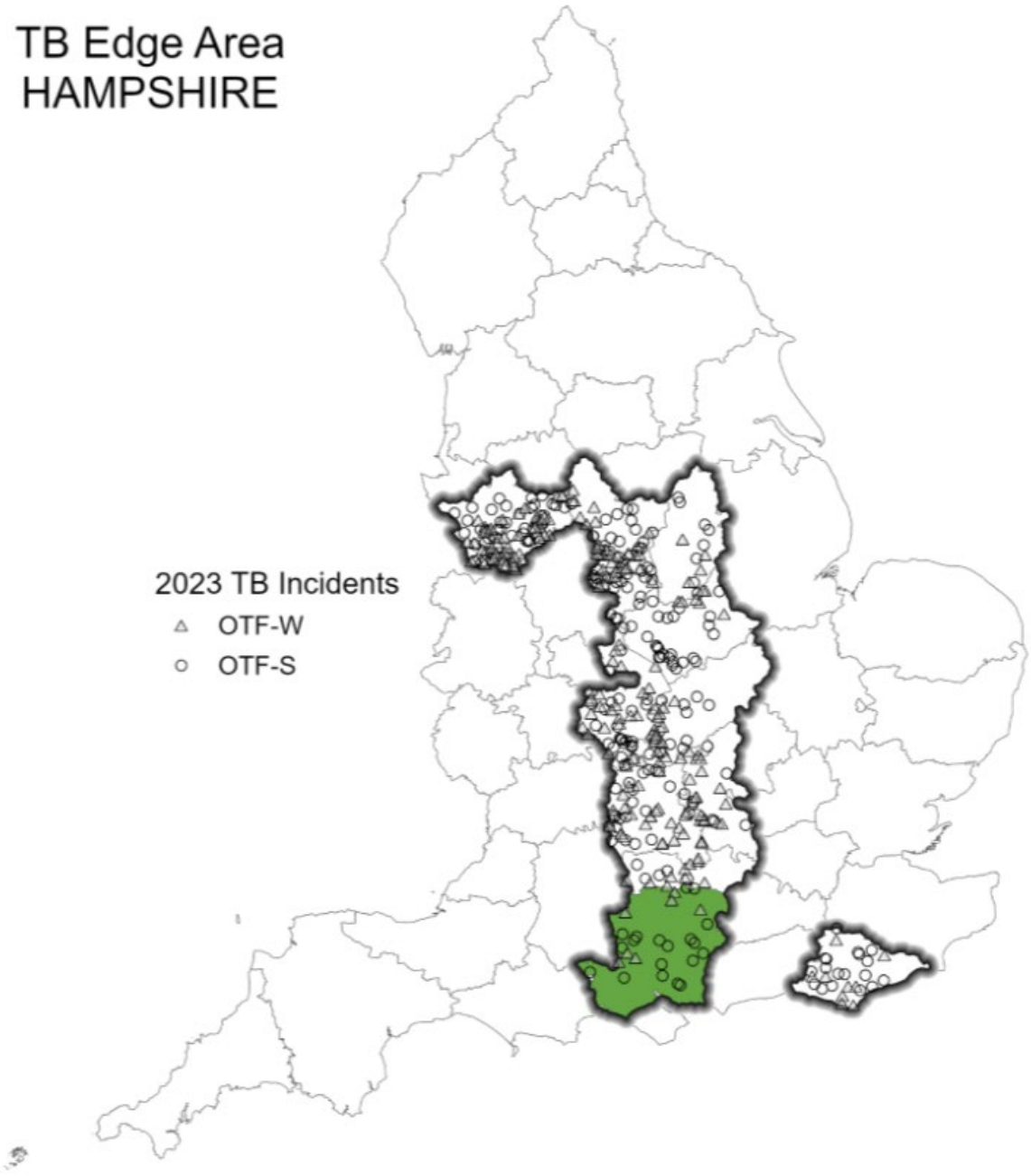
Animal &
Plant Health
Agency

Year End Descriptive Epidemiology Report: Bovine TB in the Edge Area of England 2023 County: Hampshire



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Introduction

The Edge Area was originally established in 2013, along with the Low Risk Area (LRA) and High Risk Area (HRA) of England. In 2014, the 3 bovine tuberculosis (TB) risk areas were incorporated into the UK government's 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 adjust the approaches to TB surveillance and control in each risk area accordingly. The current aim is to obtain OTF status for the Edge Area as soon as possible.

This report describes the frequency and geographical distribution of TB in cattle herds in Hampshire, an Edge Area county, in 2023. It examines what factors are likely to be driving TB in this area, and the risks the disease in this county may pose to neighbouring areas.

TB in cattle and other mammals is primarily caused by the bacterium *Mycobacterium bovis* (*M. bovis*), and the disease is subsequently referred to in this report as TB. Although other sources may refer to TB 'breakdowns', this report will use the term 'incidents' throughout.

This report is intended for those involved in the control of TB, both locally and nationally. This includes, but it is not limited to, cattle farmers, government and private veterinarians, policy makers and the scientific community.

Details of the data handling methodology used in this report, a glossary of terms, and the TB control measures adopted in the Edge Area, can be found in the explanatory supplement for the annual reports 2023.

Types of TB incidents

Unless otherwise specified, this report includes all new TB incidents detected during the reporting period (1 January to 31 December 2023). This includes both 'Officially Tuberculosis-Free Status Withdrawn' (OTF-W) and 'Officially Tuberculosis-Free Status Suspended' (OTF-S) incidents.

OTF-W incidents are those involving at least one skin test reactor, an animal positive to the Single Intradermal Comparative Cervical Tuberculin (SICCT) test, with either:

- typical lesions of TB identified at post-mortem (PM) meat inspection
- at least one animal with *M. bovis*-positive PCR test (or bacteriological culture) results in tissue samples collected from carcasses during the PM inspection

OTF-S incidents are triggered by reactors to the skin test, but without subsequent detection of TB lesions or positive polymerase chain reaction (PCR) test (or culture) results in any of those animals.

TB incidents in Approved Finishing Units (AFUs) without grazing are not included in the prevalence and incidence calculations in this report due to the limited epidemiological impact of these incidents.

Furthermore, the number of TB incidents and designation of those incidents as OTF-W or OTF-S may differ in this report compared to other official TB statistics due to differences in the information available at the time datasets are accessed.

Cattle industry

There are just over 700 cattle herds registered within the county of Hampshire, and around two thirds of those (65%) comprise of beef enterprises. The majority of herds are small with 63% of herds having fewer than 50 cattle, as shown in Appendix 1 and 2.

There are no livestock markets in Hampshire. The markets predominantly used are in the HRA: Frome in Somerset and Salisbury in Wiltshire, and there is a flow of cattle, especially for fattening, from the HRA into Hampshire. There is one medium-sized abattoir in Hampshire. There are grazing rights across the common area of the New Forest for adjacent registered holdings, which must comply with the regulations set out in the New Forest TB control plan. There was one Exempt Finishing Unit (EFU) and no AFUs in Hampshire in 2023.

The number of cattle markets in operation in 2023 is captured and maintained centrally by the Animal and Plant Health Agency (APHA) TB Customer Service Centre. Where possible, this data is then subject to further validation by APHA veterinarians subject to their best knowledge of the local area. Some small discrepancies may therefore exist where changes to markets were not captured in time for this report.

Most cattle in Hampshire undergo annual testing, bar herds in the north-west of Hampshire which undergo routine 6-monthly TB surveillance testing. However, 37% of cattle herds in this area were regarded as having a lower risk of contracting TB, and thus eligible for annual testing under the earned recognition scheme in 2023.

New TB incidents

Figure 1 shows the total number of new TB incidents in Hampshire in 2023 was 25. Between 2014 and 2018, there had been no obvious trend in the numbers of new TB incidents within Hampshire. There had been a consistent downward trend between 2018 and 2021 in the county, where new TB incidents fell from 42 to 21. However, this trend appears to have been reversing in the last 3 years, with 22 new TB incidents recorded in 2022 and 25 recorded in 2023.

The number of OTF-W incidents increased to 7 in 2023, compared to 6 in 2022. There was also an increase in the number of OTF-S incidents from 16 in 2022 to 18 in 2023.

