

The Effect of Ivermectin Pour-On Administration Against Natural *Trichostrongylus colubriformis* Infestations and Prevalence Rate of that in Cattle

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Abstract: These days one of the real problems that cause the prejudice economic in animal farms yearly is parasitic diseases. For that reason to prevent these problems, the use of antiparasitic drugs is necessary. Ivermectin is a broad spectrum antiparasitic agent and different dosage forms such as injection, oral and pour-on used. The aims of this study was evaluation of the efficacy of ivermectin pour-on administration against natural *Trichostrongylus colubriformis* nematode infections in cattle and also determine the prevalence rate of this parasite in Tabriz area. In this study, 120 heads of male and female hybrid cattle were carried out LPG (Larves Per Gram of feces) feces test. Willis method was applied for feces test and Stoll method was used for counting nematode larvae (LPG). After confirm worm contamination and counting *Trichostrongylus colubriformis* nematode larvae in feces in infected animals, ivermectin (0.5 mg kg^{-1}) pour-on was administered. Feces test was repeated in 1st, 7th, 21st and 28th day after treatment. Results showed that total prevalence of *Trichostrongylus colubriformis* nematode infections was 20% in cattle's of Tabriz area. The effects of ivermectin pour-on on *Trichostrongylus colubriformis* nematode were 40, 79.23, 93.84 and 99.23% in 1st, 7th, 21st and 28th days, respectively.

Key words: Ivermectin, pour-on administration, *Trichostrongylus colubriformis*, cattle, infections, Iran

INTRODUCTION

Infections with Gastrointestinal (GI) nematodes are very common on cattle farms in Iran and all over the world. Parasitic infections of cattle's are major factors responsible for economic losses through reduction in productivity and increased mortality. Parasites cause the animals to be unthrifty which may include the loss of weight, low birth weights and difficulty in kidding. Due to parasitism, the animals become susceptible to other health problems which can lead to death. However, there is substantial evidence that they can also exert important negative effects on the productivity of adult dairy cows (Sanchez *et al.*, 2004). Many researchers for prevalence rate of gastrointestinal parasites in all the world have been reported but research for effect of anti parasitic drug by different administration ways is low and in Iran, the study on present subject has not been done (Chaudhri *et al.*, 2003; Georgi *et al.*, 1990; Kassai, 1999; Mandal, 2006; Soulsby, 1986; Urquhart *et al.*, 2003). Ivermectin is a member of the macrocyclic lactone class of endectocides, commonly referred to as avermectins. It is labeled for the treatment of internal and external parasites in dogs, cats, horses, pigs, sheep and cattle. Subcutaneous (SC) and Topical (TOP) formulations are available for use in

non-lactating dairy cattle at a dose of 0.2 and 0.5 mg kg^{-1} Body Weight (BW), respectively. Ivermectin is a highly potent broad-spectrum anthelmintic that is widely used in cattle. It is available in injectable, oral and topical formulations for use in cattle (Vermunt *et al.*, 1995). The most important GI nematode responsible for considerable production losses in cattle is *Trichostrongylus colubriformis* (Armour, 1989). By attention to this subject which in Iran study on pour on administration of ivermectin on *Trichostrongylus colubriformis* has not been done and the facile use of this drug. The objective of this study were to determine the evaluation of the effect of ivermectin pour-on administration against natural *Trichostrongylus colubriformis* nematode infections and prevalence rate of them in cattle. This study is the 1st report in Iran.

MATERIALS AND METHODS

In present study, a total number of 120 dubious cattle to *Trichostrongylus colubriformis* infestation from 50 different farms in Tabriz area for fecal examination and LPG were collected. After 3 times fecal examination, a total number of 120 cattle infected to *Trichostrongylus colubriformis* were distinguished and after this step,

infected cattle's isolated and then pour on ivermectin at a dose of 0.5 mg kg⁻¹ were administrated. Also, pour on form of ivermectin by melting the ivermectin powder in solution of isopropyl alcohol (weight-weight) with 0.5% concentration were made (Reinemeyer and Courtney, 2001). In this study for differential diagnostic of cooperia oncophora larvae from other larvae of authentic book were used (Soulsby, 1986), also for exact distinguish from fecal culture and shape of L₃ (3rd stage form of larvae) were used (Georgi *et al.*, 1990; Kassai, 1999; Soulsby, 1986; Urquhart *et al.*, 2003).

