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Therapeutic Efficacy of Different Brands of Albendazole Drug against Pheretima Postuma

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ABSTRACT

In the current study, experiments were conducted to evaluate the therapeutic effect of four different brands of albendazole purchased from local pharmacy in paramathi velur, namakkal district of Tamil Nadu for its anthelmintic effect using Pheretima Posthuma. Various concentrations (10, 20, 40, 80 and 100mg/ml) of all four brands were tested and results were expressed in terms of time for paralysis and time for death of worms. All four brand was shown effect with significant difference between them but ALB-A was reveal good anthelminthic effect and significant variation in both paralysis and death time of worms comparatively with other three brands of albendazole drug. Retrospective survey in 100 pharmacy result review people in this region mostly affected with worm infection and number of sub-branded drug available in the market so this study may help the professional to provide potent Anthelmintic drug.

Keywords: Albendazole**,** Pheretima Posthuma, paralysis, death time, Parmathi velur

I. INTRODUCTION

According to WHO guidelines, intensity of infection was classified as "light", "moderate" or "heavy"on the basis of fecal egg count [1]. Environmental sanitation is one of the methods that help to control geohelminthiases. However, in developing countries, it is difficult to prevent infection with geo helminths because improvements in environmental sanitation arenot easily achievable. Therefore, treatment of infected individuals with effective and broad-spectrum anthelminthics can minimize problems that arise from intestinal helminthic infections [2, 3]. As a result the availability of safe, effective, broad-spectrum anthelminthics that can be administered in single doses has changed the approach to the control of intestinal helminthiases. There are several types of earthworms. The most common genus of earthworm is Pheretima in India and Lumbricus in Europe. Pheretima has 500 species, 13 of them are found in India. Anthelmintics are drugs that are used for the treatment of infections caused by the worms, flukes, nematodes, round worms, tapeworms etc. Anthelmintics are the tropical and veterinary types of medicines which are of huge importance. Parasitic worms also infect the livestock and crops thus affecting the food production with a resultant economic impact. It comes as no surprise, that the drugs available for human treatment were first developed as veterinary medicines. The first thiabendazole was discovered in 1961 and it is a broad spectrum anthelmintics. There is an extensive literature on benzimidazole compounds which showed a number of different biochemical effects. The anthelmintic efficacy of benzimidazoles is due to the ability of compromising the cytoskeleton through a selective interaction with β-tubulin factor. This showed the effects of benzimidazoles on the species of C. elegans, which includes the locomotion impairment, reproduction and detrimental effects on oocytes with the disruption of processes thus requires the integral microtubules. Thus the sensitivity of C. elegans species gives the response to benzimidazole mediated through a single gene, and encoded by β-tubulin factor. Through this the molecular basis of benzimidazole molecule resistance has been investigated in the parasitic nematodes. The benzimidazole molecule showed resistance in different nematodes like Haemonchuscontortuswhich is associated with the presence of specific alleles of β-tubulin in the drug. The specific β-tubulin isoform could confers the resistance for the drug which was tested through experiments but this showed that the sensitivity of C. elegans mutants of benzimidazole can be

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rescued by expressing the H. contortusalleles of β-tubulin frombenzimidazole through which isolation was done [4-7].

II. MATERIAL AND METHODS

Methods of collection of pheretima posthuma (Earthworm)

The appropriate time for their collection was found early in the morning in the summer, and noontime during the winter. Freshly collected alive worms were stored in the plastic bags, filled with suitable quantity of wet compost soil.

Selection of marketed brands of albendazole

The survey was done on 100 medical shop in and around paramathi velur and collected the prescription and OTC drug for anti-helminthic treatment from the pharmacist and study drug was selected based on number of prescription of albendazole brand were used and prescribed by the professionals in region of Paramathivelur, namakkal district.

Evaluation of anthelmintic activity

An Indian adult earth worm 4 -5 cm in length and 0.1 - 0.2 cm in width were used for the in vitro anthelmintic bio assay. Because of easy availability, earthworms have been used widely for the initial evaluation of anthelmintic compounds in vitro[8]. The anthelmintic assay was carried out as per the method of Ajaiyeoba et al [9]. The assay was performed in vitro using adult earthworm (Pheretima posthuma) owing to its anatomical and physiological resemblance with the intestinal roundworm parasites of human beings for preliminary evaluation anthelmintic activity.

The earthworms were divided into six groups containing six worms in each group. Control group received 1% v/v of DMSO. The Brands of Albendazole- ALB-A, ALB-B, ALB-C and ALB-D were dissolved in 1% v/v DMSO, to give 10, 20, 40, 80 and 100 mg/ml respectively.

20 ml of freshly prepared different brands of ALB with 1% v/v DMSO were poured into petri-dishes. The worms were washed with saline and released into the petri-dishes and the time taken for the worms to get paralyzed and death was noted.

