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Light and Scanning Electron Microscopy on *Parascaris equorum* (Goeze 1782), A Gastrointestinal Nematode Infecting the *Ass equus africanus asinus* (Equidae) in Egypt

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Abstract: The large roundworm, *Parascaris equorum*, is an important cosmopolitan nematode parasite of foals. The present study introduced morphological description of nematode worms isolated from the gastrointestinal tract of the donkey (ass) by light and scanning electron microscopy. Worms were freshly isolated from the gastrointestinal tracts of a dead male donkey *Equus africanus asinus* (Equidae) from the animal stables at the Giza Zoo. Macroscopically, the recovered worms from the gastrointestinal tract of the dissected donkey were long, whitish and unsegmented, with a worm burden of ten worms.Light and scanning electron micrographs revealed that both sexes have broad anterior end equipped by three interlocked lips, two sub-ventral and one dorsal with two or more cephalic papillae. The interlocked lips left an interlabium in between. The tail of the male was long, with a triangular and pointed terminal end, with numerous papillae arranged in longitudinal rows. No caudal alae were observed. Female was with conical terminal end and anal opening. The parasite recorded was compared with those isolated previously and it was shown that it belongs to the genus *Parascaris* with most of the morphological features agreed with those of *P. equorum*.

Key words: *Parascaris equorum* · Equidae · Morphology · Light And Scanning Electron Microscopy

INTRODUCTION

Livestock are of high economic importance [1-3]. Multi-purposes animals used for the production of mutton,milk, wool and skin [3]. Veterinary helminthology is the study of worms of economic domestic mammals and birds [4] with the attention now is focused on species with significant impacts on domestic animal [3]. Helminth parasites are widespread among livestock and wildlife in ecosystems around the world [3]. The most important and dangerous nematodes are those infecting the gastrointestinal system of livestock [5]. *Parascaris equorum* is the large roundworm and cosmopolitan nematode parasite of horses and donkeys [6]. The prepatency period of *P. equorum* is about 10–15weeks [6]. It can persist for many years in stables and on pasture althoughthe good anthelmintic control programs. Animals are highly susceptible to die as a result of intestinal rupture by parasitic nematodes [7]. Moderate to high infection levels may cause respiratory symptoms and bad appetite associated with weakness, decreased growth, enteritis and occasionally obstruction and peritonitis [8]. The life cycle of these parasites followed as: adult females lay eggs in the small intestine of the host animals, where they pass into the environment within the feces. The infective stage is a second stage larva L2; development requires approximately 10 days at temperatures of 25°C to 35°C. Larvated eggs can survive in the environment for up to five years and infection is acquired through inadvertent ingestion of eggs. They emerge from eggs within the alimentary tract of the host and migrate through the liver and lungs before returning to the small intestine approximately one month later as fourth stage larvae (L4). Ascarids mature progressively in the small intestine and achieve patency about 75 to 80 days after infection [9]. The present study introduced morphological description of the nematode worms isolated from the gastrointestinal tract of the donkey *Equus africanus asinus* (Equidae) by light and scanning electron microscopy.

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MATERIALS AND METHODS

Nematode worms were freshly isolated from the gastrointestinal tracts of a dead male donkey *E.africanus asinus* from the animal stables at the Giza Zoo, Egypt. The work was made according to the guidelines of animal use and welfare, Institute of Animal Care and Welfare, Cairo University, Egypt. Worms were immediately washed several times in physiologic saline and then in 10 %acetic acid in order to remove any mucus or host debris. They were fixed in 10% formalin solution for light microscopy and 3% Glutaraldehyde (pH 7.4) buffered in 0.1 Sodium cacodylate budffer for scanning electron microscopy (SEM), then transported to the Parasitology laboratory, Zoology Department, Faculty of Science, Cairo University where they further examined. Five to10 mm of the cephalic and caudal ends of male and female worms were cut away with a blade.For light microscopy, samples were cleared in a solution of lactophenol and photomicrographs were taken using Carl Zeiss 19386 photomicroscope equippedby a power shot Canon digital Camera (A 630). Identification was according to the key published by Soulsby [10, 11] and Lichtenfels [12]. Measurements were taken as a range (mean ±SD). Scanning electron microscopy was according to Madden and Tromba [13]. After worms fixation in glutaraldehyde for 18-24 h and further post-fixed in buffered osmium tetroxide in the same buffer, dehydration in ascending alcohol series was employed. After passing through an ascending series of Genosolv-D, they were processed in a critical point drier BBomer-900 with Freon 13 and sputter coatedwith gold–palladium in a Technics Hummer V and examined with an Etec Autoscan at 20 kV Jeol scanning EM.

