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Short communication

Occurrence of *Macrorhabdus ornithogaster* in exotic birds

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Abstract

Avian gastric yeast (*Macrorhabdus ornithogaster*) is a microorganism that infects aviary birds worldwide, both captive and wild. A total number of 352 birds, belonging to 18 avian species, were examined from 2019 to 2022 for *M. ornithogaster*, using fecal smears of live birds or cytological samples of the proventriculus taken at necropsy. These cytological samples were taken from birds that died from different causes. Some of the birds exhibited symptoms such as lethargy, regurgitation, weight loss and anorexia. Faecal samples were collected from all the birds and analysed for gastric yeast using a direct smear and Gram-staining method. The microorganism was diagnosed most frequently in budgerigars (55.5%), the African gray parrot (33.3%), and nymphs (34.3%). The prevalence of *M. ornithogaster* in canaries was 10%. The infection was detected in 31% of the examined birds, which shows that the occurrence of *M. ornithogaster* in exotic birds is common. No clinical signs were observed in the vast majority of birds that tested positive for gastric yeast.

Keywords: captive birds, exotic birds, faecal Gram's stain, gastric yeast, *Macrorhabdus ornithogaster*

Introduction

Avian gastric yeast (*Macrorhabdus ornithogaster*) was first described and diagnosed as a yeast and not a bacteria in the 1980s (Phalen 2014). It was formerly called "*megabacterium*" (Scanlan and Graham 1990). The host range of *M. ornithogaster* includes smaller companion birds and appears to be most commonly diagnosed in budgerigars, lovebirds, cockatiels, finches, and canaries. This yeast was also detected in production species such as poultry and ratites, but not in a significant number (Behnke and Fletcher 2011, Piasecki et al. 2012, Phalen 2014).

Diagnosis of infection can be difficult, as clinical

Fig. 1. *Macrorhabdus ornithogaster* in a bird faecal sample. Grams stain; x40

signs are not specific (Antinoff 2004). The most common signs are weight loss, lethargy, regurgitation (usually with undigested seeds or pellets in the droppings), and diarrhea. A common technique for the identification of *M. ornithogaster* is examining the droppings and the feces under a microscope, using a stained and unstained direct mount preparation. A float preparation, as well as a polymerase chain reaction (PCR) assay, are often used as identification methods (Antinoff 2004, Phalen 2014, Baron et al. 2021).

Treatment of avian gastric yeast is usually difficult due to subclinical signs that can occur in many birds. Good hygiene, as well as the use of high-quality feed, are prevention measures that lead to the minimization of the infection and preservation of other birds (Amer and Mekky 2020). The present study shows that the occurrence of *M. ornithogaster* in companion birds is common, but the vast majority of cases occur without any clinical signs.

Materials and Methods

A total of 352 companion birds, belonging to 18 avian species, were selected for evaluation of avian gastric yeast (*M. ornithogaster*) from February 2019 to June 2022. The material for the study consisted of fresh faeces taken from clinically healthy birds and impression preparations from the gastric mucosa taken during necropsy from birds that died from different causes. Faecal samples were collected from 307 birds, and impressions from 45 birds. Fresh stool samples were taken directly on microscope slides and smears were stained (Diff-Quick set, Microptic, Spain). These microscope slides were checked under a light microscope, 40x lens (Leica Microsystems, Germany). The slides were classified as *M. ornithogaster* positive or negative (Fig.1). Evaluation of the data was performed using the TIBCO Statistica 14.0.1 software and the Chi-Square test was calculated.

At necropsy, atrophy of the pectoral muscle, hyperemic proventriculi and ventriculi, thickening of pectoral muscles wall, ulceration and hemorrhage of the pro-

Table 1. The occurrence of *Macrorhabdus Ornithogaster* in various species of exotic birds.

