

St. Louis Encephalitis Virus

Disease Agent:

- St. Louis encephalitis virus (SLEV)

Disease Agent Characteristics:

- Family: *Flaviviridae*; Genus: *Flavivirus*
- Virion morphology and size: Enveloped, icosahedral nucleocapsid symmetry, spherical particle, 50 nm in diameter
- Nucleic acid: Linear, positive-sense, single-stranded RNA, ~11 kb in length
- Physicochemical properties: Nonionic detergents solubilize the entire envelope; infectivity sensitive to acid pH and high temperatures (total inactivation at 56°C for 30 min); virus stable at low temperatures, especially at -60°C or below; virus inactivated by UV light, gamma-irradiation and disinfectants (relatively less resistant than tick-borne agents); aerosol hazard noted (SLE stable for 6 hours in aerosol at room temperature and 23-80% humidity)

Disease Name:

- St. Louis encephalitis

Priority Level:

- Scientific/Epidemiologic evidence regarding blood safety: Theoretical; because of similarity to West Nile virus, transfusion risk during SLEV outbreaks may occur.
- Public perception and/or regulatory concern regarding blood safety: Low
- Public concern regarding disease agent: Low, but moderate in some regions of US where outbreaks have occurred.

Background:

- SLEV was first isolated from a brain suspension obtained from a case of acute encephalitis during a large urban outbreak of the disease in St Louis in 1933. This epidemic resulted in over 1000 clinical cases and at least 200 deaths.
- Distributed widely throughout the Western hemisphere
- Only neurotropic mosquito-borne flavivirus in North America until the introduction of West Nile virus (WNV) in 1999.

Common Human Exposure Routes:

- Vector-borne (mosquitoes)
- Aerosol hazard possible in laboratory

Likelihood of Secondary Transmission:

- Absent

At-Risk Populations:

- Elderly
- Rural agricultural communities
- Low socioeconomic status

Vector and Reservoir Involved:

- Mosquitoes (*Culex* species) associated with wild migratory passeriform (e.g., sparrows) and columbiform (e.g., pigeons) birds

Blood Phase:

- In symptomatic patients, clinically relevant viremia persists less than 2 weeks in most subjects unless they are immunocompromised in which case viremia could persist for up to 4 weeks.
- No data in asymptomatic cases exist, but probably similar to WNV; 7 days prior to the detection of antibody and 30 days after that point, although the infectivity of the genetic material detected during the later stages is unknown.

Survival/Persistence in Blood Products:

- Unknown

Transmission by Blood Transfusion:

- No cases documented; however, because of similarity to WNV (i.e., mosquito-borne flavivirus that results in community epidemics), transfusion transmission might be expected to occur during SLEV outbreaks.

Cases/Frequency in Population:

- Attack rates during epidemics can range from 1 to 800 per 100,000 population, with outbreaks occurring between May and November (peak incidence in August and September) predominantly in the Ohio-Mississippi Valley, Texas, Florida, Kansas, Colorado, and California. A 1990 epidemic in south Florida lasted from August 1990 through January 1991.

Incubation Period:

- Varies from 4 to 21 days

Likelihood of Clinical Disease:

- Age-dependent; inapparent-to-apparent SLEV infection varies from 1 to 800 in children to less than 1 to 100 in persons over 65 years of age

Primary Disease Symptoms:

- Onset is characterized by generalized malaise, febrile headache, drowsiness, anorexia, nausea, myalgia, and sore throat or cough followed 1-4 days later by the acute or subacute appearance of meningeal and neurologic signs of encephalitis or aseptic meningitis.

- Early urinary tract symptoms (frequency, urgency, and dysuria) may occur in nearly one-fourth of the cases

Severity of Clinical Disease:

- Low in children; high in adults over 55 years of age

Mortality:

- Case-fatality rate can range from 2% in young adults to more than 22% in elderly patients.

Chronic Carriage:

- None

Treatment Available/Efficacious:

- Supportive

Agent-Specific Screening Question:

- No specific question is in use.
- No sensitive or specific question is feasible.

Laboratory Test(s) Available:

- No FDA-licensed blood donor screening test exists.
- Blood and CSF: IgG and IgM EIA or IFA; complement fixation; neutralization; NAT
- Viral isolations from serum or CSF are unusual, although virus may be recovered from brain tissue of ~50% of fatal cases.

Currently Recommended Donor Deferral Period:

- No FDA Guidance or AABB Standard exists
- In the absence of contemporary data, it would be prudent to exclude donors with SLEV infection using the same policies that apply to WNV.

Impact on Blood Availability:

- Agent-specific screening question(s): Not applicable
- Laboratory test(s) available: Not applicable

Impact on Blood Safety:

- Agent-specific screening question(s): Not applicable
- Laboratory test(s) available: Not applicable

Leukoreduction Efficacy:

- Unknown

Pathogen Reduction Efficacy for Plasma Derivatives:

- Multiple pathogen reduction steps used in the fractionation process have been shown to be robust in removal of enveloped viruses.

Other Prevention Measures:

- Mosquito control
- Inactivated vaccine for horses

Suggested Reading

1. Day JF. Predicting St Louis encephalitis virus epidemics: lessons from recent, and not so recent, outbreaks. *Annu Rev Entomol* 2001;46:111-38
2. Gubler DJ, Kuno G, Lewis M. Flaviviruses. In: Knipe DM, Howley PM, editors. *Fields virology*, 5th ed. Philadelphia: Lippincott Williams & Wilkins; 2007. p. 1153-252.
3. Hopkins CC, Hollinger FB, Johnson RE, Dewlett HJ, Newhouse VF, Chamberlain RW. The epidemiology of St. Louis encephalitis in Dallas, Texas, 1966. *Am. J. Epidemiol.* 1975;102:1-15.
4. Hubálek Z. An annotated checklist of pathogenic microorganisms associated with migratory birds. *J Wildl Dis* 2004;40:639-59.
5. Reisen WK. Epidemiology of St Louis encephalitis virus. *Adv Virus Res*, 2003;61:139-83.
6. Reisen WK, Presser SB, Lin J, Enge B, Hardy JL, Emmons RW. Viremia and serological responses in adult chickens infected with western equine encephalomyelitis and St Louis encephalitis viruses. *J Am Mosq Control Assoc* 1994;10:549-55.