THE DETECTION OF ADENOVIRUS INFECTIONS IN BEARDED DRAGONS (*Pogona vitticeps*) WITH REAL TIME PCR

**R. Wagner, VMD,**1 ✶ **R. Dahlhausen, DVM,**2 and **E. Klein, VMD**3

1Division of Laboratory Animal Resources, S 1049 BST, University of Pittsburgh, Pittsburgh, PA 15261 USA; 2Veterinary Molecular Diagnostics, Inc., Milford OH 45150 USA; 3Division of Laboratory Animal Resources, S 1046 BST, University of Pittsburgh, Pittsburgh, PA 15261 USA

**ABSTRACT**

**Introduction**

There are seven species bearded dragons of which the most common in the pet trade is the inland or central bearded dragon (*P. vitticeps*). In smaller numbers, the common bearded (*P. barbata*) and the Rankin's (*P. henrylawsonii*) have become more widely available and the number of captive-bred animals is slowly increasing. Adenovirus infections have been reported in the common bearded dragon, the Rankin's dragon and the inland bearded dragon.1-3 Recently these viruses have been shown to belong to the genus *Atadenovirus* (AAAdV-1, agamid adenovirus 1), indicating a reptilian origin.4

Adenoviral infection in bearded dragons is reported to be a neonatal disease, often associated with coinfections of dependovirus and coccidial protozoa.3 Dependovirus are defective viruses that require an adenovirus or "helper" virus in order to replicate efficiently. By themselves, they are considered to be clinically unimportant. Each pathogen's role in producing disease has yet to be determined. Lesions in reptiles associated with adenovirus-like agents include hepatitis, enteritis, esophagitis, splenitis, and encephalitis.4

Little is known about the pathogenesis and biology of adenovirus in the bearded dragon. Like other viral diseases in reptiles, adenoviral infection is difficult to diagnose ante mortem. Until recently, the only definitive diagnostic test has been to demonstrate inclusion bodies in tissues or by tissue in situ hybridization.5 To better understand the disease process PCR techniques have been developed to detect the Atadenovirus.4,6,7 This diagnostic test is necessary if clinicians are to effectively manage this viral infection and prevent this virus from spreading throughout the captive population. This study utilizes real time PCR (PCR), a technique that possibly can quantitate viral load, in an attempt to better understand this infection in bearded dragons.
Methods and Materials

Case Materials and Background

Choanal, vent, whole blood and tissue swabs were taken for real time PCR analysis from a variety of bearded dragons (*Pogona vitticeps*): 1) a breeding colony with histologic-confirmed basophilic intra-nuclear inclusion bodies consistent with adenovirus, 2) a breeding colony with no known or histologic-confirmed cases of adenovirus infection (swabs were taken from animals of different ages that were healthy, sick or dead), and 3) random clinical cases of pet bearded dragons from an exotic animal practice. The relationship between clinical presentation, presence of adenovirus-like inclusion bodies, and PCR results are presented.

Results

Neonates

All dead or severely weak neonates from the breeding colony with known adenovirus problems were positive on PCR of the choanal, vent and liver swabs, but blood was consistently PCR negative. All of these sick or dead neonates had florid basophilic intra-nuclear inclusion bodies in a variety of tissues, especially the liver and the gastrointestinal tract. All neonates from the healthy breeding colony were PCR negative on blood, choanal and vent swabs. Several healthy neonates had liver biopsies that were PCR negative and did not have basophilic intra-nuclear inclusion bodies in the liver.

Juveniles

Most PCR positive bearded dragons less than 12 wk of age often appear weak, have diarrhea, poor appetite, failure to thrive, have seizures and death. Slower growth rates when compared to age matched PCR negative animals was commonly seen in PCR positive bearded dragons. Histopathology of PCR positive bearded dragons had greatly reduced basophilic intra-nuclear inclusion bodies in the liver and intestine. Inclusion bodies were seldom seen in other tissues.

Adults

Most PCR positive adult bearded dragons were clinically normal. Coccidiosis or enteritis appeared to more likely and more severe in positive animals compared to PCR negative animals. No inclusion bodies were detected in any tissues from PCR positive animals submitted for histopathology.
Conclusions

PCR appears to be a sensitive and specific method of testing bearded dragons for adenovirus.

Vent swabs appear to be consistently positive on PCR in ante mortem samples of infected animals. This finding suggests that fecal shedding of the virus is common in infected animals and vent swabs are the best sample for PCR testing.

Infected animals that survive consistently test PCR positive throughout life. Intermittent shedding of the virus is possible but all PCR positive bearded dragons tested in our study, were always positive during the study period.

The mode of transmission appears to be direct via fecal-egg or fecal-oral route. Ovaries from positive females consistently tested negative on PCR.

Clutches that incubate normally but have poor hatchability or have more than 10% death before 4 wk should be suspect for adenovirus infections. Affected animals that are between 5 wk and 12 wk may appear weak, have diarrhea, poor appetite, failure to thrive, have seizures and death. Dragons over 12 wk that grow at a slower rate than expected while appearing normal in all other ways should be suspect. If two or more clutch-mates are kept together and one is much smaller, suspicion should be high. Animals with coccidiosis or enteritis that are poorly responsive to treatment should be suspect. Also, some animals can carry the adenovirus and have no clinical signs. This seems to be especially true in adult animals.

LITERATURE CITED

