



Animal &
Plant Health
Agency

Year-end descriptive epidemiology report: Bovine TB in the Edge Area of England County: Buckinghamshire Year-end report for: 2020

TB Edge Area - BUCKINGHAMSHIRE



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Executive summary

Reporting area

Buckinghamshire is part of the Edge Area that was established in 2013. In 2014, the bovine tuberculosis (TB) surveillance strategy for this area was incorporated into the UK government's strategy to achieve Officially Bovine Tuberculosis Free (OTF) status for England by 2038. 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 on the Oxfordshire and Buckinghamshire border, channelling cattle into the county from the Edge Area, Low Risk Area (LRA), but also from High Risk Area (HRA) counties with more abundant cattle.

New TB incidents

Most new TB incidents in Buckinghamshire in 2020 were in the north-west of the county where there is the highest density of both cattle and cattle holdings.

The annual incidence rate of TB (incidents per 100 herd-years at risk) reduced slightly from 6.1 in 2019 to 5.4 in 2020, reflecting the fall in the number of incidents which has been occurring in a linear fashion since the peak in 2017. However, the number of new TB incidents in 2020 was still above the pre-2017 levels.

Risk pathways for TB infection

The main risk pathway for introducing TB into Buckinghamshire in 2020 remained the purchase of cattle with undisclosed infection from the Edge Area and HRA. Residual infection from previous TB incidents within the same herd was considered likely when there was a previous history of TB.

For a small number of incidents close to the Oxfordshire and Northamptonshire borders, wildlife infection was regarded as likely, but there was not enough evidence to confirm the development of a new area of locally infected wildlife.

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 2020 bovine TB epidemiology reports.

Disclosing tests

In Buckinghamshire in 2020, routine herd tests, post-incident six and 12 month tests and enhanced surveillance tests (3km radial testing) disclosed most of the new TB incidents.

Reactor numbers

A total of 160 reactor cattle were detected during 2020 in Buckinghamshire, of which 101 were detected by skin test and 59 by the interferon gamma (IFN- γ) test. This was 10 fewer reactor cattle than in 2019, primarily due to the decrease in the number of TB incidents from 27 in 2019 to 21 in 2020.

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 eastward geographic progression of a suspected endemic reservoir of *M. bovis* infection in wildlife from the HRA into Oxfordshire has continued since the early 2000's and now appears to have reached the border with Buckinghamshire.

Risks posed by the reporting area

Several TB incidents in Buckinghamshire from 2017 onwards have been linked to infected wildlife but located in different areas of the county.

None of these incidents have expanded to involve other local farms suggesting that infection in wildlife had not become established. In 2020 a new cluster of TB incidents located in north-west Buckinghamshire became apparent and genotyping information may indicate that this could be an area of local infected wildlife.

However, the evidence for widespread infection in wildlife is poor, and located towards the west of the county and therefore, the county represented a low risk of TB infection to the LRA.

Forward look

Buckinghamshire did not achieve its target of less than 2% OTF-W herd incidence by 2020.

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 less than 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 2020. Bovine tuberculosis is caused by the organism *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 this area, 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 UK 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 (see Appendix 1).

Buckinghamshire forms part of the Edge Area. 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

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.

Changes due to COVID-19

During 2020, public health measures adopted by the UK government to contain the COVID-19 outbreak impacted the ability to carry out some TB testing due to social distancing and self-isolation guidelines, affecting both veterinarians and farmers.

In particular, from 23 March 2020, routine or targeted TB skin tests were not mandatory for cattle under 180 days old where, in the official veterinarian's judgement, the young stock could not be tested safely in line with social distancing guidelines. The temporary amendment allowing calves under 180 days old to be excluded from TB testing did not apply to short interval tests in TB incident herds (required to restore a herds OTF status) or pre- and post-movement testing.

Routine TB skin tests are required within a pre-defined window of time to maintain a herds OTF status. From 23 March 2020, for tests that were allocated until 30 June 2020, the Animal and Plant Health Agency (APHA) permitted an extension to the TB skin testing windows on a case by case basis, where testing had not been completed due to valid reasons associated with COVID-19. The testing window for short interval tests was also extended by up to 30 days, where tests were unable to be completed due to COVID-19.

Furthermore, on-farm epidemiological assessments carried out to establish the route of infection for a TB incident herd were carried out remotely, by telephone, for the majority of 2020.

Cattle industry

Herd types

Small cattle farms (fewer than 50 cattle) predominated in Buckinghamshire in 2020 (Figure 1), which are less likely to purchase cattle in high numbers. This results in fewer TB 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 cattle in barns during the winter months (October to March) and put them out to grass for the remainder of the year.

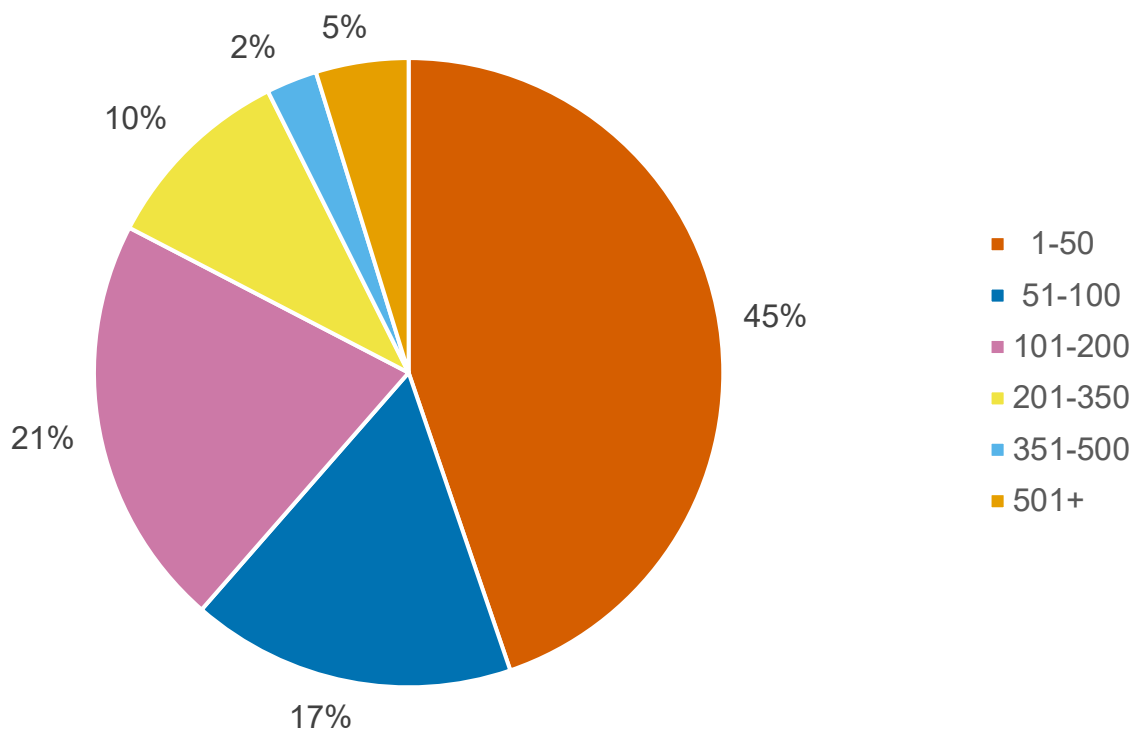


Figure 1: Proportion of cattle holdings in Buckinghamshire, by herd size in 2020 (n=420). Note: herds of an undetermined size are not shown.

Markets and abattoirs

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 from Wales.

Approved Finishing Units

There were seven non-grazing AFUs in Buckinghamshire in 2020.

Descriptive epidemiology of TB

Temporal TB trends

Three analytical measures are used to describe the level of TB infection in these reports.

1. The number of new herd incidents that were disclosed in each year (Figure 2).
2. The annual herd incidence rate, reported as the number of new incidents per 100 herd-years at risk (100 HYR) (Figure 3). 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 (Figure 4). 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 (excluding Figure 5) 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. Hence measures of incidence and prevalence in this report may be lower than those reported in the official TB statistics.

The number of new TB incidents and annual herd incidence rate in Buckinghamshire continued to decrease in a slow linear trend from 2018 to 2020 after a substantial peak during 2017.

Prior to this, the county had a period of relative stability. Compared to 2019, the number of OTF-W incidents decreased by one, to 11 in 2020 and the number of OTF-S incidents reduced by five, to 10 in 2020.

Figure 2 shows the total number of TB incidents disclosed in Buckinghamshire per year starting from 2011. In 2020, 21 new incidents were disclosed, one of which was from a non-grazing AFU.

Figure 3 shows the annual herd incidence rate has increased from 2013 to 2017, rising dramatically from 2.8 in 2016 to 7.6 in 2017, and decreased linearly since then.

In 2020, the end-of-year herd prevalence in Buckinghamshire rose marginally (0.2%) to 4.0% in 2020 but has remained relatively stable over the past three years (Figure 4).

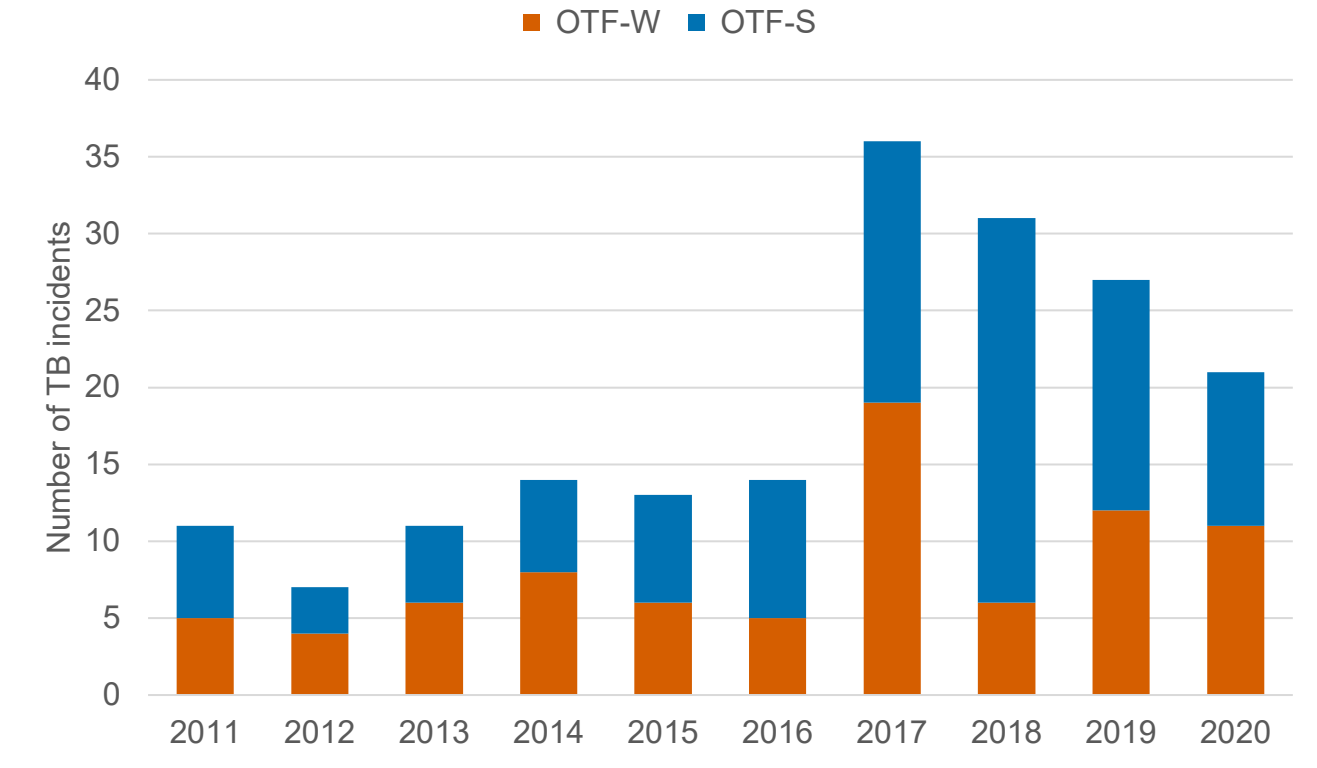


Figure 2: Annual number of new TB incidents in Buckinghamshire, from 2011 to 2020.

