American-Eurasian Journal of Sustainable Agriculture, 5(2): 258-262, 2011
ISSN 1995-0748

ORIGINAL ARTICLES

The Effect of Ivermectin Pour-on Administration Against Natural Oesophagostomum Radiatum Infestations and Prevalence Rate of That in Cattle

[1]Garedaghi Yagoob, [2]khayatnouri Mirhadi, [3]Safarmashaei Saeid

[1]Department of Pathobiology, Tabriz Branch, Islamic Azad University, Tabriz, Iran.
[2]Department of Pharmacology, Tabriz Branch, Islamic Azad University, Tabriz, Iran.
[3]Tabriz Branch, Islamic Azad University, Young Researchers club.

Garedaghi Yagoob, khayatnouri Mirhadi, Safarmashaei Saeid: The Effect of Ivermectin Pour-on Administration Against Natural Oesophagostomum Radiatum Infestations and Prevalence Rate of That in Cattle

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 Oesophagostomum radiatum 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 oesophagostomum radiatum nematode larves in feces, in infected animals, ivermectin (0.5 mg/kg) pour-on was administrated. Feces test was repeated in 1, 7, 21 and 28 day after treatment. Results showed that total prevalence of oesophagostomum radiatum nematode infections was 18.33% in cattle's of Tabriz area. The effects of ivermectin pour-on on oesophagostomum radiatum nematode were 56.36, 70.75, 92.68 and 99.52% in 1, 7, 21 and 28 day respectively. In conclusion, because the effect of this drug against oesophagostomum radiatum 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, Oesophagostomum Radiatum, Cattle.

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 majorfactors 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.*, 2004a). Many researchers for prevalence rate of gastrointestinal parasites in all the word 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; Hooke *et al.*, 1997; Georgi and Georgi, 1990; Kassai, 1999; Mandal, 2006; Soulsby, 1986). 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 bodyweight (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

Corresponding Author: Garedaghi Yagoob, Department of Pathobiology, Tabriz Branch, Islamic Azad University, Tabriz, Iran.
E-mail:Y_garedaghi@yahoo.com; Tel: 0098 914 311 0499

for use in cattle (Vermunt *et al.,* 1995). The most important GI nematode responsible for considerable production losses in cattle is Oesophagostomum radiatum (Armour, 1989). By attention to this subject which in Iran study on pour on administration of Ivermectin on Oesophagostomum radiatum has not been done and the facile use of this drug the objective of this paper were to determine the Evaluation of the effect of ivermectin pour-on administration against natural Oesophagostomum radiatum nematode infections and prevalence rate of them in cattle. This study is the first report in Iran.

Material and method

In present study a total number of 120 dubious cattle to Oesophagostomum radiatum infestation, from 20 different farms in Tabriz area for fecal examination and LPG were collected. After 3 time fecal examination, a total number of 110head infected to Oesophagostomum radiatum were distinguished and after this step, infected cattle's were isolated and then pour on Ivermectin at a dose of 0/5 mg/kg 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 Oesophagostomum radiatum larvae from other larvae of authentic book were used (Soulsby, 1986), also for exact distinguish from fecal culture and shape of L_3 (there stage form of larvae) were used (Georgi JR, Georgi ME 1990; Kassai, 1999; Soulsby, 1986; Urquhart *et al.,* 2003). 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 (Rehbein *et al.,* 1999). In end by use of following Formol for determine the effective rate of pour on administration of Ivermectin were used:

% of drug efficacy= P-R/P×100

R= average of parasite larvae number in gr of fecal sample after treatment
P=average of parasite larvae number in gr of fecal sample before treatment

Data were analyzed by non-parametric crosscal-walis and $P<0.05$ was considered significant (Aguirre *et al.,* 2005; Marley *et al.,* 1995).

Results

The results of present study indicated which from 120 cattle's, 22head of them infected to Oesophagostomum radiatum were distinguished and prevalence rate of this parasite 18.33% were calculated. Average number of enumerated larvae was 424. 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 56.36, 70.75, 92.68 and 99.52. The ivermectin pour on administration reduced the natural parasite infestation.

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

Before treatment	1 day after treatment	7 days after treatment	21 days after treatment	28 days after treatment
424	185	124	31	2

Table2:rate of Ivermectin pour on administration affect in different days after treatment for control of Oesophagostomum radiatum

1 day after treatment	7 days after treatment	21 days after treatment	28 days after treatment
56.36	70.75	92.68	99.52

Conclusion:

According to results of crosscal-walis test can say which pour on administration of Ivermectin cases decrease the natural infestation of cattle to Oesophagostomum radiatum. The effect 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 300µg/Kg in cattle is 2.8day, but in subcutaneous administration with dose of 200µg/Kg is 8day and also has been shown that the effect of sustained-releaseadministration 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 JR, Georgi ME 1990; Kassai,

