Efficacy of Ivermectin Pour-On Administration Against Natural Toxascaris Leonina Infestation in Native Dogs

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Abstract: Ivermectin is a broad spectrum antiparasitic agent and different routes of its administration such as injection, oral and pour-on were used. The aims of the current study were evaluation of the efficacy of ivermectin pour-on administration against natural Toxascaris leonina infection in native dogs and also determination the prevalence rate of this parasite in East-Azerbaijan province, Iran. In the present study, 60 native dogs were parasitologically investigated to determine eggs per gram of feces (EPG). Willis method was applied for feces test and Mack-master slide method was used for counting nematode eggs. After confirming the infection with worms, ivermectin (0.5 mg kg⁻¹) pour-on was administrated to infected dogs. Fecal examination was repeated in 1, 7, 21 and 28 days post treatment. Results showed that total prevalence of Toxascaris leonina infection was 21.66% in native dogs of East-Azerbaijan province, Iran. Efficacy rate of ivermectin pour-on was 21.16, 43.06, 88.32 and 98.54% in 1, 7, 21 and 28 days respectively. In conclusion, the effect of this drug against Toxascaris leonina resulted in reduction in egg count exceeded 98%, so this drug can be used in antiparasitic program in dogs. Further investigations are necessary to evaluate the drug effect on other nematodes and parasitic infections.

Key words: Toxascaris Leonina • Fecal Examination • Ivermectin • Topical Formulations • Dog • East-Azerbaijan Province • Iran

INTRODUCTION

Infections with gastrointestinal nematodes and heart worm are very common in native dogs in Iran and all over the world. Parasitic infections of dogs are major factors responsible for losses through increased mortality and public health risk of possible transmission to human causing zoonotic diseases [1-5]. Parasites cause the dogs to be unthrifty which may include the loss of weight. Due to parasitism, the animals become susceptible to other health problems which can lead to death. Many researches for prevalence rate of gastrointestinal parasites all over the world have been reported but researches for effect of anti parasitic drugs by different administration routes is low and in Iran the study on present subject has not been done [6-9]. Medicine combinations such as pryanl pamoate, nitroscanate, milbemycine, ivermectin, selamectin, moxidectin, praziquantel, pyrantel embonate, febantel and pyrantel pamoate have been used in dogs to treat gastrointestinal cestodes and nematodes in the recent years [2]. Macroyclic lactones such as avermectins and milbemycins show a perfect anti-parasitic activity against nematodes. Various formulations of these compounds are used all over the world for many animal species such as dogs, cattle, sheep, pigs and horses [2, 3]. Ivermectin is a member of the macrocyclic lactone class of endectocides. It is labeled for the treatment of internal and external parasites in dogs, cats, horses, pigs, sheep, cattle and birds. Subcutaneous and topical formulations are available for use in animals at a dose of 0.2 and 0.5 mg kg⁻¹ bodyweight, respectively. Ivermectin is a highly potent broad-spectrum anthelmintic that is widely used in different animals. It is available in injectable, oral and topical formulations for use in animals [1-5, 10-12]. The food and drug administration-center for veterinary medicine (FDA-CVM) approvals in the united states in the late 1980s and early 1990s of the macrocyclic lactones, ivermectin and milbemycin oxime and intended to be administrated orally at sequential monthly intervals during the heart worm transmission season, led to substantial
improvements in chemoprophylaxis to prevent infection with Dirofilaria immitis [3]. Macroyclic lactones are safe, effective and convenient drugs for prevention of heart worm diseases in virtually all dogs when used as instructed. While 100% prevention was not obtained for either macrocyclic lactones with this recent heart worm field isolate, it should be emphasized that these products are not intended to be used for just one month during the heart worm transmission season [3]. The most important GI nematode and heart worm are responsible for public health losses through increased mortality and public health risk and cause zoonotic diseases in human and animals [1-5]. The objective of the present study is the evaluation of the effect of ivermectin pour-on administration against natural Toxascaris leonina nematode infections and determination of its prevalence rate in native dogs. This study is the first report in Iran.

