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Psittacine beak and feather disease virus and avian polyomavirus detection rate in clinically healthy captive birds in the Czech Republic

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Abstract: The aim of this study was to document the detection rate of the beak and feather disease virus (BFDV) and avian polyomavirus (APV) across clinically healthy captive parrots in the Czech Republic. The presence of the BFDV and APV was tested using a nested polymerase chain rection (PCR) in 177 parrots originating from 34 facilities (breeding facilities, private owners). Positive BFDV results came from 38 parrots (21.5%) within 12 facilities (35.3%). Two parrots (1.1%) originating from two different facilities (5.9%) tested positive for APV. The results show a high detection rate of BFDV in the clinically healthy captive parrot populations in the Czech Republic. Preventive measures to stop the spread of this virus are, thus, essential.

Keywords: avian medicine; nested PCR; viral infections

Viral diseases are a major health problem for captive psittacines (Katoh et al. 2010). Psittacine beak and feather disease (PBFD) caused by the psittacine beak and feather disease virus (BFDV; Raidal 2012) and an infection caused by avian polyomavirus (APV; Pendl and Tizard 2016) are particularly problematic. They mainly manifest as chronic plumage disorders. However, they can also cause serious clinical illness, including sudden death. Rosario et al. (2017) described eleven avian circoviruses in different avian species.

PBFD was first described in Australia in birds of the family *Cacatuidae* (Pass and Perry 1984). As avian imports became more common, BFDV spread to Europe and North America. Todd (2004) specifies that the disease was described in sixty species of free-ranging birds as well as captive parrots. In 2001, BFDV was declared the main threat for endangered psittacines of Australia (Raidal et al. 2015). Modern BFDV diagnostics are based on PCR (polymerase chain rection) (Ogawa et al. 2005) and real-time PCR methods (Katoh et al. 2008).

Avian polyomavirus (APV) is spread worldwide across *Psittaciformes* (Johne and Muller 2007; Katoh et al. 2010). Young and subadult budgerigars (*Melopsittacus undulatus*) are the most susceptible to APV (Hirai et al. 1984; Johne and Muller 2007; Katoh et al. 2010). Disease progression can be peracute, acute, or chronic depending on the species, age and body condition of the afflicted birds (Enders 1997).

PCR and real-time PCR are common diagnostic tools for the detection of APV (Ogawa et al. 2005; Katoh et al. 2008).

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The detection rate of BFDV and APV has not yet been studied in the Czech Republic. Thus, the aim of this study is to establish the detection rate of BFDV and APV in clinically healthy captive psittacines in the Czech Republic.

MATERIAL AND METHODS

The study was conducted on samples collected from 177 clinically healthy parrots (Table 1), all of which originated from thirty-four facilities in the Czech Republic. All the parrots were handled in accordance with national and European legislation (EU Council Directive 86/609/EEC for the protection of animals) and with the direct approval of the animal's owners. For the detection of BFDV and APV, the plumage sample was collected by plucking 3–5 feathers from the interscapular area using non-powdered nitrile gloves. The sample was sealed in a zip lock bag and transported to the Laboratory of Avian and Exotic Animal Clinic, University of Veterinary and Pharmaceutical Sciences Brno, where the presence of BFDV and APV