1999; Soulsby, 1986; Urquhart *et al.,* 2003). This subject has been demonstrated that Ivermectin with dose of 1mg/Kg (oral or injection) have effective antiparasitic role in veterinary. The dose of this drug in cattle for oral and subcutaneous administration is 0.2mg/Kg and for pour on administration is 0.5mg/Kg; 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 JR, Georgi ME 1990; Kassai, 1999; Soulsby, 1986; Urquhart *et al.,* 2003). According to findings of researchers tablet form of Ivermectin with dose of 0.4mg/Kg causes reduce in eggs in feces during 10 week after treatment but have not protective role for reinfection of cattle with one dose of drug administration. Subcutaneous administration of Ivermectin with dose of 0.2mg/Kg and pour on of that with 0.5mg/Kg 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 0.5mg/Kg have high effect between 95-100% on Haemonchus, Oesophagostomum and Bunostomum (Egerton *et al.,* 1981; Gary and Kumar, 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 D, Preston, 1988; Borges *et al.,* 2008; Colwell and Jacobsen, 2002; 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 day respectively 99.9 and 93.7% on Ostertagia, after 21and 28 days respectively 100 1nd 99.9% on Dictyocaulushave importance 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 Oesophagostomum radiatum 99.52% determined which with calculated effective rate of Williams and *et al.* (1997) is confirm (Williams and Loyacano, 1997). Williams and et al. 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.,* 1997). In study by Eysker and et al. 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 and et al. 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.,* 1997). Gayrard and *et al*., (1999) says that can use of Ivermectin and Doramectin for control of gastrointestinal parasites in cattle. Whang and et al has been reported which pour on and injection administration of Moxidectin have positive effect more than 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 and et al indicated that Moxidectin have very importance role for control of parasitic disease (Williams *et al.,* 1996; Williams and DeRosa, 2003). Skogerboe and Rehbein and *et al* 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 (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 and Dawson, 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 (Rehbein *et al.,* 1999; Reinemeyer and Courtney 2001; Rolfe and Dawson, 1997; Skogerboe *et al.,* 1999). 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.

Reference

Armour, J., 1989. The influence of host immunity on the epidemiology of trichostrongyle infections in cattle.Vet.Parasitol., 32: 5-19.

Aguirre, D.H., A.B. Gaido, M.M. Cafrune, M.E. Castelli, A.J. Mangold, A.A. Guglielmone, 2005. Eprinomectin pour-on for control of Boophilus microplus (Canestrini) ticks (Acari: Ixodidae) on cattle. Veterinary Parasitology, 127: 157-163.

Barth, D., J.M. Preston, 1988. Efficacy of topically administered ivermectin against chorioptic and sarcoptic mange of cattle. Vet Rec, 123: 101-104.

Borges, F.A., H.C. Silva, C. Buzzulini, V.E. Soares, E. Santos, G.P. Oliveira, A.J. Costa, 2008. Endectocide activity of a new long-action formulation containing 2.25% ivermectin + 1.25% abamectin in cattle. Veterinary Parasitology, 155(3-4): 299-307.

Chaudhri, S.S., S.K. Gupta, D.P. Banerjee, P.K. Bhatnagar, N.S. Ruprah, 2003. Manual of veterinary helminthology. First edition, IBDC (International Book Distributing Company), pp: 69-70.

Colwell, D.D., J.A. Jacobsen, 2002. Persistence activity of topical ivermectin against artificial infestation with hypodermal lineatum (Diptera: Ostridae). Vet Parasitol, 105: 247-256.

Egerton, J., C. Eary, D. Suhayda, 1981. The anthelmintic efficacy of ivermectin in experimental infected cattle. Vet parasitol, 8: 59-70.

Eysker, M., J.H. Boersema, J.B. Githiori, F.N.J. Kooyman, 1998. Evaluation of the effect of ivermectin administered topically at zero and six weeks after turnout on gastrointestinal nematode infection in first-season grazing cattle. Veterinary Parasitology, 78(4): 277-286.

Gary, R., R.R. Kumar, 2007. Duration of anthelmintic effect of three formulations of Ivermection (oral, injectable and pour-on) against multiple anthelmintic-resistant haemonchuscontortus in sheep. Vet Res Commun, S0165-7380.

Gayrard, V., M. Alvinerie, P.L. Toutain, 1999. Comparison of pharmacokinetic profiles of doramectin and ivermectin pour-on formulations in cattle. Veterinary Parasitology, 81(1): 47-55.

Georgi, J.R., M.E. Georgi, 1990. Parasitology for veterinarians. Fifth edition, WB Saunders Company, pp: 3-5, 163, 243-265, 267-309.

Hooke, F.G., P. Clement, D. Dell'Osa, R.M. Porter, D. MacColl, R.S. Rew, 1997. Therapeutic and protective efficacy of doramectin injectable against gastrointestinal nematodes in cattle in New Zealand: A comparison with moxidectin and invermectin pour-on formulations. Veterinary Parasitology, 72(1): 43-51.

Kassai, T., 1999. Veterinary helminthology. First edition, BH (Butterworth Heinemann), pp: 13-19, 64-64, 147-153, 181-193, 205-221.

