SCANNING ELECTRON MICROSCOPY OF THE TEGUMENTS OF MALES FROM FIVE POPULATIONS OF SCHISTOSOMA MATTHEEI

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ABSTRACT


The teguments of males from 5 populations of S. mattheei, of which 3 were sympatric and 2 allopatric with S. haematobium, were studied by means of scanning electron microscopy (SEM).

A certain percentage of the males of each sympatric population bore tubercle spines while the allopatric populations were spineless. It is postulated that the presence of tubercle spines is a characteristic inherited from S. haematobium.

INTRODUCTION

Schistosoma mattheei, which is primarily a bovine parasite, can also infect man. In the human host it copulates with S. haematobium and the resultant hybrid has the ability to reinfect cattle (Pitchford, 1961). To determine the effect of this hybridization on the S. mattheei gene pool, we collected this parasite in certain localities in South Africa and studied the morphology of the eggs produced by the different isolates (Kruger, Schutte, Visser & Evans, 1986). The results indicate that eggs produced by populations which are sympatric with S. haematobium possess certain S. haematobium characteristics.

In this paper we describe the results of a study in which the teguments of adult males from 5 S. mattheei populations were compared in order to determine whether S. haematobium characteristics could also be detected in the adult worms.

MATERIAL AND METHODS

The same S. mattheei isolates studied by Kruger et al. (1986) were used in the present investigation. In addition, worms obtained from a S. mattheei population allopatric with S. haematobium, isolated from buffalo in the Kruger National Park, were also studied. The origin of the 5 isolates and their relation to the distribution range of S. haematobium is summarized in Table 1.

For scanning electron microscopy, adult male schistosomes were perfused from infected Pramaus (Mastomys) coucha, fixed in Karnovsky’s Solution (Bullock, 1984), post-fixed in osmiumtetroxide (2 %) and uranylacetate (2 %), dehydrated and stored in absolute alcohol. Thereafter the specimens were critical point dried, glued to stubs, carbon and gold sputter-coated to a thickness of approximately 50 nm and studied by means of a Cambridge Stereoscan 250 at 5 and 10 kV.

RESULTS

For comparative purposes the tegument of a South African S. haematobium male is illustrated in Fig. 1. The tubercles on the tegument of this species bear apically-directed spines. In the centre of each tubercle a clear area, which may or may not be nippled, was observed. Ciliated sensory receptors are scattered amongst the tubercles.

All the tegumental tubercles of S. mattheei males from the Western Transvaal (Fig. 2) and Kruger National Park (Fig. 3) were completely spineless. Most of the tubercles were terminally nippled, indicating the presence of intratubercle sensory receptors. Ciliated sensory receptors were also present.

Of the S. mattheei specimens from the Eastern Transvaal, Northern Natal and Eastern Cape 29 %, 50 % and 64 % respectively were spineless. The concentration and configuration of the spines varied considerably within each sample. The specimen from the Eastern Transvaal (Fig. 4) bears a few short spines on some of the tubercles. The Eastern Cape specimen (Fig. 5) possesses a large number of spines, arranged around a prominent, centrally placed nipple on each tubercle. The spines on the nippleless tubercle of the Northern Natal specimen (Fig. 6) appear to be malformed.

DISCUSSION

Hockley & McLaren (1977) and Tulloch, Kuntz, Davidson & Huang (1977) described the tegument of South African S. mattheei as being tuberculated and devoid of any spines. In contrast Hamilton-Attwell & Van Eeden (1981) reported that 20-25 % of the adult males from a laboratory population of S. mattheei maintained in cattle at the Veterinary Research Institute at Onderstepoort had spinous tubercles.

The question arises as to whether tegumental spines on a tubercle should be regarded as a naturally-occurring allele of S. mattheei or rather a characteristic inherited from S. haematobium. The results of this study, in which tubercle spines were found to be absent in populations allopatric to S. haematobium and present in sympatric populations, would seem to be good evidence that it is an inherited character. In order to prove this hypothesis beyond doubt further studies on the allopatric populations of S. mattheei will be necessary to ascertain whether or

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not they are all spineless. A cross-breeding experiment to study the genetic interaction between the factors responsible for the expression of tubercle spines also seems to be indicated.

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REFERENCES


