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A Case of Cat-to-Human Transmission of Severe Fever with Thrombocytopenia Syndrome Virus

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Severe fever with thrombocytopenia syndrome (SFTS), first reported in China in 2011, is caused by the SFTS virus (SFTSV), a phlebovirus belonging to the family *Phenuiviridae*, and is reportedly transmitted by species of ticks (1,2). The first case of SFTS in Japan was reported in 2013, and since then, 391 cases have been reported as of October 31, 2018. Patient notifications have mainly originated from the western region of Japan (1,2). This disease shows various symptoms, such as fever; general fatigue; gastrointestinal tract symptoms, including nausea, vomiting, and appetite loss; leukopenia; thrombocytopenia; and increased levels of aspartate aminotransferase, alanine transaminase, and lactate dehydrogenase. Some patients show rapid and severe progression, and the patient fatality rate in Japan is approximately 16% (1,2). Therefore, early diagnosis and treatment are necessary to improve disease prognosis. SFTS is a tick-borne infection, and SFTSV is maintained in ticks and mammals through tick–tick (vertical transovarial transmission) and tick–mammal cycles. SFTSV genomes have been detected in several tick species (e.g., *Haemaphysalis longicornis* and *Amblyomma testudinarium*) in Japan, which act as vectors for transmitting SFTSV to humans. A high prevalence of anti-SFTSV antibody seropositivity has been observed among deer, wild boars, dogs, and raccoons (1). The transmission of SFTSV through direct contact with blood and/or body fluids of a patient with SFTS to his or her family members or medical providers has been reported, and wild and domestic mammals are also believed to be sources of direct human transmission (1,3,4). Herein, we report on a patient with SFTS identified as developing a direct infection from a sick

cat.

The patient was a Japanese male veterinarian in his 20s who worked in an animal hospital located in the western region of Japan. His work included caring for sick mammals, including those with suspected SFTSV infection.

The patient had a fever of more than 38.0°C on the day of onset. On the next day, a visit to a medical facility revealed that he had leukopenia (2,500/ μ L; normal range, 3,300–8,600/ μ L) and slight thrombocytopenia (14.8×10^4 / μ L; normal range, 15.8 – 34.8×10^4 / μ L). Gastrointestinal tract symptoms were not observed. Urinalysis did not reveal occult blood. No other symptoms, except for fever and headache, were noted. There was no history of tick bites, and there were no tick-bite scars on his body. He was admitted to a university hospital, was safely treated supportively, and was discharged after 11 days of hospitalization. Before the onset of the disease, he had cared for three cats infected with SFTSV (Table 1). The patient had participated in a clinical investigation of cats with SFTSV infection and had performed autopsies of the cats. When performing autopsies, Cat 2 had already been confirmed as infected with SFTSV, but the diagnosis of Cat 3 was still unclear. The patient wore gloves, a disposable surgical gown, and a surgical mask; however, he did not wear eye protection (goggles and face shield). He did not suffer from any needle-stick injuries. The air ventilation in the autopsy room was functioning. During care for the cats in the animal hospital, the required protective and precautionary measures had been undertaken because of the anticipated risk of SFTSV transmission.

The three cats were confirmed as infected with SFTSV on the basis of reverse transcription polymerase chain reaction (RT-PCR) of the serum samples. The cats were infected with identical SFTSVs (data not shown). The patient's SFTSV infection was also confirmed on the basis of RT-PCR using a previously reported primer set 2 (5). SFTSV was not detected from the patient's serum sample 1 day after onset but was detected 2 days after onset. The nucleotide (nt) sequence (421nt) of a

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Table 1. Summary of severe fever with thrombocytopenia syndrome (SFTS) in the 3 cats

		Cat 1	Cat 2	Cat 3
Retrospective period from the patient's onset of disease with the cat (days)	First contact date	16	14	2
	Last contact date	0	11	2
Age (years)		6	4	< 1 (probably)
Sex		F	M	Unknown
Stray or pet		Pet	Pet	Stray
Symptoms		Fever	Fever	Weakness
		Appetite loss	Appetite loss	Jaundice
		Thrombocytopenia	Jaundice	Pancytopenia
		Leukocytopenia	Splenomegaly	
			Lymph node swelling	
Progress			Thrombocytopenia	
			Leukocytopenia	
		Recovery	Death (3 days after the hospital visit)	Death (on the day of the hospital visit)
Confirmation of the disease		RT-PCR (+) Serum	RT-PCR (+) Serum	RT-PCR (+) Serum

RT-PCR; reverse transcription polymerase chain reaction.

target region from the patient's SFTSV (DDBJ/EMBL/GenBank accession number LC433919) was identical to that from the cats' SFTSVs (cats 2 and 3). These nt sequences were compared with the sequences in GenBank using BLAST (<http://blast.ncbi.nlm.nih.gov/Blast.cgi>), and the genotype was considered as being J1 (6).

Considering the facts that the patient had recently been in close contact with at least three SFTSV-infected cats (i.e., blood and organs through treatments and autopsies) within 3 weeks before the disease onset, there was no history of tick bites, there were no tick-bite scars on his body at the disease onset, and although a thorough genome analysis is yet to be conducted, the nt sequences of the RT-PCR target region from SFTSVs in the patient and cats were identical, we can conclude that this is the first confirmed case of direct transmission of SFTSV from a cat to a human.

The occupational transmission of SFTSV has been reported previously (1, 7–9); it occurs in nosocomial settings, on contact with patients with SFTS, and through blood-borne transmissions. After inspecting the environmental situation at the workplace of the patient, the mode of transmission was hypothesized to be via a droplet or aerosol; however, direct-contact transmission cannot be excluded (10). The patient did not wear eye protection, and we can emphasize its importance. Even if protective equipment is used, exposure to respiratory secretions, blood or other bodily fluids, or materials soiled with SFTSV may pose a significant risk for SFTSV infection.

In this study, it is noteworthy that SFTSVs were detected from both stray and pet cat samples. We suggest that individuals should take safety precautions when handling sick cats in houses or dead cats found outdoors. Cats show relatively rapid progression of SFTSV infection, and high amounts of SFTSV in the blood, saliva, and excreta have been detected (K. Maeda,

unpublished data). Areas that are endemic for SFTSV burden in mammals and ticks are yet to be clarified. However, professionals who frequently encounter sick mammals, such as veterinarians, should be particularly cautious when performing their daily work. The promotion of precautions for reducing the risk of SFTSV infection is highly recommended.

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Conflict of interest None to declare.

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