

## Clinical case

# Use of secnidazole and homeopathy for giardiasis control in dogs

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## ABSTRACT

Dogs with *Giardia* infections have diarrhea that persists for days, even after treatment. We managed canine giardiasis using two distinct approaches: treatment with the antiprotozoan secnidazole alone; and secnidazole plus a homeopathic product that is indicated for control of diarrhea in dogs. Treatment I: Ten beagle dogs showed clinical signs of severe diarrhea. Their feces revealed large numbers of cysts consistent with *Giardia* sp. Therefore, we treated the dogs with secnidazole (10 mg/kg, single dose) given orally. Five days after treatment, all dogs were negative for *Giardia* spp. Treatment II: Three months later, the same ten Beagles again presented with diarrhea. Feces were collected, revealing *Giardia* sp. in all dogs. This time, we treated them with an antiprotozoan (secnidazole, 10 mg/kg dose) combined with a commercial homeopathic drug for diarrhea control (3 g dose/animal at 12 h interval). We found that three to five homeopathic doses were needed to achieve normal fecal scores in all dogs. After 5 days of treatment, stool samples had normal consistency and were negative for *Giardia*. This is the first record of using secnidazole to control canine giardiasis associated with homeopathic drugs to prevent diarrhea.

**Keywords:** *Giardia* sp; diarrhea; imidazoles; homeopathy (*Source: DeCS*).

## RESUMEN

Los perros con infecciones por *Giardia* tienen diarrea que persiste durante días, incluso después del tratamiento. Manejamos la giardiasis canina usando dos enfoques distintos: tratamiento con el secnidazol antiprotozoario solo; y secnidazol más un producto homeopático indicado para el control de la diarrea en perros. Tratamiento I: Diez perros beagle mostraron signos clínicos de diarrea severa. Sus heces revelaron una gran cantidad de quistes compatibles con *Giardia* sp. Por lo tanto, tratamos a los perros con secnidazol (10 mg/kg, dosis única) por vía oral. Cinco días después del tratamiento, todos los perros fueron negativos para *Giardia* spp. Tratamiento II: Tres meses después, los mismos diez Beagles nuevamente presentaron diarrea. Se recogieron las heces, revelando *Giardia* sp. en todos los perros. Esta vez, los tratamos con un antiprotozoario (secnidazol, dosis de 10 mg/kg) combinado con un medicamento homeopático comercial para el control de la diarrea (dosis de 3 g/

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animal a intervalos de 12 h). Descubrimos que se necesitaban de tres a cinco dosis homeopáticas para lograr puntajes fecales normales en todos los perros. Después de 5 días de tratamiento, las muestras de heces tuvieron una consistencia normal y fueron negativas para *Giardia*. Este es el primer registro de uso de secnidazol para el control de la giardiasis canina, asociado con homeopáticos en la evitación de diarrea.

**Palabras clave:** *Giardia* sp; Diarrea; imidazoles; Homeopatía (Fuente: DeCS).

## INTRODUCTION

The genus *Giardia* was first described in 1882 by Kunstler; they are flagellated protozoa that parasitize the small intestine of virtually all vertebrates (1). The parasite cycle is divided into two phases; the adult trophozoite phase is active and mobile, found adhering to the small intestinal enterocytes. It is responsible for a malabsorption syndrome mediated by enterocyte destruction, with the result being impaired nutrient absorption. The second cystic phase is eliminated in feces, where it is able to survive for months under favorable conditions and can be transmitted to other organisms (2).

*G. duodenalis* has high zoonotic potential, with an average incubation period of 5 to 20 days, depending on the host. In dogs, clinical signs appear around 10 days after infection. In 90% of cases, diarrhea is the main clinical sign, with secondary signs including vomiting, increased intestinal motility and flatulence (3).

The dog plays an important role in society, with obvious psychological, social and physiological benefits accruing to the humans among whom they live. Dogs are often considered family members (4). Nevertheless, these benefits are accompanied by health risks, as dogs carry infectious diseases with substantial zoonotic potential, including giardiasis (5).

Giardiasis is common in puppies because of their low levels of active immunity. Oral contact with only five *Giardia* cysts is sufficient to cause symptoms (6). Treatment with secnidazole or fenbendazole, were effective between 75% and 92% to eliminate the excretion of *Giardia* cysts in canines together with hygienic measures to control, like disinfection with quaternary ammonium of patients and their environment (7). Other drugs with potential against *Giardia* are known (metronidazole and albendazole), but low efficacy has been reported, as well as difficulty in treatment due to the long period (7 to 10 days) and short intervals between

doses (12/12h) (2,7). The drugs recommended for *Giardia* are few and costly, but resistance problems are rarely described (8). Secnidazole is currently used by the pharmaceutical industry to treat giardiasis, amoebiasis and trichomoniasis in humans; which has the main advantage of being a single dose. Currently, researchers are evaluating outcomes in pets and production animals because of results obtained using single doses (9,10, 11).

