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# Morphological characterization of *Haemonchus contortus* in goats (*Capra hircus*) and sheep (*Ovis aries*) in Penang, Malaysia

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**Abstract.** The large stomach worm, *Haemonchus contortus* is an important pathogen of goats (*Capra hircus*) and sheep (*Ovis aries*). This paper describes characteristics of surface cuticular ridges (synlophe) of *H. contortus* adults from the two hosts. There were more ridges in *H. contortus* from goats compared to that from sheep. Total body length, vulvar morphology, spicule length and cervical papillae had been considered as markers of physical adaptation and were studied and described.

## INTRODUCTION

The large stomach worm, *Haemonchus contortus*, commonly known as the 'barber's pole worm' is found in the abomasum of goats and sheep. It sucks blood and causes significant production losses due to morbidity and mortality. Although the worm from both hosts share similar general morphology, differences in the characteristics of cuticular ridges (synlophe) of *H. contortus* recovered from the two animals has kindled much interest to look further into a more detailed morphology of the worm, more so when *H. contortus* is synmpatric in many regions of the world, especially where goats and sheep share the same pastures (Lichtenfels *et al.*, 1986, 1988, 1994). In such conditions, a rapid tool for identification of individual worms is useful. Morphometrics of spicules, vulva flap and cervical papillae are reliable tools for species identification on individual worms, and thus adopted in the present study.

## MATERIALS AND METHODS

Adult *H. contortus* worms were recovered from abomasums of goats and sheep obtained from the city abattoir in Georgetown, Penang. Abomasums were taken to the laboratory, cut open along its greater curvature, and individual adult worms were collected using a dissecting microscope. Morphological identification of specimens was referred to Soulsby (1965). The specimens were preserved in 70% alcohol. Observations of body ridges (synlophe) were made on cross-sections of worms obtained by free-hand cuts using sharp razor blades. Specimens were viewed under the interference contrast light microscope using Image Analyzer program. Total body length, spicule, vulval flap, cervical papillae and gubernaculum observations and measurements were made on worms prepared on permanent mount slides (Patchamuthu, 1993). One hundred worms were used for each observation or measurement.

## RESULTS

Synlophe in *H. contortus* is bilaterally and dorso-ventrally symmetrical, resulting in the left and right being mirror images of each other. *Haemonchus contortus* recovered from goats bear 26 ridges in the region 4 mm from its anterior end (Fig.1) in contrast to that of sheep, which was 24 (Fig. 2). However, at region 8 mm, the ridges were 20 and 22 respectively (Figs. 3 & 4).

Morphometric values of *H. contortus* from goats and sheep are shown in Table 1. Spicule lengths of *H. contortus* in goats were significantly shorter ($p<0.05$) when compared to that from sheep for both right and left spicules. However, there is no significant difference ($p>0.05$) in the gubernaculum lengths of the worm in the two host animals.

The percentage of the different vulvar morphs per host-species is shown in Table 2. The smooth morph was relatively rare in *H. contortus* for both hosts (10% in goats, 15% in sheep) whereas knobbed and linguiform morphs were numerically well balanced with a slight predominance of knobbed females. The morph distribution was similar in the two host animals.

## DISCUSSION

This paper presents recognized characteristics of the common large stomach worms of goats and sheep that make it possible to show some morphological differences in *H. contortus* recovered from the two hosts. The distribution of surface cuticular ridges or synlophe had previously been used by Lichtenfels *et al.* (1986) to distinguish populations of *H. contortus* from *H. placei*. According to Lichtenfels *et al.* (1994), the variations in ridges or synlophe is due to either the presence of short extra ridges in a location or cross overs where one ridge reversed positions with an adjacent ridge.

Lichtenfels *et al.*, (1988) showed that spicule lengths provided the quickest and easiest character used for separating most populations of *H. contortus* and *H. placei*. Gibbons (1979) showed that the relative positions of the spicule are quite variable among the species of the genus *Haemonchus*. However, spicule lengths of *H. contortus* in the present study were generally longer than those reported for *H. contortus* in Australia (Lichtenfels *et al.*, 1988) and North America (Lichtenfels *et al.*, 1994).

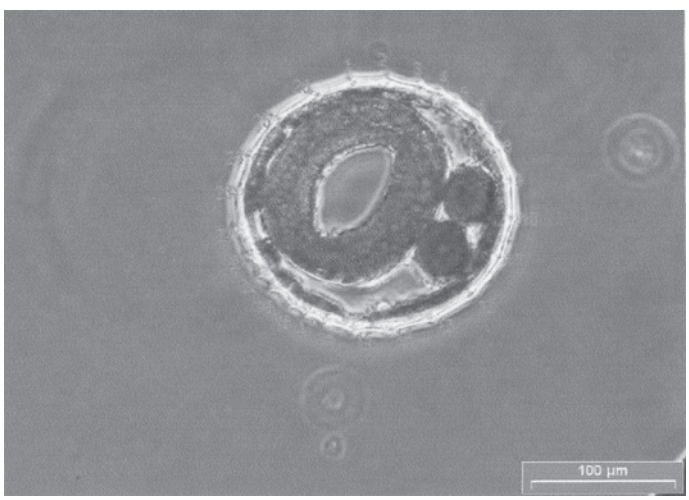


Figure 1. Cross-section of goat *Haemonchus contortus*, bearing 26 ridges/synlophe at region 4 mm from its anterior end (magnification x 40).

