

# HISTORICAL REVIEW AND CURRENT STATUS OF GNATHOSTOMIASIS IN ASIA

Yukifumi Nawa

Department of Parasitology, Miyazaki Medical College, Kiyotake, Miyazaki 889-16 Japan.

**Abstract.** The genus *Gnathostoma* contains at least twelve distinctive species. Among these, 6 species, namely *G. spinigerum*, *G. hispidum*, *G. doloresi*, *G. vietnamicum*, *G. malaysiae* and *G. nipponicum*, are found in wild animals in Asia. Related to human gnathostomiasis, *G. spinigerum* has long been believed as the only causative species. Until the early 1980s, all gnathostomiasis cases found in major endemic areas in Asia, such as Thailand, China and Japan, were caused by infection with *G. spinigerum*. In the early 1980s in Japan, new gnathostomiasis cases appeared in urban areas and these cases were shown to be caused by *G. hispidum*, of which larvae were found in loaches imported from Taiwan, Korea, or mainland China. Recently infections with *G. nipponicum* caused by eating locally obtained loaches raw, were found in 2 humans in Mie Prefecture, and 14 cases of infection with *G. doloresi*, probably caused by eating raw slices of freshwater fishes, were found in Miyazaki Prefecture. So far four *Gnathostoma* species are responsible for zoonotic infections in humans. Since *G. hispidum* and *G. doloresi*, like *G. spinigerum*, are widely distributed in Asia, care should be taken with the identification of species causing gnathostomiasis.

## INTRODUCTION

*Gnathostoma* are parasites of wild animals and at least twelve distinctive species have been identified (Daengsvang, 1980). Of these, twelve species, *G. spinigerum*, *G. hispidum*, *G. doloresi*, *G. vietnamicum*, *G. malaysiae* and *G. nipponicum* are found in Asia. However, only *G. spinigerum* has been considered the causative species of human gnathostomiasis, because other species were never found from biopsied specimens from human cases until the recent discovery of *G. hispidum*, *G. nipponicum* and *G. doloresi* in human infections in Japan. The major endemic areas of human gnathostomiasis in Asia are limited to Thailand (Daengsvang, 1980), Japan (Miyazaki, 1960) and the Peoples' Republic of China (Xu, personal communication). This is probably due to the habit of the people living in this area of eating raw or undercooked freshwater fish. In addition, a few sporadic cases were also found in India, Palestine, Malaya, Indonesia and Australia (Daengsvang, 1980). This article will describe a brief historical review of gnathostomiasis in Japan with special emphasis on identification of the causative species.

## GNATHOSTOMIASIS IN JAPAN

Before the 1940s, gnathostomiasis was a rare parasitic disease in Japan. However, from the late

1940s to 1960s, many Japanese people, especially those living in the southwestern part of Japan, often ate snakeheads, *Channa argus*, infected with *G. spinigerum*, and more than 1,000 cases were reported (Miyazaki, 1960). This outbreak rapidly terminated with the drastic improvement in the supply of food, and only a few sporadic cases were noted from the late 1960s to late 1970s.

Suddenly in 1980 gnathostomiasis infections were found in Hiroshima City (Tsushima *et al*, 1980) and, subsequently, similar mass infections were reported from various urban areas of Japan (Araki, 1986). The patients had all ingested raw loaches imported from Taiwan, Korea or the mainland China. The causative species of this new outbreak of gnathostomiasis was eventually identified as *G. hispidum* (Akahane *et al*, 1982).

Ando and his colleagues (1988) found two cases of cutaneous gnathostomiasis having a history of ingesting locally obtained loaches raw, and they identified *G. nipponicum* as the causative species.

In Miyazaki Prefecture, Ogata found several *Gnathostoma* cases having a common history of eating freshwater fish caught in the mountainous areas, but never having eaten snakeheads nor loaches. Among 8 such cases, *G. doloresi* larvae were found from the biopsied skin of 3 cases (Ogata *et al*, 1988; Nawa *et al*, 1989). A total of 14 cases (4 confirmed and 10 suspected of *G. doloresi*

Table 1

No.	Case <sup>a</sup>	Onset	Skin lesion <sup>b</sup>	WBC /mm <sup>3</sup>	Eo (%)	IgE IU/ml	Parasite found <sup>c</sup>	Source of infection
1	HM 51 M	'85.5	C	11600	14.5	4800	-	freshwater fish
2	KC 40 M	'85.4	C + Q	9800	12.0	<500	-	snake
3	TK 70 M	'85.7	C	12200	67.0	16000	+	freshwater fish
4	YA 38 F	'86.4	C	4700	16.0	ND	ND	freshwater fish
5	IK 35 M	'86.4	Q	6000	21.2	682	+	freshwater fish
6	KA 58 M	'87.3	Q	7800	14.2	83	-	freshwater fish
7	IE 34 F	'88.1	Q	5000	12.0	586	-	freshwater fish
8	NM 61 M	'88.5	C	7200	6.0	>4000	+	freshwater fish
9	IS 46 F	'88.6	C	7600	37.0	2798	-	freshwater fish
10	KS 35 M	'88.9	C + Q	9000	16.0	352	-	freshwater fish
11	NM 52 M	'90.3	C	7350	8.0	107	-	freshwater fish
12	NM 55 F	'90.4	C	9500	13.9	50	+	freshwater fish
13	NM 60 M	'90.6	C + Q	4800	25.5	10833	ND	freshwater fish
14	OH 55 M	'90.8	C + Q	7200	22.1	298	ND	freshwater fish

