

EFFICACY OF IVERMECTIN (POUR ON FORMULATION) AGAINST ECTOPARASITES IN SHEEP

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ABSTRACT

The research has been carried out from February to March 2005 on 20 sheep (infested and non infested with ectoparasites) of both sexes aged upto 3 to 4 years at the animal house of Veterinary Clinic, Bangladesh Agricultural University, Mymensingh to study the efficacy of ivermectin pour on (Ivermec[®] Pour on, Ethical Drugs Ltd., Dhaka, Bangladesh) against ectoparasites and its effect on certain haematological (Hb, TEC and PCV) parameters and body weight gain. Fifteen sheep heavily infested with different ectoparasites were randomly divided into 3 equal groups (groups B, C and D) consisting of 5 sheep in each. Another 5 sheep free from any ectoparasitic infestation were kept as uninfested control group (group A). Topical ivermectin preparation was administered at the dose rate of 400 µg / kg body weight (pour on) and 500 µg / kg body weight (pour on) in groups C and D respectively whereas sheep of group B was kept as infested control. The therapeutic efficacy of ivermectin was 100 % against ectoparasites (lice and tick) after 7 days of treatment. The mean body weight of the sheep of treated groups (C and D) were increased after treatment with ivermectin, on day 28 post treatment. Similarly, total erythrocyte count (TEC) and hemoglobin (Hb) content was increased significantly. However, PCV was also influenced appreciably. From this experiment, it may be suggested that ivermectin is a very much suitable broad spectrum anthelmintic for sheep and its pour on formulation may be used effectively and conveniently to treat ectoparasitic infestations.

Key words: Ivermectin (pour on), efficacy, ectoparasites, haematology, sheep

INTRODUCTION

Parasitic diseases are very common and one of the main constraints for sheep rearing in Bangladesh (Jabbar and Green, 1983). Parasitic diseases, both ectoparasitic (tick, lice, mite infestation) and endoparasitic diseases cause enormous economic losses through loss of body weight, stunted growth, anaemia in livestock. Ticks cause a considerable amount of blood loss, irritation and annoyance to animal, which results in disturbances in feeding and improper digestion which lead to retarded growth, loss of weight and meat production. Diseases like Texas fever, anaplasmosis, theileriosis, looping ill and viral encephalomyelitis of animals are transmitted by ticks. To combat the ectoparasitic diseases, different types of ectoparasitocidal drugs are being used by the farmers in Bangladesh. Moreover, ivermectin preparation is available in the market that acts against the ectoparasites. In addition, no report on the toxic effect of ivermectin formulation is available. Ivermectin pour on preparation is easy to administer to the animals without any risk. Considering the above facts, ivermectin was selected in this study to study its efficacy against ectoparasitic infestation and its effect on certain haematological parameters and body weight gain in sheep.

MATERIALS AND METHODS

The research has been carried out from February to March 2005 on 20 sheep (infested and non infested with ectoparasites) of both sexes aged upto 3 to 4 years at the animal house of Veterinary Clinic, Bangladesh Agricultural University, Mymensingh to study the efficacy of ivermectin pour on (Ivermec[®] Pour on, Ethical Drugs Ltd., Dhaka, Bangladesh) against ectoparasites and its effect on certain haematological (Hb, TEC and PCV) parameters and body weight gain. Fifteen sheep heavily infested with different ectoparasites were randomly divided into 3 equal groups (groups B, C and D) consisting of 5 sheep in each. Another 5 sheep free from any ectoparasitic infestation were kept as uninfested control group (group A). Topical ivermectin preparation was administered at the dose rate of 400 µg / kg body weight (pour on) and 500 µg / kg body weight (pour on) in groups C and D respectively whereas sheep of group B was kept as infested control. After pour on of ivermectin, all the sheep of treated and untreated groups were closely observed for 28 days and various parameters like clinical parameters (severity of infestation, feeding efficiency, conditions of hair coat, body weight and adverse effects) and hematological parameters (TEC, Hb and PCV) were studied. All the sheep were allowed free pasture grazing for 2 - 3 hours daily. Adequate feed and plenty of water were also provided to all the sheep.

