Exposure to Mature Puffball Spores Can Cause Lung Inflammation and Death in Dogs

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Your four-legged friend does not always need to consume a mushroom to experience toxicosis. Puffballs (Fig. 1) are the general name for a group of mushrooms within the family Lycoperdaceae that vary widely in both location and appearance. Most are considered edible when they are young and the flesh is white with a uniform consistency. However, they are considered inedible when the flesh ages to yellow or brown and spores are ready for release (Miller and Miller, 2006).

The inhalation of large quantities of these spores causes a respiratory disease known as lycoperdonosis, which is a pneumonitis, or inflammation of the lung tissue caused by a hypersensitive reaction to fungal spores (Alenghat et al., 2010). In one case, a 12-year-old golden retriever showed signs of acute onset lethargy after playing in a bed of puffball mushrooms later identified as *Lycoperdon pyriforme* (Rubensohn, 2009). Signs of pneumonia were observed including fever, dyspnea (shortness of breath, difficulty breathing), and there was fluid found in the bronchial tubes. Furthermore, the mucus membranes were cyanotic (shaded blue) due to poorly oxygenated blood, and there was an elevated white blood cell count. In this case, treatment with oral antibiotics began with amoxicillin (20 mg/kg body weight every 12 hours) and meloxicam (2 mg/kg body weight every 24 hours). Twenty-four hours later, the dog was found in a deteriorated state with worse dyspnea, lethargy, fever, vomiting, and a further increase in the white blood cell count. The ineffectiveness of the antibiotics along with increased signs of inflammatory and allergic reaction prompted the vets

Figure 1. Beagle with giant puffball *Calvatia gigantea*. Photo courtesy Kris Banowetz.

to administer dexamethasone (5 mg IV, then 1 mg orally, every 12 hours for 3 days, followed by 1 mg orally, every 24 hours for 3 more days), an anti-inflammatory and immunosuppressant corticosteroid. This treatment resulted in rapid improvement of the animal's health and breathing returned to normal after 1 week.

In Pennsylvania, a 1-1/2 year-old Shih Tzu was given antibiotics and prednisolone (corticosteroid) after playing in an area with puffballs (Alenghat et al., 2010). The dog was referred to a veterinary hospital due to worsening respiratory distress 3 days post-exposure with tachypnea (rapid breathing) and inflammation in the lungs due to pus formation. The dog continued to exhibit severe respiratory distress even in the face of broad-spectrum antibiotics, oxygen therapy, mucolytics to break up bronchial mucus, and a short course of corticosteroids, and was therefore euthanized. It may be that puppies are more sensitive to lycoperdonosis (as they are with other types of mushroom poisonings). It is also unknown whether this dog inhaled more spores than the dog in the previous case.

The last case deals with a 5 year-old Cavalier King Charles Spaniel who was brought to a veterinary teaching hospital about 1-1/2 hours after death (Alenghat et al., 2010). The dog had been digging in an area with puffball mushrooms and was brought to the referring vet afebrile (without fever) with an acute onset of tachypnea and cough. Post-mortem examination showed the presence of macrophages in the bronchioles and the tissue surrounding the alveoli of the lungs. Many of these macrophages contained *Lycoperdon pyriforme* spores.

The low number of reports describing cases of lycoperdonosis juxtaposed to the prevalence of puffballs worldwide may indicate that this toxicosis represents a rare reaction to puffball spores. Alternatively, however, cases may be overlooked and thus underreported by veterinarians in cases of pneumonia or pneumonitis. When a dog is presented with signs of pneumonia, lycoperdonosis should be considered and veterinarians should ask pet owners if their dogs were exposed to puffballs. The inhalation of fungal spores in the three case studies indicates a type of hypersensitivity pneumonitis, whereby the body invokes an exaggerated immune response to an antigen. If this conclusion is correct, then a schedule of corticosteroids should be administered immediately to halt the body's detrimental immune reaction. Although it remains to be seen whether these cases are underreported, knowledge of this condition by pet owners and veterinarians alike can go a long way in treating this condition when it arises.

References Cited

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