[Jpn. J. Parasitol., Vol. 45, No. 1, 43–46, February, 1996]

Research Note

Mermis sp. Found from Human Urine in Kochi Prefecture, Japan (Nematoda: Mermithidae)

HIDEO HASEGAWA[1)], MASATAKA KORENAGA[2)], HIDEO KUMAZAWA[2)] AND KYOKO IMAMURA[2)]

[1)]*Department of Parasitology and Research Center of Comprehensive Medicine, University of the Ryukyus, Nishihara, Okinawa 903-01, Japan.*
[2)]*Department of Parasitology, Kochi Medical School, Nankoku, Kochi 783, Japan.*
(Accepted February 6, 1996)

Key words: *Mermis* sp.; Mermithidae; Nematoda; human urine; Japan.

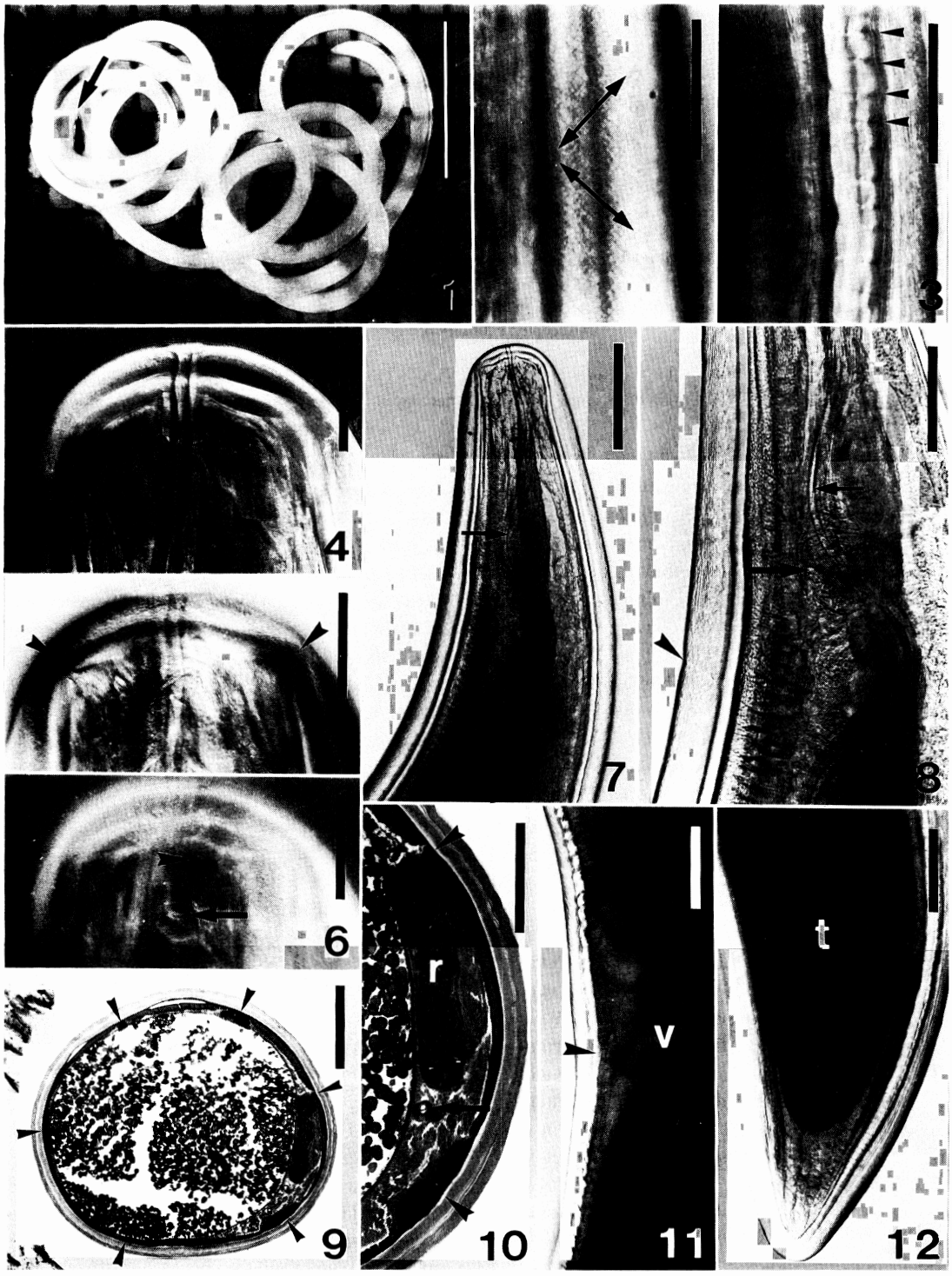
The nematodes of the family Mermithidae (Adenophorea: Enoplida: Mermithoidea) have a peculiar life history in that the larvae are parasitic in invertebrates, mostly insects, and the adults are free-living in soil or aquatic environment (Hyman, 1951). Some of the mermithids have a large body often exceeds 10 cm in length. At least 10 cases of association of mermithids with humans have been reported from various areas of the world (Poinar, 1979, 1988). In Japan, Miyazaki (1949) recorded *Agamomermis* sp. discharged in feces from a 5-year-old boy. Recently we had an opportunity to observe a nematode that was suspected to have been passed with urine by a woman in Kochi Prefecture, Japan. A close examination has revealed it to be a mermithid.