All the drugs solution and 1% v/v DMSOsolutions were prepared freshly before starting the experiments. Observations were made for the time taken for paralysis was noted when no movement of any sort could be observed except when the worms were shaken vigorously. Time for death of worms were recorded after ascertaining that worms neither moved when shaken vigorously nor when dipped in warm water (50^{o}C). [10-12]

III. STATISTICAL ANALYSIS

Experimental data are expressed as mean±standard error of mean (SEM). Statistical analysis was performed by one-way ANOVA followed by Dunnett's method of multiple comparisons was employed using GraphpadInstat 3.0 software. Data were considered significant at $p < 0.05$, $p < 0.01$.

IV. RESULTS

Anthelmintic activity

The results of anthelmintic activity are shown in Table 1 and Figure 1. The ALB-A showed effective in paralysis as well as death time at all concentrations compared to all other brands. ALB-B has less significant anthelmintic activity comparatively with other brands like ALB-A, ALB-C and ALB-D but death time was significantly less with ALB-C and ALB-D but significant variation ($p<0.01$) compared to ALB-A. ALB-C 20 mg/ml concentration was reveal Significant variation ($p<0.05$) compared to ALB-A and ALB-D. The ALB-D 80 mg/ml shows significantly ($p<0.05$) more time taken for paralysis of worm compared to ALB-A and ALB-C. There is a significant variation between the all brand was revealed in death time of earthworm. ALB-A more significantly reduce the death time of worms compared to other brands of albendazole.

Table 1: in vitro anthelmintic activity of different brands of Albendazole

Groups	Treatment	Concentration in mg/ml	Time taken for paralysis in minutes	Time taken for death in minutes
1	Control	Distilled water	-	-
2	ALB –A	10	32.47±11.2[a]	49.48±3.5[a]
		20	10.43±5.6[a]	30.06±5.9[a]
		40	06.01±8.4[a]	26.41±4.1[a]
		80	04.27±6.7[a]	22.06±3.8[a]
		100	03.48±10.4[a]	17.02±3.6[a]

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3	ALB –B	10	50.05±12.1[b]	141.43±4.5[b]
		20	33.57±6.4[b]	127.56±6.1[b]
		40	18.37±10.5[b]	95.46±2.0[b]
		80	14.46±9.4[b]	79.40±4.5[b]
		100	11.35±5.6[b]	67.21±8.1[b]
4	ALB –C	10	31.35±8.4[a]	182.48±7.5[c]
		20	13.26±8.9[c]	149.45±5.4[c]
		40	09.43±7.4[a]	138.60±8.2[c]
		80	05.28±10.5[a]	121.57±3.8[c]
		100	03.28±9.3[a]	110.28±5.6[c]
5	ALB–D	10	29.02±8.2[a]	233.16±4.6[d]
		20	15.14±7.9[d]	225.20±2.7[d]
		40	10.36±10.9[a]	187.29±9..5[d]
		80	07.60±10.4[e]	158.22±5.0[d]
		100	04.48±12.6[a]	149.36±3.1[d]

Results are expressed as mean ± S.E.M. (n=6) for each group; significance at p< 0.05, p< 0.01, as compared to between different brands of albendazole at different concentration. Mean bearing same superscript do not differ significantly, Mean bearing Different superscript differ significantly,

a- ALB-A differ significantly P<0.01) from ALB-B.

b- ALB-B (P<0.01) significantly differ from ALB-A,C,D. at all concentration in Paralysis time.

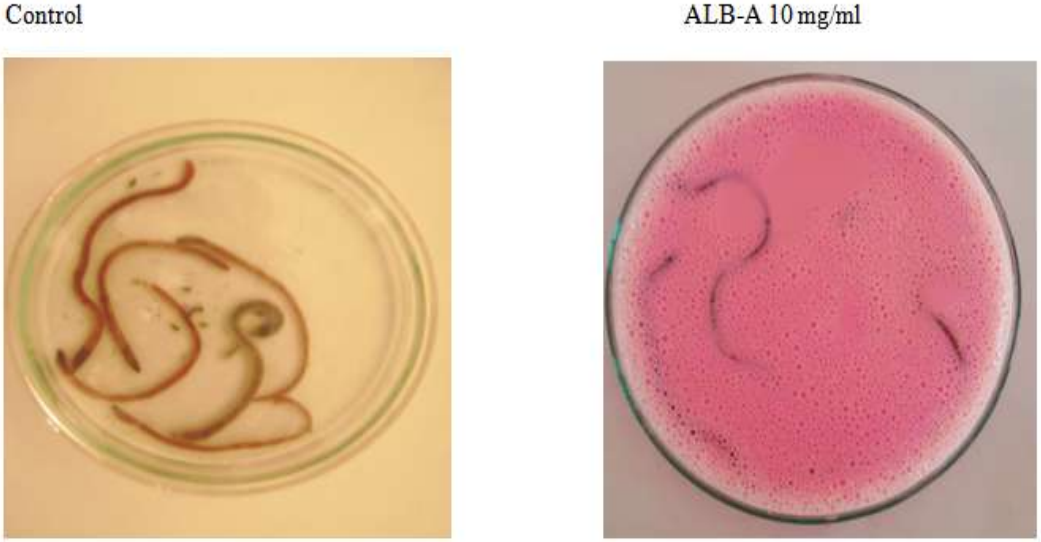
c- ALB-C (P<0.05) significantly differ from ALB-A at 20 mg/ml concentration Paralysis time.

d- ALB-D (P<0.05) significantly differ from ALB-A & ALB-C at 20 mg/ml concentration in Paralysis time.

e- ALB-A & ALB-C (P<0.05) significantly differ from ALB-D at 80 mg/ml concentration Paralysis time.

a,b,c,d- Differ significantly (P<0.05, P<0.01) between all brands at all concentration in Death time.

