GUIDELINE for Giardiasis

Published: 01/01/2013
Last updated: 01/06/2020
Last reviewed: 01/02/2022

The Giardiasis in cats guidelines were published by Tim Gruffydd-Jones et al. in the Journal of Feline Medicine and Surgery 2013, 15, 650-652. This update has been compiled by Corine Boucraut-Baralon.

Synopsis

Giardia is a protozoal parasite that infects the small intestine of cats and can cause diarrhoea. The biotypes considered as feline specific biotypes do not appear to infect humans, but zoonotic biotypes (isolated from human cases) are frequently found in cats. Infection is most common in young cats, particularly from multi-cat backgrounds. Infected cats that develop clinical signs show small intestinal diarrhoea and there may be associated weight loss. Diagnosis of infection is usually based on an in-practice ELISA for faecal antigen or zinc sulphate flotation of several pooled faecal samples. PCR tests are available but not widely used. Infection can be detected in clinically healthy cats; so, interpretation of positive results in cats with diarrhoea requires care. Fenbendazole or metronidazole are the treatments of choice. Since secondary gut changes could take time to resolve, diarrhoea can continue even after infection has been eliminated.

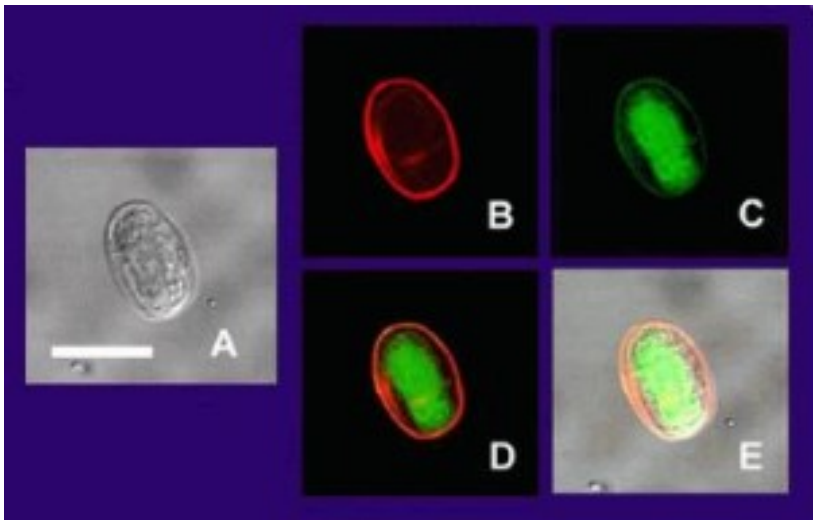

Fig. 1. Multiple views of a Giardia lamblia cyst (bar = 10 micrometers. (A) transmission (differential interference contrast) microscopy, (B) cyst wall selectively imaged through use of fluorescent-labelled (TRITC) antibody; (C) cyst imaged through use of carboxy fluorescein diacetate, a viability stain; (D) composite image of (B) and (C). (E) is a composite image of (A), (B), and (C). "Giardia". Licensed under Public Domain via Commons – https://commons.wikimedia.org/wiki/File:Giardia.jpg#/media/File:Giardia.jpg

Agent

Several names have been used for the coccidian flagellate protozoan parasite giardia – *G. duodenalis* (also known as *G. lamblia* or *G. intestinalis)*. *Giardia* can infect a number of hosts, including man. Eight different molecular subtypes have been identified, designated A-H (Table 1). F is the subgroup seen in cats, whereas A and B are the main subgroups in man (Lebbad et al., 2010). This was therefore not considered to be a zoonotic infection (Xiao and Fayer, 2008; Ballweber et al., 2010), although numerous recent studies have shown that A and B subtypes can be isolated from dogs and cats, sometimes more frequently than the F subtype that is considered to be feline-specific.

