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The prevalence of *Trichomonas gallinae* in budgerigars (*Melopsittacus undulatus*) in a Veterinary Clinic in Vienna between 2000–2019

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Abstract: The aim of this clinical retrospective study was to analyse the prevalence of *Trichomonas gallinae* in budgerigars (*Melopsittacus undulatus*). The role of *T. gallinae* in budgerigars as the cause of a typical clinical picture (young vomiting budgerigars) is clear; however, the frequency of latent and subclinical diseases in pet birds is unclear. Over the period of 20 years (2000–2019), 16 759 birds were examined, of which 5 256 (31.36%) belonged to the genus *Melopsittacus* (budgerigars). Within the 5 256 presented budgerigars, 2 547 (48.45%) were examined for trichomonads using a microscopic examination of a crop wash, and, of those, 978 birds (38.39%) were found to be positive for *T. gallinae*. Only 96 (9.8%) of the positive budgerigars showed typical signs of the disease, such as loss of appetite, vomiting, weight loss or anorexia. Unspecific clinical signs were seen in 312 (31.9%), while 570 birds (58.3%) did not show any clinical signs and had been presented for a routine check or other medical problems. Treatment using metronidazole (Anaerobex, Flagyl) was successful in 82–85% of these diseased birds. Trichomonads can be detected in over a third of budgerigars, even if less than 10% of the positive ones show clinical symptoms.

Keywords: infectious disease; parakeet; parasite; pet bird; psittacine

Since the 19th century, members of the family *Trichomonadidae*, mainly *Trichomonas gallinae* and *Tetratrichomonas gallinarum*, have been described as the cause of diseases in various birds.

Two species have an undisputedly proven pathogenic potential: *Trichomonas gallinae* and *Tritrichomonas foetus. T. gallinarum* is a commensal organism in the lower gastrointestinal (GI) tract.

From here it spreads to various viscera of the cranium, thorax and abdomen. In these locations, the host may build up a yellowish, firm, caseous mass which is commonly called a canker.

Different strains (Ganas et al. 2014; Santos et al. 2019) and different ribotypes (Sansano-Maestre et al. 2016) of *T. gallinae* have been identified in finches, free-ranging domestic and wild Columbiformes and a Bonelli's eagle.

The pathogenicity can vary so that the clinical outcome ranges from an asymptomatic to a fatal infection (Amin et al. 2012; Xu et al. 2014).

Sansano-Maestre et al. (2009) found two genotype (A and B) examination isolates of 612 wild and domestic pigeons (*Columba livia*) and 102 birds of prey in fifteen different species. The genotype prevalence was different in the two groups: genotype A was more often found in Columbiformes and genotype B was more often found in raptors. In addition, genotype B was detectable in all birds with visible changes.

T. gallinae infections are described with lesions in the upper digestive tract. The changes range from a minor inflammation of the mucosa to massive caseous lesions that may block the lumen of the oesophagus (Amin et al. 2014). The main clinical

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symptoms are vomiting, ruffled feathers, weight loss and, in some severe cases, death as a result of starvation (Henderson 1988; Oglesbee 2006; Amin et al. 2014).

The method of choice to confirm trichomonads is still light microscopy.

Nowadays, molecular studies have been introduced in order to characterise the parasites and to establish relationships between the isolates (Hamad and Hassan 2017).

Therapy is carried out primarily through imidazoles (e.g., metronidazole); however, resistant parasites are increasingly being observed, which may be a bigger problem in the future (Zimre-Grabensteiner et al. 2011; Amin et al. 2014).

Publications of the prevalence of *Trichomonas gallinae* in psittacine birds or budgerigars are rare. In Australia, where budgerigars are natural inhabitants, the prevalence of *T. gallinae* infections ranged from 0% to 11.4% in birds collected from thirteen private collections of budgerigars (McKeon et al. 1997).

In free living birds in Germany, *Trichomonas* spp. were found in 35.6% of all the birds (99 of 278 individuals) (Quillfeldt et al. 2018).

T. gallinae has a direct life cycle. The organism passes from one host to another without an intermediate or paratenic host. There are no cyst stages. *T. gallinae* can live for 20 min to several hours in water (Purple et al. 2015).

It also has been shown that decreased dissolved oxygen increases the persistence of *T. gallinae* in water, which shows the importance of keeping the birds' drinking water clean (Purple et al. 2019). In moist grain, *T. gallinae* can survive for at least five days. It can survive for up to 48 h in dove carcasses (Forrester and Foster 2008).

Infections can occur through the use of the same food and drinking areas as those used by infected animals.

However, raptors contract the infection by feeding on infected prey. The first deaths can occur as early as four days after contracting an infection. Infection with a moderately virulent or avirulent strain can provide some protection against a subsequent infection with a virulent strain (Forrester and Foster 2008). Consequently, it is possible for birds to have asymptomatic infections and become carriers. This carrier state has been documented to last as long as 620 days in pigeons (Forrester and Foster 2008).

