

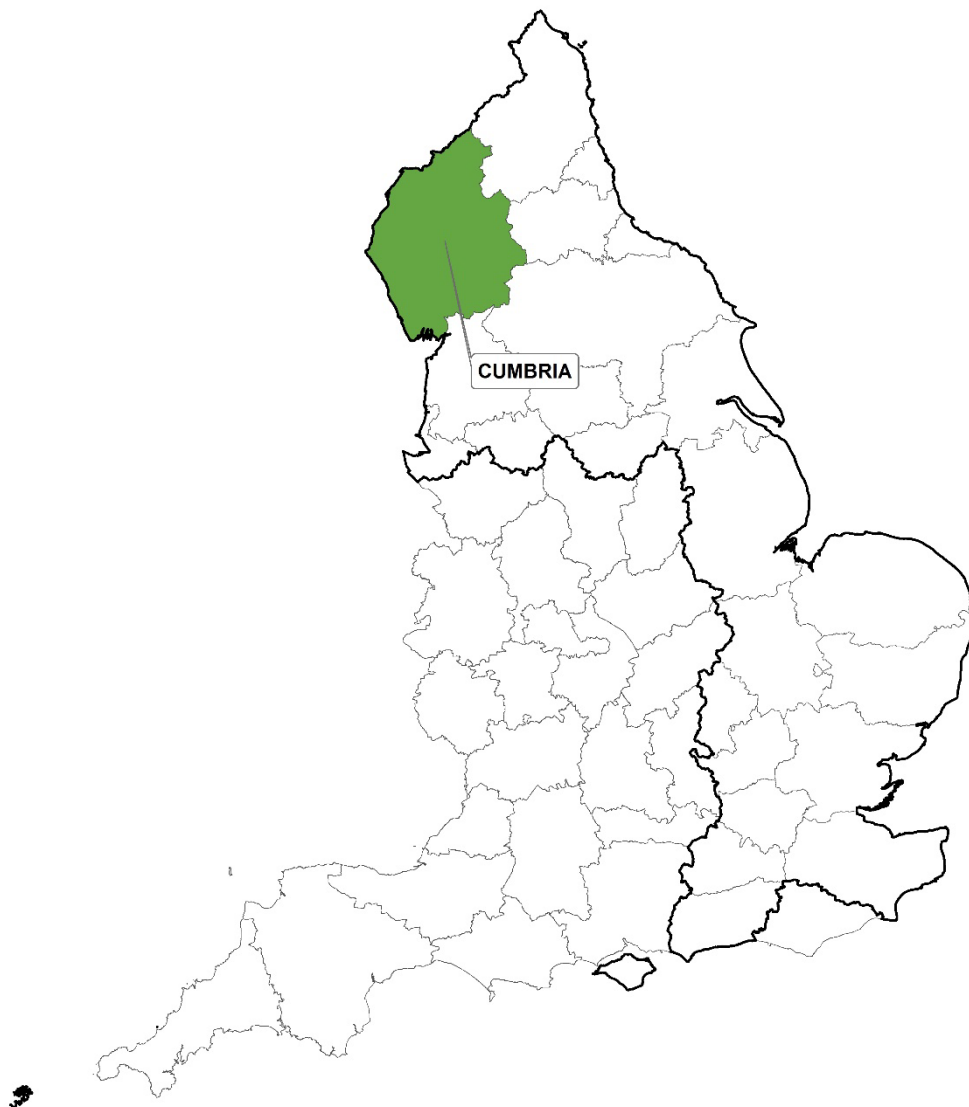


Animal &
Plant Health
Agency

Year-end descriptive epidemiology report: Bovine TB in the Low Risk Area of England County coverage: Cumbria

Year-end report for: 2020

TB Low Risk Area - CUMBRIA



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Executive summary

Reporting area

Cumbria is part of the Low Risk Area (LRA) that was established in 2013. This area was later incorporated into the Government's strategy to achieve Officially Tuberculosis Free (OTF) status for England by 2038. Overall, the LRA has a very low and stable incidence of infected herds. This end of year report describes bovine TB (bTB) in the specified reporting area only.

Local cattle industry

Cumbria has just under 430,000 cattle in approximately 3,000 herds, split between similar numbers of beef and dairy, and ranging from very small family holdings to large commercial units. Most herds are managed in a traditional way, housed during winter, and grazed in summer. There are several livestock markets, facilitating a significant number of movements in and out of the county, including between Scotland and Northern Ireland. The county has one Licensed Finishing Unit (LFU).

New incidents of TB

In 2020 there were 23 new TB incidents in Cumbria, of which four led to withdrawal of OTF herd status following detection of at least one test reactor with visible lesions of TB and/or animals with *M. bovis*-positive culture results (OTF-W incidents). This shows a reduction in the total number of new incidents, in comparison with the 29 that occurred during 2019. The number of OTF-W incidents has reduced by one.

Potential or confirmed TB hotspot areas

Currently there are two hotspot (HS) areas in Cumbria:

East Cumbria confirmed hotspot (HS21)

Established in 2016. Enhanced measures for both cattle and wildlife surveillance were put in place after the detection of three *M. bovis* positive badgers in 2017. There have been three OTF-W and four OTF-S incidents during this reporting period. The third year of TB controls in the local badger population took place in the autumn of 2020 and consisted of a combination of culling and vaccination.

South Cumbria potential hotspot (HS26)

Created in the summer of 2019 after the emergence of a cluster of cases in the south of the county. During 2020 there were only four OTF-S incidents in this area, which constitutes a marked decrease in comparison with the numbers for 2019. Only enhanced TB surveillance

in cattle and wildlife is being carried out here (no badger culling or vaccination), but the number of submissions continues to be very low to date.

Unusual TB incidents

There were no unusual TB incidents in Cumbria during the reporting period.

Suspected sources and risk pathways for TB infection

Most cases detected in this county appear to be related to localised foci of wildlife infection, local cattle (both purchased or through direct contact), or of undetermined origin due to a lack of evidence and *M. bovis* genotyping information in OTF-S cases.

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](#).

Disclosing tests

Most incidents in Cumbria were detected via enhanced surveillance TB tests such as radial, hotspot or post-incident testing. A small proportion were disclosed through routine herd testing. No incidents were disclosed through slaughterhouse surveillance in the reporting period.

Reactor numbers

A total of 39 cattle were removed for TB control purposes during 2020. Of these, 37 (95%) were skin reactors and two (5%) interferon gamma (IFN- γ) test positive cattle. This represents a dramatic reduction compared to 2019, when 190 animals were slaughtered for TB control purposes.

Risks to the reporting area

The risk of TB incursions into Cumbria from the adjoining counties of England and Scotland is assessed as low. The most likely risks come from movements of cattle from higher risk areas into the county, either directly from farms or via animal gatherings. These can be mitigated by pre- and post-movement testing where applicable, but cattle purchasing practices are not yet ideal in the LRA.

Risks posed by the reporting area

Cumbrian areas of higher disease incidence are in the east and south where the two hotspots are located. The enhanced surveillance in both these areas reduces the risk of

spreading disease via cattle moving out of the county. Therefore, the overall risk to neighbouring counties remains low.

Forward look

In order to further reduce TB incidence and maintain LRA status, enhanced TB surveillance measures need to be continued, together with the implementation of safer cattle purchasing policies, wildlife TB controls where badgers or wild deer may be implicated in the persistence of clusters of incidents in cattle, and better biosecurity in herd management.

Introduction

This report describes the level of bovine tuberculosis in cattle herds in Cumbria in 2020. Bovine tuberculosis is caused by the bacterium *Mycobacterium bovis* (*M. bovis*) and will subsequently be referred to as TB. This report explores the spatial and temporal 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 area 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 Bovine Tuberculosis 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). Cumbria forms part of the Low Risk Area (LRA). Overall, the LRA has a very low and stable incidence of infected herds. The current strategy seeks to rapidly control infection when it arises through high sensitivity testing of affected herds and temporarily enhanced local surveillance (radial and hotspot testing). Mandatory pre- and post-movement testing of cattle entering the LRA from higher risk areas of the UK is also performed to reduce the risk of TB introduction. The aim is to preserve the favourable disease status of this area so that its counties can be declared OTF as soon as possible.

Changes due to COVID-19

During 2020, public health measures adopted by the 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

Cumbria has nearly 430,000 cattle in approximately 3,000 herds, with similar numbers of beef and dairy businesses, and some mixed herds. Most herds are located out with the Lake District National Park, where the land is most suitable, mostly to the north and east of the county. Also, a proportion of them are situated towards the west coast and the Lake District Peninsulas. The most common practice is to house the animals during the winter months and graze in summer from April-May to October.

As presented in Figure 1, the size of the herds ranges from family holdings with a small number of animals to large dairy herds with over 1,000 heads.