Table 1. Genetic assemblages (Sub-types) of Giardia duodenalis infecting different species (revised nomenclature by Thompson and Monis, 2012)

SPECIES	ASSEMBLAGE (SPECIES) OF *GIARDIA*	OTHER NAMES
Human, primates, rodents, dogs, cats, livestock, some wild animals	A, B (except rodents for B) (considered as zoonotic assemblages)	*G. intestinalis*, *G. lamblia*, *G. duodenalis* (A) *G. enteritica* (B)
Dogs, canids	C, D	*G. canis*
Cattle	E	*G. bovis*
Cats	F	*G. cati*
Rats (cats)	G	*G. simondi*
Marine mammals	H	

Life cycle

The parasite has a direct life cycle. It lives in the lower small intestine of the cat in its trophozoite form, adherent to the intestinal wall. It replicates by binary fission to produce the encysted form, which is passed in the faeces in addition to the trophozoites.

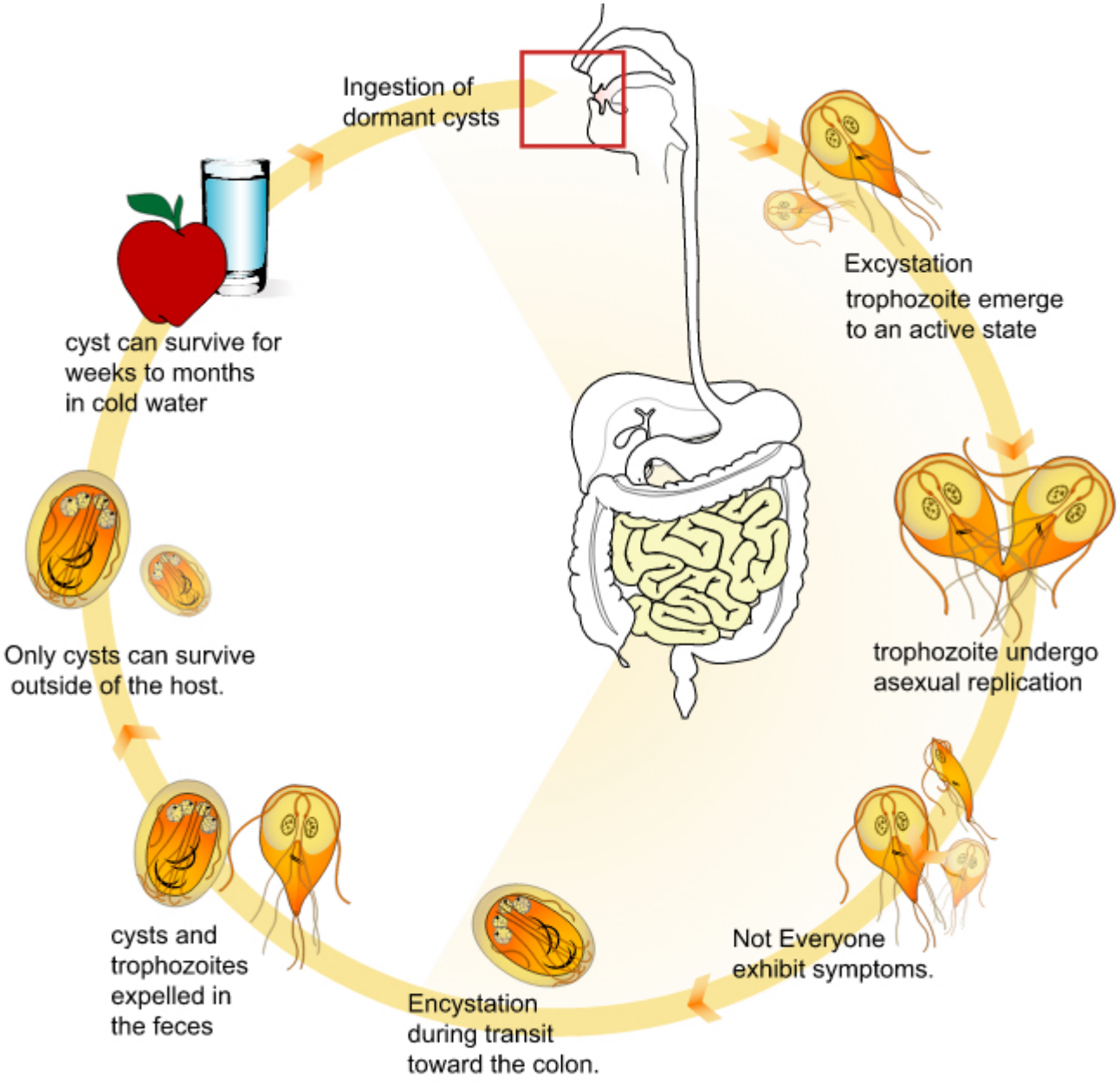

Fig. 2. Life cycle of Giardia lamblia. Wikipedia, public domain

Epidemiology

Giardia is transmitted by the faecal-oral route. Although trophozoites are excreted in the faeces, these do not survive for long in the environment and are unlikely to cause infection. In contrast, cysts are highly infectious and successful transmission requires only a small number to be ingested. The cysts can survive in the environment for up to several months in ideal conditions and so indirect transmission via faecal contamination can occur.

Epidemiological studies in different countries, and sampling different cat populations, have shown a variable prevalence. It has varied according to the diagnostic screening test used, but generally the prevalence has ranged from 1-20% (Paoletti et al., 2010; Dado et al., 2012; Sotiriadou et al., 2013; Hinney et al., 2015; Pallant et al., 2015; Piekarska et al., 2016; Gil et al., 2017; Kostopoulou et al., 2017). In recent Spanish studies, the prevalence of infection in cats is low compared to dogs (de Lucio et al., 2017; Gil et al., 2017). In one recent study from Germany, the prevalence in dogs and cats using an ELISA test detecting coproantigen showed a higher prevalence of 30 and 17% in dogs and cats respectively (Sommer et al., 2018)

In a meta-analysis study, it was demonstrated that the prevalence was higher in cats with diarrhoea compared to healthy cats (Bouzid et al., 2015). The prevalence was also higher in young cats (Bouzid et al., 2015; Pallant et al., 2015; Kostopoulou et al., 2017) in many studies and in purebred cats in one German study (Pallant et al., 2015). The prevalence in shelters appears to be higher than in owned cats (Hinney et al., 2015; de Lucio et al., 2017; Gil et al., 2017).

Pathogenesis

