



Animal &
Plant Health
Agency

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

County: Berkshire

Year-end report for: 2019

TB Edge Area - BERKSHIRE



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Executive summary

Reporting area

Berkshire 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 Berkshire.

Local cattle industry

The majority of herds in Berkshire are between 1-50 cattle (57%), with the overall number of cattle herds continuing to fall slightly from previous years. There are two commons in the county which are both grazed by cattle. There are no markets or abattoirs, but there are two Approved Finishing Units (AFUs).

New incidents of TB

There was a decrease in the overall number of new incidents disclosed in Berkshire in 2019 (25 compared to 29 in 2018). The number of Officially Tuberculosis Free Status Withdrawn (OTF-W) incidents in 2019 (14) was similar to the number in 2018 (13), and there was a decrease in Officially Tuberculosis Free Status Suspended (OTF-S) incidents from 2018 (16) to 2019 (11). Therefore, the proportion of OTF-W incidents has increased to over 50%.

Suspected sources and risk pathways for TB infection

The most likely sources of infection for new OTF-W and OTF-S incidents in Berkshire in 2019 based on weighted risk pathways recorded were infected wildlife (35%) followed by cattle movements (20%) and residual infection (9%).

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

Over 50% of incidents were disclosed at whole herd tests which included those carried out at 12 months and six months following the establishment of a six-monthly surveillance testing area in the west of the county in 2018. Other disclosing test types were radial tests, pre-movement tests and six month post incident testing.

Reactor numbers

There were 145 skin test reactors and 157 interferon gamma (IFN- γ) test positives in Berkshire in 2019. This represents little change from the 2018 data (152 skin test reactors and 156 IFN- γ test positive cattle).

Risks to the reporting area

Risks to Berkshire continue to be through endemic infection from neighbouring counties including the High Risk Area (HRA) county of Wiltshire and purchase of stock, especially from markets such as Salisbury (HRA).

Risks posed by the reporting area

There are physical barriers which help prevent the spread of TB through wildlife movements to the surrounding areas, such as the Low Risk Area (LRA) county of Surrey. Therefore the biggest risk posed by Berkshire to surrounding counties is the movement of cattle.

Forward look

In recent years the conurbations of Reading and surrounding towns have helped slow the eastward spread of suspected endemic infection towards the LRA, and numbers of incidents have remained similar over the last two years. This may mean the beginning of a plateau but it is too early to confirm, and based on this, achieving OTF status for Berkshire does not look imminent. The monitoring of infection in wildlife populations will continue to be an important aspect of TB control in Berkshire, along with continuing to increase levels of biosecurity awareness and the awareness of the risks of cattle movements in the farming community.

Introduction

This report describes the level of bovine tuberculosis in cattle herds in Berkshire 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 Berkshire, 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). Berkshire 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 Berkshire. 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 parts of Berkshire and all the other parts of the Edge Area that remained on annual testing. At the same time, herds in the western part of Berkshire moved to six-monthly surveillance testing.

Cattle industry

Herd types

Berkshire is one of the smallest Edge Area counties in size and cattle population. The number of herds is continuing to fall, from 223 in 2018, to 220 in 2019. The majority of herds are between 1-50 cattle (57%), with only 13% of herds with more than 200 cattle (Figure 1). The highest herd density is in the south and west of the county along the borders with Hampshire and Wiltshire.

Husbandry and feeding practices within Berkshire are very diverse and specific to the size and type of unit. The majority of herds are winter housed (approximately October to April) and summer grazing on rented land is not uncommon.

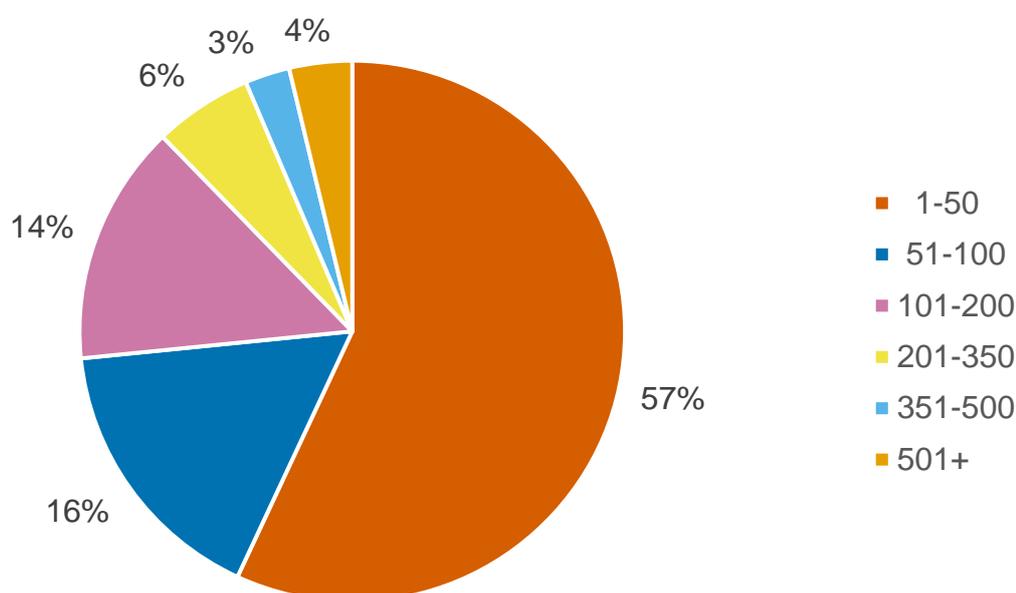


Figure 1: Proportion of cattle holdings by herd size in Berkshire in 2019 (n=188).

Markets

Berkshire has no approved markets or abattoirs. Markets close to Berkshire are Salisbury market in the neighbouring HRA county of Wiltshire, and Thame market in Oxfordshire (Edge Area).

Approved Finishing Units

There are two Approved Finishing Units (AFUs) and no Exempt Finishing Units (EFUs) in Berkshire.

Common land

There are two commons that are grazed in the county. Hungerford common operates a system of graziers who purchase a single batch of stores to graze the main common and commoners who graze geographically and epidemiological separate parcels of the common with their own stock.

Greenham common has seven commoners who exercise their rights to graze. The cattle are run as one herd on the common, but a number of commoners do have fenced pasture and/or buildings at their home premises. The herd is self-maintaining with only occasional purchase of breeding bulls.

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.

As shown in Figure 2, there were a total of 25 new incidents in the county in 2019. This represents a reduction from 2018, (29), and is similar to the number identified in 2017 (24). However, this is still a general increase in number of incidents since 2016 when there were only 12 incidents. The number of OTF-W incidents (14) has remained relatively stable from 2018 (13), however there has been a slight drop in the number of OTF-S incidents from 16 in 2018 to 11 in 2019.

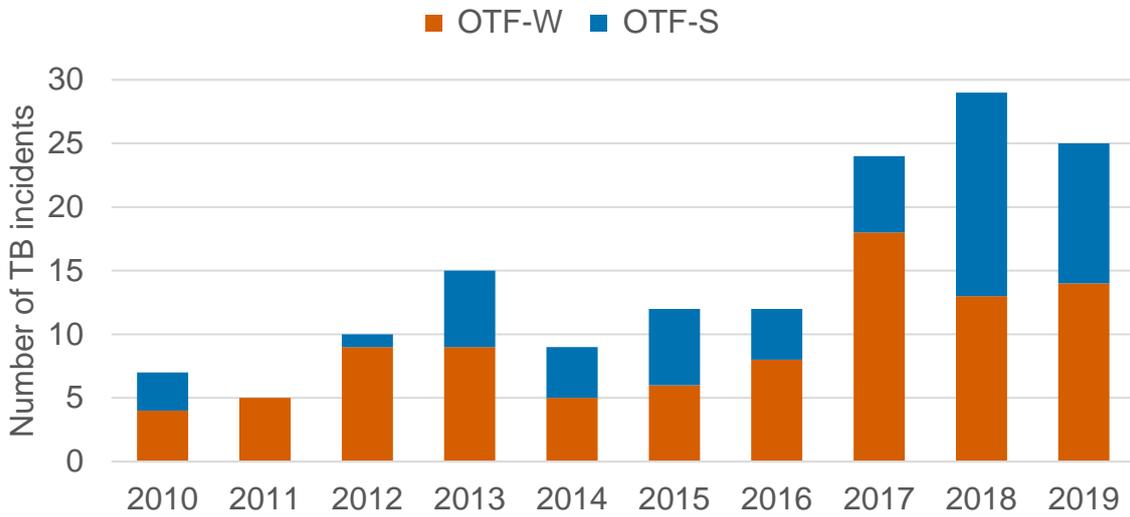


Figure 2: Annual number of new TB incidents in Berkshire, 2010 to 2019.

Figure 3 shows two different measures of herd incidence rate; TB incidents per 100 herd-years at risk (HYR) and TB incidents per 100 unrestricted herds. Using the incidents per 100 HYR measure there was an increase in incidence from 2018 13.7 to 16.4. The denominator for this incidence rate measure (herd-years at risk) is sensitive to changes in testing intervals within an area. This should be borne in mind when considering incidence rate trends in some parts of the Edge Area that moved from annual to six-monthly testing in 2018. A detailed description of the methodology used to calculate incidence per 100 HYR is available in the Explanatory Supplement for 2019 (<https://www.gov.uk/government/publications/bovine-tb-epidemiology-and-surveillance-in-great-britain-2019>). However when expressing herd incidence as incidents per 100 unrestricted herds, this shows a reduction in 2019 (13.6) compared to 2018 (15.0), which is compatible with the slight reduction in incident numbers. This is still a large increase since 2016 which was 6.5 incidents per 100 HYR or 5.8 incidents per 100 unrestricted herds.

