

Comparative anthelmintic activity of allopathic, ayurvedic and homeopathic medications using adult Indian earthworm model

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Abstract

Helminths infections are also among the most common infections in human, affecting a large proportion of the world's population in developing countries and produce a global burden of disease. Pheretima posthuma a helminthes is commonly known as earth-worms. Allopathic (various brands of albendazole), ayurvedic (wormicid plus) and homeopathic (cinalmix) medications used for the treatment of helminthic infections were evaluated for the anthelmintic activity using Pheretima posthuma model (Indian earthworm). 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. Albendazole (standard reference) test samples were prepared at the concentrations 10, 20, and 40 mg/ml in normal saline solution. Three worms (i.e. Pheretima posthuma) of approximately equal size (same type) were placed in each glass beaker containing 20 ml of above test samples. Likewise, different concentrations were prepared from various brands of albendazole, wormicid plus and cinalmix. 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°C). Homeopathic drug cinalmix has less (2.25±0.10) paralytic time when compared to wormicid plus (3.17±0.21) at the concentration of 10 mg/ml. Among all the homeopathic, ayurvedic and allopathic drugs, cinalmix shows less paralytic time and highest potency. Observations were comparable with the standard drug at concentration of 20 mg/ml. The present study results suggested that cinalmix has significant anthelmintic activity when compared to all other allopathic and ayurvedic medications.

Key-words: Cinalmix, Wormicid Plus, Albendazole, Pheretima posthuma, Paralyzed time

INTRODUCTION

Helminth infections are among the most widespread infections in humans, distressing a huge population of the world. Although the majority of infections due to helminths are generally restricted to tropical regions and cause enormous hazard to health and contribute to the prevalence of undernourishment, anaemia, eosinophilia and pneumonia (1). Parasitic diseases cause ruthless morbidity affecting principally population in endemic areas (2). The gastro-intestinal helminthes becomes resistant to currently available anthelmintic drugs therefore there is a foremost problem in treatment of helminthes diseases (3). Hence there is an increasing demand towards natural anthelmintics.

As a vermicide, albendazole (an allopathic medication) causes degenerative alterations in the intestinal cells of the worm by binding to the colchicine-sensitive site of β -tubulin, thus inhibiting its polymerization or assembly into microtubules (4). Albendazole leads to impaired uptake of glucose by the larval and adult stages of the susceptible parasites, and depletes their glycogen stores. Albendazole also prevents the formation of spindle fibers needed for cell division, which in turn blocks egg production and development; existing eggs are prevented from hatching. Cell motility, maintenance of cell shape, and intracellular

transport are also disrupted. At higher concentrations, it disrupts the helminths' metabolic pathways by inhibiting metabolic enzymes such as malate dehydrogenase and fumarate reductase, with inhibition of the latter leading to less energy produced by the Krebs cycle. Due to diminished ATP production, the parasite is immobilized and eventually dies. Some parasites have evolved to have some resistance to albendazole by having a different set of acids comprising β -tubulin, decreasing the binding affinity of albendazole (5).

Cinalmix (Homeopathic medication) from Fourrts is a natural herbal remedy that will help maintain digestive health and keep the system free of intestinal worms in children and adults. The herbal and homeopathic ingredients in this tincture will assist not only in keeping adults and children worm-free, but will also promote a healthy digestive tract. The ingredients have been selected for their natural properties in helping destroy organisms that can be harmful to your body you may be exposed to in the food you eat, water you drink and even in the air you breathe. It assists the body to naturally eradicate intestinal worms; boosts the body's immune system; promotes healthy digestive functioning and supports the optimal absorption of nutrients.

Each 100 ml of Cinalmix syrup contains Cina Q 1.5ml + Teucrium marum Q 1.2ml + Chelone Q 1.5ml + Chenopodium Q 1.2ml + Syrup base q.s. Cina Q is effective for intestinal irritation, irritability, variable appetite, grinding of teeth, bloated and hard abdomen and also craving for sweets, anal itching. Teucrium marum Q is for unnatural appetite, itching of anus and constant irritation in the evening in bed. Ascarides with nightly restlessness. Crawling sensation in the rectum after stool. Chelone glabra Q is good remedy for round worms and thread worms. It is an enemy to every kind of worming infesting the human body.