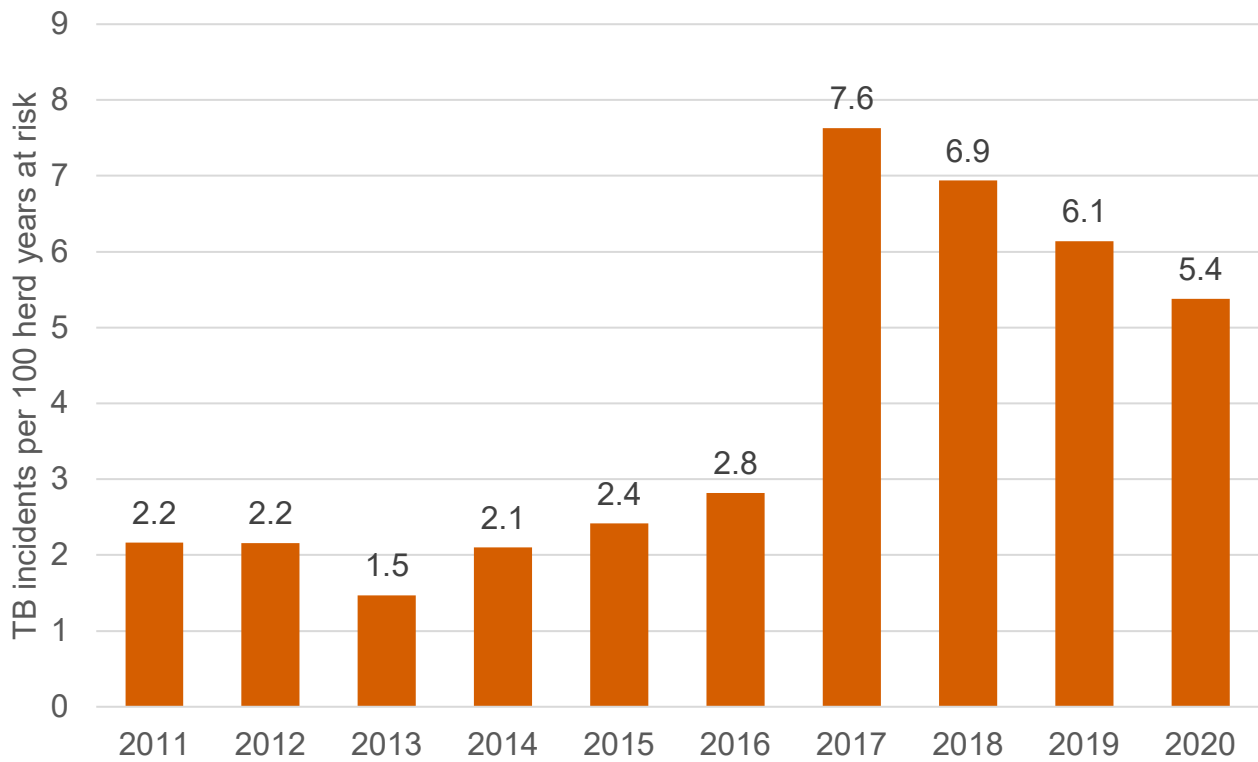


Figure 3: Annual incidence rate (per 100 herd-years at risk) for all new incidents (OTF-W and OTF-S) in Buckinghamshire, from 2011 to 2020.

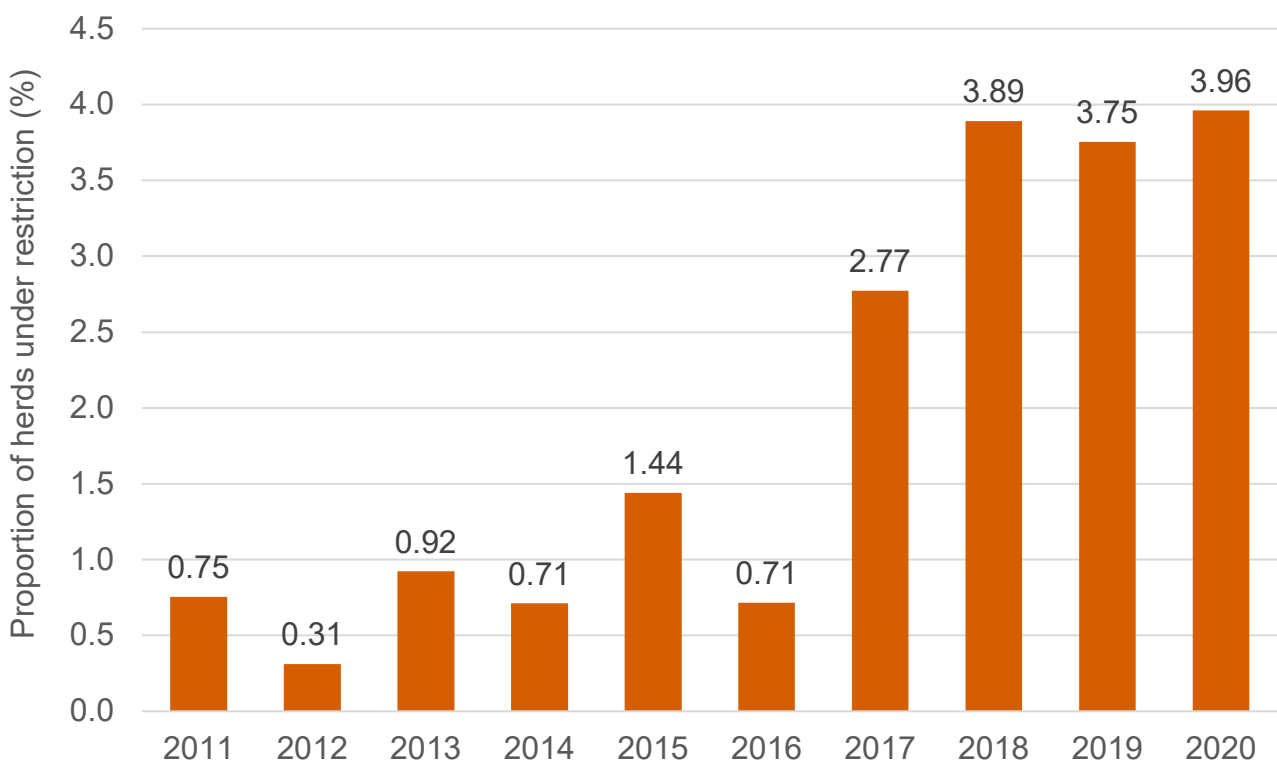


Figure 4: Annual end of year prevalence in Buckinghamshire, from 2011 to 2020.

Geographical distribution of TB incidents

As shown in Figure 5, Buckinghamshire's incidence rate was 5.7 incidents per 100 herd-years at risk during 2020 which was below the average for the Edge Area (10.1) and the HRA (16.2).

This was lower than neighbouring Edge Area counties: Northamptonshire (8.8), Oxfordshire (19.6), and Berkshire (10.6), but similar to Hampshire (5.1).

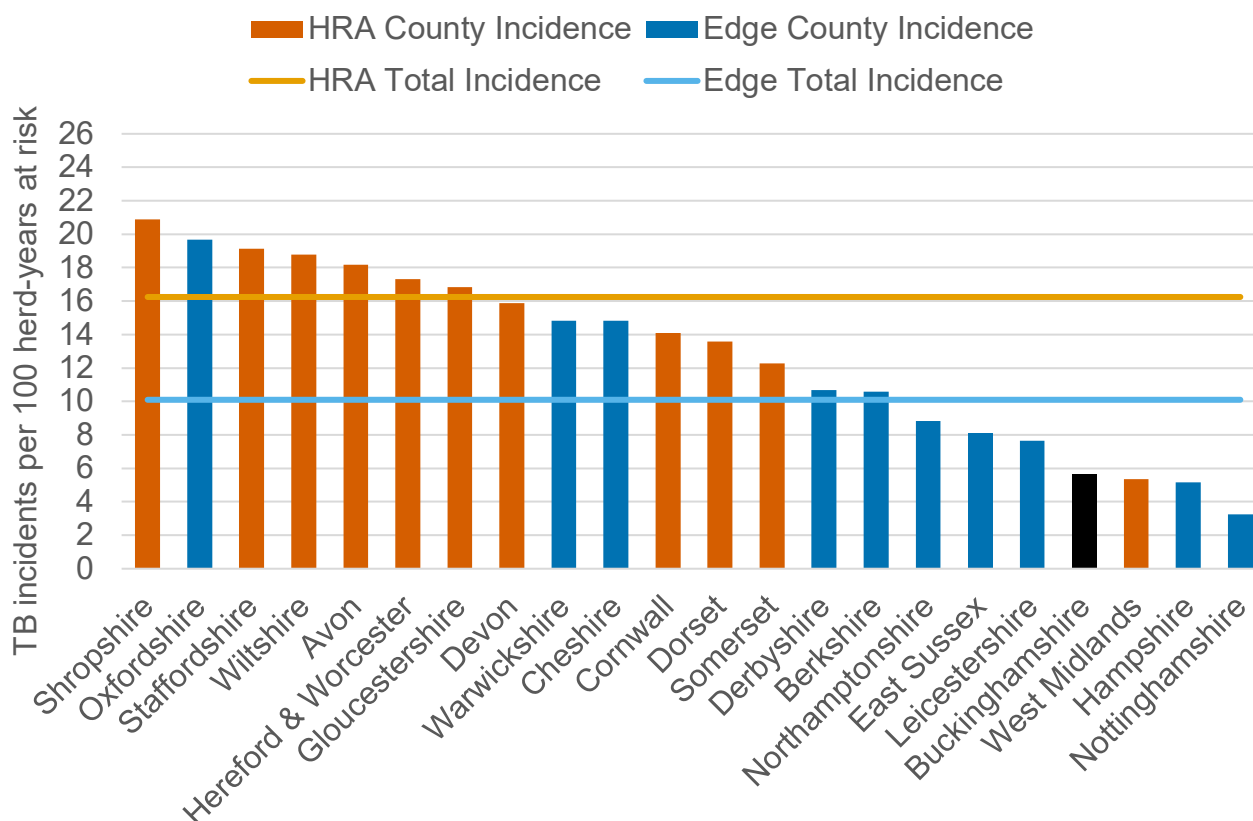


Figure 5: Incidence rate (per 100 herd-years at risk) for all new incidents (OTF-W and OTF-S including finishing units) in 2020, by HRA and Edge Area county, highlighting the county of Buckinghamshire.

A significant number of new TB incidents in Buckinghamshire in 2020 were disclosed in the north-west of the county where there is the highest density of both cattle and cattle holdings (Figure 6). The geographical distribution of TB incidents in 2020 was similar to 2019, albeit with the total number of TB incidents reducing from 27 to 21.