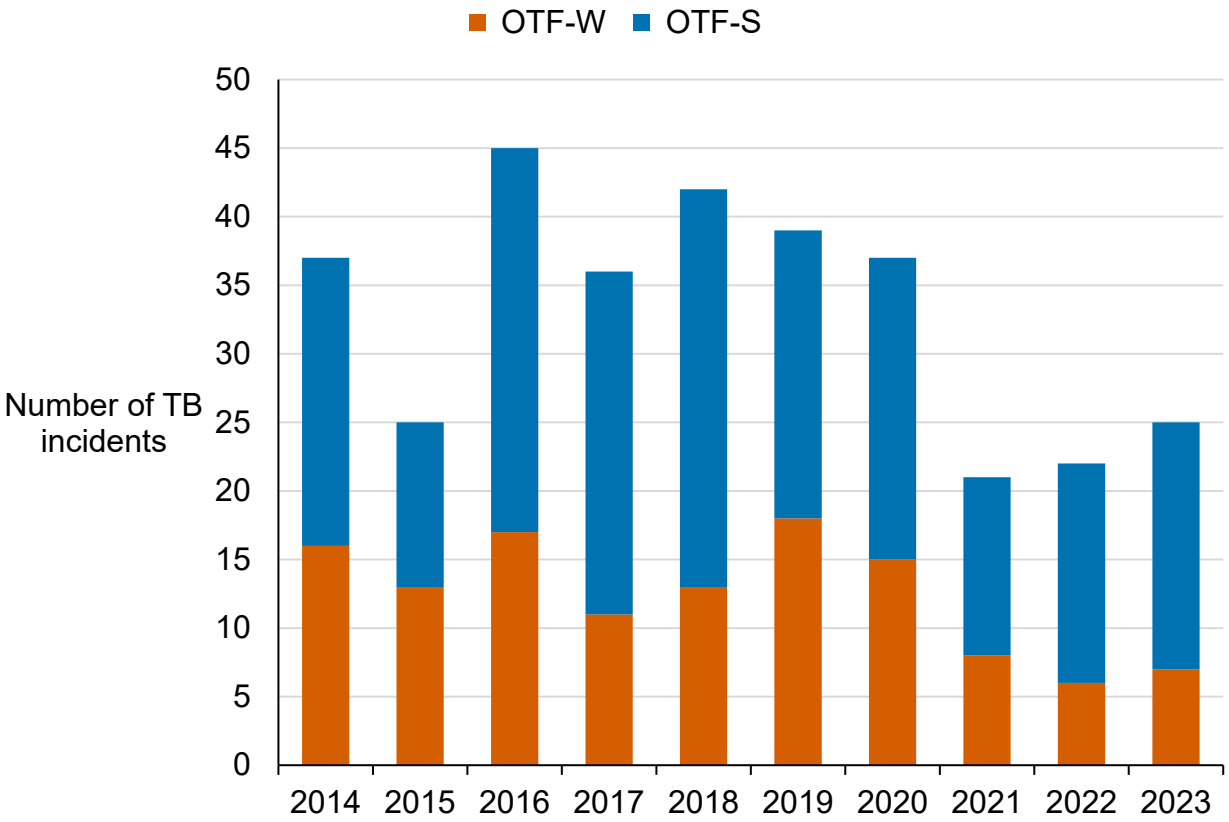

Figure 1: Annual number of new TB incidents in Hampshire, from 2014 to 2023.

Figure 1 description: Bar chart showing the number of confirmed TB incidents (OTF-W, in orange) and suspected (OTF-S, in blue) in the whole of Hampshire between 2014 and 2023. In 2023, there were 25 TB incidents in the whole county, 7 OTF-W and 18 OTF-S.

Disclosing test types

As in previous years, whole herd testing continued to detect the most incidents of TB in Hampshire in 2023 (14). This was followed by 6-monthly post-incident testing which detected 6 new incidents, as shown in Figure 2. Slaughterhouse (SLH) surveillance detected 3 new incidents and finally 12-month post-incident testing and pre-movement testing detected one incident each. This was the lowest number of incidents detected by pre-movement testing since 2015, as previously pre-movement testing was detecting between 3 to 5 incidents per year.

There were no incidents detected by radial testing in the annual TB testing area of Hampshire for the whole of 2023. This was due to emergency measures issued in December 2022 following the highly pathogenic avian influenza outbreak in 2022 to 2023. During that period, all radial testing was temporarily replaced with check testing of herds immediately contiguous to a holding affected by an OTF-W incident.

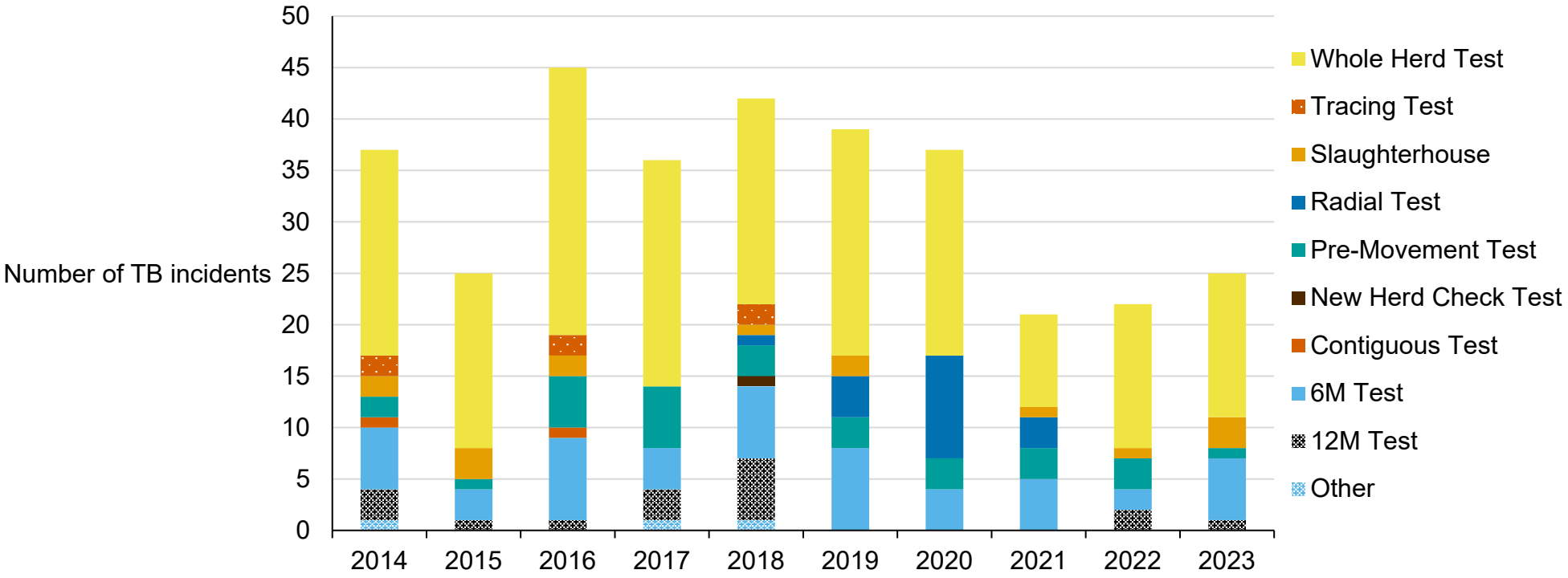

Figure 2: Number of new TB incidents (OTF-W and OTF-S) in Hampshire in 2023, according to the surveillance methods that detected them.

Figure 2 description: A bar chart showing the number of new TB incidents disclosed by test type in Hampshire between 2014 and 2023. Test types are grouped by colour in the chart and stacked. As in previous years, most incidents were disclosed by whole herd tests (14) in 2023 – a further breakdown by test type is detailed in the text.

Duration of TB incidents

A total of 23 TB incidents were resolved in Hampshire during 2023. Of these, 11 were new TB incidents that started in 2023 and 12 started in 2022.

The median duration for OTF-W incidents that ended in 2023 was 294 days, interquartile range (IQR) 203 to 337. Two OTF-W incidents took between 151 and 240 days to resolve, but the majority (5 out of 7) ended within 241 and 550 days.

Most OTF-S incidents that ended in 2023 (12 out of 16) were resolved within 240 days, and 4 were resolved within 550 days. The median duration was 181.5 days (IQR 167.5 to 246.5).

There was one OTF-S TB incident still open at the end of 2023 that had been open for more than 550 days.

The median duration for all incidents that ended in 2023 was 203 days (IQR 174 to 310). This is longer than the duration of incidents that ended in 2022; 185 days (IQR 167 to 348). For the whole Edge Area, the median duration of TB incidents that ended in 2023 was 188 days (IQR 159 to 265).

There were 14 incidents still open at the end of the reporting year on 31 December 2023, including the persistent OTF-S incident mentioned above.

Unusual TB incidents

An OTF-W incident on a large beef fattening and rearing unit in 2023 had high numbers of reactors (62). This will likely correlate to this herd being one of the largest holdings within the county (around 850 animals in the herd). This incident lasted 11 months and was resolved with SICCT testing and interferon gamma (IFN-γ) blood testing. The most likely source of infection in this incident would be undetected infected cattle purchased from the HRA.

TB in other species

There is no statutory routine TB surveillance of non-bovine species, apart from Post-Mortem Examination (PME) of animals slaughtered for human consumption, or carcasses submitted to veterinary laboratories for diagnostic investigation. Targeted TB testing takes place in non-bovine herds under TB movement restrictions due to laboratory-confirmed incidents of *M. bovis* infection, and in specific herds of camelids, goats and captive deer at an elevated risk of infection.

In Hampshire, there were no new TB incidents reported in domestic non-bovines in 2023.

There were two incidents of TB reported in wild deer in Hampshire in 2023. Both cultured *M. bovis* isolates that were identified as Whole Genome Sequence (WGS) clade B6-62, which is the same clade found in the majority of OTF-W incidents in Hampshire during 2023. Both deer were found in the north-west 6-monthly testing area of the county (See Figure 7).