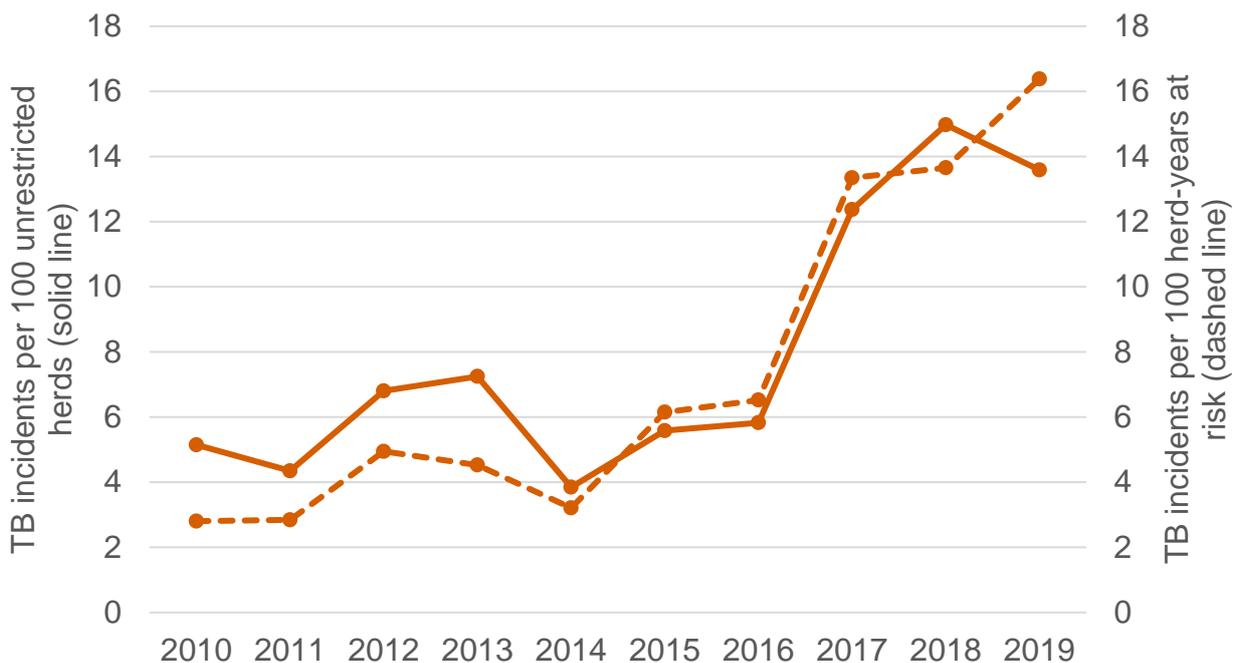


Figure 3: Annual herd incidence rate (per 100 herd-years at risk and per 100 unrestricted herds) for all new incidents (OTF-W and OTF-S) in Berkshire, 2010 to 2019.

The prevalence rate has reduced to 9.2% in 2019 from 12.7% in 2018 as seen in Figure 4. Prevalence provides a snapshot at a certain moment in time e.g. end of year as shown in this dataset. As incident numbers are relatively low, prevalence can be influenced disproportionately by a small number of incidents being disclosed or finishing when prevalence is observed. However, duration of infection is included in this measure, which is not accounted for in measures of incidence

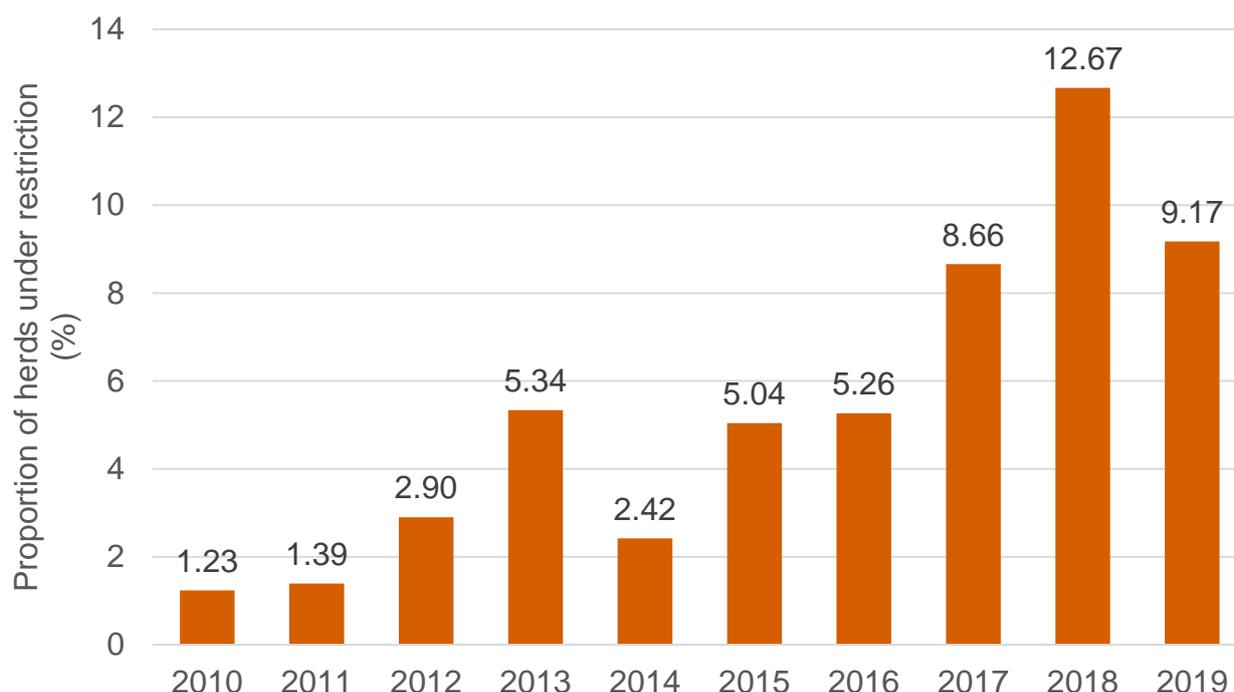


Figure 4: Annual end of year TB herd prevalence in Berkshire, 2010 to 2019.

Geographical distribution of TB incidents

As can be seen in Figure 5, Berkshire had a lower incidence rate (incidents per 100 herd-years at risk) (16.4) than its northern and western neighbours Oxfordshire (23.8; Edge Area) and Wiltshire (21.7; HRA), respectively. However, it was much higher than the counties to the north-east and south; Buckinghamshire (6.1; Edge Area) and Hampshire (5.7; Edge Area).

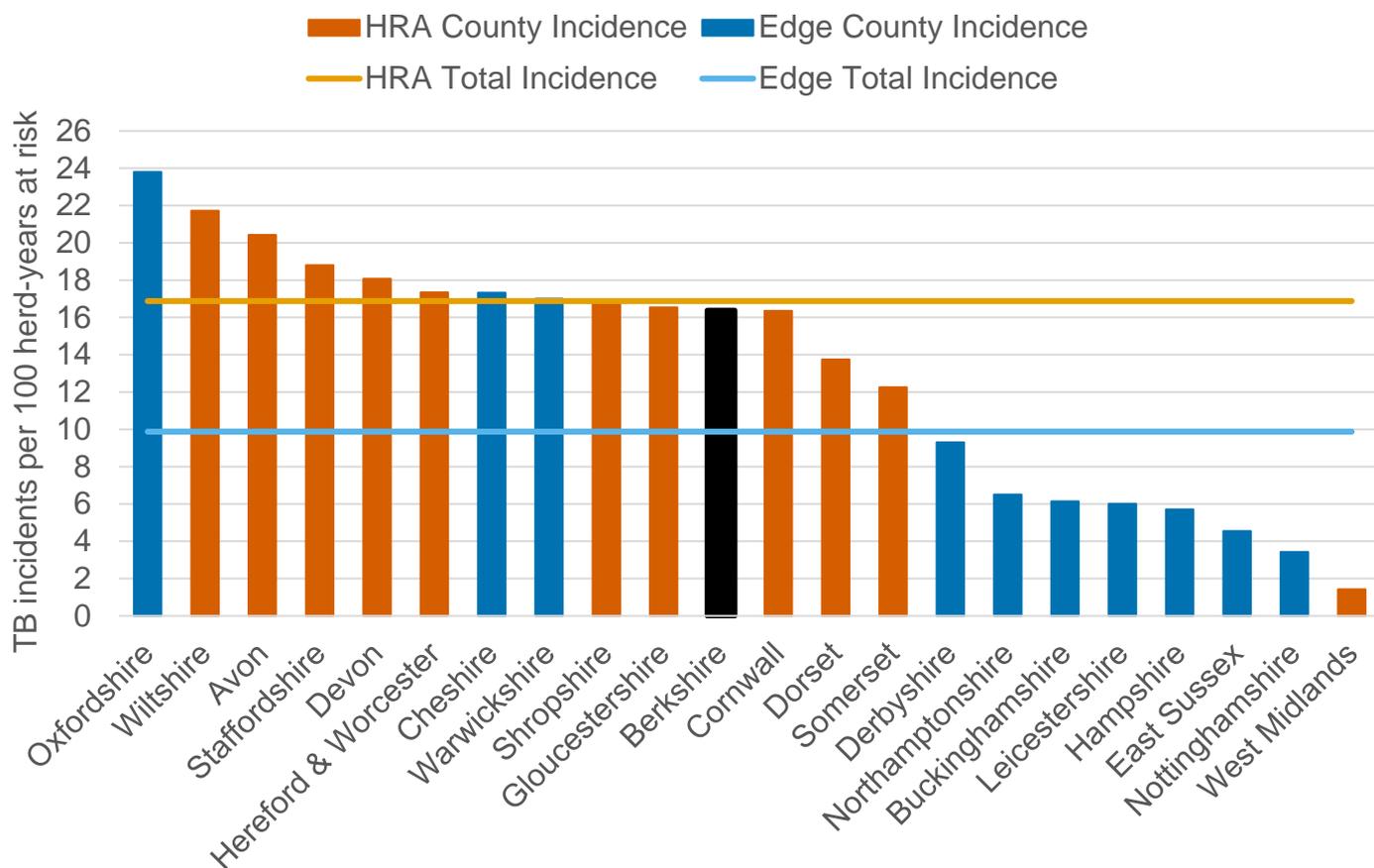


Figure 5. Incidence rate (per 100 herd-years at risk) for all new incidents (OTF-W and OTF-S) in 2019, by HRA and Edge Area County.

The incidents are evenly spread across the western half of the county reflecting the higher density of cattle in western Berkshire, however they are not all concentrated in the area with highest density of cattle in central Berkshire (Figure 6). This largely corresponds with the six monthly testing area in the Edge, whereas the eastern area is under annual testing. The eastern area of Berkshire has both less incidents and a lower cattle density. The cattle population density is similar to the cattle holding density, with more holdings situated towards the centre of the county. The majority of the OTF-S incidents towards the eastern side of Berkshire were attributed to cattle movements, whereas most of the OTF-W incidents were attributed to non-introduced sources.