During 2020, one genotype of *M. bovis*, 10:j, was attributed to a wildlife source in two OTF-W incidents in Buckinghamshire (Figure 6). The nearest area with suspected wildlife-driven TB infection in cattle was a cluster of 10:j incidents in the neighbouring county of Northamptonshire.

According to farmers' observations, the population and activity of both badgers and deer on farms in Buckinghamshire was high in 2020 and has increased in recent years.

As in previous years, the purchase of cattle with undisclosed infection remains the main driver of the TB epidemic within Buckinghamshire (see Figure 13).

Evidence for TB incidents caused by infected wildlife has been fragmentary over the last four years with little evidence for sustained infection in local wildlife.

In 2017, a cluster of five OTF-W incidents of *M. bovis* genotype 17:b located between Aylesbury and Buckingham (Figure 7), suggested the onset of a possible area of local wildlife infection in the county. Whole genome sequences (WGS) were obtained for four out of the five isolates in this cluster.

Three of these were identical and the fourth was only one single nucleotide polymorphism (SNP) 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 area with potentially infected wildlife has expanded during 2018, 2019 and 2020. Out of the 10 OTF-W incidents in the county with known *M. bovis* genotypes in 2020, 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.

In 2018, local cattle (residual and contiguous) and infected wildlife were recorded as potential sources of infection in around 20% of new incidents, but the supporting evidence provided low level of certainty. In 2019, a wildlife source (infected deer or badgers) was suspected for one incident linked to a cluster of incidents near Henley-on-Thames in Oxfordshire, a conclusion supported by WGS analysis.

This was a suckler herd with cattle being kept over two counties, Buckinghamshire and Oxfordshire, and infection from wildlife most likely occurred during grazing within the Henley-on-Thames cluster area.

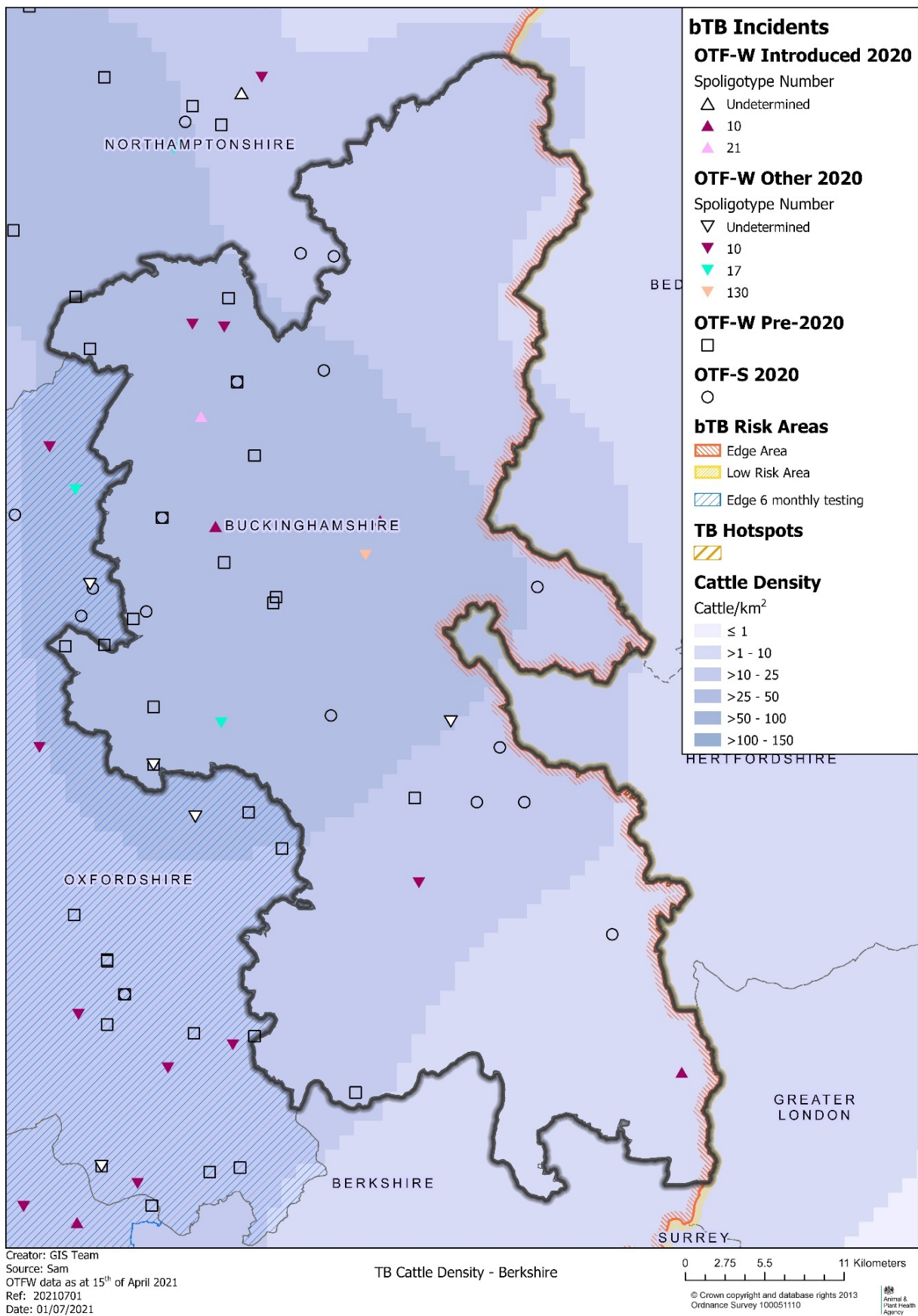


Figure 6: Location of cattle holdings in Buckinghamshire with new TB incidents (OTF-W and OTF-S) in 2020, and cattle holdings with pre-2020 OTF-W incidents still ongoing at the beginning of 2020, overlaid on a cattle density map. Note ‘OTF-W Introduced 2020’ refers to OTF-W incidents in which cattle movements were the most likely source of infection.

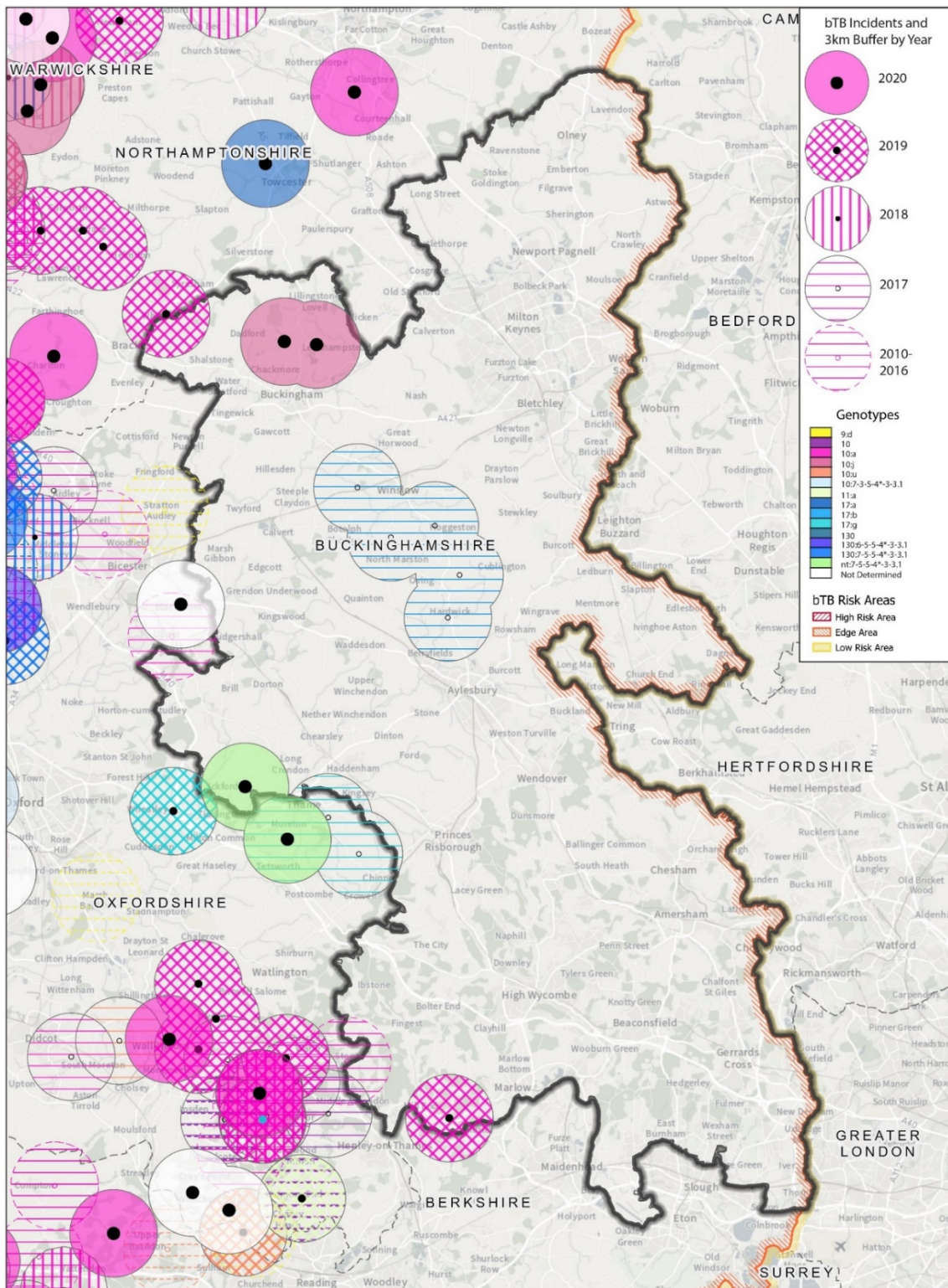


Figure 7: Selected genotypes of *M. bovis* detected in Buckinghamshire between 2010 and 2020, as an indication of a local *M. bovis* reservoir in wildlife. From 2018 onwards genotypes are displayed where combined residual and wildlife sources were attributed with a 75% certainty or above according to the DRF calculation. Two additional 2020 incidents were selected for inclusion in the map and one 2019 incident was deselected from this criteria. Prior to 2018, genotypes were selected by veterinary judgement where the chance of a wildlife source was judged to be high. Only OTF-W incidents are displayed.

Other characteristics of TB incidents

Incidents by herd type

Out of the 10 new OTF-W incidents in Buckinghamshire during 2020, two were on beef suckler units, five on beef fattening units and three were on dairy farms. The 20 new OTF-S incidents in 2020 occurred on both beef and dairy farms. Only three new incidents occurred on small farms (fewer than 50 cattle) with the remainder spread evenly across the medium and larger herd sizes (Figure 8).

