

Comparative Anthelmintic Efficacy in Dogs Treated with Vincofos, Ticarbodine, or Mebendazole^{1, 2}

D. K. HASS AND J. A. COLLINS

Shell Development Company, Modesto, California 95352

ABSTRACT: Three broad-spectrum anthelmintics have been tested in dogs for the purpose of comparing their overall parasitological effect. Vincofos was highly effective for ascarids, hookworms, whipworms, and taeniid tapeworms, while *Dipylidium caninum* was slightly less susceptible to single dosages of 18 mg/kg. Ticarbodine was highly effective for ascarids, hookworms, and all tapeworms but ineffective for the dog whipworm at the recommended dosage of 100 mg/kg. Mebendazole was highly effective for ascarids, hookworms and whipworms but lacked efficiency against tapeworms following a treatment regimen of 100 mg given twice daily for five consecutive days.

KEY WORDS: anthelmintics, efficacy, dogs, comparative evaluation.

During the past three years (1972-1974), several new candidate anthelmintic materials have been reported as effective broad-spectrum canine anthelmintics (Boisvenue et al., 1972; Vanparijs and Thienpont, 1973; and Hass and Collins, 1974). These materials represent a wide range of chemistry and are truly significant in that they claim anthelmintic efficacy for both nematode and cestode parasites. As would be expected, however, the diversity of chemical type would cause somewhat different responses with regard to the many species of helminths which can be found in parasitized dogs. Therefore, a study was undertaken to compare the anthelmintic efficiency of three candidate materials, vincofos, ticarbodine, and mebendazole, which were representative (Fig. 1) of an organophosphate, a piperidinecarbothioamide, and benzimidazolecarbamate, respectively. This report presents the collected data from a series of critical tests which were conducted for the purpose of making a comparative evaluation of each material's individual anthelmintic properties.

Materials and Methods

Specific testing for the combined nematocidal and cestocidal anthelmintic efficacy of vincofos, ticarbodine, and mebendazole was

accomplished with 60 dogs of mixed breeding and 13 Beagle puppies. Older dogs were used for their hookworm, whipworm and/or tapeworm infections, while the Beagle puppies were primarily utilized for their natural ascarid and artificially induced (each was given 500 infective larvae) *Uncinaria stenocephala* infections. All dogs obtained from commercial sources were held for a four-week period and received standard immunization for rabies, canine distemper, infectious canine hepatitis, and leptospirosis. Each dog was placed in an individual indoor pen with continuous availability to dry dog chow and water at all times. Fecal egg counts (sodium dichromate floatation) were made to identify the parasite spectrum present in each dog. In addition, several daily inspections were made for tapeworm segments in the feces so as to allow for uniform distribution of parasite populations for each material being investigated.

The vincofos was prepared as an oil solution in soft gelatin capsules and administered orally as a single dose of 18 mg/kg. The ticarbodine³ was triturated with lactose, and individual dosages of 100 mg/kg were prepared in hard gelatin capsules for oral administration. The mebendazole⁴ was triturated with lactose and prepared in hard gelatin capsules containing 100 mg of active ingredient per capsule. One 100 mg capsule of mebendazole was given orally twice daily (b.i.d.) for a total of 5 consecutive days. All of the dogs were on full free

¹ Presented in part at the 3rd International Congress of Parasitology, Munich, Germany, 25-31 August, 1974.

² Due to unforeseen toxicological problems in the field, Vincofos (Shell) has been withdrawn from the market and is no longer commercially available. Ticarbodine (Eli Lilly) has been cleared by the U.S. Food and Drug Administration but remains to be introduced to the anthelmintic market. Mebendazole is sold in various countries outside the United States as Telmin® Dog Wormer (Ethnor).

³ Obtained from Eli Lilly and Company, Greenfield, Indiana.

⁴ Obtained from Janssen Pharmaceutica, Beerse, Belgium.

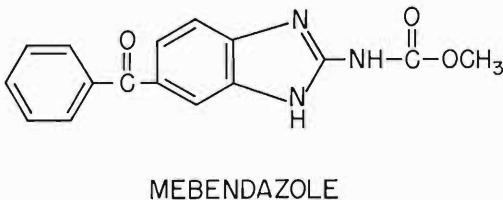
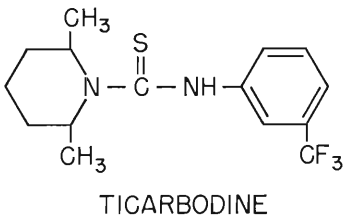
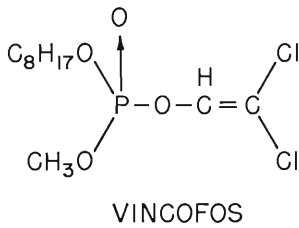


Figure 1. Chemical structures for the anthelmintics: vincofos, ticarbodine, and mebendazole.

choice feeding and none were fasted as a condition of treatment.