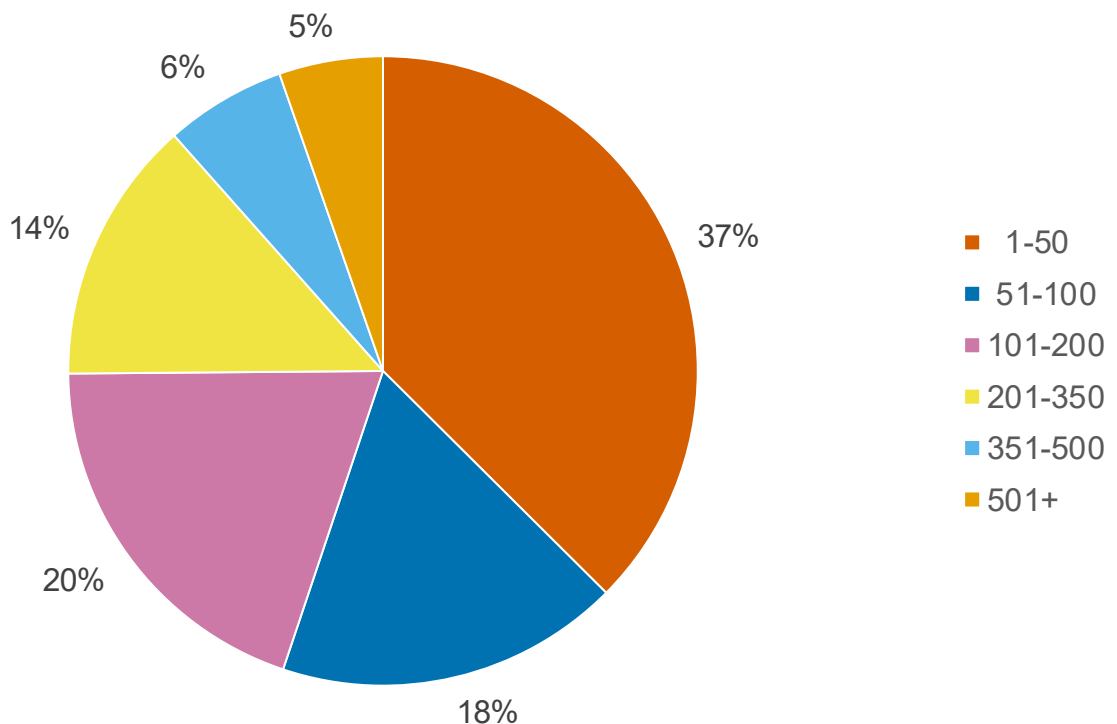


Figure 1: Proportion of cattle holdings in Cumbria, by herd size in 2020 (n=2,849). Note herds with an undetermined size are not shown.

Compulsory pre-movement TB testing (PRMT) of cattle from herds on annual or biannual surveillance testing was established in March 2006 to mitigate the risk of spreading TB through movements of infected cattle from these areas. It currently applies to all cattle of at least 42 days of age that are moved out of herds on an annual or six-monthly testing frequency. In recent years, Cumbrian farmers are becoming increasingly aware of the risk of

buying cattle from areas of high and intermediate incidence of bovine TB. Yet many herd owners who need to purchase cattle source them locally via livestock markets.

There are still a considerable number of cattle moving into Cumbrian herds every year. These movements are mostly from other holdings within the county and other parts of the LRA. However, movements from the HRA and Edge Area of England, from Ireland and from Wales are still happening, and many of these movements are through markets. Purchasers of these animals are not necessarily aware of their origin until after animals have been bought, although they will have been pre-movement tested for TB with negative results and, since April 2016, also require a post-movement test. Owners of herds that buy in cattle for final finishing tend to be less cautious about the sources of their purchased cattle, and many of these cattle will be slaughtered prior to completion of their post-movement test.

There is an important movement of cattle from Cumbria into Scotland as well as a significant number of cattle from Northern Ireland and the Republic of Ireland entering the county. These generally end up on beef finishing/fattening units. A number of pedigree breeding bulls from Northern Ireland also move onto Cumbrian farms.

Markets and abattoirs

There are nine livestock auctions in Cumbria and several collection centres, of which four gather fat cattle. These are mostly used to consign cattle direct to slaughter. There are some abattoirs for finished cattle although the main ones are in Lancashire and further south in England.

Six markets hold TB-exempt approvals, but none carry out TB slaughter gatherings at present. A ban on TB slaughter gatherings of cattle originating from TB-restricted or Approved Finishing Units (AFUs) in the LRA in England was introduced in August 2020.

Licensed Finishing Units

There is one Licensed Finishing Unit (LFU) in Cumbria, which provides an outlet for finishing cattle from OTF herds under strict biosecurity conditions. Cattle are sourced from unrestricted herds and are subject to pre-movement testing when required. Currently, this unit has capacity for 1,400 cattle.

Common land

There are many areas of common land across the county, some of which require several animals grazing every year for the farmers to receive subsidy payments. TB controls are discussed with commons graziers when required, however most commons are used for sheep only.

Descriptive epidemiology of TB

Temporal TB trends

Unless otherwise specified, this report includes all new TB incidents detected during the reporting period. This includes 'officially tuberculosis free status withdrawn' (OTF-W) incidents and 'officially tuberculosis free status suspended' (OTF-S) incidents. OTF-W incidents are those involving one or more test reactors with typical lesions of TB identified at post-mortem, and/or one or more animals with *M. bovis*-positive culture results from tissue samples. OTF-S incidents are triggered by reactors to the Single Intradermal Comparative Cervical Tuberculin (SICCT) skin test, but without subsequent detection of lesions or positive culture results in any of those animals.

In 2020 the total number of new TB incidents decreased by six in comparison with 2019, reducing from 29 to 23. Incident numbers are starting to decrease in line with the trend first observed in 2018, following the spike in 2015-2016 when the East Cumbrian cluster commenced. The number of OTF-W incidents decreased from five to four (continuing the declining trend observed since 2017), and OTF-S from 24 to 19 (Figure 2). In general, cases appear at any time throughout the year without any specific temporal pattern. Nevertheless, 2020 has seen six out of 23 incidents starting in October when cattle return from summer grazing.

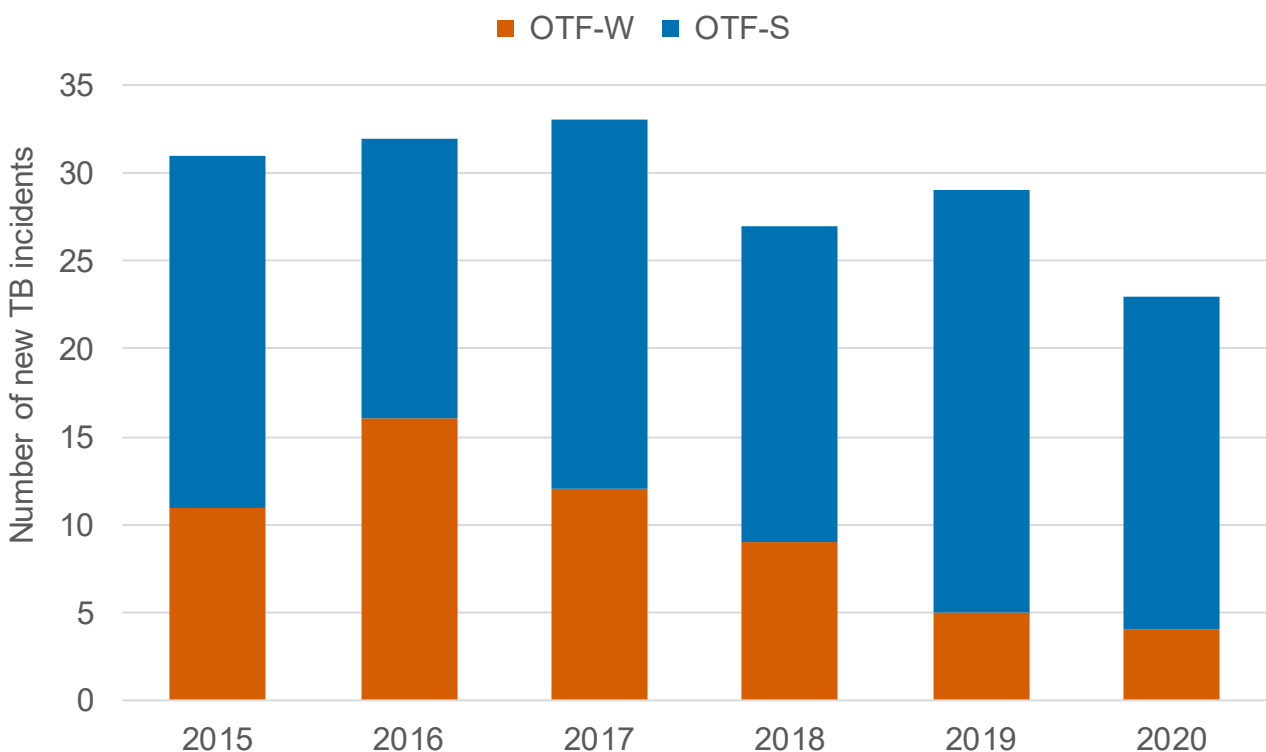


Figure 2: Annual number of new TB incidents in Cumbria, from 2015 to 2020.

Geographical distribution of TB incidents

TB incidents in Cumbria are situated predominantly outside the boundary of the Lake District National Park, where the land is more suitable for farming: the majority of them to the east along the Eden Valley and to the south of the Lake District. The geographical distribution in 2020 remained very similar to that of 2019, with incidents in the south of the county and towards the Eden Valley, where both hotspot areas are located. There were seven new incidents in HS21 (three OTF-W and four OTF-S) and four in HS26 (all OTF-S) during this reporting period, and there were no ongoing incidents from previous years.