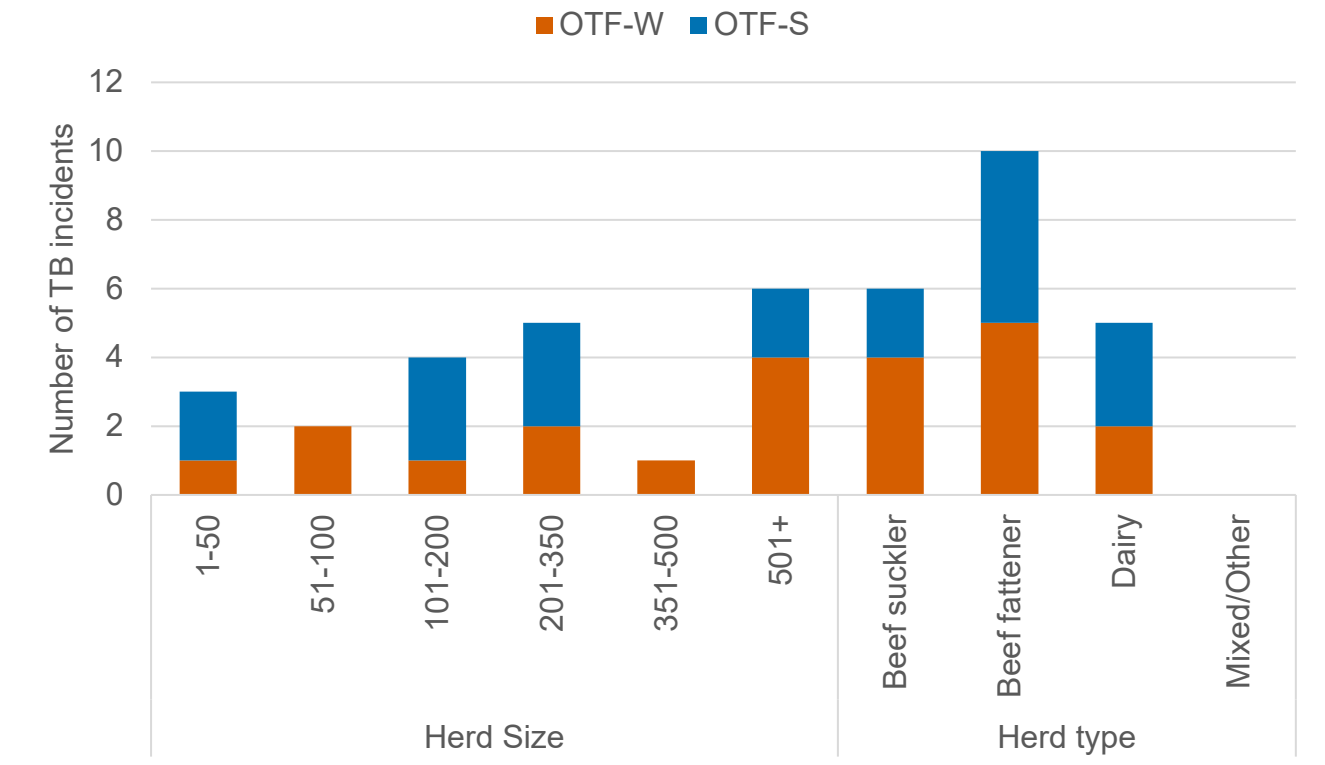


Figure 8: Number of TB incidents (OTF-W and OTF-S) in Buckinghamshire in 2020, by cattle herd size and type.

Incidents by month of disclosure

In Buckinghamshire in 2020, disclosure of TB incidents showed little seasonality (Figure 9). There was some correlation between peaks of incident occurrence and the seasonal timing of testing (Figure 10).

Most of the tests carried out on OTF herds were completed in the first part of the year from January to May, followed by a high number of tests in the last part of the year in October and November (Figure 10). Most beef herds purchase cattle in the autumn and these are tested the following autumn and winter.

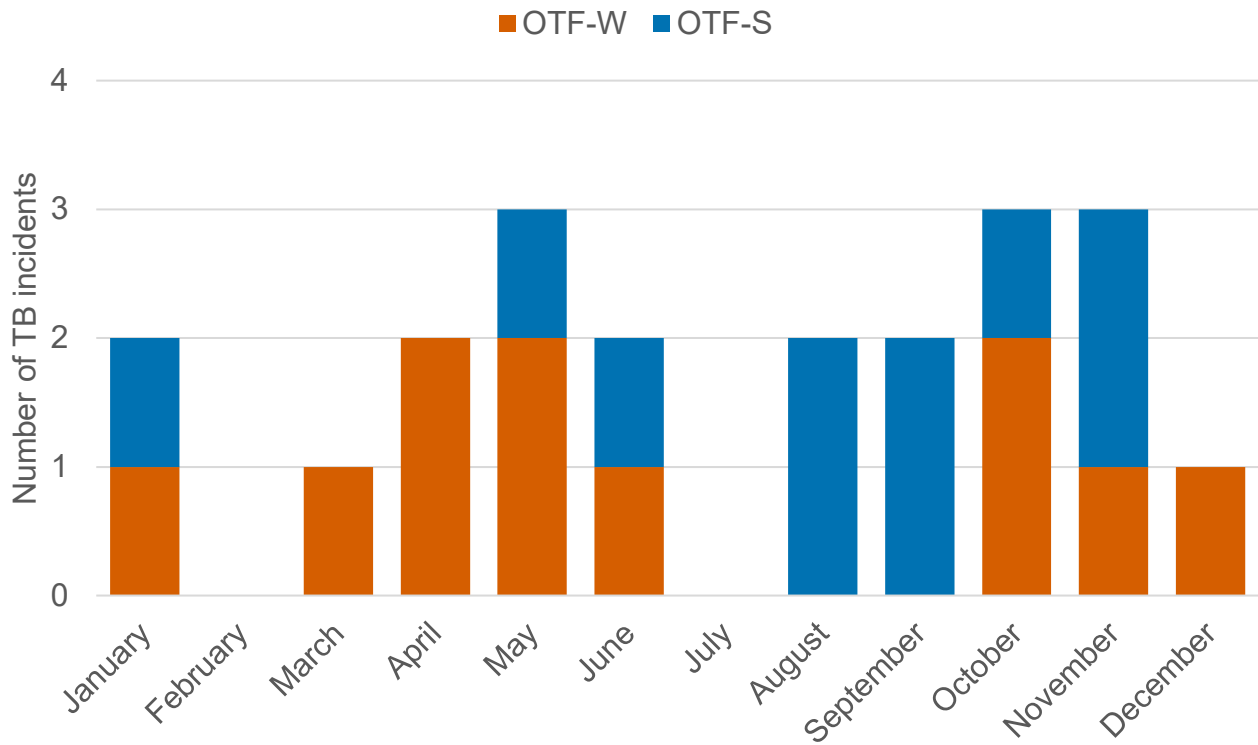


Figure 9: Number of TB incidents (OTF-W and OTF-S) in Buckinghamshire in 2020, by month of disclosure.

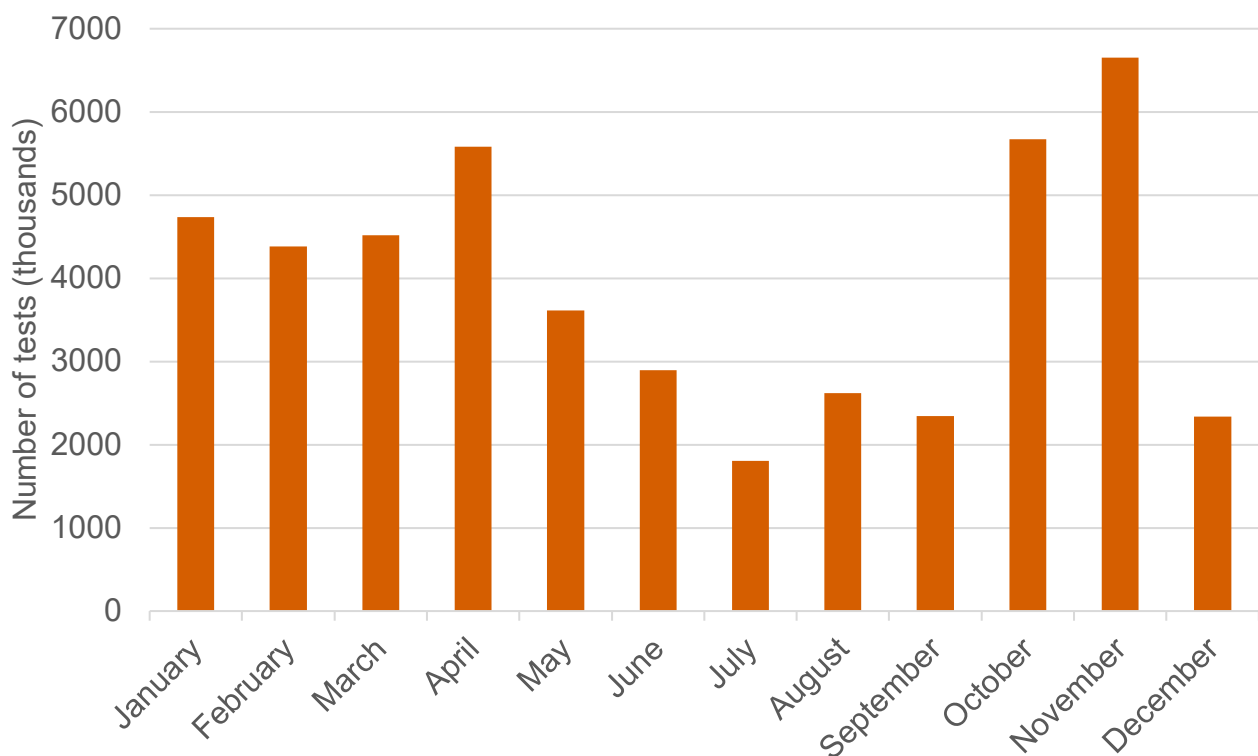


Figure 10: Number of tests undertaken in OTF herds in Buckinghamshire in 2020, by month.

Duration of incidents

Incidents which resulted in detection of lesions typical of TB at post-mortem and/or confirmed by culture to be *M. bovis* took longer to resolve than those without.

In Buckinghamshire in 2020, the mean length of OTF-W incidents was 235 days and the median 219 days, compared with a mean length of 197 days and a median of 171 days for OTF-S incidents.

The majority of incidents in 2020 were resolved between 151 to 240 days (Figure 11). No incidents became persistent (greater than 18 months duration) during 2020.

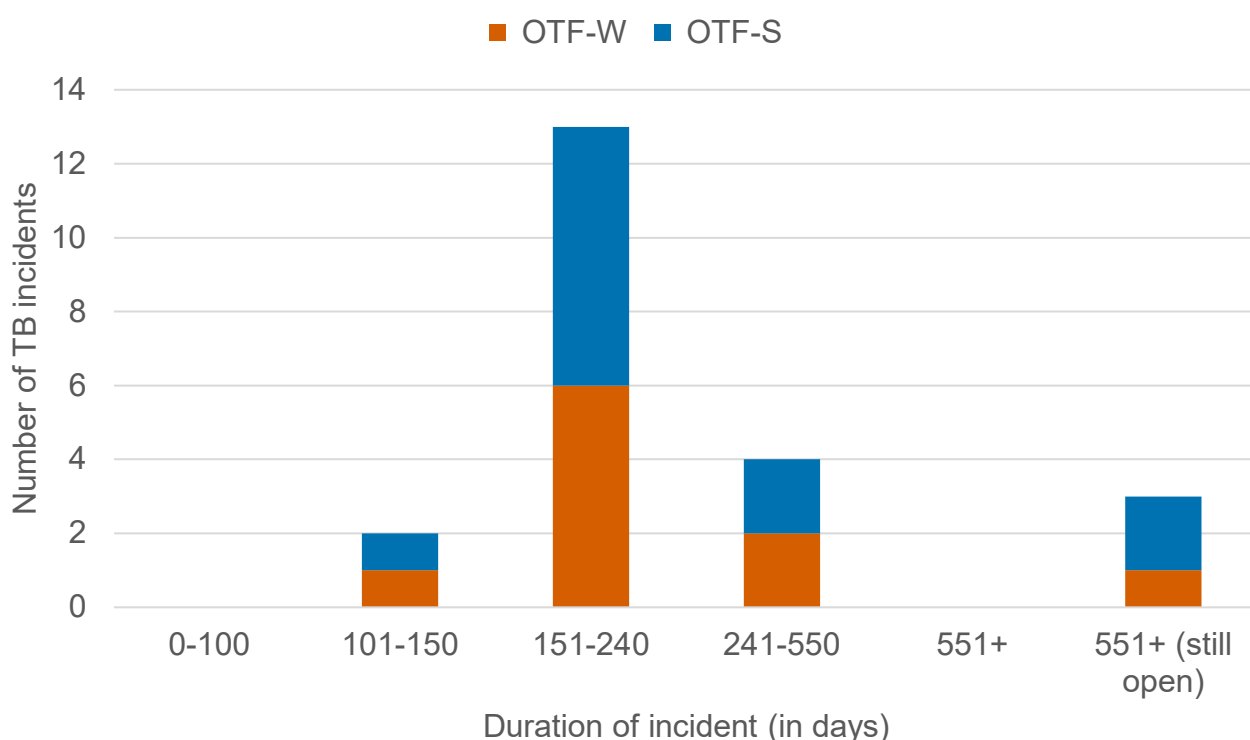


Figure 11: Duration of all TB incidents (OTF-W and OTF-S) that ended in 2020, and the number of persistent TB incidents (551+ days) that were unresolved at the end of 2020 in Buckinghamshire. Note that Approved Finishing Units (AFUs) have been excluded.

