detecting chikungunya and dengue viral antibodies was negative for both infections. In accordance with World Health Organization travel guidelines, a blood sample, taken 3 days after symptoms onset, was tested at the National Institute of Virology (Pune, India) for Ebola virus disease. This test used RT-PCR and real-time RT-PCR to detect Ebola virus nucleoprotein and polymerase genes and ruled out Ebola virus disease.

These tests were repeated with standard positive and negative controls to ensure no contamination and no false-positive results. RT-PCR for chikungunya and dengue viruses was performed by using virus gene–specific primers. RT-PCR for Japanese encephalitis and West Nile viruses also were conducted to rule out these cross-reacting arboviral infections that share common clinical manifestations with chikungunya and dengue. The failure of MAC-ELISA to detect chikungunya virus– and dengue virus–specific IgM was attributed to collection of the blood on day 2 after symptom onset, and thus the IgM would not have been generated to be detected by MAC-ELISA.

Fever similar to those common with malaria and typhoid are often exhibited with any of the arboviral infections that are endemic to Nigeria (*1*). Often these fevers are misdiagnosed as malarial fevers, and the opportunity to test for arboviral infections is missed. Dual infections of chikungunya and dengue are becoming more common in India (*2*,*3*), and there were earlier reports of dengue and malaria co-infection (*4*). Because these diseases are endemic to both Nigeria and India and because the incubation periods of infections vary, we do not know the exact location where the patient acquired any or all of these infections. Multiple infections in a single patient would drastically change the spectrum of clinical manifestations and thus complicate the diagnosis process. Our study particularly draws attention to understanding emerging arboviral infections and emphasizes the need for a multidimensional diagnostic approach in such clinical situations.

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Chikungunya Virus Outbreak, Dominica, 2014

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To the Editor: Chikungunya is a dengue-like mosquitoborne viral disease that has caused outbreaks in Africa, Asia, and the Pacific Islands (*1*). St. Martin reported the first documented occurrence of autochthonous transmission of chikungunya in the Caribbean islands in December 2013 (*2*). Dominica reported its first case on January 17, 2014 (*3*). This report describes the outbreak of chikungunya in Dominica through July 12, 2014.

Cases were characterized by using guidelines issued by the Centers for Disease Control and Prevention (CDC) and the Pan American Health Organization (*4*). Surveillance of chikungunya cases began on January 16, 2014, and data were collected on patients' age, sex, residence, date of illness onset, clinical features, and travel history.

The virus was detected at the Caribbean Public Health Agency (CARPHA) laboratory in Trinidad by using a real-time PCR (rPCR) developed by CDC; some testing was also done at CDC's Arboviral Diseases Branch in Fort Collins, Colorado, USA, by using an IgM ELISA and a plaque-reduction neutralization test, as appropriate. All suspected infections were laboratory confirmed through April 30, 2014, when community transmission was established. Thereafter, testing was done only for patients hospitalized >48 hours, women in their third trimester of pregnancy, patients who died, or patients thought to be infected and coming from geographic areas where chikungunya transmission was not yet established.

During December 15, 2013–July 12, 2014, a total of 3,559 chikungunya cases were reported in Dominica, of which 141 were confirmed by laboratory testing (134 [95%] by rPCR, 7 [5%] by serologic methods). The remaining 3,418 patients were considered infected (Figure), indicating an overall attack rate of 5% (on the basis of Dominica's census population for 2011, 71,293). Retrospective investigation showed that the 2 index patients experienced onset of illness during the week beginning December 15, 2013, and 1 of the patients had recently traveled from St. Martin. The 2 patients were unrelated and resided far apart.

Of the 141 confirmed patients, 78 (55%) were female and 60 (43%) were male; data on sex was unavailable for 3 patients. Mean age of the patients was 34 years (range 13 days–87 years; median 30 years). Thirty (21%) of the patients were children ≤9 years of age; 76 (55%) were 19–49 years of age. Most patients experienced fever (95%) and arthralgia (72%), and 21% of patients experienced rash. No deaths associated with chikungunya infection in Dominica were reported during the study period.

Across all age groups, more patients were female than male, as reported in previous outbreaks (*5*,*6*). This trend may suggest that, compared with men and boys, women and girls have greater health-seeking behaviors, greater levels of skin exposure, and potentially greater exposure due to peridomestic activities (*7*).

In this study, a disproportionate number of patients were ≤9 years of age, unlike findings for chikungunya outbreaks in Indonesia and Réunion Island, where children ≤9 years of age were least affected (*7*). Of all confirmed patients, 55% were 19–49 years of age, suggesting that the outbreak had economic effects because workplace productivity may substantially decrease if disease sequelae (e.g., arthralgia and arthritis) cause those affected to take time off from work.

Genotypic sequencing identified the Asian genotype of chikungunya as the strain currently circulating in the Caribbean (*8*,*9*). The East/Central/South African genotype was responsible for the Réunion Island outbreak, and an overall attack rate of 35% was reported after retrospective and active case detection (*6*). Differences in transmission and pathogenicity between genotypes require further investigation.

In response to the Dominica outbreak, a risk communication plan was developed and implemented on January 17, 2014, and consisted of 2 phases: an onset emergency phase and a control phase. Both phases targeted audiences through audio, print, and social media. To control and reduce the mosquito population in and around the homes of chikungunya patients, vector control activities (i.e., source reduction, application of larvicides, and fogging) were intensified with assistance from CARPHA and Yale University, New Haven, CT, USA. In addition, CARPHA and the Pan American Health Organization arranged for delivery of insecticide-treated bed nets for use in hospitals and other health care settings.

