halo of chondromucinous substance which often blended with adjacent larger deposits encircling the alveoli. This chondromucinous substance stained pale to deep blue with alcian blue stain and pink with PAS stain. The mitotic index was moderate (1 to 2/high power field). Large areas of ischemic necrosis were prominent in portions of the tumor, especially in the central portion of large lobules. Multifocal interstitial infiltration of lymphocytes and plasma cells was present in several areas.

One-half of the left auxillary lymph node was occupied by a circumscribed metastatic tumor comprised of epithelial cells arranged in solid clumps and tubuloalveolar structures (fig. 4). The cells had a higher mitotic index (2-3/high power field) than those of the primary tumor, but were morphologically similar except for the reduced content of cytoplasmic lipid and the complete absence of associated chondromucin. There was no evidence of metastasis in any of the other organs examined.

This tumor lacked the characteristic elongated myoepithelial cells which appear to give rise to the cartilaginous and osseous components observed in mixed mammary tumors of dogs; however, there was clear evidence in the primary tumor that some of the neoplastic cells, even when lining a tubuloalveolar structure, were producing chondromucin. It also was evident that epithelial cells occupied lacunar structures within areas of almost fully differentiated cartilage and that some had acquired a chondrocyte appearance. This, we believe, constitutes divergent differentiation of the essential cells of the neoplasm, the criterion for designation as a mixed tumor. The morphology of this tumor resembles the malignant mixed mammary tumor or carcinosarcoma seen in domestic animals.[3]

With the exception of poxvirus-induced fibromas,[5] tumors reported in Sciuridae have been limited to adenomas,[6] adenocarcinomas,[4,6] and hypernephromas[2,6] of the kidney; carcinomas of the lung and pancreas;[1] adenoma of the liver;[1,6] osteoma of the sternum;[2,6] and fibromyoma of the uterus.[1]

Mammary tumors have not been reported previously in squirrels.

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Disseminated Basidiobolomycosis in a Dog

R. I. MILLER and G. H. TURNWALD

Basidiobolomycosis is a disease caused by the fungus *Basidiolobus haptosporus* of the order Entomophthorales, class Zygomycetes. The disease has been reported from horses with ulcerative subcutaneous granulomas of the upper legs, trunk, neck and head[13] and from man with subcutaneous swellings of the thigh, buttocks, trunk and upper arm.[7] Another entomophthoraceous fungus, *Conidiobolus coronatus* has caused subcutaneous swellings of the nasofacial region of man,[7] horses,[3,13] and a chimpanzee.[15] These entomophthoraceous fungi rarely are reported to disseminate. Infections in man caused by *C. coronatus* have been reported in the mediastinum[6] and submandibular lymph node,[9] while *B. haptosporus* has been isolated from the inguinal lymph node,[8] gastrointestinal tract,[1] maxillary sinus and palate,[5] and pelvic cavity.[16] Culturally unconfirmed entomophthoromycosis in man have involved widespread hematogenous dissemination from the face[14] and infection of the stomach, colon, liver, biliary system, pancreas, and duodenum.[2] The only disseminated entomophthoraceous infection reported in animals was in a mandrill and was not cultured.[11] This report is in a new

host species widely removed from the traditional hosts (horse, man) and confirms dissemination of *B. haptosporus*.

A 4½-year-old intact Golden Labrador was presented with a one-month history of vomiting following ingestion of food or water and anorexia of one-week's duration. Physical examination revealed poor condition, depression, pyrexia (103.0°F), mild tachypnea (30/minute), and splenomegaly. The complete blood count revealed leukocytosis (29,600 cells/mm^3) with a mature neutrophilia (27,200 cells/mm^3). *Dirofilaria immitus* larvae were observed on a Knott test. Serum chemistry and electrolyte values were within normal limits. The urine specific gravity was > 1.035, and there was proteinuria (> 100 mg/dl). Upper gastrointestinal radiographs using barium sulfate revealed thickening of the wall of the stomach and multiple filling defects in the small intestine. During hospitalization the dog continued to vomit, became more depressed, and died before a scheduled laparotomy could be done. At necropsy, numerous firm, yellow-white, irregular, nodular masses, 1 to 20 mm in diameter were found. They were on the pleura, especially of the mediastinum and diaphragm, and on the peritoneum, especially of the diaphragm and anterior root of the mesentery. The lungs were mottled diffusely with red areas in all lobes and yellow-white firm nodules were present at the hilus. The liver and spleen were enlarged and numerous irregular focal pale areas up to 4 cm in diameter were present throughout the parenchyma of each. The gastric wall was thickened and the mucosa diffusely hemorrhagic. A large 4 cm ulcer was present in the pyloric area. Several focal areas of ulceration were present throughout the intestine. Impression smears of some lesions revealed a mixture of inflammatory cells, thus a deep mycotic infection was suspected. Tissues for fungal culture were minced into 1 mm cubes, washed vigorously in sterile water, implanted into Sabouraud's dextrose agar in 9 cm Petri plates and incubated at 26°C and 37°C.