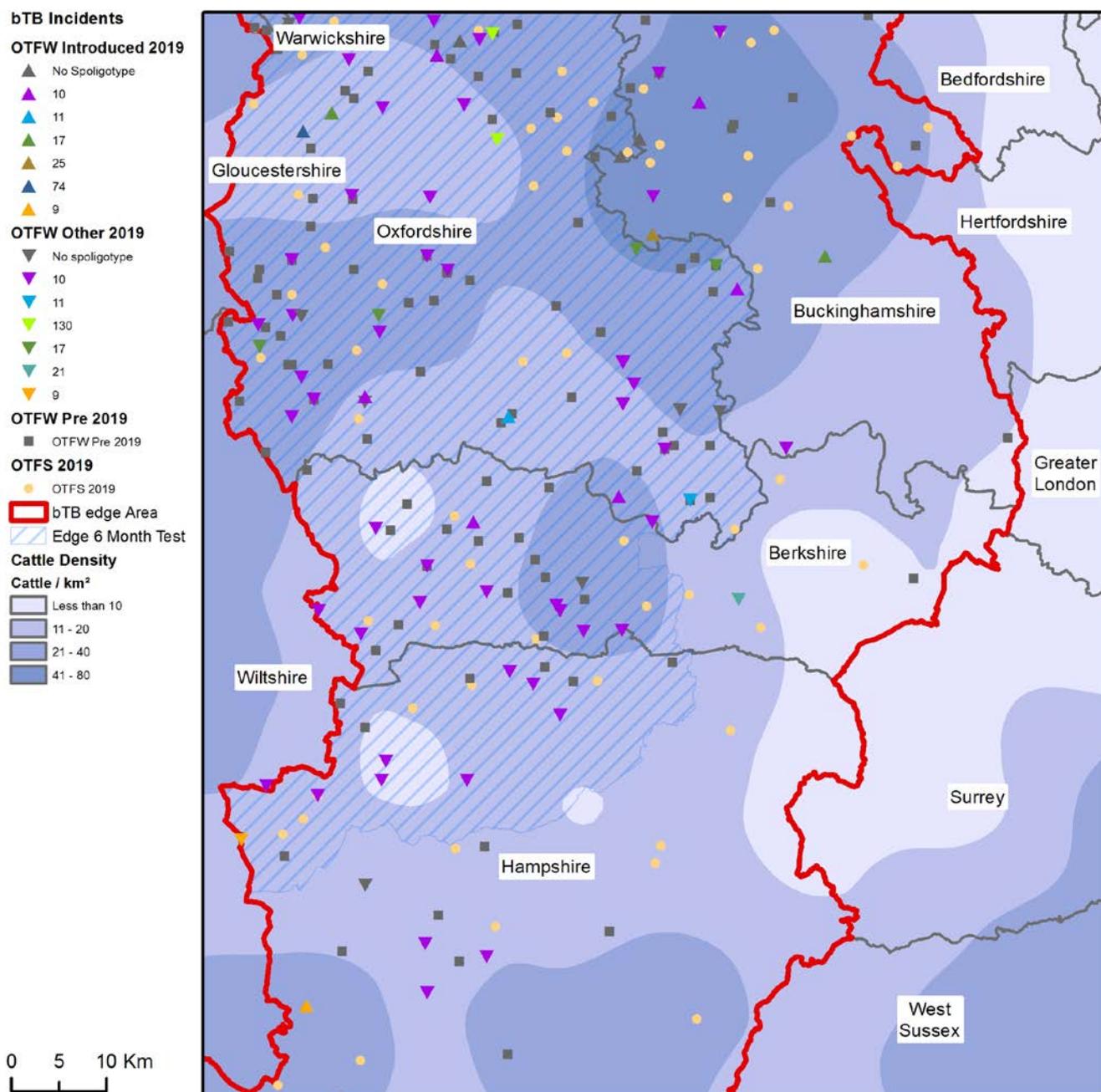


Figure 6: Location of cattle holdings in Berkshire with new TB incidents (OTF-W and OTF-S) in 2019 and cattle holdings with pre-2019 OTF-W incidents that are still ongoing at the beginning of 2019, overlaid on a cattle density map. To note, 'OTF-W Introduced 2019' refers to OTF-W incidents in which introduction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

The genotypes identified in Berkshire in 2019 remained the same as 2018 with the exception of a single disclosure of genotype 21:a. This is expected in an area with endemic TB (Figure 7). Genotype 10:a and 10:u were first disclosed in Berkshire in around 2010 and have been present and spreading in the intervening years. The genotype 10:a had been present before this time in the area of Wiltshire bordering Berkshire suggesting original incursion was from the west possibly via north-west Hampshire. Genotypes 10:a and 10:u were the only two genotypes to be confirmed in the western half of the county. This suggests local sources of infection including residual infection in herds, purchasing infected stock from 10:a or 10:u homerange areas or wildlife infection.

A cause for concern is that genotype 10:u has continued to be disclosed in central Berkshire, near to the border between six-monthly and annual testing areas. This is shown in Figure 7 by an incident disclosed in Padworth only 6.5km from the annual testing area, which was considered most likely sourced from infected wildlife. There was another genotype 10:u incident attributed to wildlife disclosed in Purley-on-Thames in the north of the county close to the border with Oxfordshire and close to the edge of the annual testing area. However the conurbation of Reading and the route of the river Thames may help to prevent the spread eastwards from this incident.

Genotype 10:a continues to appear in disparate locations throughout the western endemic area of Berkshire. There is a cluster that has been developing around the Thatcham area over the past three years.

There is a risk of introduced genotypes via beef fattener units sourcing stock from HRA markets. Of the genotypes disclosed on beef fattening premises in 2019 only the two local genotypes, 10:a and 10:u, have been identified. This suggests that wildlife, residual infection or local purchase are the likely sources of the majority of incidents.

A single OTF-W incident in the eastern portion of Berkshire was confirmed with genotype 21:a. This is outside the typical 21:a homerange which is predominantly in Somerset, Avon and to a lesser extent Wiltshire. Whole Genome Sequence (WGS) analysis has suggested a link to other incidents in the HRA, although it is unclear how this has occurred as there have been no related cattle movements to the premises where the incident was identified. The incident generated a single radial zone in which additional testing was undertaken in cattle herds.

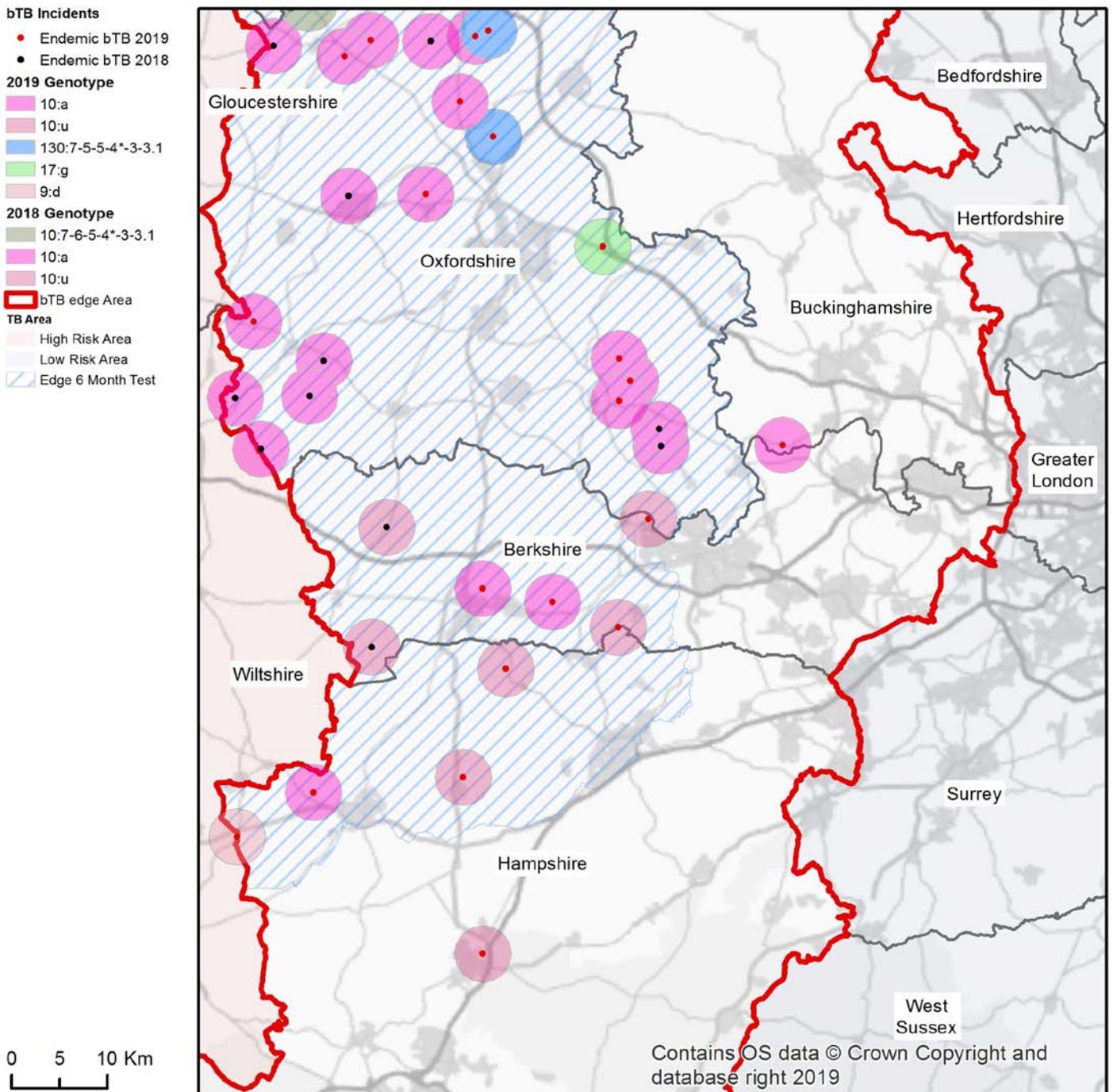


Figure 7: Genotypes of *M. bovis* detected in Berkshire in 2018 and 2019, where a wildlife source was attributed with a 75% certainty or above, as an indication of endemic infection within local wildlife populations (OTF-W incidents only).