In addition, during 2020 some incidents have occurred in the northern part of the county; five of these were OTF-S and one OTF-W. This constitutes a small increase in incidents in this area of Cumbria, compared to the distribution of 2019, as observed in Figure 3.

The non-bovine TB event in Figure 3 relates to a sheep that was sold through a Cumbrian market, and subsequently presented visible lesions of TB in the abattoir (further described in 'TB in other species').

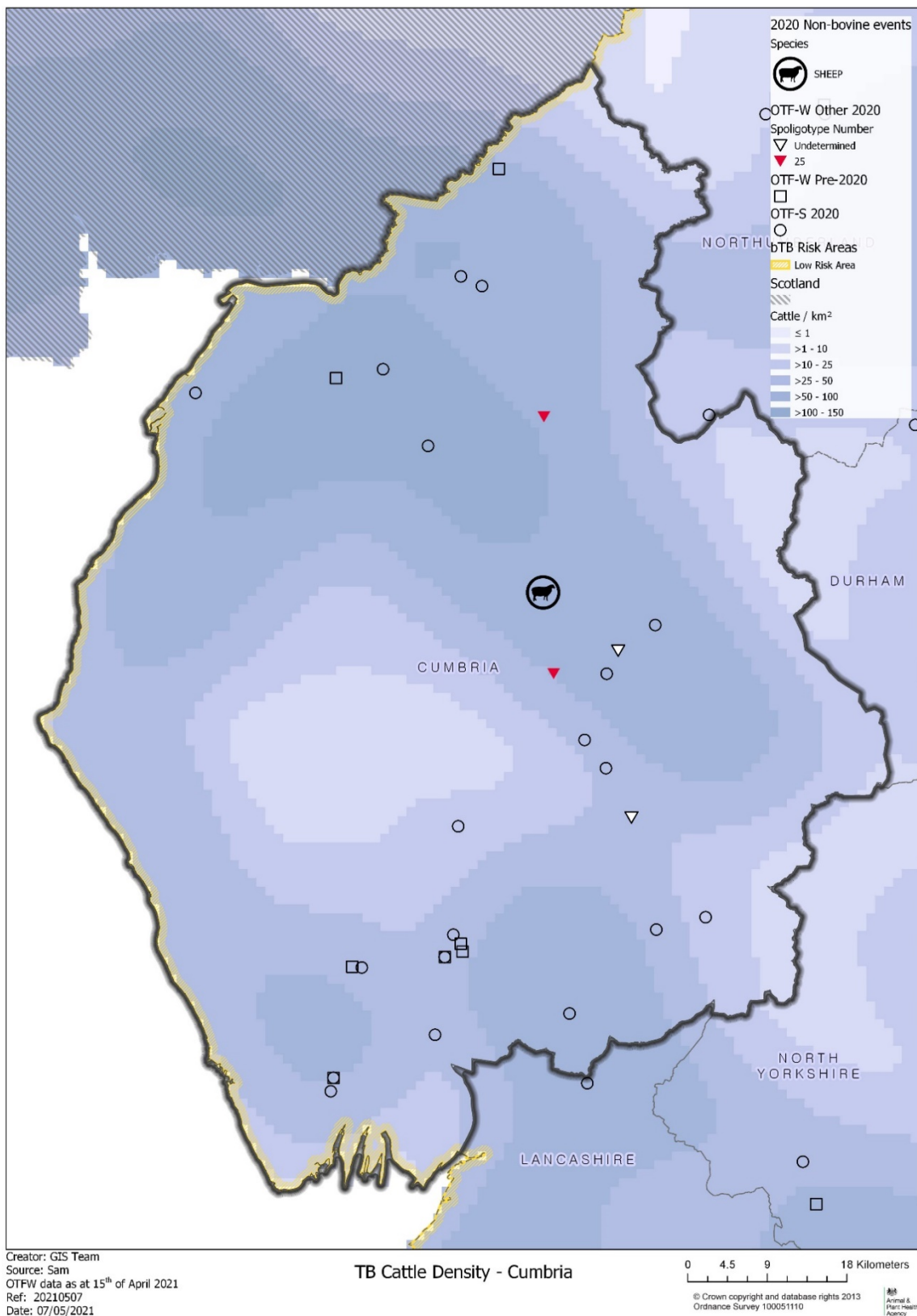


Figure 3: Location of cattle holdings in Cumbria with new TB incidents (OTF-W and OTF-S) in 2020, and cattle holdings with pre-2020 OTF-W incidents still ongoing at the beginning of 2020, overlaid on a cattle density map. Note: 'OTF-W Introduced 2020' refers to OTF-W incidents in which introduction of infection through cattle movements was the most likely source identified.

Potential or confirmed TB hotspot areas

As can be seen in Figure 4, some radial surveillance zones within HS21 were not instigated over the years. This is due to the enhanced TB testing measures that all cattle herds are subject to in this area, which rendered radial testing unnecessary. However, some tests have been instructed when the 3 km radial zone extends beyond the hotspot boundary.

Before 2017, there were some instances when radial surveillance zones were not created. These only occurred after field delivery teams had carried out a veterinary risk assessment and concluded that the risk of disease spreading from the affected herd was negligible. The exemption to initiate radial testing was subsequently considered by TB leads and Veterinary Heads of Field Delivery (VHoFD), and only endorsed in a few incidents. Radial testing plays an important role in the early detection of disease and prevention of wildlife infection and provides very valuable information on the extent of disease spread around confirmed incidents.

At present, active radial surveillance zones are located mainly towards the southern part of the county near potential HS26. Only two new radial zones were instigated during 2020, one in the southern edge of HS21 and the other one near Carlisle. A third zone within HS21 was not instigated as per the previous comment.

During the reporting period there were two TB hotspots in Cumbria, one confirmed and one potential hotspot. These are considered separately below:

East Cumbria confirmed hotspot (HS21)

The East Cumbria hotspot was established in 2016 and subsequently confirmed in the spring of 2017 following the isolation of genotype 17:z of *M. bovis* from the carcasses of three badgers collected within the perimeter of HS21. Further enhanced TB surveillance and control measures for both cattle and wildlife were then put in place. Three OTF-W incidents were reported in 2020, two of which because of suspected lesions of TB identified at post-mortem examination of skin test reactors, but with subsequent negative culture results. The third OTF-W incident had *M. bovis* isolated and characterised as genotype 25:a, with the source of infection identified as purchase of infected cattle from another Cumbrian premises. In fact, no 17:z isolates were identified in cattle herds in HS21 during 2019 and 2020.

Four OTF-S incidents were also disclosed during the reporting period, of which two remained open and were the only herds under restrictions due to a TB incident in HS21 at the time of writing this report. Three of these OTF-S incidents are recurrent events on premises that had suffered previous TB incidents. Sources of infection have been assessed as undetermined, after consideration of cattle movements, fomites, residual infection, and potential wildlife involvement. However, the latter has decreased significantly in the last couple of years following the instigation of TB control measures in badgers.

Most cattle herds in HS21 are still subject to six monthly testing and herd owner compliance has been excellent throughout the area. The ninth round of herd testing was already underway at the time of writing this report. During 2020, as part of the exit strategy for HS21, APHA started to implement a reduction in frequency of enhanced cattle surveillance (from six

monthly to annual testing) in the outer section of HS21, where there has been no evidence of wildlife infection, i.e., outside the wildlife intervention area. Eligible farmers could apply for this reduced testing frequency from September 2020. To date, five applications have been approved, two additional premises reverted to four yearly testing as per LRA requirements, and a further application was rejected, after veterinary risk assessment.

One of the enhanced cattle measures in place in HS21 is to apply whole-herd movement restrictions when only IRs have been disclosed at a skin herd test. Six herds were affected by this in 2020: one of them became an incident and the others returned to OTF status at the retest.

A Local Steering Group was created in 2019, with representatives from the local community including NFU, private veterinary surgeons (PVS), farmers, APHA and Defra. This group holds regular meetings with the aim of finding ways forward to deal with TB in the area, discussing biosecurity, risk-based trading practices and wildlife measures. Training for local PVSs and an informative event for farmers, including farm walks, took place in January 2020.

South Cumbria potential hotspot (HS26)

In 2019 a cluster of TB incidents emerged in South Cumbria near Cartmel Fell, between Kendal and Windermere. Following consultation with Defra TB Programme, the local APHA field delivery team applied for a Potential Hotspot Area, currently known as HS26 - South Cumbria. Wildlife surveillance in this potential hotspot has taken place since August 2019, however *M. bovis* has not been identified in local badgers or deer so far. No enhanced cattle measures have been applied to potential HS26 to date, apart from the radial zones triggered around the OTF-W incidents from 2019.

During 2020 there were only four OTF-S incidents in HS26, of which three were recurrent. This constituted a significant decrease in comparison with the numbers for 2019 (11 OTF-S and three OTF-W). Unfortunately, no subsequent culture of *M. bovis* was obtained in test skin test reactors removed from any of those four incident herds and thus no clear sources of infection could be determined.

Wildlife surveillance is essential to determine the presence or absence of disease and inform local epidemiological investigations. To date, only four badgers and three deer have been submitted from HS26, with no positive results obtained for *M. bovis*.

