Chikungunya in Singapore: Imported Cases Among Travelers Visiting Friends and Relatives

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Chikungunya infections were detected in Singapore among returning travelers who had visited friends and relatives (VFR) in India and Malaysia. These sporadic imported cases occurred over a year before the 2008 chikungunya outbreaks in Singapore, demonstrating the potential for introducing this emerging viral infection into new areas via VFR travel.

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Chikungunya infection is an acute viral infection that reemerged in Asia, with ongoing outbreaks in India, Indonesia, and Malaysia since 2006. Returning travelers with chikungunya infection have been reported in North America and Europe, as well as in Hong Kong and Taiwan. However, imported cases of chikungunya infection among travelers visiting friends and relatives (VFR) have not been as extensively documented to date. We report three cases of imported chikungunya in Singapore among VFR travelers and briefly summarize five other cases (Table 1), all of whom presented within a 4-month period (October 2006–February 2007) and were investigated for evidence of acute or recent chikungunya infection. Cases were considered as proven if confirmed by real-time reverse transcription-polymerase chain reaction (RT-PCR) on serum samples, and probable if serology was positive. These sporadic imported cases occurred a year before the first outbreak of localized transmission, which occurred in Singapore in January 2008. Although they did not directly cause the 2008 outbreak in Singapore, these cases represent one potential mean through which chikungunya infection was introduced into Singapore with implications for disease surveillance and outbreak prevention strategies.

Case 1

A 28-year-old Indian woman arrived from Tamil Nadu, India on December 2, 2006. She developed fever, nausea, and right knee arthralgia a day later and was admitted to Tan Tock Seng Hospital. She was a permanent resident in Singapore but had returned to India during the preceding year for her pregnancy and childbirth. Her physical exam was unremarkable except for fever. Laboratory data revealed mild leukopenia and normal chemistries. She provided a history of many contacts with chikungunya patients in Tamil Nadu, so serology and RT-PCR for chikungunya and dengue viruses were performed. Blood cultures and thick and thin blood films were also sent to exclude typhoid and malaria, respectively. Chikungunya RT-PCR returned positive in serum. The patient’s 6-month-old infant daughter had traveled back from India with her, developed fever on the same day, and had been admitted to another hospital. The etiology of the infant’s illness was not determined. The patient had concerns about breastfeeding, so expressed breast milk was tested for chikungunya virus by RT-PCR and this was negative.

Case 2

A 27-year-old Malaysian woman working in Singapore developed fever on January 3, 2007, 7 days after her visit home in Kuala Lumpur on December 23 to 27, 2006. Her examination in clinic at Tan Tock Seng Hospital was notable for an erythematous, maculopapular rash. Laboratory investigations demonstrated mild leukopenia (white blood cells 2.3 × 10^9/L) and mild thrombocytopenia (platelets 125 × 10^9/L). The provisional diagnosis was dengue fever. However, when her dengue serology returned negative, further investigations were pursued. Her fever lasted 5 days, but chikungunya RT-PCR was still positive in serum drawn on January 11, 2007, 2 to 3 days after resolution of symptoms.

Case 3

A 45-year-old Indian man with type 2 diabetes was admitted in November 2006 to Changi General Hospital with fever of 10 days duration. He had traveled to Chennai,
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India to visit friends and relatives for several weeks but became ill and was hospitalized for 3 days in India prior to his return to Singapore. He presented with fever, myalgia, arthralgia, rash, and cough. His exam was notable for conjunctivitis, as well as bilateral ankle edema and mild swelling of the small joints of his hands. His laboratory findings included mild leukocytosis (white blood cells $14.5 \times 10^9/L$) and a mildly elevated C-reactive protein of $78.1 \text{ mg/L}$. Blood films for malaria parasites, urine and blood cultures were all negative. Radiographic studies of hands and ankles were unremarkable. His chikungunya RT-PCR was negative but his chikungunya immunoglobulin M serology, using a previously described indirect immunofluorescence assay, subsequently returned positive.

Discussion

In our increasingly globalized world, many countries have populations of immigrants and foreign-born nationals who travel back to their countries of origin to visit friends and relatives. This category of VFR travelers has been documented to be at increased risk for systemic febrile illnesses including vector-borne infections such as malaria. In addition to the increased personal risk among ill travelers, there are also potential public health risks through the introduction of pathogens with epidemic potential into new areas, and where competent transmission vectors exist, potentially causing these pathogens to become established endemic problems. Concern for infections being introduced via travelers is the rationale underlying the international health regulations governing yellow fever vaccine requirements and is relevant to other vector-borne infections such as malaria.

The presence of chikungunya virus in serum by RT-PCR even in patients whose fevers have resolved for 48 hours or more (Case 2) may not represent viable virus, but if it does, the period of potential infectivity may be longer than the actual duration of febrile illness. In patients with mild illness who are able to continue normal activities, this extended viremia combined with daytime exposure to the Aedes vector could contribute to ongoing transmission. This case underscores the need for vector control and the use of screens or repellants to prevent secondary transmission.

The large chikungunya outbreak in Italy in 2007 followed the occurrence of 17 imported cases in 2006, illustrating the outbreak potential of chikungunya even in Europe. This outbreak has been attributed to the ability of this strain of chikungunya virus to replicate efficiently in *Aedes albopictus*, a factor that may drive the geographic

<table>
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<tr>
<th>Patient</th>
<th>Age (y)</th>
<th>Sex</th>
<th>Nationality</th>
<th>Travel Destination</th>
<th>Reason</th>
<th>Travel Start (MM/DD/YY)</th>
<th>Travel End (MM/DD/YY)</th>
<th>Illness Onset (MM/DD/YY)</th>
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<th>IgG</th>
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expansion of chikungunya well beyond Aedes aegypti infected areas. A similar sequence of events has now occurred in Singapore, further demonstrating the epidemic potential of this virus if imported infections occur with enough frequency to result in sustained localized transmission. While it is neither possible nor desirable to stop VFR travel, understanding the potential risk that VFR travel represents is an important step for reducing imported cases and controlling transmission of chikungunya infection.

Declaration of Interests
The authors state that they have no conflicts of interest.

References