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### Scrub Typhus (Tsutsugamushi Disease) in Kanagawa Prefecture in 2001 - 2005

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Until 1988, about 10 cases of scrub typhus (tsutsugamushi disease) were reported annually in Kanagawa Prefecture. Since then, however, a steep cycle of rising and falling has ensued. Cases jumped to 81 in 1989 and 112 in 1990, then declined to only 9 in each of 1996 and 1997. Increases began again in 1998, peaking at 42 in 2000, followed by 7 in 2001, 4 in 2002, and 10 in 2003. In 2004 and 2005 there were 18 and 19 cases, respectively (1-3).

We examined 87 cases of suspected of scrub typhus occurring in 2001 - 2005 (13, 7, 17, 23, and 27 cases from 2001 - 2005, respectively) for serum antibody by immunofluorescence (IF) assay (4) and for *Orientia tsutsugamushi* DNA by PCR (5). Among them, 58 were confirmed as scrub typhus (7, 4, 10, 18, and 19, respectively) (Table 1).

From the scrub typhus cases in 2001 and 2003, a total of 5 *O. tsutsugamushi* isolates were obtained (1,2). Four of these isolates were obtained from patients infected in Kanagawa Prefecture, and the remaining one was obtained from a patient presumably infected in Korea. Typing by PCR and IF assay using monoclonal antibodies revealed that the four Kanagawa Prefecture isolates consisted of one Karp-type strain, two Kawasaki-type strains, and one Kuroki-type strain, and that the isolate of the Korea case was a Kuroki-type strain. The sequence of the 56-kDa protein gene of the Karp-type isolate was identical to that of the Jp2 type.

Using PCR, we tried to type the *O. tsutsugamushi* present in the patients' blood specimens (5). For specimens whose genomes were not detected, the type was assessed by the IF method. We found that the *O. tsutsugamushi* that caused infection in Kanagawa Prefecture and in the nearby region of Shizuoka Prefecture was either Karp type (4 cases, 7%), Kawasaki type (37 cases, 69%), or Kuroki type (13 cases, 24%). The majority of cases were Kawasaki type. The Karp and Kuroki types were less common, but the incidence of the

Table 1. Detection of immunofluorescence antibody and *O. tsutsugamushi* DNA by PCR

Year	No. of samples	No. of positive samples			Confirmed cases
		IF	IF and PCR	PCR	
2001	13	0	7	0	7
2002	7	1	3	0	4
2003	17	2	7	1	10
2004	23	4	13	1	18
2005	27	6*	13	0	19
Total	87	13	43	2	58

All the samples were tested by IF and PCR except one that was tested only by IF (marked with asterisk).

Table 2. Types of *O. tsutsugamushi* detected in confirmed cases

Year	No. of samples	Strain type		
		Karp	Kawasaki	Kuroki
2001	7	2	4	1
2002	4	0	3	1
2003	8	1	6	1
2004	17	1	11	5
2005	18	0	13	5
Total (%)	54	4 (7)	37 (69)	13 (24)

latter tended to increase in the most recent years (Table 2).

The suspected places of infection are plotted in Fig. 1A. They are clustered on the western side (the Shizuoka Prefecture side) of Kanagawa Prefecture. Each region was infested by more than one type (Fig. 1B). Infections were most frequent in October, November, and December, with a peak in November. In 2005, however, an infection in March was observed.

The recent trend of scrub typhus appears to be characterized by alternating high and low incidence periods, each lasting 2 to 3 years. What factors are causing the fluctuation is unknown. The natural history of the pathogen itself, the vector mites and reservoir animals, and possibly climate

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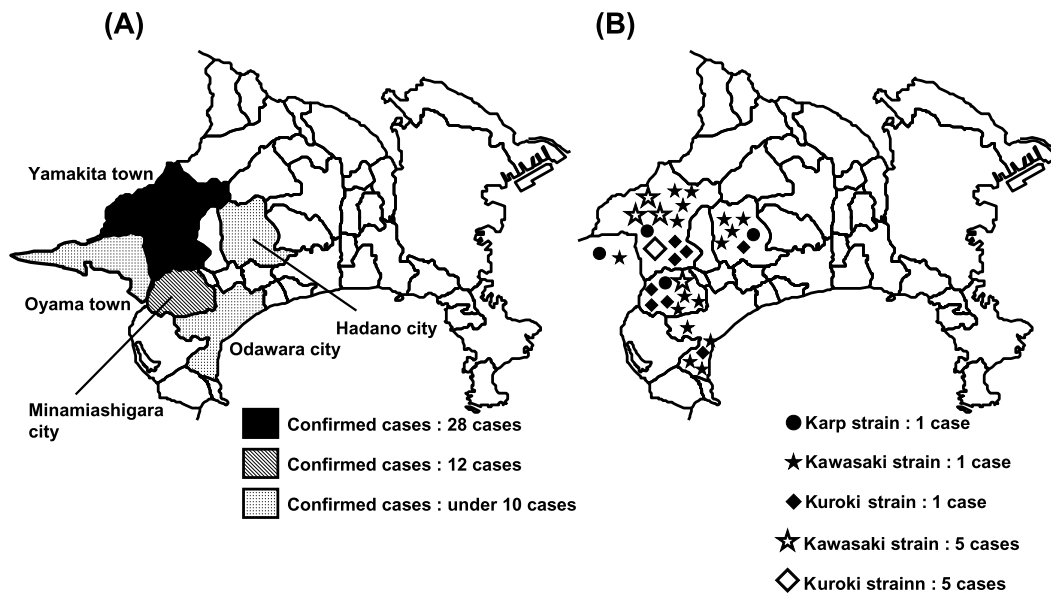


Fig. 1. Scrub typhus infectious area in Kanagawa Prefecture (2001-2005).

change may all be important determinants. As scrub typhus is curable with appropriate chemotherapy, early diagnosis is very important. IF and PCR are useful methods for early confirmatory diagnosis.

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