

STUDIES ON SCHISTOSOMIASIS (*S. MANSONI*) IN PORTO RICO

I. PRELIMINARY REPORT ON THE DISTRIBUTION OF *S. MANSONI* *

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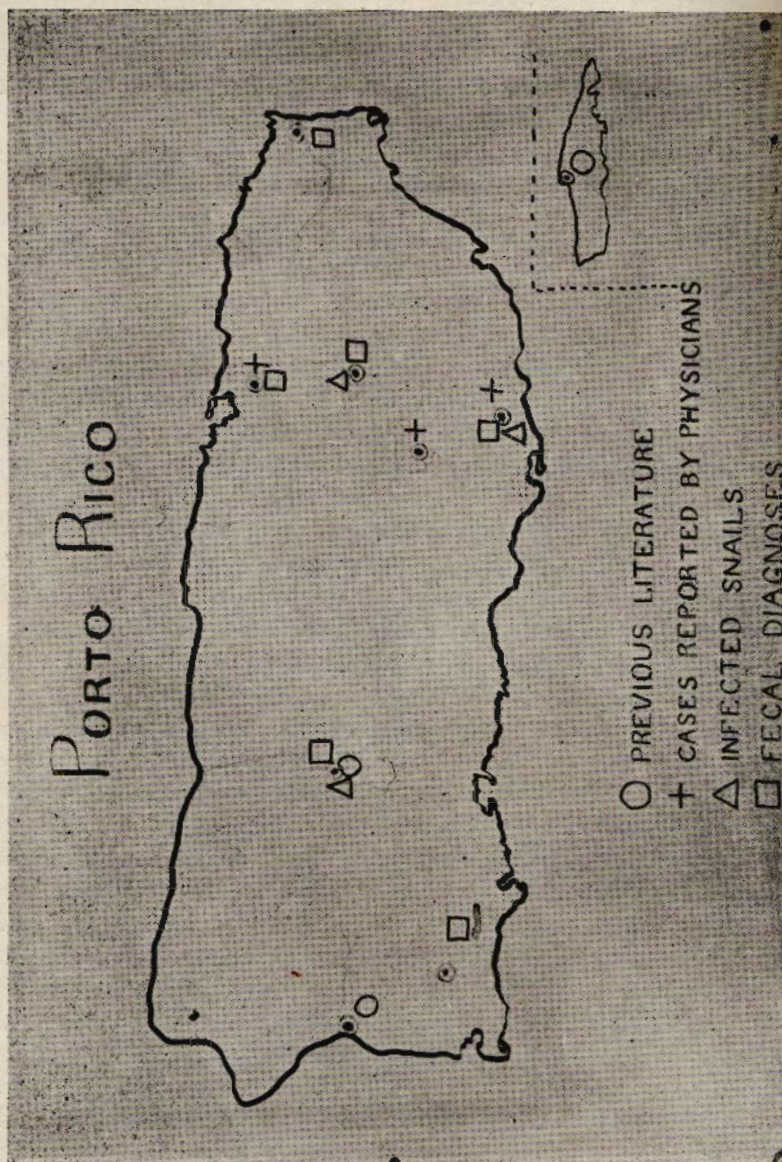
To the Anemia Commission is due the credit for first establishing the presence of schistosomiasis in Porto Rico. In the Commission's report for 1904-5 is recorded the finding of schistosoma ova in stools of patients at Utuado. At that time the parasite was considered to be *Schistosoma haematobium* but González Martínez on the basis of a careful examination of adults obtained from two autopsies early recognized the flukes as representatives of a new species later described as *S. mansoni*. That this form was introduced into South America, Porto Rico and the various islands of the Lesser Antilles from Africa, there can be no doubt. The more dangerous relative, *S. haematobium*, also prevalent in the dark continent must have traversed the same route, but failed to gain a foothold, probably because of the lack of a suitable snail host. Holecomb demonstrated in 1907 the presence of the parasite in Vieques, a small island just off the southeast coast of Porto Rico.