Genotypes associated with TB incidents

Genotyping of *M. bovis* isolates has been used to trace the origin of TB infection. It is particularly useful in identifying where spread has occurred through cattle movements. Stable genotype clusters tend to be found in areas where there is a persistent local reservoir of infection.

APHA implemented whole genome sequencing (WGS) in place of genotyping from April 2021. During 2020 however, genotyping was still performed on *M. bovis* samples isolated from all OTF-W herds in the Edge Area.

In Buckinghamshire in 2020, genotypes of *M. bovis* were identified for nine of the 10 OTF-W incidents, including one new genotype not found in the county previously (Figure 12). The genotypes of *M. bovis* isolated from the nine OTF-W incidents in 2020 were 10:a (four), 10:j (two), 21:a (one), NT:7-5-5-4*-3-3.1 (also isolated in 2019) and one new type 130:7-5-5-4*-3-3.1.

These incidents were mostly attributed in equal proportion to the purchase of undetected infected cattle from the Edge and HRA and residual infection. A small number of incidents were attributed to infected wildlife.

Genotype information was not available for one OTF-W incident because the culture was still pending at the end of the reporting period, but residual infection in the herd was considered the most likely source.

M. bovis samples isolated from 2020 incidents at the time of writing this report have provided no evidence for a continuation of the genotype 17:b cluster of incidents identified north of Aylesbury during 2017.

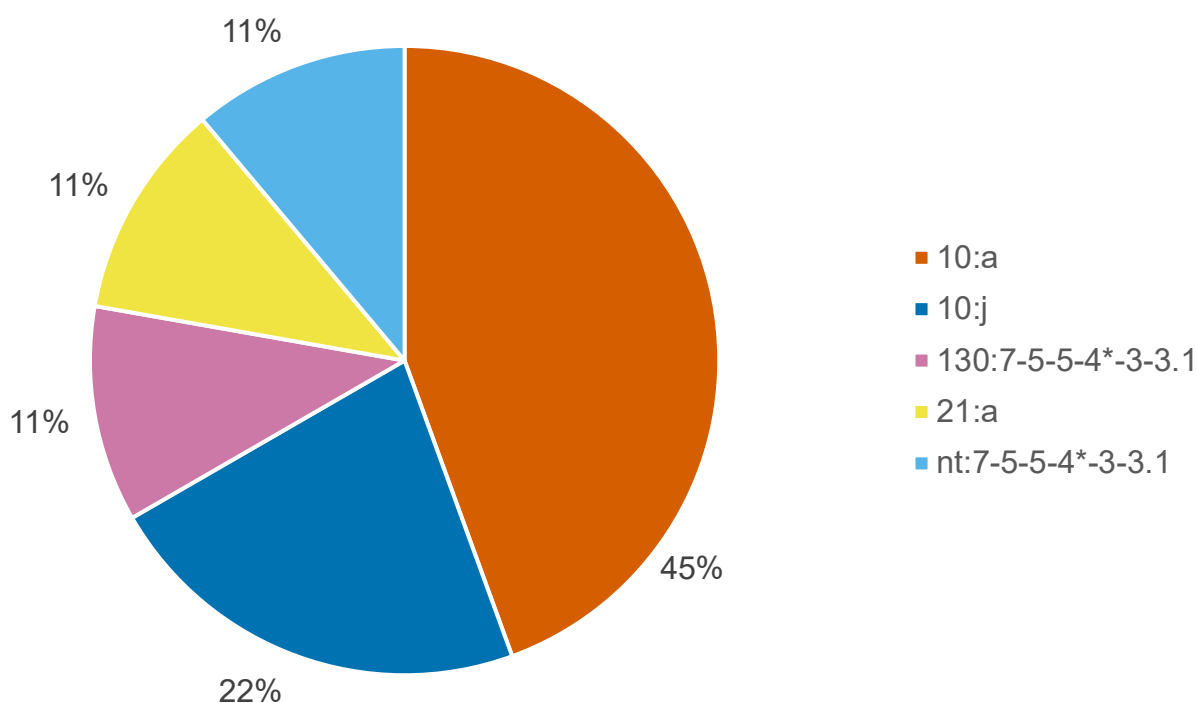


Figure 12: Genotypes of *M. bovis* identified in herds with OTF-W incidents in Buckinghamshire that began in 2020 (n=9).

Unusual TB incidents

The largest single incident (48 reactors in total) in Buckinghamshire during 2020 was an OTF-W dairy herd located in the south of the county. This was the herd’s first TB incident. Genotype 10:a was isolated, but the source of infection could not be attributed.

Suspected sources, risk pathways and key drivers for TB infection

Key drivers of infection

The key drivers of the TB epidemic in Buckinghamshire during 2020 were as follows:

- Cattle movements onto farms from higher incidence areas
- Residual infection causing recurrent incidents.

Purchase of cattle with undetected infection remained the principal driver of the TB epidemic in Buckinghamshire deemed responsible for 50% of the new incidents during 2020. These purchased cattle originated equally from both the HRA and Edge Area (markets, dealers and direct from farms) as was reported for 2019.

Residual infection may also explain some of the 2020 incidents and was included as a potential risk pathway in a third of incidents. Some of these had a previous incident with the same *M. bovis* genotype or became OTF-W in 2020 a few months after an OTF-S incident in 2019.

Buckinghamshire has a large beef finishing industry. These farms are dependent on frequent purchases of cattle from both high cattle density and higher incidence areas. This poses a risk for spread of TB from the west of the country.

Moving finishing cattle to non-grazing AFUs has reduced the risk considerably by preventing TB exposure from undetected infected cattle amongst these to cattle on other farms and to local wildlife.

Sources of infection and risk pathways

It can be challenging to retrospectively establish the route of infection for a TB incident herd. 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. This information is captured on the Disease Report Form (DRF).

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 is recorded as either definite (score 8), most likely (score 6), likely (score 4) or possible (score 1). Risk pathway data are explored both at the herd and county level.

The most likely source of infection in individual TB incidents

The most likely source identified by the APHA veterinary assessment is explored spatially for individual TB incidents. The most likely source of infection for individual TB incidents discounts additional risk pathways identified with a lower level of certainty.

Where two sources were ranked equally as the most likely source for an incident, both sources are reported for the incident using a split symbol in the map.

Infection by direct or indirect contact with TB infected badgers was considered likely for two new incidents in 2020 (Figure 13) and possible for a number of others. There is currently no detected reservoir of TB in wildlife in Buckinghamshire.

However, for incidents close to the Oxfordshire and Northamptonshire border which had weak epidemiological links to purchased or residual infection, TB infected badgers could not be ruled out as the source of infection. The exposure of wildlife to *M. bovis* and subsequent development of a reservoir of infection would hinder TB control in the county.

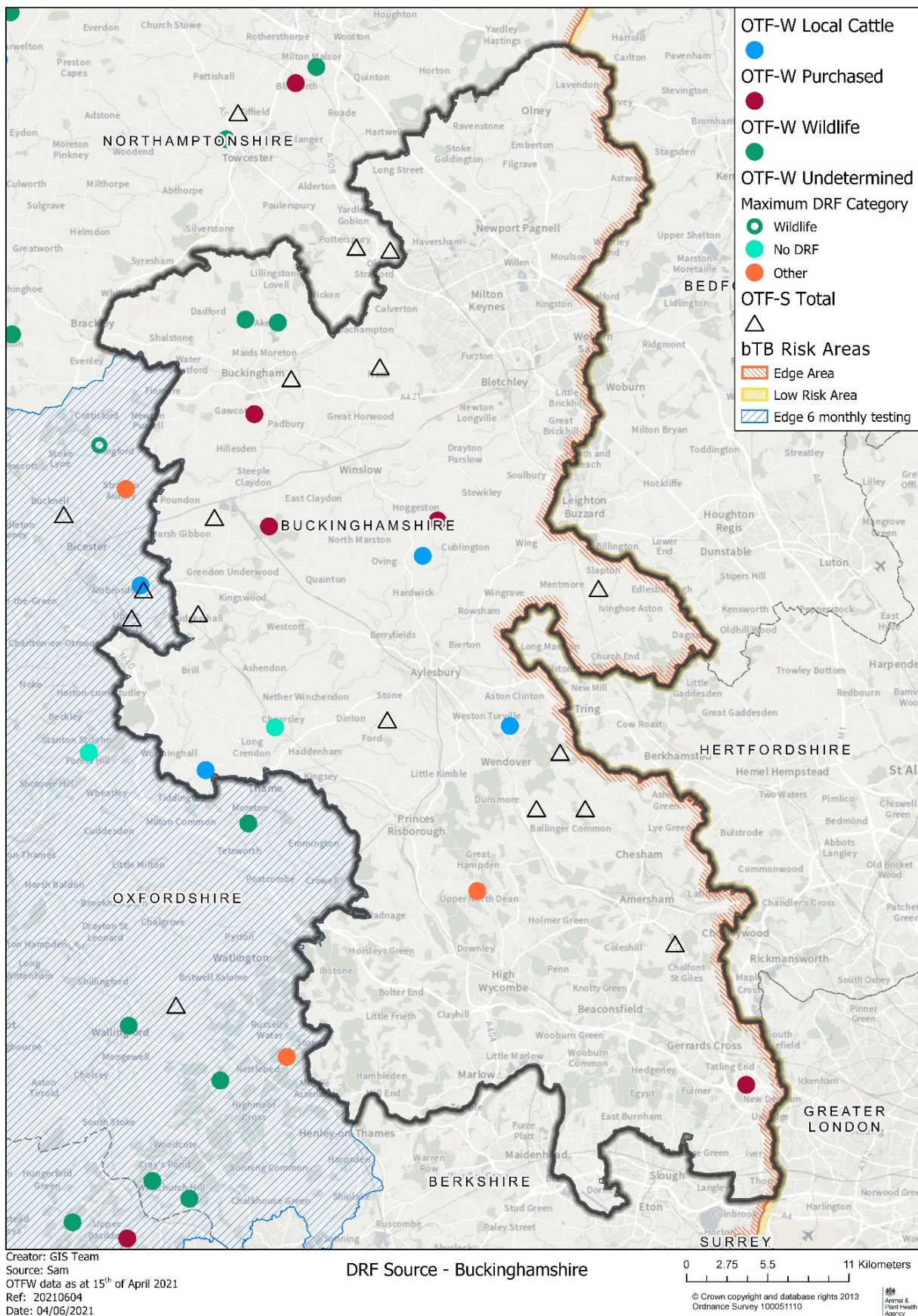


Figure 13: Map of the source of infection pathway recorded with the highest level of certainty, for all TB incidents (OTF-W and OTF-S) in Buckinghamshire which started in 2020. Where none of the sources of infection were identified with greater than 50% certainty, the highest ranking source is displayed with an OTF-W undetermined 'maximum DRF category' symbol.

