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Toxoplasmic meningoencephalitis in a West Indian manatee

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A YOUNG, approximately 1-year-old, female West Indian manatee *(Trichechus manatus)* was noticed to have breathing difficulties in the shallow waters of the Indian River, St Lucie County, central Florida. The animal was brought to the attention of the Sirenia Project of the Denver Wildlife Research Center, US Fish and Wildlife Service, and arrangements were made to take it to Sea World in Orlando, Fla, for treatment. It died shortly thereafter. The carcass was necropsied at the Veterinary Medical Teaching Hospital of the College of Veterinary Medicine, University of Florida, in Gainesville.

At necropsy, the animal weighed 79 kg and was 162 cm long. The most prominent gross findings were multiple dermal and subcutaneous abscesses and multifocal, moderate pneumonia. Serous atrophy of fat was marked in the coronary grooves of the heart and in the mesentery. The brain was grossly unremarkable.

Microscopically, cerebral and meningeal vessels were surrounded by cuffs of lymphocytes (Fig 1A). The cerebral cortex contained several abscesses and granulomas (Fig 2A). Basophilic, cyst-like structures measuring between 50 and 60 μm were in the cerebral cortex (Fig 1B). A thin wall surrounded these cysts. The encysted bradyzoites, measuring 1 to 2 μm, stained positively with periodic acid-Schiff (PAS) and silver stains. The cyst wall was PAS-negative (Fig 2B). Tachyzoites were not detected.

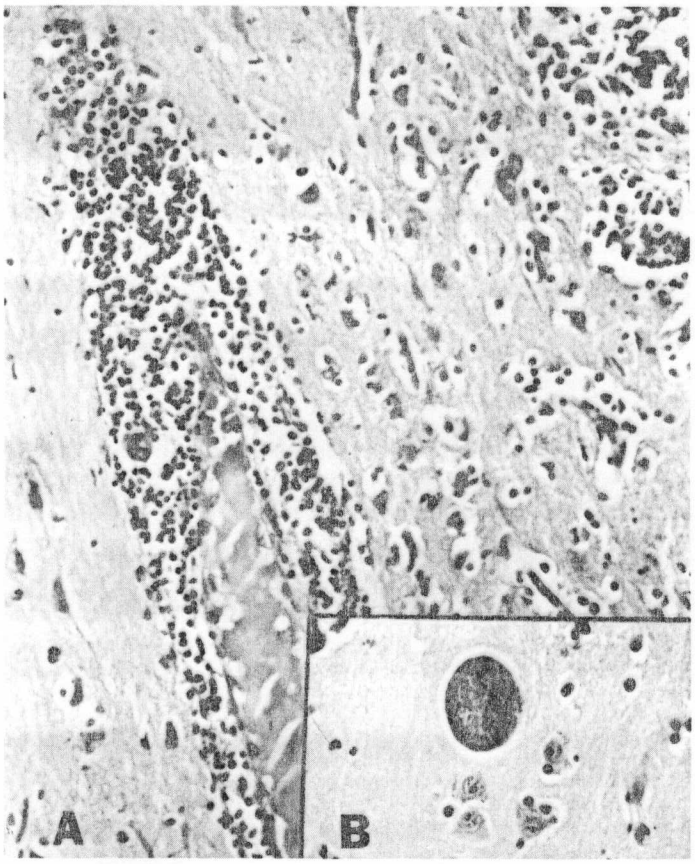

Fig 1A—Lymphocytic cuffings around cerebral blood vessel and mononuclear cell infiltrations within cerebral cortex. H&E stain; ×125.

Inset (B)—Toxoplasma cyst in cerebral neuropil. H&E stain; ×375.