Wormicid Plus (An Ayurvedic medication) each 10 ml contains Athivisha (Aconitum heterophyllum) 25 mg + Palasha (Butea monosperma) 125 mg + Indrayava (Hollerina antidysenterica) 100 mg + Parasika Yavani (Hyoscyamus niger) 10 mg + Musta (Cyperus rotundus) 150 mg + Nimba (Azardichta indica) 75 mg + Shigru (Moringa olifera) 75 mg + Pippali (Piper longum) 20 mg + Triphala 125 mg + Ajamoda (Carum roxburgianum) 50 mg + Vindanga (Embllica ribes) 150 mg. Vidanga and Indrayava kills the intestinal worms, parasites and helps to expel the worms out of the body. Ajamoda and Pippali relieve the abdominal pain and improves the digestion. Musta and Ativisha stops the diarrhoea and blood loss. Triphala and Parasika Yavani reduce the inflammation of inner layer of the intestine and soothes. In the present study, comparative anthelmintic activity of allopathic, ayurvedic and homeopathic medications were evaluated using adult Indian earthworm model

MATERIALS AND METHODS

Drugs and chemicals

Various brands (BANDY, ZENTEL, BENDEX, ZEEBEE and ALBENCARE) of albendazole were purchased from Medplus Pharma, Vijayawada, India. Distilled water, prepared from deionized water, was used throughout the study. Homeopathic medication (Cinalmix) was purchased from Fourrts India Laboratories Pvt. Ltd. Ayurvedic medication (Wormicid Plus) was purchased from Prakruti Products Pvt. Ltd. All other chemicals and reagents used were of analytical grade.

Animals

Adult earthworms (*Pheretima posthuma*) were used to evaluate anthelmintic activity in vitro. Earthworms were collected from Vermi Compost Unit located at Vijayawada, Andhra Pradesh, India and washed with normal saline. The earthworms of 6-8 cm in length were used in the study.

Evaluation of Anthelmintic activity

The anthelmintic assay was carried out as per the method of Dash et al. 2002 (6). 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. Albendazole test samples were prepared at the concentrations, 10, 20, and 40 mg/ml in normal saline solution. Three worms (i.e. *Pheretima posthuma*) of approximately equal size (same

type) were placed in each glass beaker containing 20 ml of above test samples. Albendazole (20 mg/ml) was used as reference standard and distilled water as control. All the test solution and standard drug solution 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°C).

Statistical Analysis

All the results were shown in Table.1 and expressed as a mean \pm SD of three worms in each group. Analysis of the data was performed using Graph Pad Prism 5 version 5.01. One way ANOVA test with confidence interval at 95% (* = $p \leq 0.05$) was used to determine the statistical significance of the differences of the mean.

RESULTS AND DISCUSSION

All medications produced dose dependent paralytic effect (Table 1). At the concentration of 10 mg/ml the paralytic time of zeebee was found to be less (6.13 ± 0.06) when compared to all other allopathic drugs followed by albencare (6.42 ± 0.17) At the concentration of 10 mg/ml the paralytic time of bendex was found to be highest (7.20 ± 0.14) among all other allopathic drugs. Similarly, at the concentration of 40 mg/ml the paralytic time of zeebee was found to be less (2.35 ± 0.19) when compared to all other allopathic drugs and followed by albencare (3.24 ± 0.10) By considering all the above points zeebee was observed to be more potent when compared to all other allopathic drugs. Homeopathic drug cinalmix has less (2.25 ± 0.10) paralytic time when compared to wormicid plus (3.17 ± 0.21) at the concentration of 10 mg/ml. Among all the homeopathic, ayurvedic and allopathic drugs, cinalmix shows less paralytic time and highest potency (Table 2).

