

Article

Comparative efficacy of ivermectin (Vermic[®]), neem and trichlorfon (Negotox[®]) against humpsore in cattle

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Received: 07 April 2017/Accepted: 24 April 2017/ Published: 30 April 2017

Abstract: The experiment was conducted to evaluate the comparative efficacy of ivermectin, neem and trichlorfon against humpsore in cattle. A total of 2765 cattle from different villages of Barisal and Patuakhali district were selected for the diagnosis of humpsore. The prevalence of humpsore was found to be 7.52% in the southern part of Bangladesh. Out of humpsore infected cattle, twenty five (25) cattle between 2 - 7 years of age and irrespective of sexes having typical lesion on hump and neck were selected for the experiment divided into five equals groups (A, B, C, D and E) and each group consists of 05 cattle. Group A kept as control group. Group B was treated with ivermectin (Vermic[®] @200 ug/kg body weight subcutaneously on 1th and 14th day), group C with neem ointment (20%) topically twice daily for 25 days and group D with trichlorfon 10% (Negotox[®]) topically twice daily for 25 days and group E was treated with combined ointment (Neem + Trichlorfon 10%) topically twice daily for 25 days. On the basis of the reduction of sore lesions of cattle in all treated groups, the efficacy of ivermectin, neem, trichlorfon and combined ointment (Neem + Trichlorfon 10%) were found 100%, 57.78%, 64.16% and 82.07% at 28 days of post treatment respectively. The present findings demonstrated that ivermectin was much more effective than others therapeutic trials against humpsore in cattle.

Keywords: neem; ivermectin; trichlorfon; humpsore

1. Introduction

Bangladesh is an agro-economy based developing country. Parasitism is thought to be one of the major constraints for profitable livestock rearing and production (Jabber *et al.*, 1983). Humpsore (Stephanofilaria) is an economically important parasitic chronic skin disease caused by the presence of nematodes (*Stephanofilaria assamensis*) in the skin of cattle with prevalence in summer because it is transmitted by flies (Taylor *et al.*, 2004). Stephanofilaria was first recognized in western cattle in 1934. As an enzootic disease, the prevalence of stephanofilaria is very variable depending on the areas. *Musca conducens* is identified as the vector of *S. assamensis* in Bangladesh. As this disease is usually located on or near the hump and neck regions is popularly called "humpsore". It is cosmopolitan in distribution. But it is most frequently observed in Bangladesh and India. Cattle below one year of age was said to be resistant (Dewan, 1971). Nooruddin and Hoque (1985) noted the disease in cattle of 2-18 years of age. Stephanofilarial lesions are rounded wounds, 2 to 15 cm diameter in size, exudative, ulcerative and pruritic when the lesion is active or dry and scabby the infection pressure is low. Healing of these lesions is very hard to obtain without any treatment. The disease is said to cause gradual

deterioration of animal health, impaired performance in work, diminished milk production, and reduction of market value of the animals and its hides.

Ivermectin, macrocyclic lactone endectocide is the most commonly use anthelmintic with high potency and wide spectrum of activity against both endo and ecto parasites (humpsore) and skin lesions in animals. In 1981, the first 1 percent injectable ivermectin for cattle was released in the veterinary market (Lopes *et al.*, 2014). Ivermectin was safest and more effective for the treatment of endo and ectoparasites (Shannon *et al.*, 1995). Various studies on the treatment of humpsore have been performed by several workers in different countries using many drugs with variable results (Venugopal *et al.*, 1992 and Rai *et al.*, 1993). Best therapeutic efficacy was found against humpsore by applying ivermectin and medicinal plants ((Mostofa *et al.*, 2002). Treatment of humpsore with organophosphate compounds like trichlorfon was effective to prevent the spread of the disease to herd (Patnaik, 1970).

Various kinds of herbal extracts showed the larvicidal and acaricidal effects as reported by (Chungsamarnyart *et al.*, 1991). In fact, the preliminary study on the traditional system of Veterinary Medicine by Food and Agriculture Organization (FAO, 1980), revealed that indigenous system for the treatment of animal diseases is popular in man in Asian countries including Bangladesh. There are several indigenous medicinal plants (neem, pineapple, tobacco) have anthelmintics action (Mostofa *et al.*, 1983 and Hossain *et al.*, 1994) and used against both ecto and endo parasites in Bangladesh (Mostofa *et al.*, 1983; Mannan *et al.*, 1997).