a: Initial, age and sex of the patient

b: C = creeping eruption, Q = mobile swelling

c: *Gnathostoma doloresi* larvae found in biopsied specimen

ND: not determined

infection have been found in Miyazaki Prefecture (Table 1). The natural life cycle of *G. doloresi* is preserved well in Miyazaki Prefecture because the infection rate is extremely high in wild boars, *Sus scrofa leucomystax*, the final host (Nawa and Imai, 1989), or in snakes, *Agkistrodon halys*, the paratenic host (Imai *et al.*, 1988). Since the infection rate in this species of snakes was 100% and the *G. doloresi* larvae found in the snakes could develop into adult worms in a pig (Imai *et al.*, 1989), this snake species seems to be important for the maintenance of the natural life cycle of *G. doloresi*.

#### DISCUSSION

The results reported here show two important points as to the endemic of food-borne parasitic diseases. First of all, people are extremely conservative about traditional food habits and/or the ways of cooking, even when aware of the risk of infection. Secondly, the development of the transport system or of the preservation methods of fresh food sources would produce an outbreak of a new type of parasitic disease.

Concerning the causative species of gnathostomiasis, *G. spinigerum* has long been believed as the only one to cause human gnathostomiasis (Miyazaki, 1960; Daengsvang, 1980). However, recent discoveries in Japan of gnathostomiasis caused by other species (Akahane *et al.*, 1982; Ando *et al.*, 1988; Ogata *et al.*, 1988; Nawa *et al.*, 1989) provide direct evidences that a wide range of *Gnathostoma* species can cause cutaneous larva migrans in humans. Among these newly discovered pathogens, *G. nipponicum* is found only in Japan, so that gnathostomiasis caused by this species is rather a local problem. However, *G. hispidum* and *G. doloresi* are both widely distributed in Southeast Asia (Miyazaki, 1960; Daengsvang, 1980). Therefore, care should be taken for the identification of the causative species. Since these *Gnathostoma* species can be easily distinguished by morphological examinations, detailed survey including the cases found in the past would elucidate actual distribution of gnathostomiasis caused by different species.

#### REFERENCES

Akahane H, Iwata K, Miyazaki I. Studies on *Gnathosto-*

GNATHOSTOMIASIS IN ASIA

- ma hispidum* Fedchenko, 1872 parasitic in loaches imported from China. *Jpn J Parasitol* 1982; 31 : 507-16 (in Jpn, with Eng abstr).
- Ando K, Tanaka H, Taniguchi Y, Shimizu M, Kondo K. Two human cases of gnathostomiasis and discovery of a second intermediate host of *Gnathostoma nipponicum* in Japan. *J Parasitol* 1988; 74 : 623-7.
- Araki T. Gnathostomiasis - parasitic disease caused by eating raw loaches. *Infect Inflamm Immunol* (Kansen-Ensyuu-Meneki) 1986; 16 : 110-1 (in Jpn).
- Daengsvang S. A monograph on the genus *Gnathostoma* and gnathostomiasis in Thailand. Southeast Asian Medical Information Center, Tokyo, 1980.
- Imai J, Asada Y, Horii Y, Nawa Y. *Gnathostoma doloresi* larvae found in snakes, *Agkistrodon halys*, captured in the central part of Miyazaki Prefecture. *Jpn J Parasitol* 1988; 37 : 444-50.
- Imai J, Akahane H, Horiuchi S, Maruyama, Nawa Y. *Gnathostoma doloresi*: Development of the larvae obtained from snakes, *Agkistrodon halys*, to adult worms in a pig. *Jpn J Parasitol* 1989; 38 : 221-5.
- Miyazaki I. On the genus *Gnathostoma* and human gnathostomiasis, with special reference to Japan. *Exp Parasitol* 1960; 9 : 338-70.
- Nawa Y, Imai J, Ogata K, Otsuka K. The first record of a confirmed human case of *Gnathostoma doloresi* infection. *J Parasitol* 1989; 75 : 166-9.
- Nawa Y, Imai J. Current status of *Gnathostoma doloresi* infection in wild boars captured in Miyazaki Prefecture, Japan. *Jpn J Parasitol* 1989; 38 : 385-7.
- Ogata K, Imai J, Nawa Y. Three confirmed and five suspected human cases of *Gnathostoma doloresi* infection found in Miyazaki Prefecture, Kyushu. *Jpn J Parasitol* 1988; 37 : 358-64.
- Tsushima H, Numata T, Yamamoto O, Iwasaki H, Iwanaga Y. Gnathostomiasis cutis probably infected in Hiroshima city. *Acta Medica Hiroshima* 1980; 33 : 1183 - 7 (in Jpn).
-