Male-to-Male Sexual Transmission of Zika Virus — Texas, January 2016

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Zika virus infection has been linked to increased risk for Guillain-Barré syndrome and adverse fetal outcomes, including congenital microcephaly. In January 2016, after notification from a local health care provider, an investigation by Dallas County Health and Human Services (DCHHS) identified a case of sexual transmission of Zika virus between a man with recent travel to an area of active Zika virus transmission (patient A) and his nontraveling male partner (patient B). At this time, there had been one prior case report of sexual transmission of Zika virus (*1*). The present case report indicates Zika virus can be transmitted through anal sex, as well as vaginal sex. Identification and investigation of cases of sexual transmission of Zika virus in nonendemic areas present valuable opportunities to inform recommendations to prevent sexual transmission of Zika virus.

Epidemiologic Investigation

In January 2016, 2 days after returning to Dallas, Texas, from a 1-week visit to Venezuela, patient A developed subjective fever, pruritic rash on his upper body and face, and conjunctivitis lasting 3 days. Both 1 day before and 1 day after his symptom onset (Day 0), patient A had condomless insertive anal sex with patient B. Patient A reported that during and after illness he experienced no symptoms of prostatitis or dysuria, and noted no macroscopic hematospermia.

On Day 7, patient B developed a subjective fever, myalgia, headache, lethargy, and malaise; a few days later, he developed a slightly pruritic rash on his torso and arms, small joint arthritis of his hands and feet, and conjunctivitis. All symptoms resolved after 1 week. On Day 11, while still symptomatic, patient B visited his primary care provider for evaluation. Suspecting Zika virus infection, the provider obtained serum specimens from patient B on Day 11 (4 days after patient B's illness onset), and from both patients A and B on Day 14 (14 and 7 days after respective illness onsets). On Day 24, semen, urine, and saliva specimens were collected from both patients (24 and 17 days after respective illness onsets).

Patient A had traveled regularly to Central and South America for many years. During his recent trip to Venezuela, he reported that multiple persons in the area he visited were experiencing symptoms consistent with Zika virus disease; autochthonous transmission of Zika virus had been confirmed in Venezuela in late November 2015.* Patient B had not recently traveled outside of the United States and had never traveled to countries with active autochthonous Zika transmission. Neither patient had a history of prior known arboviral infection nor had they received yellow fever or Japanese encephalitis vaccinations. The men had been mutually monogamous for more than 10 years and had no major medical illnesses or history of sexually transmitted infections. Neither patient reported ulcerative anal or genital lesions.

Laboratory Investigation

Samples of all clinical specimens were sent by DCHHS to CDC. Patient A's serum from 14 days after illness onset and patient B's serum from 4 days after illness onset contained no detectable Zika virus RNA using reverse transcription polymerase chain reaction (RT-PCR) testing (Table) (*2*). Sera from both patients demonstrated positive immunoglobulin M (IgM) responses by capture ELISA for Zika virus and dengue virus, but not for chikungunya virus (Table) (*2*). Plaque-reduction neutralization tests (*3*) indicated that patient A had been infected with Zika virus, dengue virus serotype 1, or both, but that patient B had been infected only with Zika virus. Urine and saliva specimens collected from patients A and B at 24 and 17 days after respective illness onsets had no detectable Zika virus by RT-PCR.

* Pan American Health Organization and World Health Organization Regional Office of the Americas. Epidemiological alert. Neurological syndrome, congenital malformations, and Zika virus infection. Implications for public health in the Americas — 1 December 2015.

TABLE. Reverse transcription polymerase chain reaction (RT-PCR) and serologic testing of serum from patients A and B — Texas, January 2016

Patient	Days after symptom onset	ZIKV RT-PCR	ZIKV IgM*	DENV IgM	CHIK IgM	ZIKV PRNT†	DENV-1 PRNT†	DENV-2 PRNT†
Patient A	14	Negative	Positive	Positive	Negative	>20,480	>20,480	5,120
Patient B	4	Negative	ND	ND	ND	160	<10	<10
Patient B	7	Negative	Positive	Positive	Negative	2,560	10	<10

Abbreviations: CHIKV = chikungunya virus; DENV-1 or 2 = dengue virus serotype type 1 or 2; IgM = immunoglobulin M; ND = not done; PRNT = plaque-reduction neutralization test; ZIKV = Zika virus.
* IgM antibody capture-enzyme linked immunosorbent assay.
† Serum dilution-plaque reduction neutralization test, titers of neutralizing antibodies to ZIKV, DENV-1, and DENV-2.

