

AVIAN BORNAVIRUS INFECTION AND PROVENTRICULAR DILATATION DISEASE

Avian bornavirus (ABV) infection is one of the most frustrating diseases encountered in avian medicine today. Since its initial recognition in the United States, ABV has been reported worldwide and infection poses a significant threat to the captive breeding of endangered psittacine (parrot) species. At least eight different psittacine bornaviruses have been identified in captive parrot populations worldwide, and researchers around the world are working on learning more about ABV infection.

Avian bornaviruses are enveloped ribonucleic acid (RNA) viruses that are shed in the droppings, but can also be transmitted through the egg. The incubation period for ABV infection can be as brief as days but may also be much, much longer, possibly decades, in some birds.

How Do We Determine if a Bird Carries Avian Bornavirus?

Definitive diagnosis of ABV infection is challenging in the living bird, but typically relies upon a combination of blood tests (serology for antibodies against the virus) and polymerase chain reaction (PCR) testing that looks for a short sequence of viral RNA. Your avian veterinarian can collect blood and cloacal and crop swabs to test for the presence of viral antibodies and viral RNA in your bird.

There is evidence that ABV is widespread in parrots in both the United States and Europe. Infection rates as high as 33% to 60% have been identified in apparently healthy birds in homes and aviaries. Since ABV infection can be difficult to confirm, infection rates are probably even higher.

Proventricular Dilatation Disease or PDD

Avian bornavirus was experimentally confirmed to be the cause of proventricular dilatation disease or PDD in 2008. Proventricular dilatation disease was first recognized in the late 1970s. Initially, this mystery disease seemed to be limited to macaws, and was termed “macaw wasting” or “fading syndrome”. Today PDD has been reported in over 50 species, including cockatoos, cockatiels, parakeets, Amazon parrots, conures, eclectus parrots, African grey parrots, and lovebirds. Proventricular dilatation disease has also been reported in songbirds, like the canary, honeycreeper, and finch, as well as waterfowl, toucans, and birds of prey. Adult birds appear to be more commonly affected than juveniles.

Terms used to describe disease caused by ABV include PDD, neuropathic gastric dilatation, myenteric ganglioneuritis, proventricular and ventricular myositis, psittacine encephalomyelitis, and infiltrative splanchnic neuropathy. Neuropathic ganglioneuritis is a very common term used to describe symptomatic avian bornavirus infection today.

What are the Signs of Neuropathic Ganglioneuritis/PDD?

The signs of disease associated with ABV infection in psittacine birds are extremely variable. Common signs of neuropathic ganglioneuritis or PDD range from mostly gastrointestinal signs to primarily neurological defects, or a combination of both. Once signs of disease are observed, the chances of a bird recovering are slim.

Gastrointestinal signs mainly occur as a result of a dysfunction of the proventriculus. The proventriculus is the glandular portion of the bird stomach. Disease of the proventriculus leads to an inability to digest or absorb food normally; therefore, common signs include depression, weight loss, regurgitation, and/or passage of undigested food in the feces. Abdominal distension, lethargy, weakness, diarrhea, scant feces, or an increase in the water component of the droppings have also been described in some birds. Secondary bacterial and fungal infections are also common.

Neurologic signs can include wobbliness, tremors, weakness, abnormal head movements, or even seizure activity. Some affected birds develop central nervous system signs in the absence of gastrointestinal abnormalities.

There is currently no treatment that definitively halts the progression of disease. Given the inflammatory component of disease, some avian veterinarians administer nonsteroidal anti-inflammatory drugs (i.e. celecoxib, robenacoxib, or meloxicam) or cyclosporine. Management of the PDD patient frequently relies upon nursing care, treating any secondary infections that are present, and feeding high quality, easily digestible nutrition.



Fig. 1. Undigested seed in the droppings is one common clinical sign in birds with proventricular dilatation disease (PDD). Photo provided by Dr. Gregory Rich.