Table 1. Species and the number of parrots tested for the BFDV and APV presence

Species of parrots	BFDV-PCR		APV-PCR	
	positive	total	positive	total
African grey parrot (*Psittacus erithacus*)	5	51	1	51
Alexandrine parakeet (*Psittacula eupatria*)	20	36	1	36
Australian king parrot (*Alisterus scapularis*)	4	10	0	10
Blue-and-yellow macaw (*Ara ararauna*)	0	5	0	5
Blue-throated macaw (*Ara glaucogularis*)	0	3	0	3
Bronze-winged parrot (*Pionus chalcopterus*)	0	2	0	2
Budgerigar (*Melopsittacus undulatus*)	0	2	0	2
Cuban amazon (*Amazona leucocephala*)	0	1	0	1
Fischer's lovebird (*Agapornis fischeri*)	1	1	0	1
Galah (*Eolophus roseicapilla*)	0	4	0	4
Great green macaw (*Ara ambiguus*)	0	4	0	4
Green-winged macaw (*Ara chloropterus*)	0	10	0	10
Kea (*Nestor notabilis*)	0	3	0	3
Leadbeater's cockatoo (*Lophochroa leadbeateri*)	0	2	0	2
Lord Derby's parakeet (*Psittacula derbiana*)	0	1	0	1
Military macaw (*Ara militaris*)	0	2	0	2
Orange-winged amazon (*Amazona amazonica*)	0	1	0	1
Pileated parrot (*Pionopsitta pileata*)	0	2	0	2
Red-crowned parakeet (*Cyanoramphus novaezelandiae*)	0	1	0	1
Rose-ringed parakeet (*Psittacula krameri*)	4	7	0	7
Rüppell's parrot (*Poicephalus rueppellii*)	2	2	0	2
Salmon-crested cockatoo (*Cacatua moluccensis*)	0	2	0	2
Scarlet macaw (*Ara macao*)	0	4	0	4
Senegal parrot (*Poicephalus senegalus*)	0	1	0	1
Sulphur-crested cockatoo (*Cacatua galerita*)	0	6	0	6
Sun parakeet (*Aratinga solstitialis*)	0	2	0	2
Turquoise-fronted amazon (*Amazona aestiva*)	2	6	0	6
White cockatoo (*Cacatua alba*)	0	2	0	2
Yellow-crested cockatoo (*Cacatua sulphurea*)	0	2	0	2
Yellow-crowned amazon (*Amazona ochrocephala*)	0	2	0	2

APV = avian polyomavirus; BFDV = beak and feather disease virus; PCR = polymerase chain rection

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were detected using the nested PCR described in details by Tomasek et al. (2008). Standard precautions were taken in order to minimise the risk of cross-contamination of the samples (sample collection using nitrile gloves, individual packaging, individual manipulation with the samples as well as with the positive control in the laboratory by experienced personnel).

RESULTS

The study detected the incidence of BFDV and APV in clinically healthy captive parrots in the Czech Republic. With the use of a nested PCR, the presence of BFDV and APV was confirmed in 38/177 (21.5%) and 2/177 (1.1%) samples, respectively (Table 1). There were two multi-positive animals, which tested positive for both BFDV and APV. The study revealed BFDV and APV positive birds in 12/34 (35.3%) and 2/34 (5.9%) of the tested facilities, respectively.

DISCUSSION

Hulbert et al. (2015) found a 31.0% BFDV detection rate in Australian birds and Hsu et al. (2006) reported a 41.2% BFDV detection rate in captive birds from Taiwan. Hulbert et al. (2015) reported 13.0% APV positive birds in Australia and Hsu et al. (2006) found 15.2% APV positive birds in Taiwan. The high BFDV and APV detection rate in Australia and Taiwan might have been caused by free-ranging populations of parrots acting as a natural reservoir and carrier of viral agents in Australia and Asia.

Studies undertaken on different European bird populations showed a low APV and BFDV detection rate. The APV detection rate in this study was found to be 1.1%, which is consistent with the results reported from Italy (0.8%; Bert et al. 2005), Japan (2.7%; Ogawa et al. 2006), Germany and Spain (0.0%; Kessler et al. 2020). Kessler et al. (2020) did not find any BFDV positive samples collected from parrots in Germany or Spain. Bert et al. (2005) found an 8.05% detection rate of BFDV in parrots in Italy. These results do contrast with the detection rate of 21.5% BFDV positive individuals in this study. However, the samples tested for BFDV in this study came from 34 facilities, from private owners keeping a single parrot to large breeding facilities with up to 30 individuals per owner. This fact and the low interest of avian breeders for avian preventive medicine in the Czech Republic are plausible reasons for the high measured detection rate of BFDV amongst the clinically healthy captive bred parrots in the Czech Republic. The results in this study were obtained with the use of a standardised nested PCR method (Tomasek et al. 2008). The results were not confirmed by sequence analysis and the risk of some false positive results cannot be excluded completely.

All precautions were taken in order to minimise the risk of cross-contamination (sample collection and transport by a veterinarian specialised in avian medicine, standardised nested PCR performed by experienced personnel). The results of this study indicate a high detection rate of BFDV in the clinically healthy captive parrot population in the Czech Republic. Thus, preventive measures based on establishing an effective quarantine system and checking all incoming parrots for avian viral diseases in avian facilities in the Czech Republic are necessary.

Conflict of interest

The authors declare no conflict of interest.

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