RESULTS

***Parascaris equorum* Goeze (1782), Figs. 1-13**

Family: Ascarididae: Macroscopically, the recovered worms from the gastrointestinal tract of the dissected donkey were long, whitish and unsegmented, with a worm burden of 10 worms. Male and female worms were distinguished externally by the naked eyed, where male worms possessed a wrapped end while females have a straight end. Males were 14–17(16 ± 2) cm long while females were 16–21 (19 ± 2) cm.

Light and scanning electron micrographs revealed that both sexeshave broad anterior end equipped by three interlocked lips, two sub-ventral and one dorsal with two or more cephalic papillae. The interlocked lips left an interlabium in between. Each lip beard a single row of triangular teeth with a pointed ends. Cuticle was transversely striated with remarkable narrow annules. The tail of the male was long, with a triangular and pointed terminal end,with numerous papillae arrangedin longitudinal rows. No caudal alae were observed. Female was with conical terminal endand anal opening.

DISCUSSION

Donkeys (*Equus asinus*) are among the early domesticated equines that have been around as long as mankind [14]. The domestic donkey belongs to the genus *Equus* and family Equidae. It is believed that all domestic donkeys in the world are descended from African wild ass. In the developing countries, there are estimated 110 million of equines. Equines as a mean of transport for material provides livelihood to a number of rural and semi urban population of the world, they have prominent position in the agricultural systems of many developing countries [14]. Gastrointestinal parasitism identified as one of the most important problems for equids in developing countries [15]. *P. equorum* is a parasite of the small intestine, it is worldwide in distribution. Although found usually in small numbers in adult horses and donkeys, it is mainly a problem in foals and yearlings [16]. Soulsby [17] stated that hotness dry conditions and direct sunlight kill the eggs infew weeks. During the current study, the gastrointestinal tract of the donkey was found to be infected with only the described nematode, this finding agree with Mulate [18]; Yoseph *et al.* [15], they stated that of the all examined horses and donkeys during their studies were foundto be positive at least for one type of helminth regardless of sex, age, animal purpose and altitude. They have reported 100 % strongyles infections in donkeys. Other studies also reported very high prevalence of strongyles, between 90 and 100% [5, 19, 20]. The morphological description of thewormisolated from the present study revealed that it belongs to the genus *Parascaris*, this coincide with the studies reported by many authors, Yorke and Maplestone [21] who originally described this ascarid with the light microscope and a few of the current texts in veterinary parasitology refer to the original description given by these authors.Each lip in the described parasite in the present study beard a single row of triangular teethes with a pointed ends, the shape and distribution of the denticles similar to descriptions of other ascaridoid nematodes [22]. Madden and Tromba [13] found that the shape and size of denticles in *Ascari ssuum* are related to the age of the

