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

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ABSTRACT

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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 *Praomys (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.

TABLE 1 The origin of 5 *S. mattheei* isolates and their relation to the distribution range of *S. haematobium*

Origin of isolate	Relation to distribution range of *S. haematobium*	Geographical coordinates
Western Transvaal (Ventersdorp District)	Allopatric	26°20′S 26°50′E
Kruger National Park (Mlondozi area)	Allopatric	25°00′S 31°40′E
Eastern Cape (Humansdorp District)	On the perimeter of its former range	34°01′S 24°45′E
Eastern Transvaal (Kangwane)	Sympatric	25°30′S 31°00′E
Northern Natal (KwaZulu)	Sympatric	28°00′S 31°30′E

Of the *S. mattheei* specimens from the Eastern Transvaal, Northern Natal and Eastern Cape 29 %, 50 % and 64 % respectively were spined. 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 spined tubercles.

The question arises as to whether tegumental spines on a tubercle should be regarded as a natarally-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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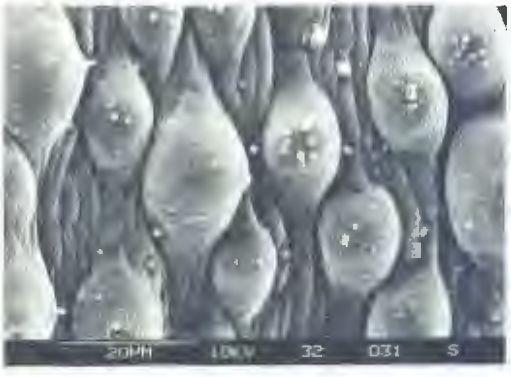

FIG. 1 A scanning electron micrograph of the tegument of an adult *S. haematobium* male

FIG. 2–6 Scanning electron micrographs of the teguments of *S. mattheei* males from the Western Transvaal (2), Kruger National Park (3), Eastern Transvaal (4), Eastern Cape (5) and Northern Natal (6)

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

BULLOCK, G. R., 1984. Fixation for electron microscopy. *Journal of Microscopy*, 133, 1–16.

HAMILTON-ATTWELL, V. L. & VAN EEDEN, J. A., 1981. SEM studies of the integumental variation within samples of *Schistosoma mattheei* Veglia & Le Roux (1929). *Proceedings of the Electron Microscopy Society of South Africa*, 11, 111–112.

HOCKLEY, D. J. & MCLAREN, DIANE J., 1977. Scanning electron microscopy of eight species of *Schistosoma*. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 71, 292.

KRUGER, F. J., SCHUTTE, C. H. J., VISSER, P. S. & EVANS, A. C., 1986. Phenotypic differences in *Schistosoma mattheei* ova from populations sympatric and allopatric to *S. haematobium*. *Onderstepoort Journal of Veterinary Research*, 53, 103–107.

PITCHFORD, R. J., 1961. Observations on a possible hybrid between the two schistosomes *S. haematobium* and *S. mattheei*. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 55, 44–51.

TULLOCH, G. S., KUNTZ, D. L. DAVIDSON, D. L. & HUANG, T. L., 1977. Scanning electron microscopy of the integument of *Schistosoma mattheei* Veglia & Le Roux (1929). *Transactions of the American Microscopical Society*, 96, 41–47.

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