The worm was collected in a nursing home for the aged in Takaoka County, Kochi Prefecture, Japan. Most of the inmates had dementia of various degree and nocturnal poriomania. A matron on duty on 14 October 1995 found the worm in fresh urine in a Japanese-style water-closet bowl in the lavatory for staff at 11 p.m. Abnormal sign such as contamination of blood or mucus was not noticed in the urine. Because the Japanese-style water-closet was seldom used by the staff, the matron thought that some female inmate had urinated. However, the inmate urinated has not been identified. Recently the nursing home had experienced some enterobiasis cases, the matron therefore suspected that the worm was discharged by the inmate. The worm was collected and put into tap water, and submitted to the health office of the county. Then, the worm was sent to the Department of Parasitology, Kochi Medical School, for identification on 17 October 1995.

On receipt, the worm was actively motile, and it remained alive for subsequent 10 days in tap water. On 28 October 1995, the motile worm was fixed with 70% ethanol at 70°C. It was cleared in a glycercol-alcohol solution for microscopical observation. In order to examine the inner structure, the middle portion of the worm was resected, embedded in paraffin, sectioned at 8 μm of thickness, and then stained with hematoxylin and eosin in usual procedure. The specimen was deposited in the Meguro Parasitological Museum, Tokyo, with the accession number MPM-19692.

The worm was large, glossy white and cylindrical, forming coils on the ventral surface (Fig. 1). The anterior and posterior ends were tapered. The worm was 133 mm long and 0.6 mm wide in the midbody. The body was covered by double cuticle, and the outer cuticle had fine cross fibers (Fig. 2) and the inner cuticle was striated transversely (Fig. 3). The cephalic end was round and has 4 cephalic papillae and 2 lateral labial papillae (Figs. 4 and 5). The amphidial pores were large, opening slightly poste-

Correspondence: Hideo Hasegawa, h1949105@med.u-ryukyu.ac.jp
長谷川英男[1]，是永正敬[2]，熊沢秀雄[2]，今村京子[2]
（琉球大学医学部寄生虫学教室・同地域医療研究センター，[2]高知医科大学寄生虫学教室）


