RESEARCH COMMUNICATION

Tuberculosis, caused by *Mycobacterium bovis*, in a kudu (*Tragelaphus strepsiceros*) from a commercial game farm in the Malelane area of the Mpumalanga Province, South Africa

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ABSTRACT

BENGIS, R.G., KEET, D.F., MICHEL, A.L. & KRIEK, N.P.J. 2001. Tuberculosis, caused by *Mycobacterium bovis*, in a kudu (*Tragelaphus strepsiceros*) from a commercial farm in the Malelane area of the Mpumalanga Province, South Africa. *Onderstepoort Journal of Veterinary Research*, 68:239–241

Tuberculosis, caused by *Mycobacterium bovis*, was diagnosed for the first time, in a kudu cow from a commercial game ranch in the Malelane area of the Mpumalanga Province close to the Kruger National Park. This diagnosis has important implications for the eradication of the disease in commercial and communal livestock in the area. Kudus are considered to be a potential maintenance host and, because of discharging fistulae in the parotid area where the lymph nodes are commonly infected, they have the potential of disseminating bacteria over wide areas. Cognisance should be taken of the presence of tuberculosis in a species other than domesticated cattle in this area and its implications for the control of tuberculosis in cattle.

Keywords: Kudu, *Tragelaphus strepsiceros*, tuberculosis

INTRODUCTION

In South Africa, tuberculosis (TB) in free-ranging wildlife on commercial farms was first reported in the Eastern Cape Province in kudus (*Tragelaphus strepsiceros*) by Paine & Martinaglia (1928). Following further investigations, Thorburn & Thomas (1940) published a report summarizing the knowledge at the time of the disease, then referred to as "Bushveld disease" of kudus. Commonly, the first clinical sign of tuberculosis in kudus is the development in the parotid area of a uni- or bilateral, fluctuating swelling (Fig. 1) that increases in size with time and frequently ruptures to intermittently discharge a thick, creamy exudate. Pressure exerted by enlarged lymph nodes on the larynx of tuberculous animals have sometimes been noted to cause a roaring or snoring sound (stridor) with respiration, hence the designation "roarers" used to refer to old, tuberculous kudus. In most instances, kudus remain in fairly good condition despite suffering from generalized tuberculosis; only advanced, terminal cases become emaciated. At necropsy, generalized cases reveal granulomatous lymphadenitis of the nodes of the head, neck, thorax and mesentery. Affected lymph nodes are markedly enlarged, some being 100 mm or more in diameter. Severe granulomatous pneumonia, tuberculous pleuritis and scattered granulomas in the liver, spleen and kidneys were also described in most terminal cases. The exudate in affected tissues is mostly soft and creamy. Histologically the exudate is characterized by the presence of large numbers of neutrophils in addition to the usual granulomatous inflammatory reaction in animals with TB typified by the presence of

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Accepted for publication 19 July 2001—Editor

FIG. 1 Multiple subcutaneous lumps caused by tuberculous lymph nodes in the parotid area of a kudu bull

large numbers of epithelioid cells and Langhans' giant cells.

Although it is uncertain, it appears that kudus in the Eastern Cape Province first contracted the disease from tuberculous cattle that were introduced into the area from the Western Cape Province. Conservation efforts that resulted in an increase in the numbers of kudus, apparently contributed to the increase in the prevalence of the disease. Other factors such as the dense bushveld and high humidity may have enhanced bacterial survival in the environment for extended periods. The use of communal drinking places, narrow game paths, as well as the intermittent discharge of exudate containing large numbers of bacteria, from the superficial lesions of affected kudus, probably also facilitated the transmission of the disease (Thorburn & Thomas 1940). It has been postulated that free-living kudus become infected per-cutaneously by scratching the inside of their ears with *Mycobacterium*-contaminated hooves. In contrast, kudus that apparently contracted tuberculosis by inhalation of aerosols containg mycobacteria, lacked lesions in the lymph nodes of the head and neck; most of the lesions in these animals were present in the lungs and thoracic lymph nodes (Himes, Lyvere, Thoen, Essey, Lebel & Freiheit 1976).

This communication reports the first diagnosis of tuberculosis, caused by *M. bovis*, in a kudu outside of the Kruger National Park in the Mpumalanga Province.

MATERIALS AND METHODS

The head and pluck of a kudu cow shot on a game farm in the Malelane area just south of the Kruger National Park were submitted for diagnostic purposes to the Veterinary Investigation Centre at Skukuza in the Kruger National Park. Smears made from the exudate of affected lymph nodes were stained with the Ziehl-Neelsen (ZN) staining method and examined at Skukuza. Specimens of the affected tissues were collected for histopathological examination and bacterial culture. Specimens for histopathology were fixed in 10 % buffered formalin and submitted to the Department of Pathology, Faculty of Veterinary Science, University of Pretoria at Onderstepoort, where they were processed using the routine methods for histopathological examination. Sections cut from these blocks were also stained with the ZN staining method for detection of acid-fast bacteria. Specimens for culture were collected in sterile containers, frozen at –20 °C and submitted to the Onderstepoort Veterinary Institute where they were cultured according to standard procedures (Bengis, Kriek, Keet, Raath, De Vos & Huchzermeyer 1996). Mycobacterial isolates were identified by biochemical tests and PCR (Keet, Kriek, Penrith, Michel & Huchzermeyer 1996). Genomic typing by RFLP was performed by the method of Skuce, Brittain, Hughes, Beck & Neill (1992).

