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Anthelmintic Activity of Liquid Self Emulsifying Drug Delivery System (SEDDS) of Praziquntel

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Abstract: *The present study aims at developing a new adaptable method for evaluation of anthelmintic activity. Liquid self emulsifying drug delivery system was prepared by using design expert method. The anthelmintic activity of emulsion was evaluation by using Indian earthworms at doses 2.5,5,10,15,20 mg/ml. The Praziquantel was used as standard drug (10 mg/ml).The paralysis and death time of earthworms after administering doses were determined. The result of anthelmintic activity of earthworms showed that the earthworms had taken less time for paralysis and less time for death. It can be concluded that earthworms can be used successfully for the anthelmintic activity study as it is easy, prominent, an 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 earth worms cultured in laboratory conditions. We studied the anthelmintic activities of an Praziquantel drug on earthworms. This result showed that the earthworms had taken less time for paralysis and death. This novel dosage form might be a promising dosage form in the prevention of worm infections for pediatric patients.*

Keywords: Anthelmintic, Self emulsifying drug delivery system (SEDDS), Praziquantel, Earthworms, Paralysis

I. INTRODUCTION

Anthelmintics are antifungal worm drugs used to treat parasitic worm infestations. It includes flat worms (e.g., flukes and tapeworms) and circular worms (e.g., nematodes). Based on its anthelmintic prescription, they are essential for tropical and veterinary medications and are a wide spectrum of therapies. Around 2 billion people suffer from parasite worm illnesses, the World Health Organization said. These parasites may damage animals and crops, limit food output and cost money. While parasitic worms are common, anthelmintic drug research in pharmaceutical companies is unfortunate. Helminths may be found all over the place, but more common and fatal illnesses in poor countries. Helminth transmission is all influenced by climate, sanitation, diet and vector exposure. [1-2]

- Infection: Helminth illness, depending on the type of worm, has been transmitted by egg or larvae, by penetration, by vector meat dough, or by flesh consumption. Worms lengthy lives. Worms long lives.
- Pathogenesis: Most of the infections are asymptomatic and the disease indicates the size, function, and metabolism of the worms, Immune and inflammatory responses may potentially cause pathology. Most people are asymptomatic when they become ill at first. Some people may have stomach pain, diarrhoea and fever if the small intestine of the worms breaks and the intestinal wall. In extreme (and sometimes deadly) circumstances, larvae may enter the heart muscle and brain tissue.
- Host defence: Antibodies and cells mediated responses are required to be inflammatory. Non-specific defence mechanisms decrease their sensitivity. A number of evasive detection methods are used by parasites.
- Diagnosis: Helminth problems are detected by medically, physical examination, faece, and other laboratory tests.
- Treatment: Hands must be frequently washed, bathrooms and kitchens must be cleaned routinely and the food infesting them must be fully cooked. Chlorinated water should be utilized whenever possible. Vermifuges are most often used to kill worms that are very strong anti-worm medications.

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Parasite worms depend entirely for survival on their hosts. In order to perpetuate their species, they need to be able to escape from the host body and their progeny (eye or larvae); helminthis eggs or larvae generally do not cause a new host to be infected. They must be able to enter the host body. In the event of oxyurids, it is necessary to return for many hours to prevent parasites from spreading in other parasites before any preventive action may be taken. This crucial step of the helminth life cycle needs to be well understood. A third of the human populations are affected by helminths infections and, in the majority of instances, multiple infections. Helminth infections are common in tropical areas but are afflicted by more than 40 million Americans. In addition, because a broad variety of parasite illnesses may be caused by a large number of domestic animals, these diseases pose a major economic problem for the animal industry.

Helminthiasis is a helminth disease caused by parasites that live in people and the intestines of animals. People with helminthiasis deposit in their faeces worm eggs. These eggs contaminate the soil in places with prevailing or insufficient open defeat. The eggs have a moist floor, and the larvae or eggs are infected with food (red or whip worm) or by the skin (hook worm). Soil helminthiasis is one of the world's most common and neglected tropical diseases, impacting over two billion of the world's poorest populations. It is thought that it takes less than half a year per person to guard against soil-borne helminthiasis. It is estimated that Helminthiasis is 12.5% to 66% of India's population. Helminthiasis affects 50% of the urban population and 68% of the rural population, according to research. Furthermore, using the life years adjusted for handicap the international burden of helminthiasis is evaluated. It is predicted that TB DALY (34.7 million) and malaria (39 million) will be comparable to 39 million DALY years (DALYs) (46.5 million DALYs). Although the number of diseases is small, mortality kills about 5.00 thousand people annually. [3-5]

The anthelmintic drug Praziquantel is categorized. It works by removing parasites from the body. Parasites are also paralyzed so that they lose hold of the blood artery's walls and are naturally expelled from the body. Because of its large efficacy, minimal toxicities and simple oral administration, PZQ remained the favored therapy for all forms of schistosomiasis in people compared with two other major schistosomiasis medicines: metrifonate and oxamniquine. PZQ was the first anthelmintic to follow the requirements for parasite chemical therapeutic illness in the population of the World Health Organization (WHO). Nearly a million patients were treated with PZQ by 1985. In this respect, the creation of PZQ might be regarded as an example of how tropical diseases have been successfully developed.

