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## Histoplasmosis in a Striped Skunk (*Mephitis mephitis* Schreber) from Southern Illinois

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Histoplasmosis is a widespread mycotic disease affecting numerous mammalian species. The Mississippi, Missouri, and Ohio river valleys are major endemic areas in North America where the prevalence of infection in humans is high (Acha and Szyfres, 1980, Sci. Publ. No. 354, Pan American Health Organization, World Health Organization, Washington, D.C., pp. 150–152). The numerous reports of histoplasmosis in humans and other mammals are usually based on serological surveys or incidental necropsy findings without clinical evidence of disease. According to Sanger (1981, *In Infectious Diseases of Wild Mammals*, Davis et al. (eds.), Iowa State Univ. Press, Ames, Iowa, pp. 356–360), the prevalence of infection in wildlife is low based on the small percentage of recoveries from thousands of animals examined. However, Smith et al. (1972, *Veterinary Pathology*, Lea and Febiger, Philadelphia, Pennsylvania, 1521 pp.) noted that most cases of histoplasmosis, both animal and human, may be neither recognized nor reported.

A <6-mo-old male striped skunk was live-trapped and radio-collared near Carbondale, Illinois on 30 September 1983; body weight (1,325 g) was low normal compared to data presented by Verts (1967, *The Biology of the Striped Skunk*, Univ. Illinois Press, Urbana, Illinois, 218 pp.). The skunk was recaptured on 22 February 1984; the radio collar was miss-

ing and there was a healing superficial abrasion on the dorsal neck apparently caused by the radio collar. Body weight was not recorded, but the skunk did not appear to be in poor condition. The animal was confined outdoors and fed dry and canned cat food ad libitum. On 14 March, the animal was obviously thin and moderately anemic. Hematological tests confirmed the apparent anemia (hemoglobin, 8.0 g/dl; PCV, 25%), but a clinical examination was inconclusive. When euthanized the following day, body weight was 1,250 g, a decline of about 5.6% from the September weight.

Necropsy revealed a cachectic animal virtually lacking fat reserves. The stomach was distended with food and formed feces were in the colon. Gastrointestinal nematodes, especially *Physaloptera* sp. were abundant; only one unidentified cestode was present. Gross lesions were limited to the lungs in which there were multifocal, coalescing, firm, light brown nodules throughout the parenchyma leaving only an estimated 10–15% normal parenchyma (Fig. 1). The four largest masses were up to 22 mm in diameter; numerous smaller ones (about 22 could be distinguished) scattered about the lungs ranged from 1–8 mm in diameter. Nodules were uniform in texture and appearance on the cut surfaces; they were discrete but not encapsulated, and there was no apparent surrounding tissue reaction.

Formalin-fixed sections of brain, lung, liver, kidney, adrenal, spleen, lymph node, bladder and small intestine were embed-

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FIGURE 1. Dorsal view of a striped skunk's lung with multifocal discrete to confluent masses (arrows) caused by *H. capsulatum*.

ded in paraffin, sectioned at 6  $\mu\text{m}$  and stained with hematoxylin and eosin. The lung nodules consisted of a highly cellular, homogeneous population of macrophages with a mild, diffuse infiltration of lymphocytes and plasma cells (Fig. 2) which

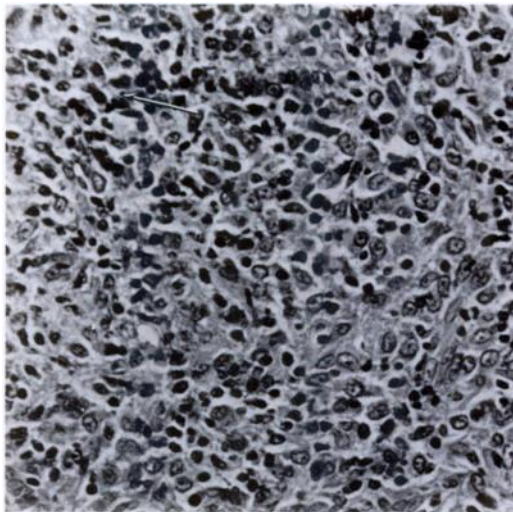


FIGURE 2. Pulmonary granuloma in a striped skunk consisting of a homogeneous population of macrophages with lymphocytes and plasma cells. Yeast cells are visible in macrophages (arrow). H&E stain,  $\times 500$ .

