[Jap. J. Parasit., Vol. 21, No. 4, 257-261, 1972]

Terranova (Nematoda : Anisakidae) Infection in Man II. Morphological Features of *Terranova* sp. Larva found in Human Stomach Wall

TSUTOMU KOYAMA, MITSUYOSHI KUMADA
Department of Parasitology, National Institute of Health, Tokyo 141, Japan
HIROMICHI SUZUKI, HAJIME OHNUMA, YOICHI KARASAWA
Karasawa Hospital, Asahikawa 070, Hokkaido, Japan
MASASHI OHBAYASHI
Department of Parasitology, Faculty of Veterinary Medicine, Hokkaido University, Sapporo 060, Hokkaido, Japan
AND
MUNEO YOKOGAWA
Department of Parasitology, School of Medicine, Chiba University, Chiba 280, Japan

(Received for publication ; June 15, 1972)

During the past four years between 1969 and 1972, thirty-six human cases of intragastric infections with larval nematodes were found on patients who had complained of acute abdominal pain and visited Karasawa Hospital, Asahikawa, Hokkaido. The penetration of larvae into the wall of stomach was endoscopically confirmed in all the cases, sometimes accompanied by bleeding spot, localized swelling of mucous membrane or hemorrhagic erosion, and all larvae were removed from the stomach wall by means of biopsy technique. Some of them were identified as *Terranova* sp. larvae based on their morphologic features. This report seems to be the first publcation on the morphological features of the larva removed from human stomach wall.

Materials and Methods

The larvae, after removing from the stomach wall, fixed with 10% formalin were immersed in glycerin to obtain the transparent preparations, and then, several portions of the larvae were morphologically examined. Parasites were sectioned at 10 μ and stained with Mayer's hematoxylin and Eosin Y for the detailed investigation on their internal structures.

Results

On the basis of the morphologic characteristics, most of the worms were identified as *Anisakis* sp. larvae (Type I), and five worms as *Terranova* sp. larvae (Type A) according to the description of Koyama *et al.* (1969b).

The clinical findings on the cases of *Terranova* sp. larva (Type A) infection are very similar to those of anisakiasis already described by many investigators (Asami *et al.*, 1965 ; Otsuru *et al.*, 1965 ; Yokogawa and Yoshimura, 1965, 1967). The detailed clinical features are described in the previous paper (Suzuki *et al.*, 1972b).

Five specimens of *Terranova* sp. larvae obtained are about 35 mm in length and

The abstract of the present paper was read at the Forty-first Annual Meeting of the Japanese Society of Parasitology held in April, 1972, in Okayama (Suzuki *et al.*, 1972a)

Table 1 Several characteristics of *Terranova* sp. larva found in the stomach wall of man

Boring tooth	+	Intest. caecum	+	Genital organ	−
Mucron	+	Renette cell	+	Vulva	−
Vent. append.	−	Excretory pore	Between subventral lips	Interlabium	−

Table 2 Several characteristics on the cross section of *Terranova* sp. larva found in the stomach wall of man

Lateral chord	Number of muscle cells in the body wall	Intestine			Excretory organ (Renette cell)
		Wall	Cell number	Lumen	
Large butterfly-shaped	280 or more	Thick	About 120	Wide	Runs from the level of hind oesophagus to some distance behind the ventriculus Large banana-shaped

0.8 mm in width, being colourless and transparent when they are alive. A boring tooth is present at the anterior end of the body and a mucron at the posterior end but not any interlabium between lips. A ventriculus and a short intestinal caecum (Fig. 1) are present but ventricular appendix is lacking (Table 1). The excretory pore is situated between the subventral lips. The excretory organ runs from the level of hind oesophagus to some distance behind the ventriculus. The anlage of genital organ is invisible.

The main characteristics on the cross section of the larva are: a banana-shaped excretory organ, a pair of butterfly-shaped lateral chords, a large ventriculus, an intestine with wide lumen and thick wall, a small interorganic space in the body cavity, and about 280 muscle cells in the body wall (Table 2, Figs. 2 and 3).

Measurements of several organs of the worm are also shown in Table 3.

These data are almost identical to those obtained by Koyama *et al.* (1969 a, b, c, 1970) on *Terranova* sp. larvae (Type A) isolated from marine fishes.

