Unusual cluster of *Mycobacterium bovis* infection in cats


BOVINE tuberculosis (TB) caused by *Mycobacterium bovis* is a major problem in British cattle. Furthermore, *M bovis* infection has been documented in many other mammals, with badgers acting as an important reservoir and vector of infection for cattle in the west of England and parts of Wales. However, with a few exceptions, the bovine TB epidemic in British cattle has not significantly affected companion animal populations, which are considered ‘spillover’ hosts (Shrikrishna and others 2009, Broughan and others 2013, Gunn-Moore and others 2013). In the seven years (2006/12) since *M bovis* infection in pet animals became notifiable to the AHVLA, fewer than 30 cats have been confirmed with *M bovis* each year in Great Britain (Broughan and others 2013, Defra 2013). The vast majority of these cases are sporadic and concentrated in regions of Great Britain where bovine TB is endemic, although a small number of multiple cases in single households have been reported (Monies and others 2000).

Between December 2012 and March 2013, seven laboratory-confirmed cases of feline *M bovis* infection were presented to one small animal veterinary clinic in Newbury, Berkshire, England. A further two suspected cases of *M bovis* infection were also identified in the same time-frame, but the cats died without further sampling and confirmation of the diagnosis by laboratory culture of the bacterium was not possible. All nine cats belonged to separate households and presented with different clinical pictures, although some common signs were seen. In three cases, one enlarged popliteal lymph node was the principal finding. In two of these, general malaise including anorexia was accompanied by a serosanguinous fluid discharge from the skin overlying the lymph node. Three other cats had a non-healing lesion on a foot (two forefeet and one hindfoot) consistent with having been bitten; most likely by rodents or another cat judging by the size of the lesions. Generalised lymphadenopathy with no other signs was much larger than other palpably enlarged nodes. One case was identified incidentally at a booster vaccination, presenting with an abdominal mass and a history of diarrhoea. Radiography of this cat and six of the other cases showed interstitial pneumonia. The ninth case was possibly a nosocomial infection presenting with a serosanguinous discharge from a swollen castration wound three weeks after the operation. *M bovis* was isolated in all seven confirmed cases from tissue samples – three biopsies of lymph node, lung removed postmortem, and three samples from non-healing wound tissue. Five cases were confirmed with an isolate similar to the isolated in the nine other confirmed cases from tissue samples – three biopsies of lymph node, lung removed postmortem, and three samples from non-healing wound tissue. Five cases were confirmed with an isolate similar to the isolated in the nine other confirmed cases. One sample was identified at postmortem, with a serosanguinous fluid discharge from the skin overlying the lymph node. Three other cats had a non-healing lesion on a foot (two forefeet and one hindfoot) consistent with having been bitten; most likely by rodents or another cat judging by the size of the lesions. Generalised lymphadenopathy with no other signs was much larger than other palpably enlarged nodes. One case was identified incidentally at a booster vaccination, presenting with an abdominal mass and a history of diarrhoea. Radiography of this cat and six of the other cases showed interstitial pneumonia. The ninth case was possibly a nosocomial infection presenting with a serosanguinous discharge from a swollen castration wound three weeks after the operation. *M bovis* was isolated in all seven confirmed cases from tissue samples – three biopsies of lymph node, lung removed postmortem, and three samples from non-healing wound tissue. Five cases were treated with antibiotic combinations of azithromycin with either marbofloxacin or rifampicin. All showed an apparent good response with marked diminishment of signs on chest radiographs taken one to three months following the beginning of treatment. For cases that were not treated, one died and the rest were euthanased. Only three of the five treated cats were known to have survived (one was euthanised and one disappeared). The presence or history of likely bite wounds in four cases, and popliteal lymph nodes potentially enlarged from a distal hindlimb inoculation in three others, offers a route of infection through biting for seven of the nine cases.

Geographically, the nine cats lived within a 5 km radius; six lived within a 250 m radius on a housing estate located adjacent to woodlands and approximately 250 m from a common, grazed with cattle from three different herds. Following the diagnosis of *M bovis* infection in the cats, tuberculin skin testing of the cattle on the common revealed a small number of test reactors infected with the same geno-
type as the cats. Direct contact of cats with these cattle was unlikely considering the cats’ roaming ranges. We suggest that the most likely source of infection for at least some of the cats is infected wildlife – probably rodents and/or badgers. Cat-to-cat transmission cannot be ruled out and could explain the tight spatiotemporal clustering of cases. Apart from one case mentioned, the veterinary practice could be ruled out as the source of infection for these cats because all were first presentations with little history of previous visits.

All *M. bovis* isolates from the culture-confirmed feline cases were of the 10:u genotype, previously identified in Great Britain in another cat (2011), an alpaca (2010) and 21 cattle herd breakdowns (Fig 1). All eight 10:u feline isolates and a selection of 10:u isolates from cattle and an alpaca were whole genome sequenced (WGS), as well as representative isolates of the closely related genotype, 10:a (Fig 2). Strains of 10:a in Great Britain represent 3.5 per cent of cattle isolates and are the closest *M. bovis* home range to Newbury (Fig 1). The isolates of 10:u from the cats are very similar in WGS, although two clusters can be separated by an informative mutation (Fig 2). These two clusters are also found in *M. bovis* isolates from local cattle. Although these data can be interpreted in a number of ways, the simplest explanation is that the two clusters of 10:u isolates in cats represent two separate transmissions from the local bovine TB population into these cats. That is, the informative WGS polymorphism in Newbury cats merely reflects the polymorphism found in the local cattle/wildlife population.

The detection of this unusual cluster of tuberculous disease in cats associated with *M. bovis* infection does not alter the current view that these animals represent occasional spillover hosts of the bacterium and play a limited role in the epidemiology of bovine TB in Great Britain. Nevertheless, *M. bovis* infections in cats can cause a serious chronic disease that, if not quickly diagnosed, can pose a very low risk of infection to human contacts and other animals (Public Health England 2014).

Given the lack of validated ante-mortem diagnostic assays for feline TB infection, the similar clinical and pathological presentations caused by different mycobacteria, and the implications for prognosis and case management, identification of the causative organism by culture remains the ‘gold standard’ diagnostic technique for bovine TB in cats. Practitioners faced with a suspected case of feline mycobacterial infection should submit fresh tissue samples from the affected animal for culture to a specialist laboratory such as AHVLA – Weybridge.

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Competing interests
No competing interests recorded.

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