The cysts were studied ultrastructurally. A cyst wall was demonstrable at lower magnification. Each cyst contained many ovoid, slender bradyzoites of the subphylum Apicomplexa (Fig 3). Each bradyzoite was surrounded by a pellicle consisting of 2 electron-dense membranes. The inner membrane formed a polar ring at the anterior end. Several electron-dense micronemes and rhoptries were in the anterior portion of the bradyzoites. Electron-lucent amylopectin granules were intermingled. A nucleus was at the posterior end.

On the basis of the ultrastructural and tinctorial features of the organisms, the etiologic diagnosis

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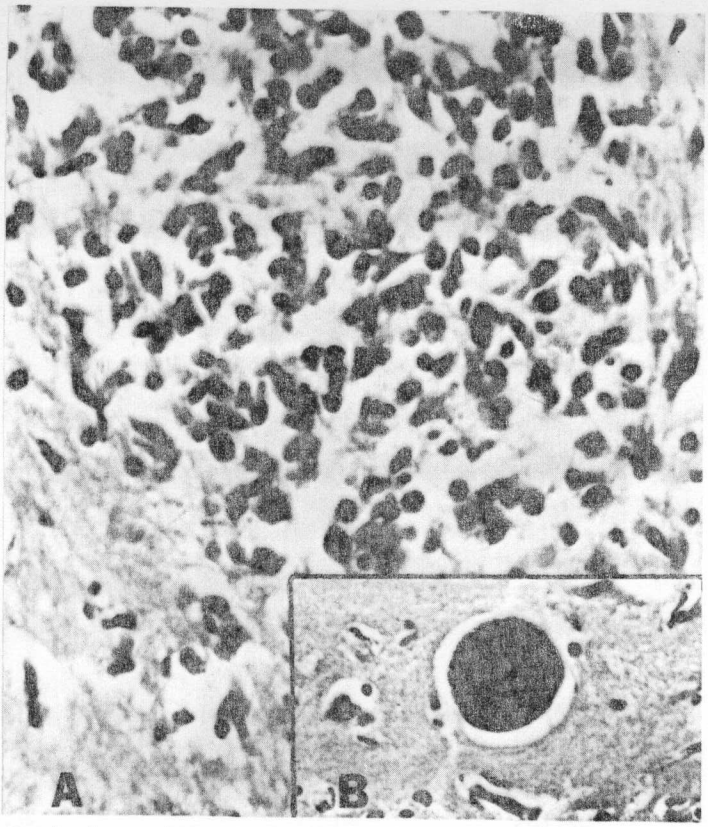

Fig 2A—Cerebral granuloma composed of macrophages and lymphocytes. H&E stain; ×310.

Inset (B)—Intracystic bradyzoites are PAS-positive. PAS stain; ×500.

