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# Avian Borna Virus/ Proventricular Dilatation Disease: What We Are Learning

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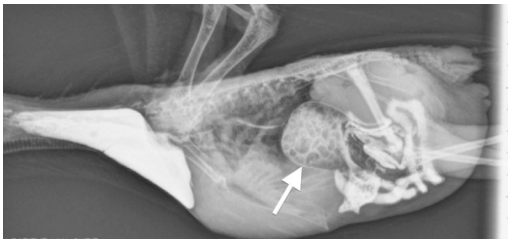
*Editor’s note:* This article is an updated version of the Avian Borna Virus write-up in the April 2016 edition of The Mickaboo Bird Rescue Companion.



Radiographic evidence of proventricular dilatation (arrow).
Photo credit: Dr. Sharman Hoppes

**Introduction**

Avian Borna Virus, the causative agent for Proventricular Dilatation Disease (“PDD”) and several other neurological problems, has with good reason been an important issue in the avian community for some time. Recent advances in testing, understanding and treatment have made this a very hot topic. This article attempts to summarize some of the research findings.

**Background**

In the late 1970’s, wild-caught macaws imported into Europe and the US from Bolivia were identified with a disease syndrome which caused them to waste away and die. Originally called “macaw wasting syndrome”, it later became known as PDD because impaction, dilatation, and degeneration of the Proventriculus (the glandular stomach in birds) was often a finding on necropsy. This was a frightening syndrome because once clinical signs were seen a large percentage of these birds progressively worsened and died.

**Identification and Prevalence**

PDD has been identified in a broad spectrum of parrots. PDD was found in captive parrots in North and South America, Europe, Africa, Australia, Japan and the Middle East. The search was on for the causative agent.

Borna Virus family viruses have been known to cause neurologic disease in mammals since the 1920’s. In 2008, a new member of the Borna Virus family was discovered in the tissues of PDD-affected birds. It is a large enveloped single strand RNA virus, which lives and reproduces in the nucleus of infected nerve cells. Its genome was sequenced into its unique DNA “signature”, and it was named “Avian Borna Virus” (“ABV”). Further research done by injecting brain tissue from infected birds directly into muscle, veins, and brains of previously uninfected birds showed that this new virus actually caused infection and disease (vs just being a coincidental finding).

Since then, much research has been devoted to identifying subtypes/genotypes of the Avian Borna Virus. At least 15 genotypes have been identified so far, of which two primarily infect parrot-family birds. Various genotypes of Avian Borna Virus have been found in wild parrots, waterfowl, seagulls, finches, canaries, raptors, and many other kinds of domestic and wild birds. These genotypes seem to be species specific. However, this abundance of genotypes has made developing accurate genetic tests a challenge.

Surveys of groups of normal healthy pet birds, as well as analysis of laboratory samples submitted for other kinds of testing, reveal that 10-40% are positive for the presence of ABV. Screening of some homes and aviaries found ABV in 33-60% of these clinically healthy birds. Robert Dahlhausen DVM, MS, who has done major work in this field, stated during his AAV 2015 presentation that **basically, if you have three birds, there is a good chance that one of them is infected with ABV.** As a practical matter, this means that any of us who have or have had numbers of birds in our homes have/have had ABV-infected birds.

Routine testing for the presence of ABV infection in the absence of disease is generally not recommended. Most birds with ABV infection do not progress to disease for decades, if ever. Also, there is no one test right now that reliably gives accurate results as to the presence or absence of ABV infection, though combination tests may do so. There are RT-PCR tests, antibody blood tests, biopsies (crop, ventriculus, adrenal gland) and radiographs. With most of the tests, a positive result indicates viral infection (not necessarily disease), and a negative result does not mean there is no infection. There is no combination of tests right now that can predict if a bird will progress to disease from mere infection, though a new kind of antibody test is under development, which should be more accurate in birds that have clinical disease.

**Expanded Understanding of the Disease Caused by ABV**

We now know that ABV can infect various parts of the bird's nervous system, causing inflammation in the affected nerves. Because of this characteristic inflammation of the nervous system, the new preferred name for this disease syndrome is *Avian Bornaviral Ganglioneuritis*.

Depending on what aspect of the nervous system is involved, different birds will manifest different clinical signs.

- "New World" parrots (macaws, amazons, conures etc.) are more likely to have gastrointestinal disease, as seen in "macaw wasting"/PDD - delayed food processing, regurgitation, anorexia, diarrhea, weight loss, and the characteristic passage of undigested food in the feces. The disease also impairs the natural resistance to bacterial and fungal overgrowth in the gastrointestinal tract.

- "Old World" parrots (African greys, lovebirds, cockatoos, cockatiels etc.) are more likely to have central nervous system ("CNS") involvement, giving rise to problems like lack of balance (ataxia), tremors, incoordination, reduced cognitive ability, self-mutilation, even seizures. Feather destructive behavior may sometimes be caused by ABV's inflammation of peripheral nerves.

Some birds manifest a combination of GI and CNS neurologic signs.

Current thinking is that if a bird is exhibiting otherwise unexplained neurologic and/or GI signs, ABV should be investigated as a possible cause. ABV is only one potential cause of these kinds of clinical signs, so a careful assessment is warranted.

