



## Case Report



# Prevalence of Avian Gastric Yeast (*Macrorhabdus ornithogaster*) in Parrots and Parakeets: A Case Study

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### ABSTRACT

**Introduction:** The avian gastric yeast (*Macrorhabdus ornithogaster*) is a microorganism that infects aviary birds worldwide and can cause chronic wasting disease. *Macrorhabdus ornithogaster*, previously named Megabacter, infects a large group of companion birds, such as cockatiels, budgerigars, lovebirds, parrots, African gray parrots, and green-cheeked parakeets. The aim of the present case study was to evaluate the infection by *Macrorhabdus ornithogaster* in some companion birds and to show their prospects in the future.

**Case report:** The investigated species included 145 cockatiels, gray parrots, lovebirds, green cheeks, and budgerigars with symptoms, such as lethargy, weight loss, regurgitation, and gasping when they were referred to the Aria Veterinary Hospital, Mashhad, Iran, during 2021-2022. The samples were randomly evaluated for gastric yeast (Megabacter) using the gram-staining method of their feces. The results revealed that almost half of the symptomatic cases showed active or non-active yeast in their slides. A 14-day treatment of nystatin, apple vinegar, and metronidazole was applied for all cases, and then gram-staining slides were tested after three weeks, showing that the treatment was successful.

**Conclusion:** The results indicated that nystatin, apple vinegar, and metronidazole can be an effective treatment for gastric yeast in birds. The recurrence of infection was detected in several birds, suggesting food hygiene control.

## 1. Introduction

Avian gastric yeast, *Macrorhabdus* (*M.*) *ornithogaster*, which is more common in smaller companion birds like parrotlets, lovebirds, finches, cockatiels, and budgerigars, often colonizes the digestive tract of birds. A weakened immune system seems to be the most important risk factor for the birds to be infected<sup>1</sup>.

The most common signs of infection are chronic weight loss, lethargy, regurgitation with or without undigested seeds or pellets in the droppings, and diarrhea. Therefore, droppings can create a suitable environment for both relapses and potential shedding of the infection<sup>2</sup>.

The disease can be diagnosed by examining the

droppings and the feces under the microscope. The gram-staining method and wet slides aid the diagnosis by positively identifying the organisms. As the organisms could be shed sporadically and in low numbers, repeated evaluation may be necessary<sup>1</sup>.

Controlling and treating avian gastric yeast are always difficult for clinicians, as subclinical infections can occur in many birds. Amphotericin B is the choice for treatment, as many antimicrobial and antifungal medications are ineffective against *M. ornithogaster*. The recommended oral dosage is 100 mg/kg, administered twice daily, for a duration of 30 days<sup>3</sup>. Other antibacterial and antifungal recommendations for treatment include metronidazole and fluconazole.

As the organisms develop in an alkaline environment, oral administration of apple vinegar or grapefruit juice can be used to increase the proventricular activity. For prevention, good hygiene, like proper cleaning and disinfecting of the nest box, cages, and any feeding utensils, and providing high-quality feed is crucial to minimize the infection and preserve the other birds<sup>4</sup>.

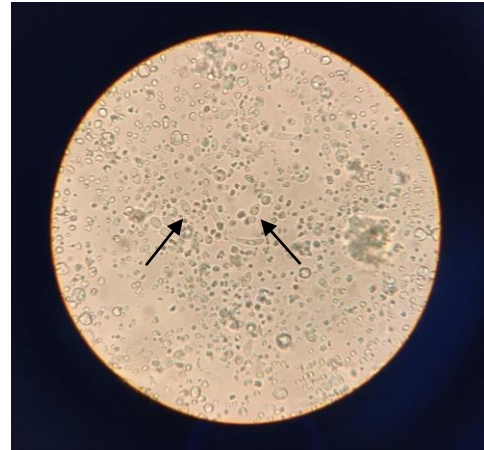
## 2. Materials and Methods

A total of 145 companion birds, including 50 cockatiels, 20 gray parrots, 20 Budgerigars, 5 parrots, 30 love birds, and 20 green cheeks, which had symptoms of lethargy, weight loss, regurgitation and gasping, were referred to Aria Veterinary Hospital, Mashhad, Iran. The birds were evaluated for avian gastric yeast (*M. ornithogaster*) by gram-staining of their feces during 2021-2022. After fluid therapy focusing on the dehydration and the weight of the birds, the fecal samples were collected and referred to the laboratory of Aria Veterinary Hospital, Mashhad, Iran. The samples were stained and checked with a 100x lens (Olympus, Japan). A 14-day medication, including nystatin (at a dose of 10 mg/kg q12h), apple vinegar (10 drops in 1.5 liter of drinking water), metronidazole (30 mg/kg q12h), and B-complex (10 drops in 1.5 liter of drinking water), was applied for the infected birds. After 3 weeks of treatment, all the infected birds were evaluated again, considering their clinical signs and gram-staining sampling.

