Psittacine Beak and Feather Disease

Introduction

Psittacine beak and feather disease (PBFD) is a common viral disease of captive and wild psittacine species throughout the world. PBFD is caused by a circovirus which attacks cells of the immune system and those cells that produce the feathers and the beak. The disease is thought to be specific for psittacines, and all species including budgerigars and cockatiels should be considered susceptible. PBFD seems to be more prevalent and severe in the Old World parrots originating from Africa and Australasia. Our native New Zealand parrots fall into this class. This contrasts with the New World parrots native to Central and South America which appear to be inherently more resistant to the infection.

PBFD was first recognised in 1975 by a veterinary practitioner in Sydney, and over the ensuing years many ideas were put forward as to its cause – from sunflower seeds to inbreeding. It was demonstrated to be a new viral disease at Murdoch University in Perth, and subsequently characterised by researchers at the University of Georgia.

Until 2001 New Zealand samples for PBFD virus testing were being sent to Australia, USA and UK. As well as the expense this involved there was concern that not all cases of PBFD were being diagnosed, that there were a significant number of false negatives, birds infected with the virus but remaining undetected. The New Zealand Avicultural Society funded Dr Peter Ritchie of the Institute of Molecular Biosciences at Massey University, to design a new PBFD virus detection test specifically targeting the viral strains represented in New Zealand and Australia. This was then developed into a commercial test for detection of PBFD virus at the Equine Parentage and Animal Genetic Services Centre at Massey University.

There is a high prevalence of PBFD in free living and captive Australian parrots, and the disease probably arrived in New Zealand via the importation of Australian parrots. In New Zealand the disease is endemic in captive parrots, and in a recent study undertaken by the Institute of Veterinary and Biomedical Sciences at Massey University, it was shown to be widespread in wild populations of Sulphur Crested Cockatoos and Eastern Rosella. This obviously raises concerns about the impact this could have if transmission was to occur to native New Zealand native parrots such as the kaka, kea, kakariki and kakapo.

PBFD is an extremely infectious disease and the virus spreads in a number of ways. Infection may be from one individual to another by direct contact, inhalation or ingestion of aerosols, crop feeding, infected faecal material and feather dust. There is also the possibility of vertical transmission from the hen to the egg embryo. Spread from a contaminated environment is also very important. For example bird carriers, feeding formula, utensils including nail clippers, food dishes, clothing and nesting material. Viral particles are able to remain viable in the environment for months.

The incubation period can be as short as 21 days, and is dependent on the dose of virus, the age of the bird, the stage of feather development and the bird’s immune status. PBFD is generally considered to be fatal, most infected birds surviving from 6 months to 2 years after the onset of clinical signs.

There is no treatment available for PBFD.
Symptoms

Symptoms of PBFD are also dependent on the age, health and breed of bird. It tends to be seen from 0-3 years of age but all ages of bird are susceptible. Three forms of the disease are recognised – the peracute form seen in neonatal birds, the acute form also in young birds and chronic infection, the most commonly presented form as seen in older birds.

Species reported to be particularly affected by PBFD, especially in the peracute form, are cockatoos, African Grey parrots and lovebirds.

In peracute cases there is depression, anorexia, crop stasis and diarrhoea. Death can occur before feather lesions are seen, and is usually due to secondary viral, bacterial or fungal infections.

In acute cases feather changes are most dramatic if the bird develops PBFD during the developmental stages of feather formation, with necrosis, fracture, bending, haemorrhage or shedding of malformed feathers and lesions of the feather shaft. The skin may be thickened. The clinical picture is less dramatic if young birds develop the disease after body feathers are mature, and may be limited to lesions of the flight and tail feathers.

Chronic disease is seen in older birds, where symptoms appear over time, through successive moults. Infected birds may not show signs of the disease until their next moult, which could be 6 months or more after infection. Some signs seen include irreversible shedding of feathers, shedding of developing feathers, development of abnormal feathers, new pinched feathers, loss of the powder down, overgrown or abnormal beak, symmetrical lesions on the beak and occasionally nails. Ultimately secondary viral, fungal, bacterial or parasitic infections will occur as a result of immune depression.

There are also two groups of birds which may test positive for the PBFD virus yet show no signs of clinical disease. There are those birds with a subclinical infection which remain infected with the virus, and may develop clinical disease at a later stage, for example in response to another stressor or disease. It is possible that these birds can shed the virus and infect other birds. Then there are those birds which are infected with the virus, but their immune response clears the virus and the infection is only transient.

It should be remembered that many birds with an adequate immune system, when infected with the PBFD virus will mount an effective immune response resulting in elimination of the virus – in effect a natural vaccination.