The identification of a similar clade highlights the role deer and wildlife other than badgers play in the transmission of bovine TB, and the need for greater knowledge in this area. Suspect TB lesions in wildlife carcasses, especially deer, should continue to be reported by members of the public to APHA to help provide more information on the transmission dynamics of *M. bovis* between cattle and wildlife.

APHA, in collaboration with the University of Nottingham, conducted a project to detect the presence and location of TB infection in badgers in Buckinghamshire, Oxfordshire, Berkshire, Hampshire and East Sussex, collectively known as the 'Southern Edge Area'. Volunteers were recruited in each county to help with the safe and timely retrieval of badger carcasses. They were delivered to the University of Nottingham, where they underwent post-mortem examination and testing for the presence of TB infection by culture. Those that tested positive were sent for further WGS and clade identification (genetic strain). The project aimed to collect 100 carcasses of badgers found dead per county, most likely those killed in road traffic accidents (RTAs). Once 100 carcasses of a sufficient quality were examined per county, collection ceased in that county. Once county targets were achieved, all stakeholders were informed. The survey ended in April 2023 and the results will be communicated to all stakeholders once all the bacteriological cultures and WGS analysis have been completed. The results will help develop a picture of the disease situation in the Southern Edge Area.

Incidence of TB

In 2023, the annual incidence rate (3.8 incidents per 100 herd-years at risk) was slightly higher than in 2022 (3.4) and 2021 (3.3), as shown in Figure 3. The increase since 2021 followed 2 consecutive years of reducing incidence, from a high of 5.6 in 2019.

Hampshire had the second lowest incidence rate of TB out of the 11 Edge Area counties in 2023 and remained below the incidence rate of the Edge Area overall as displayed in Figure 3.

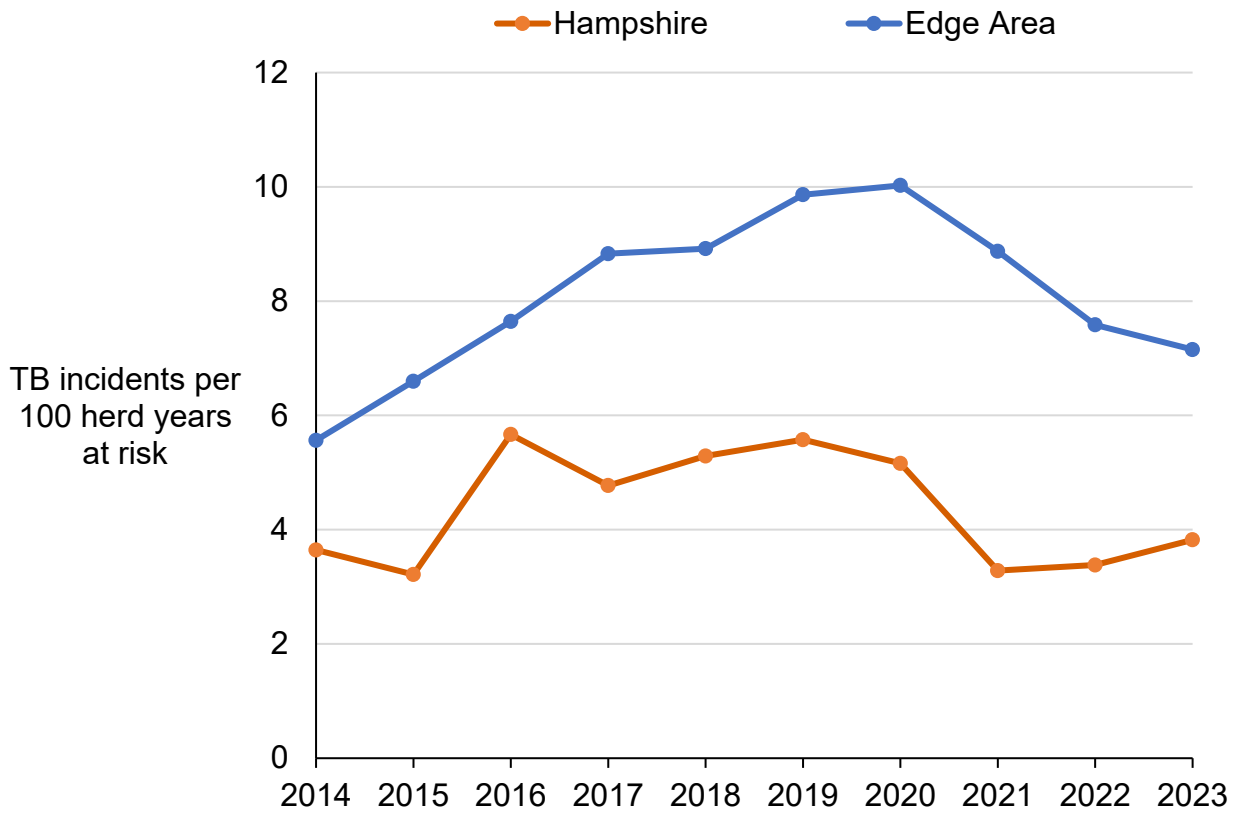

Figure 3: Annual incidence rate (per 100 herd-years at risk) for all new incidents (OTF-W and OTF-S) in Hampshire, from 2014 to 2023.

Figure 3 description: Line chart showing the incidence rate of new TB incidents per 100 herd years at risk (100 HYR) in Hampshire (orange) and the overall Edge Area (blue) between 2014 and 2023. Incidence in Hampshire has remained under the incidence of the overall Edge Area throughout the last decade. Incidence had been falling between 2020 and 2021, however has been increasing slightly since 2022. Further detail is explained in the text.

Prevalence of TB

Figure 4 shows the herd prevalence of TB in Hampshire at the end of 2023 (1.8%) which was a slight increase compared to 2022 (1.6%). It is similar to the reported annual prevalence back in 2014 for the county (1.8%), which had been on a steady increase reaching a high of 3.0% of herds under TB restrictions in 2020 before dropping to a low of 1.5% in 2021. Since 2021, there has been a steady increase in both incidence and prevalence in Hampshire.

Hampshire had the second lowest end of year prevalence out of the 11 counties in the Edge Area. This was lower than the overall rate for the whole of the Edge Area in 2023 (3.7%).

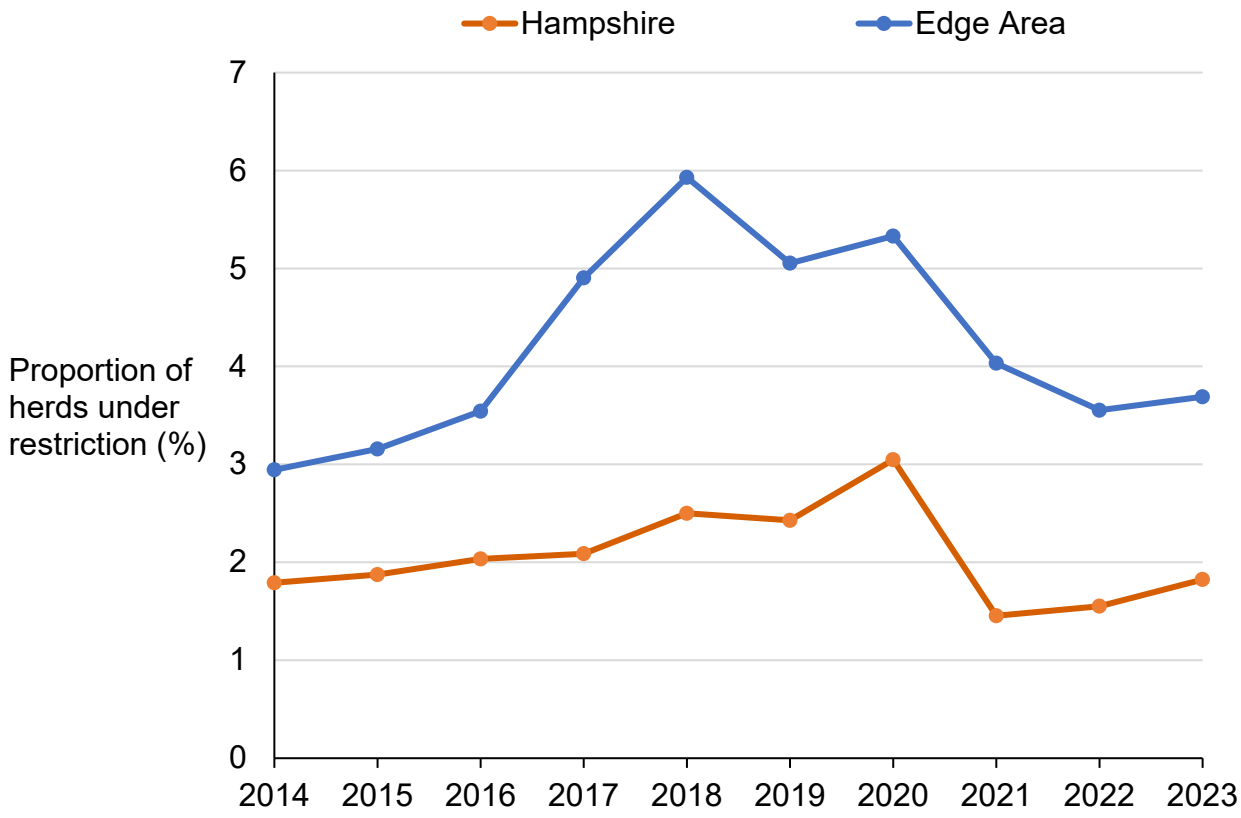

Figure 4: Annual end of year prevalence in Hampshire, from 2014 to 2023.