MATERIALS AND METHODS

In present study a total number of 60 native dogs from different regions of East-Azerbaijan province, Iran were subjected to fecal examination and EPG of Toxascaris leonina infestation,. Ivermectin was administrated to treat infected animals at a dose of 0.5 mg kg⁻¹. Pour-on form of 0.5 % ivermectin powder in Isopropyl alcohol was made. Before and after treatment of dogs, 3 fecal samples of each animal were taken for fecal examination and egg count was recorded. Fecal examination in days 1, 7, 21 and 28 after treatment were repeated. In the present study, Willis method for fecal examination and Mack-master slide method for egg count (EPG) were used [6, 9]. Ivermectin efficacy was calculated according to the following equation: % of drug efficacy= P-R/P×100:

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R = \text{Average number of parasite eggs in gram of fecal sample after treatment}
\]
\[
P = \text{Average number of parasite eggs in gram of fecal sample before treatment [12].}
\]

Data were analyzed by non-parametric crosscal-walis and P<0.05 was considered significant.

RESULTS

The results of present study indicated that 13 dogs from a total of 60 were infected with Toxascaris leonina with a prevalence rate of 21.66%. Average number of enumerated eggs in infected non treated animals was 137. The average number of enumerated eggs in fecal samples after treatment with pour on ivermectin has been shown in Table 1. Reduction percentages in egg count after 1, 7, 21 and 28 days of treatment with ivermectin were 21.16, 43.06, 88.32 and 98.54% respectively (Table 1).

