Case Report

Probable Pulmonary Blastomycosis in a Wild Coyote (*Canis latrans*)

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A female coyote (*Canis latrans*) was fatally injured by a vehicle on a road in San Luis Potosi, Mexico. Because of deteriorating clinical signs, the animal was euthanized. Postmortem examination of the lungs showed numerous small multifocal white nodules (0.5–1 cm diameter) disseminated throughout. Histopathologic examination revealed multifocal coalescing granulomas with abundant macrophages, numerous neutrophils, fibroblasts, plasma cells, and lymphocytes. Abundant intracellular and extracellular thick-walled, refractile, spherical yeasts (10–15 μ m) were observed within the granulomas. The yeasts were intensely PAS-positive, with granular protoplasm. Broad-based single budding yeasts were occasionally present. Based on the microscopic findings of the pulmonary lesions and the morphological features of the organism, a diagnosis of chronic pyogranulomatous pneumonia caused by *Blastomyces dermatitidis* was made. To our knowledge, the case described herein is the first report of pulmonary blastomycosis in a wild coyote.

1. Introduction

Blastomycosis is a severe systemic fungal disease due to *Blastomyces dermatitidis*, a spore-forming dimorphic saprophytic fungus that thrives in humid and acidic soil rich in decaying plant or animal waste [1]. This organism grows as a mold in the environment and becomes yeast in host tissues [2]. The fungus is a primary pulmonary pathogen in humans and outdoor or hunting dogs and can sporadically affect cats [3]. The environment is a reservoir of the spores. Zoonotic transmission is rare, but possible in humans through bites or through handling of infected tissues [4]. Typically, infection occurs by inhalation of infectious spores (aleurioconidia). In the pulmonary tract, the spores transform into yeasts, causing pyogranulomas [5]. However, yeasts can be transported from the lungs via the bloodstream or lymphatics and disseminate

to other organs, like the skin and the brain. Blastomycosis is more prevalent in certain regions of United States and Canada and has been reported in Europe, Africa, and the Middle East. There are few human pulmonary blastomycosis cases reported in Mexico, but all of them were imported infections from other countries where the fungus is endemic [6]. This fungal disease has been diagnosed in aquatic mammals, such as the sea lion (*Zalophus californianus* and *Eumetopias jubatus*) [7] and dolphins (*Tursiops truncatus*) [8]. It has also been reported in wild animals, including the Indian fruit bat (*Pteropus giganteus*), ferret (*Mustela putorius furo*), African lion (*Panthera leo*), American black bear (*Ursus americanus*) [9], and wolves (*Canis lupus*) [10]. However, it has not been observed in coyotes (*Canis latrans*). This case report describes findings in the pulmonary tract of a wild coyote from Central Mexico infected with blastomycosis.

2. Case Description

A female coyote was seriously injured by a vehicle on a road in the municipality of Venado (23°06'N; 101°051'W), San Luis Potosi, Mexico. The animal was taken to the local veterinarian who noticed that it was emaciated and was coughing. Because of multiple bone fractures and deteriorating clinical signs, the coyote was euthanized by IV injection of an overdose of pentobarbital sodium and necropsy was performed. During post-mortem examination, the lungs did not collapse. Firm and numerous small multifocal white tumor-like nodules (0.5–1 cm diameter) were observed throughout the pulmonary parenchyma. The other organs were grossly normal. Only lung tissue was collected for histopathology. Samples of lung tissue were collected, fixed in 10% neutral-buffered formalin, and sent to the Histopathology Department at the Facultad de Medicina Veterinaria (Universidad Autónoma de Nuevo León). Tissue samples were paraffin embedded, sectioned at 5 μ m, and stained with hematoxylin and eosin (H&E), periodic acid-Schiff (PAS), and Grocott. On H&E staining, there were small unencapsulated multifocal coalescing granulomas with abundant macrophages (epithelioid cells), variable numbers of neutrophils, fibroblasts, plasma cells, and lymphocytes. Multinucleated giant cells were not apparent. Numerous intracellular or extracellular thick-walled, refractile, spherical yeasts (10–15 μ m diameter) with a clear space around a granular nucleus were present in the granulomas (Figure 1). The yeasts were intensely PAS-positive, with granular protoplasm. Broad-based single budding yeasts were occasionally present. Based on the pulmonary lesions and morphological features of the organism, a diagnosis of chronic pyogranulomatous pneumonia caused by *Blastomyces dermatitidis* was made.

3. Discussion and Conclusions

Although it has been diagnosed in wild felids [9], rhesus monkey (*Macaca mulatta*) [11], and a polar bear (*Ursus maritimus*) kept in captivity [12], as well as a wild wolf [10], pulmonary blastomycosis has not been diagnosed in wild coyotes. The animal in this case report only had gross evidence of pulmonary fungal infection and systemic fungal infection was not recognized grossly. The differential morphological diagnosis must include *Coccidioides* spp., *Paracoccidioides brasiliensis*, *Histoplasma capsulatum*, and *Cryptococcus* spp. [4]. The positive identification of *B. dermatitidis* was based on histological criteria and identifying the distinctive features of the yeast using different stains [13]. The histological appearance was consistent with blastomycosis but there was not enough tissue to confirm the diagnosis by PCR. The source of infection or how this coyote was infected with the organism is unknown. Some environmental factors associated with blastomycosis are sandy acidic soil, bodies of water, and exposure to excavation sites [14]. Inhalation of infectious spores is considered the main route of pulmonary infection in dogs and is likely the route of infection in this case given the abundance of pyogranulomas and fungal elements in the lungs. Domestic canids appear to be more susceptible to pulmonary blastomycosis than humans because they seem

FIGURE 1: Mature extracellular thick-walled yeast of *Blastomyces dermatitidis* (arrow), with a clear space around the eccentric nucleus. Periodic acid-Schiff (PAS) stain. Bar = 10 μ m.

to inhale larger quantities of the fungus spores closer to the ground [1]. This could have happened to the coyote in this report, as it was roaming a field that contained bodies of water. The proximity of the animal's nose to the ground while rooting, digging, or sniffing in an endemic area could have initiated spore inhalation [14]. Curiously, the nasal cavity in dogs is less affected by blastomycosis infection [4]. Some studies have suggested a seasonal predilection for the disease, which usually presents during late summer and autumn [2]. The case herein was observed in the middle of September 2014. However, this is controversial, since the fungal infection could have started before the summer. The area where the animal was found has intense mining activity. There are at least three mineral extraction zones around the area where the coyote was found. In addition, the soil around these sites is sandy and acidic, and there is a small river nearby. Thus, access to those sites could have increased the risk for pulmonary blastomycosis in the coyote. Although pulmonary blastomycosis is not considered to be indigenous to Mexico [15], this particular geographic region could be considered an endemic area. It is unknown how long this coyote was infected with the fungus and if other coyotes are already infected. Because this is considered the first case report of pulmonary blastomycosis in the coyote, the extent to which other wild animals are infected with this fungus is currently unknown. Consultation with veterinarians and experts revealed no previous experience with this type of infection in Mexican domestic or wild animals. Subsequent studies will help to elucidate the prevalence of blastomycosis in humans, especially mineworkers, and both domestic and wild dogs from the region where the coyote was found.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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