

## Anthelmintic effect of oxantel pamoate and pyrantel pamoate suspension against intestinal nematode infestations

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### INTRODUCTION

Multiple intestinal helminthic infections constitute a major health problem in Korea as in most of Asia, Africa and South America. From the medical and public health standpoint it is important to have a safe and effective agent against several species of common nematodes. Pyrantel pamoate (Combantrin) has been shown to be highly effective and safe against human ascariasis, enterobiasis and hookworm, when given in a single dose. However, pyrantel pamoate does not possess any significant efficacy in the treatment of *Trichuris trichiura* (Rim et al., 1972, 1973). *T. trichiura* has a very high prevalence rate among intestinal helminths in Korea (Seo et al., 1969). Except for mebendazole no other anthelmintic is known to be satisfactory in the treatment of this nematode infection. Anthelmintics such as dithiazanine iodide (Frye et al., 1957; Swarzwelder et al., 1957, 1958; Wagner et al., 1958; Aguilar,

1959) and stilbazium iodide (Swarzwelder et al., 1962; Hsieh et al., 1963; Yokogawa et al., 1968) has been used in the treatment of trichuriasis. However these drugs have demonstrated undesirable side effects. Recently a new research compound oxantel pamoate has been shown to be highly effective to *T. trichiura* (Howes, 1972; Park et al., 1973; Lim, 1974; Rim et al., 1975).

The present study was undertaken to determine the efficacy of an oxantel and pyrantel pamoate mixture against the multiple infection with *Trichuris trichiura*, *Ascaris lumbricoides*, hookworms and *Enterobius vermicularis*.

### MATERIALS AND METHODS

A total of 56 patients, of all age groups consisting of 18 pediatric subjects from Olyu Orphanage in Seoul, 21 subjects from 3-ku Kumshin village and 17 from 2-ku Kumshin village in Goesan Gun, Chung Chong Puk Do (Province) were included in this study. The patients

ranged in age from 6 to 68 years, 28 each were males and females. All the 56 patients except 4 with *Necator americanus* infection were given a single dose of 10 mg/kg body weight each of oxantel and pyrantel pamoate (combined dosage form as suspension). In the patients with *N. americanus* infection the same dosage was given consecutively for 3 days.

Except for *Enterobius*, the criteria of assessment of intestinal nematodes were by 24 hour fecal egg counts using Stoll's method with the specimens of stool obtained on two or three occasions during the week prior to treatment; and the same examinations repeated on the 10th and 22nd day after treatment. When the egg count was zero, at least two further counts were performed by the formalin-ether sedimentation method in order to exclude false negatives. In patients with hookworm infestation, the species of hookworm was identified by coproculture prior to treatment and this examination was repeated on the 10th and 22nd day after treatment. The patients were rated as cured if the fecal egg count were zero by the 22nd post-treatment day and either formalin-ether or zinc sulfate tests were negative and/or whenever it was performed coproculture being negative. Adult *Trichuris* worms

were also collected from 24 hours stool for 3 successive days after drug medication. In the *Enterobius* infection, the Scotch-tape swab tests were performed to establish the assessment of diagnosis and cure. The Scotch-tape swabs were taken on 2 or 3 consecutive mornings prior to treatment, and on 4th to 10th day and 20th to 22nd days after treatment. The swabs were taken in the early morning and the subjects with negative Scotch-tape swabs during the 20th to 22nd day were considered as cured.

The subjects were carefully observed to ascertain the type and severity of side effects. Hematological and biochemical examinations and routine urinalysis were undertaken in 47 out of the 56 patients before therapy and on the 10th day after medication.