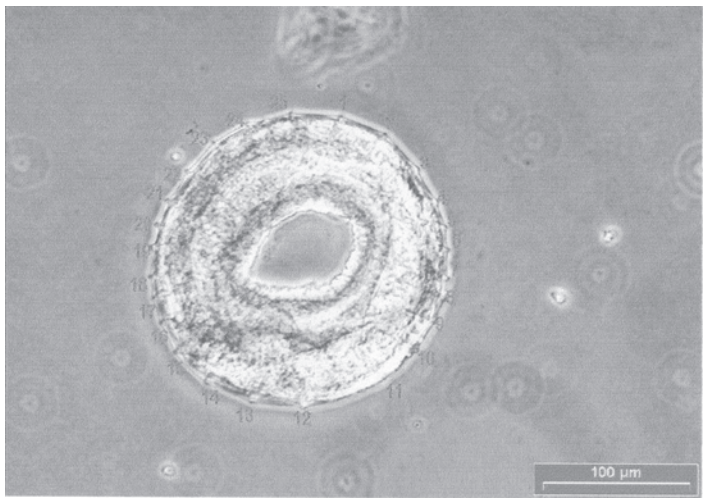


Figure 2. Cross-section of sheep *Haemonchus contortus*, bearing 25 ridges/synlophe at region 4 mm from its anterior end (magnification x 40).

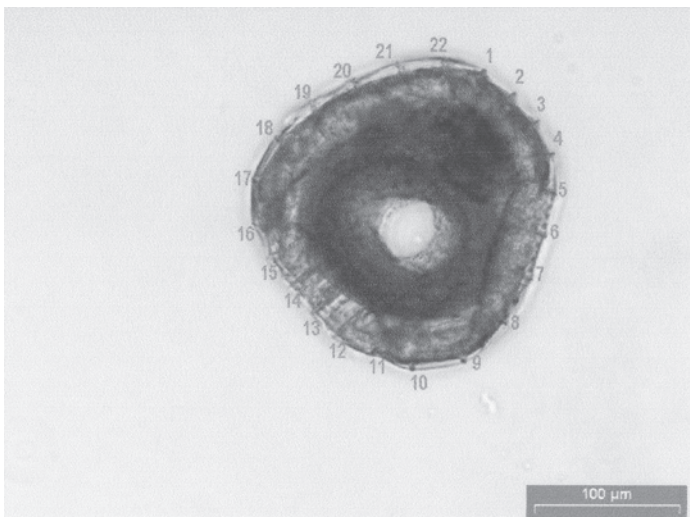


Figure 3. Cross-section of goat *Haemonchus contortus*, bearing 22 ridges/synlophe at region 8 mm from its anterior end (magnification x 40).

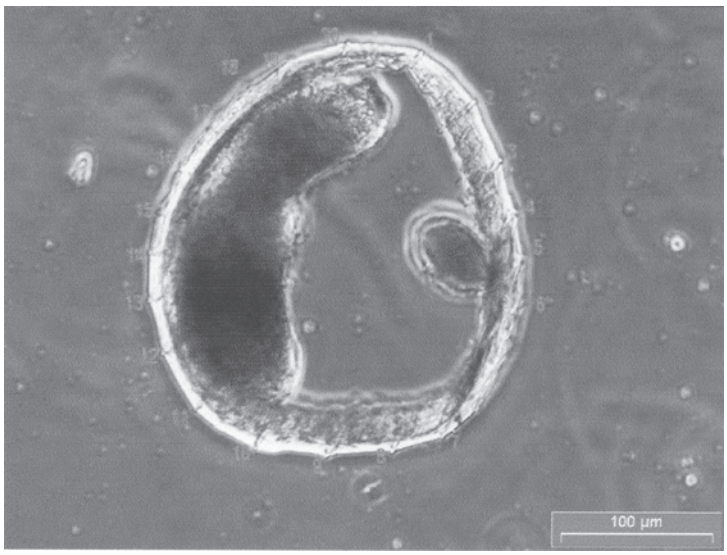


Figure 4. Cross-section of sheep *Haemonchus contortus*, bearing 20 ridges/synlophe at region 8 mm from its anterior end (magnification x 40).

Table 1. Morphometrics of *Haemonchus contortus* in goats and sheep

| Character | *H. contortus* in goats | *H. contortus* in sheep |
|---|---|---|
| Body length ♀ (mm) | 18.8 | 17.8 |
| Body length ♂ (mm) | 11.8 | 12.3 |
| Cervical papillae ♀ # | 319.7 | 333.2 |
| Cervical papillae ♂ # | 319.2 | 335.0 |
| Left spicule length | 446.0 | 483.2 |
| Right spicule length | 453.2 | 489.3 |
| Gubernaculum length | 234.0 | 231.7 |
| Synlophe (4 mm from anterior) | 26 | 24 |
| Synlophe (8 mm from anterior) | 20 | 22 |

measurements ( in micrometers unless noted otherwise) followed by means in parentheses
# measured from anterior extremity

Table 2. Distribution of the *H. contortus* vulvar morphology in the 2 host species

| Host | No. of worms | Linguiform morph (%) | Knobbed morph (%) | Smooth morph (%) |
|---|---|---|---|---|
| Goats | 100 | 26 | 64 | 10 |
| Sheeps | 100 | 31 | 54 | 15 |

In this study, the proportions of the different vulvar morphs (linguiform, knobbed and smooth) remained almost constant irrespective of the host animals. A similar observation has previously been reported by Le Jambre and Whithlock (1968) for *H. contortus*.

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