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# The Mass Treatment of *Taenia saginata* with Bithionol

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Infection with *Taenia saginata* is common on Taiwan, especially among the mountain-dwelling aborigine tribes. Hsieh (1970), in his review of gastrointestinal parasitic diseases of Taiwan, listed various surveys in which prevalence rates for *T. saginata* ranged from 0.04% to 28.24%, and recently Chung and Liu (1970) reported an area in Hsinchu county where the prevalence rate was 36.76%. Various drugs have been used in the treatment of taeniasis on the island; Bephenium hydroxynaphtholate (Hsieh, 1959), Atabrine (Huang *et al.*, 1964; Chung and Liu, 1970; Hsieh, 1970), Yomesan (Huang *et al.*, 1964; Hsieh, 1970), and Dichlorophen (Hsieh, 1970) have been used with various degrees of success. Many of these drugs, although effective, often have been reported to produce side reactions and are considered to be undesirable for mass treatment programs.

In 1962 Yokogawa and in 1966 Nagahana *et al.* showed that bithionol (Bitin) was effective in the treatment of taeniasis yet produced minimal side effects. As a result of the reported success of bithionol as a taeniafuge a pilot study was carried out at the U. S. Naval Medical Research Unit No. 2 (NAMRU-2) in Taipei to evaluate the use of the drug in hospitalized patients with *T. saginata* infection (Whalen *et al.*, 1967). The patients, seven females and one male, were fasted overnight and given 50 mg of bithionol/kg of body weight orally followed one to two hours later with 15 gm magnesium sulfate in 500 ml of water. No side effects from the drug were noted in any of the patients, and all eight passed large segments of worms with one possessing a scolex. Four days following the initial treatment all patients were retreated with atabrine and magnesium sulfate; no worms were passed following the second treatment, but five of the eight exhibited side effects of nausea, vomiting, and abdominal pain. As a result of these preliminary findings further studies were undertaken to determine the efficacy of bithionol in mass treatment of taeniasis in an endemic area on Taiwan.

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## Materials and Methods

An aborigine village in Hwalien county located on the east coast of Taiwan (Fig. 1) was selected for the study. Control efforts or treatment programs had not been undertaken previously in the area. Public Health workers from the local health station arranged for gathering patients who were found to have the infection by the presence of *T. saginata* proglottids or eggs in their stools. A total of 54 people all in good physical condition were found infected, 32 males and 22 females ranging in age from 22 to 74 years.

The subjects were divided into two groups; the first group of 28 were given two 1-gm doses of bithionol orally at 30-minute intervals following an overnight fast. The second group of 26 were given a similar dosage of drug but had not been required to fast overnight. Two hours after the second administration of bithionol all patients were

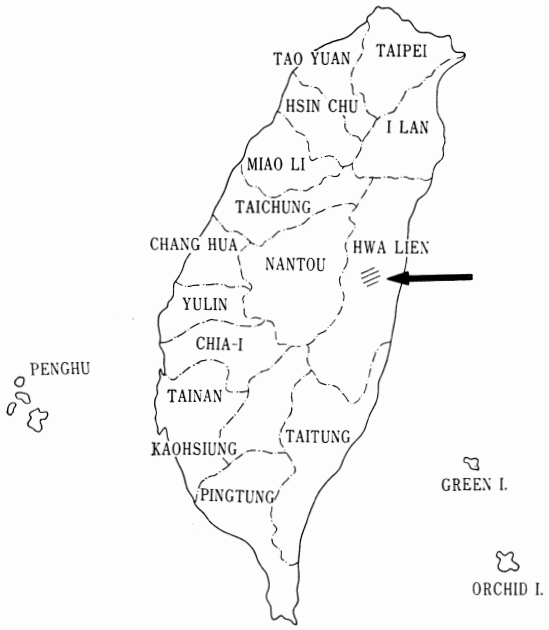


Fig. 1 Fon Lin, Hwa Lien, Taiwan. Mass treatment of *Taenia saginata* with bithionol.

given 20 gm of magnesium sulfate as a purgative and were followed closely to observe side reactions and to note passage of the tapeworm. During the ensuing four months the patients were followed by a public health nurse ; their homes were visited weekly and they were questioned regarding the passage of tapeworm proglottids. At the end of four months both stool specimens and anal cellulose tape swabs were obtained and examined for *Taenia* eggs.