The weighted source of infection at county level

To consider the contribution of all sources of infection within an area, 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 into 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. This presents the overall proportion of pathways in which each source was identified, weighted by the level of certainty 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](#).

Out of the 10 new OTF-W incidents in Buckinghamshire in 2020, only two had no previous TB infection history in the herd. Genotype information was available for nine incidents. Four incidents were most likely caused by the introduction of TB through purchase of cattle with undisclosed infection from the HRA and Edge Area (see Figure 13).

Three incidents were attributed to residual infection in the herd, and for two incidents a wildlife source was attributed, as discussed above. In the remaining OTF-W incident, it was possible that TB infection was introduced through wildlife infection, but the level of uncertainty was high and therefore the origin was attributed as unknown (Figure 14a).

In Buckinghamshire in 2020, the risk pathways for OTF-S incidents were mainly associated with movements of cattle from the HRA, but the absence of genotype information adds uncertainty to these conclusions. Residual infection may explain one incident and for another, the origin remains unknown.

For farms contiguous to the 2017 17:b Aylesbury cluster of incidents, there was no evidence from the 2019 and 2020 data to suggest TB infection in badgers was present (Figure 14b).

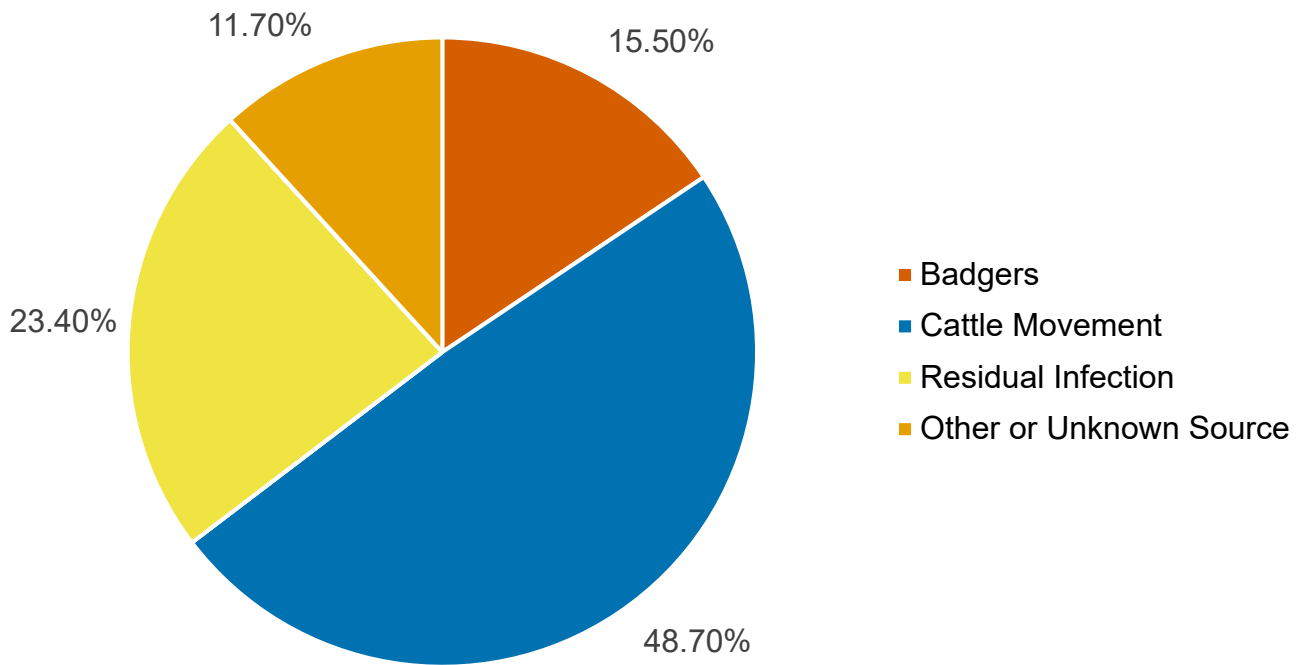


Figure 14a: Summary of the weighted source of infection pathways attributed for OTF-W TB incidents that started in 2020 in Buckinghamshire, that had a completed DRF (n=10).

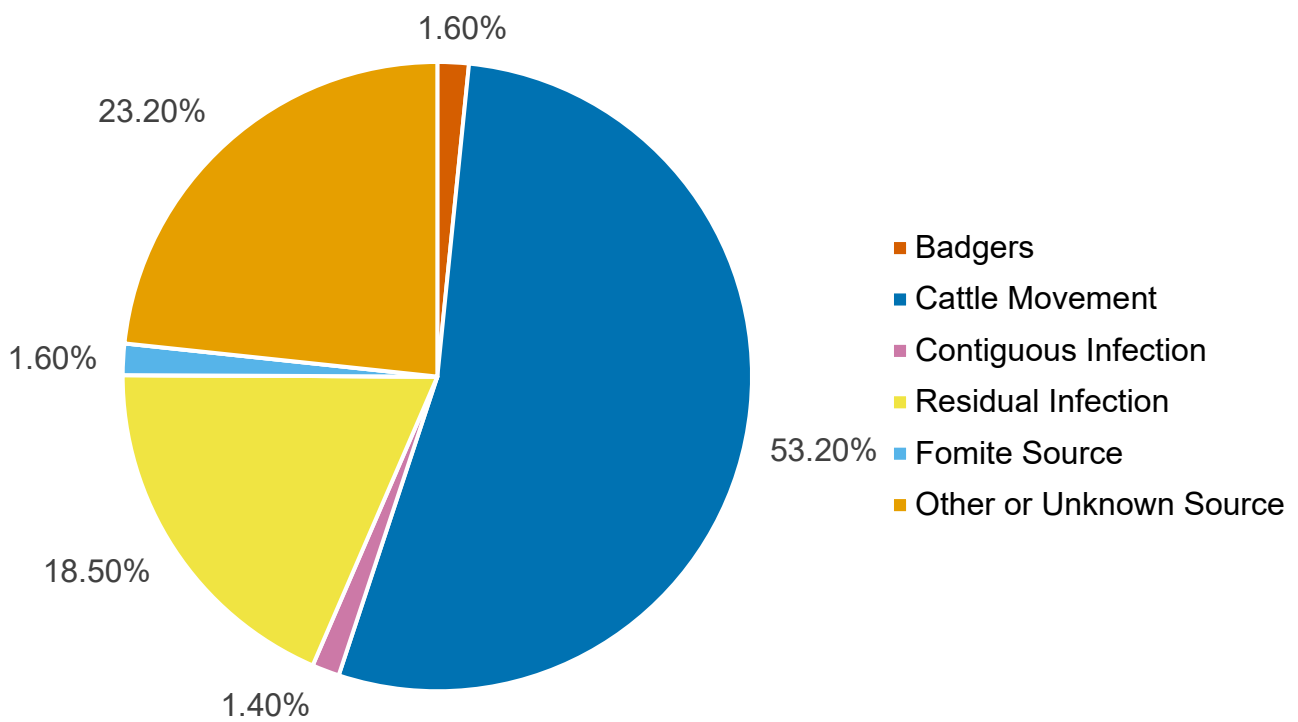


Figure 14b: Summary of the weighted source of infection pathways attributed for OTF-S TB incidents that started in 2020 in Buckinghamshire, that had a completed DRF (n=10).

TB in other species

There is no statutory routine TB surveillance of live non-bovine species. Post mortem examination (PME) is performed on suspected clinical cases reported to APHA. Furthermore, post mortem meat inspection is carried out on all captive animals (for example, sheep, goats, pigs or deer) slaughtered for human consumption.

There were no incidents of *M. bovis* infection in domestic animals or wildlife in Buckinghamshire during 2020.

Detection of TB incidents

Incidents in Buckinghamshire in 2020 were detected by a variety of TB surveillance testing methods (Figure 15a). Whole herd testing (WHT) disclosed the most incidents (6 out of 20), and six month post-incident tests (6M) disclosed four. All other categories of tests detected two to three incidents each.

Radial testing was introduced in Buckinghamshire in January 2018 (Figure 15b) whereby OTF-W incidents trigger an immediate check test of cattle herds within a 3km radius. In 2020, this disclosed one OTF-W and one OTF-S incident.

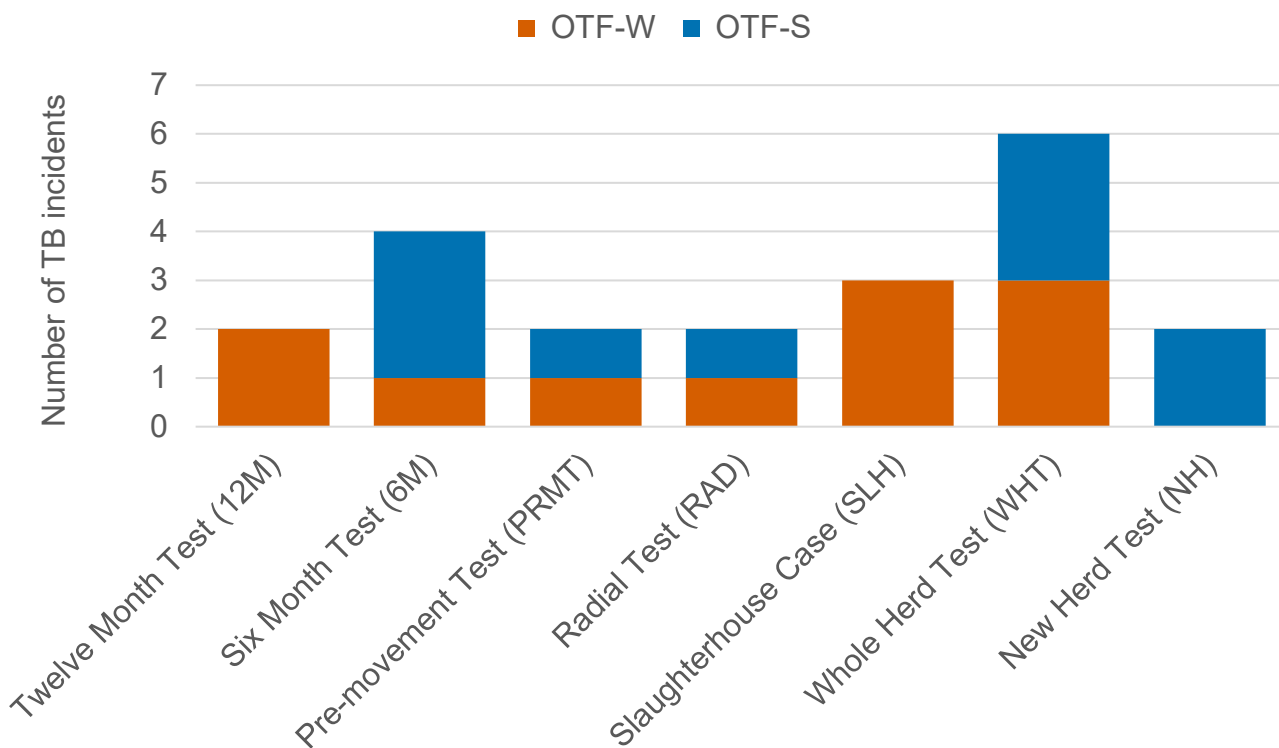


Figure 15a: Number of TB incidents (OTF-W and OTF-S) in Buckinghamshire in 2020, disclosed by different surveillance methods.

