ULTRASTRUCTURAL STUDIES OF SCHISTOSOMA SPINDALE BY SCANING ELECTRON MICROSCOPY

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Abstract

The present study was carried out to know the morphological features of most prevalent visceral Schistosome species of bovines called Schistosoma spindale by light microscopy and Scanning Electron Microscopy. Male and female worms are in copula stage with well-defined gynaecophoric canal, originating from just below the ventral sucker and extending up to the posterior end of the body, continued as a marked conical projection. The oral sucker was completely covered with numerous spines measuring about 3µm in length. The ventral sucker was pedunculated, round, thick rimmed. The rim of the ventral sucker was 22µm in width and the inner side of which had numerous pointed spines measuring around 2.5µm in length and were directed towards the center of the ventral sucker. An aspinulated region measuring nearly 5-6µm was noticed beneath the lower border of rim of ventral sucker which was followed by a spinulated region with numerous spines blunter than the spines on oral sucker. The tegument surface of S. spindale showed ridged layers with large uniciliated and pit like papillae measuring approximately 3µm in diameter which were recorded more in posterior end.

Key words: Schistosoma spindale, Scanning Electron microscopy, Oral sucker, Ventral Sucker & gynaecophoric canal

I. INTRODUCTION

The published reports indicated that, at least nine species of schistosome existing in India including Schistosoma haematobium in man [3], the other eight species are capable of infecting one or other species of domestic animals in India [7]. Two distinct forms of schistosomosis were recorded viz., hepatointestinal schistosomosis caused by S.spindale in cattle, buffalo, sheep and goat, S. indicum in sheep, goat, horse, cattle and rarely in buffaloes, S.incognitum in pig, dog and sheep, Orientobilherzia bomfordi in cattle, Orientobilherzia turkestanicum in sheep, goat and cattle, Orientobilherzia duttai in cattle, buffalo and sheep and Bivotellobilherzia nairi in elephants. Nasal schistosomosis caused by S.nasale leading to snoring condition is widely reported to occur in bovines in the Indian subcontinent. Almost all Asian schistosomes species except S. Japonicum and its variant S.mekongi have been reported from India.

II. MATERIALS AND METHODS

2.1. Recovery of schistosomes:

Immediately after slaughter, 105 intestinal tracts of cattle and buffaloes were collected and brought to the laboratory and washed thrice with water. The fascia was separated from mesenteric plexus and from surface of the lumen. The mesenteric blood vessels were held against sunlight and viewed for the presence of schistosomes. A perfusion technique was applied, by injecting small quantity of PBS (pH 7.4) in to the mesenteric blood vessels and making a small puncture on the blood vessel.
The worms were recovered by squeezing out the contents of blood vessels from opposite side of the puncture. The prevalence of schistosomosis in slaughtered cattle was recorded on the basis of adult worms in the mesenteric plexus.

After harvesting, schistosomes were examined under light microscope and were separated based on the morphological characters like appearance of smooth cuticle along with number of testes in male worms and spindle shaped eggs with terminal spine in the uterus of female worms of *S. spindale*. Similarly *S. indicum* was identified by anterior spiny cuticle along with oval shaped eggs with spine at posterior end.

### 2.2. Scanning Electron Microscopy

Detailed morphological features of *S. spindale* were studied under scanning electron microscopy. The worms were fixed in 2.5% Gluteraldehyde in 0.1M phosphate buffer (pH 7.2) for 24 hrs at 4˚C and post fixed in 2% aqueous Osmium tetr oxide for 4 hr. Dehydrated in series of graded alcohols and dried to critical point drying with CPD unit. The processed samples were mounted over the stubs with double-sided carbon conductivity tape, and a thin layer of gold coat over the samples was done by using an automated sputter coater (Model– JOEL JFC- 1600) for 3 minutes and scanned under Scanning Electron Microscope (SEM-Model: JOEL JFC- 5600) at required magnifications as per the standard procedures at RUSKA Lab’s College of Veterinary Science, SVVU, Rajendranagar, Hyderabad, India.

