Infection with New York Orthohantavirus and Associated Respiratory Failure and Multiple Cerebral Complications

Rajeev Fernando, David Capone, Susan Elrich, Raymond Mantovani, Luther Quarles III, Alison D’Amato, Nathan Lowe, Ashwin Malhotra, Teresa Khoo, Sara Zufan, Maria Morales-Betoulle, Shelley M. Brown, Deborah Cannon, James C. Graziano, John D. Klena, Shannon Whitmer, Stuart T. Nichol, Paul Strachan, Bernard C. Camins, Luis A. Marcos

Author affiliations: Stony Brook Southampton Hospital, Southampton, New York, USA (R. Fernando, D. Capone, S. Elrich, R. Mantovani, L. Quarles III, A. D’Amato, N. Lowe); New York Presbyterian Hospital/Weill Cornell Medical Center, New York, New York, USA (A. Malhotra); Stony Brook University, Stony Brook, New York, USA (A. Malhotra, T. Khoo, P. Strachan, L.A. Marcos); Centers for Disease Control and Prevention, Atlanta, Georgia, USA (S. Zufan, M. Morales-Betoulle, S.M. Brown, D. Cannon, J.C. Graziano, J.D. Klena, S. Whitmer, S.T. Nichol); Icahn School of Medicine at Mount Sinai, New York (B.C. Camins)

DOI: https://doi.org/10.3201/eid2506.181966

We report a case of infection with New York orthohantavirus in a woman who showed renal impairment and hemorrhage, complicated by hydrocephalus, in Long Island, New York, USA. Phylogenetic analysis showed that this virus was genetically similar to a New York orthohantavirus isolated in the same region during 1993.

In the United States, New York orthohantavirus (NYV) is carried by the white-footed mouse (Peromyscus leucopus). During 1993–1995, human cases of NYV infection were reported in persons who visited or resided on Long Island, New York, USA (1). Since that time, no other cases have been reported on Long Island. We report an NYV infection with unusual clinical manifestations.

A 52-year-old woman from the east end of Long Island came to an emergency department in May 2017 because of fevers, headaches, myalgias, vomiting, somnolence, and lethargy for 3 days. She had a history of tick exposure and had recently cleaned her basement, where she reported observing mice droppings. The patient had a core temperature of 102°F, a heart rate of 108 beats/min, a respiration rate of 20 breaths/min, and a blood pressure of 94/56 mm Hg. Her oxygen saturation was 95% on room air. Laboratory tests showed the following results: leukocytes 4,500 cells/mm³, platelets 102,000 platelets/mm³, aspartate aminotransferase 355 U/L, alanine aminotransferase 180 U/L, procalcitonin 4.3 ng/mL, erythrocyte sedimentation rate 2 mm/h, and C-reactive protein 4.7 mg/dL. A chest radiograph showed clear lung fields. A lumbar puncture showed an opening pressure of 45 cm of H₂O (reference range 8–15 cm H₂O), 1 nucleated cell (reference value <5/high-powered field), glucose 152 mg/dL, and protein 31 mg/dL.

On day 4 postonset, her condition rapidly deteriorated. A second chest radiograph showed developing pulmonary congestion, and she required intubation and mechanical ventilation. She also had severe thrombocytopenia (18,000/platelets mm³), acute kidney injury, proteinuria and microhematuria (peak creatinine 2.3 mg/dL, urinary protein 30 mg/dL, 50 erythrocytes/high-powered field), worsening transaminitis (aspartate aminotransferase 329 U/L, alanine aminotransferase 258 U/L), and an increased lactate dehydrogenase (769 U/L). A computed tomography (CT) scan of the lungs showed bilateral pleural effusions (day 6 postonset). Because a CT scan of the head showed cerebral edema, the patient was transferred to a tertiary care hospital (day 7 postonset).