Little progress can be made in the study of intestinal flukes without adequate knowledge of the intermediate host. The species found responsible in Porto Rico for the transmission of schistosomiasis has been identified for me by Dr. Bartsch of the National Museum as *Planorbis guadeloupensis*. Rats placed in water containing snails discharging cercariae apparently identical with those of *Schistosomiasis mansoni* were later found to harbor the adult fluke of *S. mansoni*. These experiments then established the fact that the cercariae in question were those of the human schistosome.

The data presented herein is based on (1) earlier literature, (2) experience of physicians in various localities, and (3) surveys undertaken by Mr. Marín and myself. The surveys resolved themselves into two types, fecal examinations, and search for the snail. If the latter were infected with the proper cercariae, then it was certain that *S. mansoni* occurred in the district supplying the ma-

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erial; even if not, the presence of the specific snail indicated the possibility that the parasite might be present. The results ob-



Map of Porto Rico illustrating known distribution of *Schistosomiasis mansoni*. Dot surrounded by circle indicates town in which *Schistosomiasis* is known to occur.

tained through use of the former method are based upon a study of approximately 800 stools.

The areas studied thus far include the following localities: "Cen-

tral Aguirre", Añasco, "Central Mercedita", Ponce, Fajardo, San Germán, Utuado, Guayama, Caguas, Cayey and Adjuntas.

Of the nineteen stools obtained from patients of St. Luke's Hospital at Ponce only one showed ova of *S. mansoni*. He had resided, however, at the island of Vieques, where his infection was doubtless contracted. One individual of the fifty-five whose stools were examined at Central Mercedita near Ponce was found to be positive. Some years previous to examination he had experienced considerable irritation while bathing in a stream between Ponce and Peñuelas. Snails identical with, or closely resembling, *Planorbis guadeloupensis* were found at Mercedita. Shells which appeared to be of this species occurred in immense numbers at Central Fortuna nearby. Our studies indicate that Ponce is not an endemic center of schistosomiasis. This is further supported by the findings of the local laboratory of the Department of Health. Practically no positive cases were said to have been recorded from that section.

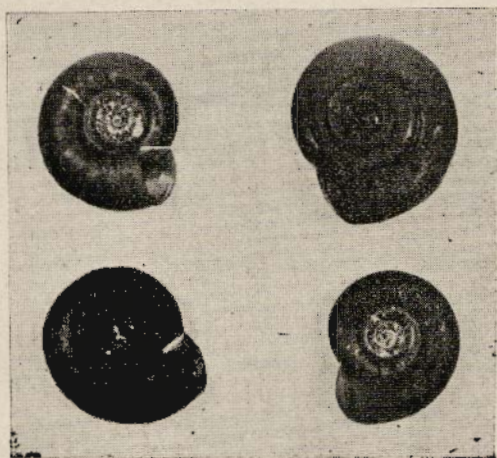
Three of the 141 stools from three *colonias* (plantations) of the Fajardo Sugar Company revealed ova. One of these, a woman of thirty, had always resided in the vicinity. Two others attributed their condition to bathing in streams at Salinas. One, however, had lived on the island of Vieques. *P. guadeloupensis* was not found. Information at present obtainable indicates that Fajardo is not a focus of any importance, though two positive autopsies done there are reported in a subsequent note. These two cases may have obtained their infection in some neighboring district which we have not yet investigated.

In the general vicinity of the sugar mills at Aguirre no cases of schistosomiasis were found. In all, 122 fecal samples were studied. The single positive had his abode at Colonia Reunión, really a part of the Guayama district. Here, what seemed to be immature specimens of *P. guadeloupensis* were abundant in some irrigation ditches. The person mentioned above was literally a living parasitological museum, for in addition to *S. mansoni* the following intestinal inhabitants were found: *Strongyloides stercoralis*, *Giardia lamblia*, *Trichomonas hominis*, and *Endamoeba histolytica*.

