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Research Note

Sarcocystis sehi sp. n. (Protozoa: Sarcocystidae) from the Porcupine (*Erethizon dorsatum*)

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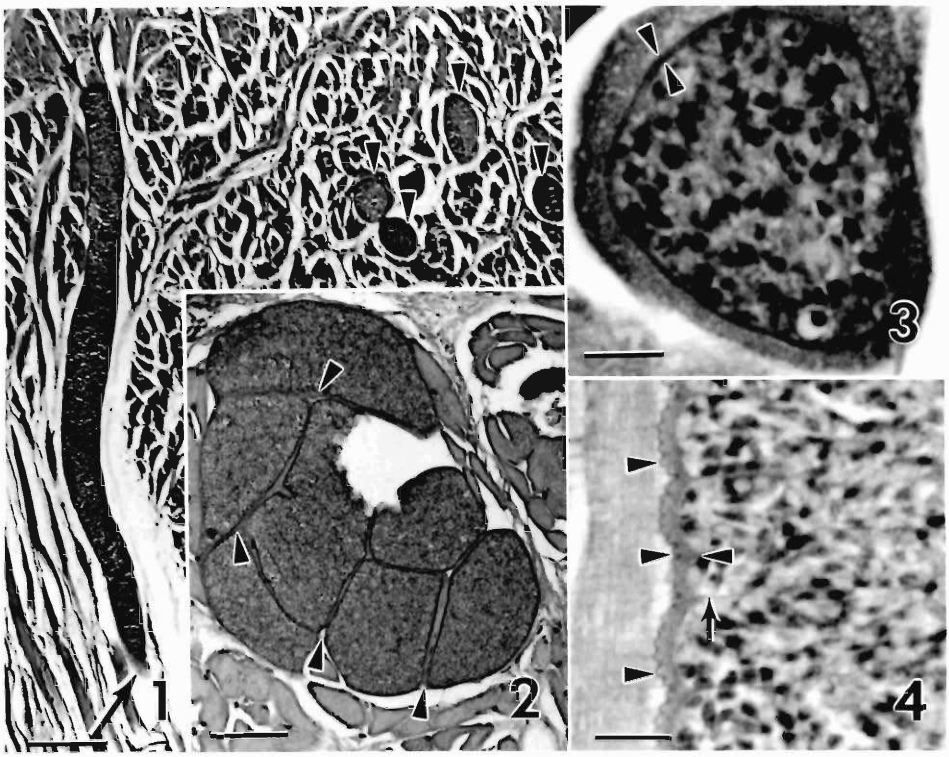
ABSTRACT: Sarcocysts were found in muscles of tongue, heart, esophagus, diaphragm, and masseter in 10 porcupines (*Erethizon dorsatum*) from Sullivan County, Pennsylvania. The sarcocysts were up to 2.3 mm long and 135 μm wide. The sarcocyst wall was 0.3–1.2 μm thick, including the projections on the wall. The parasitophorous vacuole membrane of the sarcocyst wall had conical protuberances at irregular distances and short (60 nm) electron-dense blebs. The bradyzoites were approximately 7 × 1.5 μm and the micronemes were restricted to the anterior half of the bradyzoites. Only 1 morphologic type of sarcocyst was found in all porcupines and it is named *Sarcocystis sehi.*

KEY WORDS: Protozoa, Apicomplexa, Coccidia, *Sarcocystis sehi,* sarcocysts, porcupine, *Erethizon dorsatum.*



Figures 1–4. Sarcocysts in tongues of naturally infected porcupines. Hematoxylin and eosin stain. 1. One longitudinally cut (arrows) sarcocyst and 4 sarcocysts in cross section. Scale bar = 160 μm. 2. A group of sarcocysts within 1 myocyte or in adjacent myocytes. Arrowheads point to sarcocyst boundaries. Scale bar = 75 μm. 3. Sarcocyst in cross section. The cyst wall (arrowheads) is thin and septa are not visible. Scale bar = 6.6 μm. 4. Sarcocyst in longitudinal section. The cyst wall has serrations (arrowheads) on its outer wall layer. Septa originate from the inner wall layer. Opposing arrowheads demarcate the cyst wall thickness. Compare the thickness of sarcocyst wall in Figure 3 at the same magnification. Scale bar = 6.6 μm.