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The severity of infestation of ectoparasites (ticks and lice) was observed by counting the number of ectoparasites in a selected area of the individual sheep. The ectoparasites were detected by visual examination of the sheep and the number of parasites was recorded. The procedure of examination was to count the ectoparasites (ticks and lice) of abdominal region within an area of 5 cm x 4 cm (20 square cm). The selected 20 square cm were marked with a permanent colour and the ticks and lice within this area were counted at pre-treatment (0 day) and post-treatment (7, 14, 21 & 28 day) period. Hair coat of the treated sheep as well as the untreated infested and non-infested control groups were physically examined before and after treatment. Body weight of each sheep under experiment was taken before treatment and after treatment also. Blood samples were collected from Jugular vein of the sheep of treated and control group in vials containing anticoagulant (Sodium citrate 3.8 %) at day 0, 7, 14, 21, 28 of treatment period and the effects of ivermectin on the various hematological parameters (TEC, Hb and PCV) were determined as per method described by (Coffin, 1955). The data were analyzed statistically between control and treated groups by using Student 't' test according to the standard procedures described by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION.

Ivermectin at a recommended dose (400 µg/kg, bwt pour on) was 100 % effective in group C against lice infestation in sheep. In compared to group C, in the group D ivermectin at a higher than recommended dose (500 µg/kg, bwt pour on) was also found to be 100 % effective against lice infestation. On day 0 the numbers of mean value of lice were 10.10 ± 0.58 (group D) and 8.87 ± 0.58 (group C). However, no lice were found within the selected area of sheep on 7, 14, 21 and 28 day after the treatment in both the group C and D. On the other hand, in infested control group B, the number of lice increased gradually on 7, 14, 21 and 28 day of treatment (Table 1). Similarly, ivermectin at a recommended dose (400 µg/kg, bwt pour on) and (500 µg/kg, bwt pour on) was 100 % effective against tick infestation in sheep. These results are similar to that of Hossen and Mostofa (1999), Chartier and Pors (1994) and Goglewski *et al.* (1997).

Table 1. Efficacy of ivermectin pour on formulation (Ivermec[®] pour on formulation, Ethical Drugs Ltd., Dhaka, Bangladesh) against ectoparasitic infestation in sheep

Groups of sheep	Drug with dose and route	Ecto-parasite	Number of ectoparasites (mean ± SE) (n = 5)				
			Pre-treatment 0 day	Post – treatment period			
				7 day	14 day	21 day	28 day
A	Control (Uninfested)	Lice	Nil	Nil	Nil	Nil	Nil
		Tick	Nil	Nil	Nil	Nil	Nil
B	Control (Infested)	Lice	10.60 ± 0.58	11.15 ± 0.28	11.58 ± 0.26	12.75 ± 0.28	12.98 ± 0.32
		Tick	7.40 ± 0.40	8.00 ± 0.28	8.20 ± 0.30	8.60 ± 0.36	9.20 ± 0.30
C	Ivermectin @ 400 µg / kg bwt SC	Lice	8.87 ± 0.58	Nil	Nil	Nil	Nil
		Tick	5.20 ± 0.40	Nil	Nil	Nil	Nil
D	Ivermectin @ 500 µg / kg bwt SC	Lice	10.10 ± 0.58	Nil	Nil	Nil	Nil
		Tick	6.60 ± 0.40	Nil	Nil	Nil	Nil

n = Number of sheep.