In 2019, only one OTF-W and three OTF-S incidents were attributed to purchase of livestock, compared to five OTF-W incidents where the 'most likely' source was attributed to wildlife. Incidents attributed to wildlife are spread throughout the southern half of the six-monthly surveillance testing part of the county, close to the border with Hampshire (Figure 8). It is encouraging that there was only a single genotype of *M. bovis* confirmed in 2019 which is out with its home range, which is a change from 2018 where three HRA genotypes were disclosed. This may reflect a change in farmer behaviour to purchasing cattle from lower risk herds with no recent history of TB.

There was one incident that stood out in Berkshire in 2019. This herd, situated close to the western county boundary, suffered previous incidents attributed to two different genotypes, 10:a in 2016 and 10:7-5-5-6*-3.3 in 2011. However, the incident in 2019 was found to be genotype 10:u and was very extensive. There were 19 reactors out of a total of 51 cattle tested at the whole herd test (WHT), of which 15 had visible lesions. Two IFN- γ test positive animals were later disclosed, one of which had visible lesions. No further reactors were disclosed at the subsequent short interval tests. The group of cattle with visible lesions had grazed an area in the summer of 2019 that had reports of badger activity and a resident wild fallow deer herd. A fallow deer on a neighbouring farm was confirmed with *M. bovis* genotype 10:a in April 2011, illustrating that TB may well be present in wildlife in this area.

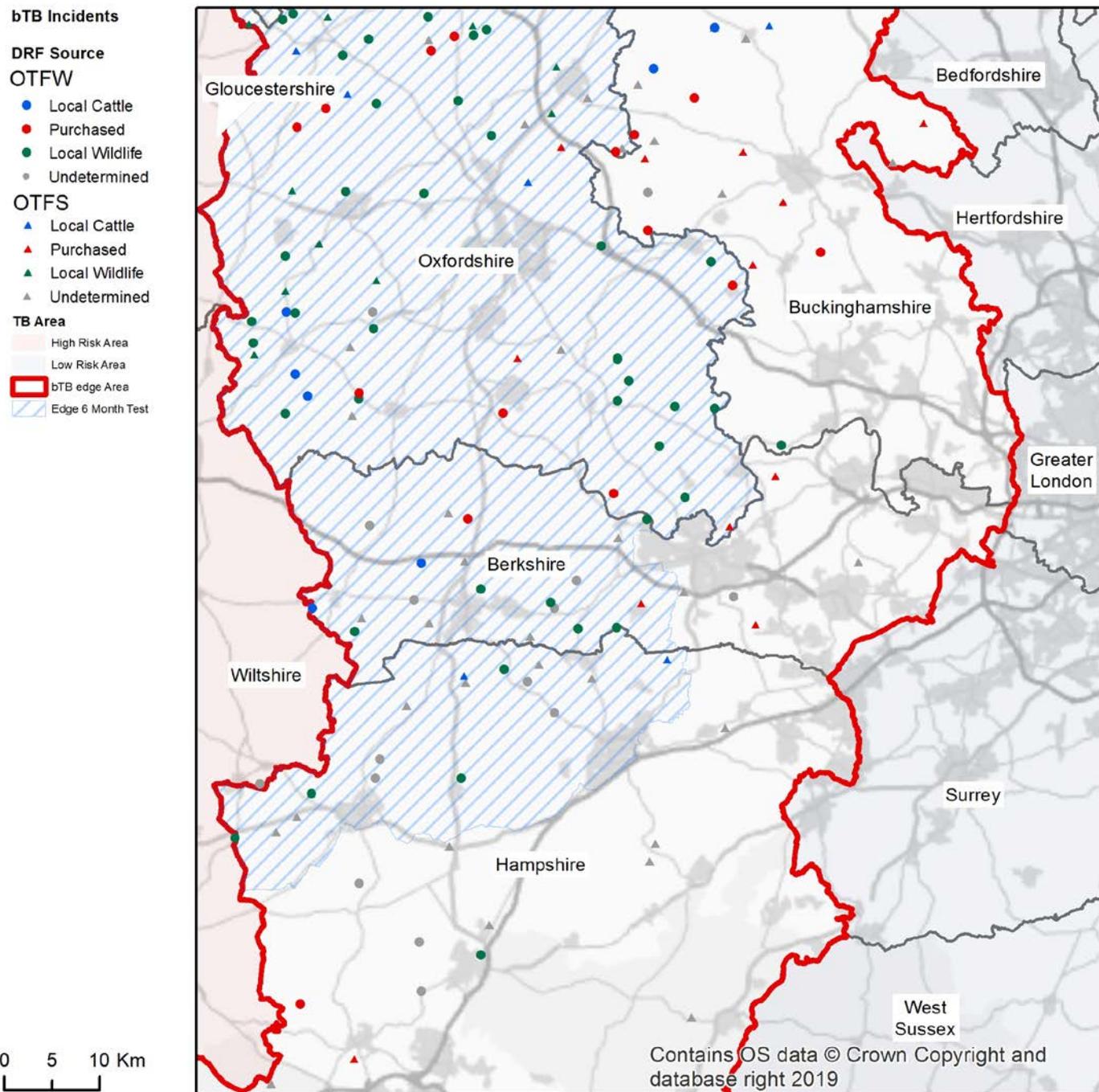


Figure 8: Map of the source of infection pathway recorded with the highest level of certainty for all TB incidents (OTF-W and OTF-S) in Berkshire, and its adjoining Edge Area counties, which started in 2019.

Other characteristics of TB incidents

Incidents by herd types

Farms are impacted by TB restrictions in various ways depending on their cattle management systems. For dairy herds, the issue is often finding an outlet for or having to rear calves which would normally have been sent to market. Those who usually sell stores rather than finished fat cattle are limited in where these cattle can be sold (usually with less of a return), or if feasible are forced to change their business practices and continue rearing them. Beef finishers can sell direct to slaughter, but are restricted by having to apply for licences to buy in replacement stock.

As shown in Figure 9, in 2019, 60% of incidents were disclosed in beef suckler herds (15 out of 25). This is in contrast to 2018, when 59% (17 out of 29) of incidents were in beef fattening herds. In 2019 beef fattener herds were responsible for a higher proportions of incidents than dairy herds (32% and 8%, respectively).

The majority of the incidents occurred within small herds of between 1-50 cattle (32%, 8 out of 25), followed by herds with 51-100 cattle (28%, 7 out of 25).

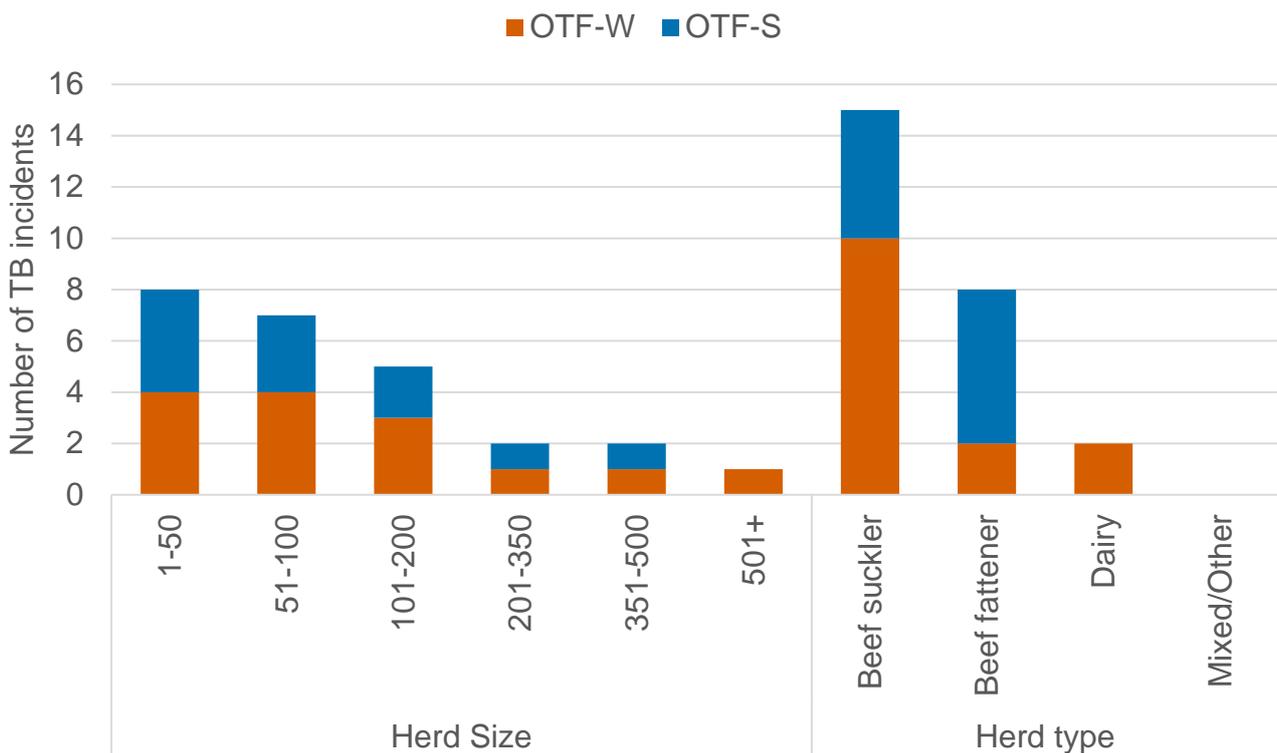


Figure 9: Number of new TB incidents (OTF-W and OTF-S) in Berkshire in 2019, by cattle herd size and type.

Incidents by month of disclosure

As shown in Figure 10, in 2019 there were three peak months: January (4), May (5), and November (4). These peaks could be attributed to the timing of testing being linked to the time when cattle are turned out after winter housing. Six-monthly surveillance testing in parts of the county may also have an impact on the distribution. This compares with 2018 when only four incidents were confirmed in the period January to April.

