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Phagicola angrense (Digenea: Heterophyidae) as a Cause of Enteritis in a Raccoon (*Procyon lotor*)

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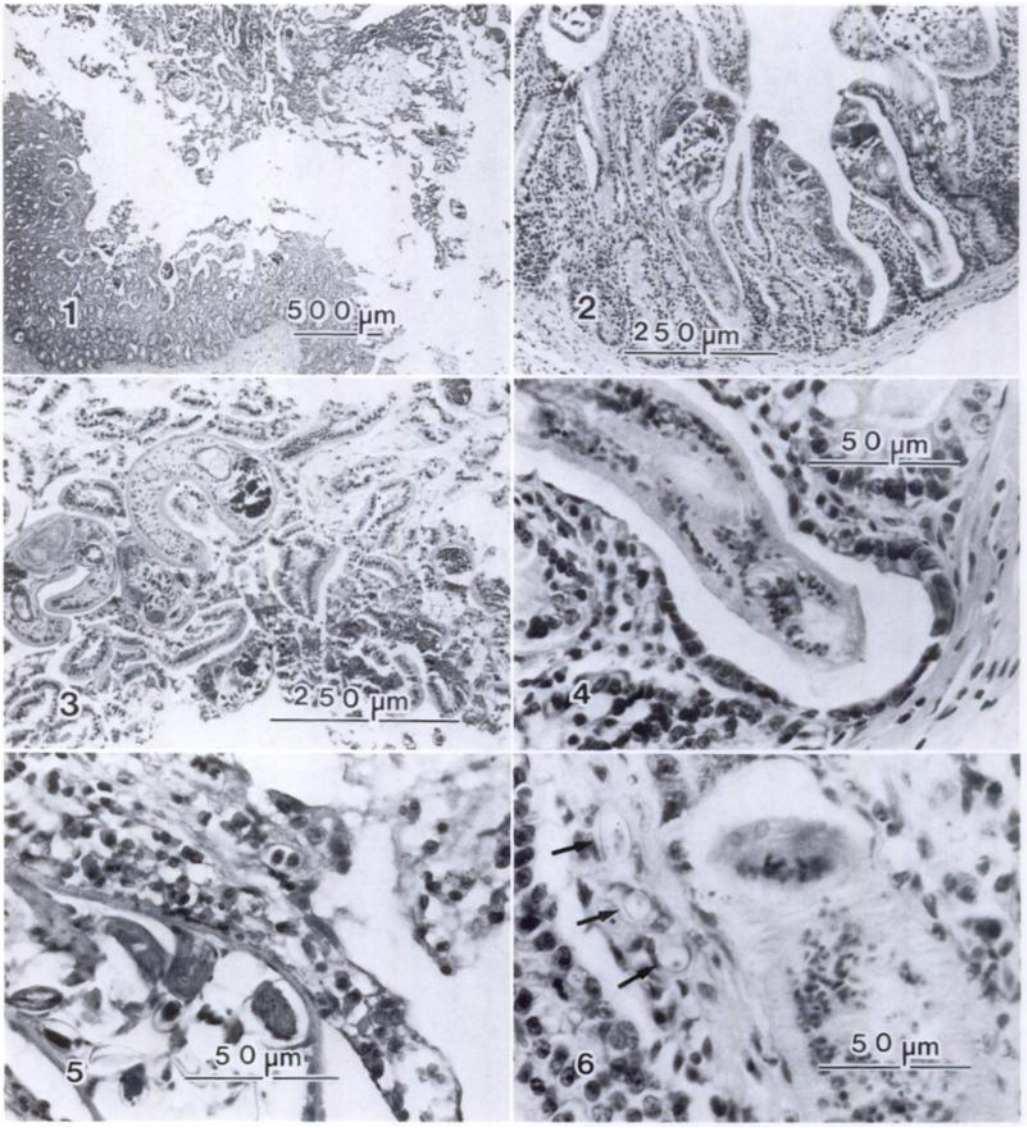
ABSTRACT: Numerous *Phagicola angrense* were associated with enteritis in a single male juvenile raccoon (*Procyon lotor*) live-trapped on Parramore Island, Virginia (USA). The raccoon was weak, ataxic and had melenic soft feces. The carcass was emaciated, pale and had ascites. Mesenteric vessels appeared prominent and the stomach and the intestines contained fetid bloody material. The small intestinal mucosa contained three locally extensive sites of necrosis. Histopathologically, there were numerous small digeneans both attached to the mucosa and free within the lumen. Digeneans were usually found deep within the crypts where the epithelium was markedly attenuated and devoid of epithelial cells at the point of parasite attachment. In the lamina propria there were areas of acute hemorrhage and infiltration with plasma cells and eosinophils. This appears to be the first record of severe enteritis in the raccoon caused by this digenean.