## RESULTS

As shown in Table 1, a total of 56 subjects harbouring *Trichuris trichiura*, *Ascaris lumbricoides*, hookworm and/or *Enterobius vermicularis* were treated with oxantel and pyrantel pamoate in the form of suspension (50 mg of each per ml) in a single dose of 10 mg base per kg of body weight of each. In all the 54 cases of *A. lumbricoides* with an average EPG of 10, 115 (100-51,

**Table 1.** Effect of a single dose of oxantel and pyrantel pamoate mixture (10 mg/kg) against intestinal nematode infections

Name of parasites	No. of subject	Pre-Tx EPG Mean (range)	Post-Tx EPG D+22		Egg reduction rate (%)	No. of cured (%)	No. of worms recovered Mean (range)
			No. of posit.	Mean(range)			
<i>Ascaris lumbricoides</i>	54	10, 115 (100-51, 267)	0	0	100%	100%	9 (1-66)
<i>Ancylostoma duodenale</i>	31	186 (100-1,000)	1	0	100%	96.8%	1.4 (0-10)
<i>Necator americanus</i> *	4	100	0	0	100%	100%	3.3 (1-8)
<i>Enterobius vermicularis</i>	36		8			77.8% D+10(97.2%)	23.6 (0-162)
<i>Trichuris trichiura</i>	56	353 (100-3, 033)	15	30 (0-1,000)	91.9%	73.2%	4.4 (0-33)

\* medicated 3 consecutive days

**Table 2.** Effect of a single dose of oxantel and pyrantel pamoate mixture against *Trichuris trichiura* by medication groups

Groups	Dosage regimen (oxt/pyr) (mg/kg)	No. of subjects	Pre-Tx. EPG Mean (range)	Post-Tx. EPG D-22		Egg reduction rate (%)	No. of cured (%)	No. of worms recovered Mean (range)
				No. of posit.	Mean (range)			
Olyu Orphanage Children	10/10	18	500 (30-3,033)	7	70 (0-1,000)	85.4	61.1	5.7 (0-23)
2-ku, Kumshin Vil. Goesan Gun, Chung Cheong Puk Do	10/10	17	360 (100-1,700)	3	12 (0-200)	96.7	82.4	6.2 (0-33)
3-ku, Kumshin Vil. Goesan Gun, Chung Cheong Puk Do	10/10	21	230 (100-800)	5	5 (0-100)	97.9	76.2	1.8 (0-9)
Total		56	353 (100-3,033)	15	30 (0-1,000)	91.9	73.2	4.4 (0-33)

267), complete cure was obtained on the 22nd day after treatment. Examination of stools for adult worms could be carried out in all cases. The mean recovered worm-load was 9 with a range of 1 to 66 worms. Thirty-one cases of *Ancylostoma duodenale* infection with an average EPG of 186 (100-1,000) were treated. All cases had negative stool egg counts, only one being egg-positive by the concentration method. Thus the cure rate was 96.8% but the average egg reduction rate after treatment was 100 per cent. The mean recovered worm-load was 1.4 with the range from 0 to 10 worms during 3 consecutive days after treatment. In the 4 cases of *Necator americanus* infection with an average EPG of 100 that were treated with 10 mg/kg of each drug once daily for 3 consecutive days, complete cure was obtained in all patients, the mean recovered worm-load being 3.3 with a range of 1 to 8 worms. In *Enterobius* infection, of the 36 patients that were positive by Scotch-tape method, 35(97.2%) were negative on the 10th day and 28 (77.8%) on the 22nd day, after treatment. The mean recovered worm-load was 23.6 with a range of 0 to 162 worms.

Table 2 shows the anthelmintic effect of a single dose of oxantel and pyrantel pamoate suspension against *T. trichiura*. In the overall results, a total of 56 cases with an average EPG

of 353 (100-3,033), the cure rate on the 22nd after the treatment was 73.2%, and the average egg reduction rate was 91.9%. The mean recovered worm-load was 4.4 with a range of 0 to 33 worms.

These findings show that a single dose of 10 mg/kg each of oxantel and pyrantel pamoate is a highly effective and acceptable treatment for multiple infections with these nematodes.

Side effects were negligible. Only a few cases complained of mild nausea, abdominal pain and diarrhea. Clinical hematology and serum biochemistry were performed in 47 patients. The routine urine tests for albumin and glucose and microscopy of urine were also carried out. No abnormalities were detected.

