



# California Serogroup Virus (CSG Virus)

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The following chapter is adapted with permission from Alberta Health, for additional guidance related to the management of California Serogroup Virus see [Alberta Public Health Disease Management Guidelines: California Serogroup Infections](#).

## 1. CASE DEFINITION

### Confirmed Case

Clinical illness\* 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, Cerebrospinal fluid (CSF)) **OR**
- Positive serum IgM antibodies for JC/SSH virus and a seroconversion demonstrated by fourfold or greater rise in JC/SSH virus-specific plaque reduction neutralization test (PRNT) antibody titres detected in acute and convalescent-phase sera ideally collected at least 2 weeks apart\*\* and occurring during a period when and where JC/SSH transmission is likely **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.

### Probable Case

Clinical illness with the following:



- Positive/equivocal serum IgM and a PRNT titre of  $\geq 1:20$  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.

### Suspect Case

Clinical illness with the following:

- Positive/equivocal IgM 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 and other causes of encephalitis have been ruled out (Arboviral encephalitis cannot be distinguished clinically from other central nervous system (CNS) infections without laboratory testing).

\* Clinical illness is characterized by:

- Febrile illness of variable severity associated with neurological symptoms ranging from headache to aseptic meningitis or encephalitis.
- Symptoms can include
  - headache,
  - confusion or other alteration in sensorium,
  - nausea and vomiting.
- Signs may include fever
  - meningismus,
  - cranial nerve palsies,
  - paresis or paraly

\*\*Seroconversion indicates a recent infection with an infectious agent such as an arbovirus. For more information see, [Diagnosis](#)

## 2. DIAGNOSIS

- To diagnose CSG infections, testing of acute and convalescent sera from suspect cases is recommended for determining the diagnostic rise or decrease in California Serogroup 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.
- The dynamics of antibody rise during a CSG infection is similar to West Nile Virus:
  - 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 in serum samples necessitating the demonstration of a seroconversion (or detection of virus) to associate positive serology with current illness.
- For detecting James Canyon and Snowshoe Hare 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](#).
- 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.
  - 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).
  - The presence of JC/SSH specific IgM in an acute CSF specimen is confirmatory.
- For diagnosis, Alberta Precision Laboratories requires:
  - 0.5 mL CSF **AND** acute blood collected at onset **AND** a convalescent blood collected 10 to 14 days after the acute sample. (Bloods should be collected in an SST Gold Top Vacutainer) **OR**
  - Acute blood collected at time illness **AND** convalescent blood collected 10 to 14 days later.
- JC/SSH transmission is most common 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.
- For more information, refer to the [Alberta Provincial Laboratory Guide to Services](#)

### 3. Reporting

#### Health Care Professionals

- Confirmed or probable cases are to be reported to the Office of the Chief Public Health Officer (OCPHO) by telephone (867) 920-8646 **immediately** after diagnosis is made or opinion is formed, **AND**
- Complete and fax (867) 873-0442 the [Communicable Disease Report Form](#) to the OCPHO within **24 hours**
- **Immediately** report all outbreaks or suspect outbreaks by telephone to the OCPHO



## Laboratories

- Report all positive results to the OCPHO by phone (867) 920-8646 **immediately AND**
- Fax positive results to the OCPHO (867) 873-0442 within **24 hours**

## 4. OVERVIEW

### Causative Agent

- California serogroup (CSG) viruses are arthropod borne-viruses and members of the *Bunyaviridae* family and include Jamestown Canyon (JC) virus, Snowshoe hare (SSH) virus, and La Crosse virus.
- The Snowshoe hare and the Jamestown Canyon viruses are the only two that have been detected in Canada.
- With climate change and resulting changes to animal reservoirs, the physical environment, and mosquito vectors, California serogroup virus infection incidence could increase in NWT.
- Jamestown Canyon virus was first isolated from a mosquito collected in Jamestown Canyon, Colorado in 1961.
- Snowshoe hare virus was first identified in a snowshoe hare in Montana in 1958.

### Clinical Presentation and Major Complications

- The majority of infections are likely asymptomatic, similar to West Nile virus (WNV).
  - Symptoms can be mild
    - Fever
    - Headache
    - Vomiting
  - Symptoms can be severe
    - High fever,
    - Meningeal symptoms,
    - Encephalitis,
    - Febrile headaches,
    - Tremors,
    - Seizures (especially in children)
    - Acute flaccid paralysis can occur.
- Severe infections result in a variety of sequelae such as
  - Behaviour changes,
  - Learning disabilities,
  - Cognitive deficits

### Transmission

- CSG viruses are transmitted to humans through the bite of an infected mosquito.
  - Mosquito vectors include non-*Culex* mosquitoes such as *Aedes* and *Anopheles* species.