In groups C and D after treatment with ivermectin, the hair coat started to become smooth and shiny gradually and on 28 day of treatment the hair coat of the treated sheep were almost alright as compared to uninfested control group (group A). On the other hand, the hair coat of the infested control group B became more rough and discolored. On day '0', the mean values of initial body weight of group C and D treated with ivermectin were 6.80 ± 0.45 kg and 6.90 ± 0.33 kg and on the 28 day of post-treatment, the mean values of body weight was 11.25 ± 0.35 kg and 11.50 ± 0.44 kg respectively. The increased body weight was significantly ($p < 0.05$) high in comparison to infested control group (Table 2). It might be due to proper digestion, absorption and metabolism of feed-nutrient. Some earlier workers found improvement in body weight after treatment with ivermectin (Bauck *et al.*, 1989; Duncan and Fordes, 1992; Kumar and Joshi, 1992; Williams, 1992; Rehbein *et al.*, 1997).

Efficacy of ivermectin pour on against ectoparasites in sheep

Table 2. Effects of ivermectin pour on formulation (Ivermec® pour on formulation, Ethical Drugs Ltd., Dhaka, Bangladesh) on body weight gain in sheep

Groups of sheep	Drug with dose and route	Body weight (kg) gain (mean ± SE) (n = 5)				
		Pre-treatment 0 day	Post-treatment			
			7 day	14 day	21 day	28 day
A	Control (Uninfested)	6.75 ± 0.50	7.25 ± 0.15	8.75 ± 0.50	10.15 ± 0.75	12.50 ± 0.50
B	Control (Infested)	6.20 ± 0.55	6.00 ± 0.25* _b	5.90 ± 0.30* _b	5.80 ± 0.44* _b	5.60 ± 0.24* _b
C	Ivermectin @ 400 µg / kg bwt SC	6.80 ± 0.45	7.35 ± 0.30* _a	8.00 ± 0.55* _a	9.15 ± 0.25* _a	11.25 ± 0.35* _a
D	Ivermectin @ 500 µg / kg bwt SC	6.90 ± 0.33	7.58 ± 0.20* _a	8.50 ± 0.42* _a	9.50 ± 0.30* _a	11.50 ± 0.44** _a

n = Number of sheep, *Significantly increased (a) / decreased (b) (p < 0.05), **Significantly increased (a) / decreased (b) (p < 0.01).

[Table 3. Effects of ivermectin pour on formulation (Ivermec® pour on formulation, Ethical Drugs Ltd., Dhaka, Bangladesh) on certain haematological parameters in sheep

Groups of sheep	Treatment	Para-meters	Values (mean ± SE) (n = 5)				
			Pre-treatment 0 day	Post- treatment values			
				7 day	14 day	21 day	28 day
A	Control (Uninfested)	TEC	11.25 ± 0.30	11.25 ± 0.40	11.25 ± 0.35	11.25 ± 0.25	11.25 ± 0.24
		Hb	11.50 ± 0.35	11.50 ± 0.40	11.60 ± 0.36	11.60 ± 0.40	11.10 ± 0.36
		PCV	33.70 ± 0.50	33.70 ± 0.55	33.80 ± 0.60	34.00 ± 1.62	34.00 ± 1.56
B	Control (Infested)	TEC	7.70 ± 0.30	7.20 ± 0.40* _b	7.00 ± 0.35** _b	6.80 ± 0.25** _b	6.65 ± 0.24** _b
		Hb	7.80 ± 0.35	7.50 ± 0.40** _b	7.30 ± 0.36** _b	7.15 ± 0.40** _b	7.00 ± 0.36** _b
		PCV	33.50 ± 0.50	33.50 ± 0.55* _a	33.30 ± 0.60** _a	30.20 ± 1.62** _a	32.30 ± 0.56** _a
C	Ivermectin @ 400 µg / kg body weight	TEC	6.80 ± 0.30	8.20 ± 0.40* _a	9.50 ± 0.35** _a	11.20 ± 0.25** _a	11.80 ± 0.24** _a
		Hb	7.80 ± 0.35	8.00 ± 0.40** _a	8.40 ± 0.36** _a	9.20 ± 0.40** _a	9.50 ± 0.36** _a
		PCV	32.80 ± 0.50	33.10 ± 0.55** _b	33.40 ± 0.60** _b	33.60 ± 1.62** _b	33.90 ± 0.56** _b
D	Ivermectin @ 500 µg / kg body weight	TEC	7.20 ± 0.30	9.10 ± 0.40* _a	9.70 ± 0.35** _a	10.65 ± 0.25** _a	12.40 ± 0.24** _a
		Hb	7.35 ± 0.35	7.80 ± 0.40** _a	8.10 ± 0.36** _a	8.60 ± 0.40** _a	9.20 ± 0.36** _a
		PCV	33.50 ± 0.50	33.90 ± 0.55** _b	34.10 ± 0.60** _b	35.50 ± 0.62** _b	35.60 ± 0.56** _b