The parasite can cause damage to and loss of the epithelial cells of the lower small intestine, provoking an inflammatory response. There may be blunting of the intestinal villi leading to malabsorption.

Clinical signs

Young cats are more susceptible to both infection and associated disease, with most clinical infections occurring in cats under one year of age. Many cases of *Giardia* infection are not associated with overt disease, and the importance of this parasite as a diarrhoeal pathogen in cats is not clear. Experimental infections have induced clinical signs, but not in all cases. The mechanism by which diarrhoea is induced is unclear, but is thought to be related to malabsorption. This can be accompanied by weight loss, which is a prominent feature in some cases. The diarrhoea is typically of a small intestinal nature with passage of liquid or semi-liquid faeces, but sometimes the diarrhoea is large intestinal, containing mucus/blood. The clinical course of the disease can last for weeks.

Immunity

The immune response to *Giardia* infection is poorly understood in cats. Based on information from infection in other species, it is presumed that cellular immunity and the IgA response are key to providing protective immunity.

Diagnosis

The infection is diagnosed using direct examination of faecal smears (wet mount examination), faecal flotation methods, faecal ELISA antigen assays, direct immunofluorescence on faecal smears and PCR.

Trophozoites can be identified in fresh faecal smears. They are motile with a rolling action. A small amount of freshly passed faeces or mucus is mixed with a drop of saline solution on a microscope slide, covered with a coverslip and immediately examined under a microscope at a magnification of x100. Further examination at x400 allows definitive identification. It is also possible to use microscopic examination of duodenal aspirates collected during endoscopic small intestinal intubation for trophozoites. However, *Giardia* tend to reside further down the small intestine of cats, beyond the reach of endoscopic intubation (McDowall et al., 2011).

A zinc sulphate flotation method is recommended for faecal screening. Excretion of cysts is erratic and therefore several (usually three) faecal samples (collected on consecutive or alternate days) should be screened. Routine saturated salt or sucrose methods are unsatisfactory since they lead to distortion of the cysts.

It is also possible to use a direct fluorescent antibody technique to detect cysts in faecal smears, although this test is not widely used in Europe.

