California Serogroup Infection

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Includes Jamestown Canyon virus and Snowshoe Hare virus

Case Definition

Confirmed Case
Clinical illness\(^1\) with laboratory confirmation of infection:
- Detection of Jamestown Canyon (JC) or Snowshoe Hare (SSH) viral nucleic acid (e.g., PCR) in an appropriate clinical specimen (e.g., blood, CSF).

OR
- Positive serum IgM antibodies for JC/SSH virus and a seroconversion demonstrated by fourfold or greater rise in JC/SSH virus-specific PRNT antibody titres detected in acute and convalescent-phase sera ideally collected at least 2 weeks apart\(^3\) and occurring during a period when and where JC/SSH transmission is likely.\(^3\)

OR
- Presence of JC/SSH IgM in a CSF sample and a PRNT titre of \(\geq 1:20\) in acute sera and occurring during a period when and where JC/SSH transmission is likely.\(^3\)

Probable Case
Clinical illness\(^1\) with the following:
- Positive/equivocal serum IgM and a PRNT titre of \(\geq 1:20\)\(^4\) for antibodies specific for JC/SSH virus on a single acute phase serum specimen taken during a period when and where JC/SSH transmission is likely.\(^3\)

Suspect Case
Clinical illness\(^1\) with the following:
- Positive/equivocal IgM\(^4\) and negative PRNT for JC/SSH on a single acute phase serum specimen taken during a period when and where JC/SSH transmission is likely.\(^3\)

\(^1\)Clinical illness is characterized by a febrile illness of variable severity associated with neurological symptoms ranging from headache to aseptic meningitis or encephalitis. Arboviral encephalitis cannot be distinguished clinically from other central nervous system (CNS) infections without laboratory testing. Symptoms can include headache, confusion or other alteration in sensorium, nausea and vomiting. Signs may include fever, meningismus, cranial nerve palsies, paresis or paralysis, sensory deficits, altered reflexes, convulsions, abnormal movements and coma of varying degree.
Seroconversion indicates a recent infection with an infectious agent such as an arbovirus. For detecting JC and SSH virus antibody IgM and IgG ELISAs may cross react to some extent. PRNT confirmatory testing documents a specific exposure to these viruses and may be requested at National Microbiology Laboratory through the Provincial Laboratory of Public Health. However, due to the possibility of persistent IgM in serum samples the demonstration of a seroconversion (or detection of virus) is necessary to associate positive serology with current illness.

The highest risk of JC/SSH exposure occurs mid-July to early fall in Canada and the Midwest United States and year round in southeast parts of the United States. Cases of febrile and meningitis/encephalitis have been documented late spring and early summer.

IgM in an acute serum sample and a single antibody titre of $\geq 1:20$ by PRNT suggests recent infection. It is recommended that a second serum sample be collected (see above). A second laboratory result with a stable (unchanged/static or $\leq 2$-fold rise) antibody titre is still suggestive of recent infection but may depend on when the specimen was taken in relation to onset of symptoms (e.g., the rise in titre may be missed due to timing of sample collection). **Note**-The presence of JC/SSH specific IgM in an acute CSF specimen is confirmatory.
Reporting Requirements

1. Physicians
   Physicians shall notify the Medical Officer of Health (MOH) (or designate) of all confirmed and probable cases of JC/SSH encephalitis in the prescribed form by mail, fax or electronic transfer within 48 hours (two days).

2. Laboratories
   All laboratories, including regional laboratories and the Provincial Laboratory for Public Health (PLPH), shall report all JC/SSH virus positive laboratory results by mail, fax or electronic transfer within 48 hours (two days) to the:
   - Chief Medical Officer of Health (CMOH) (or designate),
   - MOH (or designate) and
   - Attending/ordering physician.

3. Alberta Health Services
   - The MOH (or designate) of the zone where the case currently resides shall report in the prescribed manner (as detailed in the Notice dated March 22, 2011) using the Notifiable Disease Report (NDR) all confirmed and probable cases of JC/SSH to the CMOH (or designate) within two weeks of notification and the final NDR (amendment) within four weeks of notification.
   - For out-of-zone reports, the MOH (or designate) first notified shall notify the MOH (or designate) where the client currently resides by mail, fax or electronic transfer and fax a copy of the positive laboratory report within 48 hours (two days).
   - For out-of-province and out-of-country reports, the following information should be forwarded to the CMOH (or designate) by phone, fax or electronic transfer within 48 hours (two days) including:
     - name,
     - date of birth,
     - out-of-province health care number,
     - out-of-province address and phone number,
     - attending physician (locally and out-of-province) and
     - positive laboratory report (faxed).
Etiology
California serogroup (CSG) viruses are members of the *Bunyaviridae* family and include Jamestown Canyon (JC) virus and Snowshoe hare (SSH) virus. (2) JC virus was first isolated from a mosquito collected in Jamestown Canyon, Colorado in 1961. (3) SSH was first identified in a snowshoe hare in Montana in 1958. (4)