Although the introduction of chikungunya into the Caribbean islands may have been anticipated because of the broad distribution of the *Aedes aegypti* mosquito vector and suitable climatic conditions, our findings show that this outbreak could not be prevented. The continuing geographic spread of the disease emphasizes the ongoing challenge posed by mosquitoborne viral infections resulting from globalization and indicates a need for innovative prevention and control strategies.

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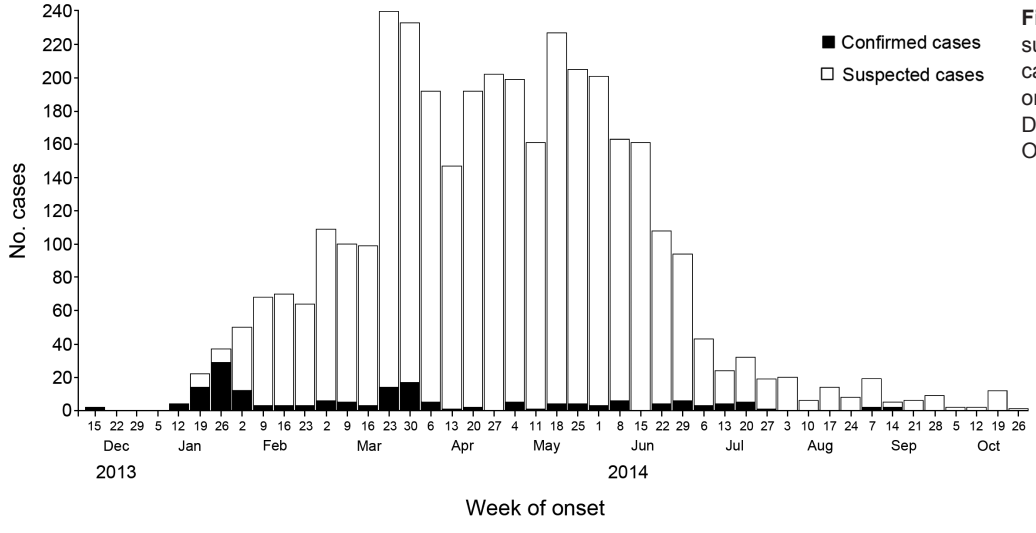

Figure. Confirmed and suspected chikungunya cases, by week of illness onset, Dominica, December 15, 2013–October 26, 2014.

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Acute Zika Virus Infection after Travel to Malaysian Borneo, September 2014

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To the Editor: Zika virus (ZIKV), a mosquito-borne flavivirus, causes Zika fever, a self-limiting febrile and exanthematic arthralgia syndrome closely resembling dengue fever. Most often, signs and symptoms are maculopapular rash, fever, arthralgia, myalgia, headache, and conjunctivitis; edema, sore throat, cough, and vomiting occur less frequently (*1*). The virus, which was initially isolated from a rhesus monkey (*Macaca mulatta*) in 1947 in Uganda, has come to attention recently after a large outbreak occurred in the western Pacific region, including French Polynesia, New Caledonia, Easter Island, and the Cook Islands (*2*). Travel-related imported infections have thus been increasingly reported from the western Pacific and sporadically also in travelers to other regions of the world, including Thailand, Indonesia, and Senegal (*2,3*). ZIKV is transmitted by different *Aedes* mosquito species, and nonhuman primates play a role as reservoirs (*1*). After the beginning of the ZIKV epidemic in late 2013, a 20-fold increase of Guillain-Barré syndrome incidence was noted in French Polynesia; 1 patient was infected a week before neurologic symptoms started (*4*). We report an acute ZIKV infection in a traveler returning from Malaysian Borneo who experienced bilateral hearing difficulties during the course of illness.

On September 1, 2014, a 45-year-old woman was seen in an outpatient clinic in Heidelberg, Germany for fever of up to 39°C and maculopapular rash covering her trunk, arms, and legs. Fever had started on August 30, which was 6 days after she had returned from a 3-week vacation to peninsular Malaysia and Sabah, Malaysian Borneo. Laboratory analyses showed a slightly elevated C-reactive protein level of 5.2 mg/L (reference range <5.0), but liver function test and complete blood count results were within reference range. During the next 3 days, the fever subsided, but the patient experienced a sore throat, bilateral conjunctivitis, and a burning sensation of the palms and soles. These symptoms were accompanied by swelling of the hands and increasing arthralgia of the wrists, palms, and fingers. There was no lymphadenopathy. An indirect immunofluorescence assay for ZIKV (*3*) demonstrated an IgM titer of 1:640 and an IgG titer of 1:320 (cutoff <1:20) on day 6 of illness (Figure). An indirect immunofluorescence assay for dengue virus demonstrated an IgG titer of 1:80 and no IgM (cutoff <1:20).

Two days later, the patient experienced sudden bilateral dull and metallic hearing; in her left ear, she experienced a very short delay between a sound and her perception of the sound. Follow-up ZIKV serologic testing on day 11 of illness showed a decreased IgM titer of 1:160 and an increased IgG titer of 1:2,560 (Figure). Viral neutralization testing (*3*) of the same sample demonstrated the presence of ZIKV-specific neutralizing antibodies. Chikungunya virus serology results were negative. An archived serum sample from day 3 of illness studied by ZIKV serology and a ZIKV-specific real-time reverse transcription PCR (*3*) was negative (Figure). Hearing difficulties lasted for 10 days and resolved gradually (Figure).

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