# A PARASITE SURVEY OF ISABELA*

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THE MUNICIPALITY of Isabela is located in the northwestern corner of Puerto Rico, and has an area of approximately 68 square miles. The narrow coast rises abruptly to a small plateau, which further inland becomes rolling and hilly country, reaching a maximum height of about 500 feet. No natural permanent stream traverses the district, though its eastern boundary is formed in part by the Guajataca River. Until recently, water was secured almost exclusively from cisterns, barrels and numerous artificial ponds (*charcos*). Water from the Guajataca reservoir now supplies all irrigable land in the district through the network of branches developed from the principal canal. The town of Isabela also utilizes this water after it has been treated.

Agriculture is diversified; vegetables, tobacco, cotton (now declining), sugar (increasing in importance), are some of the principal crops. Rainfall averages about 54 inches annually, most of the precipitation occurring from May to October. The great porosity of the soil gives this region a more arid character than the total precipitation would indicate, and explains the need for irrigation which, due to the same factor, is only partially successful.

In the latter part of 1934 the Puerto Rico Emergency Reconstruction Administration (later incorporated with the Federal Emergency Reconstruction Administration) proposed that a project dealing with schistosomiasis be attempted in the Isabela area, because a statement had previously been made to the effect that the disease would probably extend to the district in the wake of the newly developed irrigation system. In an investigation of this nature data pertaining to other parasites was also obtained, and we have incorporated the survey findings in this paper.

The character of the project had to be adapted to specification, and was therefore restricted in its scope. By far the greater part of the available funds were allotted for employment, and no preliminary studies could be made to determine conditions, nor could the progress of the work be controlled by sufficiently frequent and thorough inspections.

Three local residents were trained to carry out the necessary opera-

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tions, make pertinent observations and collect required data. Adequate samples of feces contained in half ounce tins were supplied chiefly by school children and, in addition, a number of individuals of various ages from all parts of the municipality contributed specimens of excreta. In all, 7,052 samples were obtained among a population of approximately 23,000. The collected containers were sent almost daily to San Juan for diagnosis. The laboratory staff, besides the authors, consisted of two assistants trained in the microscopic diagnosis of intestinal parasites, and a boy who cleaned glassware. The findings of the two assistants were frequently checked.

No account seems to have been published of parasitic incidence in the Isabela area. It has been stated that Dr. Rolla Hill, while representing the International Health Board locally, made a series of examinations in Isabela. If this were so, the results were apparently not prepared for publication. Dr. Hill, in co-operation with others, did carry on hookworm investigations in the neighboring municipalities. The studies of Nair on the three most prevalent intestinal nematodes illustrate conditions obtaining at Salinas, a coastal district more arid than Isabela.

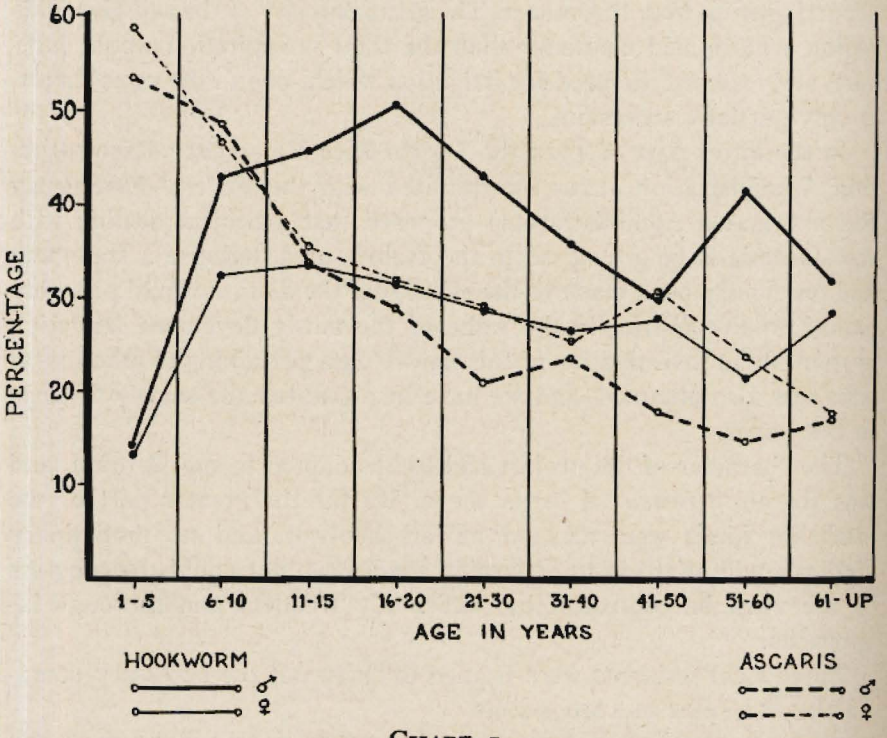


CHART 1

The present investigation is not directly comparable with studies mentioned above because it deals with *all* parasites encountered, and their incidence only. Since schistosome incidence was the primary consideration, diagnosis in great part had to be made by the concentration method. Each sample was examined four times, twice with smears of salt solution and Donaldson's iodine, twice with the concentration (upper surface and sediment). The methods employed precluded any quantitative estimates of ascaris and hookworm infestations.