## DISCUSSION

Rim et al. (1972, 1973) have earlier shown that pyrantel pamoate is very effective against *A. lumbricoides*, hookworms, *Trichostrongylus orientalis* and *Enterobius vermicularis*, but has no significant effect against *T. trichiura*. Oxantel pamoate appears to be an efficient drug against *T. trichiura* (Lim, 1974; Rim et al., 1974). Recently Park et al. (1973) reported that a single oral dose of 10 mg/kg of oxantel pamoate suspension cured 63% of the 70 patients with

trichuriasis with an egg reduction rate of 91.5 % by the 22nd day after treatment. Lim (1974) has treated 46 adult patients with *T. trichiura* infection using the same dose of the drug. He obtained 91.3% cure rate with a 98.4% mean egg reduction rate. A similar study made by Rim et al. (1975) employed two single dose levels of 10 mg/kg and 15 mg/kg of oxantel pamoate. The cure rates were 57.1% with the former and 94.1% with the latter dose.

The present clinical trial proved oxantel and pyrantel pamoate suspension to be very effective against *Ascaris*, hookworm, *Enterobius* and *Trichuris* infections. A single dose of 10 mg per kg body weight of each in the form of a suspension cured 100 per cent in *Ascaris* infection, 97.1% of hookworm infection, 77.8% of *Enterobius* infection and 73.2% of *Trichuris* infection. The mean egg per gram stool reduction rate in *T. trichiura* infection was 91.9%. This combined suspension was well tolerated and side effects were few and mild. There was no clinical or laboratory evidence of drug toxicity.

Multiple helminthic infestations are very frequently encountered in the Korean populations. Our results demonstrate that single dose each of 10 mg/kg body weight of oxantel and pyrantel pamoate suspension can be considered a treatment of choice in such multiple infestations.

### SUMMARY

A total of 56 subjects with multiple nematode infections with *T. trichiura*, *Ascaris*, hookworms and *Enterobius* were treated with oxantel and pyrantel pamoate mixture in a paratable suspension (50 mg of each per ml).

A single dose of 10 mg per kg body weight in each cured 100 per cent of 54 subjects with *Ascaris*, 97.1 per cent of 35 subjects with hookworms, 77.8 per cent of 36 with *Entero-*

*bius* and 73.2 per cent of 56 subjects with *T. trichiura* infestation. The mean egg per gram stool reduction rate in *T. trichiura* infection was 91.9%. Of the 31 subjects infected with *Ancylostoma douduenale* 96.8% were cured with a single dose and 4 infected with *Necator americanus* showed a 100% cure rate with a similar daily dose on 3 consecutive days. Side effects were few and mild. There was no clinical or laboratory evidence of drug toxicity. These findings show a single dose of oxantel and pyrantel pamoate mixture to be a highly effective and acceptable treatment for multiple infections with these nematodes.

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＝國文抄錄＝

### Oxantel 및 pyrantel pamoate合劑에 의한 腸內線蟲類 驅蟲效果

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Oxantel pamoate 및 pyrantel pamoate를 合劑로 한 syrup을 56名의 腸內線蟲類感染者에게 各各 10 mg/kg의 用量으로 單回投藥함으로써 그 驅蟲效果를 檢討하였다. 服藥者 56名中 蛔蟲感染者 54名, 鞭蟲感染者 56名, 蟯蟲感染者 36名 및 鈎蟲感染者 35名이었다. 鈎蟲感染者 35名中에 4例는 아메리카 鈎蟲에 감염되어 있어 나머지 31名, 은 모두 十二指腸蟲에 감염되어 있었다. 아메리카鈎蟲에 感染된 4例는 本合劑를 3日 계속 服用시켰다.

結果 本合劑의 單回投藥으로 蛔蟲은 100%의 陰轉率을 보였고, 鞭蟲은 73.2%, 蟯蟲은 77.8%의 陰轉率을 各各 얻었다. 그리고 鈎蟲에 있어서 97.1%의 陰轉率을 얻었고, 아메리카鈎蟲感染者 4例에 대하여 本合劑를 3日 계속 投藥한바 100%의 陰轉率을 얻었다.

. 56例中 47例에 대하여 投藥前後에 血液像, 血液生化學的 檢査 및 尿檢査를 實施한바 아무런 異常이 없었다.