History

Two adult brown anoles (Anolis sagrei), also known as Bahama anoles, were evaluated because of multiple skin lesions. These lizards were from a pet store, where 3 groups of 10 to 15 lizards each were similarly affected. Brown anoles, green anoles (Anolis carolinensis), and members of an unknown species of grass lizard (Takydromus sp) from a captive-bred source were among the affected reptiles. Husbandry was deemed adequate. The lizards’ diet consisted of dusted crickets and mealworms. A full-spectrum light source and red heating bulb were in use.

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Clinical and Gross Findings

Skin lesions in the 2 evaluated anoles were similar in appearance but varied in size and location. Lesions were round to ovoid, gray to black plaques that ranged from 1 mm in diameter to an area of 7 X 3 mm (Figure 1). Foci were usually well demarcated from adjacent, more normal-appearing skin and contained white, powdery material on their surfaces. Smaller lesions were completely black and lacked powdery material. Lesions were randomly scattered over the dorsum, ventrum, mandible, and limbs. Skin lesions were leathery and firm. The 2 lizards were euthanized and shipped to a diagnostic laboratory for complete necropsy and ancillary testing.

Formulate differential diagnoses from the history, clinical findings, and Figure 1—then turn the page→
Histopathologic and Microbiological Findings

Histologically, the affected skin was eroded or ulcerated and necrotic, with complete loss of epithelial cells. Dense tufts of arthroconidiating fungal hyphae replaced eroded epidermis or invaded beneath the keratin layer (Figure 2). Underlying dermis and subcutis were expanded by fibrin, edema, and scattered heterophils and macrophages. Fungi infiltrated the dermis and subcutis, forming long, slender hyphae that rarely branched. Hyphae were hyaline, septate, and approximately 3 to 5 µm in width. Hyphal walls were roughly parallel, with dilated or bulbous structures. A few dermal blood vessels were occluded by thrombi and infiltrated by fungal hyphae. Fungi dissected between myocytes in underlying skeletal muscle and invaded interstitial connective tissue (Figure 3). Myocytes underlying severely affected areas were necrotic, with sarcoplasmic vacuolation, loss of cross striations, and hyalinized sarcoplasm. Necrotic myocytes were infiltrated by fungi and macrophages. Foci of hemorrhage were scattered throughout the underlying muscle, and myocytes were separated by edema. Samples of skin collected from the anoles at necropsy were negative on mycotic culture.

Morphologic Diagnosis

Mycotic dermatitis, cellulitis, and myositis.

Comments

Although mycotic culture of samples of affected skin from the 2 anoles yielded negative results, histopathologic findings confirmed that the major cause of disease in these anoles was a species of nonpigmented fungus (hyalohyphomycosis). The microscopic characteristics of the fungus (including arthroconidiating hyphae at the skin surface), the extensive nature of the lesion (ie, cellulitis and myositis), and the clinical history of multiple infected lizards strongly suggested that the etiologic agent of the skin lesions was the *Chrysosporium* anamorph of *Nannizziopsis vriesii* (CANV). Although the CANV has not been completely characterized on the molecular level, initial sequencing of the internal transcribed spacers 1 and 2 and the 5.8S rRNA gene from samples of the CANV in bearded dragons shows either a 100% match with *N vriesii* or a relatively close
match to *N. vriesii*. Thus, sequencing of this region and comparison with the sequence of *N. vriesii* may be a useful diagnostic tool. Further definitive confirmation of the organism was not pursued in this case because of the paucity of remaining tissue samples for analysis.

The CANV has been implicated as the cause of dermatomycosis and deep mycosis in multiple lizard species, including chameleons, bearded dragons, and geckos. Cases of CANV-associated mycosis in multiple species of snakes as well as saltwater crocodiles have been reported. In bearded dragons specifically, the CANV causes a condition known as yellow fungus disease, which is progressive and potentially fatal. In most reptiles, infection with the CANV leads to dermal necrosis and, eventually, extension of fungi into the underlying tissues, although rate of disease progression is variable. Bearded dragons develop extensive granulomatous inflammation in response to the agent, whereas other species may mount minimal inflammatory response. In the anoles of this report, inflammation was present but mild, compared with the amount of tissue necrosis and fungal invasion.

Importantly, the CANV is considered a highly contagious, primary pathogen of reptiles. Although resident cutaneous fungi are common in reptiles, the CANV appears to be a rare inhabitant of healthy reptile skin, with <1% prevalence. Such low prevalence in normal reptiles suggests that the organism is not an opportunistic invader. In an experiment in veiled chameleons, Koch’s postulates were fulfilled for the CANV and findings also revealed that the fungus was contagious. Previous epidermal injury facilitated but was not necessary for infection in this species. In the present report, the pet store housed 10 to 15 lizards in each of 3 tanks. Multiple lizards in each tank were affected, suggesting environmental or contagious disease; given the suspected pathogen, contagious disease was considered more likely.

Because the CANV infection is associated with communicable disease, a treatment plan should include isolation of affected animals, when feasible. Reduction of overcrowding or other environmental stressors may mitigate future outbreaks. Cutaneous lesions caused by the CANV can be treated surgically, with excision or debridement of affected tissue and subsequent topical application of antifungal agents. The CANV is not usually limited to the skin; thus, concurrent systemic treatment with antifungal agents is warranted. Itraconazole is the drug of choice for systemic antifungal treatment in reptiles; fluconazole has little efficacy against the CANV and should be avoided. Two recent reports suggest that voriconazole is an effective and safe antifungal treatment against the CANV in bearded dragons and a single girdled lizard. In CANV-infected bearded dragons, administration of voriconazole resulted in fewer treatment-related deaths but required a longer period of administration, compared with administration of itraconazole. Treatment regimens should continue until lesions regress, barring development of medication-related adverse effects. Isolates of the CANV have limited thermotolerance; with regard to housing affected reptiles, adjustment of the environmental temperature to the upper end of the species’ preferred temperature range may be beneficial.

References