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THE MORPHOLOGY OF A SENSORY RECEPTOR IN THE NIPPLED TUBERCLES OF *SCHISTOSOMA MATTHEEI*

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ABSTRACT

KRUGER, F. J. & HAMILTON-ATTWELL, V. L., 1985. The morphology of a sensory receptor in the nippled tubercles of *Schistosoma mattheei*. *Onderstepoort Journal of Veterinary Research*, 52 (1985).

During scanning electron microscopy (SEM) of the tegument of *Schistosoma mattheei*, a structure was observed within the nippled tubercles.

It is postulated that it is a sensory receptor with a tactile function.

INTRODUCTION

The morphology of a ciliated sensory receptor in *Schistosoma* spp. has been studied in great detail by means of scanning and transmission electron microscopy (Morris & Threadgold, 1967; Silk & Spence, 1969; Smith, Reynolds & Von Lichtenberg, 1969; Senft & Gibler, 1977; Gluckman & Passmoor, 1978; Price & Voge, 1983). A ciliated receptor was observed in *S. mattheei* by Tulloch, Kuntz, Davidson & Huang (1977). Senft & Gibler (1977) recognized another type of receptor in *S. mansoni* which they described as a "naked, rounded boss with a central bull's eye". Hamilton-Attwell & Van Eeden (1981) described raised nipple-like areas on the tubercles on the tegument of adult *S. mattheei*. In this paper a structure observed within these tubercles is described and illustrated.

MATERIALS AND METHODS

Praomys (Mastomys) coucha, infected with adult *S. mattheei*, were perfused, as described by Jackson, Dettman & Higgins-Opitz (1982). The parasites were fixed in Bullock's (1984) modification of Karnovsky's solution (Hayat, 1972), post-fixed in osmium tetroxide (2 %) and uranyl acetate (2 %), dehydrated and stored in absolute alcohol. Specimens were sonicated in absolute alcohol at 20 kc/s (0.1A) in a sonication beaker. Thereafter, the specimens were critical point-dried, glued to stubs, carbon and gold sputter-coated to a thickness of approximately 50 nm and studied with a Cambridge Stereoscan 250 at 5 and 10 KV.

RESULTS

Sonication removed chunks of tegument from the specimens. By being in contact with the resonating glass of the beaker, the tegumental epithelium of the tubercles was the first part of the tegument to be removed.

The removal of the tegumental epithelium from the tubercles exposed the basal lamina (Fig. 3). In the case of a spined tubercle (Fig. 1), the spine bases, socketed in the basal lamina, and the interstitial connective tissue could be seen.

The tubercles which contained receptors displayed a raised or sometimes dimpled area covered with a thin perforated lamina (Fig. 2). The internal structure of a receptor uncovered by sonication is depicted in Fig. 3. It consists of an internal bulb with a distal protruding process. Nerve-like fibres radiate from the process and penetrate the bulb. Other fibres from corpuscular bodies, embedded in the tegumental epithelium (Fig. 3), also penetrate the internal bulb. On close inspection numerous of these corpuscles were observed on the surfaces of all the tubercles.

A number of ciliated sensory receptors could be seen protruding from the sides of the tubercles in Fig. 1 & 2.

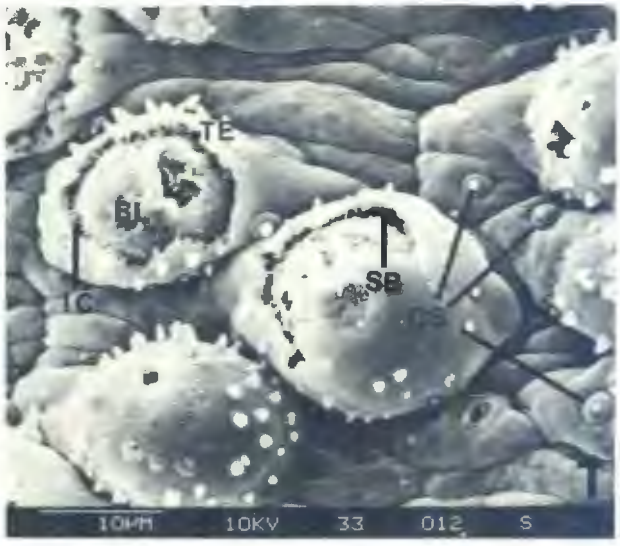

FIG. 1. Scanning electron micrograph of the sonicated tegument of *S. mattheei*. Sonication removed the tegumental epithelium (TE) from the spined tubercles exposing the basal lamina (BL), spine bases (SB) and interstitial connective tissue (IC). Note the ciliated sensory receptor (CS) on the tegument between tubercles and on the tubercle bases: × 2000