Species	Feceal samples		Cytological samples		Total	
	Positive	Negative	Positive	Negative	Sampled	Positive (%)
Ara ararauna (Blue and yellow macaw)	1	7	1	1	10	2 (20.0)
Cacatua alba (White Cockatoo)	0	6	0	0	6	0
Cacatua moluccensis (Salmon-crested cockatoo)	0	3	0	0	3	0
Psittaacus erithacus (African gray parrot)	5	10	1	2	18	6 (33.3)
Eclactus roratus (Eclactus parrot)	1	5	0	2	8	1 (12.5)
Cacatua sulphurea (Yellow-crested cockatoo)	0	2	0	0	2	0
Psittacula eupatria (Alexandrine parrot)	1	4	0	3	8	1 (12.5)
Psittacula krameri (Rose ringed parakeet)	3	3	0	6	12	3 (25.0)
Cyanoliseus patagonus (Burrowing parrot)	0	2	0	0	2	0
Platycercus eximius (Eastern rosella)	0	7	0	5	12	0
Platycercus adsitus (Pale-headed rosella)	0	1	1	1	2	1 (50.0)
Myiopasitta monachus (Monk parakeet)	0	1	0	0	1	0
Nymphicus hollandicus (Cockatiels)	7	22	5	1	35	12 (34.3)
Psephotus heamatonus (Red-rumped parrot)	0	6	0	0	6	0
Melopsittacus undulatus (Budgerigars)	66	56	10	5	137	76 (55.5)
Serinus canaria (Canary bird)	7	63	0	0	70	7 (10.0)
Amadina fasciata (Cut-troath finch)	0	6	0	1	7	0
Poephila guttata (Zebra finch)	0	12	0	1	13	0
Total	91	216	18	27	352	109 (31.0)

ventricular mucosa, were observed in both Melopsittacus undulatus and Nymphaticus hollandicus birds. Three samples additionally showed mucosal hyperplasia. Proventricular rupture was cause of death in three other positive bird samples.

Overgrowth of the mucosa of the isthmus, severe gastritis and ulceration of the proventricular and ventricular mucosa were most likely causes of death of some birds. Lot of diseases, that have immunosuppressive effect, such as Psittacine adenovirus, Avian papylomavirus are diseases in which M. ornithogaster most frequently co-occurred.

Results and Discussion

The test performed showed the presence of *M. ornithogaster* in 109 out of the 352 examined birds, i.e., the presence of infection was detected in 31% of the examined birds (Table 1). In the studied groups of birds, it was found that there are significant differences in the frequency of infection with *M. ornithogaster*.

According to the results obtained (Table 1), it can be seen that the percent of birds that tested possitive from the stool sample was 42.1%, while the percent of positive samples from the cytological sample was

66.6%. This result is in agreement with the findings obtained by Tsai et al. (1992) and Piasecki et al. (2012), who found that the percent of positive results from the cytological samples is higher than that from the faecal samples. Contrary to the overall results, in Psittacula krameri and Serinus canaria all positive results for *M. ornithogaster* were found in the feces samples.

According to the literature, canaries are species which, apart from burgerigars, have macrorhabdus in common (Herck el al. 1984, Phalen 2014). However, in this study, it was determined that the percent of canaries possitive for *M. ornithogaster* was only 10% and that all positive samples were found in feces samples. This is in agreement with the results obtained by Piasecki et al. (2012) in Poland who determined that only 9.2% of canaries were positive for *M. ornithogaster*.

The results of the Chi-square test showed that there is a statistically significant difference in the proportion of infected Canary birds (Serinus canaria) samples and the proportion of infected birds found by Herck et al. (1984) in the Netherlands and Marlier et al. (2006) in Belgium ($p<0.05$). The results obtained in this study on the proportion of infected birds are in agreement with the results obtained by Piasecki et al. (2012) in Poland and Lanzarot et al. (2013) in Spain, i.e. the results of the Chi-square test showed that there is no statistically significant difference in the proportion of infected birds ($p>0.05$). The results of the analyzed proportions of Budgerigar (*Melopsittacus undulatus*) birds showed that there is a statistically significant difference between the proportion of infected birds from these samples and the proportion of infected birds from the study by Tsai et al. (1992) in Japan, Piasecki et al. (2012) in Poland, as well as Sullivan et al. (2017) and Powers et al. (2019) in the USA ($p<0.05$). By analysing the results for the other bird species and comparing proportion of infected birds with the proportion of infected birds obtained by Piasecki et al. (2012), no statistically significant difference was found in the proportion of infected birds ($p>0.05$).

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