AVIAN BORNAVIRUS INFECTION AND PROVENTRICULAR DILATATION DISEASE

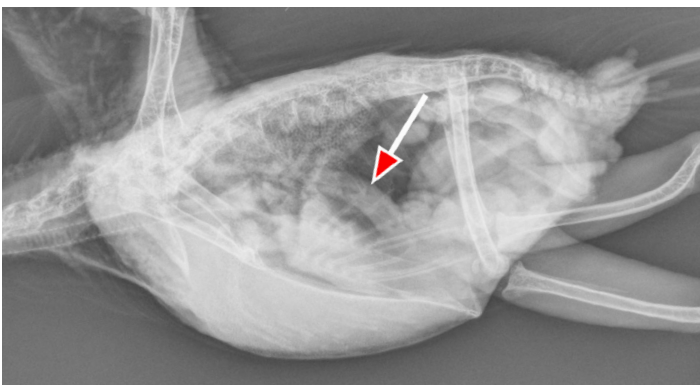


Fig. 2. The prominent keel bone of this cockatoo demonstrates that it is emaciated; birds with proventricular dilatation disease (PDD) cannot digest and absorb nutrients normally so emaciation is a common consequence of the disease. Photo provided by Dr. Isabelle Langlois.

How Can We Determine if a Bird Has PDD?

A bird showing signs consistent with PDD should be screened for ABV infection (see above). If your bird has high antibody titers against the virus and is found to be shedding virus on the swab tests, it is likely that the clinical signs are caused by ABV. If the antibody titers are not high, your veterinarian may also want to perform additional testing because there are other diseases with signs similar to PDD; it is possible for an ABV-positive bird to be affected by an entirely different illness.

In Europe there are excellent ABV antibody tests available to the avian practitioner but in the US these tests are less readily available. Thus, in the US, your avian veterinarian may want to perform a crop biopsy which is the surgical removal of a small segment of the crop wall. This sample can be evaluated beneath the microscope for signs consistent with PDD or neuropathic ganglioneuritis. However, the results of crop biopsies can be falsely negative, meaning that a bird can have PDD without the typical biopsy results.



What is the Significance of a Positive Avian Bornavirus Test (Without Signs of PDD)?

Because virus is only shed intermittently in the droppings, a negative PCR test result does not indicate the absence of infection. Cloacal and crop swabs should be pooled as one sample to decrease chances of false negative results. An ABV-positive crop/cloacal swab confirms infection (or the presence of virus), but it cannot predict when, if, or why PDD will develop. Additionally, not all birds infected with ABV will develop PDD. Some infected birds remain apparently healthy for many years and some birds never develop signs at all.

Euthanasia is NOT recommended for individuals that test positive for ABV. Instead, positive birds should be separated from negative birds. It is generally believed that parrots are unable to rid themselves of the virus and that ABV infection persists for life. Antiviral treatment of ABV infection has not been successful to date. Ribavirin, a broad-spectrum antiviral, has recently demonstrated efficacy in tissue cultures but more research is needed before this is used routinely in patients.

How Can I Minimize the Risk of ABV Infection In My Pet Bird?

Although the mode of disease transmission remains unclear, we do know that ABV is intermittently shed in droppings and the virus is susceptible to most detergents, disinfectants, and sunlight. So a good sanitation routine is important.

When ABV infection is diagnosed or suspected in a multi-bird household, isolate infected birds whenever possible. Wash your hands between birds, and always care for birds that have tested negative for ABV infection before handling ABV-positive birds.

ABV and PDD can be very confusing topics to understand; your avian veterinarian can help answer any further questions or concerns you may have.

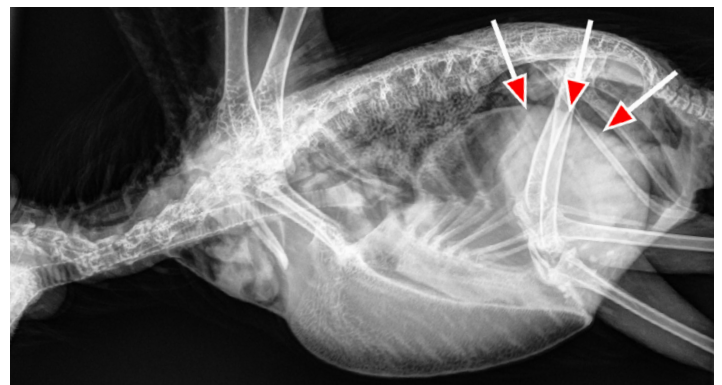


Fig. 3. Proventricular dilatation disease (PDD) gets its name from the common clinical sign of a dilated proventriculus (the glandular stomach of the bird); these radiographs compare the proventriculus of a normal bird (left) to one with PDD (right). Please note that PDD is not the ONLY cause for a dilated proventriculus.