1
3
4
7
8
6
9
10
r
11
v
12
t

rior to the lateral labial papillae (Fig. 6). The mouth was minute (Fig. 4). The slender pharynx had a thin cuticular wall and was winding beneath the body wall of the right side of the worm, extending to the mibody (Figs. 7 and 8). The nerve ring was situated at 410 μm from the cephalic apex (Figs. 6 and 7). The excretory pore was recognized only on the outer cuticle, and was situated at 503 μm from the cephalic extremity. The pseudocoelom from the level of excretory pore to immediately anterior to the caudal end was mostly occupied by a sac-like structure filled with opaque granular substance (Figs. 7, 11 and 12). In the cross-section of the midbody, 6 chords, 3 large and 3 minute, were present (Fig. 9). In the right side of the cross-section, the pharynx was observed as a minute pore, and a flat tube-like structure (presumably the uterus) composed of 1 layer of cuboidal cells was seen (Fig. 10). In the inner cuticle at midbody, vulva formation was visible ventrally, and a tubular vagina was connected to the vulva (Fig. 11). Posterior end was conical and anus was not discernible (Fig. 12).

Despite its large body, present worm is apparently in a juvenile stage because its cuticle is doubled suggesting a premolt stage. Such a large larva is unusual in the nematode parasites of vertebrates but is often observed in Mermithidae parasitic in invertebrates (Hyman, 1951). The presence of 6 chords is also a peculiar feature of the mermithids that possess 6 or 8 chords, being distinguished from the nematodes of vertebrates (Chitwood and Chitwood, 1950; Hyman, 1951). The winding slender pharynx is also characteristic of the mermithids, and the sac-like structure filled with granular material corresponds to the trophosome, a nutrient storage organ of the mermithids transformed from the intestine (Chitwood and Chitwood, 1950; Hyman, 1951). The absence of the excretory pore in the adult and the absence of the anus in adult female are also characteristic of the mermithids (Chitwood and Chitwood, 1950; Hyman, 1951). According to the key provided by Poinar (1977, 1979), the present worm belongs to the genus *Mermis* Dujardin, 1842 (Mermithoidea: Mermithidae) by having 4 cephalic papillae and 2 lateral labial papillae. The presence of vulva and vagina formations indicates that the worm is a postparasitic female juvenile.

Among the 10 previously reported cases of association of mermithids with humans, the worms were recovered from the mouth (2 cases), urethra (3 cases) and excreta (5 cases: 1 in urine, 3 in feces and 1 not specified) (Poinar, 1979, 1988; Miyazaki, 1949). However, it is uncertain if human parasitism actually occurred. In the 2 cases in which mermithids were found from the mouth, it has been surmised that the child encountered the worm through ingesting fruits infested by a parasitized insect (Poinar, 1979) and that the mermithid was presumably carried on the fur of pet dog or cat to the vicinity of the 1-month-old infant on bed and was attracted to the moist mouth (Poinar, 1988). When mermithids were found in the feces, it has been considered that the worms were ingested with food and passed unharmed through the digestive tract or else that the defecated mass was contaminated by postparasitic juveniles that emerged from coprophilic insects

Figs. 1–12 *Mermis* sp. collected from the toilet bowl in a nursing home in Kochi Prefecture, Japan.
Fig. 1 Whole worm. Arrow indicates the cephalic end. Scale bar: 5 mm.
Fig. 2 Cross fibers in the outer cuticle. Arrows indicate directions of the fibers. Scale bar: 50 μm.
Fig. 3 Transverse striations on the inner cuticle (arrowheads). Scale bar: 50 μm.
Fig. 4 Cephalic extremity showing the pharynx (arrow). Scale bar: 50 μm.
Fig. 5 Cephalic extremity showing 2 of 4 cephalic papillae (arrowheads). Scale bar: 50 μm.
Fig. 6 Cephalic extremity showing the amphidial pore (arrow) and lateral labial papilla (arrowhead). Scale bar: 50 μm.
Fig. 7 Anterior part showing the pharynx (arrow). Scale bar: 200 μm.
Fig. 8 Magnified view of Fig. 7 showing the pharynx (small arrow), nerve ring (large arrow) and excretory pore (arrowhead). Scale bar: 100 μm.
Fig. 9 Cross-section through the midbody showing 3 large and 3 small chords (arrowheads). Scale bar: 200 μm.
Fig. 10 Magnified view of Fig. 9 showing the pharynx (arrow), chords (arrowheads) and reproductive tube (r, presumably uterus). Scale bar: 100 μm.
Fig. 11 Magnified view of the ventral side of midbody showing the vulva (arrowhead) and vagina (v). Scale bar: 200 μm.
Fig. 12 Posterior extremity. t: trophosome. Scale bar: 200 μm.

visiting the sites (Poinar, 1979).