RESULTS AND DISCUSSION

The kudu cow was reported to have been in good condition and had marked, bilateral swelling of the parotid area. A blocked fistulous tract was present in the swelling on the right-hand side of her head. The lymph nodes of the head as well as the bronchial and mesenteric lymph nodes were affected by severe granulomatous lymphadenitis. Multifocal granulomas that varied in diameter from 5–50 mm and containing caseo-necrotic exudate, were scattered throughout the lungs.

Acid-fast bacilli were detected on the ZN-stained smears made from the exudate and in tissue sections

that also revealed the typical histopathological lesions associated with TB. *Mycobacterium bovis* was cultured from the specimens of the diseased tissues. DNA fingerprinting revealed the *M. bovis* strain isolated from this kudu to be a RFLP type dissimilar to strains previously isolated from other species of wildlife within the adjacent Kruger National Park and from cattle in that region. To date, *M. bovis* infection in buffaloes has been documented (Bengis *et al.* 1996) to have spilled over into lions (*Panthera leo*), baboons (*Papio ursinus*) and cheetahs (*Acinonyx jubatus*) (Keet *et al.* 1996), and into kudus (Keet, Kriek, Bengis & Michel 1997).

The detection of a tuberculous kudu on a commercial game ranch is cause for concern as it probably reflects the likelihood of current *M. bovis* infection in other species (game or livestock) in this area. It is possible that this specific animal may have become infected through contact with TB-infected commercial cattle, or other infected species from the area. Alternatively, it may have contracted the disease in the Kruger National Park, and moved from there into the farming area although the distinct RFLP pattern of the *Mycobacterium* strain isolated, does not indicate any relationship with *M. bovis* strains isolated from the various species in the Kruger National Park.

The presence of TB in a kudu in this area is significant, whatever the source of the infection. It is known that the presence of additional infected species in an environment complicates control measures for the eradication of tuberculosis in cattle (Walker, Reid & Crews 1993; Coleman, Jackson, Cook & Grueber 1994; Nolan & Wilesmith 1994). Kudus, in particular, are known to cross game fences between farms with ease and they may disseminate the infection to uninfected areas in this way. An additional feature of tuberculosis in a kudu, viz. the discharge over long periods of *M. bovis*-containing exudate from the fistulous nodes below their ears, may result in contamination of the environment (browse, water, dust) over a wide area. These features may serve to perpetuate the infection in cattle and render ineffective the control measures in place for eradication of TB in commercial and communal stock. The detection of an infected kudu outside the KNP makes it important to evaluate and monitor the status of other known or likely TB-infected host species of wildlife in areas where tuberculosis in wildlife and/or domestic stock is known to occur.

REFERENCES

BENGIS, R.G., KRIEK, N.P.J., KEET, D.F., RAATH, J.P., DE VOS, V. & HUCHZERMEYER, H. 1996. An outbreak of bovine tuberculosis in a free-living African buffalo (*Syncerus caffer,* Sparrman) population in the Kruger National Park: a preliminary report. *Onderstepoort Journal of Veterinary Research*, 63:15–18.

COLEMAN, J.D., JACKSON, R., COOKE, M.M. & GRUEBER, L. 1994. Prevalence and spatial distribution of bovine tuberculosis in brushtail possums on a forest-scrub margin. *New Zealand Veterinary Journal*, 42:128–132.

HIMES, E.M., LYVERE, D.N., THOEN, C.O., ESSEY, M.A., LEBEL, J.L. & FREIHEIT, C.F. 1976. Tuberculosis in greater kudu. *Journal of the American Veterinary Medical Association*, 169: 930– 931.

KEET, D.F., KRIEK, N.P.J., PENRITH, M.-L., MICHEL A. & HUCHZERMEYER, H. 1996. Tuberculosis in buffaloes (*Syncerus caffer*) in the Kruger National Park. Spread of the disease to other species. *Onderstepoort Journal of Veterinary Research*, 63:239–244.

KEET, D.F., KRIEK, N.P.J., BENGIS, R.G. & MICHEL, A. 1997. Tuberculosis in buffaloes (*Syncerus caffer*) in the Kruger National Park. Spread of the disease to kudu *(Tragelaphus strepsiceros*). *Onderstepoort Journal of Veterinary Research*, 68: 225–230.

NOLAN, A. & WILESMITH, J.W. 1994. Tuberculosis in badgers (*Meles meles*). *Veterinary Microbiology,* 40:179–191.

PAINE, R. & MARTINAGLIA, G. 1928. Tuberculosis in wild buck living under natural conditions. *Journal of the South African Veterinary Medical Association*, 1:87–91.

SKUCE, R.A., BRITTAIN, D., HUGHES, M.S, BECK, L.-A. & NEILL, S.D. 1992. Genomic fingerprinting of *Mycobacterium bovis* from cattle by restriction fragment length polymorphism analysis. *Journal of Clinical Microbiology,* 32:2387–2392.

THORBURN, J.A. & THOMAS, A.D. 1940. Tuberculosis in the Cape kudu. *Journal of the South African Veterinary Medical Association*, 11:3–10.

WALKER, R., REID, B. & CREWS, K. 1993. Bovine tuberculosis in predators in the MacKenzie Basin. *Surveillance-Wellington,* 20:11–14.