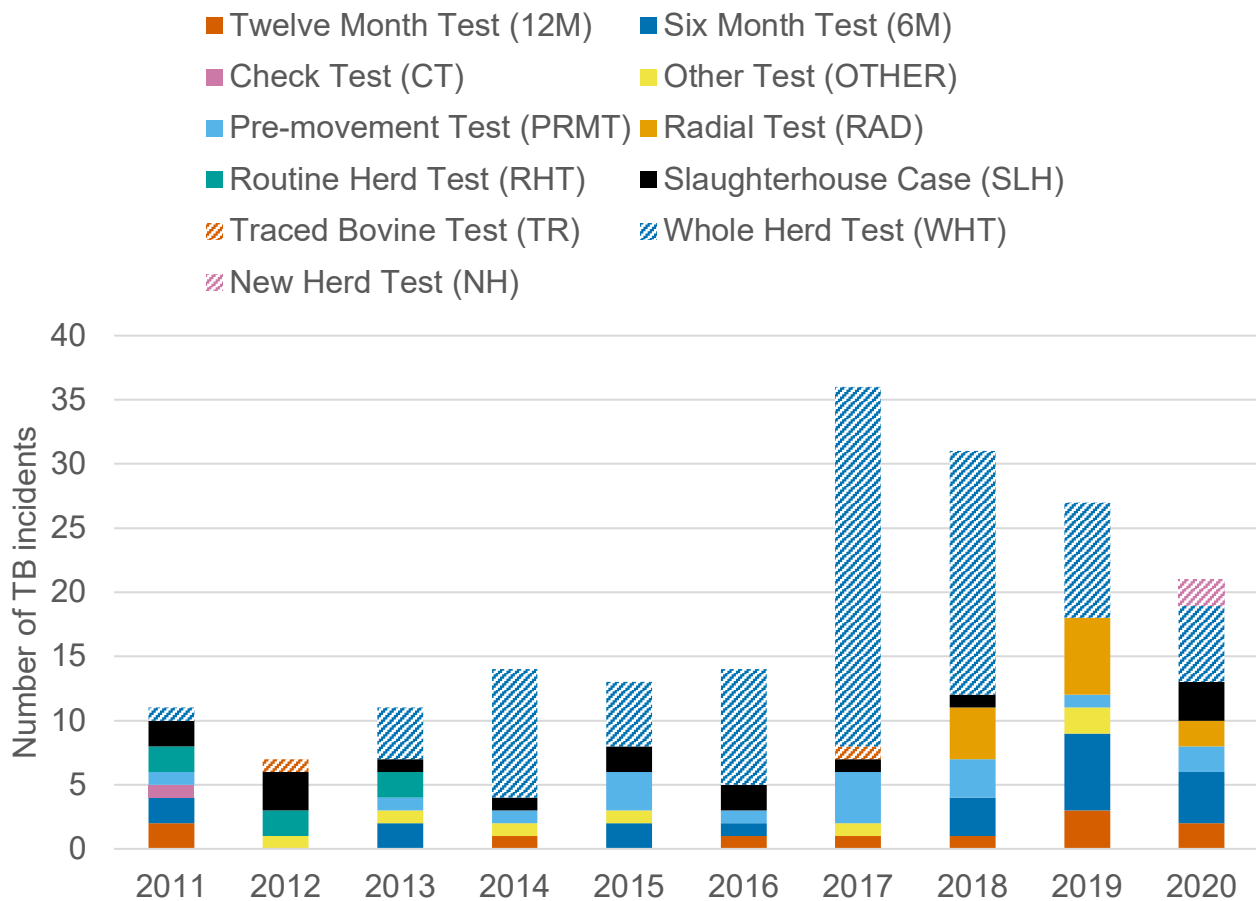


Figure 15b: Number of TB incidents (OTF-W and OTF-S) in Buckinghamshire, 2010 to 2020, disclosed by different surveillance methods by year.

Over 50% of incidents in 2020 had experienced another TB incident within the previous three years (Figure 16). These recurrent incidents were attributed to either residual infection left in the herd from the previous incident or, more often and more likely, the continued purchase of undetected infected cattle from higher risk areas.

A slightly higher proportion of the OTF-S incidents were recurrent (70%) compared to OTF-W (50%). This might be explained by the fact that herds with an OTF-S incident do not qualify for mandatory parallel IFN- γ testing.

Combining this with the skin test increases the likelihood of detecting infected cattle compared to skin testing alone, reducing the likelihood of residual infection. However, continued purchasing of cattle from higher incidence areas is a likely explanation for most recurrent incidents in Buckinghamshire.

Figure 16 shows the number of new OTF-W and OTF-S incidents in 2020, that had experienced an OTF-W incident in the previous three years. It excludes new incidents that were also on restrictions in the first four or more months of 2020 due to an incident that started before 2020.

The [Explanatory Supplement](#) (see section 4.3) provides more details on the reporting of recurrent TB incidents.

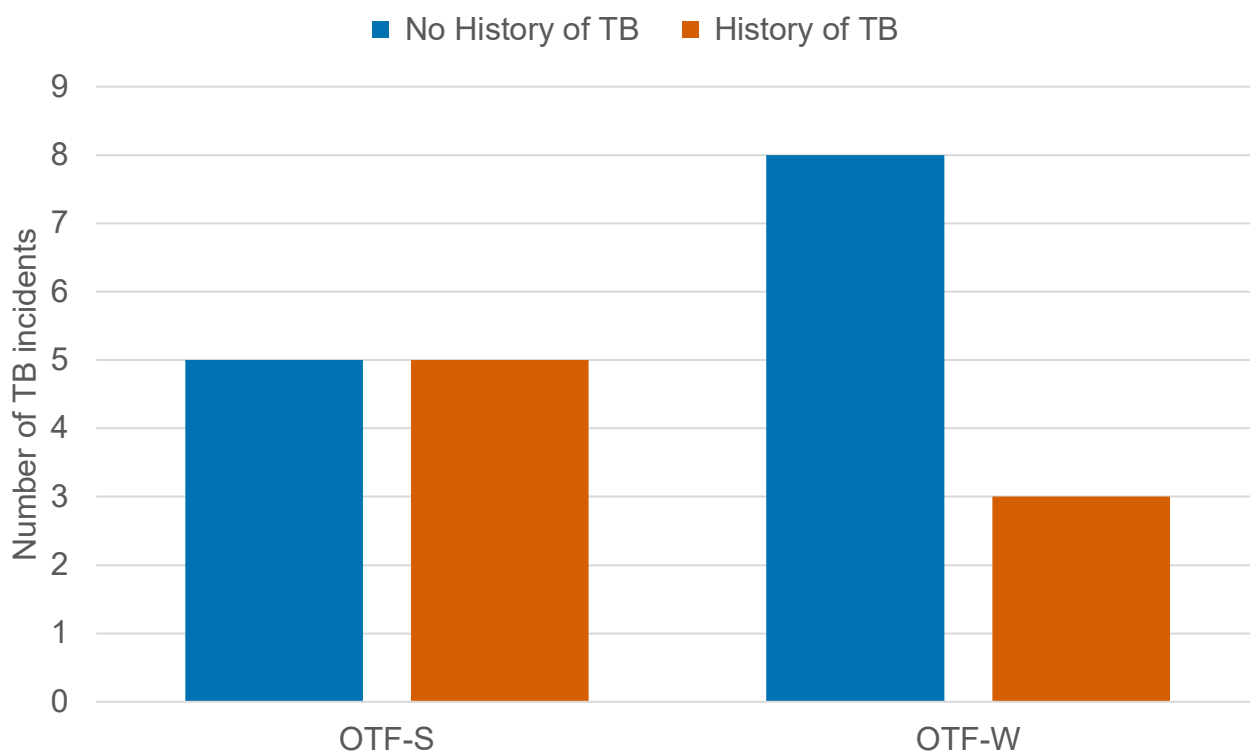


Figure 16: Number of herds with a TB incident (OTF-W and OTF-S) in Buckinghamshire in 2020, with a history of TB (herds that experienced an OTF-W incident in the previous three years), and holdings without a history of TB in the previous three years.

Skin test reactors and interferon gamma test positive animals removed

In total, 160 reactor cattle were detected during 2020 in Buckinghamshire (Appendix 3), of which 101 were detected by the skin test and 59 by the IFN- γ test (Figure 17). This is a decrease of 10 reactor cattle from 2019, partly explained by the decrease in total number of TB incidents from 27 in 2019 to 20 in 2020.

This resulted in an increase in the average number of reactors per incident from six in 2019 to seven in 2020, although still lower than that recorded for 2018 (nine).

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 2020 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.

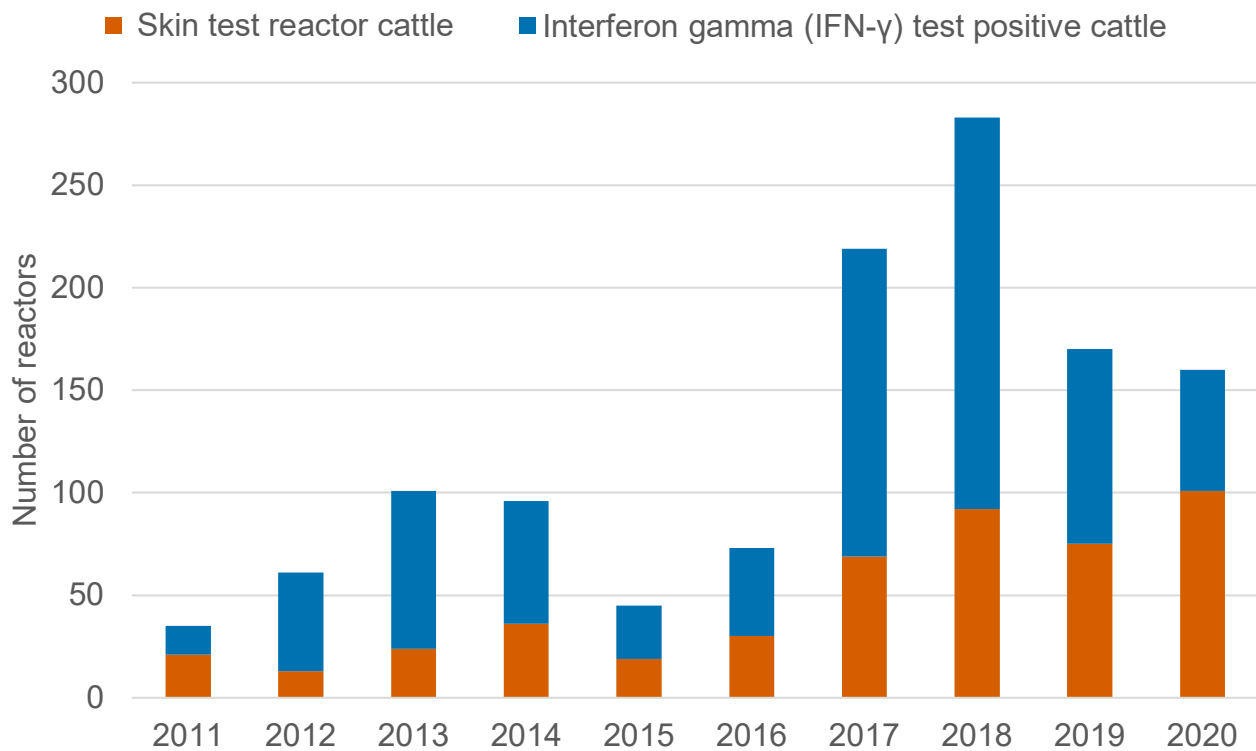


Figure 17: Number of skin test reactors and interferon gamma (IFN-γ) test positive cattle removed by APHA for TB control reasons in Buckinghamshire, 2011 to 2020.