Several individuals suffering from schistosomiasis have attributed their infection to bathing in streams at Salinas. This district is quite similar to Aguirre, which is near. However, it differs from Aguirre in that snails resembling the vector of *S. mansoni* frequent the streams there. Whether the disease occurs in that locality must still be shown.

Early in the year Dr. Buitrago stressed the fact that schistosomiasis was not uncommon at Guayama. Subsequent examination of the feces of eighty-three individuals, of whom almost 39 per cent were positive, confirmed his contention.

P. guadeloupensis occurs abundantly in the irrigation ditches about Guayama. At least eight per cent of those collected on a number of occasions gave off cercariae of *S. mansoni*. This district is an important area of infection whose significance does not seem to have been generally realized. Practically all our experimental material comes from Guayama. The numerous slowly running streams in addition to irrigation ditches suggest that the area of infection covers considerable territory, probably extending as far as Patillas.



Planorbis guadeloupensis, dorsal and ventral aspects

Because of the short period available we were compelled to rely mainly upon the presence or absence of *P. guadeloupensis* as the indicative criterion for the occurrence of *S. mansoni* in the district about San Germán. The streams from the last-named locality to Sabana Grande yielded negative results. The species occurred abundantly near Cartagena Lagoon, where our single positive case, apparently originating there, was found.

According to information given me the records of the public health laboratory at Ponce show that most of the schistosomiasis cases met with in that section come from Lajas. Dr. Rivera has not noted the disease within the limits of the town. However, a short

distance eastward marks the beginning of an immense tract devoted to cane cultivation. The main road passing through to Guánica is paralleled by a ditch overgrown with vegetation. Here numerous specimens of the snail host may be taken. It may be in this region that the disease exists. At one point a latrine had been constructed directly over the water. Shells of planorbis were also found between San Germán and Cabo Rojo in irrigation ditches, and the living snails at the latter locality. I have since been informed that schistosome infection is not unknown there. None of the molluscs collected during the course of this trip gave off schistosome cercariae.

For the four positives found in the neighborhood of Añasco no satisfactory data could be obtained relating to the place of the origin of the infections. Though carefully searched the country yielded no specimens of *P. guadeloupensis*. Uninfected individuals were taken on the land of the Mayagüez Sugar Co. González Martínez mentions Mayagüez, or rather the lands nearby, as localities where schistosomiasis was common.

Except that Utuado is considered an important center of the disease very little is known regarding the incidence of the infection there. According to Dr. Carrasquillo clinical cases are less common than formerly. Our efforts were limited to two rural districts along the Arecibo River, Salto Arriba and Salto Abajo. Ova of *S. mansoni* were demonstrated in the feces of fourteen of the forty-seven school children from the latter place, about thirty per cent. Half of the stools of fourteen individuals, mostly adults from the same locality were likewise positive. Twelve of fifty-three school children of Salto Arriba were shown to harbor the parasite, a rate of almost twenty-three per cent. In addition the feces of one of the two individuals from Utuado who tendered specimens for diagnosis, contained ova. Children are preferred for examination, for through the agency of the school considerable data and material can be obtained with relatively little effort. Furthermore the presence of schistosome ova in their stools indicates that infections are still being contracted in the vicinity.

Efforts to find *Planorbis* resulted in only partial success. The river Viví, a rapidly flowing stream typical of the hilly region which has long been suspected as responsible for harboring the intermediate host yielded no gastropods. The swift current and abundance of gravel produce an environment unfavorable to *Planorbis*. At Salto Arriba, 4.5 miles south of Utuado, *P. guadeloupensis* was recovered from a small stream flowing through a *finca*, and from a

backwash along the river where one of the few snails taken was found to be infected. Nearby the Arena River joins the main stream. Many were taken here in residual water deposits, though all were negative for *S. mansoni*. Search in the last two mentioned places during the past week failed to reveal any. The stream which brings the molluses there may also wash them away, or take them farther down stream. The second examination indicates that such places as those just mentioned seem merely more or less of a temporary nature, though breeding had been noted previously. At Salto Abajo no trace of snails was found to account for the high rate of infection, at least along the western bank of the river where the people concerned live.

