INTRA- AND INTERSPECIFIC CHEMOATTRACTION STUDIES ON Schistosoma mansoni, S. japonicum, AND S. haematobium IN THE ABSENCE OF BARRIERS

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Abstract—Heterosexual intra- and interspecific chemoattraction studies were done in polycarbonate chambers without barriers using 8- to 10-week-old Schistosoma mansoni from mice, 10-week-old Schistosoma japonicum from hamsters, and 14-week-old Schistosoma haematobium from hamsters. Experiments were done for up to 4 hr at 37°C in a humidified incubator. Single worms were not attracted to decoys or heat-killed worms. Heterosexual intraspecific and interspecific attraction was significant at all time points with all combinations. No clear differences were apparent between intra- and interspecific attraction. Differences between same and different S. japonicum or S. haematobium pairs were not significant at any time point.

Key Words—Trematode, digenetic, Schistosoma mansoni, Schistosoma japonicum, Schistosoma haematobium, chemoattraction, sexual attraction, interspecific, fluke, blood.

INTRODUCTION

Using a bioassay system described by Imperia et al. (1980) to study the effects of Schistosoma mansoni excretory–secretory products in vitro, Eveland et al. (1982) demonstrated greater chemoattraction responses between male and female worms which were initially paired with each other, than those which were...
paired with other males or females. Eveland et al. (1983) also showed that homosexual, but not heterosexual, attraction between *S. mansoni* adults was reduced in the presence of mechanical barriers constructed from dialysis tubing with a molecular weight cutoff of approximately 12,000.

A number of investigators, including Vogel (1941), Armstrong (1965), Taylor et al. (1973), and Southgate et al. (1976, 1982) have reported cross-mating of schistosomes in vivo, but similar in vitro studies have not been done.

We report here results of studies to compare intra- and interspecific chemotraction in our bioassay system, using *S. mansoni, S. japonicum,* and *S. haematobium.*

**METHODS AND MATERIALS**

*Experimental Animals and Media.* Adult 8- to 10-week-old PR-1 strain *Schistosoma mansoni* (Richards and Merritt, 1972; Fletcher et al., 1981) from CD-1 mice (Charles River, Wilmington, Massachusetts) and the albino M line of *Biomphalaria glabrata* (Newton, 1955) were used. Also used were a Chinese strain of 10-week-old *S. japonicum* from hamsters and 14-week-old *S. haematoobia* from hamsters. The *S. mansoni* had been routinely maintained in our laboratory for several years and through many passages. The *S. japonicum* and *S. haematoobia* were supplied by the University of Lowell (Lowell, Massachusetts) under an NIAID supply contract. Worms were recovered by perfusion of the portal and mesenteric veins and maintained until use at 4°C in Earle's balanced salt solution (EBSS) containing 0.1% glucose and 0.5% lactalbumin hydrolysate (Clegg, 1965; Imperia et al., 1980). All experiments were done using this incubation medium. The time between perfusion and the beginning of an experiment was always less than 1 hr. Distances between worms were measured in millimeters at 0.5, 1.0, 2.0, 3.0, and 4.0 hr. From 13 to 18 trials were carried out for each experimental design.

*Bioassay Design.* Polycarbonate chambers with 14 linear channels, each channel 3 cm long, 1 cm wide and 1.5 cm high, were used. Each channel was filled to a height of 0.85 cm with 1% agar in phosphate-buffered saline (pH 7.2). The agar was overlaid with EBSS. Experiments were carried out using nonbarrier designs (Eveland et al., 1982) at 37°C in a humidified incubator. Worms were washed in EBSS then pipetted into the chamber 15 mm apart in separate channels. This distance allowed each worm to move either toward the other, which was initially 15 mm away, or 7.5 mm in the other direction, toward the end of the channel. Distances were measured between worm centers at each time period (i.e., 0.5, 1.0, 2.0, 3.0, and 4 hr). At each time period, the distance between a worm couple was measured, and the percent attraction determined by the formula: \((15 - D/15) \times 100\), where \(D\) = the actual distance between a worm couple at a particular time point.