Figure 4 description: Line chart showing the annual end of year prevalence in Hampshire county (orange) and within the overall Edge Area (blue), between 2014 and 2023. Prevalence in Hampshire has remained under the prevalence rate of the Edge Area overall for the last decade, however prevalence had been showing a slight increasing trend until 2021, when prevalence halved from 3.0% to 1.45%. Prevalence has increased since, rising back to levels seen in 2014 (1.8%).

Recurring TB incidents

Three-year recurrence

In Hampshire, 9 of the 25 (36%) herds with a new TB incident in 2023 had a history of TB (experienced another incident in the past 3 years), as seen in Figure 5. There was also a higher proportion of OTF-S herds which had a history of TB in the previous 3 years compared to OTF-W herds (39% and 29% respectively).

The recurrence rate for Hampshire of 36% is lower than the Edge Area overall (55%). This is also the lowest recurrence rate in the Edge Area, and lower than neighbouring counties Berkshire (69%), Buckinghamshire (47%) and Oxfordshire (52%).

Recurrence is likely to be low due to herds being located in an area where wildlife infection is not prevalent. There is little evidence to support wildlife involvement in the persistence of infection. In Hampshire, the high level of introduction of disease through high risk purchases of cattle (HRA and other edge counties) is considered the main risk factor.

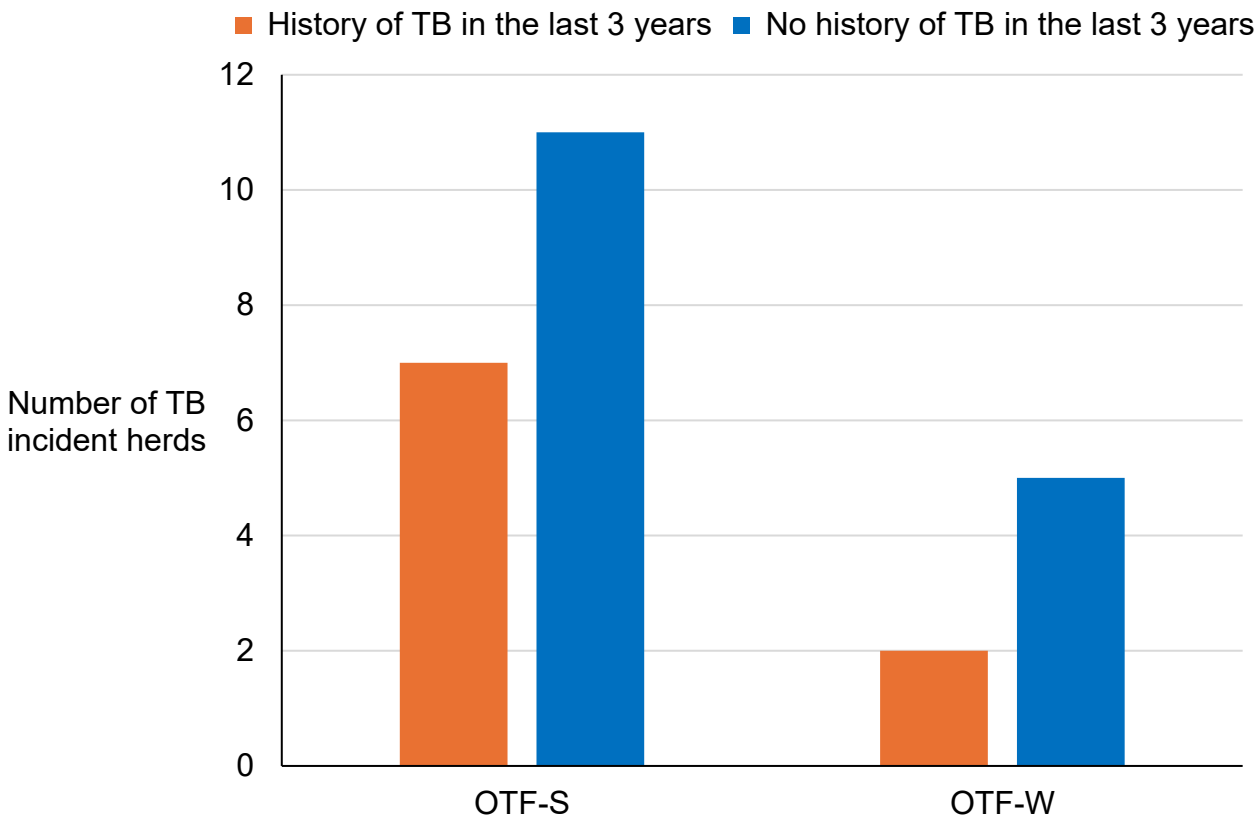

Figure 5: Number of herds with a TB incident (by OTF-W and OTF-S) in Hampshire in 2023, with and without a history of any TB incident in the previous three years.

Figure 5 description: Bar chart showing the number of herds with (in orange) and without (in blue) a history of a TB incident in the last 3 years in 2023, for OTF-S and OTF-W herds. A description of the data is provided in the text.

Overall recurrence

In 2023, 72% of incidents reported on across the region were in herds with a history of TB during the herd's lifetime, including more than 3 years previously (12 out of 18 OTF-S and 6 out of 7 OTF-W), as shown in Figure 6. The one OTF-W incident without any previous history of TB was a new herd that was registered in March 2022 and therefore not reflected in figures prior to this date.

Overall recurrence of TB increased compared to 2022 (55%, 10 out of 16 OTF-S and 2 out of 6 OTF-W). This may have been due to a change in the eligibility of herds for IFN-γ testing from April 2021, resulting in fewer IFN-γ tests being conducted in the 6-monthly

testing areas of the Edge Area (north-west Hampshire within this county). Indeed, the total number of IFN-γ reactors disclosed in 2021 was 101, compared to 21 and 44 in the 2 subsequent years (2022 and 2023). In comparison, the number of SLH cases in Hampshire has risen from one in 2021, 2 in 2022 and up to 7 in 2023. This trend likely reflects a lower detection of early disease within herds leading to the small increase in overall recurrence caused by resultant residual undetected infection.

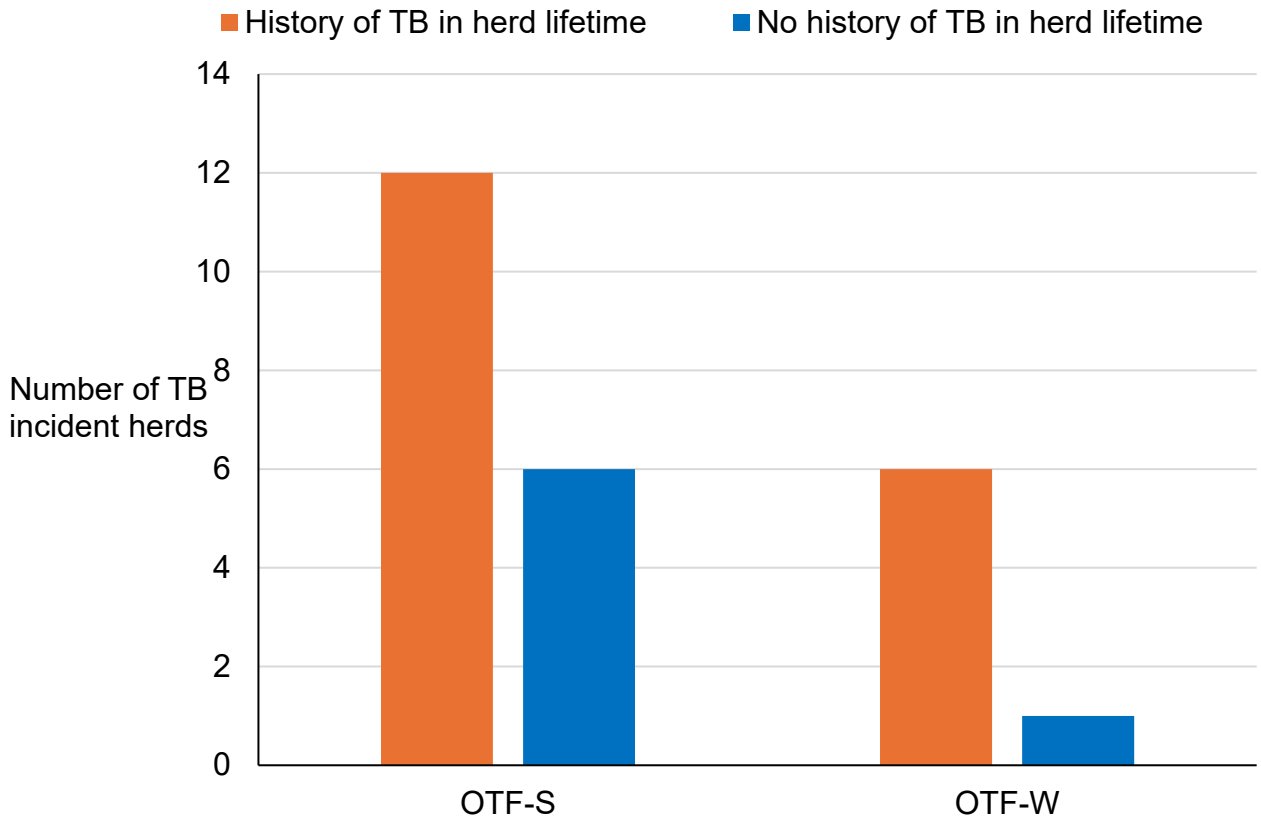

Figure 6: Number of herds with a TB incident (by OTF-W and OTF-S) in Hampshire in 2023, with and without a history of any TB incident during the herd's lifetime.