Medicinal plant plays a key role in healthcare in most developing countries (Prokash *et al.*, 2009). This plants as a potential means of therapeutic agent and their availability in locality and cost effective (Mostofa *et al.*, 1983). Various research findings suggest that the use of herbal drugs are safer and effectively kill the worms with few or no side effects. A large number of medicinal plants have been used to treat parasitic infections in humans and animals (Akhtar *et al.*, 2000). The use of plants with anthelmintic properties seems to be a dual beneficiary due to parasite control and their low environmental impact (Hammond *et al.*, 1997). *Azadirachta indica* (Neem) is well known throughout the world for its medicinal uses from very ancient period. One of the active ingredients of neem leaves is Azadirachtin which proved as an effective nematocidal compound (Sharma *et al.*, 2003).

Nowadays there are no available effective drugs without toxicities. Although ivermectin is safe and effective against in both ecto and endoparasites of animals but it is expensive. In contrast, the alternative cheapest and available source of drug is herbal origin. Therefore, the present study was undertaken with the following objectives-

- a) To find out the prevalence of humpsore in cattle at southern part of Bangladesh.
- b) To evaluate the comparative efficacy of ivermectin, neem leaf and trichlorfon against humpsore in cattle with their adverse effects if any.

2. Materials and Methods

2.1. Study area and period

The experiment was conducted for a period of one year from July 2013 to June 2014 at different villages of Babuganj, Bakerganj, Golachipa and Mirzaganj upazilla of Barisal and Patuakhali district and Veterinary Clinic of Faculty of Animal Science and Veterinary Medicine, Patuakhali Science and Technology University, Babuganj, Barisal, Bangladesh. A total of 2765 indigenous local and cross-bred cattle of 2-8 years of age irrespective of sexes were randomly selected and examined for the presence of humpsore lesion for this study. Out of 2765 cattle, 208 from both Barisal and Patuakhali district were diagnosed with humpsore. The site of the lesions, age, sex and breed were recorded in all the affected animals showing evidence of humpsore.

2.2. Collection of drugs, plant sample and chemicals

Injectable ivermectin preparation (Vermic[®], Techno Drugs Ltd., Dhaka, Bangladesh), trichlorfon power 10% (Negotox[®], Chemist Laboratories Ltd., Barisal, Bangladesh) and Vaseline (used as vehicle in the neem and Negotox[®] ointment) were purchased from local market of Barisal. The mature leaves of neem (*Azadirachta indica*) were collected from the campus of Faculty of Animal Science and Veterinary Medicine and local villages of Babuganj Upazila of Barisal.

2.3. Preparation of neem ointment

The fresh mature neem leaves were collected in the polythene and brought to the Pharmacology laboratory for further processing. The leaves were sun dried for 5 days and kept in oven at 45°C for 24 hours and then grinded (three times) by grinder to make fine powder. The particles were then sieved separately by a sieve. Twenty (20 %) percent neem ointment (20 gram neem powder and 80 gram vaseline) was prepared by slab and spatula in the laboratory and the ointment was taken in a small plastic container for this experiment.

2.4. Experimental design

Irrespective of region, out of 208 humpsore affected cattle, twenty five (25) cattle age between 2 to 7 years irrespective of sexes and breed having typical lesion on hump, neck and others region were selected for the present study. All selected cattle were divided into five equal groups (each group contains 05 cattle) and treated as following schedules

Groups of Cattle	Drug with dose and route
Group A	Without treatment (Infected control group)
Group B	Ivermectin (Vermic [®]) @ 200 micrograms / kg body weight, SC at two injection technique on 1 th and 14 th day.
Group C	Neem(20%) ointment apply topically twice daily for 25 days.
Group D	Trichlorfon 10% (Negotox [®]) ointment apply topically twice daily for 25 days.
Group E	Combined ointment (Neem ointment + Negotox [®]) apply topically twice daily for 25 days.

The comparative efficacy of ivermectin, neem and trichlorfon against humpsore lesion in cattle were evaluated by measuring the diameter of sore of each cattle of all treated groups (Group B, C, D and E) at pretreatment (0 day) and on 7th, 14th, 21th and 28th day of post treatment. All the experimental cattle were allowed for free pasture grazing daily and provided adequate drinking water.

2.5. Statistical analysis

Results of treatment in all the groups were analyzed by using unpaired student "t" test. The data were expressed as mean \pm S.E

3. Results and Discussion

3.1. Prevalence of humpsore in cattle at southern part of Bangladesh

The overall prevalence was recorded as 7.52 % irrespective of areas. The present finding supports the earlier observation of Nooruddin *et al.* (1990) who recorded 14.60% prevalence of humpsore in cattle in Bangladesh. This variation from the present result might be due to different geographical location, sample size, seasonal variation, and climatic factors like temperature, humidity, salinity, ecology of vector, husbandry and breed of the animals. The present investigation revealed that the site of the lesions was recorded over the neck region (55.29%), hump region (34.62 %) and other region (10.09 %). Details prevalence of humpsore in cattle of the selected areas of Barisal and Patuakhali district with regards to age, sex, breed and season are shown in the Table 1.