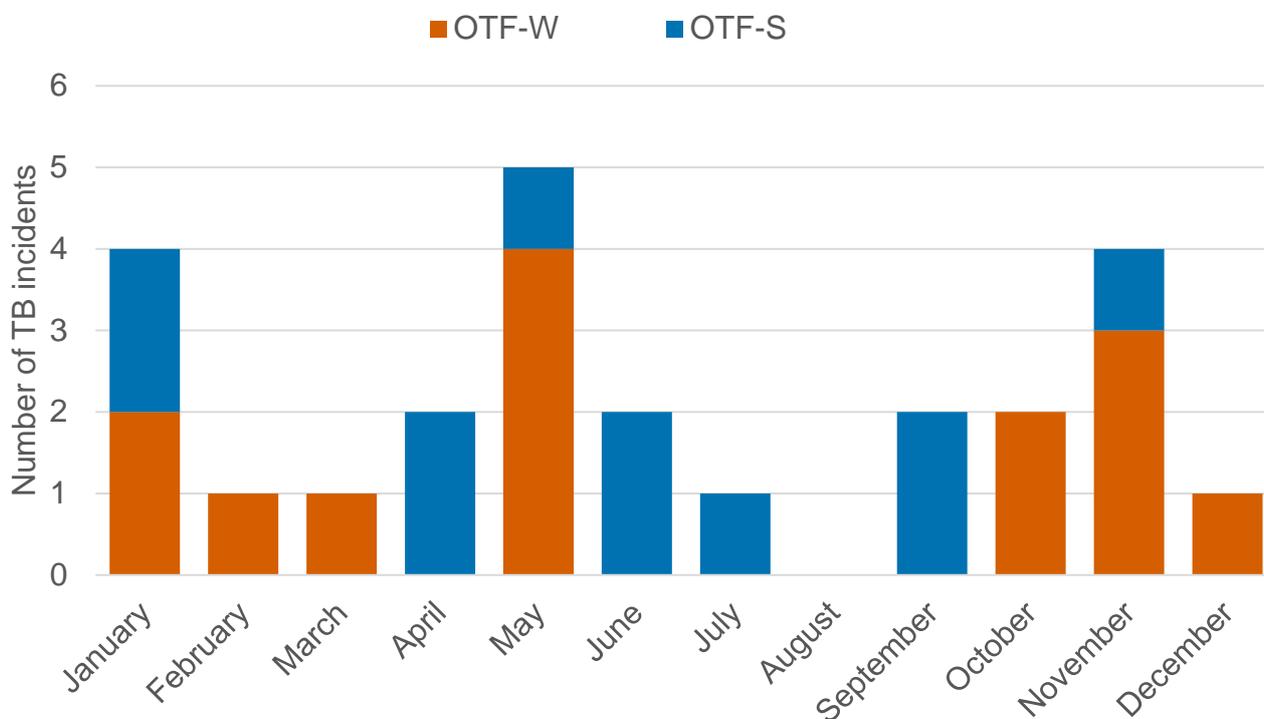


Figure 10: Number of new TB incidents (OTF-W and OTF-S) in Berkshire in 2019, by month of disclosure.

Genotypes of *M. bovis* isolated

Incidents confirmed with genotypes 10:a and 10:u comprised 92% of the cases confirmed on culture with the remaining 8% being made up of the single disclosure of 21:a (Figure 11). Berkshire is considered to be part of the homorange of the genotypes 10:a and 10:u, so it is not surprising that these are the genotypes most commonly found in the county.

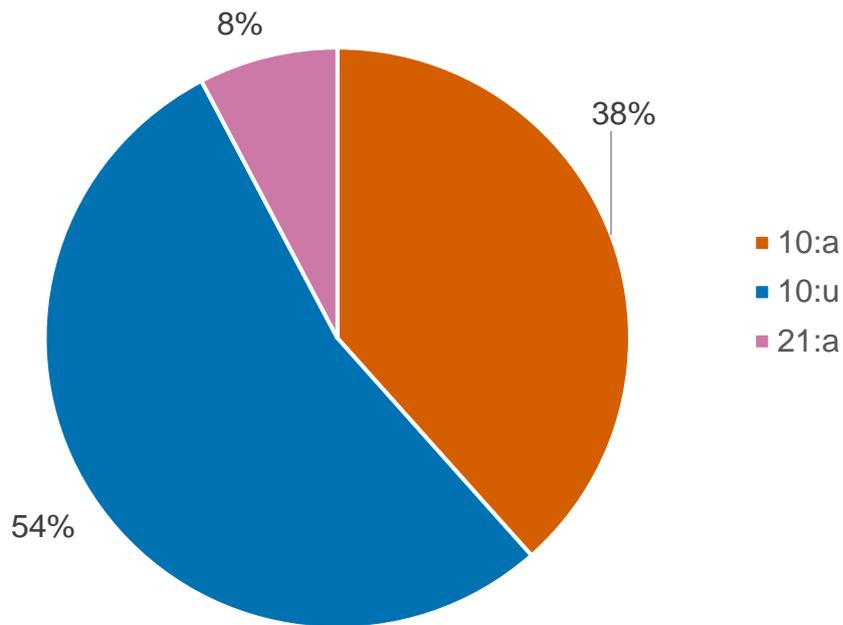


Figure 11: Genotypes of *M. bovis* identified in herds with OTF-W incidents in Berkshire in 2019 (n=13).

Duration of incidents

As can be seen in Figure 12, the majority of incidents resolved within the 151-240 days or 241-550 days categories. Those that resolved within 151-240 days were likely to have passed either the minimum of two or three short interval tests before restrictions were lifted. This suggests that infection was cleared efficiently from almost half the incidents in the county.

The mean length of OTF-W incident was 329 days and the median 272 days. This compares with OTF-S mean length of 226 days and a median of 195. This illustrates that incidents with animals that have TB lesions at post mortem inspection take longer to resolve than those without detectable lesions.

There are now four herds that have been under restrictions for longer than 551 days. All four are dairy herds. Two of these are large dairy herds, with incidents commencing in 2012/13, and have continued in a low level cyclical fashion in 2019. Both these farms were selected for wildlife surveillance in 2018 and useful information was imparted to the farmers to assist in reducing cattle-badger interactions such as exclusion measures in cattle housing and feed stores. However, the incidents had still not resolved by the end of 2019, indicating the difficulty in implementing biosecurity measures that are totally effective on a premises with a large number of animals spread over a number of sites and multiple grazing areas.

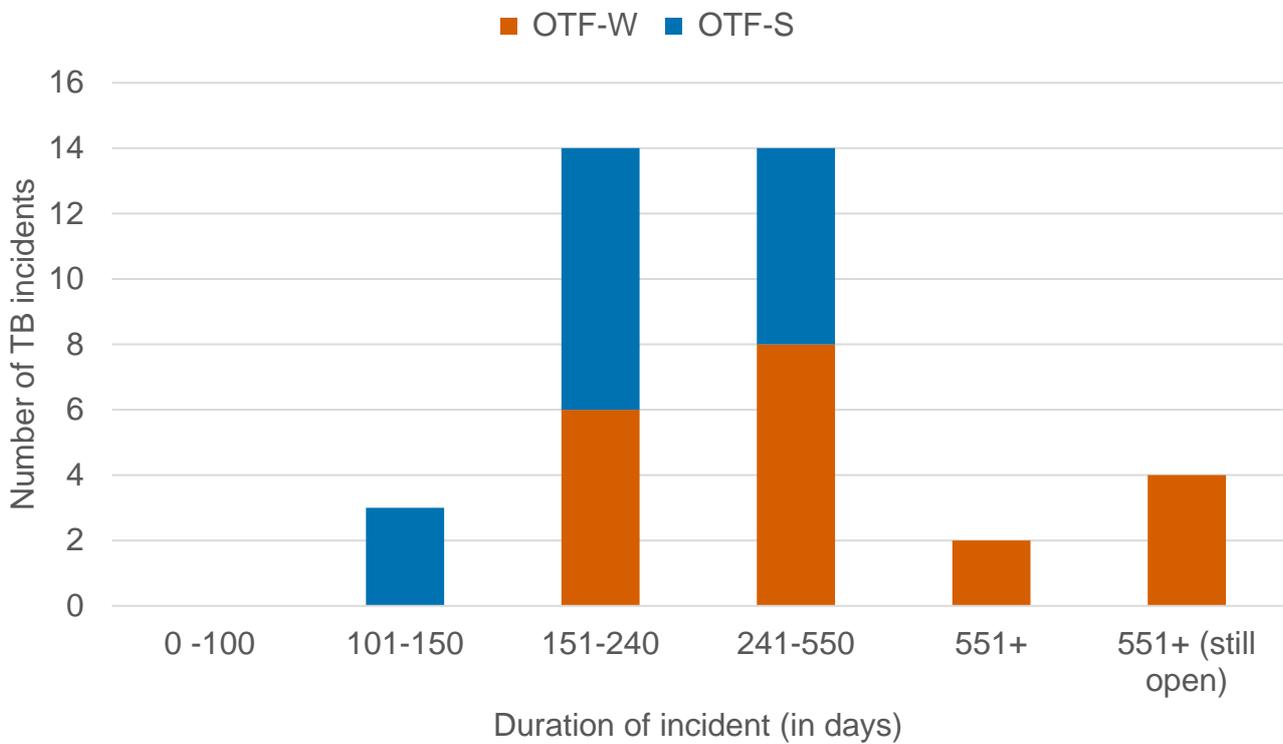


Figure 12: Duration of all TB incidents (OTF-W and OTF-S) that ended in 2019, and the number of persistent TB incidents (551+ days) that were unresolved at the end of 2019 in Berkshire. Note that Approved Finishing Units (AFUs) have been excluded.

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 within Berkshire in 2019 are as follows:

- Infected wildlife
- Cattle movements

Infected wildlife was a source attribution in nearly 50% of weighted risk pathways for OTF-W incidents in Berkshire. The genotype 10:a and 10:u cases were all in the six-monthly surveillance testing part of Berkshire where history suggests endemicity in the wildlife. Improvements in on-farm biosecurity to reduce wildlife to cattle transmission are needed to break the cycle of infection. Additionally control measures to reduce badger infectivity through vaccination and/or culling could be advantageous.

Movements of undetected infected cattle were the highest weighted risk pathway in OTF-S incidents. In the east of the county, wildlife infection was discounted by the case veterinarians on the basis of geography and infection is unlikely to be residual as 14 of the incidents had no previous history of TB.

Sources of infection and risk pathways

Approximately 60% of the weighted risk pathways for OTF-W incidents can be attributed to wildlife or residual infection with only 11% due to cattle movements (Figure 13a), potentially reflecting the endemicity within Berkshire.

Figure 13b which shows attributable sources for OTF-S incidents gives a much higher percentage of 31% of weighted risk pathways to cattle movement and only approximately 23% attributed to wildlife sources or residual infection. However 45% are defined as other or unknown source. This is as a result of case veterinarians not having a genotype to assist in identification of sources.

