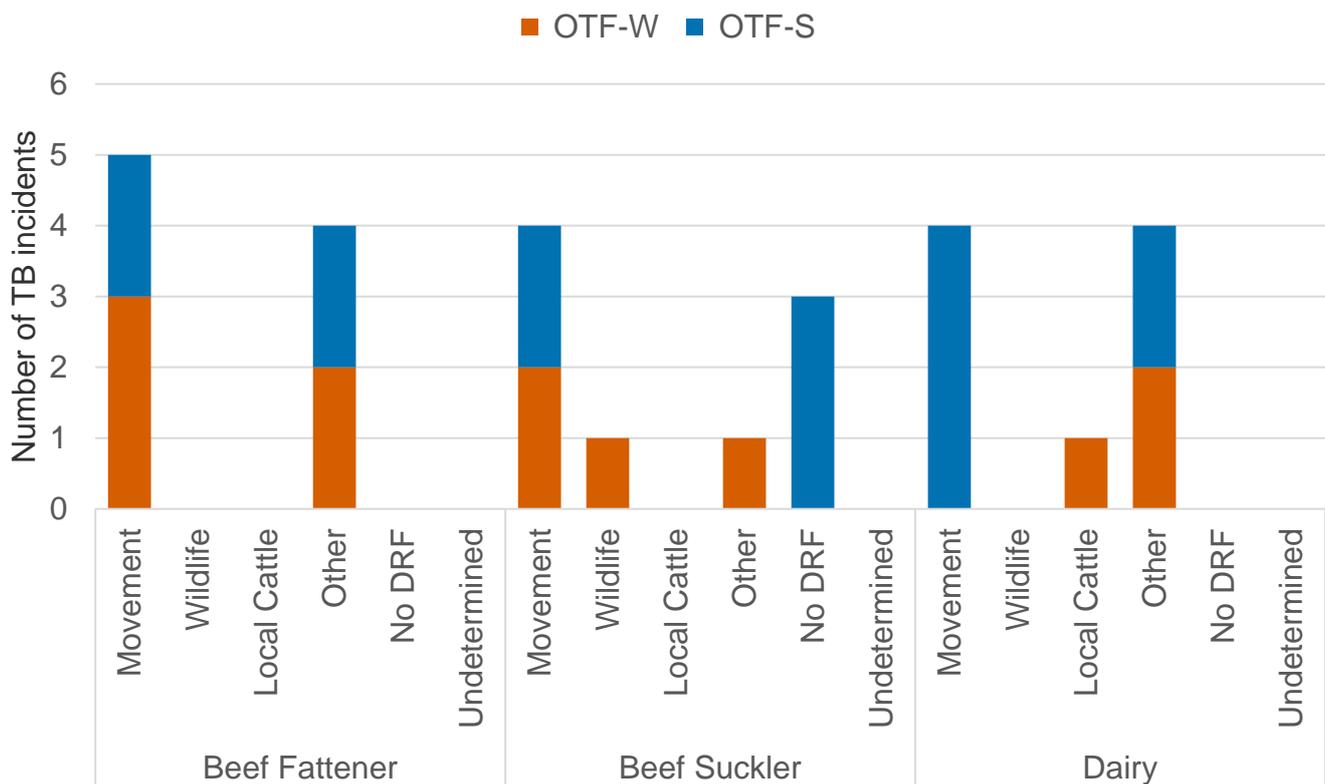


Figure 14: Source of infection recorded with the highest level of certainty for all TB incidents (both OTF-W and OTF-S) in Buckinghamshire in 2019, by herd type. Note that the categories ‘movement’, ‘wildlife’, and ‘local cattle’ are comprised of incidents where these were the most likely single source of infection recorded. Incidents where the most likely single source was stated as ‘unknown’ were assigned to the category ‘undetermined’. ‘Other’ includes incidents where there was equal weighting between the most likely sources of infection as well as other pathways not categorised elsewhere.