Diagnosis

Viral diseases of pet birds have been historically difficult to confirm on diagnosis and to manage in the avian population. Traditional diagnostic methods have inherent problems in detection in terms of sensitivity and specificity, and in interpretation of results. They also often fail to accurately identify the actively infected individual, especially in the subclinical carrier state.

Advances in the field of molecular biology have allowed for the development of extremely sensitive and specific nucleic acid (DNA and RNA) detection methods.
Nucleic acid probes are specifically designe d to bind to the unique DNA sequence of the PBFD viral genome. DNA is extracted from the feather follicle and amplified by a process called polymerase chain reaction (PCR), and if PBFD viral DNA is present multiple copies of the DNA sequence targeted by the probe will be produced, that is multiple copies of part of the viral DNA if it is present. The sample is then run through a separating gel and the presence or absence of the viral DNA detected. The level of specificity of such tests decreases the possibility of false positives and negative test results. But it also means that sample collection and handling needs to be very carefully done to prevent contamination and a subsequent false positive result. Virus can be detected by testing DNA extracted from a feather shaft even before feather lesions develop.

PBFD virus detection by this method should be part of a differential diagnosis of any psittacine with abnormal feather loss or development.

**What do the test results mean**

**Positive for PBFD virus**
- If the bird is showing clinical signs of an acute or chronic PBFD infection the result confirms diagnosis, and prognosis is poor.
- If the bird is not showing any clinical signs of the disease, retest in 2 months to determine whether this is a transient infection which the bird’s immune system will subsequently clear, in which case the second test will be negative, or whether the bird is a chronic carrier, in which case the second test will be positive. Carriers pose a threat to other birds, and may in time develop clinical signs. There should be no contact with other birds while waiting for the second test.

**Negative for PBFD virus**
- There is no evidence that the bird is suffering from the disease or is a carrier.
- If a bird has typical clinical signs of the disease it would be wise to repeat the test, in case of failure due to a poor quality sample, and failure to extract DNA.

If PBFD is a problem in a specific aviary it is wise to check for environmental contamination by performing the PCR test on swabs of contaminated surfaces, materials etc.

**Prevention**

- There must be strict isolation of all infected birds to halt the spread of the disease. DNA testing for PBFD virus should be done on all susceptible birds to rule out any carrier birds.
- Test the environment and aviary equipment to rule out contamination as a source of infection.
- Any bird that tests positive should be placed in quarantine and retested in 2 months. Those that test negative at 2 months should ideally be retested after a further 4-6 weeks.
- All areas that could be contaminated should be thoroughly treated with a product that destroys viruses, such as Virkon.
- Contaminated avian environments remain a major source of viral transmission.
- Ideally maintain a closed flock and only purchase birds from PBFD free flocks.
Prevalence

Over the last 4 years we have tested approximately 2500 samples for PBFD virus. Looking at the results on an annual basis, of these between 5% and 15% of samples submitted for PBFD virus detection tested positive. Some of the birds tested were showing clinical signs of PBFD, and some were tested as part of a screening process for an aviary or population. Of all the birds that tested positive for PBFD virus, between 15% and 31% were showing clinical signs of the disease. This highlights the large number of birds that are infected with the virus but remain as subclinical carriers, or alternatively suffer only a transient infection and become virus free.

Sample submission

Pluck 2 secondary tail or wing feathers from each bird, taking care to prevent contamination between samples.
Submit samples from each bird in individual paper envelopes, with identifying information such as breed, ring number etc
Submit to – Equine Parentage and Animal Genetic Services Centre  
Drysdale Drive PN811  
Massey University  
Palmerston North

The same sample can also be used for DNA based sex determination.
   $35 per bird for sex determination
   $35 per bird for PBFD virus testing
   $60 per bird for sex determination and PBFD test
Cheque to be enclosed with the sample.

REMEMBER WE DO OFFER DNA BASED SEX DETERMINATION

Sex determination by DNA testing is a more accurate and much less invasive technique for determining a bird’s sex than traditional methods.

Male birds have sex chromosomes ZZ, and females WZ.

We extract and amplify DNA from a gene which is present on both W and Z chromosomes. A chemical agent which cuts DNA in a very specific site and manner is then used on the sample. It will cut the gene as it occurs on the Z chromosome, but not on the W chromosome. We then separate the fragments of cut and uncut DNA out on an agarose gel, producing a specific pattern of fragment size bands for females, and another for males.

If you have any queries regarding any of the avian services we provide please do not hesitate to contact me, or our avian technician, Michelle Houston.

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