DISEASE SCREENING OF THREE BUDGERIGAR AVIARIES IN NEW ZEALAND – A REVIEW

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Summary

Disease surveillance is vital to the management of New Zealand's endemic and threatened avian species. Three infectious agents which are potential threats to New Zealand's endemic birds include Avian polyomavirus (APV), Beak and feather disease virus (BFDV) and Avian malaria. All three agents have been reported in New Zealand, however, possible reservoir populations have not been identified.

Abbreviations

APV = *Avian Polyomavirus*, BFD = budgerigar fledgling disease, BFDV= *Beak and feather disease virus*, PBFD = Psittacine beak and feather disease, PCR = Polymerase chain reaction, WCC = White cell count

Introduction

Avian polyomavirus (APV) was first discovered in 1981 (Bernier et al., 1981) and is known to be the causative agent in budgerigar fledgling disease (Müller and Nitschke, 1986) as well as causing fatal disease in a variety of other species (Forshaw et al., 1988; Garcia et al., 1994; Latimer et al., 1996; Johne and Müller, 1998; Arroube et al., 2009). APV affects a range of avian hosts, however, the clinical presentation, distribution of lesions and epidemiological effects of the virus on a population vary markedly between susceptible species (Bernier et al., 1981; Arroube et al., 2009, Deb et al., 2010). Polyomavirus infection in birds is an acute inflammatory disease and can have a mortality rate of up to 100% in fledglings (Krautwald et al., 1989).To date, there are five known polyomaviruses of birds; avian polyomavirus (APV), goose haemorrhagic polyomavirus (GHPV), finch polyomavirus (FPyV), crow polyomavirus (CPyV) and canary polyomavirus (CaPyV) (Halami et al., 2010).

A second common viral disease causing feather loss in psittacine birds is Beak and feather disease virus (BFDV), a member of the family *Circoviridae*. The virus is highly infectious and all psittacine birds

are potentially susceptible to BFDV infections which causes progressive feather loss, dystrophy, and beak deformities (Ritchie et al., 1989; Raidal et al., 1993).

Finally, avian malaria is a mosquito-borne disease caused by intracellular parasites in the Order Haemosporida, genus *Plasmodium*. Species of the genera *Plasmodium* have a cosmopolitan distribution and can infect nearly all avian taxa (Valkiunas, 2004).

Although not notifiable diseases in New Zealand, APV, BFDV, and *Plasmodium* spp. are still considered 'diseases of concern' in conservation management (Worthington, 2010), however, detailed information on the three diseases is limited, particularly within the captive bird populations.

Materials and methods

Sample collection

Thirty budgerigars were sampled from each of three breeding aviaries in the North Island of New Zealand in July 2012. Aviaries were selected on the basis that they bred budgerigars and that feather abnormalities had been present within the last three years. All three aviaries had exchanged and exhibited birds at the same shows in the last two years.

Molecular detection of APV

DNA was isolated from each sample using the DNeasy Blood and Tissue Kit (Qiagen, Valencia, CA, USA) following the manufacturer's protocol for nucleated whole blood. The presence of the polyomavirus major capsid protein VP1 gene was identified using a broad-spectrum nested PCR as described by Johne et al. (2005).

Molecular detection of BFDV

Total DNA was extracted from blood and feather budgerigar samples using iGenomic blood DNA extraction kit (Intron Biotechnology, Korea) according to the manufacturer's instructions. A BFDV screen was set up using primers that target a ~600bp region of the replication associated gene (5'-TTA ACA ACC CTA CAG ACG GCG A-3' and 5'-GGC GGA GCA TCT CGC AAT AAG-3') (Ritchie, 2003).

Molecular detection of Avian Malaria

DNA was extracted from whole blood as described for the detection of APV. The presence of the *cytochrome b* gene of *Plasmodium* spp. was identified using a nested PCR and the nested primer sets HaemNF1/HaemNR3 and HaemF/HaemR2 as described by Hellgren et al., (2004).

Animal Ethics

Samples were obtained under permission of the collection owners and The University of Queensland Animal Ethics Committee (Production and Companion Animal) permit number SVS/106/12.

Discussion

Disease surveillance is vital to the management of New Zealand's endemic and threatened avian species. In some instances, potential pathogens can infect bird species without causing disease while in others the infection results in high levels of mortality. In addition, sub-clinical disease in some hosts, particularly introduced species, may provide a reservoir population for subsequent infection of naïve endemic avifauna. Three infectious agents which are potential threats to New Zealand's endemic birds include APV, BFDV and avian malaria. All three agents have been reported in New Zealand; however, the possible reservoir populations have not been identified for APV and BFDV.

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