AN OUTBREAK OF ASCARIASIS WITH MARKED EOSINOPHILIA IN THE SOUTHERN PART OF KYUSHU DISTRICT, JAPAN, CAUSED BY INFECTION WITH SWINE *ASCARIS*

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Abstract. Ascariasis has been a representative soil-transmitted intestinal parasitic disease in warm climates. In Japan, this disease was a major and serious public health problem only a few decades ago. However, the incidence of the disease nowadays is reportedly less than 0.01%. Recently in 1994 through 1995, we experienced a total of 14 cases who were suspected as having ascariasis. They were characterized by peripheral blood eosinophilia (30-70%), high serum titers against *Ascaris* antigen, and most notably, they were absolutely negative for *Ascaris* eggs in repeated fecal examinations. Specific antibody titers against *Ascaris* antigen correlated well with the degree of eosinophilia. All patients were living in narrow areas of Kyushu, Japan, where a lot of porcine farms were located. Most of the patients were asymptomatic and pointed out to have eosinophilia during follow-up studies of chronic diseases or in regular check-up. Only one patient had a clear sign of Löffler' s syndrome and another had subcutaneous eosinophilic granuloma. However, laboratory examinations revealed moderate liver dysfunction in 7 patients and pulmonary infiltrations in 5 patients. Based on circumstantial and serological evidence, these patients were diagnosed as having been infected with *Ascaris lumbricoides suum*, a swine *Ascaris*.

INTRODUCTION

Ascaris is one of the oldest associates of humans, and ascariasis has been a representative soil-transmitted intestinal parasitic disease in people especially in warm climates. In Japan, over 80% of people were positive for *Ascaris* eggs in stool examinations only a few decades ago, when human excreta were widely used for fertilizers (Yamaguchi, 1988). During 1960-70s, the incidence of ascariasis in Japan decreased drastically along with rapid improvement of public health conditions. The incidence of the disease nowadays is reportedly less than 0.01% (Tei, 1990).

Recently in 1994 through 1995, we experienced a total of 14 cases who had marked eosinophilia and high serum titers against *Ascaris* antigen. However, none of them were positive for *Ascaris* eggs in repeated fecal examinations. All the cases occurred in particular localities in Kyushu, Japan, within a particular period. We concluded that they were infected with *Ascaris lumbricoides suum*, a swine *Ascaris*.

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CASE REPORT

In May 1994 we encountered a married couple with marked eosinophilia, who we diagnosed as having ectopic ascariasis because both of them had titers against *Ascaris* antigen but were negative for *Ascaris* eggs in repeated fecal examinations (Ogata *et al*, 1995). Subsequently until October 1995, twelve similar cases emerged including two families (Table 1). Most of them (12 of 14) had marked eosinophilia (30-70%), all had high serum titers against *Ascaris* antigen. However, none of them were positive for *Ascaris* eggs in repeated fecal examina-

tions. Specific antibody titers against *Ascaris* antigen correlated well with the degree of eosinophilia. Most surprisingly, all patients were living in rather narrow areas of Kagoshima Prefecture, Japan (Fig 1). Most of the patients were asymptomatic and they happened to have eosinophilia during the follow-up studies of chronic diseases (*eg* diabetes mellitus, idiopathic thrombocytopenic purpura) or in regular check-up. Only one patient had a clear sign of Löffler's syndrome and another had subcutaneous eosinophilic granuloma. However, laboratory examinations revealed moderate liver dysfunction in 7 patients and pulmonary infiltrations in 5 patients. Patients who had liver and/or pulmonary disorders were administered with anthelmintic drugs and currently being followed up.

Table 1

List of ascariasis patients found in Kyushu, Japan.

