Diseases of Bearded Dragons with Special Emphasis on Adenovirus

Natural History

Bearded Dragons belong to the agamid (Agamidae) family that encompasses many lizard species from Africa, around Asia, and throughout Australia. The most common species seen in the United States is the inland or central bearded dragon (*P. vitticeps*). There are other species of *Pogona* that also appear in the pet trade on occasion such as the common or Eastern bearded dragon (*P. barbata*), the Rankin's or Lawson's dragon (*P. henrylawsonii*), and hybrids called "Vittikin" dragons.

The bearded dragon gets its name from the darkened area (more prominent in males) beneath the throat that works in conjunction with bone from the hyoid apparatus to "flare" forward as a means to ward off conspecifics or scare off predators. They will often continue this display with open mouth gaping and hissing. In captivity, the full behavior is often not observed unless during introductions of new individuals to a group or during extreme stress.

Bearded dragons (*Pogona* spp.) inhabit the hot, arid deserts to semi-arid scrub lands of southeastern Australia. They are adept climbers and movers spending their time navigating for basking sites on elevated rocks or lower tree branches. One could easily find them basking on a fence post in the morning to warm up their core body temperature and at dusk absorbing heat to maintain their core temperature during the cool nights. During the day, they often will estivate under rocks or in underground burrows. They are diurnal hunters that search for prey such as opportunistic invertebrates and small vertebrates. As adults, they often forage on local plant leaves, fruits, and flowers.

Husbandry

Juvenile bearded dragons found in most pet shops are approximately 6 inches (15 cm) long. Initially they can be housed in 20 gallon (75 L) or 30 inch (76 cm) long aquaria. However, this will only suffice as housing for a few months (or less if keeping more than one). Eventually the dragon(s) will need to be housed in much larger aquaria such as a 40 gallon (150 L) breeder tank or larger or custom built enclosure. Dragons may be housed in open top enclosures such as plastic tubs or cattle troughs. Large breeding facilities for dragons often house them outdoors in sectioned areas.

Provisions for lighting with ultraviolet light (UV-A and UV-B) need to be provided for 12 to 14 hours per day with special full spectrum fluorescent bulbs or recently developed mercury vapor bulbs designed for reptiles. Temperature gradients should be provided by heat lamps to achieve 85° to 95°F (29° to 35°C) with a basking site up to 105°F (< 41°C). Humidity is generally low, but dragons do require some periodic humidity which can be provided through small plastic tubs with a hole access and filled with moist sand, moss, coir, etc.

Bearded dragons are omnivores. Juveniles receive ~25% of their diet in veggies while adults receive ~75%. The veggie part of the diet generally consists of ~75% dark green leafy veggies, ~20% color veggies, and ~5% fruits/treats. The rest of the diet is made up of insect prey such as crickets, mealworms, superworms, waxworms, etc. These insect food items need to be "dusted" with minerals/vitamins or fed with supplements (i.e., Gut-Loaded) to fortify the nutritional contents of the insect's gastrointestinal tract. A small dish of fresh water should be provided and changed daily.
Bearded Dragons become sexually mature at one to two years of age depending on juvenile growth rates and time of year hatched. Male dragons can be differentiated from females by more prominent femoral pores, a wider head, and a darker throat patch. Female dragons may lay a few eggs - up to several dozen eggs per clutch - several times during the breeding season.

**Current Topics of Medical Conditions**

There are many diseases noted in bearded dragons with each year bringing a better understanding of the etiology and the impact of cofactors such as husbandry, nutrition, etc. This increase in knowledge will continue to grow and develop better diagnostics and therapeutics. Here are examples of just a few of the most significant and currently investigated diseases in bearded dragons:

**Coccidiosis**

Coccidiosis (*Isospora amphiboluri*) in bearded dragons is one of the most common clinical diagnoses in bearded dragons. It is also one of the most frustrating diseases to manage for the veterinarian and the owner. The sporulated oocysts are about round to ovoid and 25 microns in diameter. The oocysts can be observed through direct microscopic examination of the feces and through classic concentration methods through floatation and/or centrifugation.