Table 1. Prevalence of humpsore in cattle with regards to age, sex, breed and season

Factors	Numbers of humpsore affected cattle (n= 208) N (%)	
Age	2-3 years	12 (5.77)
	3-6 years	140(67.31)
	Above 6 years	56(26.92)
Sex groups	Male	122(58.65)
	Female	86(41.35)
Breeds	Indigenous Local	135(64.90)
	Crossbred	73(35.10)
Season	Summer	95(45.67)
	Rainy	77(37.02)
	Winter	36(17.31)

In regards to age groups, highest prevalence was found to be between 3–6 years of age (67.31%) followed by more than 6 years (26.92%) and 2-3 years age (5.77%). The results are in agreement with the reports of Dewan (1971) and Phukan *et al.* (2005) who found cattle aged between three to six years had highest infection rate. The prevalence of humpsore was higher in male animal (58.65%) in compare to female (41.35%). Present investigation has little correlation with the finding of Singh *et al.*, (2014) who recorded more infection rate of humpsore in male cattle (29.25%) than in female (21.84) animal. The present findings also revealed that highest prevalence was recorded in indigenous local breed (64.90%) followed by crossbred (35.10%). An effect of seasonal variation was recorded in this study. Highest prevalence was found in summer (45.67%) followed by rainy (37.02%) and winter (17.31%).

Table 2. Comparative efficacy of ivermectin, neem and trichlorfon against humpsore in cattle.

Study days	Diameter of sore (cm) in group A (Control) (mean±SE)	% of lesion area increased	Diameter of sore (cm) in group B after application of ivermectin (mean ±SE)	% of lesion area reduction	Diameter of sore (cm) in group C After application of neem (mean ±SE)	% of lesion area reduction	Diameter of sore (cm) in group D after application of trichlorfon ointment (mean ±SE)	% of lesion area reduction	Diameter of sore (cm) in group E after application of neem + trichlorfon ointment (mean ±SE)	% of lesion area reduction
0	5.31±0.42	-	6.68±0.30	-	5.85±0.42	-	6.25±0.39	-	6.58±0.21	-
7 th	5.92±0.32	+11.49	2.68±0.18	-59.88	5.25±0.35	-10.26	4.95±0.27	-20.80	5.54±0.29	-15.81
14 th	6.59±0.21	+24.11	0.25±0.04	-96.26	4.49±0.27	-23.25	3.90±0.16	-37.60	3.71±0.19	-43.62
21 th	6.81±0.15	+28.25	0	-100	3.60±0.22	-38.46	2.97±0.11	-52.48	2.17±0.11	-67.02
28 th	7.01±0.09	+32.02	-	-	2.47±0.19	-57.78	2.24±0.13	-64.16	1.18±0.17	-82.07

Values given above are mean±SE of 5 cattle, here (-) means reduction and (+) means increased.

3.2. Efficacy of ivermectin

Cattle of Group B was treated with ivermectin (Vermic[®]) at a dose rate of 200 µg/kg body weight subcutaneously at 1th and 14th day. Therapeutic efficacy of ivermectin was found to be 100% at 21th day post treatment and remained effective up to 28th day post treatment without any visible side effect. This result was in agreement with the earlier record of Mostofa *et al.* (2002), Mannan *et al.* (1997), Islam *et al.* (2003), Gill *et al.* (1991) and Venugopal *et al.* (1992). In previous study, they observed 100 % efficacy of ivermectin against humpsore in various experiment. The sore showed slight improvement after the 1st dose which was assessed by reduction of itching, irritation and progressive drying. After 1st dose, the percentage of healing of the lesion was gradually increasing. After 14th day post treatment there was significant improvement of healing with reduction of the diameter of the lesions of humpsore and recorded as (96.26%). At the end of the 21th day post treatment, cattle with both smaller and larger lesions were completely healed up by formation of smooth black scar tissue.

3.3. Efficacy of neem ointment

Group C was treated with neem ointment (20%) topically twice daily for 25 days. Therapeutic efficacy of neem ointment was 57.78% against humpsore infestation in cattle after 28 day post treatment. The finding of the present research work is highly correlated with the findings of Das *et al.* (2015) who found 56.25 % efficacy of neem leaf against tick infestation in goats. The finding of the present research work is correlated with the findings of Mostofa *et al.* (1993), Mannan *et al.* (1997) and Hossen *et al.* (2002). The present observations were agreed well with Ghani (2003) and Ajose (2007).

