Influence of Freshwater Trematodes in Eastern Puerto Rico on Schistosomiasis Skin Test Results

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THE OCCURRENCE of larval trematodes in freshwater snails of Puerto Rico has not been adequately investigated. Faust and Hoffman (*1*) and Harry and Cumbie (*2*) observed four larval forms in the planorbid snail *Biomphalaria glabrata*. Other freshwater snails are also abundant in the Caribbean. Ferguson and Richards (*3*) recorded 27 species belonging to 10 families from Puerto Rico and the Virgin Islands.

In recent years the prevalence and distribution of human schistosomiasis in Puerto Rico have been measured by using the intradermal skin test with adult *Schistosoma mansoni* antigen (*4*). The influence of dermatitis-producing larval trematodes of nonhuman origin on skin test results was not determined. Moore and associates (*5*) and Fife (*6*) noted that persons sensitized by nonhuman schistosome larvae had false-positive skin test reactions to *S. mansoni* antigen. Blackburn and Ma (*7*) found that 11.6 percent of 827 persons tested in New Guinea had positive skin test reactions to adult *S. mansoni* antigen even though human schistosomes are unknown in that country.

Our study was undertaken to determine the possible occurrence and relative densities of larval trematodes that might affect results of the schistosomiasis skin test in the eastern portion of Puerto Rico.

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Materials and Methods

In previous schistosomiasis skin test surveys, Puerto Rico was divided into 31 watersheds as shown on the map (*4* and unpublished report of the San Juan Tropical Disease Laboratories, 1969). The watersheds conform generally to the major stream drainages. Results from both of the early skin test surveys revealed a prevalence of human schistosomiasis of more than 20 percent from watersheds 5 and 6; thus, we selected these two areas for study. All lakes or streams near high-prevalence communities in each watershed were sampled at least twice each month.

Watershed map of Puerto Rico

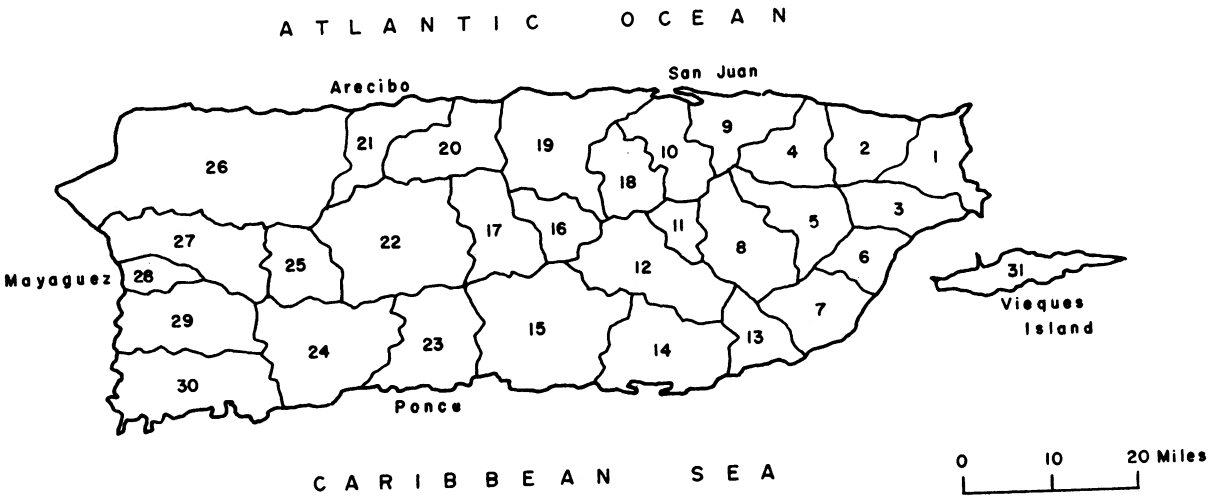

Table 1. Number of snails collected and number and percent shedding larval trematodes, by snail species and watershed of collection

