Human Tuberculosis in a Rhinoceros

Robert D. Powers, D.V.M., Ph.D., and Robert A. Price, D.V.M., M.D.

A 16-YEAR-OLD black rhinoceros, purchased from Ringling Brothers Circus in Sarasota, Fla., by the Overton Park Zoo, Memphis, Tenn., in August, 1958, was apparently in good health at that time and during the ensuing 6 years. Beginning about 1 year prior to death, the rhinoceros became mildly anorexic, and gradually lost weight. Two weeks prior to death, it developed a productive cough characterized by blood-stained mucopurulent exudate. Despite intensive penicillin therapy during these 2 weeks, the rhinoceros died (March 30, 1966).

Gross Pathologic Findings

At necropsy, the rhinoceros weighed 1,750 lb. The upper respiratory tract and oral cavity contained a large amount of mucopurulent material. Ziehl-Neelsen stain of this exudate revealed large numbers of gram-negative rod-shaped organisms. The pleural cavities contained no excess fluid. There was 500 ml. of clear straw-colored fluid in the pericardial cavity. Each lung weighed 10 kg. and was covered by fibrinous adhesions. Located in the dorsal and posterior areas of each lung were multiple fibrocystic lesions and caseous tubercles several millimeters to 8 cm. in diameter (Fig. 1). The remaining portions were consolidated, and many segments contained numerous miliary lesions. The pulmonary hilar lymph nodes were enlarged and contained several miliary lesions. There was 4,000 ml. of clear straw-colored fluid in the peritoneal cavity and focal peritonitis with hemorrhagic adhesions between the cecum, urinary bladder, and parietal peritoneum.

Histopathologic Findings.—The lungs contained multiple fibrocalcific cystic areas, microabscesses, granulomas, acute bronchopneumonia, and diffuse alveolar edema. Lesions with central necrosis surrounded by epitheloid cells, macrophages, and multinucleated giant cells were scattered throughout the lung tissue. Ziehl-Neelsen stain of lung tissue revealed numerous extracellular and intracytoplasmic acid-fast bacilli consistent morphologically with *Mycobacterium tuberculosis*. Gram stain revealed numerous gram-negative rod-shaped organisms. Cultures of lung tissue yielded *M. tuberculosis* and *Pseudomonas aeruginosa*. *Mycobacterium tuberculosis* var. *hominus* was identified through biochemical and animal inoculation typing by the National Animal Disease Laboratory, Ames, Iowa. There were small granulomas in the pulmonary hilar lymph nodes. Multiple small foci of lymphocytes were scattered throughout the liver. Hemosiderin was prominent within the cytoplasm of macrophages in the spleen and Kupffer's cells of the liver. Sections of the colon revealed numerous *Balantidium coli* within the mucosal crypts (Fig. 2). Inflammatory response to these organisms was minimal; however, mucosal epithelium was focally denuded.

Discussion

Tuberculosis (var. *hominus*) in wild mammals has been reported in ungulates, carnivores, primates, and an ele-

From the Department of Pathology, University of Tennessee, and Overton Park Zoo, Memphis, Tenn. 38103. Dr. Powers is assistant professor, Department of Pathology, University of Tennessee, and Dr. Price is Fellow in Pathology, University of Tennessee and City of Memphis Hospitals.

The authors thank Mr. R. H. Mattlin, Overton Park Zoo director, and Dr. R. P. Houk, veterinary consultant to Overton Park Zoo, for referring this case for postmortem examination.

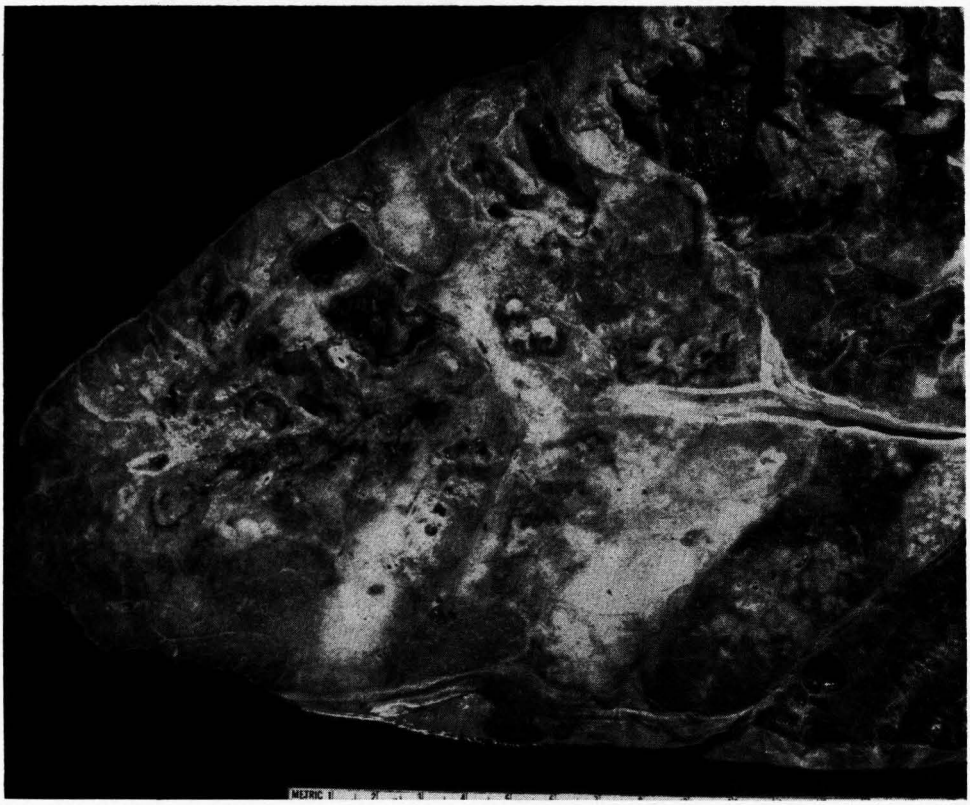

Fig. 1—Cut section of lung. There are diffuse granulomas, extensive cavitation dorsally, extensive segmental pneumonia, and alveolar emphysema (lower left).