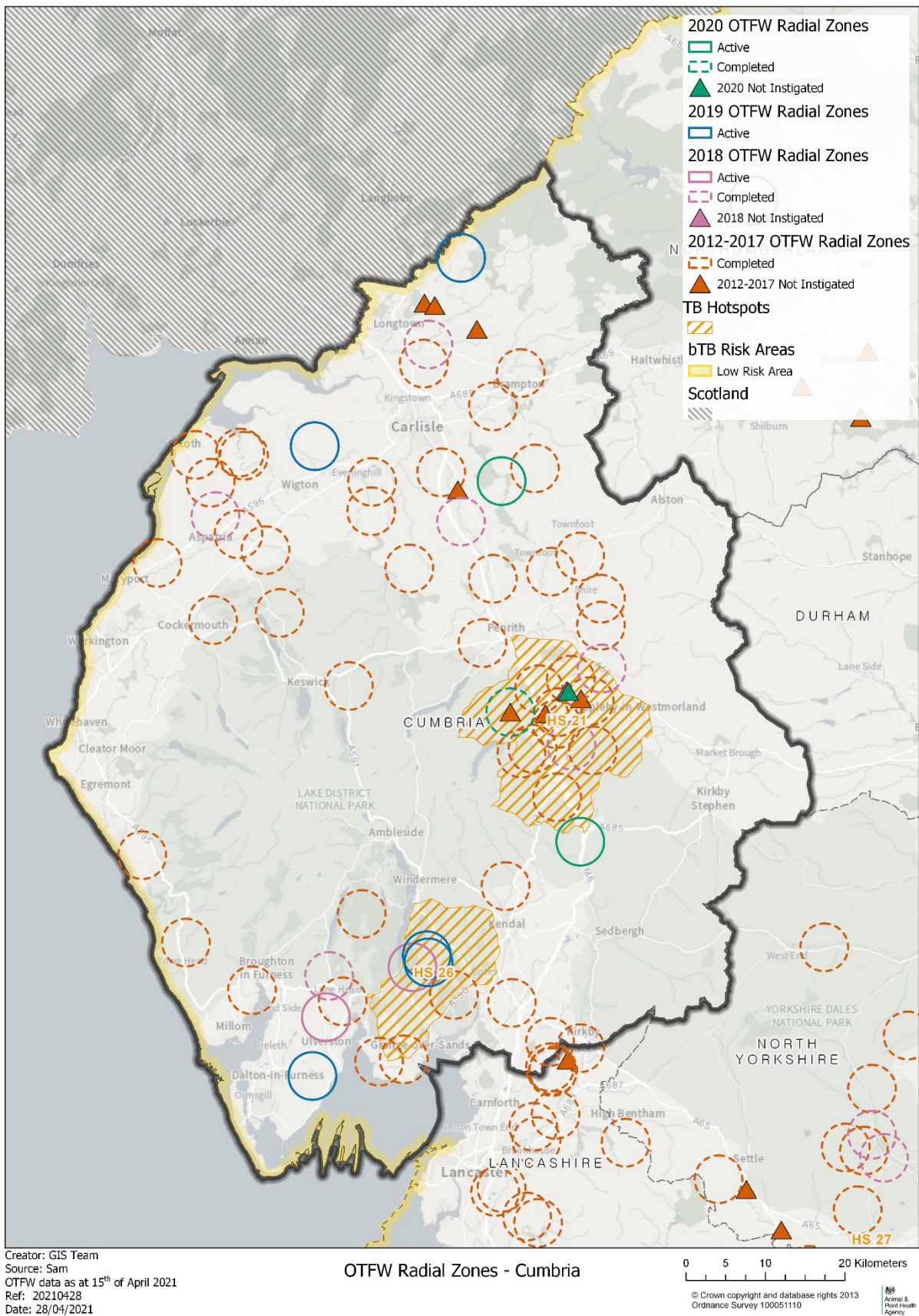


Figure 4: Potential hotspot areas and OTF-W radial surveillance zones that were active, completed or not instigated in Cumbria during 2020, by year of initiation.

Other characteristics of TB incidents

Unusual TB incidents

No unusual TB incidents have occurred during 2020. The only remarkable events are the repeat incidents in the hotspot areas (see 'Potential or confirmed hotspot areas').

Duration of TB restrictions

Most of the TB incidents that concluded in 2020 in Cumbria affected beef herds (65%), with the remaining incidents occurring mainly in dairy herds (27%) and a small proportion in mixed herds (8%). Just over half of these incidents started before 2020 including two OTF-W incidents from 2018. This can be partly attributed to radial testing surveillance zones and the six-monthly testing regime in HS21. Due to this, TB testing in Cumbria is distributed throughout the year and thus TB incidents can be disclosed at any time.

The average duration of a TB incident (considering both OTF-W and OTF-S) is between 151 and 240 days (Figure 5). This accounts for two mandatory Short Interval skin tests (SITs) and the time elapsing for reactor removal. It is worth noting that OTF-S incidents in HS21 are subjected to two SITs (and discretionary IFN- γ testing when required) as part of the enhanced control measures, which has an impact on the length of the restrictions. There were also several OTF-S incidents outside HS21 which resolved after only one SIT and thus their duration was under 100 days. One persistent TB incident from 2018 concluded at the start of 2020 and is also represented in Figure 5.

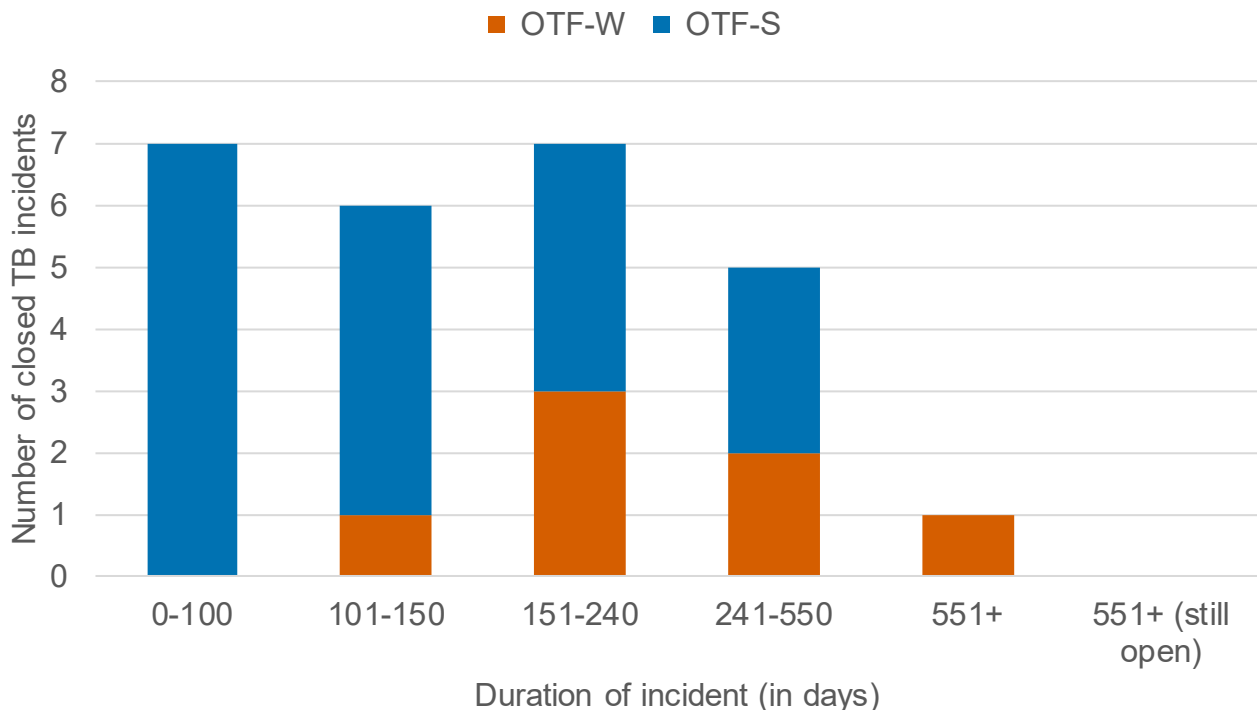


Figure 5: Duration of all TB incidents (OTF-W and OTF-S) that ended in 2020, and the number of persistent TB incidents (551+ days) that were unresolved at the end of 2020 in Cumbria. Note that Licensed Finishing Units (LFUs) have been excluded.

Genotypes associated with TB incidents

Genotyping of *M. bovis* isolates is 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 attempted for all OTF-W herds in the LRA.

As shown in Figures 3 and 4, one OTF-W incident with a 25:a genotype of *M. bovis* was located within HS21; yet the source of infection is a clear cattle movement from the LRA. Upon disclosure, tracing procedures carried out in the herd of origin of the reactor (also in Cumbria, but outside HS21) revealed further infected cattle, and the same genotype was isolated after the reporting period. The other confirmed incident with a 25:a genotype is located in the north of the county and was disclosed near the end of the reporting period. This incident has recently concluded, and the source of infection is thought to be local cattle.

At present there is no WGS information available to ascertain whether a conclusive epidemiological link can be established between these two incidents caused by the same genotype of *M. bovis*.

Suspected sources, risk pathways and key drivers for TB infection

The key drivers of the TB epidemic within the reporting area in 2020 were as follows:

- Local cattle within LRA either by direct contact or movements
- Infected wildlife
- Undetermined sources

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 LRA (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 (OTF-W incidents only).

During the APHA veterinary assessment, up to three risk pathways of infection are selected for each herd. Figure 6 shows the risk pathways identified with the highest level of certainty for OTF-W incidents only. Further details of all the risk pathways identified in both OTF-W and OTF-S incidents can be found in Appendix 4.