TB in other species

There is no statutory routine TB surveillance of non-bovine species, apart from post mortem examination (PME) of suspected clinical cases reported to APHA and post mortem meat inspection of animals (e.g. sheep, goats, pigs) slaughtered for human consumption.

There were no cases of *M. bovis* infection in domestic animals or wildlife in Buckinghamshire during 2019.

Detection of incidents

Incidents in Berkshire in 2019 were detected by a variety of TB surveillance testing methods (Figure 15). Whole herd testing (WHT) disclosed the most incidents (nine out of 27), with radial testing (RAD) and six-month post-incident testing (6M) both disclosing six incidents each. Radial testing was introduced in January 2018 whereby OTF-W incidents trigger an immediate check test of cattle herds within a 3km radius. RAD testing disclosed five OTF-W and one OTF-S incidents during 2019.

Twelve-month post-incident testing (12M) disclosed three incidents, while other testing methods (OTHER) and pre-movement testing (PRMT) disclosed two and three incidents, respectively.

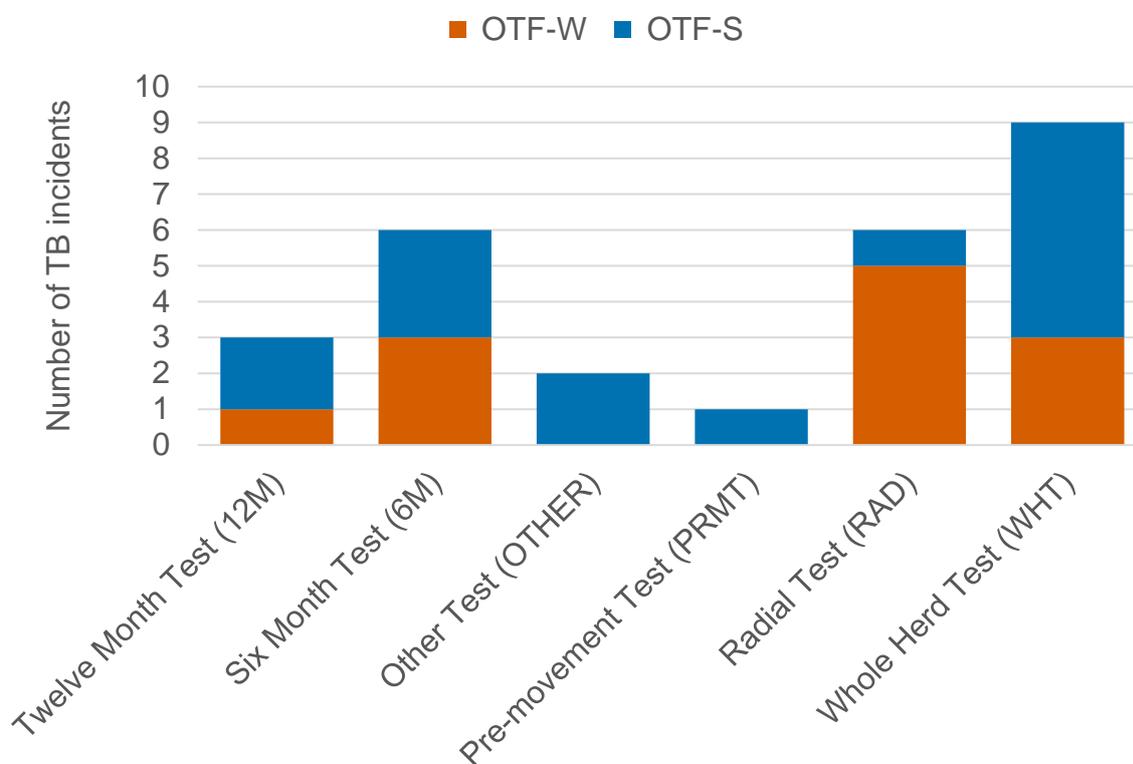


Figure 15: Number of TB incidents (OTF-W and OTF-S) in Buckinghamshire in 2019, disclosed by different surveillance methods.

