

ADAPTABILITY OF SCHISTOSOME LARVAE TO NEW HOSTS

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The spread of any digenetic trematode is limited by the distribution of the molluscs which serve as its intermediate host. Trematode species which can become adapted for development to several different species of intermediate hosts have a much better chance of entering new localities than those which are absolutely specific in one mollusc. The literature on the cercariae shows a number of species which can develop equally well in different species and even different genera of molluscs. The best known example of the relation of adaptability in intermediate hosts to the spreading of a digenetic trematode to new localities is the sheep liver fluke, *Fasciola hepatica*, which has become widely distributed to various parts of the world, adapting itself to some species of the snail genus *Lymnaea* found in each new region.

Although the larval stages of the human blood flukes have been known less than five years, the records already show a surprising lack of specificity in intermediate hosts. Leiper (1916:411) records the cercaria of *Schistosoma haematobium* from Egypt in *Bullinus contortus* and *Bullinus dybowskyi*, and the cercaria of *Schistosoma mansoni* from *Planorbis boissyi*. Cawston (1917:133) records the cercaria of *Schistosoma haematobium* in South Africa from *Physopsis africana*, and in Venezuela Iturbe and Gonzalez (1917) found the cercaria of *Schistosoma mansoni* in *Planorbis guadelupensis* Sowerby. The cercaria of *Schistosoma japonicum* has so far been described from only one host, the katayama snail, *Blanfordia nosophora*. It is significant that this species is an operculate snail belonging to a different order of the Gastropoda from the intermediate hosts of *S. haematobium* and *S. mansoni*. In addition to these at least two of the species of forked-tailed cercaria develop as described by Faust (1915:122 and 1918:105) in more than one species of intermediate host. *Cercaria gracillima* is described from *Lymnaea proxima* Lea and *Physa gyrina* Say from the Bitter Root Valley, Montana, and *Cercaria gigas* from *Planorbis trivolvis* Say and *Physa gyrina* Say from Illinois.

My own studies on the forked-tailed cercariae from the United States have shown several striking examples of lack of specificity in the choice of intermediate host. *Cercaria douthitti* Cort which was described (1915:49) from *Lymnaea reflexa* Say taken near Chicago,

Illinois, was later found in the region of Douglas Lake, Michigan, in *Lymnaea stagnalis oppressa* (Say), *Lymnaea stagnalis perampla* Walker and *Physa ancillaria parkeri* (Cuvier). *Cercaria douglasi* Cort was found in the same region in species of snails belonging to two different genera, viz., *Physa ancillaria* Say, and *Lymnaea emarginata angulata* (Sowerby). A third species of forked-tailed cercaria, as yet undescribed, was found in a single small beach pool on the shore of Douglas Lake in species belonging to three different genera of snails, viz., *Planorbis trivolvis* Say, *Lymnaea exilis* Lea, and *Physa ancillaria* Say.

The data given above seems to clearly indicate that the forked-tailed cercariae readily adapt themselves to new molluscan intermediate hosts. Further studies on the intermediate hosts of the human schistosomes will undoubtedly add to the list of snails which can be utilized as intermediate hosts by these species. The striking dissimilarity between *Blanfordia nosophora*, the intermediate host of *Schistosoma japonicum*, and the intermediate hosts of *Schistosoma haematobium* and *S. mansoni* is also very significant in this connection. If there were any great degree of specificity in the intermediate hosts among these forms, species of the same genus would hardly be expected to develop in intermediate hosts so entirely unrelated. The close relationship of *Cercaria douthitti* and *Cercaria douglasi* to the human schistosomes, indicated in a previous publication (Cort, 1917), also makes the adaptability of these species to a variety of intermediate hosts significant in relation to specificity in the human forms.

Since the cercariae of the human schistosomes penetrate directly into their host, and can develop to maturity in rats, cats, dogs and cattle, as well as man, they will probably spread rapidly if carried into any region where suitable intermediate hosts are found. It is known from case records and records of the immigration stations that *Schistosoma japonicum* has been brought into the United States from the Orient. Before August, 1917, when schistosomiasis was placed on the exclusion list by the Surgeon-General of the United States Public Health Service, orientals with this disease are known to have entered this country in considerable numbers. In many of the irrigated regions of the Pacific Coast states, oriental laborers from countries in which schistosomiasis is prevalent live in much the same relation to the soil as in their own country, making ideal conditions for the spread of this disease provided a type of snail in which the flukes can develop is present. It is, therefore, evident that the question of the adaptability of the schistosomes to new intermediate hosts becomes a problem of great significance in relation to the possible

spread of this disease in the United States, and it is of great importance to discover whether there are snails in this country in which the blood flukes can develop.

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