To minimize the impacts of diarrhea caused by *Giardia* sp., alternative products have been sought, including preventives and curative homeopathic products that treat diarrhea (12). The prevention and treatment of enteritis with homeopathy in farm animals has shown good results (13,14,15). Nevertheless, for pets, the effects of antiparasitic agents combined with homeopathic agents for the treatment of *Giardia* has not been studied. There are commercially available homeopathic products for diarrhea control; however, there are few scientific studies of their efficacy. Therefore, the aim of this study was to report treatments of canine giardiasis using two distinct therapeutic approaches: treatment with secnidazole alone, and treatment with secnidazole and a homeopathic product indicated for control diarrhea in dogs.

## CASE REPORT

The use of samples and data from clinical cases of natural infection was approved by the Animal Use Ethics Committee (CEUA) of the Santa Catarina State University, number protocol 7586290918. Two distinct treatments will be reported below, in both cases, the same animals were used (3-month interval between studies).

**Treatment I:** Ten male Beagles dogs, average 3 months old, were housed in a kennel at the Experimental Farm of the State University of Santa Catarina in Guatambu. The environment the animals were housed has restricted access and was undergoing daily cleaning with disinfectants

inside. The kennel is air-conditioned, composed of two collective boxes (n=5), and 10 individual boxes for feed. Externally the kennel has a fenced area with a cold floor area (flagstone) and a lawn area where the animals stayed during the day with access to the sun and shade.

All ten developed severe diarrhea, fever, apathy, anorexia/hyporexia and dehydration. The facility where the animals were housed was air-conditioned, with two collective kennels where the animals spent most of their time and individual kennels used only for feeding. Importantly, the animals had access to the outside lawn area during the morning.

Feces were collected and were processed using the centrifugal flotation technique with hypersaturated sugar solution. Under the light microscope samples were read at magnifications of 100 and 400x. These examinations showed more than 300 cysts of *Giardia* per gram of feces from every animal. Counting according to the methodology described by Gressler and collaborators (16), which aims to quantify the number of oocysts per gram of feces adhered to the coverslip during the centrifugation process. The dogs were treated with a single dose of oral secnidazole (10 mg/kg). This dose was based on a study of secnidazole in cats (9).

Five days after treatment, all animals presented (n = 6) or diarrheal (n = 4) faeces. However, the animals were active, hydrated and were eating normally. After treatment, the parasitological examination was repeated in all dogs again for three consecutive days, showing no *Giardia* cysts, suggesting the treatment was 100% effective. The dogs stopped displaying diarrhea 10 days of initial treatment, suggesting that the animals needed a few days to recover normal bowel functionality, even in the absence of the causative agent.

**Treatment II:** The same ten dogs, now an average 6.5 months old, allocated to the same maintenance kennel as described in Treatment I. Again, they developed severe diarrhea, fever, apathy, hyporexia and dehydration. Feces were examined using the flotation centrifuge technique as described above. This time, jugular vein blood was also collected for hematological and biochemical analyses, using syringes (3 mL) and needles (25/7); this blood distributed in two different tubes. 1 mL of blood was collected in anticoagulant-containing tubes was used for complete blood counts, measured using semi-

automatic equipment (CELM). We also prepared stained blood smear with kits fast color to perform leukocyte differential counts (*Panótico Rápido*). Hematocrits were measured using centrifugation of microtubes for 5 min at 10,000 rpm. Other tubes without anticoagulant were collected 2 mL of blood, centrifuged at 8000 rpm for 10 min to obtain the serum used for the total protein and albumin biochemical analyses, using specific commercial kits and semi-automatic equipment (Bioplus 2000). Globulin levels were calculated as the difference between total protein and albumin levels, according to methodology of Feldman and collaborators (17).

Parasitological examination revealed that dogs had high numbers of *Giardia* cysts in the stool (over 300 cysts per gram of stool). This time, we combine secnidazole (single dose of 10 mg/kg) and a commercial homeopathic product (Enteropet®, OrgaPet, Orgânica Homeopatia Veterinária) with a dose of 3 g/animal every 12h/12h. The homeopathic product is indicated by the manufacturer for prevention and/or control of diarrhea in dogs; therefore, in our protocol, stipulated that treatment would be discontinued only when the feces attained normal consistency (not diarrheal or soft). On day 1 of the experiment, we observed that the number of total erythrocytes was higher than the reference values for dogs (17), whereas hematocrits and hemoglobin concentrations were lower (Table 1). Numbers of leukocytes were within normal range as was protein levels (day 1 – Table 1).

