

# SENSITIVITY OF DIFFERENT ISOLATES OF *SCHISTOSOMA JAPONICUM* FROM CHINA TO PRAZIQUANTEL

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**Abstract.** Groups of C57BL inbred mice infected with each of the 4 different isolates, (Anhui, Hubei, Sichuan and Yunnan) of *Schistosoma japonicum* from the mainland of China were treated with praziquantel (PZQ) and the parasitocidal effects were compared. Worm reduction rate was recorded to assess systematically the sensitivity of 4 different isolates to PZQ in the mouse. Three dosage-levels of PZQ, ie 150, 230 and 310 mg/kg body weight in single doses were used.

The worm development rates of control groups infected with schistosomes from Anhui, Hubei, Sichuan and Yunnan were 75.5, 81.8, 81.5 and 83.0%, respectively. At the dosage-level of 150 mg/kg, the worm reduction rates for the 4 different isolates were 36.0, 33.9, 25.5 and 35.6%, respectively. At the dosage-level of 230 mg/kg, the rates were 47.1, 46.0, 38.1 and 47.7%, while at the dosage-level of 310 mg/kg, they were 59.3, 58.6, 50.8 and 61.7%, respectively. The results indicated that the worm reduction rate of the Sichuan isolate was lower than that of the other three isolates, however, the differences were not statistically significant, suggesting that schistosomes of Anhui, Hubei, Sichuan and Yunnan isolates bear resemblance in drug response.

## INTRODUCTION

Evidence of the existence of different strains of *Schistosoma japonicum* in the mainland of China has been obtained from observations on their differential infectivity to snail intermediate hosts and from comparative studies of their characteristics in six mammalian final hosts (He *et al*, 1991 a,b). Knowledge of the relationships between drug sensitivity and different isolates of *S. japonicum* in the mainland is inadequate. Since praziquantel is currently being used in China for the treatment and control of schistosomiasis, it is important to determine whether isolates from different areas differ in their sensitivity to this drug. The present paper deals with the results of the comparison on the sensitivity of 4 different isolates of *S. japonicum* from the mainland of China to PZQ in a suitable laboratory animal.

## MATERIALS AND METHODS

### Source of schistosome cercariae

Naturally infected *Oncomelania hupensis* were

collected from the following four localities: (1) Guichi in Anhui, at the lower reaches of the Yangtze River in the east; (2) Jianli in Hubei, at the middle reaches of Yangtze River in the middle; (3) Tianquan in Sichuan, a mountainous region in the west; (4) Eryuan in Yunnan, a high mountainous region in the southwest. They were selected on the basis of previous investigation showing different degrees of snail-parasite in compatibility between the lower-middle Yangtze River valley and the west or southwest mountainous region (He *et al*, 1991a). Cercaria shedding was stimulated by fluorescent lights and these cercariae were coded as isolates A, H, S and Y, respectively.

### Experimental animals

C57BL inbred mice weighting 18-22g and of both sexes from the Center of Experimental Animals of the Chinese Academy of Sciences in Shanghai were used.

### Praziquantel

Praziquantel was synthesized by the Department of Pharmaceutical Chemistry of the Institute of Parasitic Diseases.

## Infection, treatment and autopsy of animals

Mice were percutaneously exposed to cercariae obtained from pools of naturally infected snails from each of the four isolates and each mouse was inoculated with 40 cercariae. Infected mice from each of the isolate were divided into four groups at random. One group served as infected controls and the others were used for experimental treatment. All mice in the control group infected with different isolates were sacrificed 42 days post-infection.

Three dosage-levels of praziquantel, ie 150, 230 and 310 mg/kg body weight of mouse in single dose were used in our therapeutic experiments. They were chosen as representing ED40, ED50 and ED60 of praziquantel in mice infected with *S. japonicum* according to Wang and Mao (1989). Drug powder was added to 1% gum tragacanth and stirred thoroughly to form suspension of desired concentration. The amount of drug given was calculated by mouse weight prior to treatment. Mice were treated intragastrically once 35 days after infection. They were sacrificed 28 days after treatment and worms were retrieved by perfusion. The worm reduction rate was calculated by the equation:

$$\left[ 1 - \frac{\text{worm survival rate in treated group}}{\text{worm development rate in control group}} \right] \times 100\%$$

One-way analysis of variance (ANOVA) was used to compare worm reduction rates among these groups.