Key Words: *Phagicola angrense*, digenean, enteritis, raccoon, *Procyon lotor*, case report.

As part of baseline data collection prior to oral rabies vaccine field trials, a juvenile male raccoon was live-trapped on Parramore Island, Virginia (USA: 37°32′N; 75°38′W) on 10 December 1987. It was anesthetized with a combination of ketamine hydrochloride (Ketaset®, Bristol Veterinary Products, Syracuse, New York 13221, USA) and xylazine hydrochloride (Rompun®, Haver-Lockhart Laboratories, Shawnee, Kansas 66201, USA), ear-tagged, weighed (2.0 kg) and released. On 17 December 1987, the raccoon was recaptured approximately 90 m from the site of original capture. It appeared weak, lethargic and ataxic, and was anesthetized for examination. It was hypothermic, in poor nutritional condition, had markedly pale, tachy mucous membranes and melenic loose feces. It remained comatose after anesthetization and died within 20 hr of capture. On postmortem examination, the carcass was emaciated and the tissues were pale. There was excess clear straw colored ascitic fluid in the peritoneal cavity. The mesenteric vessels appeared prominent. The stomach and intestinal contents were fetid and bloody. The small intestinal mucosa contained three locally extensive sites of necrosis. The gross lesions were suggestive of Parvovirus-like enteritis. Representative samples of all major organs including brain were collected, fixed in 10% neutral buffered formalin, and submitted to the Laboratory of Large Animal Pathology, School of Veterinary Medicine, New Bolton Center (382 West Street Road, Kennett Square, Pennsylvania 19348, USA), for histopathological evaluation.

Histologically the small intestine revealed markedly shortened and disorganized villi with the presence of large numbers of small digeneans attached to the mucosa (Figs. 1, 2). Many of the digeneans were found deep within the mucosal crypts which were markedly dilated and were lined by attenuated epithelium (Fig. 2). At the point of attachment of the digeneans, the mucosal surface appeared to be devoid of enterocytes such that the parasites often were found in immediate contact with the lamina propria or occasionally adjacent to the muscularis mucosa (Figs. 2, 4). The lamina propria was diffusely infiltrated with numerous inflammatory cells; plasma cells and eosinophils predominated (Fig. 5). In some sections, areas of acute hemorrhage were present in the lamina propria and the submucosa. Digenean eggs also were occasionally seen within the lamina propria (Fig. 6). Numerous digeneans also were present in the lumen of the small



FIGURES 1–6. Intestine of a raccoon infected with *Phagicola angrense*. 1. Shortened and disorganized villi. 2. Several *P. angrense* embedded in mucosa. 3. Digeneans in lumen of intestine associated with necrotic cellular debris, inflammatory cells and ingesta. 4. Anterior end of *P. angrense* located adjacent to muscularis mucosa. 5. Lamina propria diffusely infiltrated with large numbers of inflammatory cells. 6. Eggs of *P. angrense* within lamina propria (arrows). All H&E.

intestine, often associated with cellular debris and ingesta (Fig. 3). Examination of tissue sections of other organs revealed moderate multifocal granulomatous myocarditis associated with PAS positive organisms (gametocytes) and intact schizonts of *Hepatozoon procyonis* and the presence of a few *Eurytrema* sp. in the pancreatic duct.

Digeneans from the intestinal mucosa were identified as *Phagicola angrense* based on previous descriptions (Miller and Harkema, 1963; Sogandares-Bernal and Lumsden, 1963); they ranged in length from 210 to 350 µm and the oral spination consisted of 16 (anterior row) plus 2 (posterior row). Representative specimens are deposited in the U.S. National Parasite

Collection (Beltsville, Maryland 20705, USA; accession number 80410).

The taxonomy of this group of parasites is confusing and still unsettled. Part of this confusion may be a result of the lack of host specificity in the adult stage for many members of this group. A large number of avian and mammalian species may be infected with these parasites. The early nomenclature of members in the *Ascocotyle-Phagicola* complex of species has been described (Burton, 1958; Miller and Harkema, 1963; Sogandares-Bernal and Lumsden, 1963; Font et al., 1984).

Enteric lesions in the raccoon caused by *P. angrense* or other related heterophyids have not been reported. Font et al. (1984) found no microscopic lesions in hamsters experimentally infected with *Phagicola nana*. Histopathologic examination of intestines from other raccoons collected on this island has revealed *P. angrense* in 19 of 24 animals. Intensities of parasites were lower in these raccoons and there were few lesions associated with these infections. It is not known why this particular raccoon was so heavily infected but the lesions associated with this digenean are probably density-dependent based on intensity of the parasite. Other primary disease conditions were not found which might have exacerbated the infection caused by this digenean.

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