Feces and blood were collected again after 5 days of treatment. We found that feces in all dogs had normal consistency at the end of the experiment. Parasitological examination showed that all dog stool samples were negative for *Giardia*. The number of applications of the homeopathic product ranged from 3 to 5 doses at intervals of 12 h each, with two dogs needing only three doses, six dogs needing four doses, and only one dog needing five doses of homeopathic product. Four days after initiation of treatment, none of the animals had soft stools or diarrhea. We performed hematological and biochemical analyses on days 1 and 5. The data did not present normal distributions according to the Shapiro–Wilk test, and were transformed to logarithms for normalization. Data were then subjected to one-way analysis of variance for analysis over time (day 1 compared to day 5 of the experiment). Significant differences were defined as p<0.05. The results of these analyses are displayed in Table 1.

**Table 1.** Blood counts and serum biochemistries in dogs with giardiasis; pre-treatment (day 1) and post-treatment (day 5) with homeopathic product and secnidazole.

Variable	Days 1	Day 5	P-values	Reference-values
<b>Complete blood count</b>				
Erythrocytes (x10 <sup>6</sup> µL)	8.65 ± 3.4	6.16 ± 2.03	0.195	<b>5.5 – 8.5</b>
Hematocrit (%)	34.6 ± 2.4	38.1 ± 3.0	0.044*	<b>37 – 55</b>
Hemoglobin (mg/dL)	10.6 ± 1.65	11.5 ± 2.3	0.412	<b>12 – 18</b>
Leukocytes (x10 <sup>3</sup> µL)	8.19 ± 3.10	7.94 ± 2.36	0.520	<b>6.0 – 17.0</b>
Lymphocytes (x10 <sup>3</sup> µL)	2.84 ± 1.96	2.71 ± 1.32	0.627	<b>1.0 – 4.8</b>
Neutrophils (x10 <sup>3</sup> µL)	5.02 ± 2.4	4.98 ± 1.95	0.674	<b>3.0 – 11.5</b>
Monocytes (x10 <sup>3</sup> µL)	0.19 ± 0.12	0.11 ± 0.08	0.498	<b>0.15 – 1.3</b>
Eosinophils (x10 <sup>3</sup> µL)	0.13 ± 0.10	0.14 ± 0.12	0.324	<b>0.15 – 1.2</b>
<b>Serum biochemistries</b>				
Total protein (g/dL)	6.14 ± 1.34	7.69 ± 1.21	0.014*	<b>5.4 – 7.1</b>
Albumin (g/dL)	2.70 ± 0.36	2.67 ± 0.24	0.841	<b>2.6 – 3.3</b>
Globulin (g/dL)	3.44 ± 0.62	5.02 ± 0.50	0.001*	<b>2.7 – 4.4</b>

\*p<0.05 show difference between start of experiment (day 1) and after treatment (day 5).

Note: <sup>1</sup>SCHALM's Veterinary Hematology [17] reference values for hematology were removed.

Notably, we found significantly greater hematocrit, total protein and globulin levels after treatment (p<0.05). The other hematological variables and albumin levels did not differ significantly over time.

## DISCUSSION

In both treatments, after 5 days, dogs given a single dose secnidazole (10 mg/kg) became negative for *Giardia*. In humans, secnidazole has been shown to be effective with administration of only one dose. In children, the results were 98% (18) and 78% cure (19) when administered at a dose of 30 mg/kg. Cats infected with *Giardia* received 10 mg/kg secnidazole, and after 6 days of treatment, the presence of cysts in feces were no longer observed (9). The necessity of treatment is that the trophozoites of *Giardia* in the canine duodenum adhere to enterocytes, destroying villi and crypts that are needed for nutrient absorption. As a result, the animal produces mucus, making it difficult for enterocytes to contact nutrients for absorption. This phenomenon also favors diarrhea or pasty feces, depending on the degree of infection.

In dogs, the drug most widely used for treatment of giardiasis is metronidazole, administered at 15 mg/kg for 7 consecutive days; this is

considered the main disadvantage of the drug (19). In children, when comparing drug efficacy, the results were 94.4% for secnidazole and 80% for metronidazole (20). The effectiveness of albendazole, when given as a single dose of 400 mg/day for 5 days, was comparable to that of metronidazole; and patients treated with albendazole tended to have fewer side effects compared with those who took metronidazole (21). Therefore, these investigators due the safety, effectiveness, and low costs of albendazole, the albendazole could be potentially used as an alternative and/or a replacement for the existing metronidazole therapy protocols in the treatment of giardiasis in humans (22).

