

## Morphological Observations of Adult Schistosoma Spindale

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**Abstract:** *Schistosoma spindale* is a parasite inhabiting the portal and mesenteric veins of *Bubalus bubalis*. The tegumental surfaces of adult *S. spindale* collected from naturally infected *Bubulus bubulo* were studied by Scanning Electron Microscopy. The inner surface of the male oral sucker possesses many spines. The ventral sucker is a fairly large protrusible organ and is infundibular in form with its margin more or less wavy. It is cup shaped and borne on a peduncle. The ventral sucker possesses spines. The width of the male and female is different at different regions. The lining of the gynecophoric canal is densely spined. The tegument of the female is similar to that of the male. The tegument of both sexes is devoid of spines.

**Key Words:** Gynaecophoric canal, *Schistosoma spindale*, Scanning Electron Microscopic Studies, SEM, Schistosomiasis.

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Date of Submission: 10-11-2018

Date of acceptance: 25-11-2018

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### I. Introduction

*Schistosoma spindale* (*S. spindale*) is the parasite that causes hepato-intestinal Schistosomiasis in cattle which was discovered by Montgomery in Muktesar, India(1,2). Schistosomiasis is a fifth major helminthiasis of domestic animals in the Indian sub-continent(3). Morphological features of Schistosomes show considerable sexual dimorphism. Females live in an extensive ventral groove, the gynaeophoric canal of the shorter but more massive males. The tegument of human schistosomes has been studied extensively by transmission electron microscopy (TEM) (4-6) and by scanning electron microscopy (SEM) (6-11). With the exception of *S. spindale*, studies of the surface architecture of nonhuman schistosomes have not been reported. The present report describes the tegument of adult *S. spindale* as observed by SEM and compares these findings with those of adult *S. mansoni*, *S. haematobium*, *S. japonicum*, and *S.mattheei*.

### II. Materials And Methods

Adult male and female *S. spindale* were obtained from the mesenteric veins of naturally infected *Bubalus bubalis* in Hyderabad, India. The parasites were fixed in 2.5% Gluteraldehyde in 0.05M phosphate buffer (pH 7.2) for 24 hr at 4<sup>0</sup> C and post fixed 2% aqueous Osmium tetroxide in the same buffer for alcohol and processed for 2 hr. After the post fixation samples were dehydrated in series of graded alcohol and processed for critical point drying with Electron Microscopy Science CPD Unit. The dried samples were mounted over the stubs. Finally, applied a thin layer of platinum metal over the sample using an automated sputter coater (JEOL JFC-1600) for 5 min. Then samples were observed and scanned in SEM (JOEL-JSM 5600) at various magnifications. SEM studies were carried as per the principles and techniques described by John and Lonne (17).

### III. Results

Fig.1A presents the anterior end of the male *S. spindale* seen under SEM and highlights oral sucker, ventral sucker and the gynaeophoric canal of parasite. Part of the female worm is in the gynaeophoric canal of the male worm and some part of it is seen outside being coiled. (Fig.1B). Different widths of male (Width: 213 to 217µm) and female (Width: 65.1 µm, 82.4 ,102µm) were observed at different lengths of the parasite, *S. spindale*(Fig 1B). Oral sucker is sub-terminal and is obliquely placed in both male and female. The rim of the oral sucker of the male is muscular and thick(Fig 1C). Its lumen is funnel shaped which terminates at the commencement of the alimentary canal. The union of the oral sucker with the rest of the body is sharply demarcated. The ventral sucker is a fairly large protrusible organ and is infundibular in form with its margin

more or less wavy. It is cup shaped and borne on a peduncle of the male *S. spindale* (Fig 1A, Fig.1C). Numerous sharp spines on the surface of the ventral sucker (Fig.1C).

The male is fairly stouter than the slender long female. It is having gynaeophoric canal having spines to adhere to the female. Female *S.spindale* is seen as a slender tube like structure (Fig.1D). The surface of the tegument of the male and the female *S. spindale* is rough(Fig 1D, Fig 1E and Fig.1F). It is devoid of spines. The gynaeophoric canal shows layers of ridges and grooves with spines on it(Fig.1G).

**Table 1. A COMPARATIVE MORPHOLOGICAL CHARACTERISTICS OF *S. spindale* AND OTHER *S. mansoni*, *S. haematobium*, *S. japonicum*, and *S. mattheei*.**

	Schistosoma species				
	<i>S. spindale</i>	<i>S. mansoni</i>	<i>S. haematobium</i>	<i>S. japonicum</i>	<i>S.mattheei</i>
<b>Source of information</b>	This study	Morris and Threadgold, 1968 (4)	Kuntz et al. 1976 (7)	Sakamoto and Ishii, 1977 (10)	Tullock et al, 1977 (13)
<b>Country</b>	India	Ireland	United States of America	Japan	United States of America
<b>Source of animal</b>	<i>Bubalus bubalis</i> (buffalo)	<i>Mus musculus</i> (albino mice)	<i>Mesocricetus auratus</i> (Golden hamster)	<i>Oryctolagus cuniculus</i> (Laboratory rabbits)	<i>Bulinus (Physopsis) Africanus</i> (freshwater snail)
<b>Shape</b>	Tubule	Tubule	Tubule	Tubule	Tubule
<b>Tegumental surface</b>	rough and devoid of spines	tubercles with spines or receptors and are more concentrated in the middle region.	small bosses and small spines scattered over the entire surface.	prominent and conspicuous depressions and ridges.	noticeable bosses but lacks spines and tegumental thickenings.