The algorithm used to weight multiple risk transmission pathways recorded for each incident in Figure 13a and Figure 13b, ascribed many incidents as unknown or undetermined origin because of lower certainty rated by the case vet. Figure 14 supports this, showing that the sources recorded with the highest level of certainty for all herd types is defined as 'other sources', although cattle movement and wildlife sources are still represented. This includes six cases with confirmed genotype but equally weighted sources of attribution e.g. wildlife and residual infection. There are no incidents that have been recorded with local cattle as the source with the highest level of certainty, which shows the difficulty in ascribing sources of infection.

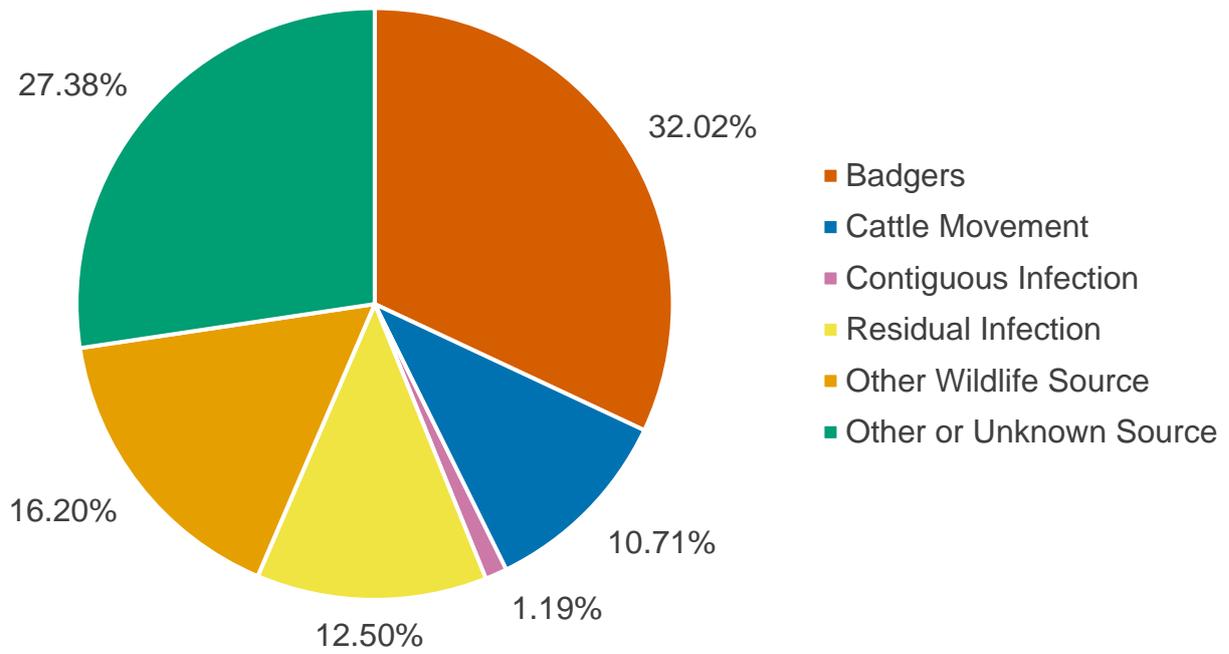


Figure 13a: Summary of the weighted source of infection pathways attributed for all OTF-W incidents in Berkshire that started in 2019, that had a completed DRF (14).

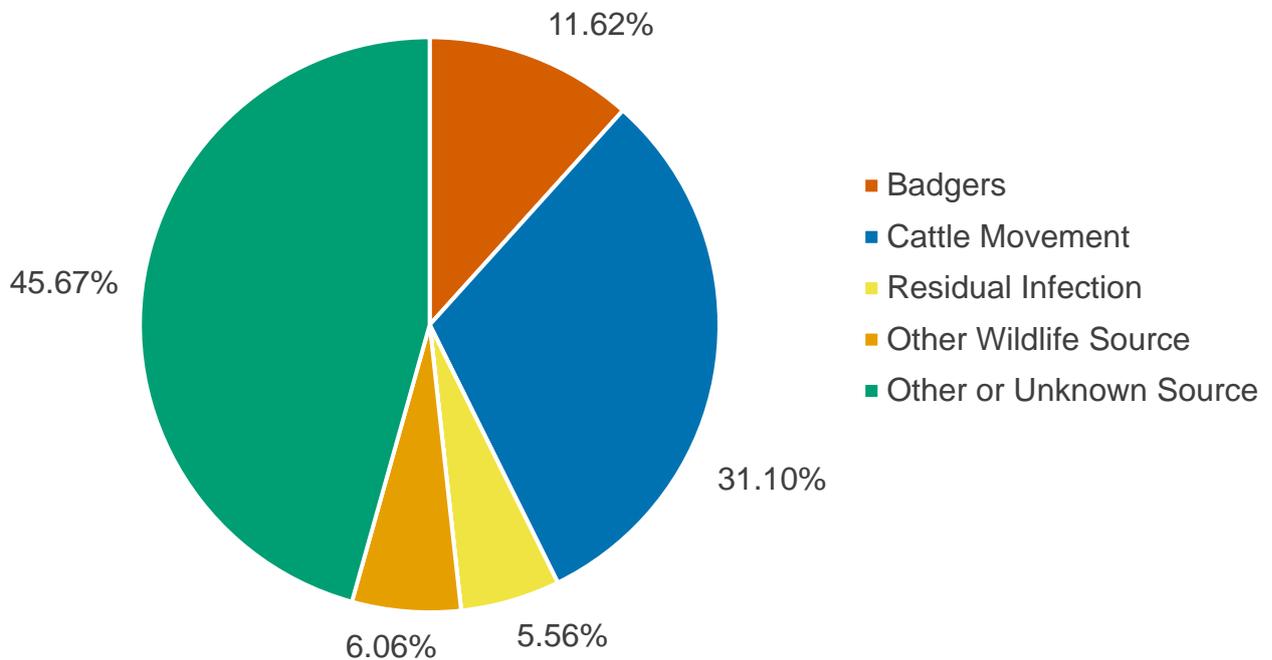


Figure 13b: Summary of the weighted source of infection pathways attributed for all OTF-S incidents in Berkshire that started in 2019, that had a completed DRF (11).

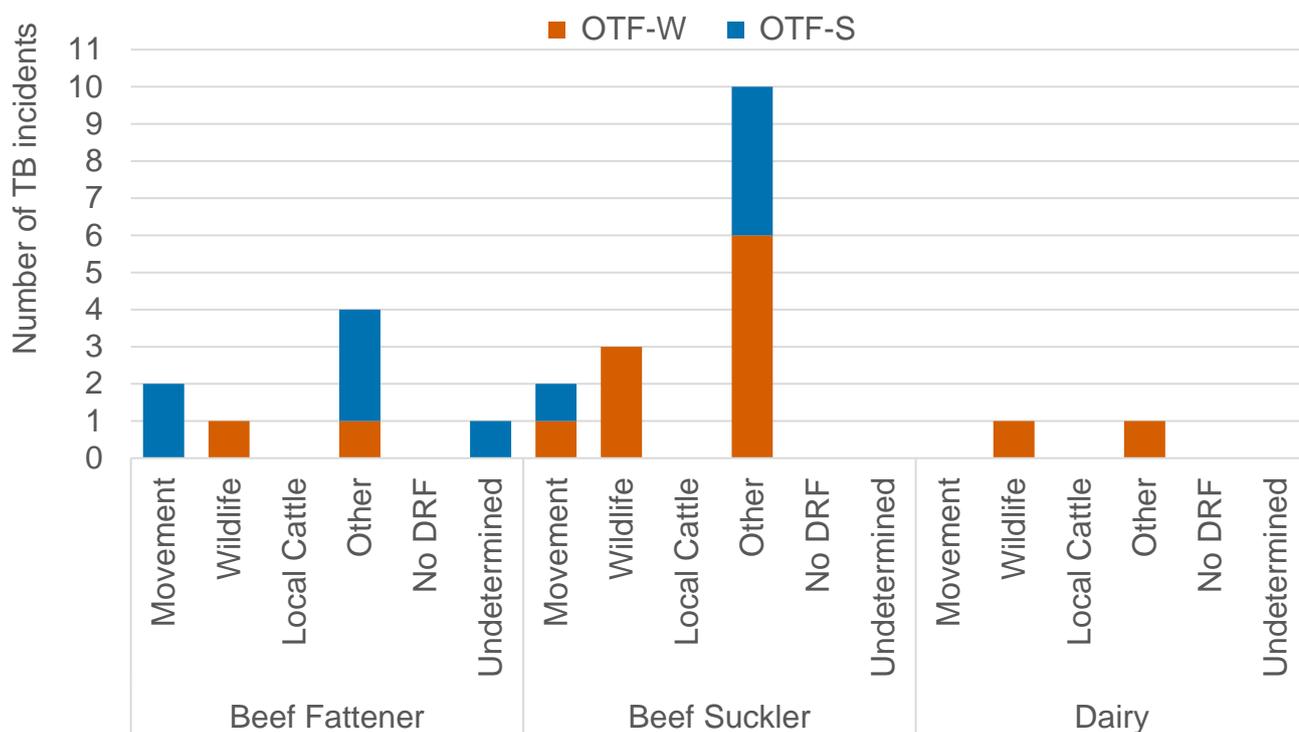


Figure 14: Source of infection recorded with the highest level of certainty for all TB incidents (both OTF-W and OTF-S) in Berkshire in 2019, by herd type. Note that the categories ‘movement’, ‘wildlife’, and ‘local cattle’ are comprised of incidents where these were the most likely single source of 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.

Anecdotally, badger and deer populations are at an all-time high in Berkshire, offering a large potential wildlife reservoir.

Badger vaccination has taken place on only one site in the county.

A single isolation of genotype 25:a was confirmed in a cat in the Newbury area. This genotype is found mainly in cattle in the northern Edge counties of Derbyshire, and Cheshire, as well as the HRA counties of Staffordshire, and Shropshire. The cat had originally come from Dorset with no obvious connections to the genotype homerange. It is important to note that whilst there was a Newbury cat cluster in 2013, this was genotype 10:u with the most likely source of infection for at least some of the cases being infected wildlife (<https://veterinaryrecord.bmj.com/content/174/13/326.2>).