For a semi-arid region, hookworm incidence is surprisingly high. While smear preparations can give no adequate idea of intensity, nevertheless the constant sparsity of hookworm ova in samples inclines one to the belief that the majority of positives represented a low level. In all age groups the rate among males exceeded that of the females, the two approximating each other in the 0-5, 40-50 and 60 years up, periods. From the sixth year on the rate of incidence fluctuated within relatively narrow limits. Among the males the greatest percentage of infected individuals (50.2%), lay in the 16-20 year range. The increase among females takes place in the former decennium. Corresponding with results obtained elsewhere in Puerto Rico, a rise occurs among males between 51 and 60. No great emphasis can be placed upon incidence among the more advanced age groups, because of the relatively few persons involved.

Ascaris occurred most frequently among individuals from 1-5 years of age, gradually diminishing with increased age. At all periods a higher rate was maintained among females. The abundance of ova in many specimens, even in smears, suggested heavy worm burdens.

Trichuris is probably the most ubiquitous parasite in Puerto Rico, and it is not surprising that higher rates obtain for this species. Incidence varied but little between the sexes, greatest abundance occurring among the 6-10 year group. Strongylloides infection appeared to be comparatively stable after the first five years. The data given for pinworm can furnish no true picture of the occurrence of this form, because ova are seldom found in feces.

Scarely one per cent of the individuals studied harbored ova of *Schistosoma mansoni*. Another article will be devoted to the various aspects of schistosomiasis in this area.

*Fasciola hepatica* occurred once, in a young woman. This species has been found at least twelve times in human beings in Puerto Rico. Tenia ova were likewise encountered on a single occasion, as were those of *Hymenolepis nana*.

Eggs of *Heterodera radicicola*, or species with similar eggs and

habits, were recovered from 76 samples, in some instances in several members of the same family. This frequency is not surprising, for the inhabitants of the district consume an abundance of root crops through which medium infestation possibly occurs. One person passed trichostrongylus. Since no hospital facilities were available he was given a purge which failed to displace any parasites. Ova resembling those of a spirurid (Physaloptera?) occurred in the excreta of eight individuals. Similar ones had been passed by two individuals from Adjuntas, in the center of the Island, in which cases a pet cat may have played a part in the infestations.

Since the principal emphasis of this investigation was placed upon helminths there exists some probability that the protozoal incidence might have been found greater had the study been prosecuted from a protozoological viewpoint, and if additional appropriate examinations, iron haematoxylin stains, and cultures had been made.

Owing to the time which elapsed between collection of specimens in Isabela and their examination in San Juan, as well as frequent delays in transportation, the condition of the samples was not very satisfactory for the recovery of protozoa.

As usual, *Endamoeba coli* occurred most frequently, with *Endolimax nana* in the second place. In comparison with surveys from many other regions, the figures given for *E. histolytica* seem quite low. On the other hand clinical amebiasis appears to be rare in Puerto Rico, being encountered less frequently than in the continental United States. Giardia, as elsewhere, is prevalent during the early years, then gradually declines. Trichomonas, chilomastix and balantidium were found, but their apparently low incidence does not justify further comment. In all probability the undetermined amebae were composed in great part of *E. coli* cysts.

Practically no effort was made to discover the factors responsible for the prevalence of hookworm under seemingly unfavorable climatic conditions. In much of this district there is very little dense vegetation in the vicinity of dwellings, a fact that throws additional difficulty in the way of an explanation. Nevertheless, local soil polution is indicated because of the high infection rate, especially of ascaris, during the period between the first and fifth year. Furthermore, the greater ascaris incidence in females who are more restricted to the home throughout the entire life span, would seem to suggest, if not confirm, the existence of local soil pollution.

One hookworm case, an adult engaged in agriculture, was questioned. Members of his family had stated previously that they used the latrine

of a neighbour, which was located quite a distance from their house. However, a dense thicket of small trees was noted about 100 yards distant. Closer inspection showed that it enclosed on three sides a cleared area about fifty feet in diameter, which space was dotted with numerous fecal deposits, though prolonged exposure to the sun had probably led to the destruction of many ova and larvae. Although this section of the Island is subject to dry periods and droughts, at times, especially between May and November the precipitation may be sufficient for the development of hookworm larvae. The infections contracted during these periods probably provided for the existence of the species, though at a low level. It is believed that the conditions described above afford a clue to the survival of hookworm in this otherwise unfavorable environment.

## SUMMARY

A survey of intestinal parasite incidence in a district of northwestern Puerto Rico.

Hookworm occurs commonly, though the individual burden appears to be light.

Ascaris is abundant, and many of the infections appear to be heavy.

The conditions probably responsible for the persistence of hookworm are indicated.

At present, schistosomiasis presents a problem of minor importance.

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