Semen specimens collected at 24 and 17 days from each man were tested for Zika virus by RT-PCR both by CDC and DCHHS using the same two sets of primers (*2*). At CDC, neither sample had detectable Zika virus with either primer set after 37 cycles. At DCHHS, which pretreated the thawed semen samples with dithiothreitol (used to induce liquefaction of viscous specimens and potentially increase detection of RT-PCR targets), patient B's specimen was negative. Patient A's specimen had Zika virus detected at 35 cycles with one primer set but produced no signal after 37 cycles with the other primer set. Patient A's semen results were thus deemed equivocal.

Environmental Investigation

Although Dallas is within the geographic range of the Zika virus mosquito vectors *Aedes aegypti* and *Ae. albopictus*, seasonal winter temperatures in the area during the week of the traveler's return were not permissive for *Aedes* activity. Maximum area temperatures during the week of the traveler's return were <12°C (<54°F)[†] and thus not suitable for overwintering *Aedes* eggs to hatch and resulting larvae to survive. BG-Sentinel (Biogents AG, Regensberg, Germany) and gravid mosquito traps placed around the residential areas of patients A and B in January yielded only *Culex* but no *Aedes* mosquitoes.

Discussion

In addition to the present case report, at least five other cases of sexually transmitted Zika virus infection supported by laboratory evidence have now been reported in the published literature; all were male-to-female transmissions involving vaginal sex. All of the male travelers had symptoms consistent with Zika virus infection and could have transmitted infections to their sex partners a few days before or after as well as during the time symptoms appeared (*3*–*5*). In this case report, patient B's potential exposures occurred both before and just after initial appearance of symptoms in the traveler, which is the time when blood viremia appears to be highest (i.e., as clinical signs and symptoms of infection emerge).[§]

Transmission of Zika virus to patient B by *Ae. aegypti* or *albopictus* was unlikely based on environmental conditions. Even if these mosquito species had been present and active, the time from exposure to illness in patient B (i.e., 6–8 days) was shorter than the minimum estimated time required for *Aedes* to become infectious had a mosquito ingested a Zika virus-infected blood meal from patient A (i.e., *Ae. aegypti* extrinsic incubation period is a minimum estimated duration of 10 days) (*6*,*7*), and for patient B once infected to have then developed illness (i.e., 3–12 days).

Studies investigating seminal shedding of infection-competent Zika virus, including its incidence, pattern (e.g., intermittent shedding or a steady decay), and duration are ongoing. At the time of Patient B's clinical presentation, there had been only one published report describing testing of semen from a man with Zika virus infection (*8*); studies of semen from two additional men have since been reported (*9*,*10*). Zika virus has been detected by RT-PCR and isolated in culture from the semen of two men at least 2 weeks after onset of illnesses (*8*,*10*) and possibly up to 10 weeks after illness in one of these cases (*8*). One report described Zika virus detectable in semen by RT-PCR 62 days after illness onset; culture was not performed (*9*). In two men, Zika virus was no longer detectable in their blood by RT-PCR when the semen specimens were analyzed (*8*,*9*). None of the three men provided follow-up semen specimens to determine when Zika virus was no longer detectable. Notably, all men in the five case reports and the three semen studies, as well as patient A, experienced symptomatic illness. In the report of the sexual transmission case that occurred in 2008 (*1*) and of the man with culturable Zika virus in semen in 2013 (*8*), symptoms also included hematospermia.

Identifying and characterizing cases of sexually transmitted Zika virus infection in areas experiencing intense autochthonous vector-borne Zika virus transmission is challenging. Reports of sexual transmission identified in areas where autochthonous transmission is not occurring offer unique and important opportunities to learn about this emerging mode of transmission and rapidly inform and refine interim prevention recommendations. Such cases highlight the need for clinicians to remain vigilant for and continue reporting any suspected cases of Zika virus infection to their state or

Summary

What is already known about this topic?

Although Zika virus is spread primarily by *Aedes* species mosquitoes, published case reports have documented sexual transmission from infected men to their female sex partners through vaginal sex.

What is added by this report?

This is the first report of transmission of Zika virus from an infected man to a sex partner through anal sex.

What are the implications for public health practice?

Sexual transmission through both vaginal and anal sex is an emerging mode of Zika virus infection that might contribute to more illness than was anticipated when the outbreak was first recognized. Cases of sexually transmitted Zika virus infection should be reported to public health agencies and can help inform recommendations to prevent Zika virus infections.

[†] National Weather Service Climate Prediction Center. Temperature data for Dallas-Ft. Worth, Texas. 2016. http://www.cpc.ncep.noaa.gov/products/tanal/temp_analyses.php.

[§] http://www.who.int/bulletin/online_first/16-171207.pdf.

local health departments, including suspected infections in symptomatic persons without travel history, but who report unprotected sexual contact with a person who has traveled to an area with active Zika virus transmission.

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