Western Equine Encephalitis Virus

Disease Agent:

- Western equine encephalitis virus (WEEV)

Disease Agent Characteristics:

- Family: *Togaviridae*; Genus: *Alphavirus*
- Virion size: Enveloped, icosahedral nucleocapsid symmetry, spherical particle, 70 nm in diameter
- Nucleic acid: Linear, positive-sense, single-stranded RNA genome, ~11.5 kb in length
- Physicochemical properties: Infectivity destroyed by heating for 10 minutes at >56°C; half life of 7 hours at 37°C; sensitive to treatment with lipid solvents, detergents, ether, trypsin, chloroform, formaldehyde, heat, and β-propiolactone; infectivity reduced after exposure to irradiation and inactivated at pH 1-3

Disease Name:

- Western equine encephalitis

Priority Level:

- Scientific/Epidemiologic evidence regarding blood safety: Theoretical
- Public perception and/or regulatory concern regarding blood safety: Absent
- Public concern regarding disease agent: Absent

Background:

- Epizootics occurred in Argentina and the central plains of the US between 1908 and 1912. WEEV was isolated in 1930 from horses with equine encephalitis and subsequently from the brain of a child with fatal encephalitis in 1938.
- No confirmed US cases since 1999
- Classified (Category B) as bioterrorism agent by the CDC.

Common Human Exposure Route:

- Vector-borne (mosquitoes)

Likelihood of Secondary Transmission:

- Absent

At-Risk Populations:

- Very young and adults >50 years (males and females)
- Rural environment, primarily in western US
- A threat as a bioterrorist weapon for populations not previously considered being at risk

Vector and Reservoir Involved:

- Principal vector: mosquitoes, primarily *Culex tarsalis*
- Reservoir: associated with domestic and passerine birds

Blood Phase:

- Unknown

Survival/Persistence in Blood Products:

- Unknown

Transmission by Blood Transfusion:

- No cases have been documented.

Cases/Frequency in Population:

- No confirmed cases in the US since 1999. There have been 639 confirmed US cases since 1964.
- Seasonal occurrence (from mid-June to late September) in North America

Incubation Period:

- 5-10 days

Likelihood of Clinical Disease:

- Low, depending on population infected; inapparent-to-apparent infection ratio is 1:1 in infants <1 year old, 58:1 in children 1-4 years old, and 1150:1 in persons >14 years old

Primary Disease Symptoms:

- Headache, fever, chills, pharyngitis
- Altered consciousness
- Seizures, fatal encephalitis

Severity of Clinical Disease:

- Low to moderate, depending on patient age
- Neurologic sequelae in 30% of recovering infants
- Adults usually recover completely

Mortality:

- Overall 3-4%, but increases to 8% if >50 years old

Chronic Carriage:

- No

Treatment Available/Efficacious:

- Supportive

Agent-Specific Screening Question(s):

- No specific question is in use.
- Not indicated because transfusion transmission has not been demonstrated
- No sensitive or specific question is feasible.

- Under circumstances of a bioterrorism threat, the need for and potential effectiveness of specific donor-screening questions would need to be addressed.

Laboratory Test(s) Available:

- No FDA-licensed blood donor screening test exists.
- Virus-specific IgM in serum or CSF; viral antigen detection or isolation of virus from brain tissue in mice or cell culture; NAT in serum or CSF

Currently Recommended Donor Deferral Period:

- No FDA Guidance or AABB Standard exists.
- The appropriate deferral period for clinical infection is not known but would likely be on the order of several weeks after the resolution of symptoms.

Impact on Blood Availability:

- Agent-specific screening question(s): Not applicable; in response to a bioterrorism threat, impact of a local deferral would be significant.
- Laboratory test(s) available: Not applicable

Impact on Blood Safety:

- Agent-specific screening question: Not applicable; unknown impact in response to a bioterrorism threat
- Laboratory tests: Not applicable

Leukoreduction Efficacy:

- Unknown

Pathogen Reduction Efficacy:

- 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
- Experimental vaccine

Suggested Reading:

1. Calisher CH. Medically important arboviruses of the United States and Canada. Clin Microbiol Rev 1994;7: 89-116.
2. Griffin D. Alphaviruses. In: Knipe DM, Howley PM, editors. Fields virology, 5th ed. Philadelphia: Lippinocott Williams & Wilkins; 2007. p. 1023-68.
3. Tsai TF, Weaver SC, Monath TP. Alphaviruses. In: Richman DD, Whitley RJ, Hayden FG, editors. Clinical Virology. Washington: ASM Press; 2002. p. 1177-210.