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A Fibrosarcoma in the Skeletal Muscle of a Capybara (*Hydrochoerus hydrochaeris*)

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ABSTRACT: An 8-yr-old male capybara (*Hydrochoerus hydrochaeris*), a resident of an urban zoological collection in upstate New York (USA), had a mass posteroventral to its left stifle; it was of unknown duration. The mass was a fibrosarcoma based on invasive sheets of interwoven spindle-shaped neoplastic cells with moderate associated extracellular matrix composed of collagen fibers. Supportive immunohistochemical staining was positive for vimentin but negative for cytokeratins, desmin, and myoglobin. The animal subsequently died of unknown causes. This is the first known report of a neoplasm in a capybara.

Key words: Capybara, *Hydrochoerus hydrochaeris*, fibrosarcoma, neoplasm, rodent, skeletal muscle, case report.

An 8-yr-old, 56 kg, male capybara (*Hydrochoerus hydrochaeris*) was examined by the veterinary staff of the Buffalo Zoological Gardens, Buffalo, New York (USA) to evaluate a swelling posteroventral to the left stifle and an associated stiff gait. The duration of the problem was unknown. Palpation of the swelling revealed a firm, immovable mass approximately 16 mm in diameter.

The animal was anesthetized via blowgun dart with 10 mg xylazine (Rompun® 20 mg/ml; Mobay Corporation, Animal Health Division, Shawnee, Kansas, USA) and 550 mg ketamine HCl (Ketaset®, Fort Dodge, Laboratories, Inc., Fort Dodge, Iowa, USA), and maintained on 4% halothane (Halothane USP, Halocarbon Laboratories, Inc., North Augusta, South Carolina, USA) and oxygen delivered at 3 l/min via face mask.

Based on radiographs of the left hindlimb mass, we observed a soft tissue density with a thick more radiodense external lining capsule. The limb mass was aspirated and cultured for aerobic and anaerobic bacteria. Aerobic cultures consisted of specimens being plated onto trypticase soy agar with 5% sheep blood, chocolate II agar with hemoglobin and IsoVitaleX, Levine EMB agar, and Columbia CNA agar with 5% sheep blood (BBL, Becton Dickinson Microbiology Systems, Cockeysville, Maryland, USA). Plates were incubated in 6% CO_2 for 72 hr, but were examined starting at 24 hr. Any bacteria isolated were identified with the biochemical techniques of Carter and Cole (1990) and Balows et al. (1991), or the Sensititre System (Senisititre Systems Group, Radiometer America, Inc., Westlake, Ohio, USA). Anaerobic cultures consisted of plating specimens onto *Brucella* blood agar, phenylethyl alcohol blood agar, and enriched in chopped meat carbohydrate broth medium (Anaerobe Systems, Inc., San Jose, California, USA). Plates were incubated for 72 hr at 37 C in an anaerobic chamber (Anaerobe Systems, Inc., San Jose, California, USA); suspect colonies were identified using the techniques of Holdeman et al. (1977) and Sutter et al. (1985). Both cultures subsequently were negative for growth.

The aspirate was a medium yellow fluid with a high protein content (>2,000 mg/dl; Multistix®, Miles Labs, Naperville, Illinois, USA). A sediment from the aspirate was air-dried on a 2.5-x-76 mm glass microscope slide, and stained on an automatic slide staining machine incorporating a modified polychrome methylene blue eosin stain (Hemateck 1000, Miles Lab, Naperville, Illinois, USA). These cytologic smears had a moderately cellular sediment with moderate numbers of macrophages, neutrophils, and erythrocytes. There were

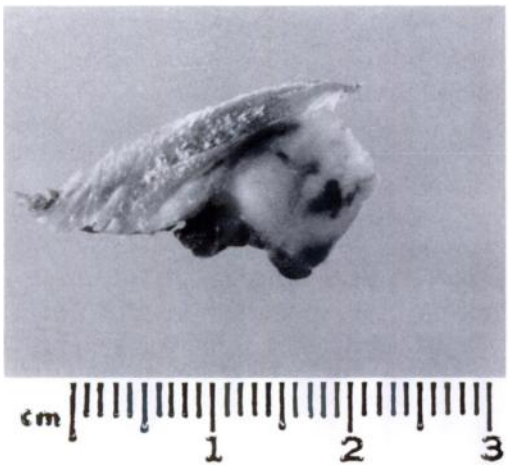

FIGURE 1. Moderately delineated, firm, white mass with central hemorrhage infiltrating skeletal muscle of left hindlimb. Formalin-fixed gross specimen.

a few lymphocytes and no bacteria were seen. The interpretation was that this fluid was removed from a seroma.