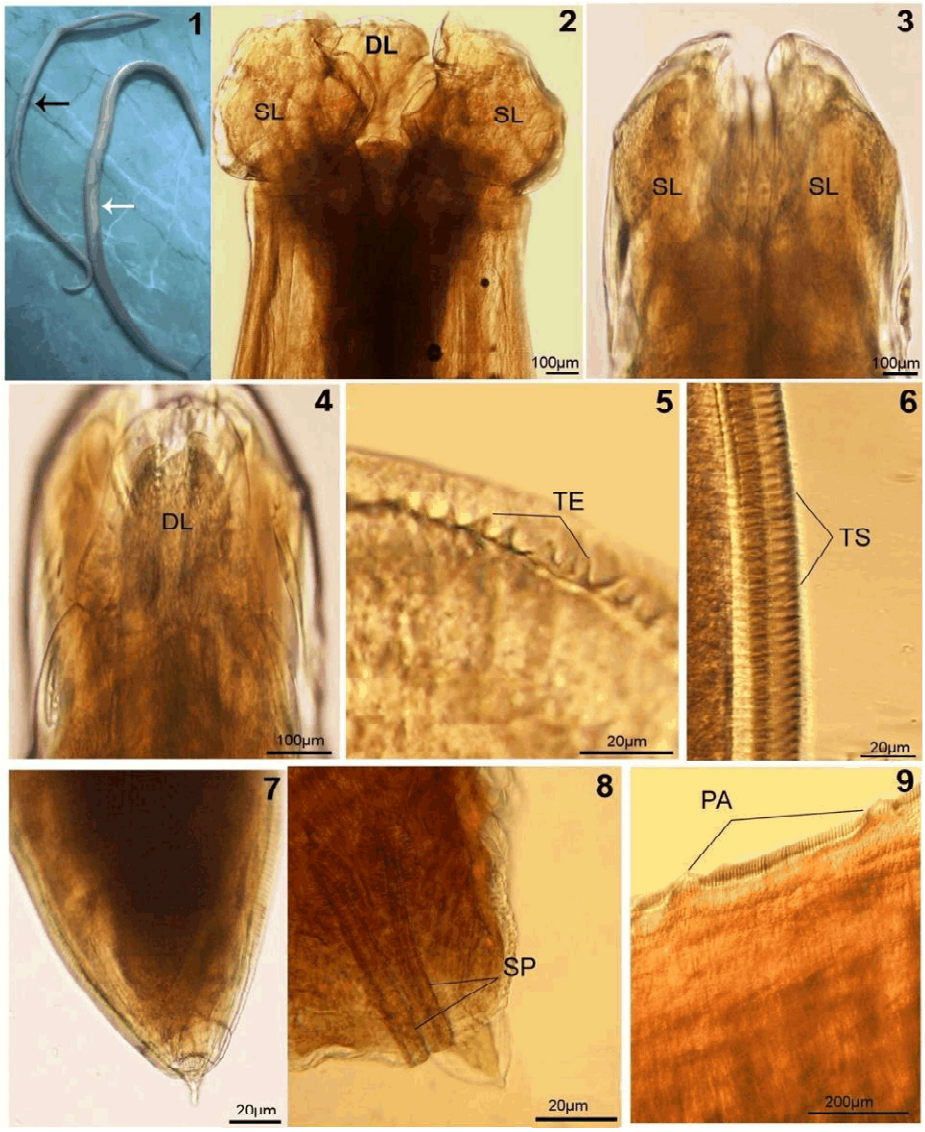

Fig. 1: A photograph of *Parascaris eqeorum* infecting intestine of the donkey *Equus africanus asinus* (Equidae), male (black arrow) and female (white arrow) worms.

Figs. 2-9: Photomicrographs showing high magnifications of: 2-4: The broad anterior end equipped by a large dorsal lip (DL), two sublateral lips (SL). 5: row of triangular teeth (TE) with pointed ends. 6: Transverse striations (TS) of the surrounding body cuticle with clear demarcations and striation. 7 &8: The posterior ends of: 7: Female with a conical end. 8: Male terminated at two short spicules (SP). 9: male papillae (PA).

wormsand can be regarded as functional changes dueto wear on the labia and denticles as these ascaridsgraze and feed on the intestinal mucosaand contents of the host. Due to this wear on the denticles with increasing age, the use of denticle shape and size is of questionable value in differentiating these ascaridoid nematodes at the genericand species level. The general position and arrangement of pre- and postanal papillae in the male are similar to previous light microscopedescriptions of *P. equorum* [23]. The caudal end of female *P. equorum*as described above is similar to the descriptions given by Yorke and Maplestone [21] and Lichtenfels [23].

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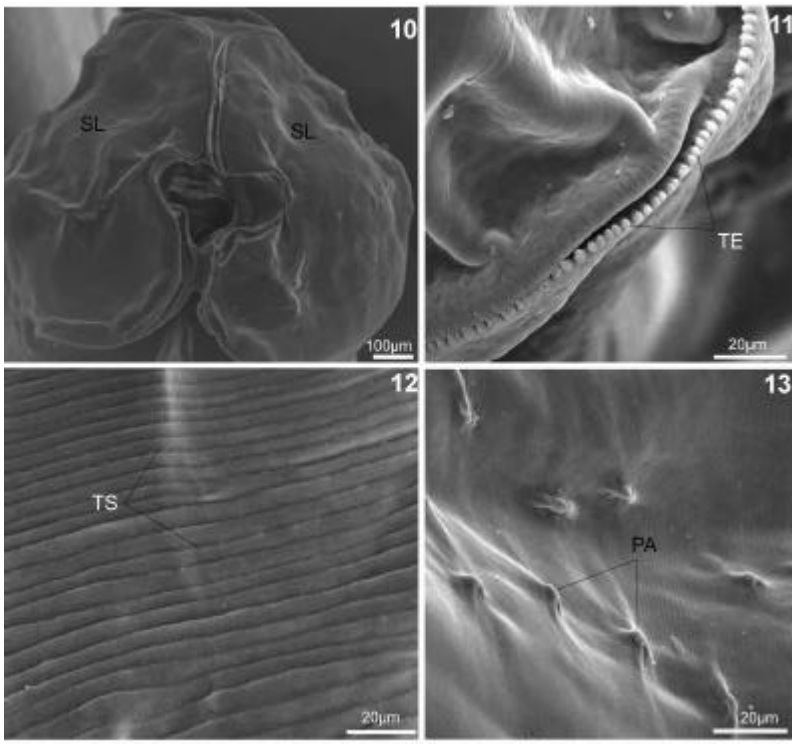

Figs. 10-13: Scanning electron micrographs showing high magnifications of: 10: The anterior end of the adult worm, two subventral lips (SL) are observed. 11: Row of triangular teeth (TE) with pointed ends. 12: Transverse striations of cuticle (TS). 13: Male papillae (PA).

Figs. 10-13: Scanning electron micrographs showing high magnifications of: 10: The anterior end of the adult worm, two subventral lips (SL) are observed. 11: Row of triangular teeth (TE) with pointed ends. 12: Transverse striations of cuticle (TS). 13: Male papillae (PA).

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