41 | ST. LOUIS ENCEPHALITIS VIRUS

41.1 | Disease agent

- St. Louis encephalitis virus (SLEV)

41.2 | Disease agent characteristics

- Family: *Flaviviridae*; Genus: *Flavivirus*
- Virion morphology and size: Enveloped, icosahedral nucleocapsid symmetry, spherical particle, 40–60 nm in diameter
- Nucleic acid: Linear, positive-sense, single-stranded RNA genome, ~11 kb in length
- Physicochemical properties: Inactivated by heating for 10 min at >56°C; half-life of 7 h at 37°C; sensitive to treatment with lipid solvents, detergents, ether, trypsin, chloroform, formaldehyde, and β-propiolactone; infectivity reduced after exposure to irradiation and inactivated at pH 1–3

41.3 | Disease name

- St. Louis encephalitis

41.4 | Priority level

- Scientific/Epidemiologic evidence regarding blood safety: Theoretical; because of similarity to West Nile virus (WNV), 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.

41.5 | 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 WNV in 1999.
- More than 130 arboviruses are known to cause human disease; most of public health importance belong to the genera *Flavivirus*, *Alphavirus* and *Orthobunyavirus*. Many are nationally notifiable via state reporting to the US CDC (ArboNet) such as dengue viruses, Zika virus, California serogroup viruses, chikungunya virus, eastern equine encephalitis virus, Powassan virus, SLEV, WNV, western equine encephalitis virus and yellow fever virus.

41.6 | Common human exposure routes

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

41.7 | Likelihood of secondary transmission

- Absent

41.8 | At-risk populations

- Elderly
- Rural agricultural communities
- Low socioeconomic status

41.9 | Vector and reservoir involved

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

41.10 | Blood phase

- In most symptomatic patients, clinically relevant viremia persists less than 2 weeks unless they are immunocompromised, in which case viremia could persist for up to 4 weeks.
- No data in asymptomatic cases exist but are 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).

41.11 | Survival/persistence in blood products

- Unknown

41.12 | Transmission by blood transfusion

- There is a single case of possible transfusion transmitted SLEV reported from Arizona. In this case, a kidney transplant recipient, who also was transfused, presented with encephalitis. Neither the organ donor nor three other organ recipients from that donor had evidence of infection with SLEV. One blood donor had a serologically confirmed recent SLEV infection. The infected transplant recipient had minimal outdoor exposure and was unlikely to have been infected by vector transmission. 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.

41.13 | 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.
- As reported by the US CDC, there have been 1−19 cases of neuroinvasive disease reported per year with the highest number in 2015 (19) followed by 2020 (15) and 2019 (14). By state, over this time, Arizona had the highest number of reported cases (36) followed by California (20) and Texas (6).

41.14 | Incubation period

- Varies from 5 to 15 days

41.15 | Likelihood of clinical disease

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

41.16 | 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.

41.17 | Severity of clinical disease

- Low in children; high in adults over 55 years of age.
- Some people may develop neuroinvasive disease such as encephalitis or meningitis with long-term disability rare.

41.18 | Mortality

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

41.19 | Chronic carriage

- None

41.20 | Treatment available/efficacious

- Supportive

41.21 | Agent-specific screening question

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

41.22 | 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.

41.23 | 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.

41.24 | Impact on blood availability

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

41.25 | Impact on blood safety

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

41.26 | Leukoreduction efficacy

- Unknown

41.27 | 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.

41.28 | Other prevention measures

- Mosquito control and avoidance such as the use of repellents or wearing clothing that minimizes skin exposure.
- Inactivated vaccine for horses.
- There are no human vaccines or specific treatments available.

SUGGESTED READING

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