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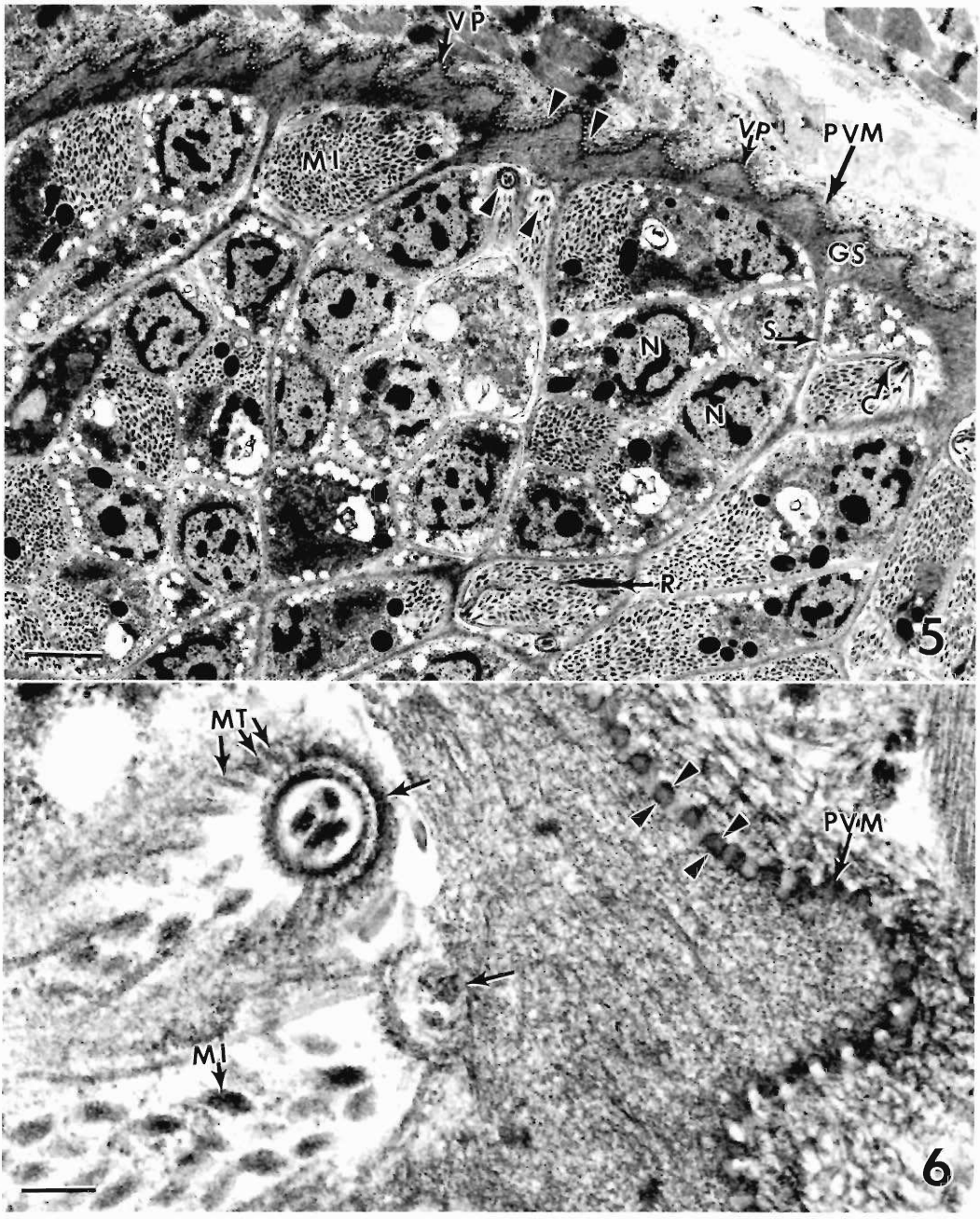