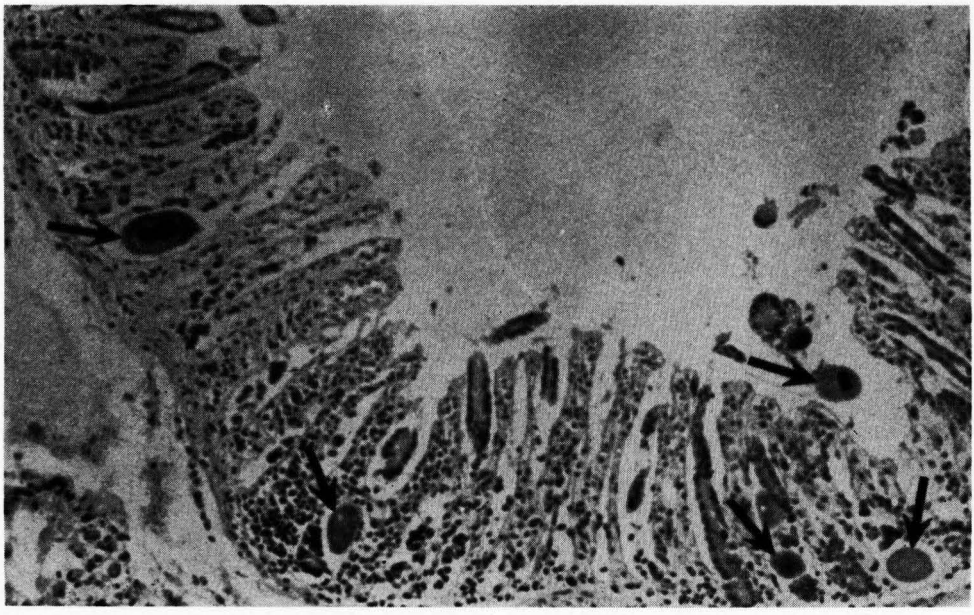

Fig. 2—Colon containing Balantidium coli (arrows). H&E stain; × 100.

phant.[1,2,5] The human variety of tubercle bacillus has also been isolated from a parrot.[5] Pulmonary tuberculosis in another elephant has been reported; however, the bacillus type was not identified.[4] Tuberculosis in a rhinoceros has been recognized in the London Zoo, but the type was identified as bovine.[2] Reports of other cases of tuberculosis in wild animals have been published elsewhere.[3] Intermediate purified protein derivative (P.P.D.) intradermal skin tests on all persons in close contact with this rhinoceros were negative for the 9 months following exposure.

References

[1] Borg, K.: Human Tuberculosis in an Otter. Tijdschr. Diergeneesk, 89, (1964); abstr. in J.A.V.M.A., 147, (Nov. 15, 1965): 1074.

[2] Griffith, A. S.: Infections of Wild Animals with Tubercle Bacilli and Other Acid-fast Bacilli. Proc. Roy. Soc. Med., 32, (1939): 1405-1412.

[3] Halloran, P. O.: A Bibliography of References to Disease of Wild Mammals and Birds. Am. J. Vet. Res., 16, (Oct., 1955): 1-465.

[4] Seneviratna, P., Wettimuny, S. G. de S., and Seneviratna, D.: Fatal Tuberculosis Pneumonia in an Elephant. Vet. Med., 61, (Feb., 1966): 129-132.

[5] Wilson, G. S., and Miles, A. A.: Topley and Wilson's Principles of Bacteriology and Immunity. 4th ed. Williams and Wilkins Co., Baltimore, Md., 1955.

Caries in Rats

The assumption that the caries experience in rats is comparable to the caries experience in man is suspect for several reasons. Results of experiments on rats should be accepted with caution, if not with suspicion.

Normal, healthy rats are immune to caries, whereas experimental rats are prone to caries. This susceptibility to caries is an inherited trait of the experimental Batell rats, and the inference is that these rats are neither healthy nor normal.

Variations in diet could have an exaggerated effect on a sick animal apart from any local effect on the teeth.

Also, the normal blood pH of a rat is 8.0, compared with the value of 7.0 in man, and this higher pH could produce a different calcium-phosphorus balance.

If the tooth proteins are involved in the carious process, proteins having an isoelectric point between 7.0 and 8.0 would be acting as alkalis in man and as acids in rats. These differences throw serious doubts on the advisability of comparing rats with man. Until it is shown that there is a definite relation between rat and human experience, results of experiments on rats should be accepted with caution.

The danger of assuming that animal and human experience is comparable was vividly demonstrated when penicillin was first tested on tubercular guinea pigs. They died much faster than the control tubercular guinea pigs. This experiment would tend to show that penicillin was absolutely lethal in tuberculosis patients, which is certainly not so.—*R. J. Morton, Brit. Dent. J., 121, (Oct. 18, 1966):* 352; *abstr. in Dental Abstracts, March, 1967.*