Giardia and Tritrichomonas: incidental findings or significant gut pathogens?

Flagellate protozoa are common commensals of the mammalian gut, but Giardia and Tritrichomonas spp may sometimes cause or contribute to diarrhoea. This makes consideration of these organisms as possible differentials important when investigating causes of diarrhoea in cats and dogs. Their presence can be difficult to interpret however, as they can sometimes be commensal in nature, making infection an incidental finding. This article considers the significance of Giardia spp in dogs, cats and humans and Tritrichomonas foetus in cats, their diagnosis, treatment and control.

Key words: Giardia, Tritrichomonas, fenbendazole, ronidazole, diarrhoea, faecal testing

Introduction

Giardia and Tritrichomonas spp are flagellate protozoa that inhabit the intestines of a variety of domestic and wild animals. They are closely related parasites, both with direct life cycles and the potential to cause diarrhoea in their host. They differ significantly however, in their epidemiology, diagnosis and treatment. Infection with these organisms can be subclinical and prevalence of infection very high, leading to difficulties in interpreting the significance of the presence of these organisms in patients with diarrhoea. With possible resistance developing to chemotherapeutic agents in Giardia, and possible side effects to treatment for Tritrichomonas, the question of whether an infection warrants treatment is a significant one and requires careful consideration. This article considers the clinical relevance, diagnosis, treatment and control of these organisms and the zoonotic risk that they may pose.

Giardia

Life cycle and epidemiology

Giardia duodenalis has a direct life cycle (Figure 1). Trophozoites remain in the lumen of the small intestine where they can be free or attached to the mucosa by a ventral sucking disk. Trophozoites divide by binary fission and form infective cysts which are passed in the faeces. These cysts are infectious when passed, and upon ingestion by the next host, the encysted trophozoites emerge from the cysts in the intestinal tract. Transmission is therefore by the faecal oral route, with the potential for environmental, food and water contamination with infective cysts.

While some species of Giardia have become very species specific, such as G. muris in mice and G. agilis in frogs, Giardia duodenalis can infect most mammals including humans, livestock and pets. A recent review study (Bouzid et al. 2015) demonstrated a prevalence of 15.2% in dogs, and 12% in cats. The study also showed symptomatic animals had higher prevalence rates, and the infection was more common in young animals. However, subclinical infection is still common (Ballweber et al. 2010). Although there is ongoing debate surrounding sub-classification of this species, it is currently split into 8 sub-groups or
Giardia between pets and people. This allows us to draw the following conclusions about transmission of *Giardia* between pets and people.

- **Giardia** is very common in cats and dogs so if an owner has human *Giardia* and their pet is positive then they may or may not have contracted it from the owner.

- Pets of any species that are infected with *Giardia* do not pose a high zoonotic risk. However, it cannot be said that they pose no zoonotic risk, so advising good hygiene to owners is still very important. This is true in clinical cases but also in all untested pets, as prevalence of subclinical carriers is high.

- Human giardiosis may be cycled through pets, allowing transmission to other people. An example would be if a person contracted *Giardia* and then visited friends who had pets. Although the infected person may exercise strict hygiene around food and communal items it would be possible for pets in the household to become infected and then pass on the disease to other people. Under these circumstances rapid identification of infected people and pets is vital so effective chemotherapeutic elimination of the parasite can be attempted and strict hygiene advised. In the same manner, people infected with *Giardia* who work with domestic animals pose a high risk of passing on the infection. Animals infected by the person may then remain a reservoir of infection and pose a risk to other people. This may remain undetected in the longer term if the carrier animals remain subclinical. As a result, there is a strong case for people working in the veterinary profession and infected with the parasite, being isolated from pets at work until the infection has been cleared.

- Infected people may also infect wild animals via water or soil contamination though inappropriate defaecation or poor hygiene during outdoor pursuits. These animals can then infect large numbers of people through contamination of domestic water supplies.

**Diagnosis**

The following methods are all useful in the diagnosis of *Giardia* spp infection.

**Direct smear examination of fresh faeces:** Direct smears can be used for the detection of *Giardia* spp life stages passed in the faeces. A small quantity (about the size of a match head) of fresh, warm faeces is mixed with saline. Active trophozoites may then be identified (Figure 2). These must be differentiated from *Tritrichomonas* spp trophozoites in cat faeces.

*Tritrichomonas* trophozoites move in a “jerky forward” motion as opposed to the “falling leaf” motion described for *Giardia*. Both have an undulating membrane but *Giardia* has a concave sucker and is binucleate. The need for fresh faeces to be examined quickly and kept warm makes this method of diagnosis impractical in many clinical situations, so faeces are often examined for faecal cysts instead.

*Giardia* cysts are small (approx. 15µm) ova with a flagellum sometimes visible crossing the ova in an “s” shape. A drop of Lugol’s iodine added to the faecal smear will stain the cysts, making them easier to identify (Figure 4). Direct smears are an insensitive test for *Giardia* as shedding of the parasite is intermittent and only a very small volume of faeces can be examined per slide. While the examination of faecal samples over three consecutive days can help to increase the sensitivity of the test, faecal flotation is often used to increase sensitivity.

**Faecal flotation:** Although this increases sensitivity, faecal samples should still be collected on three consecutive days.

**Antigen detection in faeces:** Highly sensitive ELISA snap tests are available, and other point of care immunoassays have been shown to have excellent positive and negative predictive values for identification of *Giardia* spp. (Costa et al. 2016).

PCR testing is also available for *Giardia*, but as with other tests, does not distinguish subclinical from clinical infection. PCR testing can also produce false negative results due to inconsistent shedding of the organism, or the presence of faecal inhibitors affecting the assay.

**Duodenal aspirates** can be collected during endoscopy and freshly examined for trophozoites. While the demonstration of the parasite in clinical cases is suspicious, its high prevalence in the healthy population means that...