Local cattle herds were the source of infection attributed to two of the four OTF-W incidents in 2020. One of these incidents was caused by an animal purchased from a local farm a few miles away, which is itself now under TB restrictions and had the same genotype disclosed (this is a 2021 incident). This incident is inside HS21.

The other incident has been ascribed to contact with neighbouring cattle as the likely source of infection and lies outside the hotspot areas.

The remaining two OTF-W incidents are both located in HS21, one towards the central-eastern area of the county and the other straddling the southern boundary. These were attributed to wildlife and a non-specific reaction, respectively (Figure 6). It must be noted though, that the certainty attributed to wildlife in HS21 is not as high as it used to be due to the impact of wildlife intervention in recent years and the lack of *M. bovis* isolates from the OTF-W incidents.

Wildlife was mentioned as a potential risk pathway in nearly a quarter of all the incidents (OTF-S and OTF-W) in Cumbria in 2020, and it was ascribed higher levels of certainty in five incidents. These incidents are located within HS21 or HS26. It has not yet been possible to confirm *M. bovis* infection in wildlife in HS26, and even when investigations in 2019 led to a likely wildlife involvement in this potential hotspot, no further evidence emerged during the reporting year to corroborate this hypothesis.

Cattle movements and direct contact with neighbouring cattle constituted nearly a quarter of the risk pathways assessed. However, these were not associated with high levels of certainty, apart from the aforementioned OTF-W incident. Please see Appendix 4 for further information on suspected sources of *M. bovis* infection in the county in 2020.

In instances where insufficient evidence is available (as happens with many OTF-S incidents where no genotype is obtained) and there are no clear risk pathways, it is difficult to ascertain the source of infection. These incidents have been recorded as having an 'undetermined' origin (other or non-specific reactions), and account for approximately a third of the total. This also applies when although several sources of infection have been considered, none of them has a high level of certainty. To reduce the uncertainty, it will be necessary to gather new evidence of the disease situation in local wildlife populations. The use of WGS techniques when *M. bovis* is confirmed, either in cattle or wildlife, is very valuable in achieving this, although it depends on wildlife being submitted for surveillance.

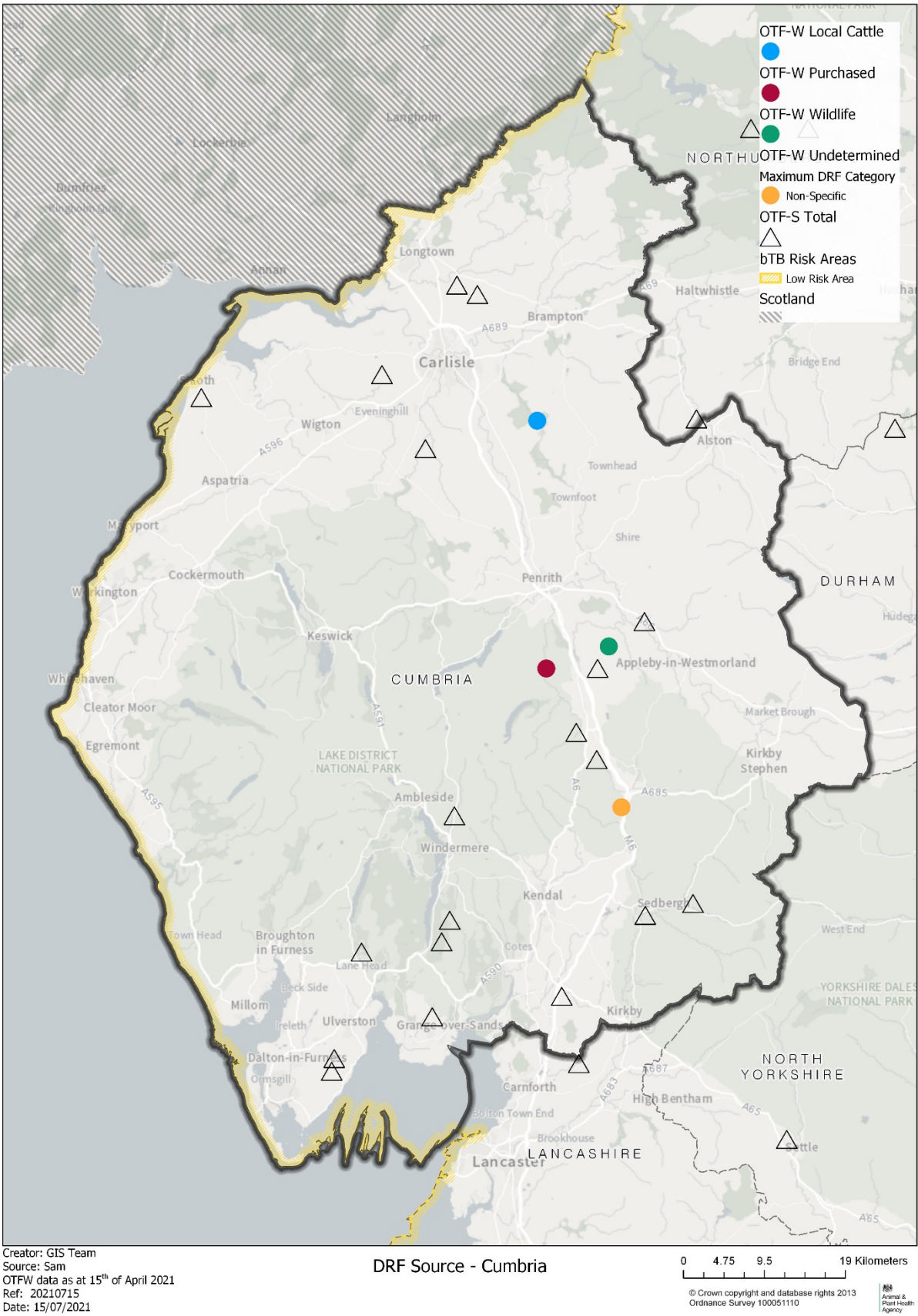


Figure 6: Map of the source of infection pathway recorded with the highest level of certainty, for OTF-W TB incidents, and the location of OTF-S incidents in Cumbria which started in 2020.

TB in other species

Badgers and other wildlife

Farmers report thriving populations of badgers in certain areas of Cumbria. Their activity has been surveyed in parts of the Eden Valley (HS21) for TB control purposes where TB incidents have been associated with infected badgers sharing a common genotype in previous years. This hotspot received a third year of badger culling in 2020; the results have already been published and are available at the following link:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/974351/tb-surveillance-in-wildlife-mar2021.pdf. The operation in 2020 included both culling and an area of badger vaccination. After three years of intervention and TB controls in wildlife, the likelihood of badgers' involvement in TB incidents has decreased significantly. There is also a rising population of badgers reported in the south of the county and some have been seen near farm steadings.

Wild deer (mostly reds and roes) are often observed by Cumbrian farmers in different parts of the county, wandering through grazing fields and into nearby woodlands. Surveillance is carried out on shot deer and any suspect incidents reported to APHA as required. The Cumbrian Deer Initiative has run sessions of TB awareness at some of their events in recent years, on the back of the East Cumbria TB hotspot. No incidents have been attributed to deer and there have been no confirmed isolates of *M. bovis* in wild cervids recorded in 2020.

Other domestic species

There was a TB incident involving non-bovine farmed species (see Figure 3) which relates to a sheep that was sold through a Cumbrian market, and subsequently presented visible lesions of TB at slaughter. The samples submitted from this animal yielded a positive result for *M. bovis*, further identified as genotype 11:a. The home range for this isolate is Devon, and it was only found on one previous occasion in Cumbria after a cattle movement from the HRA, in 2016. However, traceability issues at the abattoir level meant that further investigation of this particular case has not been possible, so the origin of this sheep could not be ascertained.

No other laboratory confirmed incidents of *M. bovis* in domestic non-bovine farm animals (camelids, goats, pigs), pets, zoo animals, captive (farmed/park) deer or captive boars, have been disclosed in Cumbria during the reporting year.

Detection of incidents

Unlike other parts of the country where most incidents are detected by routine surveillance, in Cumbria in 2020, the majority (16 out of 23) were identified using enhanced surveillance testing such as radial tests (RAD), specific hotspot testing (CT-HS1), post incident tests (6M), etc. This highlights the efficacy of the additional control measures that have been applied specifically to address areas in which infection may have potentially occurred (either residual or via spread, recently introduced or re-introduced infection). The seven remaining incidents

were detected by routine herd testing (RHT) and whole herd testing (WHT) as shown in Figure 7.

Slaughterhouse surveillance still plays a role in the county, but no confirmed TB incidents were identified through this method in 2020. This shows that active surveillance (both routine and enhanced) constitutes a highly valuable tool in the early detection of infection in cattle, resulting in a potential decrease of lateral spread.