DISCUSSION

According to results of crosscal-walis test it is possible to determine which pour on administration of ivermectin decreases the natural infestation of dogs with Toxascaris leonina. The efficacy rate of ivermectin on this parasite is more than 98%. Recently, ivermectin has different drug shapes. Half time of intra venal administration of ivermectin with dose of 300 µg kg⁻¹ in cattle is 2.8 days, but in subcutaneous administration with dose of 200 µg kg⁻¹ is 8 day and also has been shown that the effect of sustained-release administration of this drug in cattle is more than to oral and subcutaneous administration [13], but in dogs no research was done. The important base in use of antiparasitic drug is the increase of contact time of drugs with parasites rather than increase the dose of these drugs [6, 7, 9, 13, 14]. This subject has been demonstrated that ivermectin with dose of 1mg kg⁻¹ (oral or injection) has effective antiparasitic role in veterinary. The dose of this drug in cattle for oral and subcutaneous administration is 0.2mg kg⁻¹ and for pour on administration is 0.5mg kg⁻¹; these doses of ivermectin have potent anthelmintic effect between 97-100% on adult form and forth stage larvae of Haemonchus, Ostertagia, Cooperia, Trichostrongylus, Strongyloides, Bunostomum, Nematodirus, Trichuris, Oesophagostomum, Dictyocaulus and Chabertia ovina and some arthropods [6, 7, 9, 13-15, 17-21], therefore we administrated ivermectin pour on with 0.5mg kg⁻¹ dosage in dogs. According to findings of previous researches, tablet form of ivermectin with dose of 0.4mg kg⁻¹ causes reduction in fecal egg count during 10 weeks after treatment but has not protective role for reinfection of cattle [13, 15, 16]. Subcutaneous administration of ivermectin with dose of 0.2mg kg⁻¹ and pour on administration with 0.5mg kg⁻¹ dose, have high effective role for control of parasites, also have important protective role for reinfection in cattle. According to findings of Sharma et al., (1990) the efficacy of ivermectin against Ascaridia galli infection was evaluated in chickens under controlled laboratory conditions. The chicks in the treated group were subcutaneously injected with ivermectin at a dose of 0.3 mg kg⁻¹ body weight. The fall
In present study, the drug effect was observed (98.54%) 28 days after treatment by pour on ivermectin administration on Toxocara canis. Macrocylic lactones such as ivermectin, moxidectin and selamectin were previously used for the treatment of ascarid in dogs. A dose of 0.2 mg kg\(^{-1}\) ivermectin and moxidectin administered subcutaneously was reported to be 100% effectual against Toxocara canis. Moreover, selamectin administered topically at a dose of 6 mg kg\(^{-1}\) to dogs infected with Toxacara canis decreased the faeces egg number by (EPG) 99.7% [2]. But in dogs no research was done about pour-on administration of ivermectin. Ashraf et al. [4] conducted eight trials in dogs to determine the efficacy of ivermectin and pyrantel pamoate against Dirofilaria immitis, Ancylostoma caninum, Uncinaria stenocephala, Toxocara canis and Toxascaris leonina. Three studies involved induced infection with Dirofilaria immitis and 5 studies involved induced natural infection with hookworms and ascarids. Efficacy of the combined product against Ancylostoma caninum was 98.5%. In the intestinal parasite trials, each individual component was found not to interfere with the anthelmintic action of the other. They also declared that pyrantel pamoate was 99.6% and effective against Ancylostoma caninum. No side effects were observed [4]. Also studies showed that Eprinomectin (100 µg kg\(^{-1}\)) was given to treat dogs orally and eggs per gram were determined in the faeces before treatment and the second, fourth, sixth, eighth and tenth days post treatment. No side effects associated with nervous, respiratory, gastrointestinal systems and some hematological parameters were observed. Also, eprinomectin was determined to be 100% effectual against Toxocara canis [2]. In other study contaminated dogs with Toxocara canis were treated with ivermectin and levamisole hydrochloride. The efficacy of the drugs was calculated on the basis of reduction in the number of ova discharged in faeces. Those results showed that ivermectin and levamisole hydrochloride were 97.3 percent and 97.4 percent effective respectively. Levamisole hydrochloride is much cheaper than ivermectin and it was slightly more effective. Also ivermectin at the dose of 0.2 mg kg\(^{-1}\) body weight was 97.3 percent effective on 18th day post treatment [1]. In study of Snyder et al. [3] in evaluation of ivermectin and milbemycin oxime effect in experimental adult heart worm (Dirofilaria immitis) infection of dogs showed that two drugs <100% effective against a recent heart worm field isolate, supporting the hypothesis that the effectiveness of a single dose of those preventives can vary [3]. Cunningham et al. [23] showed that the covered-rod silicone implant containing ivermectin containing 7.3 mg of ivermectin was 100% effective in preventing experimental infection with Dirofilaria immitis larvae and resulted in negative results for heartworm antigen in a field trial. This product has the potential to alleviate poor owner compliance with monthly prevention regimens [23]. Georgi and Georgi [6] in the study of comparative efficacy of ancylol, ivermectin, mebendazole and piperazine against Ancyllostoma caninum in experimentally infected pups showed that ancylol at both normal (1 mg/kg/BW) and elevated dose level (1.5 ml/kg/BW) showed 93.15 % and 93.87% (based on worm count) and 93.13 and 93.75 % (based on EPG count) respectively. Whereas, ivermectin at normal dose level (1 ml/50 kg) and elevated dose level (1.5 ml/50 kg) were found to be effective. The results were 79.48 % and 86.81% based on worm count and 89.44 % and 92.50 % based on EPG count respectively. Mebendazole and piperazine even at elevated dose level was observed ineffective. Pups treated at normal and elevated dose level revealed acute toxicosis whereas those treated with mebendazole showed cough and vomiting tendencies which later subsided and also, there was no risk involved in the administration of the drugs [5]. In other study by Williams et al. [24] on comparison the effect of pour on administration of ivermectin, doramectin, eprinomectin and moxidectin in cattle, they observed that maximum and minimum effects were with eprinomectin and ivermectin respectively [24]. Whang et al. [25] reported which pour on and injection administration of moxidectin has positive effect more than 90% on gastrointestinal nematodes and significant different between these two types of administration were not reported [25]. Skogerboe et al. [26] and Rehbein et al. [27] reported that pour on administration of ivermectin during rain has antiparasitic effect more than 90% and rain has not specific effect on reduction the role of ivermectin [26-28]. In fact pour on administration of ivermectin is very easy for farmers and

<table>
<thead>
<tr>
<th>Before Treat.</th>
<th>1 day after treat.</th>
<th>7 days after treat.</th>
<th>21 days after treat.</th>
<th>28 days after treat.</th>
</tr>
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<tbody>
<tr>
<td>137</td>
<td>108 (21.16%)</td>
<td>78 (43.06%)</td>
<td>16 (88.32%)</td>
<td>2 (98.54%)</td>
</tr>
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Table 1: Average number of eggs in fecal samples before and after treatment with pour on Ivermectin and percentages of egg count reduction
so far, any specific side effects of Ivermectin administration have not been reported [13, 29]. Collectively, ivermectin is very effective drug for control of gastrointestinal parasites and heart worm in animals and its use is very easy and has not need specific tools. Effect of pour on administration of ivermectin on other helminths and arthropods needs more studies.

CONCLUSION

The effect of ivermectin pour-on against Toxascaris leonina resulted in reduction in egg count exceeded 98%, so this drug can be used in antiparasitic program in dogs. Further investigations are necessary to evaluate the drug effect on other nematodes and parasitic infections.

REFERENCES