The mass was surgically biopsied. It was edematous with firm, white nodular areas and associated fibrin, and was adherent to soft tissues at the posterior margin of the left stifle joint. Representative biopsy specimens of the mass were submitted in 10% neutral buffered formalin to the biopsy service of the Pathology Department, College of Veterinary Medicine at Cornell University, Ithaca, New York, for microscopic evaluation. Tissues were dehydrated through a series of increasingly concentrated (70 to 100%) ethanol solutions and then cleared in ProPar Clearant® (Anatech Ltd., Battle Creek, Michigan, USA) on a VIP 3000 Processor (Miles Inc., Elkhardt, Indiana, USA). They were embedded in paraffin, sectioned at 4 μm, and stained with hematoxylin and eosin.

The loose to densely cellular mass consisted of sheets of interwoven spindle-shaped cells (fibroblasts) with light eosinophilic cytoplasm and elongate basophilic euchromatic nuclei; these cells formed variable amounts of collagen which stained blue with Masson's trichome stain (Lune, 1966). There were no normal tissue boundaries to examine for possible invasion. The mitotic index was 0 to 1/high power field. A diagnosis of atypical fibroma was made.

Two days after surgery, the animal was depressed and immobile in the morning, and died in the early afternoon. Gross findings included a rounded appearance of the heart with an epicardial white fibrous material; hepatomegaly in which the liver had rounded edges, friable texture and mottled appearance; and bilateral renomegaly. The surgical biopsy site contained a partially demarcated, firm, white, nodular mass with central hemorrhage, which invaded the musculature of the left caudal thigh (Fig. 1). The cause of the animal's death was not apparent. Specimens of heart, liver, kidney and the hindlimb mass were submitted to the Pathology Department of the New York State College of Veterinary Medicine for microscopic evaluation and evaluated as previously described.

Additionally, unstained 3 μm sections of the mass (both biopsy and necropsy samples) were submitted to the immunohistochemistry laboratory of the same institution for indirect immunoperoxidase staining using the streptavidin-biotin technique via a commercial kit (Zymed Streptavidin-Biotin System, Zymed Laboratories, Inc., San Francisco, California, USA) with staining methods modified as follows. Briefly, tissues were blocked for endogenous peroxidase by incubating with 0.5% H_2O_2 in methanol for 10 min and rinsed twice with 0.01 M phosphate buffered saline (PBS) pH 7.2 for 5 min. Specimens and controls to be stained for cytokeratin and myoglobin were treated with 0.1% trypsin (Sigma Chemical Co., St. Louis, Missouri, USA)/0.1% CaCl pH 7.8 in a 37 C water bath for 1 hr; specimens and controls to be stained for vimentin and desmin were not treated with trypsin. All samples were incubated with 10% normal serum from the host animal of the second antibody. The normal serum was then gently tapped off and the tissues were stained with primary antibodies for cytokeratin (Anti-keratin AE1/AE3® monoclonal an-

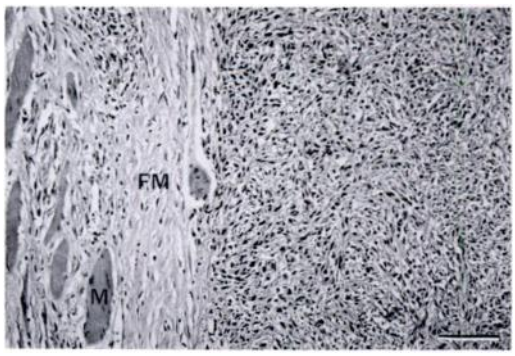

FIGURE 2. The periphery of the mass with sparsely cellular, abundant extracellular matrix (EM) dissecting between atrophic skeletal myofibers (M). H&E. Bar = 100 μm.