Lonneux, J.F., T.Q. Nguyen, B.J. Losson, 1997. Efficacy of pour-on and injectable formulations of moxidectin and ivermectin in cattle naturally infected with Psoroptesovis: parasitological, clinical and serological data. Veterinary Parasitology, 69(3-4): 319-330.

Mandal, S.C., 2006. Veterinary parasitology at a glance. First edition, IBDC (International Book Distributing Company), pp: 1-61: 178-183.

Marley, S.E., S.E. Knapp, M.C. Rognlie, J.R. Thompson, T.M. Stoppa, 1995. Efficacy of ivermectin pour-on against Oestertagiaoestertagi infection and residues in the American Bison, Bison Bison. J Wildlife Dis, 31(1): 62-65.

Marley, S.E., R.D. Hall, R.M. Corwin, 1993. Ivermectin cattle pour-on: duration of a single late spring treatment against horn flies, Haematobiairritans (L.) (Diptera: Muscidae) in Missouri, USA. Veterinary Parasitology, 51(1-2): 167-172.

Rehbein, S., R.A. Barrick, A.F. Batty, M.D. Drag, P.F. Rolfe, J.L. Cox, 1999. Evaluation of the effect of simulated rainfall on the ef®cacy of Ivomec Pour-on against Cooperia spp. infection in cattle. Parasitol Res., 85: 783-786.

Reinemeyer, C.R., C.H. Courtney, 2001. Antinematodal drugs, Section 11, Chemotherapy of parasitic diseases, In: Adams, HR, Veterinary pharmacology and therapeutics, 8th edition. IowaStateUniversity Press/Ames, pp: 963- 971.

Rolfe, P.F., K.L. Dawson, 1997. Efficacy of topical ivermectin following exposure of treated cattle to rains. Vet Rec, 141: 269-270.

Sanchez, J., I. Dohoo, J. Carrier, L. DesCoteaux, 2004a. A meta-analysis of the milk-production response after anthelmintic treatment in naturally infected adult dairy cows. Prev. Vet. Med. 63: 237-256.

Skogerboe, T.L., V.C. Cracknell, D.J. Walstrom, L. Ritzhaupt, V.K. Karle, 1999. The effect of simulated rainfall on the efficacy of doramectin pour-on against nematode parasites of cattle. Veterinary Parasitology, 86(4): 229-234.

Soulsby, E.J.L., 1986. Helminths, arthropods and protozoa of domesticated animals.seventh edition, BaillíereTindall, London, pp: 1-4, 186-191, 247-252, 761-777.

Urquhart, G.M., J. Armour, J.L. Duncan, A.M. Dunn, F.W. Jennings, 2003. Veterinary parasitology, Second edition, Book Power, Blackwell Science, pp: 49-50, 268-269, 276-279.

Vermunt, J.J., D.M. West and W.E. Pomroy, 1995. Multiple resistance to ivermectin and oxfendazole in Cooperia species of cattle in New Zealand. The Veterinary Record, 137: 43-45.

Whang, E.M., C. Bauer, D. Kollmann, H.J. Bürger, 1994. Efficacy of two formulations ('injectable' and 'pour on') of moxidectin against gastrointestinal nematode infections in grazing cattle. Veterinary Parasitology, 51(3-4): 271-281.

Williams, J.C., S.D. Broussard, G.T. Wang, 1996. Efficacy of moxidectin pour-on against gastrointestinal nematodes and Dictyocaulus viviparus in cattle. Veterinary Parasitology, 64(4): 277-283.

Williams, J.C., A. DeRosa, 2003. Dose confirmation of moxidectin 0.5% pour-on against adults and fourth-stage larvae of various Cooperia spp. and Trichostrongylus colubriformis in Louisiana. Veterinary Parasitology, 114(4): 295-303.

Williams, J.C., A. DeRosa, Y. Nakamura, A.F. Loyacano, 1997. Comparative efficacy of ivermectin pour-on, albendazole, oxfendazole and fenbendazole against Ostertagia ostertagi inhibited larvae, other gastrointestinal nematodes and lungworm of cattle. Veterinary Parasitology, 73(1-2): 73-82.

Williams, J.C., A.F. Loyacano, 1997. Comparison of the efficacy of two treatments of doramectin injectable, Ivermectin injectable and ivermectin pour-on against naturally acquired gastrointestinal nematode infections of cattle during winter-spring grazing season. Vet Parasitol, 72: 69-77.

Williams, J.C., A.F. Loyacano, A. DeRosa, J. Gurie, B.C. Clymer, F. Guerino, 1999. A comparison of persistent anthelmintic efficacy of topical formulations of doramectin, ivermectin, eprinomectin and moxidectin against naturally acquired nematode infections of beef calves. Veterinary Parasitology, 85(4): 277-288.

Williams, J.C., A.F. Loyacano, A. DeRosa, J. Gurie, D.F. Coombs, T.L. Skogerboe, 1997. A comparison of the efficacy of two treatments of doramectin injectable, ivermectin injectable and ivermectin pour-on against naturally acquired gastrointestinal nematode infections of cattle during a winter-spring grazing season. Veterinary Parasitology, 72(1): 69-77.