In the treatment with secnidazole for *Giardia* was 100% effective; nevertheless, the animals had diarrhea or loose stools for days after treatment. This persistence is undesirable for overall the health and welfare of dogs, as well as for owners, especially those with dogs that live inside houses and apartments. The presence of diarrhea in dogs with giardiasis is common. One study evaluated the correlation of protozoa-positivity in animals with diarrhea; investigators found positivity of 50%, and in puppies the percentage was still higher still (23). Importantly, diarrhea is an imbalance in the intestine that can be caused by microorganisms, as in this case for *Giardia*, that results in loss of nutrients, electrolytes,

alteration of the acidic base system and more frequent bowel movements. Fragments of intestinal mucosa are lost, thereby hindering absorption (24). To minimize these effects, diarrhea should be treated.

In the present study, we used secnidazole in combination with a commercially available homeopathic medicine to control diarrhea. The choice of a homeopathic was because the increased commercialization of these products, as well as reports of owners who made use of the product in their animals and verified its efficiency. Nevertheless, the scientific basis is scant. We found that dogs presented normal fecal scores after 3 days of homeopathic use, suggesting improvement in intestinal integrity and well-being. The commercial drug of choice is a combination thirtieth Centesimal Hahnemannian (CH) of *China officinalis* (12CH), *Podophyllum* (30CH) and *Mercurius solubilis* (30CH). According to the literature, the mechanism of action of a homeopathic complex is derived from the Law of Similars, where a substance that causes diarrhea in a healthy organism has the ability to treat a diseased organism. Despite the fact that homeopathy is a very old medicinal practice, the mechanism of action in controlling and preventing diarrhea is not yet fully understood (25).

In farm animals, the sale of diarrhea control products in young animals has also grown, and some studies have demonstrated their effectiveness. (14) used a preventive homeopathic product in suckling calves, a phase in which high rates of diarrheal animals are observed; the authors found 50% efficacy in preventing diarrhea as well as 80% in reducing antimicrobial use in animals receiving homeopathic products. A similar result was found in dairy lambs fed discarded milk (15). As early as 2012, researchers found that a homeopathic complex given piglets during the breastfeeding phase had a 95.23% efficacy in preventing diarrhea (13). These results, as well as those presented in the present study, show that homeopathic products can be a great solution to minimize or prevent diarrhea in animals.

The lower nutrient absorption rate resulted in lower serum total protein values at the beginning of the treatment of Treatment II (6.14 g/dL). After the treatment, this value increased to 7.69 g/dL), suggesting improvement of intestinal conditions, improvement in absorption rate and return to ideal fecal scores. Mean hematocrit

before treatment was 34.6% (below the reference range for dogs; 37–55%) and after treatment it was 38.1%, the result obtained before treatment is below the reference values for dogs (17). We observed that the puppies at beginning had anemia, associated with increased globulin levels (5.02 g/dL) because of immune responses to the parasite. After treatment, there was normalization of these parameters and consequent improvement in health, attributed to the change of fecal score by the homeopathic medicine.

In 2017, researchers concluded that secnidazole at a single dose might be practically applicable, reasonably priced, safe, and effective drug for therapy of dogs with giardiasis (26); results similar to our study; our study presents another novelty, that is, the association with homeopathy reduces the time of post-treatment diarrhea. Importantly, the authors are not comparing the two therapeutic protocols used in dogs to control giardiasis and diarrhea; The purpose is only to report two successful cases of *Giardia* control using single dose secnidazole. We cannot guarantee that the homeopathic product was responsible for reducing the number of days and intensity of diarrhea; because other microorganisms (viruses, bacteria, among others) could be involved in one outbreak and not another; and this was not investigated in our two cases. Future studies are necessary to confirm the efficacy of the homeopathic product, since the efficacy of secnidazole has already been verified in these two cases; which are in accordance with the literature in other animal species already described.

Secnidazole 100% effective for treatment of giardiasis. This is the first record of secnidazole use for canine giardiasis control associated with homeopathic in the avoid of diarrhea. The combination of secnidazole with a homeopathic reduced the intensity, severity and duration of diarrhea in dogs. The data suggest that the homeopathic indicated for diarrhea control in dogs is effective, however study under experimental conditions is important to allow a strong conclusion.

### Conflict of interests

The authors declare that they have no conflict of interest.

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