



Dengue Fever Among U.S. Travelers Returning from the Dominican Republic --- Minnesota and Iowa, 2008

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In February 2008, a group of U.S. residents became ill with symptoms and clinical findings suggestive of dengue fever after returning from the Dominican Republic, where they had traveled to work as missionaries. Dengue is endemic in the Dominican Republic and most tropical and subtropical areas of the world, including the Caribbean, and represents a known health risk for U.S. residents traveling to or working in those areas (1,2). Subsequent investigation by the Minnesota Department of Health (MDH), the Iowa Department of Public Health (IDPH), and CDC determined that at least 14 (42%) of 33 missionaries traveling to the Dominican Republic met the case definition for dengue fever, and 12 had cases that were confirmed serologically. Of the 13 patients interviewed, all had weakness and fever, with 12 reporting chills and body or joint pain. Ten patients had noticed mosquitoes inside or outside their house in the Dominican Republic, but only three had used repellent. Before departing on their trip, none of the 13 ill travelers interviewed had been aware of dengue in the Dominican Republic, and only two had sought pre-travel medical advice. The Dominican Republic is a frequent destination for U.S. travelers providing missionary and humanitarian services and also for vacationers. These cases indicate a need to increase awareness of dengue prevention measures among U.S. travelers to areas where they might be at risk for dengue.

In April 2008, CDC identified a cluster of blood specimens with positive dengue-specific immunoglobulin M (IgM) antibodies among samples that had been sent to the CDC laboratory by IDPH for testing. Follow-up by IDPH determined that the positive results came from a group of U.S. residents who had traveled to the Dominican Republic, where they worked as missionaries. Through interviews with patients, IDPH noted that several other persons in the group, including persons from Minnesota, had become ill after returning to the United States. IDPH alerted MDH to the potential cluster, and the two state health departments identified additional dengue cases from test results received from commercial laboratories and through additional interviews. MDH, IDPH, and CDC launched an investigation to determine possible factors that might have placed the missionaries at risk for dengue infection.

Investigators determined that, during February 5--18, 2008, a group of 33 missionaries from Minnesota and Iowa traveled to the Dominican Republic to assist with reconstruction related to damage after tropical storm Olga, which struck the country in December 2007. The 33 missionaries each stayed approximately 1 week in a tropical-style house in urban Santiago. The house had potable water, fans, and some window screens, but no air conditioners. During the day, the group participated in construction activities in mostly urban areas; members spent evenings on an open

porch at their house. After returning to the United States, at least 14 (42%) of the missionaries sought health care for nonspecific febrile illness.

For this investigation, a case of dengue was defined as illness in a person with fever and two or more of the following symptoms: headache, retro-orbital pain, myalgia, arthralgia, rash, or hemorrhagic manifestations, plus 1) a specimen with a positive dengue IgM antibody revealed by an enzyme-linked immunosorbent assay (ELISA) test or 2) no dengue-specific laboratory testing but a similar mosquito exposure pattern as a person with a positive laboratory dengue test result.

In May 2008, investigators attempted to contact all 33 missionaries in the group, but were only able to identify those who had positive dengue test results or reported symptoms consistent with dengue infection. A trip coordinator refused to release the names of the other travelers, citing confidentiality issues, and attempts to have the identified patients relay interview requests to other travelers failed. Of 14 persons whose illness met the dengue case definition, 13 agreed to be interviewed regarding demographic information, travel history, activities, and behaviors, and to respond to questions regarding prevention measures and pre-travel knowledge of the risk for dengue fever.

Of the 14 patients whose illness met the dengue case definition, 12 had positive dengue IgM antibody test results, and two had similar illness and exposures but no laboratory testing. Of the 13 patients interviewed, the mean duration of stay in the Dominican Republic was 7.6 days (range: 6--9 days). Median age was 53 years (range: 12--76 years). Eight patients were male. All 13 had weakness and fever, and 12 reported chills and body or joint pain. Six patients had abdominal pain, five had some form of bleeding, four had nausea or vomiting, and three had diarrhea. Two patients were hospitalized, and five reported being out of work from 6 days to 1 month. The mean incubation period was 7.6 days (range: 1--23 days).

Eleven of the 13 patients reported wearing long pants during the workday, primarily to avoid work-related injuries and sunburn. However, none of the patients reported wearing long pants in the evening. All reported opening window screens and doors in their house to increase air flow, and eight noted the presence of mosquitoes inside their bedrooms. Despite having mosquito repellent available in the group supplies, only three persons used repellent. None of the patients used insecticides to treat their clothing or bedding; none used bed nets, recommended for general biting arthropod protection. None of the 13 thought mosquitoes posed a threat to their health, and none were aware of the threat of dengue from mosquitoes in the Dominican Republic. Only three of those interviewed had heard of dengue previously.

Before traveling, none of the 13 patients accessed online travelers' health information or investigated health issues relevant to the Dominican Republic. None learned of dengue risk from trip coordinators or residents of the Dominican Republic. Only two patients visited a health-care provider or travel clinic before travel, and neither was provided with information on dengue. One patient did receive information about malaria, mosquito repellent use, and protective clothing; she used repellent after being prompted by mosquito bites while in the Dominican Republic.

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Editorial Note

In this case series, at least 14 persons (42%) developed dengue fever in a group of 33 U.S. travelers while performing missionary activities in a dengue-endemic country for approximately 1 week. Similar dengue case series have been reported previously in the Caribbean. For example, in 1995, 22 (69%) of 32 aid workers involved in reconstruction and teaching activities for <20 days on Tortola, British Virgin Islands, developed dengue (3). In 1997, at least eight (16%) of 50 missionaries were infected during a 1-week service trip to Mexico's Yucatan Peninsula (4). Similar case clusters likely will be reported in the future; dengue became a nationally notifiable disease in the United States in 2010.

