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The Effect of Ivermectin Pour-on Administration Against Natural Dictyocoulus Viviparous 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 were evaluation of the efficacy of ivermectin pour-on administration against natural dictyocaulus viviparous nematode infections in cattle and also determine the prevalence rate of this parasite in Tabriz area. In this study in 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 larves (LPG). After confirm worm contamination and counting dictyocaulus viviparous nematode larves in feces in infected animals, ivermectin (0.5 mg kg^{-1}) pour-on was administrated. Feces test was repeated in 1, 7, 21 and 28 day after treatment. Results showed that total prevalence of dictyocaulus viviparous nematode infections was 5% cattle's of Tabriz area. The effects of ivermectin pour-on on dictyocaulus viviparous nematode were 42.18, 54.68, 90.62 and 99.21% in 1, 7, 21 and 28 day, respectively. In conclusion because the effect of this drug against dictyocaulus viviparous 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.

Key words: Ivermectin, pour-on administration, *Dictyocaulus viviparous*, cattle, death, 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 (Gayrard *et al*., 1999; Lonneux *et al*., 1997; Skogerboe *et al*., 1999). 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 nonlactating 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 *Dictyocoulus viviparous* (Armour, 1989). This parasite is ingested as larvae that after penetration of the intestinal wall, migrate via the lymph nodes and the blood circulation to the lungs where they mature into adult worms. Eggs produced by theses adults are coughed up, swallowed and excreted in the feces as first-stage larvae. In the lungs, pathology develops due to the influx and activation of eosinophil's and mast cells that cause restriction of the airways and a collapse of the alveoli, resulting in edema and emphysema (Jarrett *et al*., 1957). By attention to this subject which in Iran study on pour-on administration of ivermectin on Dictyocoulus viviparous 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

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administration against natural *Dictyocoulus viviparous* nematode infections and prevalence rate of them in cattle. This study is the first report in Iran.

MATERIALS AND METHODS

In present study a total number of 120 dubious cattle to *Dictyocoulus viviparous* infestation from 20 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 *Dictyocoulus viviparous* 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 *Dictyocoulus viviparous* larvae from other larvae of authentic book were used (Georgi *et al*., 1990; Kassai, 1999; Soulsby, 1986; Urquhart *et al*., 2003) also for exact distinguish from fecal culture and shape of L_3 (there stage form of larvae) were used (Rehbein *et al*., 1999). After and before the beginning of cattle treatment in 3 time fecal samples taken for fecal examination and after examination, results of larvae enumeration in one designed form were written. Fecal examination in days of 1, 7, 21 and 28 after treatment were repeated. In this study, for fecal examination from Willis method and for larvae examination (LPG) of Stool method were used (Aguirre *et al*., 2005; Marley *et al*., 1995). In end by use of following Formol for determine the effective rate of pour-on administration of ivermectin were used:

$$\text{Percentage of drug efficacy} = P\text{-}R/P\times 100$$

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.

RESULTS AND DISCUSSION

The results of present study indicated which from 120 cattle's, 6 head of them infected to *Dictyocoulus viviparous* were distinguished and prevalence rate of this parasite 5% were calculated. Average number of enumerated larvae was 128. The average number of enumerated larvae in fecal samples of different days after treatment with pour-on ivermectin in Table 1 has been shown. The rate of ivermectin pour-on administration affect in different days after treatment by formol was calculated and in days of 1, 7, 14 and 21 was, respectively 42.18, 54.68, 90.62 and 99.21. The ivermectin pour-on administration reduced the natural parasite infestation (Table 2).

Table 1: Average number of enumeration the larvae in fecal samples of different days of before and afterthe treatment with pour on ivermectin

Before treatment	1 day after treatment	7 days after treatment	21 days after treatment	28 days after treatment
128	74	58	12	1

Table 2: Rate of ivermectin pour on administration affect in different days after treatment for control of *Dictyocoulus viviparous*

1 day after treatment	7 days after treatment	21 days after treatment	28 days after treatment
42.18	54.68	90.62	99.21

According to results of Crosscal Walis test can say which pour-on administration of ivermectin cases decrease the natural infestation of cattle to *Dictyocoulus viviparous*. The efficacy rate of ivermectin on this parasite is upper than 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 8 day and also has been shown 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; 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 L_4 (forth 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; 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 (Aguirre *et al*., 2005; Barth and Preston, 1988; Chaudhri *et al*., 2003; 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 important effect. In one study on natural infestation of cattle's, Doramectin causes deleting this infestation to Ostertagia and Cooperia, respectively in days of 19 and 22. By attention to this subject that effect of drug on most parasites is after days of 14 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 *Dictyocoulus viviparous* 99.22% determined which with calculated effective rate of Taylor *et al*. (1995) is confirm (Soulsby, 1986; Taylor *et al*., 1990). 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, b). 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 nematods 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*., 1997a, b). 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 upper 90% and rain have not specific effect on reduction the role of ivermectin (Skogerboe *et al*., 1999; Rehbein *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 (Skogerboe *et al*., 1999; Taylor *et al*., 1990). 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).

CONCLUSION

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.

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