

Research Note

Incidence of Seropositivity to Human Toxocariasis in Hyogo Prefecture, Japan, and Its Possible Role in Ophthalmic Disease

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Toxocara canis and *T. cati* are nematodes usually found in dogs and cats, respectively. These nematodes are important not only because they are pathogenic to their final hosts but also because their larvae may infect humans, causing human toxocariasis. Human toxocariasis was first described by Wilder in 1950. In his study, nematode larvae or larval remnants were found in 24 of 46 pseudogliomas from eyes that had been enucleated because of endophthalmitis and/or presumed retinoblastoma. When these larvae were reexamined, they were identified as *T. canis* (Beaver *et al.*, 1952). Recently, human toxocariasis was classified into visceral toxocariasis (VLM) and ocular toxocariasis (OLM) on the basis of clinical symptoms. For those diseases defined as larva migrans, conventional parasitological examinations are of little use, and immunological diagnosis is necessary. In Japan, 42 cases of human toxocariasis have been reported so far (Kondo, 1989). In only one of

these cases was diagnosed by the presence of the larva; the other cases were diagnosed immunologically. The symptoms of toxocariasis are diverse, so it is difficult to diagnose the disease from the clinical symptoms alone. The purpose of this communication is to report the prevalence of the human toxocariasis in Hyogo Prefecture and its role in OLM.

Serum samples were collected from following three different groups of 351 residents who lived in or around Kobe City of Hyogo Prefecture: 196 healthy adults (100 male, 96 female) aged 20–50 years who visited the health center for their community health care program (adult group), 80 children (45 male, 35 female) aged 1–12 years who visited the children's hospital for medical examination and were found no remarkable symptoms (child group), and 75 patients (41 male, 34 female) aged 9–69 who visited ophthalmologists with symptoms and were clinically diagnosed as uveitis or vitreous opacity (group with suspected disease).

Antibodies to *Toxocara* were measured by enzyme-linked immunosorbent assay (ELISA). The solid phase was sensitized with 5 µg/ml of the excretory secretory (ES) antigen of *Toxocara canis* (Kondo *et al.*, 1984). This was first reacted with test sera at a dilution of 1:100 and then with peroxidase-conjugated anti-human IgG (gamma chain specific: Tago Inc., USA) at a dilution of 1:1,000. The resulting enzyme activity on the solid phase was measured with 2,2'-azino-bis (3-ethylbenthiazol-6-sulfonic acid: Sigma, USA). The absorbance at 410 nm (A_{410}) was measured

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with a Microelisa Minireader MR 590 (Dynatech Laboratories) and expressed (Inoue and Tsuji, 1989) as the ratio of A_{410} of the test serum/mean A_{410} of the negative control sera (T/N). The negative control sera were prepared by treatment of pooled serum with the ES antigen. Based on the results of preliminary experiments, T/N values of ≥ 11.4 were regarded as strongly positive (+ +), those of ≥ 3.3 as positive (+), those between 3.3 and 1.8 as doubtful (\pm) and those of < 1.8 as negative (-).

The results are given in Table 1. In the adult group, 4.6% of subjects were seropositive for antibodies to *Toxocara*. Kondo (1989) reported a tendency for the antibody-positive rate in Japan to be high in the Tohoku district of Japan and low in western Japan ranging from 0.7 to 6.1%. Our results are within that range.

The positive rate was 6.3% in the child group, not significantly different ($P > 0.05$) from the value of the adult group. It has been reported that toxocariasis is present in children at a higher rate than in adults because some children have a tendency to eat dirt placing them at risk of ingesting many eggs, sometimes repeatedly (Schantz, 1989). Worley *et al.* (1984) have also reported that seropositivity was associated with both a history of pica habit and with puppy ownership of children. Infective eggs are ubiquitous in soil and are commonly found in public places where children play. In Hyogo Prefecture, eggs of *Toxocara* species were detected in 41.9% of the sandpits of public parks examined (Uga *et al.*, 1989). These eggs found

from sandpits were capable of infecting mice. However there is no evidence that the contamination of sandpits affected the seropositivity of children, although this study was carried out at the same study area as previous paper (Uga *et al.*, 1989).

The positive rate (29.3%) in the group with suspected disease was significantly ($P < 0.05$) higher than that in the other two groups. Moreover, 27% (6/22) of the seropositive individuals were strongly positive, so that *Toxocara* infection was highly likely. Of the 6 patients judged as strongly positive, one was female (31 years) and the others were male (20, 39, 40, 50 and 61 years).

There are many possible routes of exposure to *Toxocara*. We have confirmed that cockroaches (*Periplaneta fuliginosa*) eat dog's stool and around 75% of the eggs recovered from the stool of cockroaches are infective to mice (unpublished data). Recently, suspected human toxocariasis cases due to ingestion of raw chicken or cow liver were reported (Ito *et al.*, 1986). Pollard *et al.* (1979) examined 41 suspected OLM cases and found 37 of them (90%) were seropositive by ELISA. It may be concluded that toxocariasis is more frequent cause of OLM than previously suspected. Physicians, especially ophthalmologists, should keep in mind the possibility of toxocariasis.

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Table 1 ELISA test for toxocariasis in three groups of residents of Hyogo Prefecture

Groups	No. of sera	ELISA T/N*		No. of positive (%)
		+	++	
Adult	196	8	1	9 (4.6)
Child	80	5	0	5 (6.3)
With suspected disease	75	16	6	22 (29.3)

* A_{410} of test serum/mean A_{410} of negative control sera

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