## Results

All 54 patients passed *T. saginata* segments in their purged stools following the administration of bithionol and magnesium sulfate. In most instances the tapeworm segments were several feet in length except for three patients from whom complete tapeworm including the scolex was recovered. Side effects of nausea, dizziness, and abdominal discomfort were found to occur in only ten patients. These symptoms were mild and transient, however, and did not interfere with the continuation of the treatment. The side reactions were seen more frequently in those individuals who were treated after an overnight fast and generallly occurred after the second administration of the drug. It is of interest that the drug was well tolerated in three patients who were in their seventies.

Of the 54 patients treated initially only 45 could be located for follow-up. During the four months of weekly interviews by the public health nurse none of the patients reported the passage of proglottids ; however, at the end of four months when the stools and anal swabs were examined *Taenia* eggs were found in specimens from three patients. Two of the three were from the group fasted overnight and one was from the group treated without fasting.

## Discussion

The results of this study correspond to the results reported by others that bithionol is effective in the treatment of human taeniasis. In previous studies from Japan, Yokogawa *et al.* (1962) treated six cases of *T. saginata* with bithionol in two divided dosages of 40 to 60 mg/kg body weight, and in 1966 Nagahana *et al.*, using a single dose of 50–66 mg/kg body weight, reported additional successful treatments in eight patients with *T. saginata* as well as in eight cases of *Diphyllobothium latum*. In the initial studies on hospitalized patients in Taiwan, Whalen *et al.* (1967) further showed the efficacy of the drug in dosages of 50 mg/kg body weight for the treatment of *T. saginata* in eight Taiwan aborigines. In Poland, Kalisyewics and Swiezawska (1968) cured four of five cases of *T. saginata* with this compound, while in Czechoslovakia, Dufek and Kalivoda (1969) reported similar results in the treatment of 18 out of 20 patients with the same tapeworm.

In addition to confirming the reports of others the present study further shows that bithionol administered in two 1-gm dosages is effective in the mass treatment of tapeworm infections in a highly endemic area. All of the individuals treated passed large segments

of worms, three of which included the scolex. Although the scoleces were not recovered from the purged stools of most subjects, negative stool and cellulose tape examinations indicated complete cure in 42 of 45 of the individuals that could be located at the end of the 4-month follow-up period. The presence of *Taenia* eggs in the specimens from three subjects may have been reinfection rather than incomplete cure since all three admitted eating raw wild animal meat during the follow-up period.

Side effects resulting from the treatment were observed in ten individuals in the present study ; these were mild and transient, however, and did not interfere with continuation of the treatment. Other investigations (Yokogawa *et al.*, 1962 ; Nagahana *et al.*, 1966) also reported side reactions but, as in the present study, the effects were not serious. Dufek and Kalivoda (1969), on the other hand, although reporting excellent therapeutic results with bithionol found more side effects than with Yomesan treatment.

In most regimens in tapeworm therapeutics overnight fasting has been advocated. But results of this study suggest that fasting is not necessary since worms were easily expelled following purgation in the group fasted overnight as well as in the group treated without fasting.

## Summary

Fifty-four Taiwan aborigines with taeniasis saginata were treated with bithionol in a mass therapeutic study. The subjects were divided into two groups of 28 and 26 individuals. The first group received treatment following an overnight fast and the second group were treated without fasting. Bithionol was given in two 1-gm doses at 30-minute intervals followed two hours later with a purgative of magnesium sulfate. All subjects passed long segments of *Taenia saginata*, and three passed complete tapeworms with a scolex. Side effects observed in ten people were minimal and did not interfere with the treatment. Forty-five of those treated were followed weekly for four months and at the end of this period specimens from three contained *Taenia* ova. It is suspected that this was reinfection rather than incomplete cure since all ingested raw meat following treatment. The results suggest that fasting is not necessary prior to treatment with bithionol.

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## ビチオノールによる無鉤条虫の集団駆虫

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無鉤条虫に感染している54例の台湾原住民についてビチオノールによる集団駆虫を実施した．感染者を28名および26名の2群に分け，前者については駆虫前夜絶食させたのちに投薬，後者については絶食措置を行なわずに投薬した．ビチオノールは30分の間隔で1g宛2回投与とし，投与2時間後に硫苦を下剤として与えた．

投薬の結果，全例において体節の排出がみとめられたが，うち3例は頭節をもつた完全な虫体を駆出した．10例に副作用がみられたが，軽度で，駆虫を妨げるほどではなかつた．被駆虫者中45例については，4カ月間にわたり毎週糞便検査をおこない，4カ月後の時点では，うち3例に条虫卵の存在をみとめた．しかしこの3例は，恐らく不完全治癒者と考えるよりも再感染者と考えた方がよさそうである．それは被駆虫者はいずれも駆虫のあと生肉を食しているからである．以上の結果から，ビチオノール治療前には絶食させることは必ずしも必要ではないと考えられる．