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Anthelmintic Activity of liquid self-emulsifying drug delivery system

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ABSTRACT: Background: The Albendazole is a broad spectrum anthelmintic used to treat certain infections caused by worms such as pork tapeworm and dog tapeworm. **Aim:** The present study was aimed to develop a new adaptable emulsion formulation for evaluation of anthelmintic activity. **Method:** Liquid self emulsion formulation was prepared by using a design expert method. The anthelmintic activity of emulsion was evaluated by using Indian earthworms at doses 2.5, 5, 10, 15 and 20 mg/ml. The Albendazole was used as a standard drug (10 mg/ml). The paralysis and death time of earthworms after administration of doses were determined. **Result:** The result of anthelmintic activity of earthworms showed that the earthworms had taken less time for paralysis and death. **Conclusion:** It can be concluded that earthworms can be used successfully for the anthelmintic activity study as it is easy, prominent, and adaptable to laboratory conditions. Evaluation of anthelmintic activity of any drug when carried out in laboratory conditions by using the isolated worms from nature cannot be adaptable with artificial laboratory conditions. The present anthelmintic activity study reveals a new methodology with earthworms cultured in laboratory conditions.

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INTRODUCTION:

Helminthiasis is a worm (Hookworms, fluke worms, roundworms and tapeworms) infestation of humans and other animals, even livestock and crops affecting health and food production respectively and have an impact on global economic factors. The major symptoms of severe helminthiasis include diarrhea, abdominal pain, general malaise and impaired cognitive development. Chronic helminthiasis by hook worm leads to intestinal bleeding and anemia ^[1-3]. Present treatment regimens for these diseases have limitations as the currently used anthelmintic drugs are mainly microfilaricidal, with little effect on the adult worms; hence new drugs are urgently required. In this regard, natural products have made and continue to make important contributions to this

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therapeutic area. The drugs currently used for helminthes infections include combinations of Diethylcarbamazine, Albendazole, Ivermectin and Albendazole [4,5]. Previous studies have also reported that none of these is effective in killing the adult worms, which can live in the host for several years. This emphasizes the need for developing an effective and safe drug to kill or permanently sterilize the adult worms. The earthworms are eco-friendly for decomposing organic materials, feeding upon undecayed leaves and other plant materials, more geophagous [6,7]. Albendazole, also known as Albendazolum, is a medication used for the treatment of a variety of parasitic worm infestations. It is useful for giardiasis, trichuriasis, filariasis, neurocysticercosis, hydatid disease, pin-worm disease, and ascariasis, among other diseases. A benzimidazole broad-spectrum anthelmintic is structurally related to Mebendazole that is effective against many diseases [8,9].

The objective of the present anthelmintic activity study reveals a new methodology with earthworms in laboratory conditions.

MATERIAL AND METHODS: [9-19]

The drug Albendazole was purchased as a gift sample from Lasa Supergenerics Ltd., Mumbai. The solvents Sesame Oil, Tween 80 and PEG 400 were purchased from Pure Chem Lab, Pune.

Collection of Earthworms:

Earthworms (*Pheretia posthuma*) were collected from the Earthworms project along the swampy water in Thikekar wadi, near Otur Pune, India. The average size of earthworms was 5 to 8 cm. The anthelmintic activity was carried out as per the method described below. The assay was performed *in vitro* using adult earthworms owing to their anatomical and physiological resemblance with the intestinal roundworms, parasites of human beings for preliminary evaluation of anthelmintic activity. A concentration of standard drug and other chemicals was prepared as described below.

Preparation of liquid emulsion by using design expert design:

Accurately weighed Albendazole and the selected excipients such as Sesame oil, Tween 80 and PEG 400 were added to the vial and mixed by using a magnetic stirrer for 15 min. The stirring was continued unless all components were thoroughly mixed and emulsion was formed. The formulations were observed for isotropicity

and were stored at room temperature until further analysis [10].

Evaluation of Anthelmintic activity using Earthworms:

Earthworms, each of average length of 6 cm, were placed in Petridishes containing 10 ml of emulsion containing the drug concentrations 2.5, 5, 10, 15 and 20 mg/ml of solutions. Albendazole solution was used as reference standard drug and distilled water was used as control. The worms were observed for the motility after incubating at 37°C. This was done after pouring the Petridishes content in the wash basin and allowing the worms to move freely. The time taken for paralysis and death of worms were observed and recorded [11-14].

RESULTS AND DISCUSSION:

Anthelmintic activity of earthworms:

About 5 earthworms were collected and immediately transferred to Petridish containing an emulsion. Worm was weighted; the weights are shown in Table 1. Petridishes were named as batch 1, 2, 3, 4 and 5 with concentration of drugs with respect to Albendazole. The result of anthelmintic activity of drugs, based on the time of paralysis and death, was shown in Table 1. In the present anthelmintic activity study, it shows that time of paralysis and death of earthworm was very less. This reveals that the Albendazole emulsion showed potent anthelmintic activity.

Table 1. The anthelmintic activity of various doses of Albendazole emulsion on *P. posthuma*.

Doses of drug in emulsion (mg/ml)									
2.5		5		10		15		20	
Batch 1		Batch 2		Batch 3		Batch 4		Batch 5	
Time (min)		Time (min)		Time (min)		Time (min)		Time (min)	
PT	DT	PT	DT	PT	DT	PT	DT	PT	DT
5	10	4	8	2	5	1	3	1	1.45

PT and DT are paralysis and death time.

As the dose of the drug in emulsion was increased, there was a marked increase in anthelmintic activity. The result showed that the time taken for paralysis and death of earthworm is very fast when these are placed in an emulsion. The anthelmintic activities of Albendazole drugs in earthworms were performed in the laboratory conditions (Fig 1 and 2).



Fig 1. The image of paralyzed worm in Albendazole emulsion at drug concentration of 20 mg/ml.



Fig 2. The image of Dead worm in Albendazole emulsion at drug concentration of 20 mg/ml.

CONCLUSION:

Albendazole prepared emulsion is very effective for treatment of helminths. From the above result here we concluded Albendazole emulsion has a potent anthelmintic activity. The time taken for paralysis and death of the earthworms was very less for every batch. The developed formulation is easy, prominent, and adaptable to laboratory conditions for success in preventing the worm infection.

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