Figures 5, 6. Transmission electron micrographs of the sarcocyst wall from the tongue of a naturally infected porcupine. 5. The parasitophorous vacuole membrane (PVM) has conical villar projections. The sarcocyst wall is cut tangentially toward the left side. Scale bar = 1.1 μm. 6. Higher magnification of the sarcocyst wall marked by opposing arrowheads in Figure 5. Note electron-dense, short, stubby thickenings of PVM (opposing arrowheads). The conoidal ends of 2 bradyzoites (arrow) lie beneath the sarcocyst wall. Microtubules (MT) originate from the conoidal ring. MI = micronemes; GS = ground substance; N = nucleus of bradyzoite; R = rhoptry; S = septum; VP = villar projections; C = conoid. Scale bar = 0.18 μm.

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Numerous species of *Sarcocystis* are found in muscles of mammals, reptiles, and birds, but none has been reported from the porcupine (Dubey et al., 1989). In this paper, a new species of *Sarcocystis, S. sehi,* is reported from muscles of the porcupine, *Erethizon dorsatum* Linnaeus, 1758.

Specimens of esophagus, diaphragm, masseter muscles, tongue, and heart of 17 (5 males and 12 females) porcupines were fixed in 10% buffered neutral formalin. The porcupines were live-trapped during 1989 and 1990 in State Gamelands-13, Sullivan County, Pennsylvania (76°N, 41°20'W), euthanatized, and necropsied as part of baseline data collection at site selections for a potential mainland field trial with an oral recombinant rabies vaccine for raccoons (Rupprecht et al., 1986). Paraffin-embedded sections were cut at 5–6 μm, stained with hematoxylin and eosin, and examined microscopically. Formalin-fixed muscles from tongue of 1 porcupine were processed for transmission electron microscopy.

Mature sarcocysts (Figs. 1–4) were found in 10 (7 females and 3 males) porcupines, in masseter muscles of 9 of 16, tongues of 8 of 17, diaphragms of 7 of 15, esophagi of 3 of 17, and in heart of 1 of 17. Sarcocysts were longer in masseter muscles than in other muscles. Some sarcocysts were located either in a single myocyte or in adjacent myocytes giving the impression of thick compartments within a single sarcocyst (Fig. 2). Under the light microscope the sarcocyst wall was less than 1 μm thick and had minute serrations (Fig. 4).

Sarcocystis sehi sp. n. (Figs. 1–6)

DIAGNOSIS: Sarcocysts in myocytes, up to 2.3 mm long and 125 μm wide, cyst wall with spiny villar projections. Ultrastructurally, sarcocyst wall 0.6–1.3 μm thick including the villar projections, parasitophorous vacuole membrane wavy with conical villar projections without microtubules at uneven distances and short (60 nm) electron-dense circular to tombstone-like blebs. Bradyzoites approximately 7 × 1.5 μm with typical apicomplexan organelles, including numerous micronemes restricted to anterior half of bradyzoites (Figs. 5, 6).

HOST: *Erethizon dorsatum.*

DISTRIBUTION: United States.

SYNTYPE SPECIMENS: Section of tongue and masseter muscles from a naturally infected porcupine deposited in U.S. National Museum. USNM Nos. 81942 and 81943.

ETYMOLOGY: The species name is derived from the Hindi name sehi for the porcupine.

Sarcocystis species generally are considered host specific. The structure of the sarcocyst wall is a reliable criterion for distinguishing *Sarcocystis* species in a given host but not between different hosts (Dubey et al., 1989). Based on the structure of the sarcocyst walls, Dubey et al. (1989) grouped *Sarcocystis* species into 24 types. The structure of the sarcocyst wall of *S. sehi* is distinct from sarcocysts of any other species. The blebs on the sarcocyst walls in porcupines are structurally similar to those on the sarcocyst walls of type 1 species (e.g., *Sarcocystis muris*), but in type 1 species, the sarcocyst wall lacks the conical villar projections.

Sarcocystis species have a prey–predator 2-host life cycle. The predator becomes infected by eating sarcocysts from the tissues of the prey. Natural predators of porcupines include bobcats, coyotes, fishers, wolves, and cougars (Dodge, 1982).

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