Histologically all tissues with gross lesions had severe granulomatous inflammatory changes. There were also large areas of necrosis in the liver, spleen, and pancreas. The diffuse granulomatous reaction was characterized by histiocytic, fibroblastic, and endothelial proliferation and the formation of numerous giant cells. Numerous areas of necrosis were scattered diffusely throughout the granulation tissue and were associated with marked neutrophilic infiltration. Plasma cells commonly were found throughout the affected tissues but eosinophils rarely were seen. In hematoxylin and eosin-stained sections faintly outlined fungal hyphae were seen in

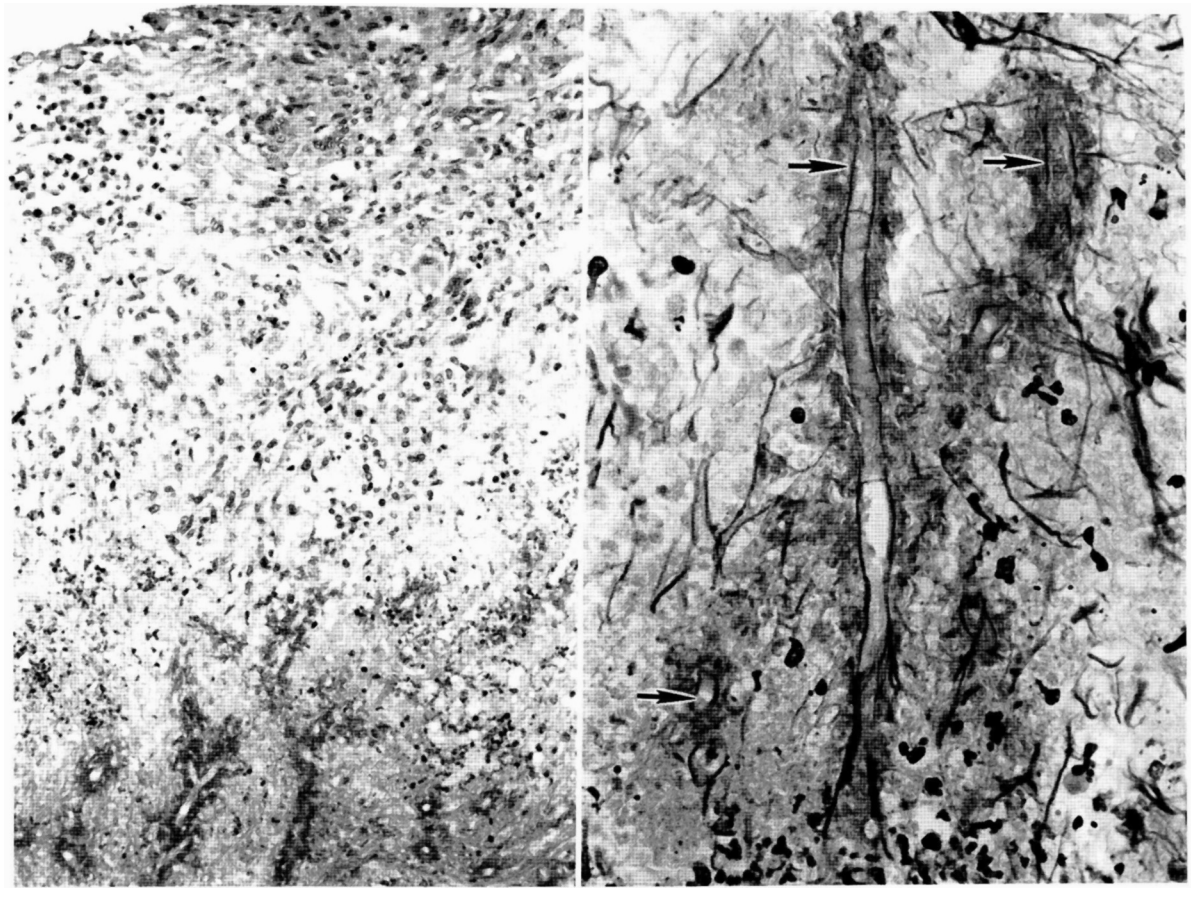

Fig. 1: Basidiobolomycosis, mediastinal mass of dog. Fungal hyphae surrounded by narrow, dark-staining sleeves within necrotic areas (lower one-third of picture) in dense granuloma that contains numerous epithelioid and giant cells.

Fig. 2: Basidiobolomycosis, mediastinal mass of dog. Amorphous material (Splendore-Hoeppli phenomenon) surrounds wide, thin-walled septate hyphae (arrows). Periodic acid methenamine-martius scarlet blue.

necrotic areas within the granulation tissue (fig. 1). Individual hyphae usually were cuffed by a granular eosinophilic material of various widths (to 15 μm) (fig. 2). In sections stained by Gridley's method, hyphae were at least ten times more numerous. Morphologically the hyphae were thin-walled, irregularly branched, and frequently septate. They varied in diameter from 5.1 to 17.7 μm (mean 9.3 ± 2.8 μm). *B. haptosporus* was isolated from all tissues cultured (diaphragm, mediastinum, root of mesentery) and was identified by recently published methods.[10,12] On Sabouraud's dextrose agar, growth at 37°C was rapid (5–10 mm/24 hours). The colony formed a dense dull yellow mat with frequent radial folds on the surface. Wet mount preparations revealed numerous large primary conidia and occasional adhesive conidia. Characteristic and diagnostic smooth walled zygospores with copulatory beaks were seen in agar mounts.

The characteristic histological change in both human and equine entomophthoraceous infections is the eosinophilic cuff surrounding individual hyphae.[3,7,11,17] This change was seen in the present case but only around a small percentage of hyphae. The cuff is thought to represent an antigen-antibody complex (Splendore-Hoeppli phenomenon). Eosinophils are assumed to play a major role in the composition of this cuff in the horse and man so the lack of eosinophils in this dog was surprising. The primary site of infection in the present dog was not determined but may have been the stomach. From here fungal organism could spread by mechanical means to focal areas of the intestine, by lymphatics to the anterior root of mesentery, by direct penetration and expansion to the diaphragm and mediastinum and by portal drainage to the liver. If the stomach was the primary site there are several possible methods of infection. *B. haptosporus* in its natural state is found in soil and organic matter as well as in the gastrointestinal tract of certain lizards and amphibians.[4,12] Ingestion of either of these sources may be responsible for infection.

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