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The Effect of Ivermectin Pour-on Administration Against Natural Heterakis gallinarum Infestation and its Prevalence in Native Poultry

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Abstract: Problem statement: One of the real problems that cause the economic prejudice in animal farms yearly is parasitic diseases. To overcome these problems the use of antiparasitic drugs is necessary. 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 Heterakis gallinarum infection in native poultry and also determination the prevalence rate of this parasite in Tabriz area. **Approach:** In the present study, 120 native poultry were investigated by Egg Per Gram of feces (EPG) feces test. 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 birds. Fecal examination was repeated in 1, 7, 21 and 28 days post treatment. **Results:** Results showed that total prevalence of Heterakis gallinarum infection was 21.66% in native poultry of Tabriz area. Efficacy rate of ivermectin pour-on was 59.14, 87.87, 97.65 and 99.57% in 1, 7, 21 and 28 days respectively. **Conclusion:** In conclusion, the effect of this drug against Heterakis gallinarum resulted in reduction in egg count exceeded 98% ($p<0.05$), so this drug can be used in antiparasitic program in poultry. Further investigations are necessary to evaluate the drug effect on other nematodes and parasitic infections.

Key words: Parasitic diseases, fecal examination, parasitic drugs, topical formulations

INTRODUCTION

Infections with gastrointestinal nematodes are very common on native poultry in Iran and all over the world. Parasitic infections of poultry are major factors responsible for economic losses through reduction in productivity and increased mortality (Lund and Chute, 1974; Bhat and Hemaprasanth, 1990). Parasites cause the birds 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 (Georgi and Georgi, 1990; Kassai, 1999; Mandal, 2006; Soulsby, 1986). 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 (Vermunt *et al*., 1995; Williams *et al*., 1997). The most important GI nematode responsible for considerable production losses in poultry is Heterakis gallinarum (Lund and Chute, 1974). The objective of the present study is the evaluation of the effect of ivermectin pour-on administration against natural Heterakis gallinarum nematode infections and determination of its prevalence rate in native poultry. This study is the first report in Iran.

MATERIALS AND METHODS

In present study a total number of 120 native poultry to Heterakis gallinarum infestation, from 20

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different farms in Tabriz area were subjected for fecal examination and EPG. Ivermectin was administrated to treat infected animals at a dose of 0.5 mg kg^{-1}. Also pour- on form of 0.5 % Ivermectin powder in Isopropyl alcohol was made. Before and after poultry treatment, 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 examination (EPG) were used (Aguirre *et al*., 2005; Marley *et al.*, 1993). Ivermectin efficacy was calculated according to the following equation: % of drug efficacy= P-R/P×100:

R = Average number of parasite egg in gr of fecal sample after treatment
P = Average number of parasite egg in gr of fecal sample before treatment

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

RESULTS

The results of present study indicated that 26 birds from a total of 120 were infected with Heterakis gallinarum with a prevalence rate of 21.66%. Average number of enumerated egg in infected non treated animals was 470. The average number of enumerated egg in fecal samples after treatment with pour on Ivermectin has been shown in Table 1. Reduction percentages in egg count after 1, 7, 14 and 21 days of treatment with Ivermectin were 59.14, 87.87, 97.65 and 99.57 respectively (Table 1).

Table 1: Average number of egg in fecal samples before and after treatment with pour on Ivermectin and percentages of egg count reduction

Before treatment	1 day after treatment	7 days after treatment	21 days after treatment	28 days after treatment
470	192 (59.14%)	57 (87.87%)	11 (97.65%)	2 (99.57%)

DISCUSSION

According to results of crosscal-walis test it is possible to determine which pour on administration of Ivermectin decreases the natural infestation of bird with Heterakis gallinarum. 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 300µg Kg^{-1} in cattle is 2.8 day, but in subcutaneous administration with dose of 200µg Kg^{-1} is 8day 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 (Reinemeyer and Courtney, 2001), but in poultry any research was not 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 (Georgi and Georgi, 1990; Kassai, 1999; Reinemeyer and Courtney, 2001; Soulsby, 1986; Urquhart *et al*., 2003).

This subject has been demonstrated that Ivermectin with dose of 1mg kg^{-1} (oral or injection) have effective antiparasitic role in veterinary. The dose of this drug in cattle for oral and subcutaneous administration is 0.2mg 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, Bonostomum, Nematodirus, Trichuris, Oesophagostomum, Dictyocaulus and Chabertia ovina and some arthropods (Georgi and Georgi, 1990; Kassai, 1999; Reinemeyer and Courtney, 2001; Soulsby, 1986; Urquhart *et al*., 2003), therefore we administrated ivermectin pour on with 0.5mg kg^{-1} dosage in poultry. According to findings of previous researches, tablet form of Ivermectin with dose of 0.4mg kg^{-1} causes reduce in eggs in feces during 10 week after treatment but has not protective role for reinfection of cattle (Egerton *et al*., 1981; Gary and Kumar, 2007; Reinemeyer and Courtney, 2001). Subcutaneous administration of Ivermectin with dose of 0.2mg kg^{-1} and pour on of that with 0.5mg kg^{-1} dose, have high effective role for control of parasites, also have important protective role for reinfection in cattle. Also according to findings of researchers, administration of Ivermectin with dose of 0.5mg kg^{-1} has high effect between 95-100% on Haemonchus, Oesophagostomum and Bunostomum (Egerton *et al*., 1981; Gary and Kumar, 2007; Reinemeyer and Courtney, 2001) and also 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). 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 post-treatment faecal egg counts was 81 and 92% in birds treated on Days 10 and 35, respectively. The drug was found to be 90 and 95% effective against immature and adult worms, respectively. The lower lesion score and post-treatment near-normal haematobiochemical picture in treated

birds confirmed these observations. The treated birds also had a better growth rate than the untreated chickens. The mature worms in the intestinal lumen of the host were more sensitive to the treatment than the immature stages of the parasite in the tissue phase (Bhat and Hemaprasanth, 1990). In present study, the drug effect was observed 28 days after treatment by pour on Ivermectin administration on Heterakis gallinarum 99.57% determined. In study by Sharma *et al*. (1990) indicated which drug has protective effect on chicks infected with Ascaridia galli (Bhat and Hemaprasanth, 1990), but in poultry any research was not done about Heterakis gallinarum. In other study by Williams *et al*. (1999) on comparison the effect of pour on administration of Ivermectin, Doramectin, Eprinomectin and Moxidectin, they observed that maximum and minimum effect was with Eprinomectin and Ivermectin respectively (Williams *et al*., 1999). Gayrard *et al*. (1999) proved that Ivermectin and Doramectin could be successfully used for control of gastrointestinal parasites in cattle (Gayrard *et al*., 1999). Whang *et al*. (1994) 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 (Whang *et al*., 1994). In two studies by Williams *et al*. (1996) indicated that Moxidectin has very important role for control of parasitic diseases (Williams *et al*., 1996; Williams and DeRosa, 2003). Skogerboe *et al*. (1999) and Rehbein *et al*. (1999) 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 (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, any specific side effects of Ivermectin administration have not been reported (Hooke *et al*., 1997; Reinemeyer and Courtney, 2001). Collectively, Ivermectin is very effective drug for control of gastrointestinal parasites 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 Heterakis gallinarum resulted in reduction in egg count exceeded 98% ($p<0.05$), so this drug can be used in antiparasitic program in poultry. Further investigations are necessary to evaluate the drug effect on other nematodes and parasitic infections.

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