* Significantly increased (a) / decrease (b) (p < 0.05), ** Significantly increased (a) / decrease (b) (p < 0.01), n=Number of sheep,

TEC values significantly increased upto 35 – 70 % in two groups of ivermectin treated sheep (groups C and D). The pre-treatment mean values of TEC (million/cu. mm of blood) were 6.80 ± 0.30 and 7.20 ± 0.30 in the treated groups of C and D respectively. On the 28 day of the post-treatment, the mean values of TEC (million/cu. mm) were significantly (p < 0.01) increased up to 11.80 ± 0.24 and 12.40 ± 0.24 in groups C and D respectively. The mean values of TEC (million / cu. mm) on 0 day in infested control group (group B) was 7.70 ± 0.30 which decreased gradually and was 6.65 ± 0.24 on 28 day of treatment (Table 3).

Like TEC, Hb content was also increased significantly (p < 0.01) in the groups (groups C and D) of ivermectin treated sheep. The pre-treatment (0 day) mean values of hemoglobin were 7.80 ± 0.35 gm % and 7.35 ± 0.35 gm %, in groups C and D respectively.

On the 28 day of post-treatment, mean values of hemoglobin were significantly ($p < 0.01$) increased up to 9.50 ± 0.36 gm % and 9.20 ± 0.36 gm %, in groups C and D respectively. The mean value of Hb content of the group B (infested control) on '0' day was 7.80 ± 0.35 gm % and decreased to 7.00 ± 0.36 gm % on the 28 day of treatment (Table 3).

Ivermectin pour on induced no significant changes on PCV in two groups (groups C and D) of treated sheep. The pre-treatment mean values of packed cell volume (PCV) were $32.80 \pm 0.50\%$ and $33.50 \pm 0.50\%$ in the groups of C and D respectively. On 28 day of post-treatment, the mean values of packed cell volume were $33.90 \pm 0.56\%$ and $35.60 \pm 0.56\%$ in the groups of C and D respectively whereas the mean value of packed cell volume of group B (infested control) on 0 day was $33.50 \pm 0.50\%$ which was decreased to $32.30 \pm 0.56\%$ on the 28 day of treatment (Table 3). The haematological changes in sheep treated with ivermectin pour on against ectoparasites are in agreement with the reports of Anosa (1977).

Significant changes in Hb content and PCV were observed in the treated groups of sheep and this might be due to expulsion of ectoparasites from the body. By judging available literature except Kumar and Joshi (1992), no information traced about the changes of Hb and PCV in the ivermectin treated group. Kumar and Joshi (1992) found increased level of Hb content level in ivermectin treated sheep.

The results revealed that topical application of ivermectin was 100% effective against ectoparasites in sheep. This effectiveness was determined by reduction number of ectoparasites resulting various physiological, haematological changes. This result is in conformity with the earlier workers (Williams and Plue, 1992; Pramanik *et al.*, 1996; Rendall and Callinan, 1996; Sisodia *et al.*, 1996; Rehbein *et al.*, 1997). From the present investigation it may be concluded that ivermectin pour on formulation may be used effectively and conveniently to treat ectoparasitic infestation in sheep.

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