Missionaries and other relief workers often travel to areas where dengue is endemic to assist in aid and recovery efforts. These groups are at particular risk for dengue infection because they work outdoors and stay in lodgings without screens and air conditioning (3,4). Repeated travel to dengue-endemic areas might increase the likelihood for reinfection with dengue and, therefore, increase the risk for severe dengue illness (e.g., dengue hemorrhagic fever) (5). As noted in a similar study (3), most of the missionaries and aid workers did not use recommended measures to prevent mosquito bites, despite mosquito infestation where they worked and slept.

In 2007, the Dominican Republic reported nearly 10,000 clinical cases of dengue.* Despite this, none of the 13 missionaries interviewed were informed of the risk for dengue before their trip. Only two of the 13 sought pre-travel health information. In response to this issue, CDC currently is working to develop partnerships to improve outreach to missionary and aid organizations active in dengue-endemic regions regarding the risk for dengue and the appropriate prevention measures (3,6--8). Efforts will include development of targeted messages and educational materials to be distributed within aid organizations. Opportunities to work with missionary and aid groups directly, as well as with Internet-based travel agencies, travel magazines, and adventure-travel clothing retailers are being explored as ways to alert travelers regarding the relationship between mosquito bites and dengue and to encourage routine use of personal protection measures such as mosquito repellent, protective clothing, and appropriate insecticide, especially when window screens and air conditioning are unavailable (8).


The findings in this report are subject to at least one limitation. Only 13 of the 33 missionaries could be contacted for interviews, and only 12 were tested for dengue. Therefore, a cohort study could not be conducted, and an attack rate could not be calculated. Because many dengue infections are asymptomatic or cause nonspecific febrile symptoms (9), additional infections might have occurred among the 33 that were not reported by the person or identified by a health-care provider.

Dengue is a major public health problem in tropical and subtropical areas of the world, with an estimated 50--100 million dengue infections and 20,000 deaths occurring annually (2). One of the most important mosquito-borne diseases among international travelers, dengue accounts for 21 of 1,000 illnesses experienced annually by travelers worldwide and 32 of 1,000 illnesses in travelers to the Caribbean (7). As seen with the 2009--2010 autochthonous dengue transmission in Key West, Florida, competent mosquito vectors are present in the United States, where conditions can allow

for sizeable local outbreaks (10). Viremic returning travelers present an ongoing risk for reintroduction of dengue viruses to the U.S. mainland. Public health efforts to control *Aedes aegypti*, the primary mosquito vector for dengue, have not been completely effective (4,8). Currently, no vaccine exists to prevent dengue. However, multiple dengue vaccine candidates are being tested in clinical trials around the world that promise a better future in dengue prevention.

References

1. CDC. Travel-associated dengue---Unites States, 2005. *MMWR* 2006;55:700--2.
2. Wilder-Smith A, Gubler DJ. Geographic expansion of dengue: the impact of international travel. *Med Clin North Am* 2008;92:1377--90.
3. Lyerla R, Rigau-Perez JG, Vorndam AV, et al. A dengue outbreak among camp participants in a Caribbean Island, 1995. *J Travel Med* 2000;7:59--63.
4. Norwood CG, Larocco A, Laravia DA, Moore RW, Pittman-Cooley L. Dengue fever risk and prevention for short-term group travelers to tropical regions. *J La State Med Soc* 1999;151:313--8.
5. Wilder-Smith A, Tambyah PA. Severe dengue virus infections in travelers. *J Infect Dis* 2007;195:1081--3.
6. Lindback H, Lindback J, Tegnell A, Janzon R, Vene S, Ekdahl K. Dengue fever in travelers to the tropics, 1998 and 1999. *Emerg Infect Dis* 2003;9:438--42.
7. Schwartz E, Weld LH, Wilder-Smith A, et al. Seasonality, annual trends, and characteristics of dengue among ill returned travelers, 1997--2006. *Emerg Infect Dis* 2008;14:1081--8.
8. Wilder-Smith A, Schwartz E. Dengue in travelers. *N Engl J Med* 2005;353:924--32.
9. Endy TP, Chunsuttiwat S, Nisalak A, et al. Epidemiology of inapparent and symptomatic acute dengue virus infection: a prospective study of primary school children in Kamphaeng Phet, Thailand. *Am J Epidemiol* 2002;156:40--51.
10. CDC. Locally acquired dengue---Key West, Florida, 2009--2010. *MMWR* 2010;59:577--81.

* Available at <http://www.paho.org/english/ad/dpc/cd/dengue-cases-2007.htm> 

What is already known on this topic?

Dengue is endemic in the Dominican Republic and most tropical and subtropical areas of the world and represents a known health risk for U.S. residents traveling to or working in those areas.

What is added by this report?

At least 14 of 33 missionaries who traveled to the Dominican Republic in 2008 became ill with dengue; of 13 who were interviewed, eight reported mosquitoes in their bedrooms, but only three used repellent, and none of the 13 considered mosquitoes a health threat.

What are the implications for public health practice?

Increased efforts should be made to coordinate with dengue-endemic countries to improve prevention and control efforts as well as to explain the risk for dengue and appropriate prevention measures to U.S. travelers, particularly missionary and other aid organizations that visit areas where dengue is endemic and whose activities might put them at risk for contact with mosquitoes.

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