Only five of the 12 OTF-W incidents disclosed in 2019 had experienced a TB incident within the previous three years (Figure 16). Seven of the 15 OTF-S incident farms had experienced an incident in the previous three years; all of them were previously OTF-S. These recurrent incidents were attributed to either residual infection left in the herd from the previous incident or, more likely, the continued purchase of cattle from higher risk areas.

It may be more likely for recurrence to occur on previous OTF-S incident farms due to the fact that herds with an OTF-S incident do not qualify for mandatory parallel IFN- γ testing. This test increases the likelihood of detecting infected cattle compared to skin testing alone, reducing the likelihood of residual infection.

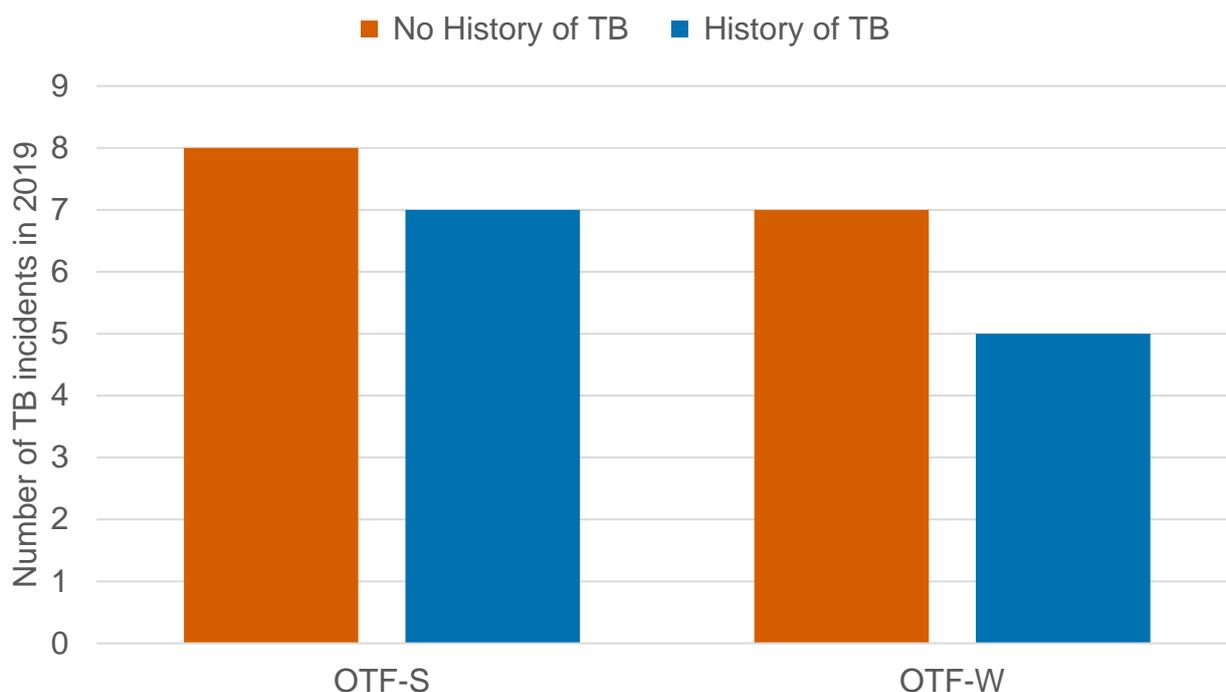


Figure 16: Number of TB incidents (OTF-W and OTF-S) in Buckinghamshire in 2019 on holdings that have suffered an OTF-W incident in the previous three years, and holdings with no history of TB in the previous three years.

Skin test reactors and interferon gamma test positive animals removed

In total, 170 reactor cattle were detected during 2019 (Appendix 3), of which 75 were detected by the skin test and 95 by the IFN- γ test (Figure 17). This is a decrease of 113 reactor cattle from 2018, partly explained by the decrease in total number of TB incidents from 31 in 2018 to 27 in 2019. This resulted in a decrease in the average number of reactors per incident from nine in 2018 to six in 2019 which is the same level as that recorded for 2017.