The death time of albencare was found to be less (7.51 ± 0.04) when compared to all other allopathic drugs followed by bandy at the concentration of 10 mg/ml. The death time of bendex was found to be the highest (11.81 ± 0.60) when compared to all other allopathic drugs at the concentration of 10 mg/ml. Whereas, the death results of zeebee and zentel were observed to be less and bendex has more death time when compared to all other allopathic drugs at the concentration of 40 mg/ml. By considering the above results, albencare shows more potency at concentration 10 mg/ml and zeebee shows more potency at the concentration of 40 mg/ml when compared to all other allopathic drugs. Homeopathic drug, cinalmix shows more death time when compared to ayurvedic drug (wormicid plus) at the concentration of 10 mg/ml. Whereas, cinalmix shows less death time when compared to ayurvedic drug (wormicid plus) at the concentration of 40 mg/ml. Among all the homeopathic, ayurvedic and allopathic drugs wormicid plus shows highest potency at the concentration of 10mg/ml and cinalmix shows highest potency at the concentration of 40 mg/ml (Table 3).

Table 1. Effect of different anthelmintic medications (various brands) on paralyzed and death times of earthworms (n=3).

Brand	Concentration (mg/ml)	Paralyzed Time (Min)				Death Time (Min)			
		Trial 1	Trial 2	Trial 3	Mean \pm SD	Trial 1	Trial 2	Trial 3	Mean \pm SD
BANDY	40	3.30	3.63	3.45	3.46 \pm 0.17	5.15	5.00	5.36	5.17 \pm 0.18
BANDY	20	4.00	4.15	4.30	4.15 \pm 0.15	6.00	5.30	5.45	5.58 \pm 0.37
BANDY	10	6.10	6.24	7.00	6.45 \pm 0.48	8.30	8.30	9.24	8.61 \pm 0.54
ZENTEL	40	2.23	2.48	3.00	2.57 \pm 0.39	4.30	5.00	5.32	4.87 \pm 0.52
ZENTEL	20	4.05	4.26	4.05	4.12 \pm 0.12	6.00	7.01	6.35	6.45 \pm 0.51
ZENTEL	10	7.10	6.58	6.55	6.74 \pm 0.31	13.00	10.0	11.37	11.46 \pm 1.50
BENDEX	40	3.20	3.10	3.54	3.28 \pm 0.23	6.43	6.54	6.20	6.39 \pm 0.17
BENDEX	20	3.59	3.24	4.07	3.63 \pm 0.42	6.40	7.12	6.45	6.66 \pm 0.40
BENDEX	10	7.26	7.04	7.30	7.20 \pm 0.14	12.50	11.40	11.54	11.81 \pm 0.60
ZEEBEE	40	2.40	2.14	2.50	2.35 \pm 0.19	4.10	4.10	4.25	4.15 \pm 0.09
ZEEBEE	20	4.02	4.42	4.00	4.15 \pm 0.24	6.49	6.50	6.35	6.45 \pm 0.08
ZEEBEE	10	6.20	6.10	6.10	6.13 \pm 0.06	11.0	10.50	10.41	10.64 \pm 0.32
ALBENCARE	40	3.15	3.34	3.22	3.24 \pm 0.10	5.00	5.07	5.32	5.13 \pm 0.17
ALBENCARE	20	4.20	4.25	4.25	4.23 \pm 0.03	5.25	5.33	5.12	5.23 \pm 0.11
ALBENCARE	10	6.53	6.23	6.50	6.42 \pm 0.17	7.55	7.52	7.47	7.51 \pm 0.04
CINALMIX	40	2.38	2.21	1.54	2.04 \pm 0.44	3.23	3.17	3.25	3.20 \pm 0.04
CINALMIX	20	2.11	2.10	2.09	2.10 \pm 0.01	4.36	4.47	4.52	4.45 \pm 0.08
CINALMIX	10	2.23	2.36	2.17	2.25 \pm 0.10	4.50	4.50	4.21	4.40 \pm 0.17
WORMICID PLUS	40	1.50	2.02	2.15	1.89 \pm 0.34	4.00	3.30	3.45	3.58 \pm 0.37
WORMICID PLUS	20	2.24	2.17	2.07	2.16 \pm 0.09	4.30	3.50	3.42	3.74 \pm 0.49
WORMICID PLUS	10	3.10	3.41	3.00	3.17 \pm 0.21	4.40	4.13	4.35	4.29 \pm 0.14

Table 2. Effect of different anthelmintic medications (various brands) on mean paralyzed and death times of earthworms (n=3).