Detection of incidents

In Berkshire in 2019 incidents were disclosed by routine whole herd testing (WHT), pre-movement testing (PRMT), radial testing (RAD), and six month post incident testing (6M). As shown in Figure 15, over two thirds of incidents were detected by the annual or six monthly whole herd test (WHT) depending on the herds location within the county. Post-incident six month testing (6M) disclosed 16% of incidents, suggesting a relatively small but important problem with recurrence. This is also evidenced by 42% of incidents having a history of TB within the previous three years (Figure 16). It should be noted that in the six-monthly testing area of Berkshire, it is difficult to differentiate between recurrence due to residual infection in the cattle herd and potential re-infection by wildlife, if both sources could be attributed, where the genotype is endemic to the locality. Therefore recurrent herds due to residual cattle infection and re-infection from wildlife are indistinguishable.

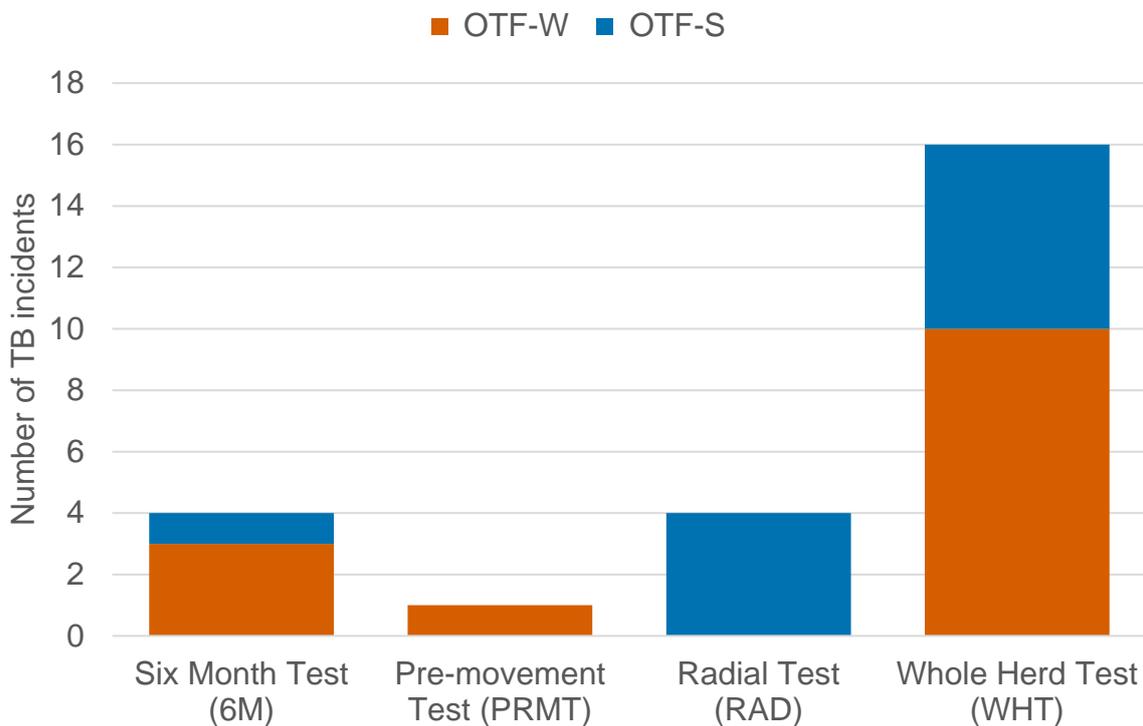


Figure 15: Number of TB incidents (OTF-W and OTF-S) in Berkshire in 2019, disclosed by different surveillance methods.

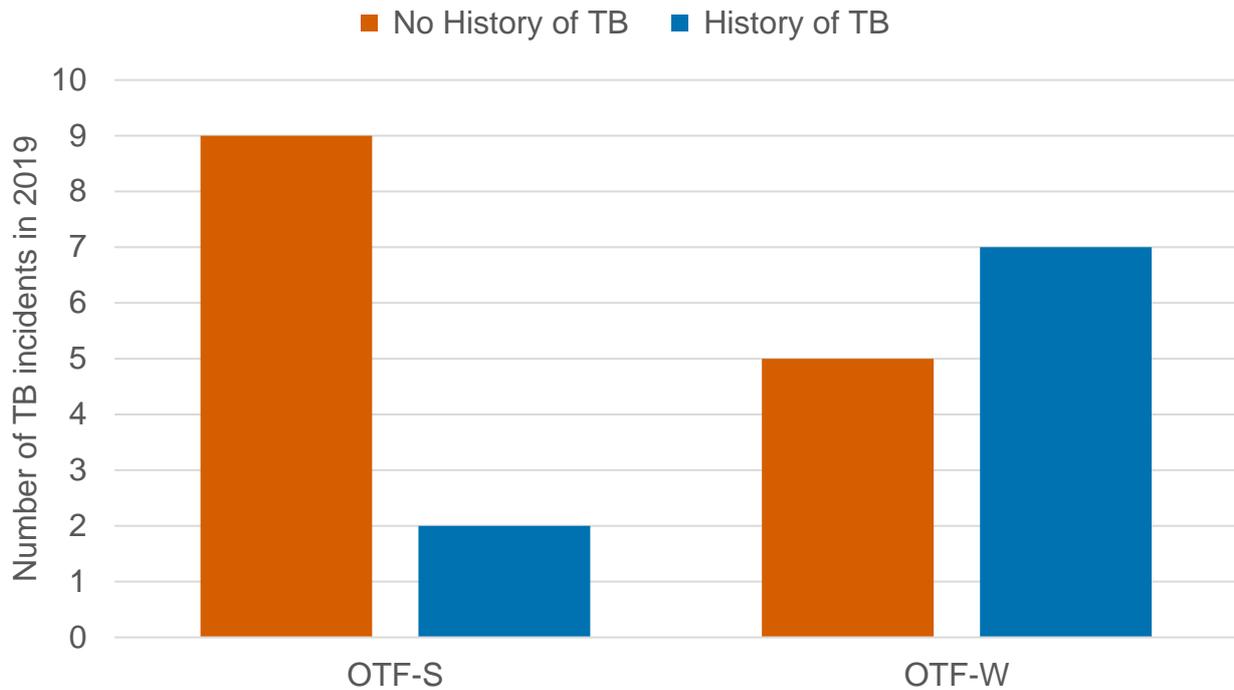


Figure 16: Number of TB incidents (OTF-W and OTF-S) in Berkshire in 2019 on holdings that have suffered an OTF-W incident in the previous three years, and holdings with no history of TB in the previous three years.

Skin test reactors and interferon gamma test positive animals removed

As shown in Figure 17, in 2019 the number of skin test reactor cattle (145) and IFN- γ test positive cattle (157) were similar to the numbers disclosed in 2018 (152 and 156, respectively). There was a peak in 2017 of 286 skin test reactor cattle and 196 IFN- γ test positive cattle.

These numbers correlate with the number of OTF-W incidents disclosed during the last three years: the higher the number of OTF-W incidents in the year the higher the number of reactors taken. There were 18 OTF-W incidents in 2017 but only 13 in 2018 and 14 in 2019. Using number of animals slaughtered for TB control as a proxy for relative costs to taxpayers, costs remained similar to 2018, but lower than 2016 and 2017

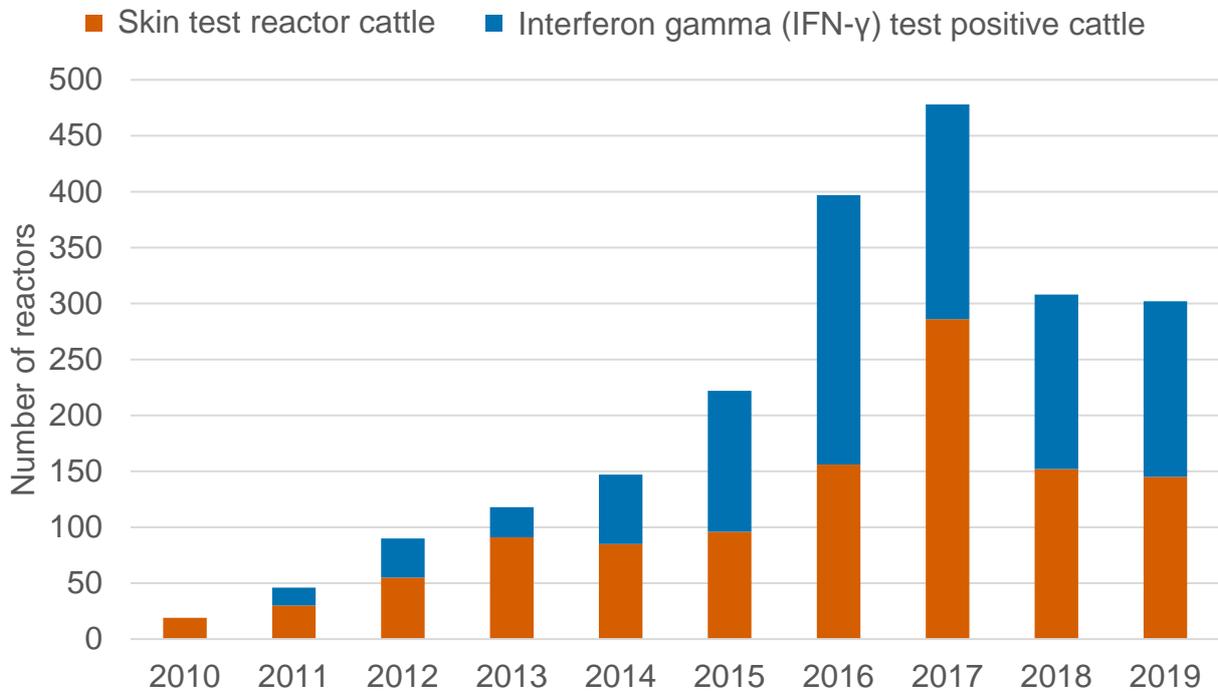


Figure 17: Number of skin test reactors and interferon gamma (IFN-γ) test positive cattle removed by APHA for TB control reasons, in Berkshire, 2010 to 2019.