The current TB control policy requires the imposition of cattle movement restrictions on the affected farm for a minimum of four months following the identification of a reactor on the farm (two clear short interval tests with 60 days between each test). Three quarters of incidents in Buckinghamshire in 2019 lasted between four and 12 months. TB control measures can be a significant burden for farmers, particularly those whose business model relies on the movement of cattle between farms.

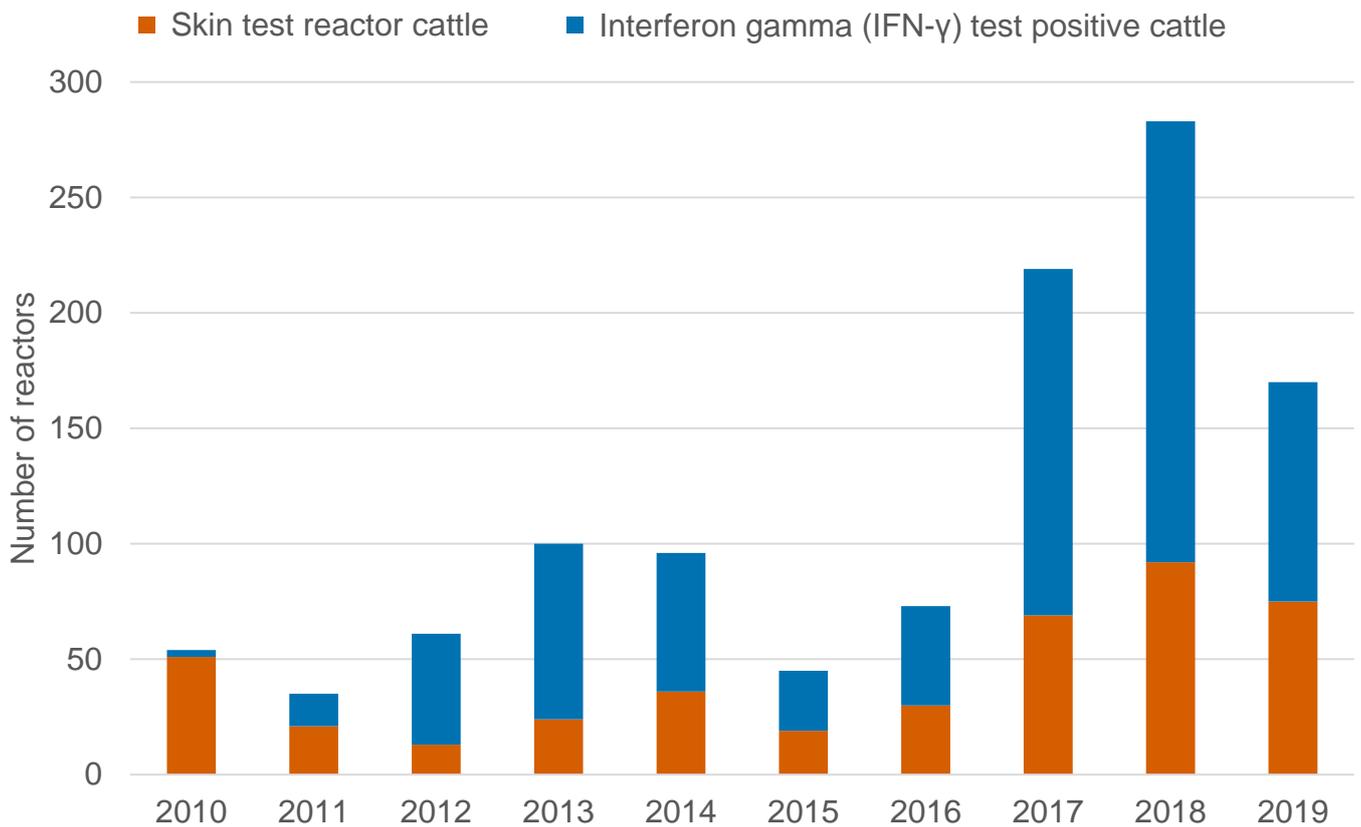


Figure 17: Number of skin test reactors and interferon gamma (IFN-γ) test positive cattle removed by APHA for TB control reasons, in Buckinghamshire, 2010 to 2019.