3.4. Efficacy of trichlorfon ointment

Group D was treated with Negotox[®] ointment (10%) topically twice daily for 25 days. The therapeutic efficacy was evaluated at 28th day post treatment and found to be 64.16%. After 28 day post treatment, the lesions exhibited better improvement which was assessed by temporarily recovery of the sores. These findings have a correlation with the findings of Mostofa *et al.* (1993) who applied Neguvon[®] ointment with neem leaves against humpsore in cattle. The present finding has close correlation with the findings of Mostofa *et al.* (1999) who observed topical application of Neguvon (1%) ointment was required for 30 days for complete healing of humpsore lesions of cattle. Topical treatment with trichlorfon was 100% effective in curing the disease (Pazinato *et al.*, 2013). The variation from the present finding might be due to lack of specific immunity against this nematode and the concentration of the active ingredient of organophosphate compound.

3.5. Efficacy of neem plus trichlorfon ointment

Group E was treated with neem plus trichlorfon ointment topically twice daily for 25 days. After 28 day of post treatment, the lesions exhibited significant reduction of sore than group C and D. The efficacy was found to be 82.07% at 20 day of post treatment. These findings have a correlation with the findings of Mostofa *et al.* (1993). They applied neguvon[®] ointment with neem leaves against humpsore in cattle. They observed that 100% animals were cured in 30 days with the formulation (neguvon[®] +neem leaves).

3.6. Comparative efficacy of ivermectin, neem and trichlorfon against humpsore in cattle

The effects of different therapeutic trials on the diameter of sore of all cattle of treated groups with their results are presented in Table 2.

In control group (A), the sore were gradually aggravated and increased up to 32.05% at 28th day. This present findings were same as Hossain *et al.*, (2002). In group B, C, D and E sore were reduced gradually at variable degree after post treatment of different therapeutic trials.

Cattle of group B treated with injectable ivermectin, the sore was reduced to 96.26% and 100% at 14th and 21th day of post treatment respectively. On the other hand, cattle of group C treated with neem ointment topically, the sore was reduced to 38.46% and 57% at 21th and 28th day of post treatment respectively without observing any visible side effects. The recovery time was longer to cure the disease when used neem ointment. In group D treated with 10% trichlorfon ointment topically, the sore was reduced to 52.48% and 64.16% at 21th and 28th day post treatment respectively. The trichlorfon ointment against humpsore in cattle showed slightly more effective than neem. This may be due to the strong antiparasitic effect of trichlorfon compound. These findings have a correlation with the findings of Mostofa *et al.* (1993). On the other hand, group E treated with combined ointment of neem and 10% trichlorfon showed that, the sore reduced up to 67.02% and 82.07% at 21th and 28th day of post treatment respectively. Between two ointments, combined action of neem plus Negotox ointment was more effective than single action of neem and negotox ointment whereas cattle treated with combined ointment took 28th days and showed 82.07% effectiveness. On the other hand, 28th day of post treatment neem and trichlorfon showed 57% and 64.16% effectiveness respectively. The efficacy of ivermectin against humpsore in cattle was highest considering the time required for healing as ivermectin treated sore lesions were cured 100% within 21 days of post treatment. The present observations were agreed well with Rahman *et al.* (2009) who found goats treated with ivermectin were cured within 18 days of post treatment and the efficacy was 99.03%.

4. Conclusions

Considering the present findings humpsore is an enzootic disease, outbreak occurred throughout the years and causes economic losses in cattle production and more prevalent in the summer season. The highest therapeutic efficacy was found with ivermectin (Vermic[®]) treated cattle @ 200 micrograms/kg body weight, subcutaneously at 1th, 14th and 21th days interval than neem and Negotox[®] ointment treated cattle with no visible adverse effects. Therapeutic effectiveness was evaluated by healing measurement of the sore of affected cattle at seven days interval for 28 day post treatment. The present study also concluded that topical treatment with neem ointment against humpsore in cattle could be used as an alternative herbal medicine instead of traditional therapy with synthetic patent drugs for curing the disease in animals. Further studies will be needed to evaluate the dosage regimens and appropriate formulation for better efficacy of herbal neem ointment.

Acknowledgements

This work was supported by Post Graduate Studies, Patuakhali Science and Technology University, Dumki, Patuakhali, Bangladesh.

Conflict of interest

None to declare.

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