Profound emaciation in a cockatoo with neuropathic ganglioneuritis. Photo credit: Dr. Isabelle Langlois

**The Good News**

1. Progression to Active Disease: Infection with ABV does NOT mean that any given bird will necessarily develop disease. To the contrary, most ABV-infected birds will remain clinically healthy most or all of their lives, with the virus dormant within the affected nerve ganglion. There is a continuum of illness as well, with many birds exhibiting only mild disease if they do show signs. There is no recommendation to cull or euthanize ABV-infected birds.

It should be noted it appears that stress can cause the virus to become active, so keeping your birds healthy and stress free is important. The stress created by reproductive hormones is one likely culprit for flare-ups.

2. How is it Spread? This is, of course, an area of considerable concern and research.

The virus is shed intermittently in the droppings, and the disease has been shown to pass by horizontal transmission (i.e.: between birds) by the oral-fecal route. However, it appears that horizontal transmission in a group of immune competent adults is relatively inefficient, and requires close contact. Some researchers feel that there is little likelihood of transmission between cages if there is good husbandry, good ventilation, and sunlight. Birds housed in adjacent cages with a common wall did not transmit disease where these conditions were met.

It is known that some birds have been housed together with ABV positive birds without getting infected. It does not appear to be particularly airborne. A group of cockatiels had ABV placed directly into their nares (the respiratory route), and also orally. At the end of the study, no signs of disease or infection were detected in any of the subject birds.

However, we should not be casual about this potentially deadly disease. When ABV negative conures were housed in the same cage with ABV positive conures and close contact (i.e. mating) ensued, all the negative birds became ABV+ after 6 months, though none showed signs of actual disease.

There is evidence that ABV might be passed vertically - i.e. from infected parents via the egg. Some researchers think this is a major mode of transmission, while others think it is less common. Not surprisingly, young unweaned birds with undeveloped immune systems are more at risk than immune competent adults.

3. Persistence in the Environment: This virus is very fragile outside the body. It is easily killed using normal cleaning techniques, such as dilute bleach and detergents. Experiments show it loses infectivity rapidly just being in the air at 77 degrees Fahrenheit and 21% relative humidity for 8 hours, and is 100% gone after 4 days. It is also killed by exposure to sunlight.

4. Development of Vaccine: Efforts are underway to develop a vaccine, and a prototype has been shown to prevent disease if given before infection. It does not reduce severity of, nor does it worsen, disease if given after infection. For those birds that are infected in the egg, the vaccine will not be effective, but perhaps one might be useful for aviary situations in the future.

5. Treatments: PDD used to be pretty much 100% fatal once clinical signs (emaciation, passing of undigested food in droppings, etc.) were manifest. There is more hope in this arena as well. Better testing has allowed for earlier detection, and the understanding of the disease as one which causes inflammation of the nerve ganglion (and increasing evidence that there may be an auto-immune reaction component) has allowed for development of appropriate treatments such as specially compounded Celebrex and injectable Robenacoxib. Some birds are greatly helped by these. They do not help all birds, of course, and they only serve to reduce symptoms. To date, there is no cure for the underlying virus. This is, of course, an area of active investigation, and another reason you should be working with a knowledgeable avian veterinarian.

Maldigestion/malabsorption diarrhea in a parrot fed a seed-based diet. Photo credit: Dr. Gregory A. Rich

**What Does This Mean for Us as Avian Caregivers?**

The “take home” here is that there is a substantial likelihood you have ABV positive birds in your flock, or that you may be adopting (or buying, or inheriting) a bird that comes with the virus. Most likely the virus will remain dormant within the nervous system of the host bird, though it will still be shed intermittently in the droppings.

Stress and poor husbandry can cause ABV to become active. There is evidence that if a bird is infected with one genotype of ABV, then becomes exposed to or infected with another genotype, this new exposure may create an overload which causes progression to disease. If one of your birds tests positive for ABV, it should be housed separately from your other birds to reduce the risk of transmission.

Do not crowd your birds’ cages closely together - distance is your friend. Keep cages, cage furnishings, dishes etc. clean, scrub down the environment regularly, ensure good ventilation and air cleaning, and let in natural sunlight whenever possible. If the birds become reproductively active, discourage this, and consider treatments like Lupron if needed. Wash your hands frequently. Any air cleaner you might use needs to remove particles down to 0.1 nm in size to be helpful (the virus is 0.7 – 1.2 nm in diameter). There is an online support group for owners of birds who are ABV positive to share information, encouragement, and, sometimes, grief.

Obviously, working with a competent avian veterinarian is essential at all times. Keeping an eye out for changes in your birds’ appetite, digestion, droppings, weight loss, balance, and coordination, coupled with regular exams, will give you and your flock the best chances for a long and happy life together.

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Sources for this article were presentations and papers by: Sharman Hoppes DVM, DABVP (avian practice) & Christal Pollock DVM, Dipl ABVP (avian) 2014; Jenna Kranz BS, Paulina Escandon MS, Jeffrey Musser DVM, PhD, DABVP (dairy) 2015; Ian Tizard DVM, PhD, ACVM 2015; Robert Dahlhsausen DVM, MS 2015; Susan Orosz DVM, PhD, DABVP (avian) 2015, Brian Speer DVM, Dipl ABVP 2015, and two personal phone calls with Arne de Kloet (researcher at Avian Biotech) in March and May 2016.