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Bovine Tuberculosis in a Free Ranging Red Fox (*Vulpes vulpes*) from Doñana National Park (Spain)

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ABSTRACT: During 1997 and 1998, a survey of Iberian carnivores was conducted to study the epidemiology of bovine tuberculosis in the Doñana National Park and surrounding areas in southwestern Spain. Post-mortem examinations were done on seven red foxes (*Vulpes vulpes*), two Egyptian mongoose (*Herpestes ichneumon*), one weasel (*Mustela nivalis*), two genets (*Genetta genetta*), one Iberian lynx (*Lynx pardinus*), one Eurasian badger (*Meles meles*), and two polecats (*Mustela putorius*). Lesions suggestive of bovine tuberculosis were not detected but, in culture, *Mycobacterium bovis* was isolated from the retropharyngeal lymph nodes of one adult male red fox. This is the first report of *M. bovis* infection in red fox in Spain.

Key words: Bovine tuberculosis, carnivores, epidemiology, *Mycobacterium bovis*, red fox, *Vulpes vulpes*.

Infections with *Mycobacterium bovis*, the etiological agent of bovine tuberculosis, have been reported from numerous wildlife species worldwide (Thoen, 1994), and, in many countries such as New Zealand, Ireland, the United Kingdom, and the United States, wildlife reservoirs for *M. bovis* have been documented (Clifton-Hadley et al., 2001). In Spain, reports of *M. bovis* are limited to a few species from the Doñana National Park, and include wild boar (*Sus scrofa*; León-Vizcaíno et al., 1990), fallow deer (*Dama dama*; León-Vizcaíno, 1989) and Iberian lynx (*Lynx pardinus*; Briones et al., 2000; Pérez et al., 2001). *Mycobacterium bovis* also has been isolated from red deer and fallow deer pellets (León-Vizcaíno, 1989).

In this study we investigated the presence of bovine tuberculosis in carnivores found dead in Doñana National Park (36°48' to 37°7'N and 6°12' to 6°34'W) and surrounding areas.

Carcasses of carnivores were collected during 1997 and 1998. Location, sex, and approximate age were recorded for each animal and carcasses were frozen and transported to the laboratory for postmortem examination. At necropsy, parotid, mandibular, medial retropharyngeal, bronchial, mediastinal, and mesenteric lymph nodes, along with kidneys, lungs, spleen, and liver were collected for histologic examination and microbiologic culture as described by Schmitt et al. (1997). Samples for histopathology were fixed in 10% neutral buffered formalin and sections were stained with hematoxylin and eosin and an acid-fast stain using the Ziehl-Neelsen method. Culture identity was confirmed by polymerase chain reaction as described by Cousins et al. (1991).

Sixteen carcasses were collected: seven red foxes (*Vulpes vulpes*; four adult females, three adult males), two adult male and one female Egyptian mongoose (*Herpestes ichneumon*), one adult male weasel (*Mustela nivalis*), one adult female Iberian lynx (*Lynx pardinus*), one adult male Eurasian badger (*Meles meles*), two adult male genets (*Genetta genetta*), and two adult male polecats (*Mustela putorius*). One male red fox was excluded from gross examination due to poor carcass condition. Gross and microscopic lesions consistent with *M. bovis* infection were not observed; all sections were negative for acid-fast organisms. *Mycobacterium bovis* was cultured from a pooled tissue sample from one adult male red fox.

Mycobacterium bovis has been reported in red foxes in the United Kingdom (Delahay et al., 2001) and Michigan, USA (Bruning-Fann et al., 2001); this is the first

report from this species in Spain. The distribution and severity of lesions associated with *M. bovis* infection can affect the transmission and potential reservoir status because successful transmission requires excretion of the infectious agent. Although most mammalian species are susceptible to bovine tuberculosis (Francis, 1958), only a few are thought to be reservoirs for *M. bovis*. The lack of gross or microscopic lesions in the carnivores of Doñana suggests either recent infection or potential resistance to tuberculosis, but based on these results there is no indication that this species can serve as an effective reservoir. With numerous historic reports of *M. bovis* in wildlife species at Doñana National Park, the presence of *M. bovis* in a carnivore species is not surprising. The potential role of this species in the epidemiology of *M. bovis* at this site will require further study.

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