### III. RESULTS

Under light microscopic studies *Schistosoma spindale* male with smooth cuticle, having 3-5 testes (fig. 1) and female with 15-20 spindle shaped eggs inside the uterus (fig. 2). Similarly *S. indicum* worms with spiny cuticle (fig. 3) and female worms were having oval shaped eggs with spine at terminal end (fig. 4& 5).

Under SEM studies The male and female worms of *S. spindale* were observed in copula stage with well-defined gynaecophoric canal, originated from just below the ventral sucker (fig. 6), up to the posterior region of the body (fig. 16).

#### 3.1 Oral sucker

The oral sucker of the male worm was hollow, triangular and sub terminal in position. It has mouth with thick muscular rim without spines (fig. 9). The ventral surface of the oral sucker was completely covered with numerous spines measuring 2-3µm in length (fig. 7). Irrespective of the position of spines on the oral sucker all spines were directed downwards in to the aperture of oral cavity (fig. 8).

#### 3.2 Ventral sucker

The ventral sucker was larger than the oral sucker, pedunculated, round, thick rimmed and situated below the oral sucker (fig. 9). Numerous uniciliated papillae were noticed between the lateral aspects of oral and ventral suckers (fig. 7 & 9) and sharp pointed spines, 2.5µm in length directed towards the center of ventral sucker were situated on the rim of ventral sucker having a width of 20-25 µm. An aspinose area (5-6 µm) was observed (fig. 10) beneath the lower border of rim of ventral sucker. Followed by aspinose area another area of spines comparatively blunt (fig. 11) than the spines of oral sucker and rim of ventral sucker were observed towards the center of ventral sucker. A gradual reduction in the number of spines towards the centre of ventral sucker, showing apparently aspinose area (fig. 12).

#### 3.3 Gynaecophoric canal

The body of male worm increased in width and folded ventrally just behind the ventral sucker to form gynaecophoric canal (fig. 6). The tegument lining of gynaecophoric canal consisted of thick, even by arranged transverse ridges and numerous papillae (fig. 13).
3.4 Tegument

Under higher magnification the tegument of *S. spindale* showed ridged layers with uniciliated and pit like papillae of 3 µm in diameter (fig. 14) and the number of papillae were more in posterior than the anterior part of the body whereas the spines were not observed in between papillae. The cuticular ridges in female were smooth, perforated, compact, dense, coarsely placed when compared to male worm. The ratio of epidermis to papillae is more in female (fig. 15) than the male worm.

3.5 Posterior end

The posterior part of male worm ended in wide conical projection (fig. 17)

IV. DISCUSSION

In the present study the male and female worms of *S. spindale* were in copula stage with well-defined gynaecophoric canal, originated from just below the ventral sucker up to the posterior region of the body. The posterior part of the male worm ends in wide conical projection and similar findings were observed by Agrawal (2000). The oral sucker of the male was hollow, triangular and sub terminal in position with thick muscular having no spines. The ventral surface of the oral sucker was completely covered with numerous spines measuring about 2-3µm in length. Irrespective of the position on the oral sucker, all spines were directed downwards to the aperture of the oral cavity. Similar observations were made by Narain and Mahanta (1999).

The ventral sucker was pedunculated, round and thick rimmed (20-25µm in width), the inner side of which has numerous spines (2.5µm in length) pointed towards the center of ventral sucker. There is aspinulated region beneath the lower border of rim of ventral sucker measuring nearly 5-6µm. Followed by spinulated region the ventral sucker posseses numerous blunt spines which were more in number than the spines on oral sucker. Our findings are in confirmation with the observations of Narain and Mahanta (1999).

Under higher magnification, the tegument of *S. spindale* showed ridged layers with large unciiliated and pit like papillae approximately 3µm in diameter and the number of papillae increased in the posterior end. There was no spination in between uni-ciliated and (or) pit like papillae. The tegument of female *S. spindale* depicts the cuticular ridges as smoothly perforated, compact, densely placed when compared to male worm. The ratio of epidermal papillae was more in female than in the male worm. The present findings could be correlated to the results of Chauan *et al.* (1973), Kruatrachue *et al.* (1983), Gupta and Agrawal (2002).

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BIBLIOGRAPHY