Classic coccidiostatic drugs (i.e., sulfadimethoxine, amprolium, trimethoprim-sulfa, etc) are effective in cessation of shedding, but after the drugs are removed the shedding returns. Shedding adults will often be asymptomatic to periodic bouts of loose stools to anorexia. Neonates and juveniles may present with more severe changes and clinical disease may progress to death. Traditional methods of therapy have not been effective, in addition to alternative natural methods such as oregano in the diet.

Coccidiocidal drugs are being investigated, but no pharmacokinetic data has been published for any of these compounds. A conference abstract was presented using 15% ponazuril paste (Marquis®; Bayer Health Care, LLC; Shawnee Mission, Kansas 66201) at 30 mg/kg PO q 48 hr for 2 treatments in bearded dragons. This drug has been on the market for several years for the treatment of equine protozoal myeloencephalitis (EPM). No full investigation on the side effects or the toxic effects has been done for this drug in reptiles, but the author reports clinical resolution of clinical signs and fecal shedding for up to a year. Clinically, some veterinarians have reported using 30 mg/kg PO q 24 hr for 10 to 30 days.

**Dermatitis**

A skin condition in bearded dragons known as "yellow fungus disease" (YFD) has been noted for the past few years by breeders and herpetoculturalists. Recent work in investigating this disease has determined that this pathology is related to *Chrysosporium* anamorph of *Nannizziopsis vriesii* (CANV), which is a ketatinophilic fungal disease that has been found to be pathologic to several reptile species. The clinical disease presents as a yellow discoloration to scaling of the dorsal skin and ventrum. The lesions may become darker and necrotic and then progress to a deeper dermal mycosis (granulomatous dermatomycosis). The disease has been noted to progress even further as a systemic mycosis with lesions in the internal organs such as the liver.
Therapy for fungal disease can be difficult due to the underlying causes or stressors that need to be corrected in conjunction with antifungal administration. Once the husbandry factors have been addressed and the patient has been stabilized with basic nursing care, then initiation of various antifungal medications either topical or systemic may begin. Itraconazole is currently the drug of choice for combating filamentous fungi such as CANV. Terbinafine has been used in avian medicine routinely for Aspergillosis, but no pharmacokinetic trials in reptiles have been published. Topical medications such as miconazole or clotrimazole may be used on superficial lesions. Deeper, more extensive lesions may require surgical debridement and postoperative wound management. 

Adenovirus

Although adenovirus (Agamid Adenovirus 1 [AgAdV1]) in bearded dragons has been noted for many years, the full significance and prevalence is becoming more evident. Adenoviruses are one of the larger, unenveloped DNA viruses. They are fairly resistant in the environment and require strict hygiene and extreme disinfection methods to control the spread of the virus.

Adenovirus infection has been noted in several Pogona species, such as the inland, common, and Rankin's dragons. It is unknown at this time if there are multiple strains of the virus present in the captive population or if the virus can be passed on to the offspring through the egg during egg deposition. Viral infections have also been noted co-infections with a dependovirus and coccidiosis. The disease state is also affected by other factors such as stressors from abnormal husbandry, nutrition, etc. Most of the clinical cases have been noted in juveniles less than 12 weeks of age presenting with acute weakness and lethargy. The clinical course may progress to head tilting, circling posture, and eventually death. Histopathologic lesions of basophilic, intranuclear inclusions include hepatitis, enteritis, splenitis, esophagitis, and encephalitis.

Polymerase chain reaction (PCR) of cloacal swabs appears to be the most sensitive and currently the best diagnostic test modality. Blood is a poor sample choice due to low rate of viremia. Electron microscopy of the feces to look for viral particles is possible, but it is not a very sensitive test when compared to PCR. The presence of the virus in cloacal swabs is indicative of active viral shedding that subsequently contaminates the environment. Also, the presence of viral DNA does not necessarily indicate active clinical disease but may indicate a subclinical infection/carrier state.