II. METHODOLOGY

2.1 Material

The drug Praziquantel was purchased as a gift sample from Microlab Pvt. Ltd., Goa. The solvents Campul MCM, Cremophore RH-40, PEG 400 was purchased from Pure Chem. Lab, Pune.

A. Collection of Earthworms

Earthworms were spotted in a marshy region near Otur, Pune, India. Earthworms size ranged between 5 to 8 cm. Due to its anatomical and physiological resemblance to intestinal round worms and parasites of human beings were used *in-vitro* to evaluate anthelmintic activity.

2.2 Methods

A. Formulation of Liquid Self-Emulsifying Formulation Loaded with PZQ

The weighed amount of Smix, i.e. Cremophore RH-40 & PEG 400, was combined in a vial on magnetic stirrer (Mixture-1). The estimated amount of PZQ was dissolved in a separate beaker in the calculated quantity of oil (Capmul MCM) (Mixture-2). The oil (Mixture-2) phase was put into the surfactant co-surfactant mixture (Mixture-1) drop by drop and mixed until liquid SEDDS was obtained.

B. Evaluation of Anthelmintic Activity by using Earthworms

In a petridish with 10 ml of optimized liquid SEDDS (F7), earthworms were kept with an average length 5 to 8 cm, at temperatures of 37°C. This was done by emptying petri plates into a wash basin and allowing the worms to move freely. These worms were paralyzed and exhibited a lack of motion in the solution. There were measurements of how long it took to paralyze the worms and perish. [6,7]

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III. Literature Review

Khan F. et al., (2012) have carried out a comprehensive bioavailability research for Atorvastatin Self-Emulsifying Drug Delivery Systems. The study was intended to develop and characterize a self-emulsifying drug delivery system (SEDDS), which is deficient in water solubility owing to a large drug load on atorvastatin for improved oral dispersion. The solubility of atorvastatin in oils, surfactants and cosurfactants has been evaluated via research. The combination of oleic acid, Tween 80 and polyethylene glycol 400 produced significant (10% w/w) medications of excellent resolution. [8]

Meena A. et al., (2012) Solubility and dissolution of albendazole (ABZ) was successfully enhanced for the purposes of increasing systemic exposure. Based on surfactants and oils, SEDDS was created. The SEDDS receptor increases solubility and systemic exposure, by examining emulsifying characteristics, droplet diameters, dissolution and other factors, compared to lipophilic anthelmintic, pharmaceuticals such as ABZ. [9]

Shukla P. et al., (2012) All the extract have significant activity but aqueous extract (100mg/ml) was found to be more effective to execute the earthworm. From this study it is concluded that *Cissampelos pareira* have potent anthelmintic activity and can be used in the treatment of helminthiasis. [6]

Sreeja M.K. et al., (2017) Aim of this work was a comparative study of anthelmintic activity of albendazole nanoemulsion containing oregano essential oil with a marketed formulation. Essential oil of *Oreganum vulgare* when taken orally kills intestinal parasites, therefore it can enhance the action potential of anthelmintics. The formulated product and marketed product was then evaluated in artificial laboratory conditions by using the earthworms (*Lumbricusterrestris*). Various parameters such as mean paralytic time, mean death time, drug content, in vitro drug release studies of both were done. The formulate nanoemulsion had shown a highly better action than that of the marketed product. This study suggest that nanoemulsion is a promising novel formulation that can enhance the solubility of poorly soluble drug like albendazole and thereby enhance its oral bioavailability. [7]

B. Clara Gnana Selvi (2016) The anthelmintic activities of different solvent extracts of *Padina tetrastromatica* were evaluated on Indian adult earthworms *Pheretima posthuma* (Annelida). Different concentrations (50 and 100 mg/ml) of methanolic, diethyl ether and aqueous extracts were evaluated for anthelmintic activity by recording the time required for paralysis and death of earthworms. The activities were compared with the standard drug Albendazole. However, the methanolic extract of seaweed *Padina tetrastromatica* showed significant anthelmintic activity than the standard drug. [10]

Dongare Sujata et al., (2015) In these work we screen Calotropis gignatea for anthelmintic activity against Indian earth worm *Pheretima posthuma*. *Pheretima posthuma* has anatomical resemble with intestinal Parasite (ascaris). In this work Methanolic extract was collected by soxhlet extraction method and compared with standard Albendazole and result shows that *Calotropis gigantea* has equivalent anthelmintic activity as albendazole. [11]

IV. Results and Discussion

4.1 Anthelmintic Activity of Earthworms

Six earthworms were collected and transferred immediately to an optimized liquid SEDDS containing petri plate as illustrated in figure 1. The average time taken for paralysis was 1.12±6 minutes and the earthworm died in 1.57±6 minutes. The result showed that anthelmintic activity for earthworms that paralysis and death needed less time when these placed an optimized liquid SEDDS.

Figure 1: Earthworm in optimized liquid SEDDS (n=6)

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V. CONCLUSION

Anthelmintic activity for earthworms showed that paralysis and death needed less time for these earthworms when placed in an optimized liquid SEDDS. Anthelmintic action on earthworms was significant in the optimized P-L-SEDDS (F7). This may lead to the development of P-L-SEDDS as a effective for worm infection treatment. Today, PZQ remains the drug of choice for all forms of schistosomiasis occurring in humans, because of its high efficacy, low toxicity and ease of single, oral administration compared to the other medicines.

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