Avian Borna Virus really is

THE CAUSE OF PDD

So what can you do about it?

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In the summer of 2008, two research groups one based at the University of California, San Francisco, and one at Columbia University in New York, and working independently, used highly sophisticated molecular techniques to show that parrots suffering from proventricular dilatation disease (PDD) were infected by a previously unknown virus they called Avian Borna Virus or ABV. Other groups such as those at Texas A&M's Schubot Center confirmed and extended these findings by isolating and growing this virus from the brains of birds that died from PDD. Scientifically however, none of these researchers had "proved" that ABV is the cause of PDD. All we had done is shown a close association between infection with ABV and the development of PDD. But some birds that are infected with ABV remain in apparent good health, while this virus cannot be detected in some birds with PDD. It was theoretically possible that another, unknown agent caused PDD. For this reason, it was necessary to formally prove that ABV causes PDD by inoculation of pure ABV into normal birds.

ABV IS THE CAUSE OF PDD

The first steps were taken by Gancz and his colleagues who showed that typical PDD developed in cockatiels that had been inoculated with brain tissue containing ABV. This was a great first step but not the final proof since other agents within the brain tissue might possibly have affected the results. The group at Texas A&M were however able to isolate the virus from eight different cases of PDD, and culture the virus for several generations in tissue culture. The pure virus culture was then administered to two Patagonian conures by mouth and injection. 66 days later one of these birds died showing the classical signs of PDD. The other conure had lost so much weight by this time that it had to be euthanized for humane reasons and it too was found to be suffering from typical PDD. Necropsy, histopathology and molecular biology all confirmed that these birds had clinical PDD and ABV was present in large amounts in their brains. ABV is proven to be the cause of PDD.

FUTURE STUDIES

All these new discoveries have been very exciting but this virus continues to kill precious rare birds. What can we do about it? There are four areas of research that we are investigating. First, we need a good diagnostic test so we can detect infected birds. Second we need to know how the virus spreads between birds so we can stop it. Third we need to be able to treat and hopefully cure clinical PDD. Finally we need to develop a vaccine to completely stop this virus in its tracks.

DIAGNOSTIC TESTS

Two diagnostic tests are now available. They measure two different things. Thus the PCR (Polymerase Chain Reaction) test can detect the virus (strictly speaking, its genetic material) in bird tissues, secretions and droppings. This is a very sensitive and specific test. We believe that it is best used to detect the virus in a bird's droppings. Unfortunately, our experience also confirms that an infected bird does not shed the virus in every dropping, every day. Thus if this test is positive, it confirms that the bird is infected with ABV. If the test is negative, it only means that there was no virus in that specific dropping. It requires multiple fecal PCR tests to "prove" that a bird does not have ABV. The number of tests required might depend on the species involved. For example, we have observed that as few as half of a group of infected cockatiels are shedding the virus at any one time. Three tests will thus identify only about 88% of infected birds. This problem notwithstanding, we suggest that the fecal PCR test is best used to identify and separate infected birds from non-infected birds. Repeated testing does not disturb the birds and it is possible to perform a single test on pooled fecal samples from multiple birds in an aviary.

The second test we have developed is a blood test known as an immunoblot. This test detects the response of a bird to ABV infection. In our experience this test becomes positive long after the bird begins to shed ABV but around the time the bird develops clinical illness. We think that this test may best be used as a diagnostic test to confirm PDD in sick birds. It appears to be positive in at least 90% of PDD cases. Unfortunately, immunoblots are slow and expensive so we are working on developing a simpler, cheaper and faster test.

CONTROL

ABV is readily found in the droppings of affected birds and can be spread between birds by the "fecal-oral" route; in other words fecal contamination. We also have some preliminary evidence that it

may also be spread by the airborne route. Either way, it will be necessary to stop its spread by cleaning and disinfection. We have yet to test the sensitivity of this virus to disinfectants. We know however that ABV is similar to Newcastle Disease Virus in its basic structure. We suggest therefore that disinfectants such as phenols, formaldehyde and bleach that are effective against Newcastle Disease may also be effective against ABV.

TREATMENT & VACCINATION

While careful flock management will likely be the best way to control this disease in the long-term, we cannot overlook possible treatments and vaccination. ABV is related to Borna disease virus, an infection of horses and sheep and possibly humans in central Europe. One published report in the scientific literature claimed that the anti-viral drug, amatidine was of benefit in treating humans possibly infected with Borna disease virus. We therefore treated three African grey parrots that although apparently healthy were shedding ABV in their droppings. We were unable to show any effect on virus shedding despite treating the birds for six weeks. Amantidine does not appear to be an effective treatment for PDD. While we will continue to screen other antiviral drugs for their effects on ABV shedding, I am not optimistic about success. Certainly human patients who suffer from viral encephalitis are simply treated by careful nursing. Many veterinarians use anti-inflammatory drugs such as Celebrex to treat PDD. This likely works by reducing the brain inflammation caused by the virus. It probably has no effect on virus survival within infected birds.

Finally, for long term control we are looking at the development of an effective vaccine. While modern vaccine technology is very sophisticated and complex, any practical vaccine for ABV will have to be cheap and simple. This is for economic rather than scientific reasons. The relatively small size of the market for an ABV vaccine will likely ensure that it will be of little interest to the large multinational vaccine companies and they will be reluctant to invest major resources into the development of such a vaccine.. Nevertheless, we will seek to determine if a simple vaccine can be made to work.

In conclusion, the pace of discovery regarding PDD and ABV over the past year has been remarkable. The logjam has broken. Now that the agent has been identified and a diagnostic test become available, we can see our way to developing methods to prevent and treat this terrible disease. In the meantime, consider beginning the process of eliminating the disease from your own aviary. While we have limited experience with this virus, consider the following suggestions.

START CONTROLLING ABV

Several laboratories, on both sides of the Atlantic are offering the PCR test. Our

experience suggests that testing of cloacal swabs or feces yields better results than blood testing. We suggest that you have your whole collection tested, perhaps by testing pooled fecal samples.

Because birds shed intermittently, a single negative test is not sufficient to prove that your birds do not have ABV. You will probably need to perform tests at least three times at weekly intervals before you can begin to relax. If you are fortunate enough to be free, do not admit any new birds to your collection until they too have tested negative at least three times. If you are free of PDD you can now stay free with careful biosecurity. It might be prudent to retest at six months just for reassurance. Never admit a new bird to your collection that has not tested negative for ABV on at least three occasions.

If the pooled fecal sample tests prove positive, then collect samples from individual birds to seek to identify the virus carriers. Any birds that test positive should be relocated to a separate aviary. Scrub and disinfect its cage using an approved disinfectant such as one of the phenols, bleach or formaldehyde. See the University of California Web page on the control of Newcastle Disease (http://animalscience.ucdavis.edu/avian/disease_control.htm).

Retest all the negative birds at least twice or until you are assured that all infected birds have been removed. Manage your clean birds separately from the infected ones. Do not share utensils or feeding dishes. Ideally have separate workers in the clean and infected flocks, ensure they wear protective clothing and use disinfectant foot baths. Manage your infected flock recognizing that it is a potential source of PDD for your clean birds.

Once you identify a bird that is shedding this virus, do not kill or euthanize it. These birds can live for many years and remain disease free. Isolate the bird, enjoy it and trust that it will live a long, happy life.