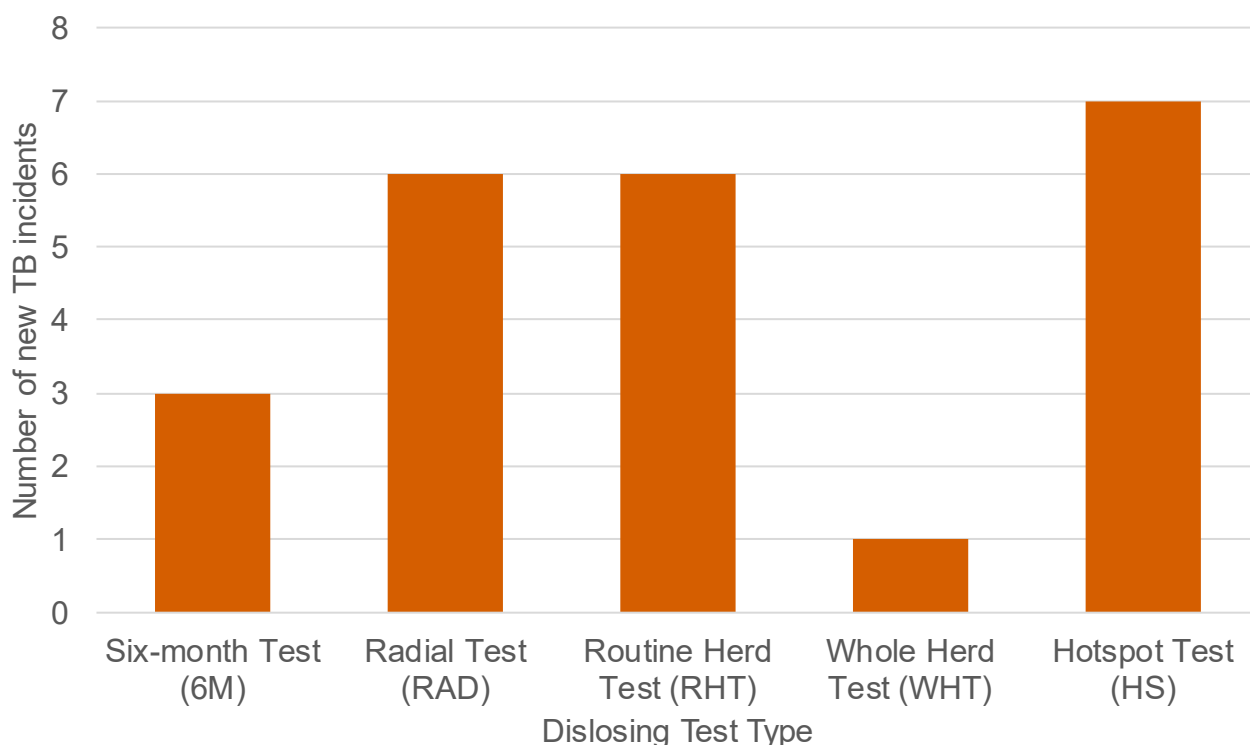


Figure 7: Number of TB incidents (OTF-W and OTF-S) in Cumbria in 2020, disclosed by different surveillance methods.

Skin test reactors and interferon gamma test positive animals removed

As shown in Figure 8, the number of animals slaughtered for TB control purposes in 2020 in Cumbria has decreased dramatically, following the trend starting in 2019. The number of TB incidents has also reduced, more slowly (see Figure 2 and Appendix 3). Only 39 cattle were slaughtered due to bovine TB, of which 37 were skin reactors and two IFN- γ test positive. These figures represent a reduction of 151 slaughtered animals compared to 2019 (190 reactors removed), and an even higher reduction when compared with 2018 data (282 reactors removed).

Since 2016, reactors disclosed by IFN- γ testing have formed a significantly higher proportion of the total than skin test reactors. One of the reasons for this is the application of discretionary gamma testing in OTF-S herds in HS21 as part of the enhanced cattle measures for the area. There have also been some herds in which more than one round of IFN- γ has been applied. Nonetheless, that has not been the case in 2020 since only two IFN- γ test positive animals were disclosed. The reason for this might be that two of the OTF-W incidents had their IFN- γ test carried out after the reporting period, and the same applies for the OTF-S incidents in HS21 where IFN- γ tests were also required. Two OTF-W herds had their compulsory IFN- γ test in 2020 but only one reactor was identified at each one.

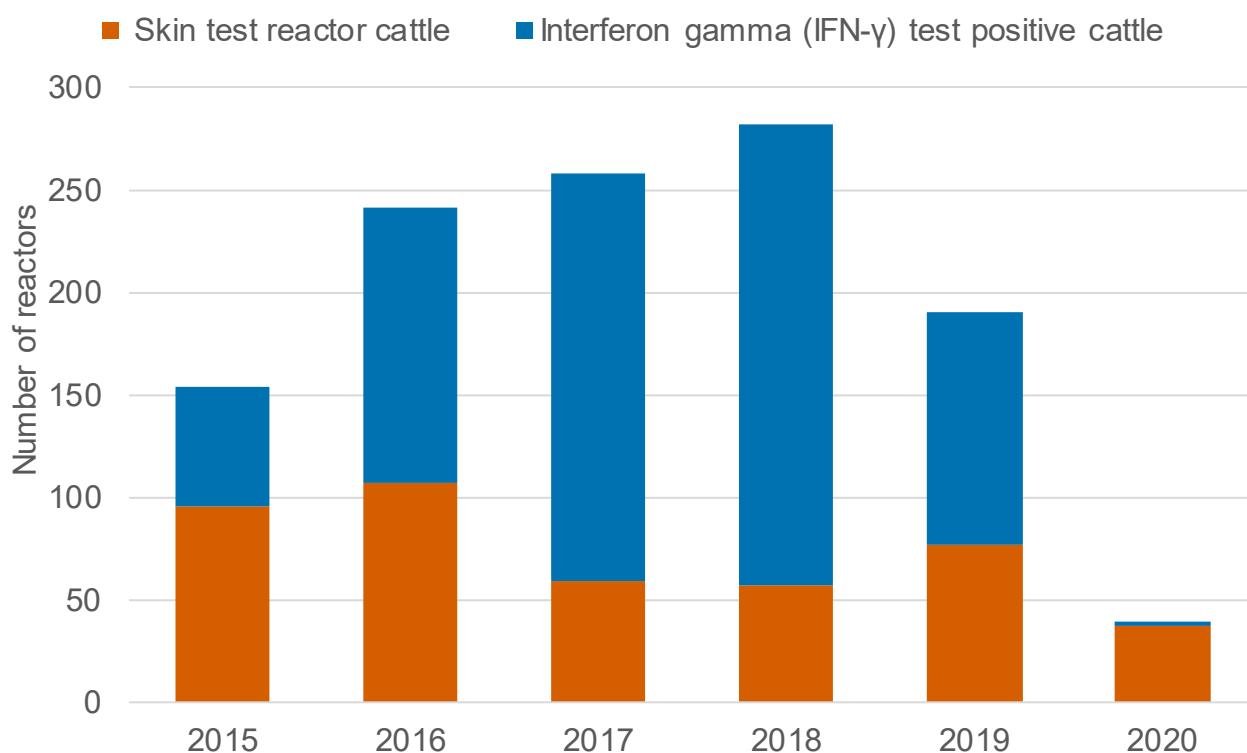


Figure 8: Number of skin test reactors and interferon gamma (IFN- γ) test positive cattle removed by APHA for TB control reasons in Cumbria, 2015 to 2020.

One of the main impacts of TB incidents and their consequent restrictions is on the ability to move stock off restricted premises. This can affect the numbers of breeding animals, weaned beef calves, store cattle, etc. The same applies to sourcing stock to replace TB reactors removed, or other necessary replacements. This proves even more difficult for pedigree animals. Acquiring stock is not permitted until after the first incident herd test and it must be carried out under a licence, which is only granted after a thorough veterinary risk assessment. This ensures that mitigation measures are followed, and the disease is not spread. Another consideration is that if cattle purchased during a TB incident become reactors at subsequent tests, there is a 50% reduction in the compensation paid to the farmer.

TB restrictions also make herds more difficult to manage when they operate using premises at different locations (i.e., heifers being reared away where there may be no facilities for calving or milking). Beef store businesses may run out of space if they must finish their animals, and this can compromise the welfare of the stock. There is also a significant economic impact in these incidents as they rely on a constant turnover of animals for cash flow. Finishing units for TB restricted cattle are a way for these businesses to release some stock, although prices are usually not as competitive.

In every incident, farmers are urged to consider contingency plans in case the restrictions last for longer than expected, with the aim of mitigating potential issues promptly without compromising animal welfare.

Summary of risks to Cumbria

Cumbria is the most northern county on the West Coast of England and is adjacent to other LRA counties and Scotland. These English counties are, in clockwise order, Northumberland, County Durham, North Yorkshire and Lancashire. The western perimeter is the Irish Sea coastline.

The main risk that other areas pose to Cumbrian livestock is in the form of cattle movements. Most of these movements are from the LRA counties, and mainly within Cumbria, although data refers to the last resident holding of the animals before the movement, and not the place of birth or other holdings in which they may have lived. In addition, several animals move from the HRA or Edge areas into Cumbria every year.

There are nine livestock auctions in Cumbria, which are widely used. Some of these markets in the north of the county also facilitate trade with Scotland. Farmers are increasingly aware of the risks of purchasing cattle from high-risk herds and their trading practices are starting to become more informed. APHA is working with local stakeholders to promote risk-based trading practices in the area, as part of the ongoing work in HS21.

