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Protothecosis

Issue Description

Disseminated protothecosis is most commonly seen in dogs. The algae enters the body through the mouth or nose and causes infection in the intestines. From there it can spread to the eye, brain, and kidneys.

*The two species of *Prototheca* that are known to cause disease in animals are *P. zopfii* and *P. wickerhamii*. Protothecosis is an opportunistic infection that occurs when the organism comes into contact with injured skin or mucosa. It is believed that those animals that have suppressed immune systems or are overwhelmed by a pre-existing disease are at greater risk of infection. It is postulated that weak cell mediated immunity is responsible for allowing the organism to gain entrance into the body. However, very few canine cases have undergone significant immune system assessment due to the rarity of this disease. It has also been theorized that the organism can become highly virulent and is able to evade the host's immune response. It is believed that in the systemic form of the disease the organism is ingested, enters the body via the intestinal mucosa and spreads through out the body hematogenously or through the lymph system. In contrast, the cutaneous form of disease originates with punctures, cuts, or abrasions in the skin.*

Symptoms and Diagnosis

The systemic form of protothecosis is most often caused by *P. zopfii*. Organs commonly infected include the eyes, kidney, liver, heart, large intestines, skeletal muscle, myocardium, lymph nodes, thyroid, pancreas, peritoneum, diaphragm, and brain. Clinical signs depend on the organ systems involved and the severity of the lesions. White to tan granulomatous lesions can be seen within affected organs (Fig. 1). These lesions range from 0.5 to 2.0 mm in diameter. The inflammatory cell types seen on histopathologic evaluation are highly variable and may include plasma cells, macrophages, lymphocytes, and neutrophils. Plasma cells often predominate.

Gastrointestinal Signs

The most commonly reported clinical sign of disseminated protothecosis is intermittent bloody diarrhea presenting as hematochezia or melena. The colon is most often affected; however, lesions can be found throughout the intestinal tract. Grossly, colonic mucosal lesions can range from large white nodules to diffuse hyperemia to ulcerations that may or may not be hemorrhagic. These lesions may extend into the submucosa.

Central Nervous System Signs

Clinical signs such as cervical pain, head tilt, depression, ataxia, circling, ataxia and paresis are seen in a large percentage of dogs with systemic protothecosis. At necropsy, the central nervous system may contain white to tan, granulomatous nodules. Microscopically, lesions in the brain and spinal cord can be highly disseminated and consist of regions of necrosis surrounded by mixed inflammatory cells. The number of organisms per lesion can vary from many to none.

Ophthalmic Signs

In a retrospective study, 20 of 26 dogs with systemic protothecosis presented with or developed ophthalmic signs. These dogs generally presented with red, painful eyes and blindness. On ophthalmic examination, the pupil or cornea appeared cloudy. The most common histologic finding in affected eyes is choroiditis characterized by exudative granulomatous inflammation and retinal detachment.

Cutaneous Infection

Cutaneous infection is associated with infection by *P. wickerhamii*. This form of protothecosis is less commonly

observed. Skin lesions consist of nodules and draining ulcers with crusty exudates on the extremities, trunk and mucosal surfaces. Hyperkeratosis may be present as well as secondary bacterial infections. Microscopically, masses of Prototheca cells may be found in the dermis, subcutis, and adjacent skeletal muscle. Occasionally, the organisms may spread to the regional lymph nodes. In some animals, the cutaneous form of disease may transform to systemic infection as organisms spread to other tissues and organ systems.

Treatment

Protothecosis is a difficult disease to treat. Amphotericin B, tetracycline, Ketoconazole, Itraconazole, fluconazole and clotrimazole have been used to attempt to treat this disease. Unfortunately, these drugs have shown little success in treating systemic protothecosis. Surgery is used to treat both systemic and skin forms of the disease.

Canine protothecosis is a very rare disease that should only be considered after other more common diseases have been excluded. Protothecosis is very difficult to treat and is often fatal.

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