Summary of risks to Buckinghamshire

The decrease in the incidence of TB in Buckinghamshire is encouraging and this trend must continue if the county is to achieve its target for OTF status by 2025. Movement of cattle, from both the HRA and Edge Area, into the county continues to be the most significant risk pathway for the introduction of TB.

The evidence of TB infection in wild animals (e.g. badgers, deer) in Buckinghamshire with spread from Oxfordshire remains very low. The exposure of wildlife to TB and subsequent development of a reservoir of infection must be avoided as it would significantly hinder TB control in the county. If this can be avoided, along with measures to prevent continued introductions through the purchase of undisclosed TB infected cattle, there is a potential for Buckinghamshire to achieve OTF status by 2025.

Summary of risks from Buckinghamshire to surrounding areas

Buckinghamshire is a buffer zone between the LRA and other Edge Area counties where a reservoir of TB infection in wildlife is believed to be present, such as in Oxfordshire. Despite infected badgers remaining as a potential source of TB infection in some Buckinghamshire incidents, there was no clear evidence in 2019 to suggest that a reservoir of TB infection is present in the local wildlife and therefore it may represent a low risk of TB to the LRA. However, the speed of movement of the presumptive wildlife infection front from the west of Oxfordshire to the eastern border with Buckinghamshire in about 15 years suggests a serious threat to the county and the LRA bordering it.

The highest density of cattle and cattle holdings are in the north and west of Buckinghamshire. This geographical separation reduces potential exposure from infected cattle to the LRA. Thame market, because of its location on the border between Buckinghamshire and Oxfordshire, predominantly trades in cattle between Edge Area counties, thereby mitigating the risk to the LRA.

The local pool of animals into Thame market, as previously discussed, is made up of cattle mainly from the Edge Area which includes the high incidence county of Oxfordshire.

Buckinghamshire is bordered by three adjacent Edge Area counties; Northamptonshire, Oxfordshire and Berkshire. Oxfordshire is the county that presents the main risk of TB spread into Buckinghamshire. This is because endemic TB is believed to be present in wildlife throughout much of Oxfordshire, and frequent cattle movements occur between the two counties facilitated by the location of Thame market on the border between them. Although, there is no strong evidence from 2019 to suggest a spread of TB infection in wildlife from Oxfordshire to Buckinghamshire near the border, one incident was attributed to wildlife infection from a cluster of incidents in Oxfordshire. In 2019 TB incidents remain sporadic and mainly attributed to purchased cattle.

Assessment of effectiveness of controls and forward look

Despite the current controls, there is continued introduction of TB into the county through the purchase of cattle with undisclosed TB infection. There is not enough evidence in 2019 to suggest the presence of a wildlife reservoir of infection in the county and the cluster of genotype 17:b incidents, north of Aylesbury, seen in 2017 has since resolved. Targeted active surveillance for TB infection in wildlife would be valuable to monitor for the presence of endemic infection in Buckinghamshire such as in areas close to the border with Oxfordshire.

Based on the current trends for the measures of TB in cattle, the county is unlikely to achieve its target of <2% OTF-W herd prevalence by 2020. The radial testing policy, which commenced in January 2018, should help to reduce the risk of lateral spread of TB and increase the likelihood of detection of areas of endemic infection should they emerge. If the trend for purchasing cattle with undisclosed TB infection can be overcome, Buckinghamshire could be on track to achieve the target

of <1% OTF-W herd incidence by 2025. However, wildlife interventions will be required to stop movement of infection in wildlife from the adjacent county of Oxfordshire.

