

Catalytic curve analysis of schistosomiasis in snails

Cohen (1973) noted that catalytic models (Muench, 1959) had been used to analyse age-prevalence curves of human (Hairston, 1965) and snail (Sturrock and Webbe, 1971) schistosomiasis, but that no account had been taken of selective host mortality (ϵ) due to the infection. Such mortality undoubtedly occurs among snails (Pan, 1965; Sturrock and Sturrock, 1970a) and, using Pan's data, Cohen demonstrated that it substantially modified estimates of two parameters obtained from catalytic curve analysis of St. Lucian data (Sturrock and Webbe, 1971). The force of infection a was increased and the force of defection b decreased.

We have now had an opportunity to obtain estimates of ϵ for St Lucian *Biomphalaria glabrata* infected with *Schistosoma mansoni*. The results are shown in the accompanying table together with the effect on the two catalytic curve parameters from the most reliable set of the original St Lucian data (Sample 5, Table 1, Cohen, 1973).

TABLE

Selective mortality ϵ in *B. glabrata* infected with *S. mansoni* and its effect on parameters calculated from age-prevalence curves

Based on data from	Snail mortality/wk		ϵ	Force of infection			Force of defection		
	Uninfected m	Infected $m + \epsilon$		Original a	Modified $a(\epsilon)$	Change	Original b	Modified $b(\epsilon)$	Change
St Lucia (lowest)	0.0043	0.0220	0.0177	0.070	0.0734	+5%	0.296	0.2845	-4%
St Lucia (median)	0.0071	0.0584	0.0513	0.070	0.0797	+14%	0.296	0.2626	-11%
St Lucia (highest)	0.0938	0.1808	0.0870	0.070	0.0865	+24%	0.296	0.2395	-19%
PAN (1965)	0.0070	0.1157	0.1087	0.070	0.0906	+29%	0.296	0.2254	-24%

Natural mortality m in 34 separate determinations ranged from 0 to 0.0938/week for uninfected snails kept either indoors or in outdoor laboratory ponds. Mortality was influenced by temperature, length of observation period, crowding and depth, volume and surface area of the waterbody. In 12 matched groups of snails infected with *S. mansoni*, mortality due to infection (excluding two values of 0) ranged from 0.0177 to 0.0870/wk with a median of 0.0513. Only among the oldest St Lucian snails, exposed at 44 weeks, did ϵ approach the value derived from Pan's data. The latter figure overcorrected the original values of a and b by a factor of two, judging by the median St Lucian value of ϵ . The St Lucian laboratory data may still not reflect fully the field values of ϵ , but they are probably more relevant than Pan's data because of known infra-specific strain variations in both schistosome infectivity (James and Webbe, 1973) and snail susceptibility (Sturrock and Sturrock, 1970b). Thus, the corrected values do not differ greatly from the original values of a and b . Independent confirmation was obtained that the original values were of the right order of magnitude (Sturrock and Sturrock, 1971).

Nevertheless, selective mortality due to infection does occur among snails. It has measurable consequences in relation to catalytic curve analyses and should not be ignored.

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