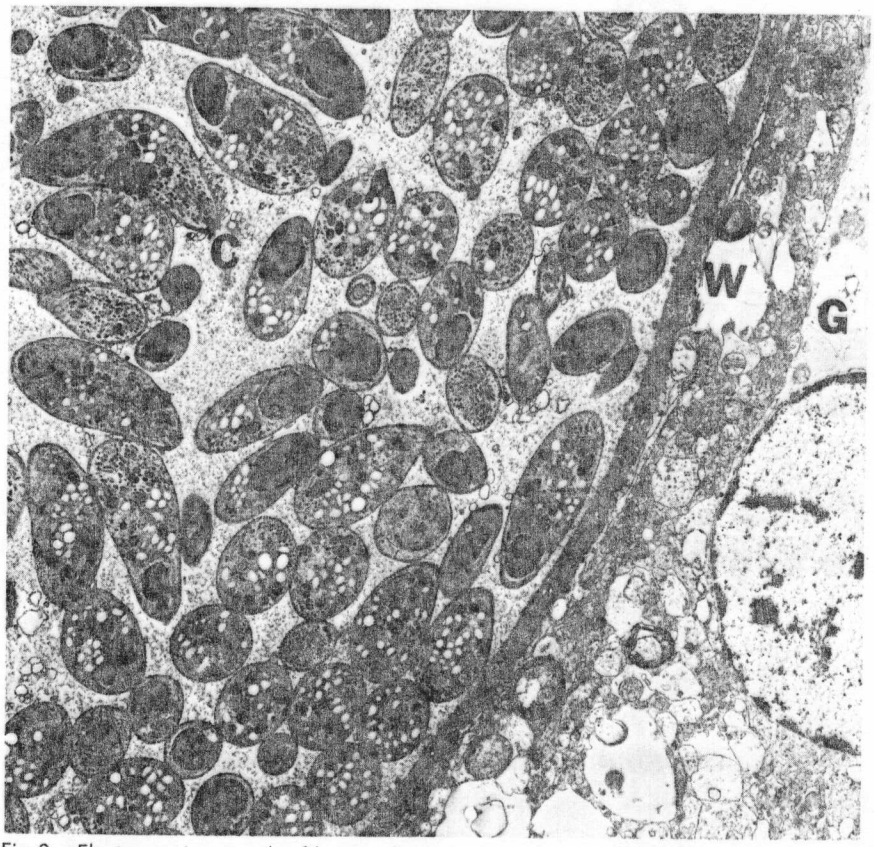

Fig 3—Electron micrograph of brain, showing portions of cyst filled with bradyzoites within host glial cell (G). Cyst wall (W) is well defined. Intracystic bradyzoites have a conoid (C), rhoptries (R), micronemes (M), amylopectin granules (A) and a nucleus (N). ×5,850.

of intracystic bradyzoites of *Toxoplasma gondii* was made.

Other microscopic findings included dermal and subcutaneous abscesses as well as thromboembolic pneumonia. *Proteus* spp were cultured from the skin and lungs.

Infection with *T gondii* has been reported in many mammals and birds (intermediate hosts).[1,2] In marine mammals, toxoplasmosis has been documented in 3 individuals from 2 species of pinnipeds.[3,4] Infection of *T gondii* may be acquired mainly through ingestion of either the tissue cyst that is found in certain meats, or the oocyst, which is shed in the feces of cats.[2] Recently, oocyst-transmitted toxoplasmosis in a battalion of US Army soldiers, trained in the Panama Canal area, was associated with ingestion of contaminated water.[5] Attempts to implicate meat or dirt as a means of infection were unsuccessful. Only ingestion of jungle creek water, possibly contaminated by feces from infected jungle cats, accounted for the distribution of infection.[5]

Manatees are herbivorous animals that feed on aquatic plants.[6] The route of *T gondii* infection in this manatee, therefore, remains speculative; however, manatees have been observed in the wild drinking from sewer effluents.[7] The consumption of oocyst-contaminated water may have been responsible for the toxoplasmosis in this manatee. Oocysts have been shown to survive in a viable state for extended periods under favorable environmental conditions (proper temperature and humidity).

The manatee may have suffered from impaired central nervous system function, perhaps causing some degree of ataxia. The *T gondii* infection, in addition, might have made it susceptible to secondary bacterial disease. Dual infection with *T gondii* and viral or bacterial agents have been reported in man and other animals.[1] Similarly, terminal cancer or immunosuppressed patients frequently develop fatal toxoplasmic encephalitis.[1]

Studying the files of the Denver Wildlife Research Center, it be-

came evident that this case was the first to document a naturally occurring disease process as cause of manatee death. The most frequently reported cause of death in manatee (21%) has been attributed to motorboat propellers or barge collisions inflicting severe dermal lacerations.[8]

Electron microscopy, used in this study, is time-consuming and depends on fresh tissue, which is not always available in dead wild animals. A recently reported indirect immunoperoxidase technique successfully demonstrated *T gondii* in formalin-fixed, paraffin-embedded tissues with a high degree of specificity and sensitivity.[9] It detected cysts as well as the free-form tachyzoites in tissue—the latter forms being particularly difficult to recognize in conventionally stained sections.

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