Fungal Dermatitis in Captive Toads (Bufo americanus) and Attempted Therapy

Carl Darby, MA, VETMB,1 Drury R. Reavill, DVM, Dipl ABVP (AP), Dipl ACVP,2 and Robert E. Schmidt, DVM, PhD, Dipl ACVP2

1A&A Veterinary Clinic, 414 Franklin Avenue, Franklin Square, NY 11010 USA; 2Zoo/Exotic Pathology Service, 2825 KOVR Drive, West Sacramento, CA 95605 USA

ABSTRACT

A collection of rescued toads (Bufo americanus) succumbed to a mixed fungal skin disease (Basidiobolus ranarum and Batrachochytrium dendrobatidis) after the introduction of one new animal. Basidiobolus dermatitis was recognized by histopathology and culture results. Various topical treatments were attempted. On retrospective examination of the tissue sections, organisms histologically similar to those of chytridiomycosis were demonstrated.

Introduction

Fungal skin infections are of concern with both captive and wild populations of amphibians as several fungal agents that can result in life-threatening disease and death. Fungal infections generally signal the presence of underlying pathology (immunosuppressive disease) or husbandry problems. Recent shipping, traumatic injuries, or other environmental stresses have been identified as predisposing factors. The infectious agents themselves cause death by disruption of cutaneous homeostatic functions, possible mycotoxin production, or providing a portal of entry for secondary/tertiary bacterial infections.

Case Report

One year previously the owner had rescued four toads from a Florida marsh undergoing drainage for transformation into a condo complex. All of these toads were kept in individual aquaria, each with a waterfall, moss substrate, and a filter. More recently, the owner returned to the condo complex and rescued another toad. The new toad was immediately introduced to each of the other toads for socialization. After 3 wk, all five toads became anorexic, lethargic, and developed red lesions on the ventrum. The newly acquired toad was the most severely affected and died shortly after presentation. The toad was submitted for necropsy examination. The most significant lesions were in the skin and kidney. The dermatitis was characterized by severe hyperkeratosis with intralesional fungal organisms and bacteria. There was an interstitial nephritis. Based on the histologic features of the fungal organisms the diagnosis was Basidiobolus ranarum dermatitis.
A complete blood count (CBC), serum chemistry profile, fecal parasite examination, and blood culture were run on one of the other toads. The surviving toads were started on amikacin (5 mg/kg s.c. every 72 hr) and fluid therapy (1 ml LRS s.c. every 72 hr). Clinical pathology revealed electrolyte disturbances, hypoalbuminemia, hypoglycemia, and increased white cell count with segmented neutrophils. The fecal result revealed strongyles and the blood culture was negative.

A second toad died and a section of skin was submitted for histopathology and bacterial and fungal culture. A skin biopsy from a second toad had similar although more severe skin lesions. Skin cultures confirmed B. ranarum. The three surviving toads were treated topically with nystatin solution (300,000 units/ml). Additionally one toad was treated by bathing for 5 min in a 2% chlorhexidine solution. Within minutes of being placed in the chlorhexidine the toad became very agitated; its skin became erythematous and the toad had a seizure and died. Itraconazole treatment was discussed with the pathologist, but the remaining toads died before therapy could be instituted.

**Discussion**

*Basidiobolus ranarum* is a saprophytic fungus with variable chitinolytic activity and an affinity for insect cuticle. It is found in the intestinal contents of normal frogs and lizards and in plant detritus. In frogs and toads it is reported as causing a mycotic dermatitis that approaches 100% fatality once clinical signs develop. Clinical signs in toads include long periods spent sitting in water bowls, constant arching of their backs, darkening of the dorsal skin, hyperemia, sloughing of epidermis on ventral abdomen, and small erosions or ulcers on ventrum of toes. Secondary bacteremia may also contribute to debilitation and death in toads. The most likely route of infection is by the disruption, through wounds or other lesions, of the natural protective skin barrier. Natural outbreaks have been described in Wyoming toads (*Bufo baxteri*), in dwarf African clawed frogs (*Hymenochirus curtipes*) and experimentally in Canadian toads (*Bufo hemiophrys*). Dilute benzalkonium chloride dips are effective treatments (30 min in 2 mg/100 ml water, every 48 hr for three treatments). Copper sulfate, formalin and Malachite green baths/dips were not found to be as efficacious.

In a recent retrospective review of *Basidiobolus* dermatitis cases, at least some of those identified as basidiobolomycosis were instead dual infections with the more recently described amphibian chytrid fungus *Batrachochytrium dendrobatidis*. Review of the histologic lesions in these cases demonstrated organisms histologically similar to those of chytridiomycosis. Secondary infections with bacteria and other fungi are extremely common in chytridiomycosis as environmental bacteria and fungi become entrapped in the hyperkeratotic skin lesions. Transmission is by direct contact with infected animals or through water or moist conditions permitting the movement of flagellated zoospores. Chytridiomycosis is diagnosed cytologically or histopathologically by demonstration of characteristic 7-15 μm spheric fungal thalli (bodies) within the cytoplasm of epidermal keratinocytes. Because lesions are concentrated on the ventral body surfaces and feet, these sites are preferred when performing skin scrapings and obtaining sections for histopathology. *Batrachochytrium* requires specialized techniques for culture and cannot be isolated using routine
Successful treatment of chytridiomycosis has been described using 5-min baths in an 0.01% solution of itraconazole for 11 days.\textsuperscript{5} Solutions are prepared by diluting the commercially available 10 mg/ml suspension in 0.6% (normal saline is 0.9%) saline. Because of the superficial location of the infection, topical treatment with itraconazole is suggested over oral administration. Control of the disease in amphibian colonies includes thorough disinfection of enclosures and implementation of husbandry practices that prevent cross-contamination. Consideration should be given to colony-wide treatment with itraconazole if repeated outbreaks occur.

Use of chlorhexidine is not advised as chlorhexidine toxicity\textsuperscript{11} has been reported in amphibians. Clinical signs of toxicity include erythema, petechia, increased mucus production, irritability, agitation, lethargy, and dyspnea. Depending on the exposure, symptoms may progress to convulsions, flaccid paralysis, regurgitation, diarrhea and death. Therapy for toxicity should consist of placing the exposed amphibian into clean water and employing symptomatic treatment.

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LITERATURE CITED