Recently a hasty survey was made at Adjuntas to determine whether schistosomiasis occurred at such a high elevation (Utuaado is located 426 feet above sea level, and Adjuntas 1,968), and if so whether the hypothetical infection influenced conditions existing at Utuaado. Samples were examined of both rural school children and those from the town. Of the ninety-five cases studied only two were positive; and these were shown to have lived in Utuaado. No specimens of the planorbis type were noted in the streams and water deposits of this area. Adjuntas need therefore be considered no further in connection with schistosomiasis.

Snails first begin to appear about six miles above Utuaado, and then only sparsely. They were found in protected spots near the confluence of a small tributary with the river. It would seem that they were washed down from similar situations in the smaller stream—careful questioning showed this to be apparently the case.

Dr. Font of Cayey states that schistosomiasis occurs commonly there, sometimes associated with serious symptoms. He also believes the disease occurs at Barranquitas.

Two, possibly three, instances of infection have been seen from Caguas, one quite serious. *P. guadeloupensis* can be taken in great numbers in the district. One from the Cagüitas river showed cercariæ.

I have encountered two positives from Río Piedras material. Several students of the San Augustine Academy contracted infections while bathing in a stream there. I have seen numerous snails there but have never ascertained whether they contained cercariæ.

Some believe the disease prevails throughout the coastal region. Cursory examinations shows, that the intermediate host seems to be absent between Rincón and Arecibo, nor is there much evidence

that schistosomiasis occurs to any extent at San Juan, Ponce and Aguirre.

I have noted in the literature the case of an individual who had lived in Santo Domingo, and have shown that another who also had resided there harbored the parasite. In Haiti numerous smear examinations have failed to demonstrate ova. While engaged in an anopheline survey of Haiti I found no form resembling *P. guadeloupensis*, though I frequented situations apparently favorable to their existence. We must therefore await specific proof that bilharziasis is endemic there. If suitable snail hosts occur in Santo Domingo, then the arrival of infected immigrants might be looked upon as a potential source of danger. Endemic schistosomiasis has not been encountered in Cuba, and Dr. Hoffman of Havana has written me that *P. guadeloupensis* has never been found in that island.

To some, the emphasis placed upon the intermediate host may seem disproportionate. The present trend of medicine is toward prevention. If schistosomiasis is shown to be of importance in Porto Rico the logical step would be to attempt control through destruction of the snail, rather than through treatment with tartar emetic or related substances, which requires a number of injections over a relatively long period.

The data thus far gathered in all probability give but a mere indication of the distribution of schistosomiasis. The smear method used to detect the presence of ova doubtless misses many light infections, and therefore fails to give a true picture of actual conditions.

SUMMARY

1. A preliminary investigation of the distribution of *S. mansoni* has been carried out by (1) a review of previous studies, (2) collection of reports from practicing physicians, and, (3) surveys including fecal examinations and search for the intermediate snail host.

2. Using the reports of physicians and earlier workers as guides, surveys have been carried out in some ten districts. Altogether 800 fecal specimens have been examined, and search for snails made in every locality.

3. It has been established that *Planorbis guadeloupensis* is the intermediate snail host of *S. mansoni* in Porto Rico through the experimental infection of rats with cercariæ given off by snails taken from an endemic area.

4. Of the ten districts investigated evidence of the existence or

possible existence of *S. mansoni* was found in eight, indicating that the infection is much more widely distributed in Porto Rico than has been popularly supposed.

The surveys are being continued.

In closing I should like to state that any additional information that members of the medical association can contribute will be welcomed.

To Dr. Pedro N. Ortiz, Commissioner of Health, who has frequently placed the facilities of his department at my disposal, to the numerous physicians throughout the Island who have cooperated, I am under great obligation for the many acts of kindness accorded me and also to Mr. Marín, my assistant, who has worked with me in this study and has rendered invaluable service. My colleague Dr. D. H. Cook kindly prepared the photographs which illustrate this article.

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