## 3. Results

The laboratory revealed the following results. Of 50 cases of symptomatic cockatiels, 38 were positive for active and 4 for non-active yeast in their fecal samples. The fecal samples of 10 gray parrots (out of 20) were positive for active, and 2 cases for non-active yeast. Of 20 Budgerigars, 12 and 2 cases were positive for active and non-active yeast, respectively. Regarding love birds (30 cases), 13 were infected by active and 1 case by non-active yeast. In green cheeks, 16 had active yeast in their fecal samples. Finally, only 1 parrot out of 5 was infected by active yeast in its fecal sample. **Figure 1** shows positive fecal samples for *M. ornithogaster* in a two-year-old female cockatiel and a three-year-old male African gray parrot.

Regarding the clinical signs after 14 days, all birds showed fewer symptoms and a return to routine life. Another fecal sampling applied for all of them was gram-staining. Despite the treatment, nine cockatiels, two gray parrots, four Budgerigars, five love birds, and five green cheeks were still infected (no positive samples for parrots).



**Figure 1.** The presence of *Macrorhabdus ornithogaster* in the fecal sample of a two-year-old female cockatiel

## 4. Discussion

Regarding the frequency of positive samples for *M. ornithogaster*, Luján Vega et al.<sup>6</sup> found that 99 out of 150 birds (66%) were positive with the clinical signs of weight loss, regurgitation, gasping, and lethargy. In another study, 90 cases (90%) showed active yeast in their slides, but only 9 (0.09%) cases had non-active yeast<sup>2</sup>. Furthermore, the highest and lowest infection rates were for cockatiels (42/50) and parrots (1/5). This shows that avian gastric yeast is frequently observed by avian clinicians when confronted with a companion bird with the mentioned clinical signs<sup>5</sup>. The infection rate of the present study was higher than a study in Peru, indicating an incidence rate of  $15.9 \pm 2.9\%$  in companion birds<sup>6</sup>.

Regarding the treatment options and interruption of the infection cycle, control and treatment of *M. ornithogaster* are challenging for avian clinicians, as subclinical infections with any specific clinical sign can happen in many companion birds. It seems impossible to keep all the infected birds free from the disease. According to other studies, the only effective treatment for *M. ornithogaster* is amphotericin B at the oral dosage of 100/kg q12h for 30 days and apple vinegar or grapefruit juice in drinking water<sup>5-7</sup>. However, one study revealed that amphotericin B is not 100% effective for budgerigars, as some birds remained infected even after 30 days<sup>8</sup>. Furthermore, some reports showed that fluconazole (100mg/kg q12h) could be promising for the treatment of *M. ornithogaster* as the second choice. Despite that, the mentioned dose of fluconazole can be highly toxic to budgerigars<sup>7,8</sup>. Although nystatin was effective as a treatment of *M. ornithogaster* in a small group of goldfinches, it was not effective enough for budgerigars in Australia<sup>9</sup>.

To summarize, the suggested treatments, including

iodine preparations, ketoconazole, terbinafine, lufenuron, and itraconazole, were ineffective against *M. ornithogaster* in companion birds<sup>7</sup>. Although the information was completely against the present study, where nystatin was found as a proper medication for the infected birds, it should be noted that nystatin was not applied alone. As a proper treatment for avian gastric yeast, apple vinegar was added to the treatment regime<sup>5</sup>. Of note, none of the studies have mentioned the importance of non-infected feed, which could lead to the recurrence of the disease. As mentioned in the present study, some birds (25/150) showed the infection after 2 months. This may be due to the incomplete elimination of the microorganism from the gastric tract of the birds, as nystatin is not considered the choice drug. Furthermore, there is a strong possibility for reinfection by contaminated feed used by the owners. Unfortunately, most bird keepers provide their feeds from invalid pet shops, which elevates the infection rate by contaminated feed.

## 5. Conclusion

Avian gastric yeast (*M. ornithogaster*) is one of the most important diseases that clinically or subclinically infects companion birds worldwide. Controlling and treating this disease have always been difficult for avian clinicians, as the bird could remain infected despite receiving the medications. Although amphotericin B is considered the best choice for *M. ornithogaster*, the current study claims that combining nystatin and apple vinegar can properly cure the infection. On the other hand, the importance of feed should be considered as the contaminated feed can cause reinfection. Every 3-month checkup by gram staining the fecal samples is recommended to all bird owners and clinicians.

## Declarations

### Competing interests

There is no conflict of interest.

### Authors' contribution

The authors contributed equally to visiting the birds, preparing the data, and writing the article.

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## Ethical considerations

Ethical issues (including plagiarism, consent to publish, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy) have been checked by all the authors.

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