Appendices

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

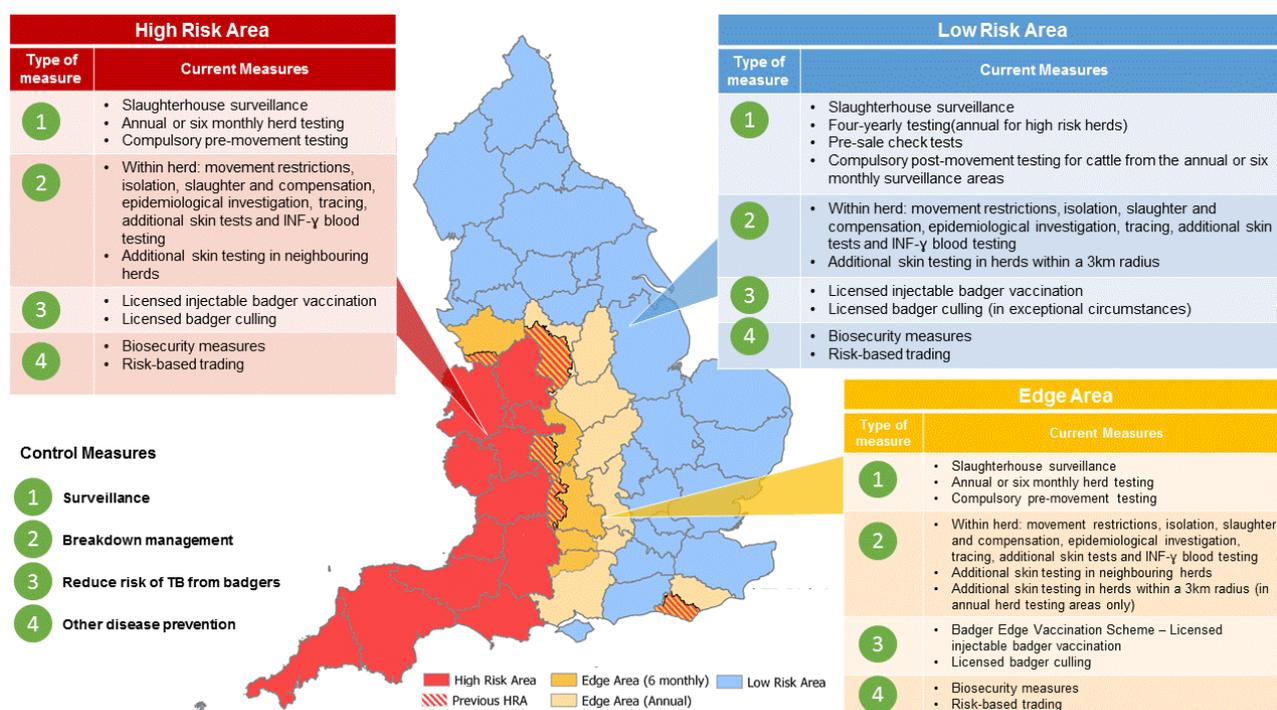


Figure A1: TB risk and surveillance areas of England effective since January 2018, as set out in the Government's Strategy for Achieving Officially Bovine Tuberculosis Free status for England. Map based on information published on www.tbhub.co.uk.

Policy objectives for the Edge Area

Short to medium term:

- slow down geographic spread
- maintain crude herd incidence of OTF-W incidents <2% overall by 2019
- begin to reduce the incidence rate

Longer term:

- reduce geographic spread of TB and push the Edge Area boundaries westward
- reduce OTF-W herd incidence to <1% by 2025
- attain OTF status (crude incidence of indigenous OTF-W herd incidents <0.1%) for the lowest incidence counties in the Edge Area

For more information about the governments approach to controlling TB, visit the strategy for achieving Officially Bovine Tuberculosis Free status for England, published in 2014 and independently reviewed in 2018, see:

<https://www.gov.uk/government/publications/a-strategy-for-achieving-officially-bovine-tuberculosis-free-status-for-england>

