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Description of a Badger-Related Outbreak of Bovine Tuberculosis in County Donegal

J. M. Griffin

Introduction

Tuberculosis, due to Mycobacterium bovis, was first identified in a badger in Ireland in 1975, in Co. Cork (Noonan et al., 1975). Since then a number of other reports have implicated tuberculous badgers as a source of infection for cattle (Clancy, 1989; O'Connor and O'Malley, 1989; McAleer, 1990). This paper describes an outbreak of Tb in a previously clear area of Donegal, where there was evidence of badger involvement.

Since the beginning of the Bovine Tb Eradication Scheme in 1954, bovine Tb has been endemic in the northern part of County Donegal. This area includes the Fanad Peninsula and extends south to the outskirts of Letterkenny (Figure 1). The area was subjected to extended Tb control measures during the 1980's; however, there has been no long term improvement in the level of the disease in this area or in the county as a whole. Up to the late 1980's, only small sporadic outbreaks occurred in other parts of Donegal. However, in 1988 and 1989, the disease spread in a southerly direction (Figure 1).

At the end of 1989, the disease had spread to the south of Ballybofey, across the Finn river and as far as the Northern Ireland border. It had also spread eastwards as far as Convoy and Raphoe. One of the areas that was newly affected was the Glendowan area in the District Electoral Division (DED) of Church Hill. A detailed field investigation was undertaken in Glendowan to determine the source of the outbreak.

Glendowan is a mountainous, lowly populated area about twelve miles north-west of Letterkenny.

Figure 1. Map of Donegal indicating the area with a high historical incidence of Tb and the areas to which Tb spread in 1988 and 1989.
The soil is of poor quality, consisting mainly of shallow blanket bog supporting heather, bog cotton and mosses. Most of the mountain land is used as commonage. Approximately 486ha (1,200ac) of the 2670ha (6,600ac) in the five townlands where the study was undertaken were owned by 22 individuals. The average size of a holding was 21ha (51ac). The commonage and most of the pasture land were used for raising sheep. Only 13 of the landowners normally kept cattle. However, a number of them had recently ceased cattle raising because of the relatively higher income available from sheep production and the fear of an outbreak of bovine Tb. The total number of cattle in the study area was 120, giving a stocking rate for cattle, over the total area, of one animal per 22ha (55ac).

There had been no recorded outbreak of Tb in this area between 1959 and 1987. During 1987 and 1988, six herds were restricted. All of the herd owners involved in the outbreak operated suckler systems and had between 8 and 41 cattle on their premises at the time of their first restriction. Annual testing of herds was the normal procedure in this area.

Materials and Methods
The investigation was carried out in October and November, 1989. This included a review of the Tb history of all herds in the five townlands involved in the outbreak, using DVO records.

Results
Two herds had outbreaks of Tb in 1987. The other four herds were clear at their 1987 round tests but became infected in the interval between this and their next annual test in 1988. Two of the four herds which had breakdowns in 1988 had relapses of infection after going clear (Table 1). The location of these six herds are shown in Figure 2.

Sixteen (66%) of the twenty four reactors found in the six herds were positive to the standard interpretation of the single intradermal comparative cervical test; 13 (81%) of these animals showed tuberculous lesions at post mortem examination (PME). The lesion rate for all reactors was 63%.

During the course of the study a number of possible sources of infection were investigated.

<table>
<thead>
<tr>
<th>Herd</th>
<th>Date</th>
<th>Test Type</th>
<th>Number of Reactors</th>
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<tbody>
<tr>
<td>A</td>
<td>27/02/87</td>
<td>SCT*</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>10/09/87</td>
<td>RND**</td>
<td>8</td>
</tr>
<tr>
<td>C</td>
<td>26/03/88</td>
<td>SCT</td>
<td>2</td>
</tr>
<tr>
<td>E</td>
<td>11/08/88</td>
<td>RND</td>
<td>3</td>
</tr>
<tr>
<td>F</td>
<td>27/08/88</td>
<td>RND</td>
<td>2</td>
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<tr>
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<td>2/09/88</td>
<td>RND</td>
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</tr>
<tr>
<td>E</td>
<td>11/10/88</td>
<td>R/R-ldc*</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>4/03/89</td>
<td>SMC1o'o'c*</td>
<td>3</td>
</tr>
<tr>
<td>E</td>
<td>21/09/89</td>
<td>SMC</td>
<td>1</td>
</tr>
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</table>

| Total | 24 |

* Special Check Test  ** Round Test  *** Reactor Retest  **** Six-Month Check Test
1. Cattle to cattle spread from infected to clear herds

There was no evidence that cattle to cattle transmission played anything other than a minor role in the spread of disease between the herds under investigation. The herds in which the initial breakdowns occurred were not contiguous and there was no evidence of contact between them (Figure 2).