Summary of risks to Berkshire

There are risks from the adjacent HRA counties, both from cattle movements (especially from Salisbury market in Wiltshire) and endemic wildlife infection from the adjacent county of Wiltshire. However, it is interesting to note that genotype 9:d, which is endemic along the Wiltshire-Berkshire border, has not been identified in cattle incidents in and around the Hungerford area as would have been expected. Hungerford is close to the border between Berkshire and Wiltshire, and has a relatively high cattle density in the surrounding land south of the M4. Berkshire's position with three of its neighbours harbouring endemic areas near the border reflects the low likelihood of the wider area achieving OTF status in the short-term.

Summary of risks from Berkshire to surrounding areas

The area of suspected endemic infection (within the 6 monthly testing) in the west of Berkshire has not advanced in 2019. It is approximately 35km from the nearest LRA county of Surrey. Its advance eastwards may be slowed by the presence of large urban conurbations (Reading, Caversham, Wokingham and Bracknell) and a commensurate reduction in cattle density.

On the eastern and south-eastern boundaries of Berkshire the M3 and M25 motorways may act as a barrier to reduce spread of disease through wildlife movement towards the LRA.

To the north, the River Thames and M4 may act as a physical barrier to slow down introduction of wildlife infection into the lower incidence county of Buckinghamshire.

There are no known business or land (temporary land association) links that could facilitate long range spread to the LRA through cattle movements. There are no markets in Berkshire but infected cattle from the county could be sold through markets in Oxfordshire, Wiltshire and Somerset to buyers in the LRA.

Assessment of effectiveness of controls and forward look

Considering the crude measure of annual number of incidents, the epidemic in Berkshire shows signs of plateauing over the last two years. At present, the endemic spread eastwards has stalled around the Reading area of central Berkshire. The fact that only one OTF-W incident was recorded in the annual testing area of the county in 2019 also indicates a change in the trend of yearly deterioration, with a slowdown of infection spread.

It is possible that the effect of six-monthly surveillance testing in the west of Berkshire is starting to play a role through the earlier detection of disease. This should lead to shorter incidents with fewer reactors by reducing the time for cattle-to-cattle spread within herds. It may also reduce the potential cyclical infection of wildlife from infected cattle in the endemic area. There is a potential that appropriate wildlife measures, either culling or vaccination, may help to reduce the burden of TB particularly in the western part of the county,

In 2019, the total number of badgers vaccinated was twenty-two. These were all in a single licensed vaccination area. No badger control areas have been licensed in Berkshire to date.

The possibility of wild deer acting as a reservoir /spreading vector cannot be ruled out. Fallow deer have been confirmed with spoligotype 10 in Berkshire.

Appendices

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

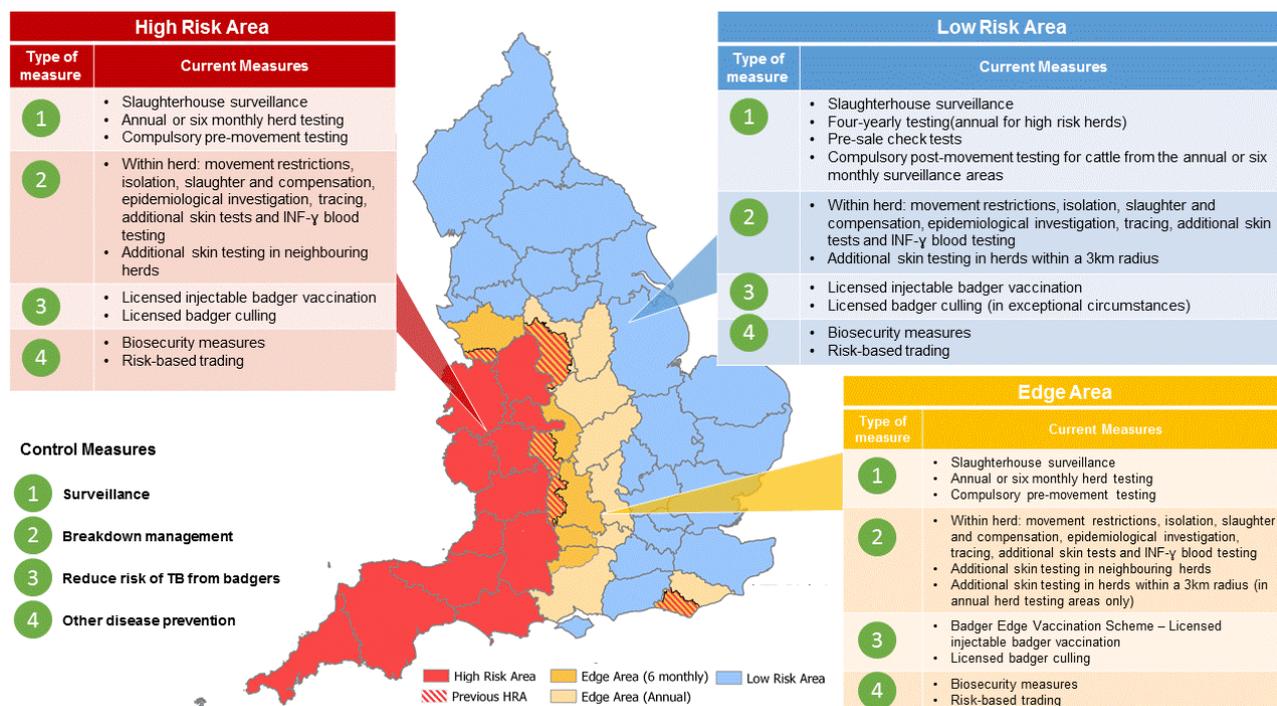


Figure A1: TB risk and surveillance areas of England effective since January 2018, as set out in the Government’s Strategy for Achieving Officially Bovine Tuberculosis Free status for England. Map based on information published on www.tbhub.co.uk.

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 Berkshire

Edge Area testing policy

- Four OTF-S incidents were disclosed at radial tests: three relating to a 2019 incident and one to a 2018 incident. In all four cases the most probable source was purchase from HRA or Edge Area rather than local spread
- Slaughter of inconclusive reactors (IRs) and direct contacts (DCs) is used as a management tool to remove infection from the herd.
- No exemptions have been applied to the deployment of the IFN- γ test in OTF-W incidents.
- There were no issues with radial surveillance testing in the single radial zone in Berkshire in 2019

Other testing measures

- Certain herds may be exempted from WHT if they meet the following criteria
 - All cattle movements off the holding (County Parish Holding (CPH)) must be to slaughter (either direct or via an approved slaughter gathering)
 - 100% annual (or more frequent) turnover of all the stock
 - No births registered in the holding
 - No breeding takes place in them
 - All cattle are permanently housed
- No testing exemptions were given for fattener herds in Berkshire in 2019
- No contiguous testing was carried out in relation to the only *M. bovis* case in non-bovines in Berkshire in 2019. This involved a domestic cat near Newbury that was not linked to infection from wildlife
- Overdue testing continued to be at a very low level and was intensively managed

Other control measures

- The TB Advisory Service (TBAS, www.tbas.org.uk/) was used by a number of Berkshire farmers
- Official Veterinarian (OV) quality assurance audits were carried out in both random and targeted manners.
- Regional meetings were held with farmers and Official Veterinarians when requested. These were co-ordinated by regional National Farmers Union (NFU) representatives
- Berkshire continues to have a local TB eradication group which met approximately quarterly in 2019.
- Liaison continued with local authorities as enforcement bodies and Public Health England as necessary.

Appendix 2: cattle industry in Berkshire

Table A2.1: Number of cattle premises by size band in Berkshire 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	4	107	31	27	11	5	7	192	99	36

*The number of herds with an undetermined size.

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

Breed purpose	Beef	Dairy	Dual purpose	Unknown	Total
Number of Cattle	13,866 (72%)	4698 (24%)	522 (2%)	1 (<0.01%)	19,087

Appendix 3: summary of headline cattle TB statistics

Table A3.1: Herd-level summary statistics for TB in cattle in Berkshire 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	233	223	220
(b) Total number of whole herd skin tests carried out at any time in the period	269	324	329
(c) Total number of OTF cattle herds having TB whole herd tests during the period for any reason	185	180	172
(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)	206	187	196
(e) Total number of cattle herds that were not under restrictions due to an ongoing TB incident at the end of the report period	213	194	199
(f) Total number of new TB incidents detected in cattle herds during the report period, (including all FUs)	24	29	25
• OTF-S	6	16	11
• OTF-W	18	13	14
(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?	4.5	5	1
• New OTF-W incidents triggered by skin test Reactors or 2xIRs at routine herd tests	11	8	10

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.) 	7	3	4
<ul style="list-style-type: none"> New OTF-W incidents first detected through routine slaughterhouse TB surveillance 	0	2	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 	0	0	4
<ul style="list-style-type: none"> OTF-W 	0	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)	18	16	14
(j) New confirmed (positive <i>M. bovis</i> culture) incidents in non-bovine species detected during the report period (indicate host species involved)	1 cat	1 deer 2 cats	1 cat
(k) Number and type of finishing units active at end of the period:			
Approved Finishing Units: Grazing	0	0	0
Approved Finishing Units: Non Grazing	2	2	2
Exempt Finishing Units: Grazing	0	0	0
Exempt Finishing Units: Non Grazing	0	0	0

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

Animal-level statistics (cattle)	2017	2018	2019
(a) Total number of cattle tested in the period (animal tests)	38,098	41,031	45,935
(b) Reactors detected in tests during the year:			
Tuberculin skin test	286	152	145
Additional IFN- γ blood test reactors (skin-test negative or IR animals)	192	156	157
(c) Reactors detected during year per incidents disclosed during year *	19.9	10.6	12.1
(d) Reactors per 1000 animal tests	12.5	7.5	6.6
(e) Additional animals slaughtered during the year for TB control reasons:			
• DCs, including any first-time IRs	15	54	27
• Private slaughters	1	1	5
(f) SLH cases (tuberculous carcasses) reported by Food Standards Agency (FSA)	0	3	5
(g) SLH cases confirmed by culture of <i>M. bovis</i> **	0	2	2

* 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 2019.

Source of infection	Possible (1)	Likely (4)	Most likely (6)	Definite (8)	Weighted contribution
Badgers	11	5	1	0	23.0%
Cattle movements	14	4	0	0	19.7%
Contiguous	1	0	0	0	0.7%
Residual infection	3	2	1	0	9.4%
Domestic animals	0	0	0	0	0.0%
Non-specific reactor	0	0	0	0	0.0%
Fomites	0	0	0	0	0.0%
Other wildlife	14	0	1	0	11.7%
Other or unknown source	0	3	1	0	35.4%

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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