MATERIAL AND METHODS

The caseload of a small animal clinic in Vienna was retrospectively evaluated. During the time between January 1, 2000 to December 31, 2019, 16 759 birds (Psittaciformes, Columbiformes, Passeriformes, Falconiformes) were examined.

Of those birds, 5 256 (31.36%) were budgerigars (*Melopsittacus undulatus*). No breeding collections or zoos were included in this number. The birds belonged to private owners who had between two and thirty birds, which were presented for a routine examination, health check, nail trim or because the owner observed clinical signs. Although other species have been checked for *T. gallinae,* only budgerigars are discussed in this study.

Within the 5 256 presented budgerigars, 2 547 (48.45%) were examined for trichomonads. The examination was performed by using 0.5 cc to 1 cc saline, which was first warmed by holding the syringe for 30 s in the hand and then instilled into the crop. A sample of 0.1–0.2 cc was recovered and examined under a microscope within a few minutes at × 100 and × 400 magnification (Gelis 1994; Park 2011).

Rapidly moving, translucent small flagellates are typical findings and can be identified as *Trichomonas gallinae* (Wernery 2016).

RESULTS AND DISCUSSION

In 2 547 of the 5 256 (48.45%) budgerigars seen between 2000 to 2019, a crop wash was performed, and 978 (38.39%) of those birds tested were found to be positive *for T. gallinae.*

Typical clinical signs for trichomoniasis are described as a loss of appetite, vomiting, ruffled feathers, weight loss and moisture around the beak (Henderson et al. 1988; Oglesbee 2006; Amin et al. 2014).

Only 96 (9.8%) of the positive budgerigars showed all the typical signs of the disease, whereas 312 (31.9%) showed unspecific clinical signs, such as only a mild weight loss or what the owner's described as "not behaving normal" or "something wrong". The remaining 570 (58.3%) positive birds that did not show any clinical signs had been presented for a routine check or had other medical problems, such as tumours, trauma or fractures.

With a case load of 16 759 birds/5 256 budgerigars in 20 years, this means about 16 birds are seen

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per week, of which approximately five are budgerigars and one of those is positive for *T. gallinae.*

Only 96 (1.8%) of the 5 256 budgerigars were presented due to typical clinical symptoms of the disease. These cases were confirmed by the crop wash and were defined as real cases caused by *T. gallinae.*

The 312 birds with unspecific clinical signs did appear sick, and besides *T. gallinae*, one or more other issues such as *Chlamydia psittaci, Macrorhabdus ornithogaster, Ascaridia* spp. or a bacterial overgrowth with *E. coli* or other bacteria could also be found.

About 50% of the budgerigars presented over the 20 years were checked for *T. gallinae*. The tests were declined for various reasons, such as customer compliance or cost issues. However, it can be expected that a large number of budgerigars have the pathogen in their crop without visibly falling ill.

The diagnosis of *T. gallinae* in this study was performed only by identifying the parasite in crop washes. Positive samples will display high numbers of highly motile protozoa, which can be easily identified. Other possibilities like polymerase chain reaction (PCR) testing, staining or cultures are possible; however, those are not practical in a clinical situation (Hamad and Hassan 2017).

False negative results should be avoided, but can happen, especially if cold saline is used for the crop wash.

It is especially important to include the examination for *T. gallinae* in any pre-purchase inspection of budgerigars to avoid introduction of this parasite into an existing group. Although it is not known for budgerigars, the carrier state has been documented to last as long as 620 days in pigeons (Forrester and Foster 2008).

Treatment

Metronidazole (Anaerobex®, Flagyl®), 30 mg/kg q12 h, p.o. for 10 days is recommended. Tablets can be crushed and mixed with water and then given either drop by drop onto the beak or administered with a cannula directly into the crop (Oglesbee 2006; Amin et al. 2014). No side effects have been observed, and the clinical success has been reported as good. Of the 96 birds with typical clinical signs, 82 (85%) were treated successfully. Of the 312 non-specific cases, 285 were treated and 234 (82%) were successfully resolved.

Clancy (2019) also recommends treatment using metronidazole in the drinking water (500 mg/l × 21 days); the metronidazole tablets which are approved in Austria are only poorly soluble in water and most budgerigars drink very irregularly. Since the group sizes were relatively small, we only carried out individual treatments.

Budgerigars are known to develop diseases when different factors come together.

Therefore, it is recommended to check each budgerigar for *T. gallinae* and treat it if positive, because the presence of *T. gallinae* can be an important factor in the immune response of the bird to other pathogens.

Conflict of interest

The authors declare no conflict of interest.

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