Figure 1: Therapeutic efficacy of different brands of Albendazole drug against earthworm



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ALB-A 20 mg/ml

ALB-A 40 mg/ml

ALB-A 80 mg/ml

ALB-A 100 mg/ml

ALB-B 10 mg/ml

ALB-B 20 mg/ml

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ALB-B 40 mg/ml

ALB-B 80 mg/ml

ALB-B 100 mg/ml

ALB-C 10 mg/ml

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ALB-C 20mg/ml

ALB-C 40 mg/ml

ALB-C 80 mg/ml

ALB-C 100 mg/ml

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ALB-D 10 mg/ml

ALB-D 20 mg/ml

ALB-D 40 mg/ml

ALB-D 80 mg/ml

ALB-D 100mg/ml

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V. DISCUSSION

The predominant effect of albendazole on Primary action is binding to beta tubulin and thus inhibition of microtubule polymerization,more specific to parasitic beta-tubulin than that of host cell. Immobilisation & death of parasites occur slowly and they produce many biochemical changes in susceptible Nematodes Inhibition of mitochondial fumarate reductase, reduced glucose transport and uncoupling of oxidative phosphorylation. The ALB-A, ALB-C and ALB-D revealed significantly decrease the paralysis time as compared to ALB-D but ALB-A as well as significant decrease in death time compared to ALB-B, at all concentration. While the brand ALB-B when compared between different brands of albendazole was less efficacy in Paralysis time but death time shows significantly decrease compare to ALB-C and ALB-D. It may attribute to many factors like manufacturing techniques, additives or expients used in formulation.

VI. CONCLUSION

We conclude that all brands of albendazole used in study were effective against parasitic infections in humans and the present result supported that all brands had good Anthelmintic activity but drug onset of action may differ from different brands of albendazole also study concludes the brand ALB-A comparatively effective than other brands. The present study may help the professional to prescribe the potent medication based on severity of helminthic infection.

BIBLIOGRAPHY

[1]. Mohammed MS, Mohammed M, Yusuf OA, Joseph OA. Anthelmintic activity of the crude methanol extracts of Xylopia aethiopica against Nippostrongylus brasiliensis in rats. Veterinarski Arhiv 2005; 75: 487-495.
[2]. Barar FSK, Essential of Pharmacotherapeutics. 2000. p. 347-453.
[3]. Ibrahim MA, Nwude N, Ogunsusi RA, Allu YO. A paper presented at the 5th International Symposium on Medicinal plants, University of lfe, lle-lfe, Nigeria; 1983. p.13-15.
[4]. Borgers M, De Nollin S. Ultra structural changes in Ascaris suum intestine after mebendazole treatment in vivo. J Parasitol 1975; 61: 110–122.
[5]. Driscoll M, Dean, E, Reilly E, Bergholz, E, Chalfie M. Genetic and molecular analysis of a Caenorhabditis elegans beta-tubulin that conveys benzimidazole sensitivity. J Cell Biol 1989; 109:2993–3003.
[6]. Kwa M.S, Veenstra, JG, Roos M H. Benzimidazole resistance in Haemonchus contortus is correlated with a conserved mutation at amino acid 200 in beta-tubulin isotype. Mol. Biochem Parasitol 1994; 63: 299–303.
[7]. Kwa MS, Veenstra JG, Van D M., Roos, M.H. Beta-tubulin genes from the parasitic nematode Haemonchus contortus modulate drug resistance in Caenorhabditis elegans. J. Mol Biol 1995; 246:500–510.
[8]. Sollmann T. Anthelmintics: Their efficiency as tested on earthworms. J Pharmcol Exp Ther 1918; 12:129-70.
[9]. Ajaiyeoba EO, Onocha PA, Olarenwaju OT. In vitro anthelmintic properties of Buchholzia coriaceae and Gynandropsis gynandra extract. Pharm Biol. 2001; 39: 217-20.
[10]. Vigar Z. Atlas of Medical Parasitology. 2nd ed. P. G. Publishing House Singapore 1984. p. 242.
[11]. Dash GK, Suresh P, Kar DM, Ganpaty S, Panda SB. Evaluation of Evolvulus alsinoides Linn. For anthelmintic and antimicrobial activities, J Nat Rem. 2002; 2: 182-185.
[12]. Shivkumar YM, Kumar VL. Anthelmintic activity of latex of Calotropis procera. Pharma Biol. 2003; 41: 263-265.