Discussion

It has been said that the nematodes belonging to the genus *Terranova* are naturally parasitic on marine mammals and not on other mammals. However, Kitayama *et al.* (1967) found naturally infected *Terranova* sp. larvae in the canine stomach. On the other hand, Otsuru *et al.* (1968), who tried an experimental infection of rabbits with *Terranova* sp. larvae, reported that the larvae invaded into the wall of the stomach of rabbits. Kikuchi *et al.* (1970, 1972) also obtained the same result after experimental infections with *Terranova* sp. larvae to rabbits and dogs. But, so far as we know, there has been no record about the human infection with this parasite. Therefore, this communication seems to be the first report of human cases of *Terranova* infection.

As these larvae are parasitic on various kinds of marine fishes (Otsuru *et al.*, 1968; Koyama *et al.*, 1969 b; Hatada, 1970), the infection probably takes place by eating raw marine fishes. It should be noted that some of acute epigastric pains may be caused also by *Terranova*, in addition to *Anisakis*.

Summary

Five specimens of *Anisakis*-like larvae removed by means of biopsy technique under the gastroscopic observation from the stomach

Table 3 The measurement of *Terranova* sp. larvae from the stomach wall of man

Length (mm)	Width (mm)	Oesophagus (mm)			Intestinal caecum (mm)	Tail (mm)
		Muscular	Glandular (Ventriculus)	Total		
34.1	0.84	2.11	1.09	3.20	0.64	0.09
29.7—40.0	0.72—0.92	1.94—2.26	0.70—1.32	2.64—3.58	0.42—0.84	0.08—0.12

α	β_1	β_2	β_3	γ	W	Y
Body length / Body width	Body length / Oesoph.	Body length / Muscul. part of oesoph.	Body length / Ventriculus	Body length / Tail	Ventriculus / Intest. caecum	Body length / Intest. caecum
40.76	10.68	16.13	32.55	392.56	1.70	55.20
36.22—43.48	9.37—11.25	13.93—17.70	28.65—42.43	333.33—496.67	1.57—1.94	46.56—70.71

walls of patients suffering from acute abdominal symptoms at Karasawa Hospital, Asahikawa, Hokkaido were identified as *Terranova* sp. larva (Type A). The morphological features of these larvae were described since these worms were first found from human stomach wall.

Acknowledgement

We are indebted to Dr. T. Ishizaki, Department of Parasitology, National Institute of Health, for his continued interest and counsel throughout the course of this work.

References

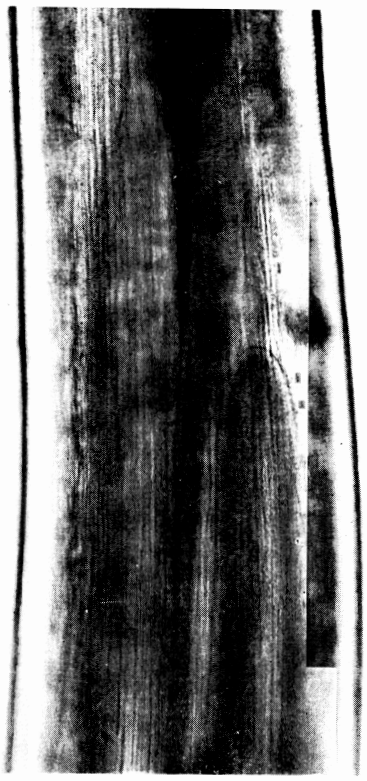
1) Asami, K., Watanuki, T., Sakai, H., Imano, H. and Okamoto, R. (1965): Two cases of stomach granuloma caused by *Anisakis*-like larval nematodes in Japan. Am. J. Trop. Med. & Hyg., 14, 119–123.
2) Hatada, T. (1970): A survey on Anisakidae larvae found in fishes and cephalopods caught in the Seto Inland Sea and the Japan Sea. Bull. Publ. Health Inst. of Hyogo Pref., 5, 34–43 (in Japanese).
3) Kikuchi, S., Kosugi, K., Hirabayashi, H. and Hayashi, S. (1970): On the pathogenesis of *Terranova* larvae from codfish against dogs and rabbits. Jap. J. Parasit., 19, 340 (in Japanese).
4) Kikuchi, S., Kosugi, K., Hirabayashi, H. and Hayashi, S. (1972): Studies on the pathogenicity of the larvae of a species of *Terranova* (Anisakinae, Nematoda) to experimental animals. Yokohamaigaku, 22, 297–304 (in Japanese).
5) Kitayama, H., Ohbayashi, M., Satoh, H. and Kitamura, Y. (1967): Studies on parasitic granuloma in the dog. Jap. J. Parasit., 16, 28–35 (in Japanese).
6) Koyama, T., Kobayashi, A., Kumada, M., Omibuchi, Y., Oshima, T., Kagei, N., Ishii, T. and Machida, M. (1969 a): Histological study on Anisakinae larvae found in marine fishes and squids. Jap. J. Parasit., 18, 353–354 (in Japanese).
7) Koyama, T., Kobayashi, A., Kumada, M., Komiya, Y., Oshima, T., Kagei, N., Ishii, T. and Machida, M. (1969 b): Morphological and taxonomical studies on Anisakidae larvae found in marine fishes and squids. Jap. J. Parasit., 18, 466–487 (in Japanese).