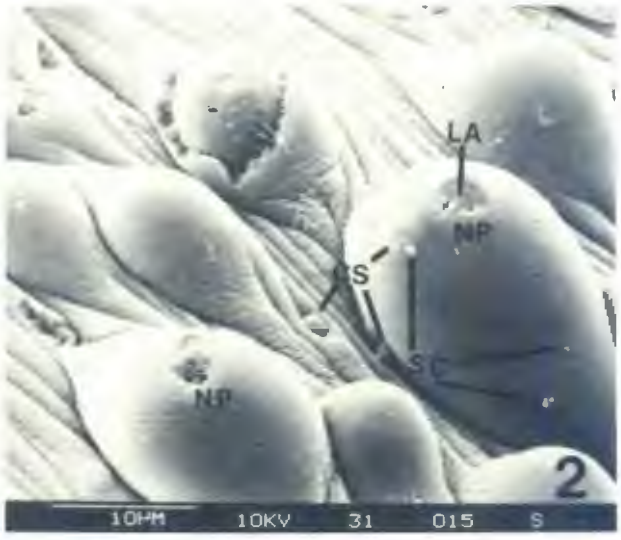

FIG. 2. Nippled and non-nippled, naked tubercles with the tegumental epithelium removed from one tubercle. The nipples (NP) are covered with a thin, perforated lamina (LA). Also to be seen are the presumed sensory corpuscles (SC) and the ciliated sensory receptors (CS): × 2000

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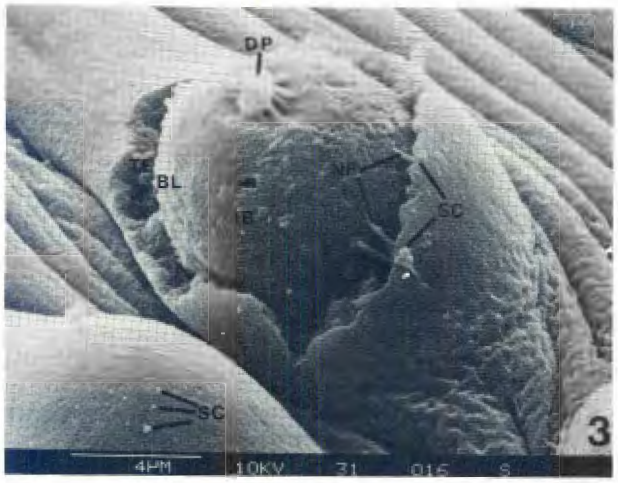

FIG. 3. An enlargement ot the exposed receptor in Fig. 2. The tegumental epithelium (TE) has fallen away from the basal lamina (BL). The distal process (DP) is connected to the internal bulb (IB) with fibres radiating from it. Nerve-like fibres (NF) from the sensory corpuscles (SC) also penetrate the bulb: × 6000

DISCUSSION

It is difficult to determine the function of a structure observed by SEM, as there is no evidence of its physiological function. Considering the fact that the distal process is terminally placed in such a way that it would be the first to make contact with any object in the environment, the most obvious function of the receptors within the tubercles would seem to be a tactile one. The thin covering membrane probably enhances the tactile abilities of the structure. It must be kept in mind that, in view of the presence of perforations in the membrane, it may be a chemoreceptor as well.

The innervation and distribution of the corpuscles embedded in the tubercular tegument indicate that they, too, may have a tactile function.

Differences of opinion exist among the various authors with regard to the function of the ciliated receptors. Smith *et al.* (1969) and Senft & Gibler (1977) agree that these receptors possess tactile abilities. Morris & Threadgold (1967), on the other hand, speculate that the function of these receptors is to detect the direction of the flow of the surrounding medium. During the present study, ciliated receptors were predominantly found on the tegument between and on the bases of the tubercles. This arrangement in relation to the nippled areas and the corpuscles on the tubercles lend support to the theory of Morris & Threadgold (1967), viz., that they detect the direction of the flow of the medium.

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