Brand	Concentration(mg/ml)	Paralyzed Time (Min)	Death Time (Min)
		Mean \pm SD	Mean \pm SD
BANDY	40	3.46 \pm 0.17	5.17 \pm 0.18
BANDY	20	4.15 \pm 0.15	5.58 \pm 0.37
BANDY	10	6.45 \pm 0.48	8.61 \pm 0.54
ZENTEL	40	2.57 \pm 0.39	4.87 \pm 0.52
ZENTEL	20	4.12 \pm 0.12	6.45 \pm 0.51
ZENTEL	10	6.74 \pm 0.31	11.46 \pm 1.50
BENDEX	40	3.28 \pm 0.23	6.39 \pm 0.17
BENDEX	20	3.63 \pm 0.42	6.66 \pm 0.40
BENDEX	10	7.20 \pm 0.14	11.81 \pm 0.60
ZEEBEE	40	2.35 \pm 0.19	4.15 \pm 0.09
ZEEBEE	20	4.15 \pm 0.24	6.45 \pm 0.08
ZEEBEE	10	6.13 \pm 0.06	10.64 \pm 0.32
ALBENCARE	40	3.24 \pm 0.10	5.13 \pm 0.17
ALBENCARE	20	4.23 \pm 0.03	5.23 \pm 0.11
ALBENCARE	10	6.42 \pm 0.17	7.51 \pm 0.04
CINALMIX (H)	40	2.04 \pm 0.44	3.20 \pm 0.04
CINALMIX (H)	20	2.10 \pm 0.01	4.45 \pm 0.08
CINALMIX (H)	10	2.25 \pm 0.10	4.40 \pm 0.17
WORMICID PLUS (A)	40	1.89 \pm 0.34	3.58 \pm 0.37
WORMICID PLUS (A)	20	2.16 \pm 0.09	3.74 \pm 0.49
WORMICID PLUS (A)	10	3.17 \pm 0.21	4.29 \pm 0.14

Table 3. Comparative study of different anthelmintic medications (various brands) on paralyzed and death times of earthworms (n=3).

Concentration (mg/ml)	Paralyzed Time (Min)						
	BANDY	ZENTEL	BENDEX	ZEEBEE	ALBENCARE	CINALMIX	WORMICID PLUS
10	6.45 ± 0.48	6.74 ± 0.31	7.20 ± 0.14	6.13 ± 0.06	6.42 ± 0.17	2.25 ± 0.10	3.17 ± 0.21
20	4.15 ± 0.15	4.12 ± 0.12	3.63 ± 0.42	4.15 ± 0.24	4.23 ± 0.03	2.10 ± 0.01	2.16 ± 0.09
40	3.46 ± 0.17	2.57 ± 0.39	3.28 ± 0.23	2.35 ± 0.19	3.24 ± 0.10	2.04 ± 0.44	1.89 ± 0.34
	Death Time (Min)						
10	8.61 ± 0.54	11.46 ± 1.50	11.81 ± 0.60	10.64 ± 0.32	7.51 ± 0.04	4.40 ± 0.17	4.29 ± 0.14
20	5.58 ± 0.37	6.45 ± 0.51	6.66 ± 0.40	6.45 ± 0.08	5.23 ± 0.11	4.45 ± 0.08	3.74 ± 0.49
40	5.17 ± 0.18	4.87 ± 0.52	6.39 ± 0.17	4.15 ± 0.09	5.13 ± 0.17	3.20 ± 0.04	3.58 ± 0.37

CONCLUSION

The present study results suggested that cinalmix has significant anthelmintic activity when compared to all other allopathic and ayurvedic drugs.

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Conflict Of Interest

The authors declare that this research does not have any conflict of interest with anyone or any institute.

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