8) Koyama, T., Kobayashi, A., Kumada, M., Oshima, T., Kagei, N., Ishii, T. and Machida, M. (1969 c): Histological study on Anisakidae larvae found in marine fishes and squids. Jap. J. Parasit., 18, 650 (in Japanese).
9) Koyama, T., Kobayashi, A., Kumada, M., Oshima, T., Kagei, N., Ishii, T. and Machida, M. (1970): On the excretory system of Anisakidae larvae. Jap. J. Parasit., 19, 339–340 (in Japanese).
10) Otsuru, M., Hatsukano, T., Oyanagi, T. and Kenmotsu, M. (1965): The visceral migrans of gastro-intestinal tract and its vicinity caused by some larval nematode. Jap. J. Parasit., 14, 542–555 (in Japanese).
11) Otsuru, M., Shiraki, T., Hatsukano, T. and Kenmotsu, M. (1968): Morphological observations on Anisakinae larvae of fishes in the sea near Hokkaido. Jap. J. Parasit., 17, 267 (in Japanese).
12) Suzuki, H., Ohnuma, H., Karasawa, Y., Ohbayashi, M., Koyama, T., Kumada, M. and Yokogawa, M. (1972 a): *Terranova*-like larva picked out from the wall of human stomach with endoscopy. Jap. J. Parasit., 21, Suppl., 61 (in Japanese).
13) Suzuki, H., Ohnuma, H., Karasawa, Y., Ohbayashi, M., Koyama, T., Kumada, M. and Yokogawa, M. (1972 b): *Terranova* (Nematoda: Anisakidae) infection in man. I. Clinical features of five cases of *Terranova* larva infection. Jap. J. Parasit., 21, 252–257.
14) Yokogawa, M. and Yoshimura, H. (1965): *Anisakis*-like larvae causing eosinophilic granulomata in the stomach of man. Am. J. Trop. Med. & Hyg., 14, 770–773.
15) Yokogawa, M. and Yoshimura, H. (1967): Clinicopathologic studies on larval anisakiasis in Japan. Am. J. Trop. Med. & Hyg., 16, 723–728.

Terranova 人体感染について
II. 人の胃壁より見出された *Terranova* sp. 幼虫の形態学的特徴

小山　力・熊田三由
（国立予防衛生研究所寄生虫部）
鈴木博通・大沼　肇・唐沢洋一
（北海道旭川市唐沢病院）
大林　正士
（北海道大学獣医学部寄生虫学教室）
横川　宗雄
（千葉大学医学部寄生虫学教室）

北海道旭川の唐沢病院にて，急性の胃痛を訴えて来院した患者について胃内視鏡検査をおこない，過去4年間(1969～1972) に36例の幼線虫胃内感染を経験した．摘出虫体を形態観察の結果，これらの虫体は，*Anisakis* sp. 幼虫(I型)，*Terranova* sp. 幼虫(A型)，前記2種幼虫の破損したものなどと同定した．以上のうち，確実に *Terranova* sp. 幼虫(A型) と考えられるものは，5症例につき各1匹づつ計5匹えられた．本虫種が人体から見出されたのはこれが最初の例と思われるでその形態学的特徴について報告する．



1

2

3

Explanation of Figures

Fig. 1 The fore part of *Terranova* sp. larva showing an intestinal caecum.

Fig. 2 Transverse section of *Terranova* sp. larva showing an intestinal caecum, a ventriculus, and an excretory organ.

Fig. 3 Transverse section of *Terranova* sp. larva showing an intestine, a pair of lateral chords, and an excretory organ.