A study of the temporal and spatial relationships also indicated that it was highly unlikely that there was any transmission of Tb between the two herds infected initially and those infected subsequently. Nominally, land belonging to the owner of Herd B was contiguous to that of E. The area where contiguity occurred, however, was a mountainous area which was totally unsuitable for cattle, and on which cattle were never grazed. Thus, in practice, cattle from Herd B were not in direct contact with any of the other infected herds. Likewise, it is unlikely that Herd A acted as a source of infection for other herds as both of its contiguous herds had clear tuberculin tests eight months after the positive animal in Herd A was removed.

Thus, the two initial breakdowns in this area were separated either temporally or spatially from each other and from the subsequent breakdowns.

Of the four breakdowns which occurred in 1988, Herds C and D were not contiguous to other infected herds. There was no evidence of contact between the cattle in these herds and cattle in the other infected herds. In fact the position of Herd D was unique in that none of the contiguous land owners kept cattle. The cattle in this herd were kept in a river valley which was surrounded by mountains and forestry. The nearest cattle were those in Herd E further along the valley about half a mile away.

The only occasion on which contiguous herds had breakdowns at the same time was when Herds E and F produced reactors at tests conducted in August/September, 1988.

Figure 2. Map of the study area in Glendowan, County Donegal
2. Movement of cattle into the study area from home farms or outfarms

Three of the six herd owners (A, E and F) had land outside the study area. Cattle were constantly moved to and from these lands. However, the outfarms of Herd A and E were situated in clear areas. None of the herds contiguous to these outfarms had Tb in recent years. Thus, it is unlikely that the disease was introduced to the study area by moving cattle from these lands.

There were some reactor herds contiguous to the home farm of Herd F outside the study area. It is unlikely, however, that cattle moving from this farm introduced the disease into the study area because this herd had a clear test eight months after the start of the outbreak under discussion.

3. Purchase of infected animals

Two of the reactor cattle had been bought in as adult animals. Both had passed at least one test in the herds in which they were subsequently deemed reactor; neither of these had visible lesions at PME There was no history of Tb in the herds from which they were purchased.

Two other animals had been bought in as calves. Both had passed a number of tests in the herds in which they were subsequently deemed reactors. Thus, it appears unlikely that bought in cattle were the initial source of infection in the area.

4. Residual infection in the cattle population

In view of the fact that no disease outbreak had been recorded since 1959, it is most unlikely that residual infection in the cattle population was responsible for any of the outbreaks in 1987 or 1988.

There was some evidence of anergy in Herd E following the initial disclosure of reactors in that herd. A homebred cow which had passed all previous tests showed no increases at the avian or bovine sites at a test in October 1988. This animal was removed on clinical grounds and it showed tuberculous lesions at PME Another breakdown occurred in this herd in 1989 and, in view of the herd history, the possibility of residual infection from the previous outbreak being related to the outbreak under discussion cannot be discounted.

5. Wildlife

There were active badger setts on the lands of at least three of the infected herds i.e. Herds B, D and E. Badgers were also been found on the lands of Herd A.

There was evidence of movement of badgers between the farms of herd owners B and E. This evidence consisted of badger paths between the two holdings. In addition, herd owner E saw badgers collect bedding on land belonging to B and bring it to a sett on his own land about 200 yards away.

After the 1988 Tb outbreak, a licence was obtained to snare badgers in the area. A total of eleven badgers were snared and one of these was tuberculous. Tb was also suspected in another badger, but, because of the degree of autolysis, it was not possible to confirm the diagnosis. Both of these badgers were found on the lands of Herd E. The holdings of the other infected herds were all within half a mile of where the positive badger was snared.

Post-mortem examinations of badger carcasses were not carried out prior to 1988, so it is not possible to say when the badger population in Church Hill became infected. A possible source were other infected badger colonies in the nearby Glenswilly area which also had a serious bovine Tb problem. This area is situated about 3 miles to the east of the study area.

With regard to possible points of contact between the cattle and the infected badger population, at least one of the badger setts was in a field regularly used by cattle. Cattle had direct access to sett entrances. Another possible point of contact related to the feeding of cattle. All six herd owners stated that their cattle were kept outdoors for the winter where they were fed hay and meal. Experiments have shown that badgers will readily utilise such sources of food when they are available.

The land of Herd B was contiguous to a wooded area which contained wild deer. Sometimes they grazed on his land. In 1989,
one animal from the herd had a tuberculous lesion identified at slaughter. While herd owner B said that deer, occasionally, encroached on his land, the other herd owners said that they had never seen deer on their lands.

Conclusion
It was concluded that the badger population was the most likely source of the initial infection for herds in this area. This was based on (i) laboratory confirmation that a proportion of the local badger population was tuberculous, (ii) the identification of possible means of contact between cattle and badgers, (iii) evidence of the movement of badgers between infected herds and (iv) the absence of evidence for an alternative source for the outbreak apart from the possibility of a wild deer source for one of the herds.

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