Figure 6 description: Bar chart showing the number of herds with (in orange) and without (in blue) a history of a TB incident during the herd's lifetime in 2023, for OTF-S and OTF-W herds. A description of the data is provided in the text.

Geographical distribution of TB incidents

Figure 7 shows that most of the new and ongoing OTF-W TB incidents were located in the west part of Hampshire and within the 6-monthly surveillance testing area in the north-west of the county. OTF-S incidents were more widely spread across the county, within both the 6-monthly testing area and more centrally radiating towards the south. This is similar to the distribution seen in 2022 for both OTF-W and OTF-S.

Most OTF-W incidents were caused by *M. bovis* WGS clade B6-62. This clade has a homerange including the northwest and east Hampshire along with the neighbouring counties of Wiltshire and West Berkshire. This homerange clade extends up the central region of the UK Edge Area and HRA.

WGS clade B4-11 was disclosed in 2 OTF-W incidents, one to the east of the 6-monthly testing area in the north-west and one in the west of the county. This clade has a homerange in the south-west of England, covering parts of Wiltshire, Avon, Somerset and Devon. One of these incidents (to the east of the 6-monthly testing area in the north-west of Hampshire) was unusual due to the affected herd being ended. The premises has one previous incident of TB infection (OTF-S) in 2009. The closest genetically related incidents, within one to 3 Single Nucleotide Polymorphisms (SNPs) were in Avon, Somerset and Worcestershire. It is, therefore, difficult to conclude the relationship between them.

The WGS clade was undetermined for 2 OTF-W incidents.

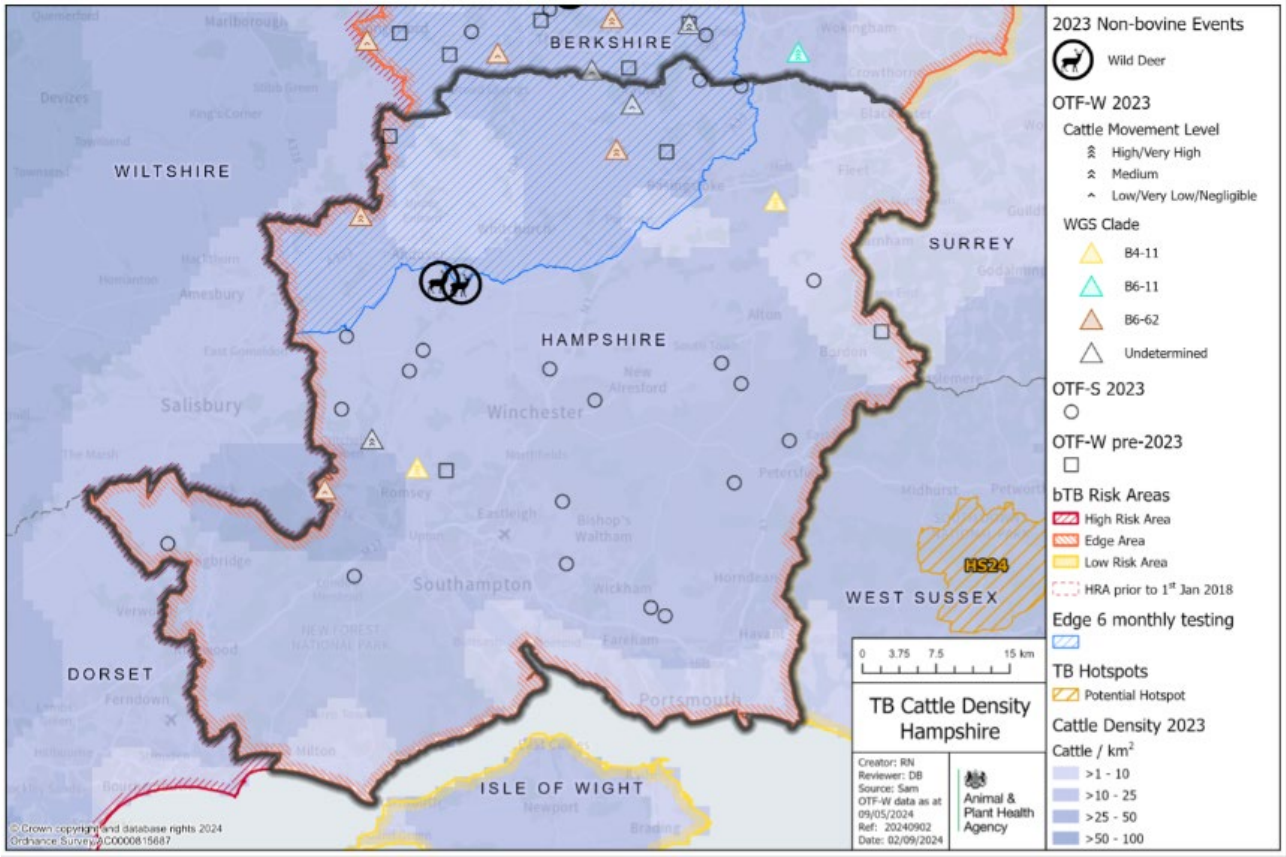

Figure 7: Location of cattle holdings in Hampshire with new TB incidents (OTF-W and OTF-S) in 2023 and cattle holdings with pre-2023 OTF-W incidents still ongoing at the beginning of 2023, overlaid on a cattle density map. The movement score for each farm is symbolised with 3 chevrons for cattle movements associated with a high likelihood of infection, 2 chevrons for a medium likelihood and one chevron for a low likelihood.

Figure 7 description: Map of the Hampshire county showing the locations of cattle holdings in Hampshire with new TB incidents (OTF-S and OTF-W) in 2023 and pre-2023 OTF-W incidents on the map. 2023 OTF-W incidents are shown as triangles, 2023 OTF-S as circles and pre-2023 OTF-W as squares. The 2023 OTF-W incidents are also coloured by WGS clade and contain chevrons to show the cattle movement algorithm score allocated to the incident (low, medium or high risk of cattle movements). Most incidents are in the centre of the county – more detail provided in the text.

Skin test reactors and interferon gamma test positive animals removed

In 2023, there was a total of 162 test positive animals in Hampshire, as shown in Figure 8. This was an increase compared to 2022 where there were 140 test positive animals removed from herds in Hampshire, the lowest since 2014. Of the test positive animals in 2023, 118 (73%) were skin test reactors, compared to 85% in 2022. 44 (27%) of animals removed in 2023 were IFN-γ test positive, compared to 15% in 2022.