Pt No.	Age	Sex	Address	Date	Remarks	WBC (/l)	Eo (%)	IgE (IU/ml)	Eggs	Findings in Liver	Findings in Lung
322	58	M	Sueyoshi	7/15/94	eosinophilia by regular check up	20,400	66	4162	No	+	
323	57	F		7/15/94	same as above	9,300	53	14	No		
372	66	M	Gamou	11/11/94	eosinophilia by regular check up	29,100	71	637	No	+	+
409	37	M		1/23/95	family member of Pt#372	16,800	65	ND	No	+	
419	68	F		1/23/95	same as above	5,800	0	ND	No		
434	?	M		5/17/95	same as above	?	9	ND	No		
443	66	F	Sueyoshi	4/19/95	Angina pectoris	18,000	51	4,810	No	+	
452	53	M	Matsuyama	5/16/95	Eo granuloma in skin	10,000	51	12,960	No	+	+
465	52	F		6/5/95	family member of Pt#372	13,700	42	2,212	No		
466	23	F		6/5/95	same as above (PIE)	22,700	50	2,002	No	+	+
485	60	F	Sueyoshi	6/21/95	ITP	5,800	30	52	No		
491	59	M	Aira	6/30/95	Paragonimiasis suspected	10,500	44	9,200	No		+
495	60	F	Sueyoshi	7/7/95	DM	9,500	32	6,230	No	No	+
496	61	M	Matsuyama	7/9/95	DM	19,300	57	ND	No		+

ND: not determined, PIE: pulmonary infiltraion with eosinophilia, ITP: idiopathic thrombocytopenic purpura, DM: Diabetes mellitus

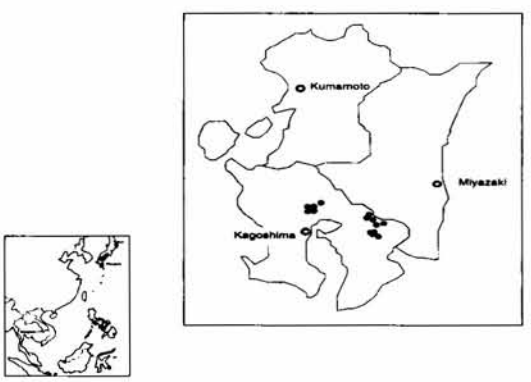

Fig 1 - Distribution of the ascariasis patients found in Kyushu, Japan.

DISCUSSION

A huamn round worm, *Ascaris lumbricoides* Linnaeus, 1758, has been assumed as the only causative agent for human ascariasis. However, *Ascaris lumbricoides suum* Goeze, 1782, a swine round worm, which is morphologically indistinguishable from human *Ascaris*, is claimed to be able to reach maturity in humans after accidental or experimental infection (Taffs, 1985). According to Takata (1951), 7 of 19 volunteers only transiently passed swine *Ascaris* eggs

after experimental infection and the adult worms seemed to be expelled rapidly from the hosts. In contrast, once human *Ascaris* established and reached maturity in human intestine, they almost persistently produced eggs. In the present study, all patients had high serum antibody titers against *A. lumbricoides suum* antigen, suggesting that they had been sensitized with *Ascaris* antigens in spite of the negative results in repeated fecal egg examinations. It is, therefore, rather unlikely that all 14 patients were infected with human *Ascaris* and cured spontaneously. Also, it is unlikely that all cases had ectopic or monosexual infections. In the areas where the patients lived, human excreta had not been used for fertilizers for a long time. Instead, numerous porcine farms are present and the excreta are occasionally used as fertilizer or are disposed of in inappropriate ways (Horii, personal communication). In our trial survey, we found *Ascaris* eggs in a soil sample collected in one of the areas. Based on this circumstantial evidence, we conclude that the cases reported here are naturally infected with swine *Ascaris*.

Much debate has taken place concerning the taxonomic status of the human and swine *Ascaris*. Reviewing all the immunological and biochemical differences, Nadler (1987) concluded that *A. lumbricoides* and *A. lumbricoides suum* are sibling species. It would be interesting to examine the binding specificities of sera from the present patients to *A. lumbricoides* and *A. lumbricoides suum* antigens. Kurimoto (1974) reported that rabbits immunized with swine *Ascaris* hemolymph produced antibodies that precipitated a swine *Ascaris* - specific band after the absorption with human *Ascaris* hemolymph in immunoelectrophoresis. It is not known whether specific antibodies that can discriminate pig from human *Ascaris* antigen could be produced in humans in a natural infection. In our preliminary study by an Ouchterlony's double diffusion test, we found that sera from 12 of 14 patients produced strong precipitin bands against *A. lumbricoides suum* antigen, whereas only 2 produced weak bands against *A. lumbricoides* antigen. These findings strongly support that these patients were infected with swine *Ascaris*.

In conclusion, taking all parasitological and serological findings into consideration, the 14 patients reported here were infected with *A. lumbricoides suum*.

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