tibody, Boehringer Mannheim, Indianapolis, Indiana, USA) run at a 1:100 dilution, vimentin (DAKO-Vimentin® monoclonal antibody, Dako Corporation, Carpinteria, California, USA) run at a 1:20 dilution, desmin (DAKO Desmin D33® monoclonal antibody, Dako Corporation, Carpinteria, California, USA) run at a 1:25 dilution, and myoglobin (polyclonal rabbit anti-myoglobin, Zymed Laboratories, Inc., San Francisco, California, USA) run at a 1:200 dilution. The sections were then rinsed three times with PBS for 5 min each and incubated for 10 min with the appropriate biotinylated secondary antibody (rabbit anti-mouse IgG or goat anti-rabbit IgG). Next, sections were rinsed three times with PBS for 5 min each, incubated with streptavidin/peroxidase conjugate at 20 C, washed three times with PBS, and subsequently stained with the chromagen 0.05% 3,3-diaminobenzidine (Kirkgard and Perry Lab, Inc., Gaithersburg, Maryland, USA). This resulted in the development of a brown reaction ≤15 min. The reaction was stopped by rinsing in distilled water and the sections were counterstained for 3 min with #2 hematoxylin (Fisher Scientific, Springfield, New Jersey, USA). All reactions were carried out in a humid chamber. Negative controls consisted of substitution of non-immune rabbit serum or Balb/c ascites fluid for the primary antibody on contiguous sections.

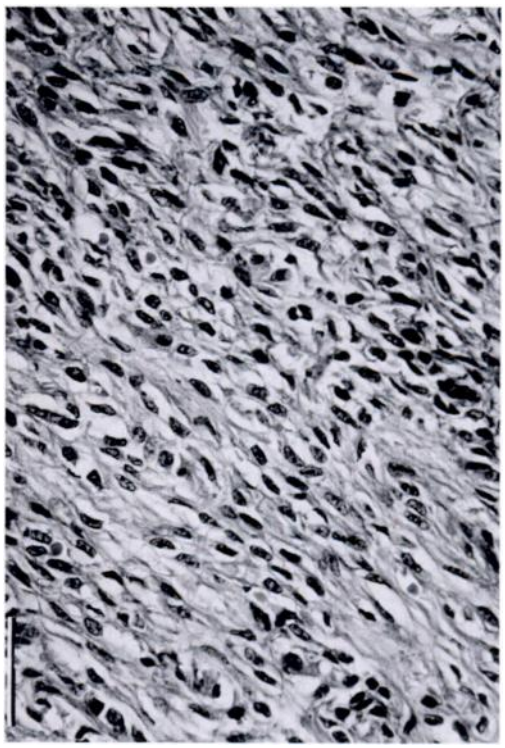

FIGURE 3. The densely cellular neoplastic mass is composed of sheets of spindle-shaped cells with elongate basophilic nuclei. H&E. Bar = 50 μm.

The skeletal muscle specimen contained a large, well-demarcated but nonencapsulated mass. The periphery of the mass was sparsely cellular, and had abundant extracellular fibrillar matrix composed of collagen fibers which dissected between and around atrophic myofibers (Fig. 2). The presence of collagen was confirmed with Masson's trichome stain. The mass proper was composed of densely cellular sheets of interwoven spindle-shaped cells with large, elongate basophilic nuclei (Fig. 3). The mitotic index was 0 to 1/high power field. There was extensive necrosis in the central portion of the mass. Immunohistochemical staining was positive for vimentin (a characteristic intermediate filament of mesenchymal origin cells) within the cytoplasm of the neoplastic cells but was negative for cytokeratins, desmin, and myoglobin.

Based on the microscopic and immu-

nohistochemical analyses, we interpreted this to be a low-grade fibrosarcoma. We believe that the antemortem and postmortem specimens represented slightly variant patterns of the same neoplasm. A representative specimen of this neoplasm (#2373749) has been deposited with the Armed Forces Institute of Pathology Tumor Registry (Washington, D.C., USA).

The heart had moderate epicardial and endocardial fibroelastosis. There were no significant hepatic or renal histologic lesions. The cause of this animal's death was not evident. However, it's initial anamnesis is compatible with this space-occupying neoplastic mass.

Capybaras are susceptible to staphylococcosis and tuberculosis (Wallach and Bolver, 1983). Griner (1983) found sarcoptic mites, *Salmonella typhimurium* enteritis, *Aspergillus* sp. dermatitis, *Trichuris* sp. enteritis, trypanosomiasis, cestodes, nematodes and *Balatidium coli* in 13 capybaras.

Numerous published surveys fail to list a single report of neoplasia in these rodents (Halloran, 1955; Appleby, 1969; Effron et al., 1977; Griner, 1983; Nowak and Paradiso, 1983; Schmidt and Hubbert, 1987). This appears to be the first report of a skeletal muscle fibrosarcoma (or any neoplasm) in the capybara.

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