## RESULTS

The worm development rates of isolates Anhui, Hubei, Sichuan and Yunnan in untreated C57BL mice 42 days post-infection were 75.5, 81.8, 81.5 and 83.0%, respectively (Table 1). In animals treated with praziquantel at the dosage-level of 150 mg/kg, the worm reduction rates for the 4 different isolates were 36.0, 33.9, 25.5 and 35.6%, respectively (Fig 1). At the dosage-level of 230 mg/kg, the worm reduction rates were 47.1, 46.0, 38.1 and 47.7%, while at the dosage-level of 310 mg/kg, being 59.3, 58.6, 50.8 and 61.7%, respectively (Table 1, Fig 1). The results indicated that the worm reduction rate of the Sichuan isolate was lower than that of the other three isolates, however, the differences were not statistically significant ( $p > 0.05$ ).

## DISCUSSION

Hsü *et al* (1963) demonstrated that the Japanese strain of this parasite was more resistant to stibophen and antimony potassium tartrate than the Chinese mainland, Taiwan Province and Philippine strains. Although study of Webbe and James (1977) showed that sensitivity to praziquantel was not significantly influenced by interstrain variation in *S. mansoni* and *S. haematobium*, this has not been demonstrated in *S. japonicum*. Recently, Yue *et al* (1988) reported that the worm reduction rate

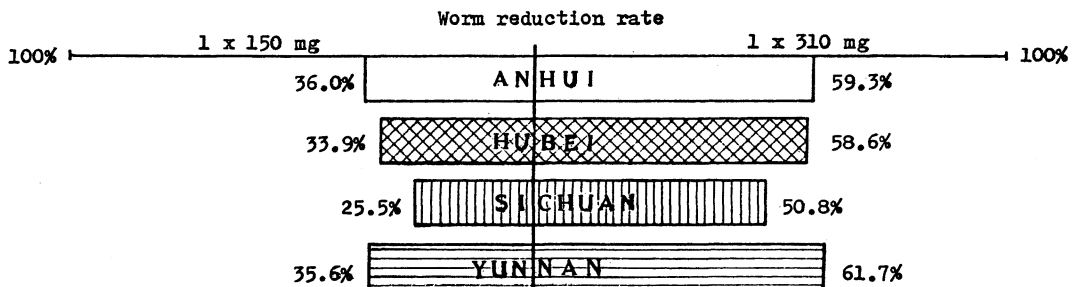


Fig 1—Sensitivity to praziquantel of four different isolates of *Schistosoma japonicum* from the mainland of China in C57BL mice.

Table 1

Worm reduction rate of 4 different isolates of *S. japonicum* treated with praziquantel in C57BL mice.

Single dose (mg/kg)	Anhui			Hubei			Sichuan			Yunnan		
	No. of mice	Average worm per mouse	% worm reduction $\bar{X} \pm SD$	No. of mice	Average worm per mouse	% worm reduction $\bar{X} \pm SD$	No. of mice	Average worm per mouse	% worm reduction $\bar{X} \pm SD$	No. of mice	Average worm per mouse	% worm reduction $\bar{X} \pm SD$
control	36	30.2		34	32.7		36	32.6		33	33.2	
150	36	19.3	36.0 ± 17.9	35	21.8	33.9 ± 30.4	33	24.3	25.5 ± 14.4	33	21.4	35.6 ± 17.8
230	36	16.0	47.1 ± 16.9	35	17.7	46.0 ± 33.7	34	20.2	38.1 ± 20.7	31	17.4	47.7 ± 17.6
310	36	12.3	59.3 ± 12.7	35	13.5	58.6 ± 27.8	33	16.0	50.8 ± 20.3	33	12.7	61.7 ± 20.2

of Yunnan schistosomes was much less than Anhui parasites from the mainland of China in experimental schistosomiasis japonica of outbred albino mice treated with praziquantel. On the other hand, Wang and Mao (1989) and Wu *et al* (1990) declared that Yunnan schistosomes were not less susceptible to praziquantel than the worms of Anhui in their respectively therapeutic experiments of mice. In the former report, the sensitivity of Yunnan parasites to praziquantel was even higher than that of those from the Anhui locality.

In the present study, our experimental results showed that at the three dosage-levels as representing ED40, ED50 and ED60 of praziquantel in mice, the Yunnan isolate was not less sensitive to praziquantel than the isolate from Anhui, and that the worm reduction rate of the Sichuan isolate was lower than that of the Anhui, Hubei and Yunnan isolates, however the differences were not statistically significant.

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