Serologic test results were negative for Powassan virus, Ehrlichia spp., Anaplasma spp., Lyme disease, and Rocky Mountain spotted fever. Results of a hantavirus IgM and IgG ELISA (recognizing the nucleocapsid protein common to all hantaviruses) were positive (Associated Regional and University Pathologists Laboratories, https://www.aruplab.com). An acute hantavirus infection was confirmed by the Centers for Disease Control and Prevention (Atlanta, GA, USA) by ELISA and identified antibodies that cross-reacted with Sin Nombre virus antigens (serum titers: IgM 1:6,400 and IgG 1:400). Orthohantavirus RNA was also detected by using reverse transcription PCR specific for the large RNA segment (2).

Although the patient’s condition improved on day 14 postonset, she had 3 episodes of witnessed tonic–clonic seizures. A CT scan of the head showed an acute intraparenchymal hemorrhage (platelet count range 37,000/μL–57,000/μL) in the left basal ganglia with intraventricular extension into the left lateral and third ventricles and hydrocephalus that required placement of an emergent external ventricular drain. Blood and cerebrospinal fluid (CSF) collected at day 15 postonset had undetectable levels of virus RNA but IgM (serum 1:6,400, CSF 1:20) and IgG (serum 1:6,400, CSF 1:20) antibody titers had increased. She was discharged on day 26 postonset and given anticonvulsant therapy. One year later, the patient was asymptomatic.

We sequenced hantavirus RNA isolated from the initial blood specimen by using Sanger and unbiased next-generation sequencing (Figure). Phylogenetic analysis of
a partial genome inferred that the virus had a most recent common ancestor with an NYV collected in 1994 from a white-footed mouse from Shelter Island, NY (3). Given the inferred evolutionary relationship, our data are consistent with disease transmission likely occurring after contact with excreta from a local rodent. It is unclear if NYV (formerly classified as a distinct species) might have caused the neurologic complications (hydrocephalus and intracranial bleeding) for this case. Neurologic signs and symptoms did not develop for previous cases of infection with NYV (1).

Hantavirus pulmonary syndrome is a severe respiratory illness caused by infection with New World hantaviruses (4). During 1993–2015, a total of 688 cases of hantavirus pulmonary syndrome were reported in the United States (case-fatality rate 36%) (3). We report an orthohantavirus infection that progressed to respiratory failure and renal impairment...
on day 4 postonset, which preceded cerebral complications on day 14 postonset. Brain complications, including subarachnoid (6), pituitary hemorrhage (7), and encephalitis (8), with orthohantavirus infections have been reported. The direct effect of the virus into the brain has been demonstrated in an animal model (9), which raises the question whether intracranial bleeding for this case-patient was associated with endothelial damage directly from the virus infection.

In conclusion, we report an orthohantavirus infection in New York that caused intracranial bleeding and hydrocephalus that required an emergent surgical intervention. Because orthohantaviruses are endemic to North America and several strains/species have not been fully characterized, it is essential that clinicians recognize and be aware of other clinical manifestations of these infections (e.g., kidney injury), which are often indicators of subsequent complications.

About the Author
Dr. Fernando is an infectious diseases specialist at Stony Brook Southampton Hospital, Southampton, NY. His primary research interest is tropical medicine.