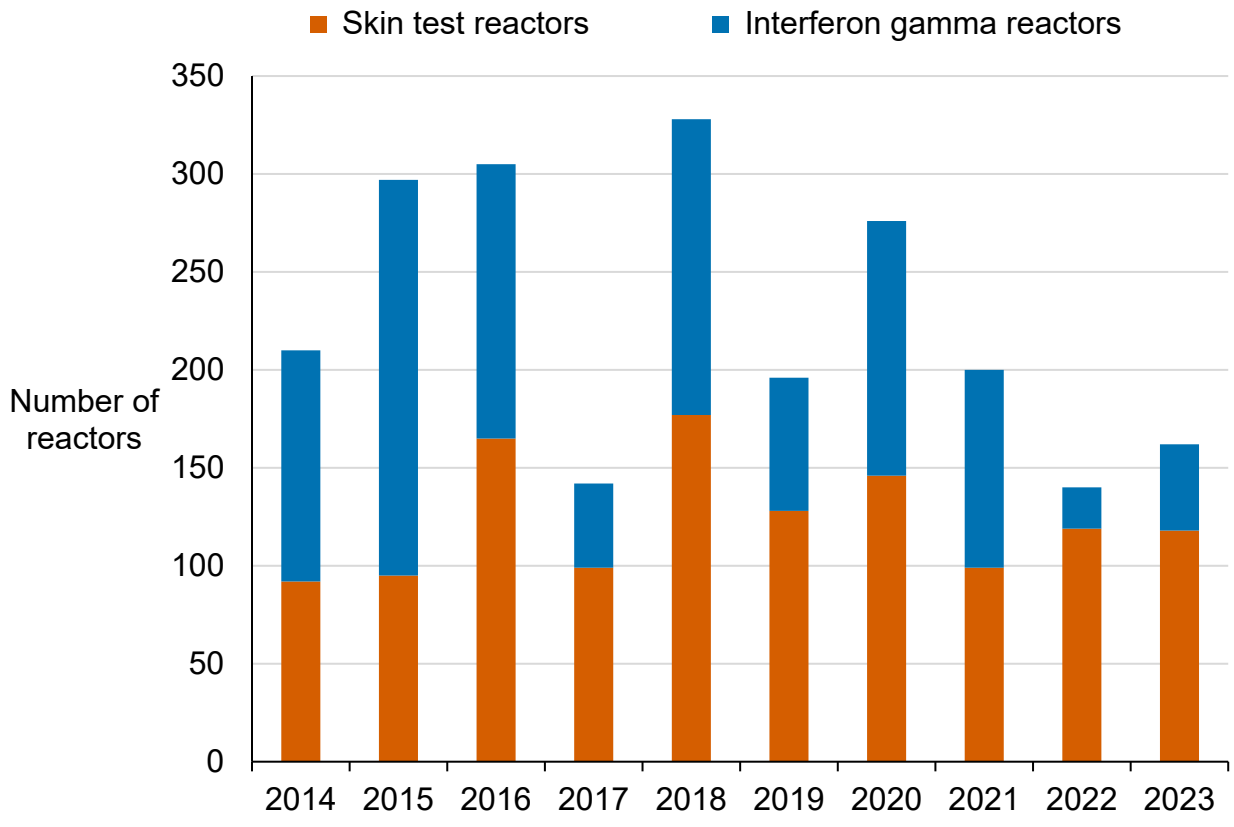

Figure 8: Number of skin test reactors and IFN-γ test positive cattle removed by APHA for TB control reasons in Hampshire, from 2014 to 2023.

Figure 8 description: Bar chart showing the number of skin test reactors IFN-γ test reactors removed for TB control reasons in Hampshire between 2014 and 2023. In 2023, 118 skin test reactor cattle and 44 IFN-γ reactors were removed in Hampshire – this is 22 more

than in 2022, due to 21 more IFN-γ reactors in 2023 compared to 2022, and similar numbers of skin test reactors.

Main risk pathways and key drivers for TB infection

It is important to try to understand the risk pathways and key drivers that are likely to have introduced TB infection into a herd. This information can help identify biosecurity measures that may reduce the TB risk for individual businesses.

Implementing practical measures can help to reduce the risk of TB incursion into a herd that is TB free (biosecurity), as well slowing disease spread within a herd where TB is present (biocontainment).

Furthermore, the ibTB online mapping tool can be used to inform purchasing choices, reducing the risk of introducing undetected infection when moving cattle into a herd.

In 2023, 8 out of 25 (32%) new TB incidents in Hampshire received a preliminary or final APHA veterinary investigation to identify the source of infection. Not all investigations were carried out in 2023. This was due to the continued impact and diversion of field resources as part of the 2022 to 2023 highly pathogenic avian influenza outbreak, which continued into spring 2023, in addition to the Bluetongue Virus outbreak from summer 2023 onwards.

The findings from this investigation are reported in Appendix 3.

New data-driven methods to quantify the likelihood of risk pathways for TB infected herds have been developed by APHA. These include the:

- cattle movement algorithm
- WGS local transmission of infection indicator

The cattle movement algorithm uses cattle movement data to identify individual animals that were moved into a TB incident herd as having a negligible, very low, low, medium, high or very high likelihood of being the source of the TB infection. At the herd level, the cattle movement score is dictated by the animal with the highest ranked movement into that herd. Herds are classified as having either:

- cattle movements associated with a high likelihood of infection (a herd with any movements scored as a high or very high likelihood)
- no cattle movements with a high likelihood of infection (the highest likelihood score was negligible, very low, low or medium)

The WGS local transmission of infection indicator uses WGS data from cattle *M. bovis* isolates to identify TB incidents that are linked by genetics, time and space. A TB incident where at least one other TB incident is identified that satisfies all the following 3 criteria is considered to have evidence of a local transmission event:

- it has a WGS with no more than three SNP differences relative to the TB incident of interest
- it is within 4 years before or 6 months after the start date of the incident of interest
- it is within a 9km radius of the incident of interest

Further details about the methodology used can be found in the explanatory supplement to the annual reports 2023.

There is always a degree of uncertainty about the estimated true routes of TB infection into a herd. The absence of a local transmission event, or cattle movements associated with a high likelihood of infection does not completely negate these pathways. Nonetheless, the evidence provided by the cattle movement and WGS data, when combined, can provide valuable insights into the possible risk pathways. Figure 9 provides the percentage of herds where each risk pathway combination was identified. The spatial distribution of these categories is presented in Figure 10. Each category is described in greater detail in the following text.

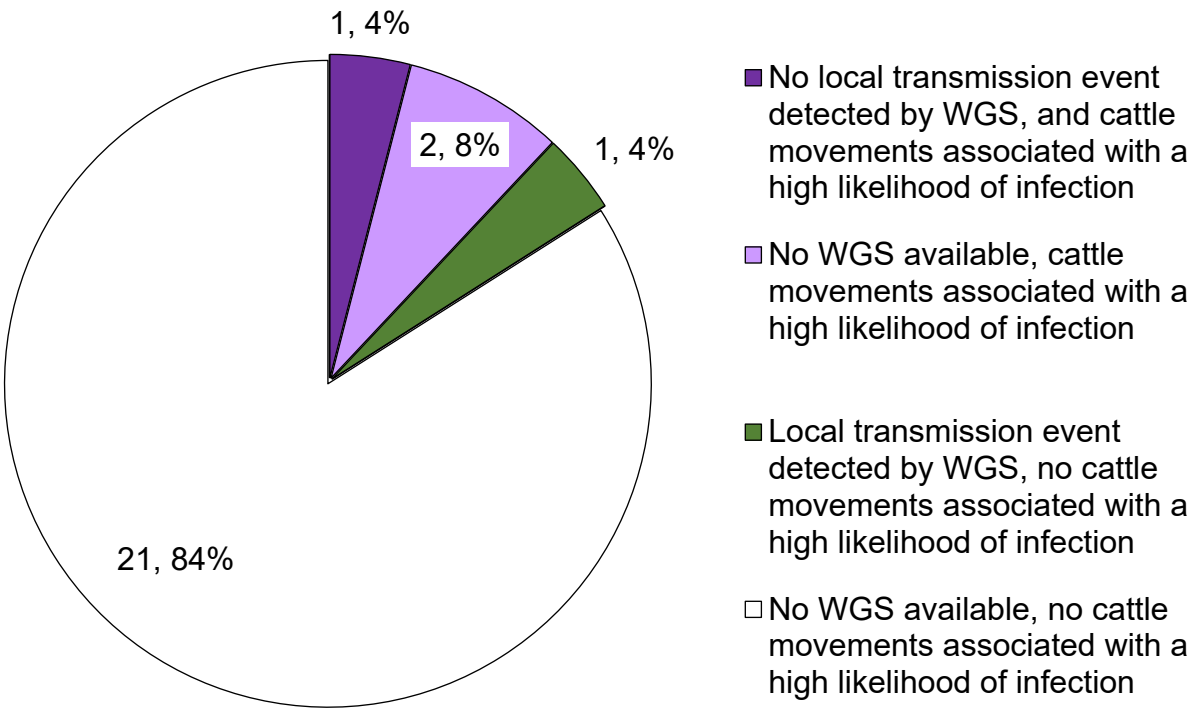

Figure 9: Risk pathway combinations identified by the WGS local transmission of infection indicator and cattle movement algorithm for all 25 new TB incidents starting in Hampshire in 2023.

Figure 9 description: Pie chart showing the risk pathway combinations identified by the WGS local transmission of infection indicator and cattle movement algorithm for all 25 new TB incidents in Hampshire in 2023. Most (21, 84%) did not have any WGS and no cattle movements were identified with a high likelihood of infection. Further description provided in the text.

WGS data with a suitable quality to analyse for a local transmission event was available for 2 (8%) of all new TB incidents in Hampshire. The WGS local transmission of infection indicator identified a local transmission event for one (4%) new TB incident in 2023 without strong evidence of cattle movements. These are dark green symbols in Figure 10.

For these incidents, a broad spectrum of local pathways cannot be ruled out, including:

- residual infection in the herd
- contiguous contact with infected cattle
- direct or indirect contact with potentially infected wildlife

In Hampshire, 2 TB incidents (8%) had evidence of cattle movements associated with a high or very high likelihood of TB infection, but no WGS evidence was available to assess local transmission events. For those herds it was considered likely that cattle movements played a part in the introduction of infection, however the presence of a local transmission event has not been assessed (purple symbols, Figure 10).

There was no strong evidence of cattle movements and no WGS available to explore the presence of a local transmission event for 21 of the 25 (84%) TB incidents. These are shown as white dots in Figure 10, as there is insufficient evidence to determine a likely infection pathway.

