Morphological Study Of *Taenia taeniaeformis* Scolex Under Scanning Electron Microscopy Using Hexamethyldisilazane

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**ABSTRACT**

*Taenia taeniaeformis* commonly known as feline tapeworm, is recognized by lack of neck and bell shape of posterior segments. This is known as the ‘broad necked’ tapeworm of cats. The neck is almost as broad as the scolex and segmentation begins immediately behind the scolex. The scolex of *T. taeniaeformis* is armed with a large double circlet of 30 to 40 hooks and four clearly lateral suckers with lack of a neck. The very large hooks are arranged with double and alternating circlet of hooks, and their size 0.36-0.44 mm for the anterior crown and 0.25-27 mm for the posterior one. Therefore, it can be clearly differentiated *T. taeniaeformis* from all other *Taeniae* species microscopically. The samples were dried by hexamethyldisilazane (HMDS) before examination under scanning electron microscopy.

**INTRODUCTION**

*Taenia taeniaeformis* (Cestoda: Taeniidae) is a parasite characterized by a cosmopolitan geographic distribution. The final hosts are carnivores of the families Felidae, Canidae and Mustelidae, including domestic cats and dogs (Nichol, *et al.*, 1981). Adults reach a maximum length of about 60 cm and it occurs as adult tapeworms in the small intestine of carnivores as definite hosts. The intermediate hosts of *T. taeniaeformis* are mouse, rat, cat, muskrat, squirrel, rabbit, other rodent, bat and human. *Cysticercus fasciolaris* is a larval stage of *T. taeniaeformis* which, commonly found in a liver of intermediated host through contaminated water or feed materials with infected cat feaces. There are some sporadic cases were reported in human from Argentina, Czechoslovakia, Denmark and Taiwan (Nichol, *et al.*, 1981; Ekanayake, *et al.*, 1999).

The adult *T. taeniaeformis* can be subdivided into three body sections. The anterior region in called the scolex, which is used to adhere to the intestine of the host species. In *T. taeniaeformis*, the scolex is made up of four large suckers arranged around the sides with double circlet of hooks. Behind the scolex is the neck region, and finally the third region is the strobilus. The neck region is fairly small, almost nonexistent, and it produces the proglottids (Iwaki, *et al.*, 1994). The HMDS treatment seems very satisfactory for biomaterials as same as quality to CPD drying with a great saving in time and without complex equipment (James, 1984; Al-Salihi *et al.*, 2004). Therefore, the objective of this study was to demonstrate the morphological structures of *T. taeniaeformis* scolex under scanning electron microscopy using HMDS.

**MATERIALS AND METHODS**

Collecting specimens and scanning electron microscopy procedure

Scolexes of ten adult *T. taeniaeformis* parasites were collected from one cat which had positive stool examination. In the rapid procedure, specimens were fixed in 2.5% glutaraldehyde,
dehydrated through a graded ethanol series, immersed in hexamethyldisilazane (HMDS) for 5 minutes 3 times, and air dried. Finally removed as much of the HDS as possible and allow the specimen to air-dry. The samples are then ready to mount and sputter coated with gold for scanning electron microscopy.

RESULTS

The scolex is distinctly large, bearing four lateral suckers and a rostellum armed with double and alternating rings of large and small hooks, hooks arranged in a circular pattern with a large double circlet of 30 to 40 hooks, and their size 0.36-0.44 mm for the large anterior hooks and 0.25-27 mm for the small posterior one (Figure). The scolex is a visible shape with four lateral distinct suckers (Figure). Top surface of the rostellum had micro-papillae (Figure 3). Specimens prepared using the HMDS, and the results showed very clear structures and microstructures with excellent surface details were observed. The HMDS treatment required about 15 minutes.

DISCUSSION

The rostellum armed with double and alternating rings of hooks, these hooks might have roles to adhere the scolex of parasite within the gut epithelium of the host and later might due to a damage of intestinal epithelium. Histopathology of stomach and small intestine revealed gastroenteropathy associated with mucosal hyperplasia, and such observation has been recorded in rats infected with larvae of *T. taeniaeformis* (Abella, et al., 1997), where there was proliferation of submucosal glands and severe lymphoid follicular hyperplasia in duodenum. Immunofluorescence assay of fibrosarcoma in liver sections showed concurrence with spindle cell sarcoma (Bannasch, et al., 1980). The scolex often bears suckers which was sometimes able to absorb materials not available to the other body segments, but absorption mainly occurs throughout the segments (Nichol, et al., 1981).

Used the HMDS as a dryer material showed that the morphological structures were very clear and microstructures with excellent surface details were observed. The HMDS treatment required about 15 minutes, whereas the critical point drying procedure required about 1.5 hours (Al-Salihi, et al., 2004). Specimens prepared by the HMDS treatment did not shrink or distort upon air drying (Hochberg and Litvaitis, 2000).

The results showed that HMDS is an effective alternative for preparing parasites for SEM because it saves time and is cheaper compared to critical-point drying (CPD). The evaluation of HMDS as an alternative treatment to CPD for preparing microscopic specimens for SEM and as the primary dehydration solvent, was and compared with the results of earlier investigations using CPD. The results of HMDS dehydration are similar to or better than CPD for resolution of these important taxonomic features. The only unfavorable result of HMDS dehydration was an occasional coagulation of gold residue when the solvent had not fully evaporated before sputter-coating (Bray et al., 1993; Hochberg and Litvaitis, 2000). This chemical hexamethyldisilazane is readily available and cheap, no heating or cooling is needed for using HMDS. Some researchers used as merely dehydrate specimens to 100% alcohol, and then do the two soaks of one-half hour in pure HMDS (i.e. change the HMDS once). Other users agree with finding that HMDS is just as effective or more effective than CPD for producing perfect specimens of various tissues (Nation, 1983).

CONCLUSION

HMDS treatment and subsequent air drying provide good quality scanning electron
micrographs that reveal both macro- and microstructures. The disadvantage of HMDS drying may be a shrinkage and distortion similar to other drying agents. Ease of handling, low cost, and a high rate of success are advantages that favor HMDS desiccation over other drying methods.

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REFERENCES