<https://www.gov.uk/government/news/government-sets-out-next-phase-of-strategy-to-combat-bovine-tuberculosis>

Key control measures

Surveillance:

- six monthly or annual routine herd testing
- additional targeted surveillance of cattle herds located within a 3km radius of new OTF-W incidents in annual testing sections of the Edge Area (radial testing)
- slaughterhouse (SLH) surveillance

Management of cases ('incidents'):

- increased sensitivity of incident herd testing:
- all incident herds must pass two consecutive short interval skin tests at severe interpretation to regain OTF status, irrespective of PM and bacteriological findings
- mandatory IFN- γ parallel testing of herds with OTF-W incidents
- enhanced management of herds with persistent incidents
- enhanced epidemiological investigation and data analysis
- information sharing - location of incident herds publicly available (using ibTB online (www.ibtb.co.uk) interactive mapping tool)
- restriction for life of all inconclusive reactors (IRs) that give a negative result on a re-test was introduced in November 2017. The only permitted movements of these animals are to slaughter or an Approved Finishing Unit

TB controls in the wildlife reservoir (badgers):

- licensed badger culling in high incidence sections of the Edge Area
- Government grants for licensed voluntary badger vaccination projects using injectable badger BCG (Badger Edge Vaccination Scheme - BEVS)

Other measures:

- compulsory pre-movement skin testing of cattle moved between herds
- promotion of herd biosecurity measures to reduce the risk of new incidents

Summary of enhanced TB control measures in Buckinghamshire

Edge Area testing policy:

- annual whole herd surveillance testing (no change from previous year)

A new radial testing policy commenced on 1st January 2018. This provides additional targeted surveillance of cattle herds located within a 3km radius of new OTF-W incidents.

Other testing measures:

- the number of overdue tests in the county continues to be very low. Enforcement is achieved in association with the county local authority, police and local contractors
- the Berkshire, Buckinghamshire and Oxfordshire TB eradication group which is comprised of local vets, farmers, auctioneers, and other stakeholders has continued to meet quarterly and discuss TB eradication initiatives
- during 2019 a large number of TB audits were conducted for Official Veterinarian (OV) TB testing quality control

Other control measures:

- provision of free biosecurity advice by the TB Advisory Service (TBAS, www.tbas.org.uk)

Appendix 2: cattle industry in Buckinghamshire

Table A2.1: Number of cattle premises by size band in Buckinghamshire at 1 January 2019.

(RADAR data)

Size of Herds	Un*	1-50	51-100	101-200	201-350	351-500	501+	Total Number of Herds	Mean Herd Size	Median Herd Size
Number of Herds	5	188	80	81	48	15	21	438	127	61

*The number of herds with an undetermined size.

Table A2.2: Number of animals by breed purpose in Buckinghamshire at 1 January 2019.

Breed purpose	Beef	Dairy	Dual purpose	Unknown	Total
Number of Cattle	42,906 (77%)	11,239 (20%)	1,290 (2%)	5 (<0.01%)	55,440

Appendix 3: summary of headline cattle TB statistics

Table A3.1: Herd-level summary statistics for TB in cattle in Buckinghamshire between 2017 and 2019.

Herd-level statistics	2017	2018	2019
(a) Total number of cattle herds live on Sam at the end of the reporting period	546	519	513
(b) Total number of whole herd skin tests carried out at any time in the period	531	562	600
(c) Total number of OTF cattle herds having TB whole herd tests during the period for any reason	449	424	423
(d) Total number of OTF cattle herds at the end of the report period (i.e. herds not under any type of Notice Prohibiting the Movement of Bovine Animals (TB02) restrictions)	534	497	492
(e) Total number of cattle herds that were not under restrictions due to an ongoing TB incident at the end of the report period	529	497	492
(f) Total number of new TB incidents detected in cattle herds during the report period, (including all FUs)	36	31	27
• OTF-S	17	25	15
• OTF-W	19	6	12
(g) Of the OTF-W herd incidents:			
• How many can be considered the result of movement, purchase or contact from/with an existing incident based on current evidence?	16.5	4	6
• New OTF-W incidents triggered by skin test Reactors or 2xIRs at routine herd tests	15	6	12