Clinical Presentation
The majority of infections are likely asymptomatic, similar to West Nile virus (WNv). Symptoms can range from mild with fever, headache and vomiting, to severe with high fever, meningeal symptoms, tremors, occasionally seizures (especially in children) and rarely acute flaccid paralysis can occur. Severe infections result in a variety of sequelae such as behaviour changes, learning disabilities, and cognitive deficits. (2)

Diagnosis
Recent advances in diagnostic testing using both serological and molecular assays have made it possible to more accurately identify acute cases. To diagnose CSG infections, testing of acute and convalescent sera from suspect cases are recommended for determining the diagnostic rise or decrease in CSG-specific antibody titres. As well, samples of cerebrospinal fluid should be included for detection of acute IgM antibody or viral genomic sequences (PCR) which would constitute confirmatory laboratory evidence of an infection associated with accompanying clinical characteristics. (5)

The dynamics of antibody rise during a CSG infection is similar to WNv. Approximately one week after the onset of symptoms, a full IgM response should be detectable. IgG will begin to be present at about 10 days post onset of symptoms. Variations to this will depend upon the patient. IgG should last several years after exposure. In certain cases there is evidence of persistent IgM (as observed with WNv) which needs to be taken into consideration for diagnostic purposes (Personal communication, Drebot M, National Microbiology Laboratory, 2010 Nov 23).

Epidemiology
Reservoir
The amplifying hosts/reservoirs for CSG viruses can be either small mammals such as squirrels, chipmunks, hares for SSH viruses or larger animals such as deer and elk for JC viruses. *Aedes, Culexita* and *Anopheles* mosquitoes (2), which are present throughout Canada from May to October, allow CSG to overwinter. (5) These mosquito species feed mainly from dusk until dawn, although some *Aedes* species also feed during the day (Personal communication, McIntosh J, Alberta Environment, 2010 Nov 17).

Transmission
CSG viruses are transmitted to humans through the bite of an infected mosquito. The mosquito becomes infected after feeding on a source infected with the virus and then spreading the infection in subsequent blood meals. (2)

CSG viruses may rarely be transmitted person-to-person through blood transfusion, organ transplantation, intrauterine transmission and possibly milk. (1;6)

Incubation Period
The incubation period of CSG viruses is between five and 15 days. (7)
Period of Communicability
CSG viruses are not directly transmitted person-to-person. Mosquitoes are infective for life.(7)

Host Susceptibility
Identified cases of SSH virus have been predominately associated with encephalitis in children.(5) JC virus appears to be primarily associated with illness in adults but cases involving individuals younger than 18 years have also been documented.

Occurrence
General
California serogroup viruses are found mainly in Canada and the United States and both JC and SSH have a wide geographic distribution. In the United States, JC is found throughout the West and Midwest, although most human cases have been found in New York and New England and the upper Midwest states. JC seroconversion has more recently been documented in local populations in Alaska. SSH is found internationally in Russia, China and Alaska.(8)

Based on serosurveys in Canada and the United States it is estimated that approximately 25% of the population may have antibodies to these viruses but the actual seroprevalence rates may range from 4 to 50% depending upon the region.(5;9;10)

Canada
CSG is not nationally notifiable so it is difficult to estimate the burden of this disease in Canada. JC has been found in Newfoundland, Quebec, Ontario, Manitoba, Saskatchewan and the Northwest Territories(11); SSH has been documented in all provinces and territories.(8)

In 2009, 8 acute cases of exposure were confirmed in Canada with approximately 100 probable cases based on the presence of virus specific IgM and significant PRNT titres. In the serums of patients evaluated for suspect WNv infections (febrile and neurological illness) in Manitoba between 2008 and 2009, 2% of the patients were identified as having evidence of SSH virus exposures and 9% were identified as having evidence of JC virus infection. Similar detection rates of CSG virus antibody were identified among suspect WNv cases (later determined to be WNv negative) in Ontario and Saskatchewan. Although patients may have SSH or JC specific IgM antibody, it is not known if these results represent current or previous infections due to the possible persistence of IgM in certain cases.(5)

Alberta
CSG became notifiable in Alberta in 2011. Information in this section will be updated as it becomes available.

Key Investigation
Single Case/Household Cluster
Assess potential risk factors and likely mode of transmission for the acquisition of CSG within three weeks prior to onset of symptoms, as well as other considerations:
- Living in or travel to an area when and where JC/SSH transmission is present (see Occurrence).
- Recall being bitten by mosquitoes.
Control

Management of a Case
- Supportive care including IV fluids, ventilation and the prevention of secondary infections.
- Symptomatic treatment.

Treatment of a Case
- There is no known antiviral therapy available.

Management of Contacts
- There is no evidence to suggest that CSG virus can be transmitted to household contacts of persons infected with CSG virus.

Preventive Measures
- Preventing mosquito bites is considered the best measure to avoid the low risk of contracting JC and SSH infection.
References