The spread of TB from cattle moved into the county from other areas is mitigated by the pre- and post-movement testing policies introduced in 2006. However, these are only required when cattle move out of herds tested annually or more frequently, which in the LRA applies to herds included in radial zones or subject to post incident testing. Similarly, Scottish herd owners must adhere to the Scottish rules for pre-movement testing when moving cattle out of Scotland. Hence, not all cattle that move to Cumbria from neighbouring regions will have been subjected to pre-movement testing and there are instances in which cattle may be moved without ever being tested.

APHA carry out tracing tests on cattle moved into Cumbria from herds that are found to be infected with TB after the cattle movement took place. Since 1 April 2017, these skin tests are read at severe interpretation.

There are no known areas of endemic *M. bovis* infection in wildlife or other clusters of TB incidents in the neighbouring counties that could pose a high risk to the area. The density of cattle along the border between Cumbria and the eastern counties of Northumberland, Durham and North Yorkshire is relatively low due to the Pennine Chain, which separates the North West of England from Yorkshire and the North East of England. Lancashire to the south has a low level of disease. Therefore, the overall risk of transmitting TB from these counties to Cumbria is deemed to be low.

Summary of risks from Cumbria to surrounding areas

The Cumbrian areas of higher disease incidence are in the east and the south of the county, where the hotspots are located. The eastern cluster does not pose a risk geographically as

the Pennine Chain acts as a physical barrier. There are incidents in the south near the aforementioned HS26 and relatively close to the border with Lancashire that could perhaps pose a risk, but there were no OTF-W incidents here in 2020. Cattle movements from these areas would represent a greater threat than wildlife or local spread. This could be facilitated by livestock auctions such as those at Kendal or Lancaster.

The enhanced cattle surveillance activities in parts of Cumbria (as in HS21 and the radial zones), mitigate the risk of disease spread to other counties, as premises in such areas are also required to pre-movement test their stock unless moved directly to slaughter or finishing units.

Nevertheless, the level of bovine TB in Cumbria is decreasing, and therefore the risk to surrounding areas is assessed as low.

Assessment of effectiveness of controls and forward look

Effectiveness of controls

The incidence rate of TB in Cumbria has been relatively similar over the past few years with a slight variation in the number of TB incidents, nevertheless a slow decrease in OTF-W incidents and numbers of animals slaughtered for TB control purposes has occurred since 2018. This reduction is more evident in 2020, especially in the number of reactors.

Most incidents have been disclosed using enhanced surveillance such as radial and hotspot testing, which is a very positive outcome, since these were detected at an earlier stage avoiding further spread of disease not only within the herd but also to local farms and wildlife. It also demonstrates that enhanced cattle surveillance is a key factor in the control of TB in the LRA and will continue to be so in the forthcoming years.

The situation in HS21 seems to be improving: the third annual round of badger culling was completed in November 2020 and results are now published. An area of badger vaccination was also included. The cattle situation has been slightly worse during this period, with three OTF-W incidents, yet no isolates of 17:z genotype were identified. Sources of infection other than infected badgers are becoming more frequent, however, a wildlife role cannot be completely ruled out.

The lack of positive wildlife surveillance data obtained so far in South Cumbria hinders the investigations of the likely progression of TB in this area. Considering the lateral spread of disease observed between cattle herds in 2019, it is essential to gather as much evidence as possible from the local wildlife to ascertain their level of infection, if any, and the degree of their involvement. This will also allow APHA to apply the relevant control measures in a timely fashion. No OTF-W incidents were identified in this area in 2020.

Forward look

To overcome TB in this part of the LRA, biosecurity and informed cattle trading are paramount. Awareness of both has been growing in the county since the development of HS21, which has acted as a warning for other communities, although there is still much work to do in this respect. Many farmers are still reluctant to implement additional biosecurity measures as it may involve extra expenditure, however these need not be prohibitively costly to be effective. Risk-based trading seems to be well received, but it takes time to conduct a thorough search of the animals offered for sale through the available information, which some farmers don't have.

Current measures are to continue and should aid in the prompt detection of incidents. This together with safer trading practices and a better understanding of herd biosecurity will, in a few years' time, hopefully contribute to a decline in the spread of disease and eventually remove it.

Appendices

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

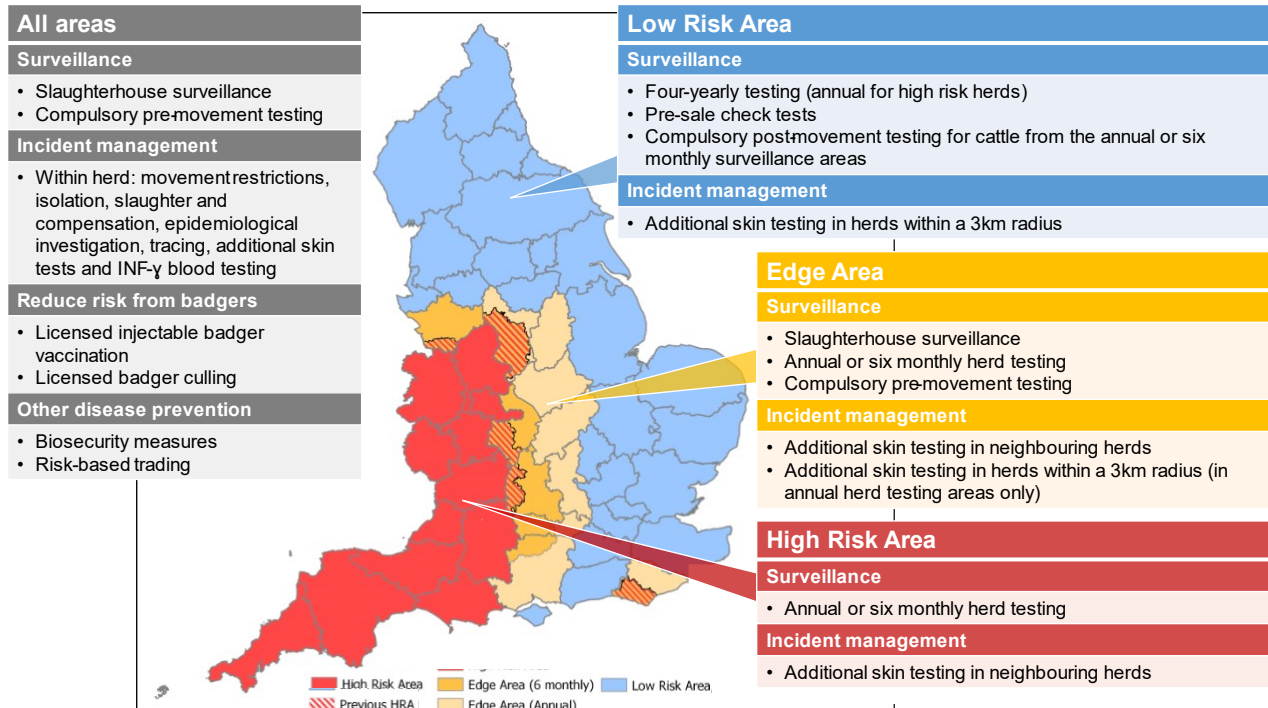


Figure A1: TB risk and surveillance areas of England effective since January 2018, as set out in the Government’s Strategy for Achieving Officially Tuberculosis-Free Status for England. The map is described in more detail in the Explanatory Supplement for England 2020 (<https://www.gov.uk/government/publications/bovine-tb-epidemiology-and-surveillance-in-great-britain-2020>).

Policy objectives for the LRA

Progressive attainment of OTF status for individual counties (or groups of counties) within the current LRA, with the declaration of OTF status for all LRA counties by 2025. For more information about the government’s 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 in the Low Risk Area

Surveillance:

- default four-yearly routine surveillance (skin) testing of cattle herds, with annual testing for a small proportion of high-risk herds
- voluntary pre-sale skin check tests
- compulsory pre- and post-movement testing for cattle entering farms in the LRA (to live) from the annual or six-monthly surveillance areas of England and Wales
- additional targeted surveillance (radial testing) of cattle herds located within a 3km radius of new incident herds with OTF status withdrawn (OTF-W) following the detection of lesion-positive test reactors and/or culture-positive animals
- slaughterhouse (SLH) surveillance (through PM meat inspection) of all cattle slaughtered for human consumption

Management of incidents:

- herd movement restrictions, isolation and rapid slaughter of TB test reactors and any direct contacts with statutory compensation payments to farmers, epidemiological investigation, tracing tests (at severe interpretation), and short interval skin testing supplemented in all herds affected by OTF-W incidents with mandatory interferon gamma (IFN- γ) blood testing

TB controls in the wildlife reservoir (badgers):

- licensed injectable badger vaccination
- licensed badger culling in exceptional circumstances, where *M. bovis* infection has been confirmed in badgers and it has a clear epidemiologically link with a local cluster of TB in cattle (e.g., East Cumbria TB hotspot)

Other measures:

- biosecurity measures
- promotion of responsible sourcing of cattle (e.g., through the use of the ibTB online (www.ibtb.co.uk) mapping application)

Summary of enhanced TB control measures in this reporting area

In addition to all the standard LRA requirements, the enhanced disease surveillance and control measures implemented for HS21 in Cumbria were maintained in 2020 and will continue for the foreseeable future. These include:

- Six monthly whole-herd check testing of all cattle herds, with consequential pre-movement testing of all cattle at least 42 days old moving out of these herds. In 2020, herds in the outer area of HS21 were eligible to move to 12 monthly testing, provided that certain criteria were met. The level of compliance with this testing regime has been outstanding from both farmers and PVSs.
- Whole herd movement restrictions are applied to herds with inconclusive reactors only, pending the 60-day re-test of those animals.