Snail species	Watershed 5			Watershed 6			Total		
	Number collected	Shedding trematodes		Number collected	Shedding trematodes		Number collected	Shedding trematodes	
		Number	Percent		Number	Percent		Number	Percent
Biomphalaria glabrata	1,448	211	14.6	2,661	141	5.3	4,109	352	8.6
Marisa cornuarietis....	540	0	0	310	0	0	850	0	0
Lymnaea.....	28	0	0	16	0	0	44	0	0
Physa cubensis.....	176	0	0	289	0	0	465	0	0
Tarebia granifera.....	1,020	0	0	2,483	0	0	3,503	0	0
Ampullaria.....	77	0	0	114	0	0	191	0	0
Drepanotrema.....	13	0	0	62	0	0	75	0	0

Table 2. Number and percent of snails of *Biomphalaria glabrata* species shedding larval trematodes, by trematode species and watershed of collection

Trematode species	Watershed 5		Watershed 6		Total	
	Number of snails	Percent (N=1,448)	Number of snails	Percent (N=2,661)	Number of snails	Percent (N=4,109)
Schistosoma mansoni.....	2	0.14	10	0.38	12	0.29
Ribeiroia marini.....	197	13.6	137	5.1	334	8.1
Cercaria neotropicalis.....	1	.07	1	.038	2	.05
Cercaria paucispina.....	1	.07	0	0	1	.025
Apharyngostrigea.....	0	0	2	.075	2	.05
Clinostomum.....	8	.55	1	.038	9	.22
S. mansoni and *R. marini*.....	2	.14	0	0	2	.05

From June 1971 through January 1972, a total of 9,237 freshwater snails were collected with rectangular 8½-inch dip scoops of 1-mm mesh steel (*8*) and with long-handled forceps. All snails were brought to the laboratory and held for 5 to 7 days under light and darkness to determine whether cercariae were emerging. From each collection, 10 to 30 percent of the snails were also crushed and examined for larval stages. The cercariae were identified microscopically, and observations were made to determine if any of these forms penetrated mouse skin or other organisms such as fish or other snails.

Results

The species of snails collected and those shedding larval trematodes are summarized in table 1. Only *B. glabrata* was found to be infected.

The larval trematodes identified in this study and their abundance are presented in table 2. Only cercariae of *S. mansoni* penetrated mouse skin. Other cercariae formed metacercariae on or in the body of fishes or tadpoles. *Ribeiroia marini* was the form most frequently encountered; it was present in 8.1 percent of the snails of the *B. glabrata* species examined. Two snails of this species harbored a double infection caused by *S. mansoni* and *R. marini* cercariae.

Discussion

The results of this study show that larval trematodes appear to be commonly associated with the planorbid snail *B. glabrata* in freshwater bodies of eastern Puerto Rico. Our findings are similar to those of Harry and Cumbie (*2*), who observed *R. marini* in 15 of 55 random freshwater stations and *S. mansoni* at 6 stations. *Cercaria neotropicalis* and *Cercaria paucispina* were also occasionally encountered by these workers.

Since *S. mansoni* cercariae were the only forms capable of penetrating mouse skin, it seems likely that past skin test results do not reflect any sensitizing activity of nonhuman schistosomes.

Further studies are needed to identify the definitive hosts of the cercariae other than *S. mansoni* that were encountered here. Since these organisms typically form metacercariae and never penetrate the skin of their hosts, they do not affect skin test results. The morphology of these larval trematodes suggests that their definitive hosts are birds or small mammals.

The liver fluke (*Fasciola hepatica*) is fairly common in cattle of Puerto Rico (*9*). However, we only collected small numbers of lymnaeid snails, and these were from streams and lakes where this snail was not abundant. Human fascioliasis is rare in Puerto Rico (*10*). Furthermore, the cercariae do not penetrate the skin, but must be ingested as metacercariae.

The results described here indicate that the high prevalence of skin test sensitivity found in eastern Puerto Rico is not due to human contact with trematodes other than *S. mansoni* and thus increase the usefulness of the skin test as an epidemiologic tool in Puerto Rico. We suggest that surveys such as ours may be helpful in other areas where schistosomiasis skin tests are used and where the occurrence of false-positive reactions has not been adequately evaluated.

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