AVIAN BORNAVIRUS INFECTION AND PROVENTRICULAR DILATATION DISEASE

AAV: Setting a Standard in Avian Care Since 1980

Avian medicine is a distinct and very specialized field that requires extensive training, advanced skills, and facilities specifically designed and equipped to treat and hospitalize birds. The Association of Avian Veterinarians was established to provide veterinarians with this special education, and to keep them up to date with the latest information on bird health. The AAV holds an annual conference on avian medicine and publishes the peer-reviewed Journal of Avian Medicine and Surgery. AAV also makes annual contributions toward avian conservation and sponsors studies advancing the understanding of avian medicine.

For More Information

For more information on birds, ask your veterinarian for copies of the following AAV Client Education Brochures:

- Avian Chlamydiosis and Psittacosis
- Veterinary Care for Your Pet Bird*
- Basic Care for Companion Birds*
- Behavior: Normal and Abnormal
- Caring for Backyard Chickens
- Digital Scales
- Falconry Brochure Series
- Feather Loss
- Feeding Birds
- Injury Prevention and Emergency Care
- Managing Chronic Egg-laying in Your Pet Bird
- Protecting Your Pet Birds from Household Dangers
- Signs of Illness in Companion Birds*
- Ultraviolet Lighting for Companion Birds
- When Should I Take My Bird to a Veterinarian?*
- Zoonotic Diseases in Backyard Poultry*

*Available in multiple languages. All others are available in English only at this time.

Online Resources

Follow AAV on Facebook (www.facebook.com/aavonline) for great tips and the latest news for pet bird owners. You can also find us on Twitter (@aavonline) and YouTube!

Our website, www.aav.org, offers a Find-a-Vet tool to help pet bird owners locate avian veterinarians around the world. We also offer a variety of resources such as basic bird care instructions and more. Visit the website today!

References

- de Araujo JL, Rech RR, Heatley JJ, et al. (2017) From nerves to brain to gastrointestinal tract: A time-based study of parrot bornavirus 2 (PaBV-2) pathogenesis in cockatiels (*Nymphicus hollandicus*). PLoS ONE 12(11): e0187797. <https://doi.org/10.1371/journal.pone.0187797>
- Delnatte P, Mak M, Ojkic D, et al. Detection of Avian bornavirus in multiple tissues of infected psittacine birds using real-time reverse transcription polymerase chain reaction. J Vet Diagn Invest 26(2):266-71, 2014.
- Honkavuori KS, Shivaprasad HL, Williams BL, et al. Novel borna virus in psittacine birds with proventricular dilatation disease. Emerg Infect Dis 14(12):1883-6, 2008.
- Hoppes SM, Tizard I, Shivaprasad HL. Avian bornavirus and proventricular dilatation disease: diagnostics, pathology, prevalence, and control. Vet Clin North Am Exot Anim Pract 16(2):339-355, 2013.
- Kistler AL, Gancz A, Clubb, S, et al. (2008). Recovery of divergent avian bornaviruses from cases of proventricular dilatation disease: identification of a candidate etiologic agent. Virol J 5:88, 2008. doi: 10.1186/1743-422X-5-88.
- Lierz M. Avian bornavirus and proventricular dilation disease. In: Speer BL (ed). Current Therapy in Avian Medicine and Surgery. St. Louis: Elsevier; 2016. 28-46.
- Murray O, Turner D, Streeter K, et al. Apparent resolution of parrot bornavirus in cockatiels. Vet Med (Auckl) 8:31-6, 2017.
- Musser JMB, Hatley JJ, Koinis AV, et al. Ribavirin inhibits parrot bornavirus 4 replication in cell culture. PLoS One 10(7):e0134080. doi: 10.1371/journal.pone.0134080. eCollection 2015.
- Piepenbring AK, Enderlien D, Herzog S, et al. Parrot bornavirus (PaBV)-2 isolate causes different disease patterns in cocaktiels than PaBV-4. Avian Pathol 45(2):156-68, 2016.



Visit aav.org or find us on Facebook at facebook.com/aavonline