After and before the beginning of cattle treatment in 3 times fecal samples taken for fecal examination and after examination, results of larvae enumeration in one designed form were written. Fecal examination in day 1st, 7th, 21st and 28th after treatment were repeated. In this study for fecal examination from Willis method and for larvae examination (LPG) of Stool method were used (Rehbein *et al.*, 1999).

In end by use of following equation for determine the effective rate of pour on administration of ivermectin were used:

$$\text{Efficacy of drug (\%)} = \frac{P - R}{P} \times 100$$

Where:

R = Average of parasite larvae number in g of fecal sample after treatment

P = Average of parasite larvae number in g of fecal sample before treatment

Data were analyzed by non-parametric crosscal-walis and p<0.05 was considered significant (Aguirre *et al.*, 2005; Colwell and Jacobsen, 2002).

RESULTS AND DISCUSSION

The results of present study indicated which from 120 cattle's, 24 head of them infected to *Cooperia oncophora* were distinguished and prevalence rate of this parasite 20% were calculated. Average number of enumerated larvae was 520. The average number of enumerated larvae in fecal samples of different days after treatment with pour on ivermectin in Table 1 has been showed. The rate of ivermectin pour on administration affect in different days after treatment by formol was calculated and in day 1st, 7th, 14th and 21th was respectively 40, 79.23, 93.84 and 99.23. The ivermectin pour on administration reduced the natural parasite infestation (Table 2). According to results of crosscal-walis test can say which pour on administration of ivermectin cases decrease the natural infestation of cattle to *Trichostrongylus colubriformis*.

Table1: Average number of enumeration, the larvae in fecal samples of different days of before and after the treatment with pour on ivermectin

Before treatment	Day (after treatment)			
	1st	7th	21st	28th
520	312	108	32	4

Table2: Rate of ivermectin pour on administration affect in different days after treatment for control of *Trichostrongylus colubriformis*

Before treatment	Day (after treatment)		
	7th	21st	28th
40	79.23	93.84	99.23

The effect rate of ivermectin on this parasite is >99%. In these days, ivermectin have 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 8th day and also has been showed that the effect of sustained-release administration of this drug in cattle is very more than to oral and subcutaneous administration of that (Reinemeyer and Courtney, 2001). The importance base in use of antiparasitic drug is the increase of contact time of drugs with parasites is very effective in comparison with increase the dose of these drugs (Georgi *et al.*, 1990; Kassai, 1999; Reinemeyer and Courtney, 2001; Soulsby, 1986; Urquhart *et al.*, 2003). This subject has been demonstrated that ivermectin with dose of 1 mg kg⁻¹ (oral or injection) have effective antiparasitic role in veterinary. The dose of this drug in cattle for oral and subcutaneous administration is 0.2 mg kg⁻¹ and for pour on administration is 0.5 mg kg⁻¹, these doses of ivermectin have importance antihelmintic effect between 97-100% on adult form and L₄ (4th stage of larvae) of *Haemonchus*, *Ostertagia*, *Cooperia*, *Trichostrongylus*, *Strongyloides*, *Bonostomum*, *Nematodirus*, *Trichuris*, *Oesophagostomum*, *Dictyocaulus* and *Chabertia ovina*, also with these doses have effective role in reduce of some arthropods (Georgi *et al.*, 1990; Kassai, 1999; Reinemeyer and Courtney, 2001; Soulsby, 1986; Urquhart *et al.*, 2003). According to findings of researchers, tablet form of ivermectin with dose of 0.4 mg kg⁻¹ causes reduce in eggs in feces during 10 weeks after treatment but have not protective role for reinfection of cattle with one dose of drug administration. Subcutaneous administration of ivermectin with dose of 0.2 mg kg⁻¹ and pour on of that with 0.5 mg kg⁻¹ dose have high effective role for control of parasites, also have importance protective role for reinfection in cattle's. Also according to findings of researchers one administration of ivermectin with dose of 0.5 mg kg⁻¹ have high effect between 95-100% on *Haemonchus*, *Oesophagostomum* and *Bunostomum* (Egerton *et al.*, 1981; Garg *et al.*, 2007;