ELISA techniques for detecting antigen in faeces are available, including an in-practice SNAP test (IDEXX Ltd.), but these methods do not appear to be more sensitive than careful faecal screening (Barr et al., 1992). Studies have shown that ELISA detection of antigen correlates well with direct fluorescent antibody screening results (Cirak and Bauer, 2004).

PCR tests are available but not widely used. They have the advantage of being able to identify the subtype present. The first PCR-based studies revealed a high proportion of positives (up to 80%), which has raised concerns that PCR tests might detect infections that are not clinically relevant (McGlade et al., 2003). However, quantitative real-time PCR assays are now available for *Giardia* detection and recent studies gave similar prevalence rates to other techniques (Yang et al., 2015).

The faecal flotation method was the standard test used in the past, but the in-practice faecal antigen test appears to be equally sensitive and specific and is convenient to perform. Examination of faecal smears is cheap and has the advantage of identifying other potential parasites – but it is not popular in practice and is less sensitive (Olson et al., 2010).

A pragmatic approach often used by practitioners as an alternative to testing is to assess the response to treatment. However, this approach should be avoided because of the risk of altering the gut flora with antibiotics. Moreover, co-infections with other parasites such as *Tritrichomonas foetus* or *Cryptosporidium* are frequent and the treatment, if necessary, should be adapted to the results of analyses.

Treatment

Due to the potential appearance for anti-bacterial and parasiticide resistance, it is not recommended to treat asymptomatic Giardia-positive cats, especially with metronidazole or fenbendazole.

The standard treatment for *Giardia* infection has generally been an imidazole, usually fenbendazole (Panacur) given at 50 mg/kg for 5-7 days (Barr et al., 1994; Keith et al., 2003). Fenbendazole may be used in pregnant queens. Metronidazole is an alternative, and the original recommendation was to use it at a dosage of 50 mg/kg for five days, but this drug should not be used in pregnant queens. This dosage carries an increased risk of side effects – central nervous toxicity causing weakness, ataxia, disorientation and seizures. Recently it has been suggested that a daily dosage of 25 mg/kg is effective and is unlikely to induce side effects. In some difficult cases involving many infected cats, a second treatment might be necessary and, in that situation, a combination of fenbendazole and metronidazole might be effective. However, it has been suggested that a second-round treatment with fenbendazole could potentiate the emergence of *E. coli* antibiotic resistance (Tysnes et al., 2016).

An alternative is to use Ronidazole which has been proven to be efficient against Giardiasis in dogs (Fiechter et al., 2012) and cats (Zanzani et al., 2016). Ronidazole is also currently used to treat *Trichomonas foetus* infection in cats.

It is not recommended to treat asymptomatic cats, but in multi-cat environments where cats have clinical signs it might be more efficient to treat all animals (dogs and cats) living together (ESCCAP recommendation). Moreover, positive cats living in contact with immunocompromised people should be treated.

As well as treating the infected cats, it is critical to manage the environment to prevent super-infection and re-infection following treatment.

Prevention and hygiene

In contaminated environments, intensive cleaning and the use of 4-chlorine-M-cresol (Chlorocresol) or quaternary ammonium compounds are efficient to prevent re-infection and spread of the infection in multi-cat houses. Faeces from infected animals should be destroyed and bowls and surfaces should be cleaned and disinfected with quaternary ammonium compounds. If possible, moving the cat to another room can also help to avoid re-infection.

Washing/shampooing of animals, or at least the perianal area, with shampoo containing chlorhexidine at the beginning and end of treatment can help to eliminate the cysts.

Testing could be proposed for new cats entering a multi-cat environment to avoid introduction of the parasite. This can be done during the quarantine period.

Care staff (nurses, vets, veterinary students) should be aware of and should respect the hygiene rules.

A vaccine based on inactivated trophozoites has been used in the USA but not in Europe; it is no longer available. It was used for treatment as well as prevention.