With the vincofos and ticarbodine treated dogs, each test animal was treated on a Monday morning and subjected to a routine parasitological necropsy on the following Friday morning. During the ensuing 4 days, 24-hr fecal collections were washed on 60 mesh screens and the washings retained in 10% formalin for future recovery of nematodes and cestodes and subsequent identification and tabulation of helminths expelled following therapy. With the mebendazole-treated dogs, the test animals were held and fecal washings made for an additional 5 days because of the delay in passage of worms associated with this drug. On the day prior to necropsy, the dogs were taken off

feed so as to facilitate the procedures and reduce food present in the gastrointestinal tracts. At necropsy, all of the intestinal contents and mucosal scrapings were washed onto a 60 mesh screen and the washings retained in 10% formalin for further recovery of any parasitic worms that may be remaining after treatment. Comparative critical anthelmintic evaluations were made on the basis of the tabulated data following identification and counting of the parasites recovered from the feces versus those found at necropsy.

Results and Discussion

The results for this comparative study are summarized in Table 1. As will be noted, there were considerable numbers of worms present in these dogs, and each of the seven most common parasites was well represented. With the vincofos-treated dogs, all or nearly all of the ascarids, hookworms, whipworms, and the tapeworm, *Taenia pisiformis*, were expelled following therapy. The tapeworm, *Dipylidium caninum*, was also effectively removed by the vincofos treatment, but it appeared that a slightly greater dosage would be required to obtain maximum anthelmintic effect.

The ticarbodine treatment was also very effective for the ascarids, hookworms and both types of tapeworms. Ticarbodine is not effective for the dog whipworm, *Trichuris vulpis*. Of specific interest is that six of the dogs were confirmed to be infected with tapeworms on the basis of fecal egg counts and observations of segments passed in the feces. Yet, no intact worms or scolices were removed from the fecal or necropsy washings. These observations support the theory that ticarbodine causes dissolution of the tapeworms before they are passed in the feces or softens the tapeworm so that it is washed through the screens.

The multiple dose mebendazole treatment effectively expelled all of the ascarids, hookworms and whipworms from the dogs. However, the cestocidal properties of mebendazole demonstrated in this study were somewhat less than had been reported previously (Vanparijs and Thienpont, loc. cit.). Only 40% of the *taenia* and 6% of the *Dipylidium* tapeworms were expelled following mebendazole treatment.

In recapitulation, vincofos was effective for all of the nematode and most of the tapeworm

Table 1. Anthelmintic response in dogs treated with vincofos, ticarbodine and mebendazole.*

Parasite	Vincosol—40 dogs			Ticarbodine—14 dogs			Mebendazole—19 dogs		
	No. of worms		Per cent efficiency	No. of worms		Per cent efficiency	No. of worms		Per cent efficiency
	Passed	Necropsy		Passed	Necropsy		Passed	Necropsy	
<i>Toxocara canis</i>	146	0	100	70	0	100	82	0	100
<i>Toxascaris leonina</i>	212	4	98	408	3	99	129	0	100
<i>Ancylostoma caninum</i>	1516	9	99	262	0	100	609	0	100
<i>Uncinaria stenocephala</i>	1541	18	99	353	47	88**	356	0	100
<i>Trichuris vulpis</i>	277	3	99	45	855	5	354	0	100
<i>Taenia pisiformis</i>	35	3	92	†	0	100	46	69	40
<i>Dipylidium caninum</i>	269	56	83	†	0	100	10	165	6

* Treatment dosages: Vincosol = 18 mg/kg; ticarbodine = 100 mg/kg; mebendazole = 100 mg b.i.d. × 5 days.

** All 47 *U. stenocephala* remaining at necropsy were from 4 puppies artificially exposed to infective larvae.

† Six dogs were positive for fecal egg counts and tapeworm segments in the feces, but no tapeworms or scolices were passed or recovered at necropsy.

parasites of dogs. Ticarbodine was effective for the ascarids, hookworms, and tapeworms but not the whipworm of dogs. Mebendazole with its multiple dose treatment was highly effective for all of the nematodes but lacked significant efficacy for the tapeworm parasites.

Acknowledgment

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The 500th meeting of the Helminthological Society of Washington featured the presentation of three invited papers on the subject: "Control of Parasitic Infections." The authors, T. C. Cheng, E. J. L. Soulsby and W. C. Campbell, discussed the respective roles of the parasite, the host and of drugs. Publication of these papers is planned for the January 1977 issue of the *Proceedings*—Ed.