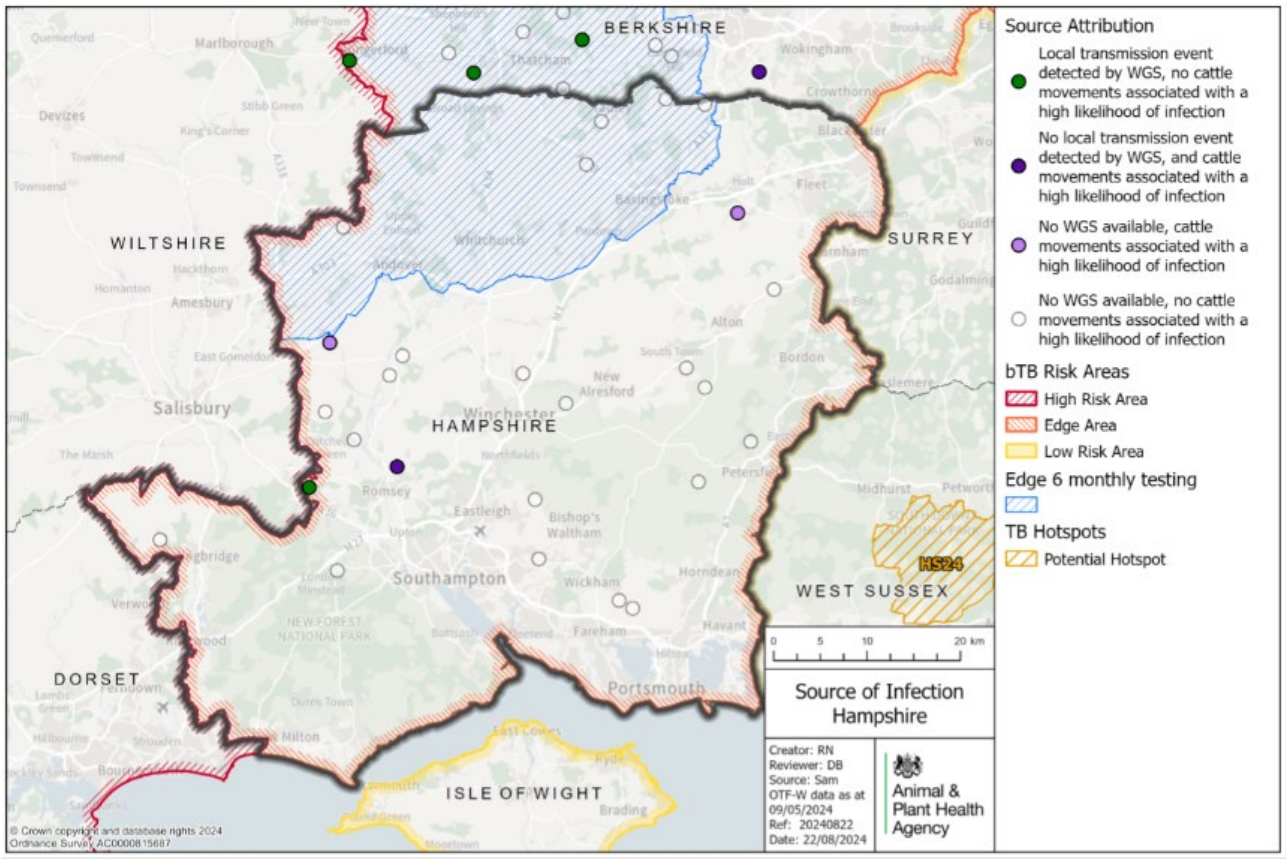

Figure 10: Map of the available evidence for risk pathways of TB infection into the herd, for all TB incidents (OTF-W and OTF-S) in Hampshire that started in 2023.

Figure 10 description: Map of the Hampshire county showing the locations of the 25 new TB incidents in Hampshire, coloured by the risk pathway identified for the incident. Dark green are herds with a local transmission event was identified from WGS and no cattle movements with a high likelihood of infection were identified in the herd. Light green represents incidents where local transmission event was identified from WGS and cattle movements with a high likelihood of infection were identified in the herd. Dark purple represents incidents where no local transmission event was identified from WGS and there were cattle movements identified with a high likelihood of infection in the herd. Light purple represents incidents with no WGS available and where there were cattle movements identified with a high likelihood of infection in the herd. Grey shows incidents where no local transmission event was identified from WGS and there were no cattle movements with a high likelihood of infection were identified in the herd either. White shows incidents with no WGS available and where there were no cattle movements with a high likelihood of infection were identified in the herd either. A breakdown of the incidents by group is provided in the text.

Genotyping was replaced with WGS of *M. bovis* isolates at APHA in 2021.

For the two OTF-W incidents which had WGS data available in Hampshire in 2023, infection was caused by WGS clade B6-62 of *M. bovis* (see Figure 11). WGS clade B6-62

encompasses the previously designated spoligotype 10, as well as other closely related spoligotypes.

This clade has historically also been detected in these areas and is the most common cause of incidents in the county. The levels of genetic relatedness could suggest a common source of infection within the local wildlife, however, as local movements occur frequently within the county, the possibility of cattle moving with undetected infection, along with other risks such as the presence of residual infection within herds that have suffered previous incidents, are both also plausible risk pathways for these new incidents.

The more widespread nature of OTF-S incidents will need to be continually monitored, especially at the Dorset border because of a number of OTF-S incidents in this area in previous years, to assess for any across-border spread of new clades in the future.

Figure 11 shows that new incidents in 2023 occurred in areas where TB was previously detected.

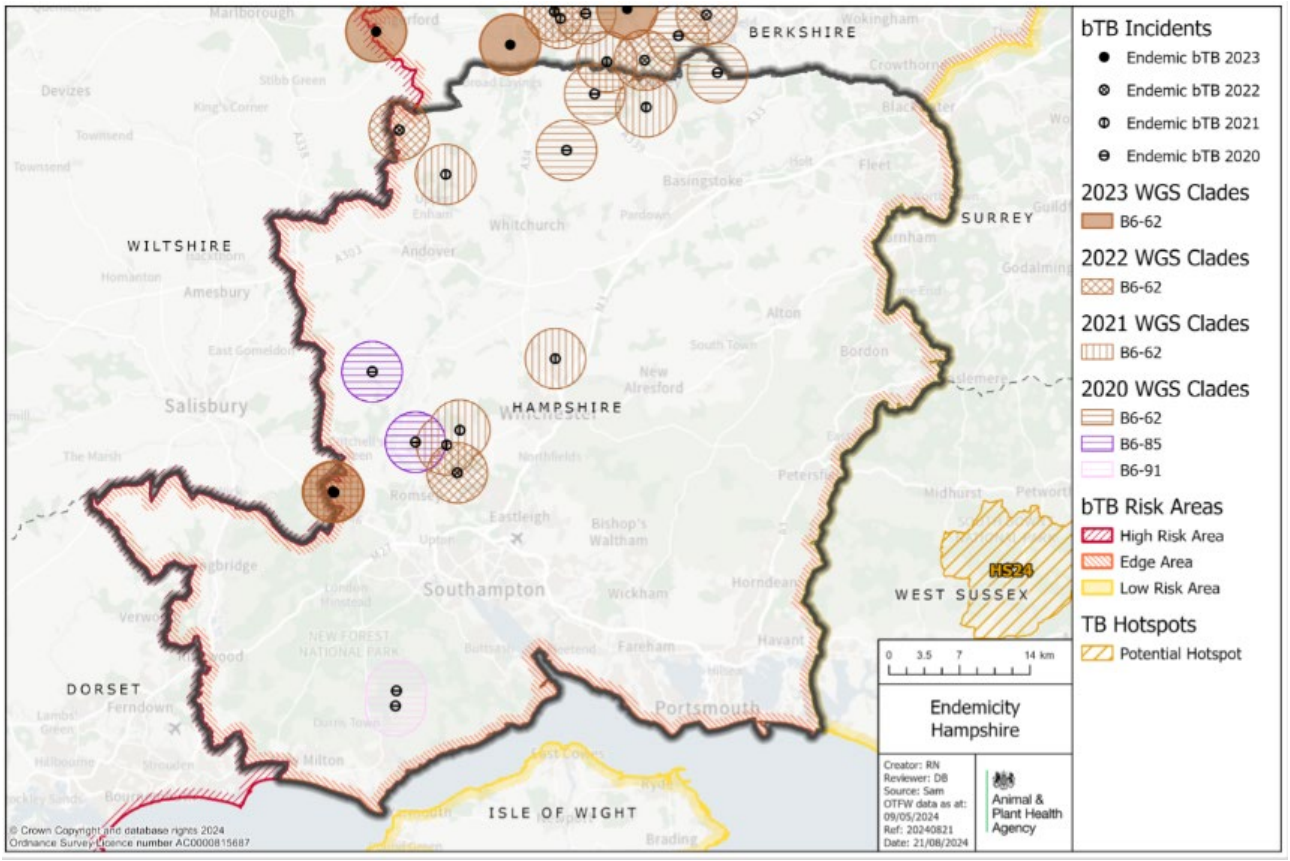

Figure 11: WGS clades of *M. bovis* detected in Hampshire between 2020 and 2023, where the WGS identified in the infected herd was within 3 SNPs of another TB incident in the past 4 years and 9km (OTF-W incidents only).