Zoonotic risk

Many European studies conducted in Germany, Italy, Spain, Greece and Poland demonstrated the presence of subgroup A in cats (Paoletti et al., 2010; Dado et al., 2012; Sotiriadou et al., 2013; Zanzani et al., 2014; Pallant et al., 2015; Piekarska et al., 2016; Kostopoulou et al., 2017; Gil et al., 2017), either alone or as a dual infection (A and F; Dado et al., 2012). Genotype B has also been identified in cats (Pallant et al., 2015; Kostopoulou et al., 2017), but A is most prevalent, according to the different European studies and a Canadian one (McDowall et al., 2011). The risk of harbouring zoonotic Giardia seems to be higher in young cats <1 year compared to older cats.

A recent study failed to detect zoonotic assemblages in 3 *Giardia* positive dogs and 2 positive cats living in the Alava region of Spain, suggesting that household transmission of *Giardia* by pets, if it occurs, is infrequent. In this study no simultaneous infections in human and canine/feline hosts by *G. duodenalis* were demonstrated although 29% (16/55) of dogs and 5.9% of cats tested positive (de Lucio et al., 2017), and the presence of zoonotic assemblage A was detected in cats in a shelter in the same region (Gil et al., 2017).

On the other hand, a study conducted in children from poor environmental conditions in Slovakia showed that cat specific assemblage F is present in humans in Europe (Pipikova et al., 2018).

To date there is no study demonstrating direct transmission of *Giardia* from cats to humans and the main sources of contamination for humans appear to be raw vegetables and water. Moreover, the prevalence of *Giardia* infection in asymptomatic cats is low in most European countries.

However, although there is no proof of direct transmission of Giardia from cats-to-humans and considering that zoonotic species are sometimes detected in infected (young) cats, the zoonotic potential of *Giardia* in cats should be considered where young cats are living with immunocompromised people. Testing such cats is therefore recommended.

Acknowledgement

ABCD Europe gratefully acknowledges the support of Boehringer Ingelheim (the founding sponsor of the ABCD), Virbac and IDEXX.

References

Ballweber LR, Xiao L, Bowman DD, Kahn G, Cama VA (2010): Giardiasis in dogs and cats: update on epidemiology and public health significance. Trends Parasitol 26, 180-189.

Barr SC, Bowman DD, Erb HN (1992): Evaluation of two test procedures for diagnosis of giardiasis in dogs. Am J Vet Res 53, 2028.

Barr SC, Bowman DD, Heller RL (1994): Efficacy of fenbendazole against giardiasis in dogs. Am J Vet Res 55, 988-990.

Bouzid M, Halai K, Jeffreys D, Hunter PR (2015): The prevalence of Giardia infection in dogs and cats, a systematic review and meta-analysis of prevalence studies from stool samples. Vet Parasitol 207, 181-202.

Cirak VY, Bauer C (2004): Comparison of conventional coproscopical methods and commercial coproantigen ELISA kits for the detection of Giardia and Cryptosporidium infections in dogs and cats. Berl Munch Tierarztl Wochenschr 117, 410-413.

Dado D, Montoya A, Blanco MA, Miró G, Saugar JM, Bailo B, et al (2012): Prevalence and genotypes of Giardia duodenalis from dogs in Spain: possible zoonotic transmission and public health importance. Parasitol Res 111, 2419-2422.

de Lucio A, Bailo B, Aguilera M, Cardona GA, Fernández-Crespo JC, Carmena D (2017): No molecular epidemiological evidence supporting household transmission of zoonotic Giardia duodenalis and Cryptosporidium spp. from pet dogs and cats in the province of Álava, Northern Spain. Acta Trop 170, 48-56.

Fiechter R, Deplazes P, Schnyder M, et al (2012): Control of Giardia Infections With Ronidazole and Intensive Hygiene Management in a Dog Kennel. Vet Parasitol 187, 93-98.

Gil H, Cano L, de Lucio A, Bailo B, de Mingo MH, Cardona GA, Fernández-Basterra JA, Aramburu-Aguirre J, López-Molina N, Carmena D (2017): Detection and molecular diversity of Giardia duodenalis and Cryptosporidium spp. in sheltered dogs and cats in Northern Spain. Infect Genet Evol 50, 62-69.

Hinney B, Ederer C, Stengl C, Wilding K, Štrkolcová G, Harl J, Flechl E, Fuehrer HP, Joachim A (2015): Enteric protozoa of cats and their zoonotic potential – a field study from Austria. Parasitol Res 114, 2003-2006.