- Mandatory IFN- γ blood testing of all OTF-W herds and discretionary blood testing of certain OTF-S incident herds.
- Severe interpretation of skin tests for both OTF-W and OTF-S incident herds.
- Samples from all cattle with visible lesions of TB at post-mortem are submitted for culture and genotyping.
- Ad hoc surveillance of camelid (skin testing followed by serology) and goat (skin testing only) herds.

Two radial zones were instigated in 2020 around two of the four OTF-W incidents mentioned in this report. The other two incidents were located within HS21 and the local enhanced testing requirement was sufficient. Five radial zones remain active from 2019 incidents.

In autumn 2019, a local ownership steering group was formed with the purpose of selecting and promoting tools to improve herd resilience against TB, initially within the East Cumbria hotspot (HS21). It is hoped that these interventions will provide a lasting legacy in the area. There was no limit to the tools used, as long as they focused on improving knowledge and uptake of biosecurity measures. Defra provided funding to put in place the chosen tool(s). The group discussed many initiatives that could be implemented, but decided that the following would be best suited to the area:

- Free on-farm advice delivered by private vets, this included up-skilling of the private vets. A training session for PVS was delivered in January 2020 and a total of 130 on-farm advice visits have been completed at the time of writing this report.
- Open farm event to launch advice visits took place in January 2020.
- All cattle keepers received an information pack, including a farm-level data report, badger sett survey (if applicable) and a flyer for the advice visits.
- A further event was held in May 2021 to explain the principles of badger vaccination to farmers in the area. This event had originally been planned for November 2020 but had to be postponed for COVID-19 reasons.

Meetings of the local ownership steering group were held regularly during 2020, by videoconference. The delivery of the on-farm biosecurity visits was paused for several months during the year due to COVID-19 considerations. They restarted in 2021 and the uptake has been generally high, with only a handful of premises yet to receive one. To move to 12 monthly testing, one of these farm visits is required.

Appendix 2: Cattle industry in the reporting area

Table A2.1 Number of cattle premises by size band in each county 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	22	1,067	504	562	387	177	152	2,871	150	82

*The number of herds with an undetermined size.

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

Breed purpose	Beef	Dairy	Dual purpose	Unknown	Total
Number of cattle	210,450 (48%)	203,352 (47%)	15,928 (3%)	25 (<0.01%)	429,755

Appendix 3: Summary of headline cattle TB statistics

Table A3.1 Herd-level summary statistics for TB in cattle in 2020.

Herd-level statistics	2018	2019	2020
(a) Total number of cattle herds live on Sam at the end of the reporting period	3,398	3,398	3,386
(b) Total number of cattle herds subject to annual TB testing (or more frequent) at the end of the reporting period (any reason)	915	704	460
(c) Total number of whole herd skin tests carried out at any time in the period	1,775	1,715	1,391
(d) Total number of OTF cattle herds having TB whole herd tests during the period for any reason	1,390	1,386	1,141
(e) Total number of OTF cattle herds at the end of the report period (i.e., herds not under any type of TB2 restrictions)	3,351	3,355	3,345
(f) Total number of cattle herds that were not under restrictions due to an ongoing TB incident at the end of the report period.	3,388	3,384	3,375
(g) Total number of new TB incidents detected in cattle herds during the report period	27	29	23
• OTF status suspended (OTF-S)	18	24	19
• OTF status withdrawn (OTF-W)	9	5	4
(h) Of the new OTF-W herd incidents, how many:			
• occurred in a holding affected by another OTF-W incident in the previous three years?	0	0	1
• could be considered secondary to a primary incident based on current evidence?	0	1	1

Herd-level statistics	2018	2019	2020
<ul style="list-style-type: none"> • were triggered by skin test reactors or 2xIRs at routine herd tests? 	0	1	1
<ul style="list-style-type: none"> • were triggered by skin test reactors or 2xIRs at other TB test types (forward and back-tracings, contiguous, check tests, post-movement, etc.)? 	0	3	3
<ul style="list-style-type: none"> • were first detected through routine slaughterhouse TB surveillance? 	2	1	0
(i) 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 	9	8	6
<ul style="list-style-type: none"> • OTF-W 	0	3	0
(j) 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)	6	6	3
(k) Number of OTF-W herds still open at the end of the period that are within a finishing unit	0	0	0
(l) 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 llama	0	(1 sheep)

Table A3.2 Animal-level summary statistics for TB in cattle in 2020.

Animal-level statistics (cattle)	2018	2019	2020
(a) Total number of cattle tested in the period (animal tests, blood, and skin)	320,880	285,775	224,678
(b) Reactors detected in tests during the year:			
• tuberculin skin test	57	77	37
• additional IFN- γ blood test reactors (skin-test negative or IR animals)	225	113	2
(c) Reactors detected during year per incidents disclosed during year	10.44	6.55	1.70
(d) Reactors per 1000 animal tests	0.88	0.66	0.17
(e) Additional animals identified for slaughter for TB control reasons (DCs, including any first-time IRs)			
• DCs, including any first-time IRs	9	10	5
• Private slaughters	0	3	5
(f) SLH cases (tuberculous carcasses) reported by the Food Standards Agency (FSA) during routine meat inspection.	10	7	6
(g) SLH cases confirmed by culture of <i>M. bovis</i>	1	1	0

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 of the new OTF-W and OTF-S incidents identified in the report period

Each TB incident could have up to three 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) 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 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.

Table A4.1 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). 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. 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 to the 2020 bovine TB epidemiology report for England (<https://www.gov.uk/government/publications/bovine-tb-epidemiology-and-surveillance-in-great-britain-2020>)

Table A4.1 Suspected sources of *M. bovis* infection for all the new OTF-W and OTF-S incidents identified in 2020.

Source of infection	Possible (1)	Likely (4)	Most likely (6)	Definite (8)	Weighted contribution
Badgers	4	1	5	0	20.2%
Cattle Movements	5	3	1	0	15.9%
Contiguous	6	2	0	0	10.2%
Residual Infection	1	0	1	0	4.2%
Domestic Animals	0	0	0	0	0.0%
Non-specific Reactor	2	1	2	0	7.7%
Fomites	4	1	0	0	4.6%
Other Wildlife	6	1	0	0	5.0%
Other or Unknown Source	8	4	0	0	32.2%

Please note that each TB incident could have up to three potential pathways so totals may not equate to the number of actual incidents that have occurred. Details of the methodology used to calculate the weighted contribution of the different suspected sources of *M. bovis* infection for all new incidents can be found in the main body of the report and in the Explanatory Supplement for England 2020

(<https://www.gov.uk/government/publications/bovine-tb-epidemiology-and-surveillance-in-great-britain-2020>).

Appendix 5: Assessment of the origin of (and potential for spread of infection from) all the new OTF-W incidents identified in the report period

A risk matrix was used to identify isolated incidents that were likely to have been introduced to the LRA by cattle movements, while not causing any onward local spread. The following two questions were considered for each incident, and a score attributed. TB incidents with a score of 1A, 1B or 2A may be removed from the county TB incidence calculations during an application for OTF status (but remain in the incidence calculations in this report).

What is the probability of *M. bovis* infection being introduced to the LRA via infected cattle movements?

1. Definite - for example, traced reactors found in the LRA OTF-W incident herd in question as a result of spread tracings from another TB incident herd, genotype/WGS linked.
2. Likely - for example, a Reactor or IR originated from a previous incident herd (and the genotype does not suggest otherwise), other cattle were moved into the herd from previous incident herd (but were subsequently slaughtered without testing), or the trading practice of herd provides likely evidence (purchasing large numbers of cattle from High Risk Area (HRA), or Edge Area, High and Intermediate TB areas of Wales, or from the island of Ireland).
3. Possible - not a closed herd, but cattle are purchased from the LRA, Scotland and/or EU Member States.
4. Not likely - indigenous infection is known in the locality, closed herd, genotype/WGS has been identified in local wildlife.

What is the probability of this being an isolated, sporadic ('one-off') incident, without secondary local spread from the index case?

- A. Likely - no secondary incidents have been detected. There are no further incidents as a result of spread tracings anywhere and no genotype/WGS linked OTF-W incidents within 3km radial zone around the LRA OTF-W incident herd in question (or the 3km radial surveillance zone was not triggered).
- B. Possible - no secondary incidents have been detected, but the dataset is incomplete. For example, incidents have occurred in the 3km radial zone, but only OTF-S ones, or, if OTF-W, they were of an unknown/different genotype.
- C. Not likely - secondary spread from the index case, or exposure to a common wildlife source has occurred. For example, OTF-W incidents have occurred in the 3km zone linked by genotype or WGS, or there is known wildlife infection in the area with this genotype/close WGS.

Table A5.1 Risk matrix of the veterinary assessment of the origin of, and potential for spread of infection from, all the new OTF-W incidents identified in 2020.

		Probability of isolated, sporadic ('one-off') incident, without secondary local spread from the index case (A, B, C)		
Probability of <i>M. bovis</i> infection introduced through cattle movements (1, 2, 3, 4)		A. Likely	B. Possible	C. Not likely
1. Definite		1		
2. Likely			1	
3. Possible		1		
4. Not likely		1		



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National.TBEpi@apha.gov.uk

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