During 2016–2017, when Kruger National Park, South Africa, was under quarantine to limit bovine tuberculosis spread, we examined 35 white and 5 black rhinoceroses for infection. We found 6 infected white rhinoceroses during times of nutritional stress. Further research on Mycobacterium bovis pathogenesis in white rhinoceroses is needed.

Tuberculosis (TB) caused by Mycobacterium tuberculosis or M. bovis has been reported in captive rhinoceroses since the early 1800s (1–3). Bovine TB is endemic in many wildlife populations worldwide, including among those in Kruger National Park (KNP), South Africa (4). KNP contains the largest free-living population of white rhinoceroses in the world (estimated at 6,649–7,830). However, prolonged drought in South Africa (2015–2017) raised concerns that starvation and disease could increase the mortality rate and affect conservation efforts for this species (5).

In June 2016, a black rhinoceros (Diceros bicornis minor) with an M. bovis infection was discovered (6). Thereafter, a surveillance program was initiated to screen rhinoceros carcasses in KNP, leading to 35 white and 5 black rhinoceros carcasses being examined during June 2016–October 2017. To determine which animals were infected, we conducted macroscopic examinations and collected samples for histopathologic studies and mycobacterial culture, as previously described (7). Research protocols were approved by the South African National Park Animal Use and Care Committee and ethics committee of Stellenbosch University.

No additional cases of M. bovis infection were found in black rhinoceroses. However, we confirmed M. bovis infection in 6 white rhinoceroses (Table). Grossly visible lesions, mostly found in the retropharyngeal or tracheobronchial lymph nodes or lung, were typically small and localized and could easily be missed or mistaken for granulomas caused by other pathogens if careful dissections of tissues were not performed (online Technical Appendix, https://wwwnc.cdc.gov/EID/article/24/12/18-0293-Techapp1.pdf). On histologic examination, we found granulomatous inflammation in lung or lymph node sections and rare acid-fast organisms in some granulomas (Table). We typed these M. bovis isolates as strain SB0121, the most common strain found in KNP (8).

Four of the infected animals were found during September–November 2016, near the end of the drought, and the remaining 2 animals were found in September and October 2017, at the end of the next winter. The timing of infections suggests that animals under nutritional stress might be more susceptible to infection, similar to observations in other species (9). The low number of positive cases and localized paucibacillary lesions support the hypothesis that white rhinoceroses, although susceptible to infection,
are able to limit disease progression (10). However, whether infected animals would develop disease if compromised is unknown. Location of lesions yielding positive cultures suggests an aerosol route of exposure, although M. bovis was also isolated from mesenteric and peripheral lymph nodes (Table). Although no data were available to evaluate transmission, a previous study has shown white rhinoceroses with localized M. bovis infection did not regularly shed bacilli (10). Further research is required to understand the pathogenesis and epidemiology of M. bovis infection in these animals.

Fresh samples from animals that die naturally are difficult to locate in a large ecosystem, especially before predators arrive at the carcass or decomposition occurs due to elevated temperatures. In our study, collection of samples with minimal degradation was facilitated by our examining only rhinoceroses dead for <12 hours and animals euthanized because of their severe state of debilitation, most often from poaching wounds. Bovine TB was not considered the cause of the poor condition or death in any of these animals. We found small, nonspecific culture-positive lesions histologically similar to those caused by helminths, foreign material, and fungi, and the paucibacillary nature of the infection could result in false-negative histopathologic results. Therefore, we needed to confirm infection by mycobacterial culture and species determination with every tissue set collected. However, low numbers of viable bacteria, sample handling, and the likelihood of overgrowth by contaminants could also lead to false-negative culture results. Positive culture results from >1 tissue sample in the same rhinoceros suggests infection rather than contamination. However, no cases of disseminated bovine TB have been observed in this species, supporting the authors’ hypothesis that the disease in white rhinoceroses is self-limiting. Factors such as drought might play a role in altering susceptibility to infection, considering no positive culture results were obtained in >20 rhinoceros carcasses examined before June 2016.

Although disease and death associated with bovine TB have not been observed in white rhinoceroses, M. bovis infection nonetheless presents a threat to conservation of this species. Genetic management and translocation of rhinoceroses are essential components of in situ conservation; animals need to be moved from high-risk poaching areas to more secure locations (5). In addition, calves orphaned by poaching require intensive specialized care, which is only available outside KNP (5). Because M. bovis is a controlled disease, premises with infected populations are placed under quarantine to prevent translocation of potentially infected animals. With a paucity of data to assess risks, movement restrictions are a substantial impediment to conservation and can threaten the survival of this population. Therefore, research into antemortem detection, pathogenesis, and epidemiology of M. bovis infection is essential for programs to conserve rhinoceroses of Africa.

Acknowledgments
We thank the staffs of the South African National Parks, State Veterinary Services of KNP, National Zoological Gardens of South Africa, and Faculty of Veterinary Science, University of Pretoria, for providing assistance with these cases.
This study was supported by South African National Parks, National Research Foundation South African Research Chair Initiative in Animal Tuberculosis (grant no. 86949), the Department of Science and Technology–National Research Foundation Centre of Excellence for Biomedical Tuberculosis Research, and the South African Medical Research Council.

About the Author
Prof. Miller is the South African Research Chair in Animal TB at the Department of Science and Technology–National Research Foundation Centre of Excellence for Biomedical TB Research, and a member of the South African Medical Research Council, Centre for Tuberculosis Research, at Stellenbosch University, Cape Town, South Africa. Her research interests include infectious diseases that threaten animal conservation.

References

Address for correspondence: Michele A. Miller, DST-NRF Centre of Excellence for Biomedical TB Research, MRC Centre for Tuberculosis Research, Division of Molecular Biology and Human Genetics, Faculty of Medicine and Health Sciences, Stellenbosch University, PO Box 241, Cape Town 8000, South Africa; email: miller@sun.ac.za

Lung Involvement in Chronic Schistosomiasis with Bladder Squamous Cell Carcinoma

Anastasia Saade, Edith Carton, Audrey Mansuet-Lupo, Romain Jouffroy, Diane Damotte, Hélène Yera, Marie-Pierre Revel, François Goldwasser

Author affiliations: Hopital Cochin, Paris, France (A. Saade, E. Carton, A. Mansuet-Lupo, D. Damotte, H. Yera, M.-P. Revel, F. Goldwasser); Universite Paris Descartes, Paris (A. Saade, R. Jouffroy, M.-P. Revel, F. Goldwasser)

DOI: https://doi.org/10.3201/eid2412.180355

We report a case of chronic Schistosoma haematobium infection with pseudometastatic pulmonary nodules and high-grade squamous cell carcinoma in a 30-year-old man in Mali. Lung biopsies revealed chronic pulmonary involvement of S. haematobium and ruled out lung metastases.

A 30-year-old man from Mali, who had immigrated to France a year before, was hospitalized for acute urinary retention. The patient reported isolated hematuria over the preceding month with recent dysuria. He was afebrile and had normal vital signs. Physical examination revealed pelvis tenderness and guarding. The only biologic abnormality was a hypereosinophilia (1,640 cells/mm³). Unenhanced computed tomography (CT) revealed linear calcifications on the bladder wall, with a large intraluminal mass infiltrating the left ureter (Figure, panel A). Cystoscopy was typical of schistosomiasis. Anatomopathology revealed urinary schistosomiasis complicated by a high-grade, well-differentiated, keratinized squamous cell carcinoma (SCC) (Figure, panel B). Within the wall, ovoid structures, sometimes calcified,