Summary of risks to Buckinghamshire

The decrease in the incidence of TB in Buckinghamshire in 2020 is encouraging and this trend must continue if the county is to achieve its target for OTF status by 2025. Movement of undetected infected cattle from both the HRA and Edge Area into the county continues to be the main risk pathway for the introduction of TB.

The evidence for TB infection in local wildlife (badgers and deer) in Buckinghamshire including areas adjacent to areas with endemically infected wildlife in Oxfordshire and Northamptonshire remains sparse.

The exposure of wildlife to TB and subsequent development of a reservoir of infection would 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 potential for Buckinghamshire to achieve OTF status by 2025.

Summary of risks from Buckinghamshire to surrounding areas

Buckinghamshire acts as a buffer zone between the LRA and other Edge Area counties where reservoirs of TB infection in wildlife are believed to be present, such as in Oxfordshire.

Although infected badgers remained a potential source of TB infection in Buckinghamshire, there was no clear evidence in 2020 to suggest that a reservoir of TB infection was present in the local wildlife. Therefore, Buckinghamshire represented a low risk of spreading TB to the LRA.

However, the speed of eastward geographic progression of presumptive *M. bovis* infection in wildlife in Oxfordshire to the eastern border with Buckinghamshire over about 15 years suggests a serious threat to the county and in the future to 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 including the high incidence county of Oxfordshire rather than with LRA counties, thereby mitigating the risk to the LRA.

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 infection 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 2020 to suggest a spread of TB infection in wildlife from Oxfordshire to Buckinghamshire near the border, two incidents were attributed to wildlife infection from a cluster of incidents at the border with Northamptonshire. In 2020 TB incidents remained sporadic and mainly attributed to purchased cattle.

Assessment of effectiveness of controls and forward look

Effectiveness of controls

Despite the current controls, there was continued introduction of TB into the county through the purchase of cattle with undisclosed TB infection.

There was not enough evidence in 2020 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 not recurred.

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.

Forward look

Based on the current trends for the measures of TB in cattle, the county is unlikely to achieve its target of less than 2% OTF-W herd prevalence by 2021. The radial testing policy should help to reduce the risk of lateral spread of TB and increase the likelihood of detection of areas of infection in local wildlife 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 less than 1% OTF-W herd incidence by 2025. However, TB controls in wildlife will be required to stop movement of infection in wildlife from the adjacent counties of Oxfordshire and Northamptonshire.

Appendices

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

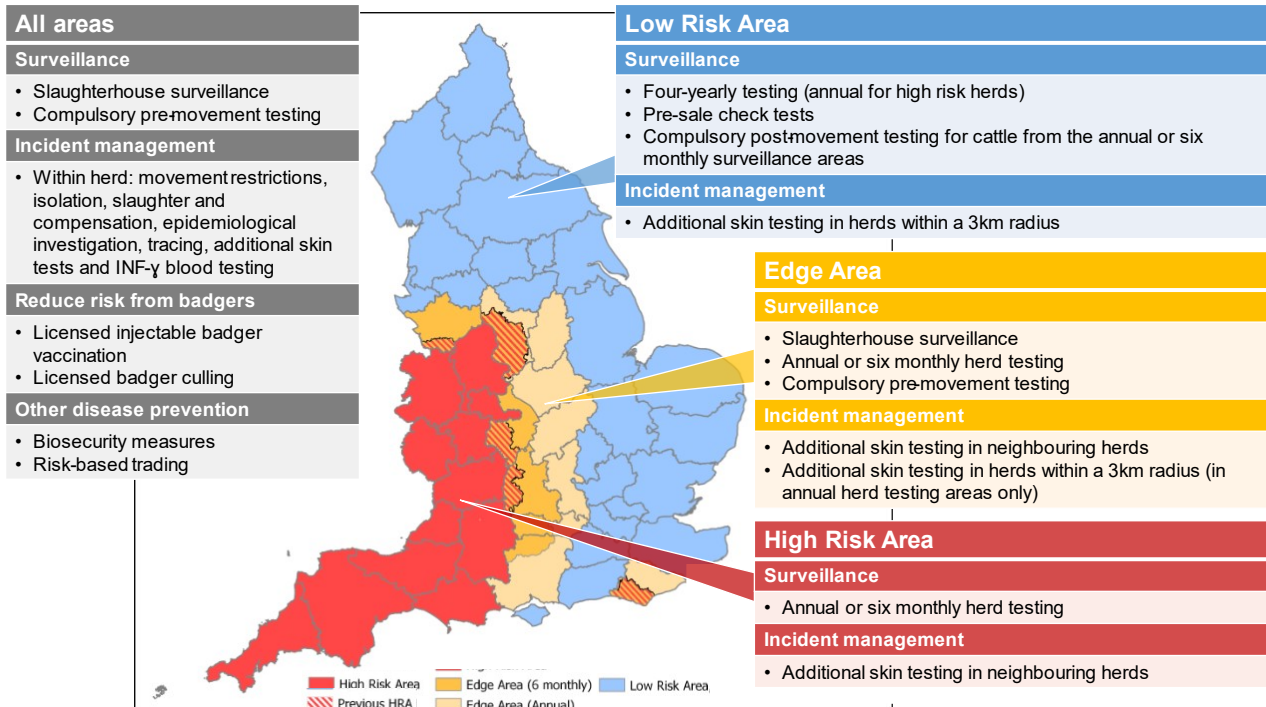


Figure A1: TB risk and surveillance areas of England effective since January 2018, as set out in the UK government’s Strategy for Achieving Officially Tuberculosis-Free Status for England. The map is described in more detail in the [Explanatory Supplement for England 2020](#).

Policy objectives for the Edge Area

- slow down geographic spread of endemic infection
- maintain crude herd incidence of OTF-W incidents less than 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 less than 1% by 2025
- attain OTF status (crude incidence of indigenous OTF-W herd incidents less than 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:

- [A strategy for achieving officially bovine tuberculosis free status for England](#)
- [Government sets out next phase of strategy to combat bovine tuberculosis](#)

Key Control Measures

Surveillance:

- six monthly or annual routine whole 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 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 ('resolved IRs' policy). The only permitted movements of these animals are to slaughter or an Approved Finishing Unit, or after being subjected to a private IFN- γ test with negative results

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

- 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. In 2020, 10 OTF-W incidents generated radial testing zones and one OTF-W incident was disclosed as a result.
- One 2019 incident that became persistent resolved in 2020 after several rounds of skin testing and one round of IFN- γ blood testing.

Other testing measures

- Despite the COVID-19 public health restrictions, no TB tests were considered overdue in 2020.
- There were no culture confirmed incidents of *M. bovis* in non-bovine species.

Other control measures

- Local Authority enforcement including livestock market checks (the various types of approved TB gatherings) and overdue TB testing.
- The number of overdue TB tests in the county continued to be very low in 2020.
- The Berkshire, Buckinghamshire and Oxfordshire local TB eradication group which is comprised of local vets, farmers, auctioneers, and other stakeholders did not meet in 2020 because of COVID-19 restrictions.
- A lower number of TB test audits were conducted for Official Veterinarians (OV) compared to the previous year because of COVID-19 public health restrictions.
- Provision of free biosecurity advice by the [TB Advisory Service \(TBAS\)](#)

Appendix 2: Cattle industry in Buckinghamshire

Table A2.1. Number of cattle premises by size band in Buckinghamshire at 1 January 2020. (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	0	188	70	89	42	11	20	420	122	56

*The number of herds with an undetermined size.

Table A2.2 Number of animals by breed purpose in Buckinghamshire at 1 January 2020.

Breed purpose	Beef	Dairy	Dual purpose	Unknown	Total
Number of cattle	4,0233 (78%)	9,846 (19%)	960 (1%)	1 (less than 0.01%)	51,040

Appendix 3: Summary of headline cattle TB statistics

Table A3.1 Herd-level summary statistics for TB in cattle in Buckinghamshire between 2018 and 2020.

Herd-level statistics	2018	2019	2020
(a) Total number of cattle herds live on Sam at the end of the reporting period	519	513	512
(b) Total number of whole herd skin tests carried out at any time in the period	562	600	511
(c) Total number of OTF cattle herds having TB whole herd tests during the period for any reason	424	423	399
(d) Total number of OTF cattle herds at the end of the report period (herds not under any type of Notice Prohibiting the Movement of Bovine Animals (TB02) restrictions)	479	473	468
(e) Total number of cattle herds that were not under restrictions due to an ongoing TB incident at the end of the report period	497	492	489
(f) Total number of new TB incidents detected in cattle herds during the report period, (including all FUs)	31	27	21
• OTF-S	25	15	10
• OTF-W	6	12	11
(g) Of the OTF-W herd incidents:			
• How many can be considered the result of movement, purchase or contact from or with an existing incident based on current evidence?	4	6	3

Herd-level statistics	2018	2019	2020
<ul style="list-style-type: none"> New OTF-W incidents triggered by skin test Reactors or 2xIRs at routine herd tests 	6	12	3
<ul style="list-style-type: none"> New OTF-W incidents triggered by skin test Reactors or 2xIRs at other TB test types (such as, forward and back-tracings, contiguous or check tests) 	6	12	5
<ul style="list-style-type: none"> New OTF-W incidents first detected through routine slaughterhouse TB surveillance 	0	0	3
(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	1	4
<ul style="list-style-type: none"> OTF-W 	1	5	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)	6	8	9
(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	7	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 in Buckinghamshire between 2018 and 2020.

Animal-level statistics (cattle)	2018	2019	2020
(a) Total number of cattle tested in the period (animal tests)	87,457	92,392	73,862
(b) Reactors detected in tests during the year:			
• Tuberculin skin test	92	75	101
• Additional IFN- γ blood test reactors (skin-test negative or IR animals)	191	95	59
(c) Reactors detected during year per incidents disclosed during year	9.1	6.3	7.6
(d) Reactors per 1,000 animal tests	3.2	1.8	2.2
(e) Additional animals slaughtered during the year for TB control reasons:			
• DCs, including any first-time IRs	1	4	3
• Private slaughters	9	11	0
(f) SLH cases (tuberculous carcasses) reported by Food Standards Agency (FSA)	7	9	7
(g) SLH cases confirmed by culture of <i>M. bovis</i>	0	0	3

Note: (c) Reactors detected during year per incidents disclosed during year, reactors may be from incidents disclosed in earlier years, as any found through testing during the report year count here.

Note: (g) SLH cases confirmed by culture of *M. bovis*, 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 the new OTF-W and OTF-S incidents identified in the report period

Table A4 Suspected sources of *M. bovis* infection for all the new OTF-W and OTF-S incidents identified in Buckinghamshire, in 2020.

Source of infection	Possible (1)	Likely (4)	Most likely (6)	Definite (8)	Weighted contribution
Badgers	3	2	0	0	8.7%
Cattle movements	5	7	7	2	51.2%
Contiguous	1	0	0	0	0.7%
Residual infection	1	0	3	2	21.0%
Domestic animals	0	0	0	0	0.0%
Non-specific reactor	0	0	0	0	0.0%
Fomites	1	0	0	0	0.8%
Other wildlife	0	0	0	0	0.0%
Other or unknown source	1	0	1	0	17.6%

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](#).



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