- The mosquito becomes infected after feeding on a source infected with the virus and then spreading the infection in subsequent blood meals.
- CSG cannot be transmitted from person to person.
- Animal reservoirs for CSVs include small mammals such as squirrels, chipmunks and hares or larger animals such as deer and elk.
- Livestock are likely incidental hosts which do not contribute significantly to the cycle of transmission because of infections with low levels of viremia.

### Incubation Period

- Onset of illness likely occurs 3 to 7 days after exposure to the virus through mosquito bite but longer incubation periods (up to 15 days) are possible.
- CSG viruses are not directly transmitted person-to-person.
- Mosquitoes are infective for life.

### Clinical Guidance

- For patient-specific clinical management consult your local healthcare professional, paediatrician, or infectious disease specialist.
- Health Care Providers should consult with Alberta's virologist on call if they suspect mosquito borne CNS infection by calling the University of Alberta Hospital Switchboard at 780-407-8822 and paging the virologist on call.

## 5. PUBLIC HEALTH MEASURES

### Key Investigations

- Assess potential risk factors and likely mode of transmission for the acquisition of CSG within 3 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
    - West, and Midwest portions of the United States, Alaska, Russia, China, Newfoundland, Quebec, Ontario, Manitoba, Saskatchewan, and the Northwest Territories
  - Recall being bitten by mosquitoes.

### Management of Cases

- There are no Public Health steps in the management of CSG virus cases.

### Management of Contacts

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

### Prevention



- **Preventing mosquito bites is considered the best measure to avoid the low risk of contracting JC and SSH infection.**
- Mosquito bite prevention includes:
  - Using Health Canada approved insect repellants
  - Wearing long pants and sleeves as well as shoes and socks
  - Clothing should be loose fitting made of tightly woven material
  - Using mosquito netting when sleeping outdoors
  - Wearing long pants and sleeves
  - Using stroller, crib, or playpen covers for young children
  - For more information see: <https://www.canada.ca/en/health-canada/services/pest-control-tips/mosquitoes.html>
- Healthcare providers (HCPs) should be vigilant for California serogroup virus infections as an emerging mosquito-borne infection in children and adults.

## 6. PUBLIC & HEALTH PROFESSIONAL EDUCATION

For more information about California Serogroup Virus:

- The Government of Canada: Canada/ [Pathogen Safety Data Sheet](#)
- Centers for Disease Control and Prevention: CDC/ [Jamestown Canyon Virus](#)

## 7. EPIDEMIOLOGY

- In Canada, California serogroup virus infections are infrequently diagnosed, but infections have occurred in all provinces and territories.
- Snowshoe hare virus and Jamestown Canyon virus co-circulate throughout Canada including the northern regions of the country.
- NWT experiences infrequent documented infections due to California serogroup infections in the previous decades.
- The incidence of California Serogroup Type Virus may increase in the NWT due to climate change and resulting changes to animal reservoirs, the physical environment and mosquito vectors.
- For more information on the epidemiology of California Serogroup Virus in the Northwest Territories (NWT) see: [Epidemiological Summary of Communicable Diseases HSS Professionals.](#)

## 8. REFERENCES

Information for this chapter was adapted with permission from Alberta [Health's Public Health Disease Management Guidelines: California Serogroup Infection.](#)

Additional Resources used in this chapter include:



1. Alberta Precision Laboratories Bulletin, Changes in Ordering California Serogroup Virus testing: <https://www.albertahealthservices.ca/assets/wf/lab/wf-lab-bulletin-pl-changes-in-ordering-california-serogroup-virus-testing.pdf>.
2. Centers for Disease Prevention and Control- Jamestown Canyon virus: <https://www.cdc.gov/jamestown-canyon/>
3. Emerging mosquito-borne bunyaviruses in Canada: <https://doi.org/10.14745/ccdr.v41i06a01>
4. Government of Canada Pathogen Safety Data Sheet: <https://www.canada.ca/en/public-health/services/laboratory-biosafety-biosecurity/pathogen-safety-data-sheets-risk-assessment/california-serogroup-pathogen-safety-data-sheet.html>
5. La Crosse virus: a scoping review of the global evidence: [Public health disease management guidelines : California serogroup infection - Open Government \(alberta.ca\)](#)