


An Overview of Jamestown Canyon Virus Disease

Kyle J. Coleman, MD¹, Lakshmi Chauhan, MD¹,
Amanda L. Piquet, MD¹, Kenneth L. Tyler, MD^{1,2},
and Daniel M. Pastula, MD, MHS^{1,3} 

Keywords

Jamestown Canyon virus, orthobunyavirus, California serogroup, arbovirus, encephalitis, meningitis, meningoencephalitis, mosquito, mosquitoes, North America

Jamestown Canyon virus is a mosquito-borne California serogroup orthobunyavirus first isolated from *Culiseta inornata* mosquitoes near Jamestown, Colorado, in 1961.¹⁻³ It is closely related to La Crosse, snowshoe hare, and California encephalitis viruses (and may have been historically mistaken for these given significant antibody cross-reactivity within the California serogroup).² It has subsequently been identified in other mosquito species, with principal mosquito vectors likely varying by region.¹⁻⁵ White-tailed deer are likely the primary amplifying hosts, though moose, elk, bison, and pronghorns may also play a role.^{1,2,4,5} Jamestown Canyon virus-specific neutralizing antibodies have been found in mammals and humans throughout North America suggesting a widespread geographic distribution.^{2,3}

Since the 1960s, human cases of Jamestown Canyon virus disease have been reported throughout the United States, though there appears to be a geographic predilection for northern states.^{1,2,3,5} Case detection improved in 2013 when the Centers for Disease Control and Prevention (CDC) began routine testing of all domestic arboviral disease samples with a Jamestown Canyon virus-specific immunoglobulin (Ig) M test.^{1,3} Approximately 10–75 cases per year have been reported throughout the United States since then, though many other cases have likely gone unidentified.^{1,3} Interestingly, Wisconsin and Minnesota have reported more than half of these known cases, likely due to both increased surveillance and disease incidence.^{1,3,5} Most cases have symptom onset from April through September with bimodal peaks in spring and late summer (likely reflecting different mosquito populations involved throughout the year).^{2,3,5} Similar to other arboviral diseases, reported cases are more likely to be male.^{1,3,5} Unlike La Crosse virus disease which has a predilection for children, there is no such age predilection with Jamestown Canyon.^{1,3,5} Neuroinvasive disease has been reported in children, young adults, and older adults.^{3,5}

Many Jamestown Canyon virus infections are thought to be asymptomatic, but the proportion is unknown.^{1,3,5} Symptomatic Jamestown Canyon virus disease cases may present

with fever, fatigue, myalgia, and/or headache.^{1,2,3,5} Some patients may present with upper respiratory symptoms (e.g., cough, rhinitis, pharyngitis), which is uncommon for arboviral infections.^{1,2} About half of reported cases are neuro-invasive presenting with meningitis or meningoencephalitis.^{1,2,3,5} Lumbar puncture in neuroinvasive cases may show a lymphocytic cerebrospinal fluid (CSF) pleocytosis with normal glucose and elevated protein.^{5,6} Magnetic resonance imaging (MRI) of the brain may show bi-hemispheric lesions, basal ganglia lesions, or meningeal enhancement.⁵ Approximately 50% of reported cases have been hospitalized, but deaths are rare.^{1,3,5} More chronic progressive courses may occur in those immunocompromised.⁶

Diagnosis is typically made by serology (i.e., a positive Jamestown Canyon virus-specific IgM test in serum and/or CSF).^{1,3} Due to significant antibody cross-reactivity among the California serogroup, any positive IgM should be followed by a confirmatory plaque reduction neutralization test (PRNT).^{1,3} Rarely, Jamestown Canyon virus infection may be diagnosed through reverse transcription-polymerase chain reaction (RT-PCR) tests on serum or CSF samples from immunocompromised patients or on infected tissue.^{3,6}

Treatment of Jamestown Canyon virus disease is supportive since no specific anti-virals are available.^{1,5} Intensive care

¹ Neuro-Infectious Diseases Group, Division of Infectious Diseases, Department of Neurology, University of Colorado School of Medicine, Aurora, CO, USA

² Department of Immunology-Microbiology, University of Colorado School of Medicine, Aurora, CO, USA

³ Department of Epidemiology, Colorado School of Public Health, Aurora, CO, USA

Corresponding Author:

Daniel M. Pastula, MD, MHS, University of Colorado School of Medicine, Department of Neurology, 12700 E 19th Ave, Mailstop B-182, Aurora, CO 80045, USA.

Email: daniel.pastula@cuanschutz.edu

may be necessary for those with refractory seizures, cerebral edema, and/or decreased consciousness.

Jamestown Canyon virus infection can be prevented by avoiding mosquito bites (e.g., wearing insect repellent, avoiding outdoors between dusk and dawn, wearing long-sleeved shirts and pants).¹ Clinicians can contact their local and/or state health departments for questions regarding Jamestown Canyon virus disease and for assistance with testing.


Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Daniel M. Pastula  <https://orcid.org/0000-0001-9342-4459>

References

1. Centers for Disease Control and Prevention. Jamestown canyon virus. Published 2019. Accessed March 18, 2021. <https://www.cdc.gov/jamestown-canyon/index.html>
2. Grimstad PR. California group virus disease. In: Monath T, ed. *The Arboviruses: Epidemiology and Ecology*. CRC Press; 1988: 99-136.
3. Pastula DM, Johnson DK, White JL, Dupuis AP II, Fischer M, Staples JE. Jamestown Canyon virus disease in the United States—2000-2013. *Am J Trop Med Hyg*. 2015;93(02):384-389.
4. Andreadis TG, Anderson JF, Armstrong PM, Main AJ. Isolations of Jamestown canyon virus (Bunyaviridae: Orthobunyavirus) from field-collected mosquitoes (Diptera: Culicidae) in Connecticut, USA: a ten-year analysis, 1997-2006. *Vector Borne Zoonotic Dis*. 2008;8(02):175-188.
5. Matkovic E, Hoang Johnson DK, Staples JE, et al. Enhanced arboviral surveillance to increase detection of Jamestown canyon virus infections, Wisconsin, 2011-2016. *Am J Trop Med Hyg*. 2019;100(02):445-451.
6. Solomon IH, Ganesh VS, Yu G, et al. Fatal case of chronic Jamestown canyon virus encephalitis diagnosed by metagenomic sequencing in patient receiving rituximab. *Emerg Infect Dis*. 2021;27(1):238-242.