In this study, we detected Zika virus RNA in 2 pools of engorged *Ae. aegypti* mosquitoes that were collected during a mosquitoborne virus surveillance program in Rio de Janeiro. Information regarding Zika virus infection rates is lacking for female and male mosquitoes trapped in the field. However, experiments performed in the laboratory demonstrated transovarial transmission of Zika virus among *Ae. aegypti* mosquitoes and revealed a minimal filial infection rate of 1:290 (10). Mosquitoborne virus surveillance provides an early warning for arbovirus circulation, points out high-risk areas for virus transmission, and provides data for directing control measures. Furthermore, future surveillance-based studies should further illuminate Zika virus ecology and patterns of spatial dynamics.

In conclusion, we showed the presence of Zika virus in engorged *Ae. aegypti* mosquitoes trapped in Rio de Janeiro before the first case of autochthonous Zika virus disease was diagnosed in the city (3). This finding emphasizes the importance and benefit of routine entomologic surveillance programs to public health in terms of ensuring timely implementation of disease prevention and control measures. Furthermore, considering that the analyzed Zika virus from Rio de Janeiro clustered in different lineages, our phylogenetic analysis suggests multiple introductions of Zika virus from other regions of Brazil, rather than from outside the country, and an early presence (2013) of Zika virus in Rio de Janeiro State.

Acknowledgments

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References


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Scrub Typhus Outbreak in a Remote Primary School, Bhutan, 2014

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Scrub typhus in Bhutan was first reported in 2009. We investigated an outbreak of scrub typhus in a remote primary school during August–October 2014. Delay in recognition and treatment resulted in 2 deaths from meningoencephalitis. Scrub typhus warrants urgent public health interventions in Bhutan.

Scrub typhus, caused by the intracellular parasite *Orientia tsutsugamushi*, is a miteborne infection that largely occurs in the “tsutsugamushi triangle” (online Technical Appendix Figure 1, https://wwwnc.cdc.gov/EID/article/23/8/16-2021-Techapp1.pdf), where Watt et al. estimated ≈1 million cases occurred annually in 2003 (1). Infected persons commonly have fever, headache, conjunctival congestion, myalgia, lymphadenitis, rashes, and eschars with and without complications (2). Among untreated persons, the case-fatality rate is 6%–35% (3). In scrub typhus–endemic areas, central nervous system involvement occurs in ≈25% of patients (4). Consequently, scrub typhus should be considered in the differential diagnosis of aseptic meningitis.

During January–October 2016, Nepal reported scrub typhus in 37 districts, resulting in 8 deaths (5). Himachal Pradesh, India, reported 700 case-patients, 20 of whom died (6). In Bhutan, scrub typhus gained clinical attention after an outbreak in 2009 (7); earlier cases might have been missed because of low awareness.

During August–October 2014, a scrub typhus outbreak occurred in Singye Namgyal Primary School (SNPS), a remote community boarding school in the Wangduephodrang district of Bhutan (online Technical Appendix Figure 2). On August 17, three girls from SNPS reported 5–6 days of fever, headache, cough, and body aches and were treated symptomatically by the visiting health assistant from Kami chu Basic Health Unit (KBHU). Two of the girls recovered; the third was admitted to the KBHU on August 20 and transferred to Bajho Hospital (BH) the next day. By August 26, she experienced neck stiffness, irritability, and disorientation. Viral encephalitis was suspected, and she was referred to the Jigme Dorji Wangchuck National Referral Hospital (JDWNRH) in Thimphu on August 27. On admission, a serum sample tested positive for *O. tsutsugamushi* by rapid diagnostic test (RDT); she died the next day.

Another girl and her brother from SNPS were admitted to the Punakha district hospital on September 1 with similar symptoms. The boy was sent home with medications and recovered; his sister had meningeal symptoms and severe thrombocytopenia and was transferred to the JDWNRH on September 2, where she died on September 28. Specimens from both patients were *O. tsutsugamushi*–positive by RDT.

On September 22, a 10-year-old girl from SNPS was referred to JDWNRH with similar symptoms. Her serum specimen was *O. tsutsugamushi* positive, but she recovered with treatment.

<table>
<thead>
<tr>
<th>Patient ID</th>
<th>Age, y/sex</th>
<th><strong>Orientia tsutsugamushi</strong></th>
<th>Kato</th>
<th><strong>O. chuto</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gilliam</td>
<td>Karp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>6/M</td>
<td>256</td>
<td>512</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>9/F</td>
<td>8,192</td>
<td>8,192</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>6/M</td>
<td>512</td>
<td>128</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>10/F</td>
<td>1,024</td>
<td>1,024</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>13/M</td>
<td>1,024</td>
<td>256</td>
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</tr>
<tr>
<td>7</td>
<td>15/M</td>
<td>1,024</td>
<td>128</td>
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</tr>
<tr>
<td>9</td>
<td>7/F</td>
<td>2,048</td>
<td>4,096</td>
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<tr>
<td>11</td>
<td>10/F</td>
<td>1,024</td>
<td>512</td>
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<tr>
<td>12</td>
<td>14/F</td>
<td>128</td>
<td>1,024</td>
<td></td>
</tr>
</tbody>
</table>

*ID, identification.*
Of the acutely ill patients who had positive mIFA results, 67% had pathognomonic eschars, confirming the clinical diagnostic value in this sign of systemic infection. Thrombocytopenia as a sign of scrub typhus could be useful but is a less specific diagnostic indicator (9). There was only a 75% agreement between the rapid test kit and the precise mIFA, but RDTs were shown to be more useful in early detection (10).

The deaths of 2 children in this outbreak could have been prevented if the public had greater awareness of the signs and symptoms of scrub typhus. Lapses of 7–10 days from symptom onset to initial medical consultation and >1 month until the outbreak was investigated demonstrate the importance of training school health coordinators to identify and report incidences of abnormal medical findings to public health agencies, especially in remote, hard-to-reach areas. Parents delayed seeking medical advice, and in some cases, school staff had to persuade them to take their children for medical evaluation. Rapid medical care during illnesses should be encouraged through better community education.

Despite inadequate identification and reporting, there is increasing evidence of endemic scrub typhus in Bhutan. Outbreaks may be common but unrecognized, and past outbreaks may have been missed. Scrub typhus warrants a dedicated public health program or incorporation into the existing vectorborne disease control program in this country.

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Scrub Typhus as a Cause of Acute Encephalitis Syndrome, Gorakhpur, Uttar Pradesh, India

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Outbreaks of acute encephalitis syndrome (AES) have been occurring in Gorakhpur Division, Uttar Pradesh, India, for several years. In 2016, we conducted a case–control study. Our findings revealed a high proportion of AES cases with Orientia tsutsugamushi IgM and IgG, indicating that scrub typhus is a cause of AES.