Reinemeyer and Courtney, 2001) and when ivermectin with present dose used in this time have importance effect on *Boophilus*, *Damalina* and others arthropods (Barth and Preston, 1988; Borges *et al.*, 2008; Colwell and Jacobsen, 2002; Lonneux *et al.*, 1997; Marley *et al.*, 1993; Reinemeyer and Courtney, 2001). Doramectin administration (with ivermectin are in one family) after 14 and 21 days, respectively 99.2 and 90.7% on *Cooperia* after 21 and 28 days, respectively 99.9 and 93.7% on *Ostertagia* after 21 and 28 days, respectively 100 and 99.9% on *dictyocaulus* have importance effect. In one study on natural infestation of cattle's, doramectin causes deleting this infestation to *Ostertagia* and *Cooperia*, respectively in days of 19th and 22nd. By attention to this subject that effect of drug on most parasites is after day of 14th therefore, permanent of drug on surface of body have very importance in effective rate of drugs (Reinemeyer and Courtney, 2001).

In present study, effective rate in day of 28 after treatment by pour on ivermectin administration on *Trichostrongylus colubriformis*, 99.23% determined which with calculated effective rate of Gill and Lacey (1998) have a low different. Williams in one study on natural infected cattle's to *Ostertagia*, *Cooperia*, *Oesophagostomum*, *Trichostrongylus*, *Haemonchus* and *Bunostomum* with comparison, the effect of injection doramectin and ivermectin with pour on ivermectin shows which these 3 drugs causes decrease the number of eggs and larvae of these parasites in feces and from effect comparison aspect, these drugs have not considered different and they reported which pore on administration of these is similar to injection administration (Williams *et al.*, 1997a). In study by Eysker indicated which this drug have protective effect on cattle and causes reduce the specific antigen of *Cooperia oncophora* (Eysker *et al.*, 1998). In other study by Williams on comparison, the effect of pour on administration of ivermectin, doramectin, eprinomectin and moxidectin shown that maximum and minimum effect was with eprinomectin and ivermectin observed, respectively (Williams *et al.*, 1999). In one study on comparison the effect of suspension albendazole, oxfendazole and fenbendazole with pour on ivermectin on gastrointestinal and respiratory nematodes indicated which maximum effect was with pour on administration of ivermectin with 99.2, 98.3 and 98.1% effect on *Ostertagia*, *Cooperia* and *Dictyocaulus*, respectively and minimum rate was with fenbendazole (63.6, 17.7 and 39.7) and oxfendazole (78.5, 42.1 and 32%) (Williams *et al.*, 1997b).

Gayrard *et al.* (1999) says that can use of ivermectin and doramectin for control of gastrointestinal parasites in cattle (Gayrard *et al.*, 1999). Whang has been reported

which pour on and injection administration of moxidectin have positive effect >90% on *Ostertagia* and *Cooperia* and significant different between these two type of administration were not reported (Whang *et al.*, 1994). In two studies by Williams indicated that moxidectin have very importance role for control of parasitic disease (Williams *et al.*, 1996; Williams and De Rosa, 2003). Skogerboe and Rehbein reported that pour on administration of ivermectin during rain too have antiparasitic effect >90% and rain have not specific effect on reduction the role of ivermectin (Rehbein *et al.*, 1999; Skogerboe *et al.*, 1999) of course, other studies on this subject has been done and indicated that during raining pour on ivermectin is active against parasites (Rehbein *et al.*, 1999; Rolfe *et al.*, 1997; Skogerboe *et al.*, 1999). In fact, pour on administration of ivermectin is very easy for farmers and so far for this way of ivermectin administration any specific side effect has not been reported (Reinemeyer and Courtney, 2001). In end can say, ivermectin is very effective drug for control of gastrointestinal parasites in ruminant and use of that is very easy and have not need to specific tools. Of course, effect of pour on administration of ivermectin on other helminths and arthropods need to more studies.

CONCLUSION

In this study because the effect of this drug against *Trichostrongylus colubriformis* nematode was >99% ($p < 0.05$) so in cattle can use this drug in antiparasitic program. Of course, the effect of this drug on other nematodes and parasitic infections are needed to be more investigated.

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