Keith CL, Radecki SV, Lappin MR (2003): Evaluation of fenbendazole for treatment of Giardia infection in cats concurrently infected with Cryptosporidium parvum. Am J Vet Res 64, 1027-1029.

Kostopoulou D, Claerebout E, Arvanitis D, Ligda P, Voutzourakis N, Casaert S, Sotiraki S (2017): Abundance, zoonotic potential and risk factors of intestinal parasitism amongst dog and cat populations: The scenario of Crete, Greece. Parasit Vectors 10, 43.

Lebbad M, Mattson JG, Christensson B, Ljungstrom B, Backhans A, Andersson JO, Svard SG (2010): From mouse to moose: multilocus genotyping of Giardia isolates from various animal species. Vet Parasitol 168, 231-239.

McDowall RM, Peregrine AS, Leonard EK, Lacombe C, Lake M, Rebelo AR, et al (2011): Evaluation of the zoonotic potential of Giardia duodenalis in fecal samples from dogs and cats in Ontario. Can Vet J 12, 1329-1333.

McGlade TR, Robertson ID, Elliot AD, Thompson RC (2003): High prevalence of Giardia detected in cats by PCR. Vet Parasitol 110, 197-205.

Olson ME, Leonard NJ, Srout J (2010): Prevalence and diagnosis of Giardia infection in dogs and cats using a fecal antigen test and fecal smear. Can Vet J 51, 640-642.

Pallant L, Barutzki D, Schaper R, Thompson RC (2015):The epidemiology of infections with Giardia species and genotypes in well cared for dogs and cats in Germany. Parasit Vectors 8, 2.

Paoletti B, Otranto D, Weigl S, Giangaspero A, Di Cesare A, Traversa D (2010): Prevalence and genetic characterization of Giardia and Cryptosporidium in cats from Italy. Res Vet Sci 91, 397-399.

Piekarska J, Bajzert J, Gorczykowski M, Kantyka M, Podkowik M (2016): Molecular identification of Giardia duodenalis isolates from

domestic dogs and cats in Wroclaw, Poland. Ann Agric Environ Med 23, 410-415.

Pipiková J, Papajová I, Majláthová V, Šoltys J, Bystrianska J, Schusterová I, Vargová V (2018): First report on Giardia duodenalis assemblage F in Slovakian children living in poor environmental conditions. J Microbiol Immunol Infect 53, 148-156.

Sommer MF, Rupp P, Pietsch M, Kaspar A, Beelitz P (2018): Giardia in a selected population of dogs and cats in Germany – diagnostics, coinfections and assemblages. Vet Parasitol 249, 49-56.

Sotiriadou I, Pantchev N, Gassmann D, Karanis P (2013): Molecular identification of Giardia and Cryptosporidium from dogs and cats. Parasite 20, 8.

Thompson RC, Monis P (2012): Giardia – from genome to proteome. Adv Parasit 78, 57–95.

Tysnes KR, Luyckx K, Cantas L, Robertson LJ (2016): Treatment of feline giardiasis during an outbreak of diarrhoea in a cattery: potential effects on faecal Escherichia coli resistance patterns. J Feline Med Surg 18, 679-682.

Xiao L, Fayer R (2008): Molecular characterisation of species and genotypes of Cryptosporidium and Giardia and assessment of zoonotic transmission. Int J Parasitol 38, 1239-1255.

Yang R, Ying JL, Monis P, Ryan U (2015): Molecular characterisation of Cryptosporidium and Giardia in cats (Felis catus) in Western Australia. Exp Parasitol 155, 13-18.

Zanzani SA, Gazzonis AL, Scarpa P, Berrilli F, Manfredi MT (2014): Intestinal parasites of owned dogs and cats from metropolitan and micropolitan areas: prevalence, zoonotic risks, and pet owner awareness in northern Italy. Biomed Res Int.: 2014: 696-508.

Zanzani SA, Gazzonis AL, Scarpa P, Olivieri E, Balze HJ, Manfredi MT (2016): Coinfection with *Tritrichomonas foetus* and *Giardia duodenalis* in Two Cats with Chronic Diarrhea. Case Rep Vet Med Article 5705168.