Herd-level statistics	2017	2018	2019
<ul style="list-style-type: none"> New OTF-W incidents triggered by skin test Reactors or 2xIRs at other TB test types (forward and back-tracings, contiguous, check tests, etc.) 	15	6	12
<ul style="list-style-type: none"> New OTF-W incidents first detected through routine slaughterhouse TB surveillance 	1	0	0
(h) Number of new incidents revealed by enhanced TB surveillance (radial testing) conducted around those OTF-W herds			
<ul style="list-style-type: none"> OTF-S 	1	4	0
<ul style="list-style-type: none"> OTF-W 	5	0	0
(i) Number of OTF-W herds still open at the end of the period (including any ongoing OTF-W incidents that began in a previous reporting period, but not including non-grazing Approved Finishing Units)	9	6	8
(j) New confirmed (positive <i>M. bovis</i> culture) incidents in non-bovine species detected during the report period (indicate host species involved)	0	0	0
(k) Number and type of finishing units active at end of the period:			
<ul style="list-style-type: none"> Approved Finishing Units: Grazing 	0	0	0
<ul style="list-style-type: none"> Approved Finishing Units: Non Grazing 	5	5	7
<ul style="list-style-type: none"> Exempt Finishing Units: Grazing 	0	0	0
<ul style="list-style-type: none"> Exempt Finishing Units: Non Grazing 	0	0	0

Table A3.2: Animal-level summary statistics for TB in cattle between 2017 and 2019.

Animal-level statistics (cattle)	2017	2018	2019
(a) Total number of cattle tested in the period (animal tests)	82,138	87,457	92,392
(b) Reactors detected in tests during the year:			
• Tuberculin skin test	69	92	75
• Additional IFN- γ blood test reactors (skin-test negative or IR animals)	150	191	95
(c) Reactors detected during year per incidents disclosed during year *	6.1	9.1	6.3
(d) Reactors per 1000 animal tests	2.7	3.2	1.8
(e) Additional animals slaughtered during the year for TB control reasons:			
• DCs, including any first-time IRs	2	1	4
• Private slaughters	4	9	11
(f) SLH cases (tuberculous carcasses) reported by Food Standards Agency (FSA)	4	7	9
(g) SLH cases confirmed by culture of <i>M. bovis</i> **	2	0	0

* Note: reactors may be from incidents disclosed in earlier years, as any found through testing during the report year count here.

** Note: not all cases reported are submitted for culture analysis. All cases reported are from any period prior to or during restrictions.

Appendix 4: suspected sources of *M. bovis* infection for all of the new OTF-W and OTF-S incidents identified in the report period

Table A4.1: Suspected sources of *M. bovis* infection for all of the new OTF-W and OTF-S incidents identified in Buckinghamshire, in 2019.

Source of infection	Possible (1)	Likely (4)	Most likely (6)	Definite (8)	Weighted contribution
Badgers	5	1	0	0	6.3%
Cattle movements	14	10	3	0	47.9%
Contiguous	1	1	0	0	3.5%
Residual infection	5	2	0	0	9.0%
Domestic animals	0	0	0	0	0.0%
Non-specific reactor	0	0	0	0	0.0%
Fomites	1	0	0	0	0.7%
Other wildlife	2	0	0	0	1.4%
Other or unknown source	2	0	0	0	31.2%

Please note that each TB incident could have up to three potential pathways so totals may not equate to the number of actual incidents that have occurred. Details of the methodology used to calculate the weighted contribution of the different suspected sources of *M. bovis* infection for all new incidents can be found in the main body of the report and in the Explanatory Supplement for 2019

(<https://www.gov.uk/government/publications/bovine-tb-epidemiology-and-surveillance-in-great-britain-2019>).



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