#### IV. Conclusion

The major difference between *S.spindale* and other schistosomes *S. mansoni*, *S. haematobium*, *S. japonicum*, and *S.mattheei* that have been studied by SEM are in the tegumental surface. In *S. mansoni*, prominent knoblike protuberances or bosses are present on the male, along with large spines distributed throughout the length of the worm (5, 9). The bosses on *S. haematobium* are small and consist of blunt, low elevations but are present over the entire body (7). *S. japonicum* possesses prominent and conspicuous depressions and ridges. Elevations and spines are absent on the dorsal surface (10). The surface morphology of the adult *S. japonicum* (Chinese, Phillipine and Indonesian strains) showed the surface to be highly spongy and consisted of ridges and papillae (10). *S. mattheei* has noticeable bosses but lacks spines and tegumental thickenings (13). *S. mansoni* females are free of elevations but the posterior end of this species is covered with large, prominent, anteriorly directed spines (5, 14). *S. mansoni* possess tubercles with spines or receptors and are more concentrated in the middle region and in one of the margins of the gynaeophoric canal (14). The female *S. haematobium* has small bosses and small spines scattered over the entire surface (7). *S. japonicum* females lack elevations, but spines are present over most the body anterior to the ventral sucker (10). *S. mattheei* has an essentially smooth integument with some elevations (13). The tegumental surface of adult male and female *S. spindale* was studied under SEM (15) is found to be rough and devoid of spines. The body surface of the male appeared to be fairly uniform from anterior end to posterior end. It was characterized by the presence of transverse ridges and papillae of various types. The tegument of the female worm is covered with smooth and perforated ridges and sensory bulbs with apical nodules (15). The SEM studies on the *S. spindale*

(Jabalpur, India) was studied and the surface was found to be non-tuberculated (16). In the present study the tegumental surface of *S. spindale* is found to be rough and devoid of spines. The surface of the female *S. spindale* is similar to that of the male. The results of the present study and similar studies indicate that noticeable differences exist among the various schistosome species (Table 1). The difference between *S. spindale* and other schistosomes suggests that additional studies of nonhuman schistosomes are warranted. Findings from such studies could lead to a better understanding of structural and functional relationships among the sanguivorous parasites.

#### Acknowledgement

We are extremely grateful to Vivek Vardhini Educational Society, Jambagh, Koti for rendering the laboratory facilities for the Research work undertaken. We are also grateful to Ruska Laboratory, ANGRAU campus, Rajendranagar, Hyderabad, for the Scanning Electron microscopy work.

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**Figure 1. Scanning electron microscopy of S. spindale.**

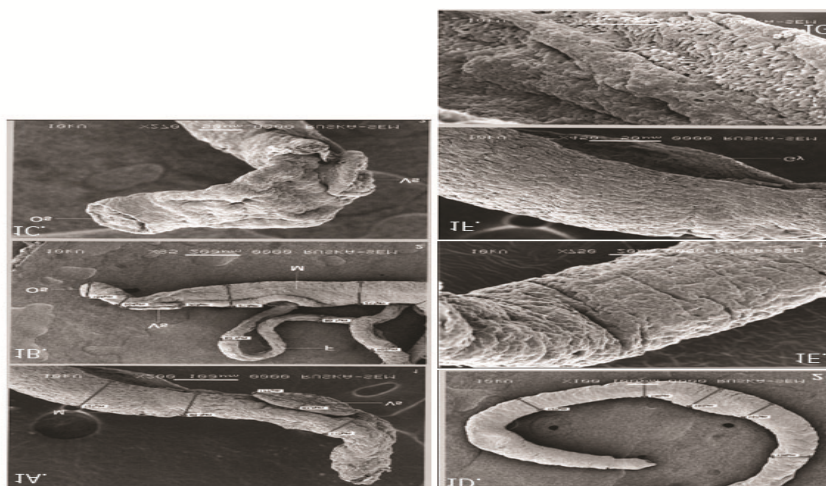


Fig1A. The anterior end of *S. spindale* × 200. Fig1B. The anterior end showing female in the gynaecophoric canal of the male × 85. Fig1C. The anterior end of the male *S. spindale* showing oral sucker and ventral sucker × 270. Fig1D. Female *S. spindale* × 100. Fig1E. The tegument of the female *S.spindale* × 750. Fig1F. The tegument of the male *S. spindale* × 450. Fig1G. The gynaecophoric canal of the male *S. spindale* ×2300.

Vanita Malewar "Morphological Observations of Adult Schistosoma Spindale." IOSR Journal of Pharmacy and Biological Sciences (IOSR-JPBS) 13.6 (2018): 01-03.