Biomphalaria pfeifferi Snails and Intestinal Schistosomiasis, Lake Malawi, Africa, 2017–2018

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Two surveys conducted in 2017 and 2018 demonstrated Biomphalaria pfeifferi snails in Lake Malawi in Africa. Epidemiologic examination of 175 local children at 3 primary schools confirmed emergence of intestinal schistosomiasis. These findings highlight autochthonous transmission of Schistosoma mansoni flukes in Lake Malawi and the need to revise international travel advice.

Throughout sub-Saharan Africa, Biomphalaria pfeifferi snails are freshwater intermediate hosts for Schistosoma mansoni blood flukes, which cause intestinal schistosomiasis (1). Geographic distribution of B. pfeifferi snails delineates actual or potentially active zones of S. mansoni fluke transmission (2). Other than a report of a single Biomphalaria shell at Karonga in the far northern portion of Lake Malawi (3), considered to be from a marginal swamp (4), B. pfeifferi snails have not previously been found in Lake Malawi (5). However, in November 2017, during malacologic surveillance for intermediate hosts of schistosomiasis in the Mangochi District, Malawi, along the southernmost tip of Lake Malawi, 2 discrete populations of Biomphalaria snails were unexpectedly encountered in submerged beds of Vallisneria spp. plants (Figure, panel A). DNA sequence analysis of the mitochondrial cytochrome oxidase subunit 1 (cox1) (6) indicated that the cox1 sequences (1,006 bp) of those snails differed from sequences of B. pfeifferi snails from Chiweshe, Zimbabwe (GenBank accession nos. DQ084829 [HCO/LCO region] and DQ084872 [Asmit1/2 region]) by only 3 synonymous single-nucleotide polymorphisms.

In May 2018, to confirm B. pfeifferi colonization within the lake and suspected risk for intestinal schistosomiasis, we undertook a conjoint malacologic and parasitologic survey with ethics approvals from the Liverpool School of Tropical Medicine, UK (application 17-018) and the Ministry of Health and Population, Malawi (application 1805). Reinspection of all prior malacologic sampling locations and another 43 sites found further populations of B. pfeifferi snails (Figure, panel A); large numbers (>50), along with innumerable dead shells, were again found at site 9. All snails were inspected for shedding cercariae, and although cercariae from snails at site 5 were seen, identification by microscopy (<100) was unsuccessful. Supplementary analysis indicated that cox1 sequences from 9 snails from sites 2, 5, 7, 10, and 11 were identical.

We conducted an epidemiologic survey of 175 schoolchildren, 5–15 years of age, equal numbers of boys and girls, from 3 primary schools closest to site 9 (Figure, panel B). Mean prevalence of intestinal schistosomiasis, calculated by detection of S. mansoni circulating cathodic antigen (CCA) on urine dipstick testing, was 34.3% (95% CI 27.9–41.3); prevalence rates by school were Samama, 46.7% (95% CI 36.7–56.7); Mchoka, 25.0% (95% CI 15.0–36.7); and Palm Beach, 9.1% (95% CI 0.0–22.7). We requested fecal samples from 60 S. mansoni–positive children and received samples from 46. Duplicate Kato-Katz examinations confirmed S. mansoni ova in 7 children; infection intensities were graded as light (<100 eggs/g feces). All urine samples were inspected for S. haematobium ova by syringe filtration (10 mL); general prevalence was 14.9% (95% CI 9.8–20.1); 52% of these samples were also positive by CCA urine dipstick, indicative of S. mansoni co-infection. To further determine autochthonous transmission of S. mansoni flukes, 2 egg-positive children from Samama and Mchoka took us, on foot, to the shoreline where they regularly swam, which corresponded to snail...
Schistosomiasis control initiatives in the region of Lake Malawi, Africa, have been intensified in recent years to combat intestinal schistosomiasis in local schoolchildren (9). The absence of circulating cathodic antigen (CCA) detected by urine dipstick in children tested for intestinal schistosomiasis in the region of Lake Malawi, Africa, suggests recent ecologic and epidemiologic change. However, increased surveillance of snails and characterization of schistosomes, along with intensified control interventions to arrest further spread of intestinal schistosomiasis is necessary. We recommend increased surveillance of snails and characterization of schistosomes, along with intensified control interventions to arrest further spread of intestinal schistosomiasis.
About the Author
Mr. Alharbi is a PhD student under the supervision of L.J. and J.R.S. He has specific interests in medical malacology and molecular epidemiology of schistosomiasis in Africa and the Kingdom of Saudi Arabia.

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etymologia revisited

schistosomiasis
[shis”-, skis” to-so-mi’ə-sis], from the Greek—skhastos (split) and soma (body)

Infection of the blood with a parasite of the genus Schistosoma. Originally thought a single organism with a split body, the parasite was eventually recognized as having male and female forms. Three main species cause human infection: S. haematobium, S. mansoni, and S. japonicum. Each species has its own range of host snails. The parasite releases eggs containing larvae through feces or urine; if the eggs reach water, the larvae are released and may penetrate a snail. A very large number of larvae are then produced inside the snail and released back into the water. Infection is acquired through skin contact with contaminated water.

Schistosomiasis, which leads to chronic hepatic and intestinal fibrosis of the urinary tract, was first identified in Egypt in 1851 by German pathologist Theodor Bilharz and is also called bilharzia. Approximately 160 million persons throughout the world are infected, particularly in Africa, the Middle East, South America, and Southeast Asia.

Source: Institute of Tropical Medicine of Antwerp: www.itg.be

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