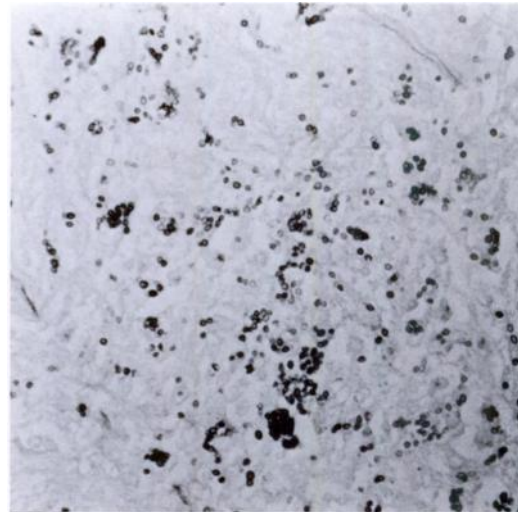


FIGURE 3. Yeast-form cells of *Histoplasma capsulatum* var. *capsulatum* in the pulmonary granuloma from a striped skunk are better visualized with special stains. GMS stain,  $\times 500$ .

formed aggregates around the periphery. Many small (1–3  $\mu\text{m}$ ), circular clear inclusions with a dark eosinophilic center were present within macrophages. Several islands of macrophages and lymphocytes identical to those in the lung were present in the liver. Multiple small foci of coagulative necrosis also were scattered throughout liver sections, especially in midzonal regions. A mild diffuse reticuloendothelial cell hyperplasia was noted in sections of spleen and lymph node. No significant lesions were present in other tissues.

Replicate sections of lung, liver, lymph node and spleen were stained by periodic acid–Schiff (PAS) and Gomori's methenamine silver (GMS) procedures. The pulmonary granulomas clearly contained numerous, predominantly intracellular yeast forms morphologically compatible with *Histoplasma capsulatum* var. *capsulatum* (Fig. 3). The liver contained an occasional yeast-like structure within the areas of necrosis, but organisms were not evident in other tissues.

Direct immunofluorescence staining at

the Centers for Disease Control (CDC) was unable to confirm the morphological identification of *H. capsulatum* var. *capsulatum*. Additional immunofluorescence tests on replicate sections indicated that the fungus in this case was not *Cryptococcus neoformans*, *Blastomyces dermatitidis*, *Sporothrix schenckii*, nor a *Candida* sp. of medical importance (including *Torulopsis glabrata*).

Yeast forms morphologically characteristic of *H. capsulatum* var. *capsulatum* which would not stain with the specific FA conjugate for this fungus have been encountered rarely at CDC. It is probable that these yeast forms represent a unique serotype. Tissues were not available for culture or further characterization. Classification must be presumed based on the morphology observed using the GMS staining procedure.

*Histoplasma capsulatum* was isolated from five of six spotted skunks (*Spilogale putorius* L.) in Georgia (Emmons et al., 1949, Public Health Rep. 64: 1423–1430); the authors speculated that there was a high prevalence of histoplasmosis in skunks. A review (Sanger, 1981, op. cit.)

noted other reports of histoplasma in skunks (including *M. mephitis*), but clinical cases were not reported. The present case represents a new host record of clinical histoplasmosis.

The gross and microscopic appearances of lung lesions in our case were similar to those described in progressive canine histoplasmosis (Farrell and Cole, 1968, Am. J. Pathol. 53: 425–434) except there was no fibroplasia. Fibroplasia was not a feature in lung changes reported in experimentally infected gnotobiotic dogs at 14 and 18 days post inoculation (DeFavero and Farrell, 1966, Am. J. Vet. Res. 27: 60–66).

Histoplasmosis is endemic in the region where this skunk was trapped. It may have been infected at the time of capture, and clinical disease appeared with the stress of captivity. The gross appearance of lesions were tumor-like and microscopic features superficially resembled a histiocytic lymphoma. Special stains were required to confirm a mycotic agent. This lends support to the contention by Smith et al. (1972, op. cit.) that many cases of histoplasmosis may be unrecognized.

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## Pulmonary Cryptococcosis in a Striped Dolphin (*Stenella coeruleoalba*)

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The striped dolphin is widely distributed across the tropical and temperate waters of the Atlantic, Pacific and Indian Oceans. It is a gregarious species and large

schools of up to 3,000 have been reported. The species is not often seen in coastal waters and appears to prefer a deeper offshore habitat (Watson, 1981, Sea Guide to Whales of the World, Hutchinson, London, England, pp. 264–265). This report concerns a 1.9-m immature striped dol-

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