References
1. Nuovo GJ, Simsir A, Steigbigel RT, Kuschner M. Analysis of fatal pulmonary hantaviral infection in New York by reverse transcriptase in situ polymerase chain reaction. Am J Pathol. 1996;148:685–92.
2. Woods C, Palekar R, Kim P, Blythe D, de Senarclens O, Feldman K, et al. Domestically acquired Seoul virus causing hemorrhagic fever with renal syndrome. Maryland, 2008. Clin Infect Dis. 2009;49:e109–12. http://dx.doi.org/10.1086/644742
3. McMullan LK, Albariño CG, Ksiazek TG, Nichol ST, Spiropoulou CF. Complete genome sequences of a hantavirus isolate from New York. Genome Announc. 2018;6:e00188–18. http://dx.doi.org/10.1128/genomeA.00188-18
4. Nichol ST, Spiropoulou CF, Morzunov S, Rollin PE, Ksiazek TG, Feldmann H, et al. Genetic identification of a hantavirus associated with an outbreak of acute respiratory illness. Science. 1993;262:914–7. http://dx.doi.org/10.1126/science.8235615
5. Centers for Disease Control and Prevention. Annual US hantavirus disease and HPS case fatality, 1993–2016 [cited 2018 Nov 30]. https://www.cdc.gov/hantavirus/surveillance/annual-cases.html
6. Xu Z, Xu P, Lei X, Xu Z, Wu Q, Zhang J. Subarachnoid hemorrhage associated with epidemic hemorrhagic fever: a rare case report. Int J Med Sci. 2011;8:640–2. http://dx.doi.org/10.7150/ijms.8.640
7. Hautala T, Hautala N, Mäihänen SM, Sironen T, Pääkkö E, Karttunen A, et al. Young male patients are at elevated risk of developing serious central nervous system complications during acute Puumala hantavirus infection. BMC Infect Dis. 2011;11:217. http://dx.doi.org/10.1186/1471-2334-11-217
8. Talamonti L, Padula PJ, Cantelli MS, Posner F, Marczceski FP, Weller C. Hantavirus pulmonary syndrome: encephalitis caused by virus Andes. J Neurovirol. 2011;17:189–92. http://dx.doi.org/10.1007/s13365-010-0011-4
9. Shin OS, Song GS, Kumar M, Yanagihara R, Lee HW, Song JW. Hantaviruses induce antiviral and pro-inflammatory innate immune responses in astrocytic cells and the brain. Viral Immunol. 2014;27:256–66. http://dx.doi.org/10.1007/vim.2014.0019

Rickettsia japonica Infection after Land Leech Bite, Japan

Eiichiro Sando, Motoi Suzuki, Mitsuya Katayama, Masakatsu Taira, Hiromi Fujita, Koya Ariyoshi

Author affiliations: Kameda Medical Center, Kamogawa, Japan (E. Sando, M. Katayama); Nagasaki University, Nagasaki, Japan (E. Sando, M. Suzuki, K. Ariyoshi); Chiba Prefectural Institute of Public Health, Chiba, Japan (M. Taira); Mahara Institute of Medical Aca rology, Anan, Japan (H. Fujita)

DOI: https://doi.org/10.3201/eid2506.181985

We report a case of Rickettsia japonica infection in an 81-year-old man in central Japan. The patient had fever, rash, and an eschar but no evidence of a tick bite. His symptoms began 8 days after a land leech bite. The land leech is a potential vector of R. japonica.

Japanese spotted fever, a tickborne disease caused by Rickettsia japonica, has been reported in Japan, Korea, and China (1–3). We describe a case of Japanese spotted fever after a land leech (Haemadipsa zeylanica japonica) bite.

On August 3, 2016, an 81-year-old man was transported to an emergency department with a 2-day history of fever (temperature of 38°C), staggering, appetite loss, and general malaise. He was undergoing hormonal therapy for prostate cancer and had an indwelling urinary catheter. However, he was fully independent and walked 2 km every day as a tour guide to a mountain road in the southern Boso area of Japan. At admission, he was alert and oriented, with no apparent fever (temperature of 36.8°C). Clinicians observed a nonpruritic, painless rash on his torso and extremities (Figure, panels A, B), including his palms and the soles of his feet. The attending physician thoroughly searched for an eschar and noted only a single nonpruritic, painless lesion on the man’s lower abdomen (Figure, panel C). The patient and his family reported that the eschar appeared at the site where a land leech had been attached on July 24, 10

Address for correspondence: Luis A. Marcos, Stony Brook University Health Sciences Center School of Medicine, Internal Medicine, Division of Infectious Disease, 101 Nicolls Rd, Health Science Center T16, Rm 0271, Stony Brook, NY 11794, USA; email: luis.marcos@stonybrookmedicine.edu