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Avian Borna Virus/ PDD: Good News and Bad News – New Research Findings

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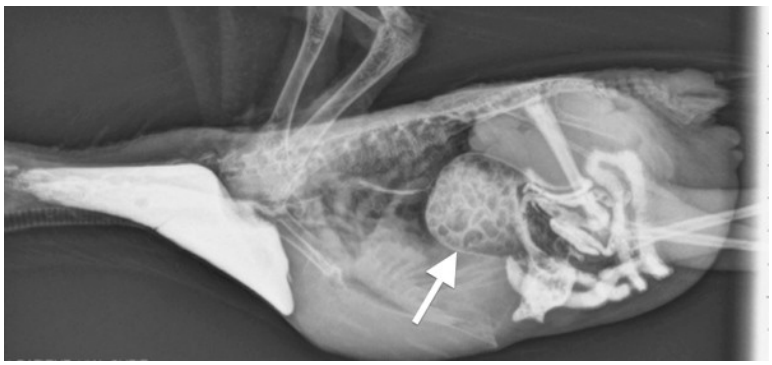

Radiographic evidence of proventricular dilatation (arrow).
Photo credit: Dr. Sharman Hoppes.

In the late 1970’s, wild-caught macaws imported into Europe and the U.S. 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 Proventricular Dilatation Disease (“PDD”) because impaction, dilatation, and degeneration of the Proventriculus (the glandular stomach in birds) was often a finding on necropsy. This was a frightening newly-identified syndrome because once clinical signs were seen, a large percentage of these birds progressively worsened and died.

The Bad News

PDD was identified in over fifty different species of birds, including canaries, weaver finches, honey creepers, toucans, birds of prey, water fowl, and 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.

In 2008, a new member of the Borna Virus family was discovered in the tissues of PDD-affected birds. It was an enveloped single strand RNA virus, living and reproducing in the nucleus of infected cells. Its DNA was sequenced into its unique DNA “signature”. It was named “Avian Borna Virus” (“ABV”). Since then, fifteen genotypes have been identified, of which two primarily infect parrot-family birds.

Further research showed that this new virus actually caused infection and disease (vs. just being a coincidental finding) by injecting infected brain tissue directly into muscle, veins, and brains of previously uninfected birds.

Surveys of groups of normal healthy birds, as well as of laboratory samples submitted for other kinds of testing, reveal that 15-40 % 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 ExoticsCon presentation that **basically, if you have 3 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 not recommended, however, for reasons explained below (see “The Good News”). Most birds with ABV infection do not progress to disease.

Also, there is no one test now that reliably gives accurate results as to 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 no infection. There is currently

no combination of tests 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 who 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 and loss of myelin sheath protection. Depending on what aspect of the nervous system and body is most involved, different birds will manifest different clinical signs. Because of this characteristic inflammation of many parts of the nervous system, the new name for this disease syndrome is *Avian Bornaviral Ganglioneuritis.*

"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 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 involvement, giving rise to problems like lack of balance (ataxia), tremors, incoordination, reduced cognitive ability, even seizures.

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

Feather destructive behavior can sometimes be caused by ABV's inflammation of peripheral nerves. Some birds manifest a combination of gastrointestinal and 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. It is important to note that ABV is only one possible cause of these kinds of clinical signs.

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 their entire 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.

2. How is it Spread? 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. Some researchers feel that there is little likelihood of transmission between cages if there is good husbandry. It is known that some birds have been housed together with ABV-positive birds without getting infected. A group of cockatiels were experimentally infected with ABV into the 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.

It does appear, however, that the disease is passed on vertically – i.e. from infected parents via the egg, and some feel that this is a major mode of transmission. 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 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 who 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. This is, of course, an area of active investigation which shows considerable promise, and another reason you should be working with a knowledgeable avian veterinarian.

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

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 which 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. Also, there is evidence that if a bird is infected with one genotype of ABV, then becomes exposed to/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 kept separately from your other birds to reduce the risk of transmission. The infected bird(s) does not need to be in a separate room, but their cages should be at least several feet away from other birds. The infected birds should not have direct contact with other birds and should be serviced last. The virus is about 0.1 microns big. This means that most air cleaners (including Rabbits and Austins) will not clear the virus from the air. The Blue Air cleaners, among other brands, will do so.

Do not crowd your birds’ cages. Keep cages, cage furnishings, dishes etc. clean, scrub down the environment on a regular basis, 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 as well.

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.