Figure 11 description: Map of Hampshire showing the WGS clades of *M. bovis* detected in Hampshire between 2020 and 2023, where the *M. bovis* clade identified in the infected herd was within 3 SNPs of another OTF-W incident in the past 4 years and within 9km of

it. Clades are shown as circles on the map with each clade represented by a different colour. The year from which the clade was identified is shown by either having the colour be solid (2023) or different types of hash (2022 to 2020). All incidents show in the southern and eastern parts of Hampshire. Further detail is provided in the text.

Forward look

The number of new TB incidents has slightly increased in 2023. OTF-W incidents have increased from 6 in 2022 to 7 in 2023 and OTF-S incidents from 16 in 2022 to 18 in 2023.

There is growing evidence to support a local transmission event in Hampshire. *M. bovis* WGS clade B6-62 has been isolated over several years in cattle incidents and infected wildlife in this area, and there are a number of isolates that show very close genetic relatedness between cattle and wildlife isolates. However, the role this local transmission event plays in maintaining infection within herds, resulting in the high rates of residual infection and overall recurrence seen in Hampshire, is unclear.

The 6-monthly testing area in the northwest of the county will continue to detect infection earlier through regular testing, which will help reduce the spread of infection both within and to other herds through movements and to wildlife.

From 1 August 2023, mandatory post-movement skin testing of bovines was introduced for cattle entering a herd in the annual surveillance testing parts of the Edge Area (all but the north-west of Hampshire) from a holding in the HRA or 6-monthly surveillance testing parts of the Edge Area. This will also further improve early detection of undisclosed disease.

Measures that would help address the most common risk pathways for TB infection in Hampshire have been highlighted in previous reports, however they remain important in 2023 if both incidence and prevalence are to return to a more consistent downward trend. These include:

- incentivising the uptake of effective biosecurity measures
- managing the TB risks posed by cattle movements to reduce the risk of spread of TB within and between farms: promote better informed purchasing of cattle
- continuation and further adoption of control measures to prevent the spread of TB between cattle and wildlife, including on-farm biosecurity, badger culling or vaccination, and local control of the population of wild deer, where appropriate

It also includes the continuation of additional measures taken during, both, OTF-W and OTF-S TB incidents to prevent residual cattle infection in herds after the end of incidents, such as:

- increasing sensitivity by using severe interpretation for the SICCT on incident herds
- gamma testing OTF-W herds

- de-coupling gamma and skin testing in OTF-W herds to help identify gamma positive animals earlier in the incident
- limiting or excluding all cattle movements onto all incident herds

The likelihood of achieving a herd prevalence of less than 1% OTF-W incidents in the county by 2025 is low.

Appendix 1: cattle industry demographics

Table 1: Number of cattle herds by size category in Hampshire as of 31 December 2023 (RADAR data on number of holdings in the report year)

Size of herds	Number of herds in Hampshire
Undetermined	5
1 to 50	441
51 to 100	96
101 to 200	85
201 to 350	38
351 to 500	17
Greater than 500	21
Total number of herds	703
Mean herd size	80
Median herd size	28

Table 2: Number (and percentage of total) of animals by breed purpose in Hampshire as of 31 December 2023 (Sam data showing the number of herds flagged as active at the end of the report year)

Breed purpose	Number (and percentage of total) cattle in Hampshire
Beef	36,828 (65%)
Dairy	16,899 (29%)
Dual purpose	2,676 (4%)
Unknown	0 (0%)
Total	56,403

Appendix 2: summary of headline cattle TB statistics

Table 3: Herd-level summary statistics for TB in cattle in Hampshire between 2021 and 2023

Herd-level statistics	2021	2022	2023
(a) Total number of cattle herds live on Sam at the end of the reporting period	825	838	822
(b) Total number of whole herd skin tests carried out at any time in the period	887	840	815
(c) Total number of OTF cattle herds having TB whole herd tests during the period for any reason	680	670	676
(d) Total number of OTF cattle herds at the end of the report period (herds not under any type of TB movement restrictions)	802	801	792
(e) Total number of cattle herds that were not under restrictions due to an ongoing TB incident at the end of the report period	813	825	807
(f.1) Total number of new OTF-S TB incidents detected in cattle herds during the report period	13	16	18
(f.2) Total number of new OTF-W TB incidents detected in cattle herds during the report period	8	6	7
(g.1) Of the new 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?	2	0	2
(g.2) Of the new OTF-W herd incidents, how many were triggered by skin test reactors or twice-inconclusive reactors (2xIRs) at routine herd tests?	3	5	2

Herd-level statistics	2021	2022	2023
(g.3) Of the new OTF-W herd incidents, how many were triggered by skin test reactors or 2xIRs at other TB test types (such as forward and back-tracings, contiguous or check tests)?	5	1	5
(g.4) Of the new OTF-W herd incidents, how many were first detected through routine SLH TB surveillance?	1	1	3
(h.1) Number of new OTF-W incidents revealed by enhanced TB surveillance (radial testing) conducted around those OTF-W herds	0	0	0
(h.2) Number of new OTF-S incidents revealed by enhanced TB surveillance (radial testing) conducted around those OTF-W herds	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)	7	4	4
(j) New confirmed (positive *M. bovis* culture) incidents in non-bovine species detected during the report period (indicate host species involved)	1 cat	1 wild fallow deer	2 wild deer
(k.1) Number of grazing approved finishing units active at end of the period	0	0	0
(k.2) Number of non-grazing approved finishing units active at end of the period	0	0	0
(k.3) Number of grazing EFUs active at end of the period	1	1	1
(k.4) Number of non-grazing EFUs active at end of the period	0	0	0

Table 4: Animal-level summary statistics for TB in cattle in Hampshire between 2021 and 2023

Animal-level statistics (cattle)	**2021**	**2022**	**2023**
(a) Total number of cattle tested with tuberculin skin tests or additional IFN-γ blood tests in the period (animal tests)	99,773	94,400	89,466
(b.1) Reactors detected by tuberculin skin tests during the year	99	119	118
(b.2) Reactors detected by additional IFN-γ blood tests (skin-test negative or inconclusive reactor [IR] animals) during the year	101	21	44
(c) Reactors detected during year per incidents disclosed during year	9.5	6.4	6.5
(d) Reactors per 1,000 animal tests	2.0	1.5	1.8
(e.1) Additional animals slaughtered during the year for TB control reasons (dangerous contacts, including any first time IRs)	0	10	1
(e.2) Additional animals slaughtered during the year for TB control reasons (private slaughters)	8	2	2
(f) SLH cases (suspect tuberculous carcasses) reported by Food Standards Agency (FSA) during routine meat inspection	1	2	7
(g) SLH cases confirmed by *M. bovis* PCR testing or bacteriological culture	1	1	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 in the table above.

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

In 2023, 8 out of 25 (32%) new TB incidents in Hampshire received a preliminary or final APHA veterinary investigation to identify the source of infection. Not all Disease Report Form (DRF) investigations were carried out in 2023. This was due to the continued impact and diversion of field resources as part of the 2022 to 2023 avian influenza outbreak which continued into spring 2023, in addition to the Bluetongue Virus outbreak from summer 2023 onwards.

Each TB incident could have up to 3 potential risk pathways identified. 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)
- possible (score 1)

The sources for each incident are weighted by the certainty ascribed. Any combination of definite, most likely, likely, or possible can contribute towards the overall picture for possible routes of introduction into a herd. If the overall score for a herd is less than 6, then the score is made up to 6 using the ‘Other or unknown source’ option. Buffering up to 6 in this way helps to reflect the uncertainty in assessments where only ‘likely’ or ‘possible’ sources are identified.

Table 5 combines the data from multiple herds and provides the proportion of pathways in which each source was identified, weighted by the certainty that each source caused the introduction of TB. The output does not show the proportion of herds where each pathway was identified (this is skewed by the certainty calculation). WGS of *M. bovis* isolates can be a powerful tool in identifying a likely source of infection, however WGS clades are not determined for OTF-S herds. As a result of varying levels of uncertainty, only broad generalisations should be made from these data. A more detailed description of this methodology is provided in the explanatory supplement for the annual reports 2023.

Table 5: Suspected sources of *M. bovis* infection for the 8 incidents with a preliminary or a final veterinary assessment in Hampshire, in 2023

Source of infection	Possible (1)	Likely (4)	Most likely (6)	Definite (8)	Weighted contribution
Badgers	6	1	0	0	15.1%
Cattle movements	3	2	3	1	57.7%
Contiguous	1	0	0	0	1.4%
Residual cattle infection	1	1	1	0	15.9%
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	2	0	0	0	2.6%
Other or unknown source	0	0	0	0	7.4%

Each TB incident could have up to three potential pathways so totals may not equate to the number of actual incidents that have occurred.

Data Protection:
For information on how we handle personal data visit www.gov.uk and search Animal and Plant Health Agency Personal Information Charter.

This publication is available Bovine TB epidemiology and surveillance in Great Britain.

Any enquiries regarding this publication should be sent to us at the National TB Epi Mailbox.

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