From Japan, Uchikawa *et al.* (1988) reported a case in which a motile nematode was found in the urine from a woman with chyluria in Kagoshima Prefecture. The worm was a male adult possessing 2 spicules, and was considered to belong to one of three superfamilies: Filarioidea, Diplotriaenoidea, or Aproctoidea. However, it was unusual as a filarial parasite because it lacked caudal papilla (Anderson and Bain, 1976). In mermithid male adults, the caudal papillae are numerous but are often minute and hardly discernible (Rubtsov, 1978). Although Uchikawa *et al.* (1988) did not mention or figure the arrangement of cephalic papillae and the number of chords, it is strongly suspected that the worm belongs to Mermithidae because a slender winding pharynx is seen in the photomicrograph (Fig. 2 of Uchikawa *et al.*, 1988).

Although the present case could not completely exclude the possibility that the mermithid had some association with human body, it is strongly suggested that the worm has emerged from some insect in the lavatory and entered the toilet bowl. Besides mermithids, various arthropod-parasitic and free-living helminths could appear in the water-closet bowl. Careful identification should be made on such helminths because they may be often mistaken as parasites passed from human body.

Acknowledgment

Sincere gratitude is expressed to Dr. M. Machida, National Science Museum, for his kindness in lending us relevant literatures, and to Prof. Y. Hashiguchi, Department of Parasitology, Kochi Medical School and Prof. Y. Sato, Department of Parasitology, University of the Ryukyus, for their kindness in reviewing manuscript.

References

1) Anderson, R. C. and Bain, O. (1976): Keys to Genera of the Order Spirurida. Part 3. Diplotriaenoidea, Aproctoidea and Filarioidea. In: R. C. Anderson, A. G. Chabaud and S. Willmot (eds.) CIH Keys to the Nematode Parasites of Vertebrates. Commonwealth Agricultural Bureaux, Farnham Royal, Buckinghamshire, England, 116 pp.
2) Chitwood, B. G. and Chitwood, M. B. (1950): An Introduction to Nematology. Monumental Printing Co., Baltimore, Maryland, U.S.A., 213 pp.
3) Hyman, L. H. (1951): The Invertebrates. Vol. III Acanthocephala, Aschelminthes and Entoprocta. The Pseudocoelomate Bilateria. McGraw-Hill Book Co., New York, 572 pp.
4) Miyazaki, I. (1949): A rare case of *Agamomermis* (larval mermithid) passed in human feces. Tokyo-iji-shinshi, 66, 26 (In Japanese).
5) Poinar, G. O., Jr. (1977): CIH Key to the Groups and Genera of Nematode Parasites of Invertebrates. Commonwealth Agricultural Bureaux, Farnham Royal, Buckinghamshire, England, 43 pp.
6) Poinar, G. O., Jr. (1979): Nematodes for biological control of insects. CRC Press, Boca Raton, Florida, U.S.A., 277 pp.
7) Poinar, G. O., Jr. (1988): *Mermis nigrescens* (Mermithidae: Nematoda) recovered from the mouth of a child. Am. J. Trop. Med. Hyg., 39, 478–479.
8) Rubtsov, I. A. (1978): Mermithids: classification, importance and utilization. Izdatelstvo "Nauka", Leningrad, 207 pp (In Russian).
9) Uchikawa, R., Setoue, K., Kagei, N. and Sato, A. (1988): Unidentification filarioid worm discharged into human urine in Japan. Jpn. J. Parasitol., 37, 343–346.