Chikungunya Virus

Disease Agent:

- Chikungunya virus (CHIKV)

Disease Agent Characteristics:

- Family: *Togaviridae*; Genus: *Alphavirus*
- Virion morphology and size: Enveloped, icosahedral nucleocapsid symmetry, spherical particle, 60-70 nm in diameter
- Nucleic acid: Linear, positive-sense, single-stranded RNA, ~11.8 kb in length
- Physicochemical properties: Susceptible to 70% ethanol, 1% sodium hypochlorite, 2% glutaraldehyde and lipid solvents. Inactivated by dry or wet heat >58°C; susceptible to drying; relatively stable at –40°C.

Disease Name:

- Chikungunya

Priority Level:

- Scientific/Epidemiologic evidence regarding blood safety: Theoretical; although no transfusion transmission has been documented, rapid reemergence, increased pathogenicity, and asymptomatic viremia suggest that transfusion transmissions are possible.
- Public perception and/or regulatory concern regarding blood safety: Very low to absent in the US; Moderate/High in non-US endemic and threatened areas
- Public concern regarding disease agent: Very low to absent in the US; Moderate/High in non-US endemic and threatened areas

Background:

- First isolated in 1953 by RW Ross in a sample from a Tanzanian patient with fever and joint pains. The name comes from the Makonde language and is translated as "that which bends up."
- Endemic with occasional outbreaks in Africa, India, Southeast Asia, and the Philippines
- Several recent large-scale outbreaks have occurred in the Indian Ocean islands of Comoros, Madagascar, Mayotte, Mauritius, Seychelles, and Reunion Island, then spreading to several states in India.
- Local transmission was identified in Italy in the summer of 2007.
- It appears that a new strain of the virus, derived from the southern and eastern African lineage, has emerged during the current epidemic.

Common Human Exposure Routes:

- Vector borne (mosquitoes)

Likelihood of Secondary Transmission:

- Vertical transmission has been reported during the Reunion Island epidemic. This includes in utero infections resulting in fetal deaths and perinatal infection with symptomatic disease in the affected neonates.

At-Risk Populations:

- Elderly
- Pregnant women
- Immunosuppressed patients

Vector and Reservoir Involved:

- Mosquitoes, mainly of the *Aedes* family: *A. aegypti, A. albopictus, A. polynesiens*, as well as: *Culex, Anopheles, Mansonia, Eretmapodites*, and *Coquillettidia*
- Infected species: Birds, humans, chimpanzees, some domestic animals, reptiles
- Human-to-mosquito-to-human infection occurs without the need for an intermediate amplifying host.

Blood Phase:

- Viremia is present in most patients during first few days of disease. Viremia usually disappears by day 5.
- Viral loads as high as 3×10^9 copies per mL have been documented in patients during epidemics.
- The duration of presymptomatic viremia is unknown.
- A recent study on Reunion Island during the 2005-2006 epidemic peak identified the chikungunya viral genome by RT-PCR in 2 out of 568 blood donors. One donor was in the presymptomatic phase of the infection, and the other never developed symptoms (Personal communication by Georges Andreu, Établissement Français du Sang, 2008).

Survival/Persistence in Blood Products:

- Unknown

Transmission by Blood Transfusion:

- Theoretical

Cases/Frequency in Population:

- Outbreaks are sporadic and explosive.
- The number of cases varies depending on the immunity of the exposed population. It has been estimated that about one-third of the 700,000 residents of Reunion Island have been infected during the 2005-2006 epidemic and that an estimated 1.3 million cases have occurred in India.
- Autochthonous transmission has been described in Italy in the summer of 2007.

- A substantial number of imported cases have been documented in the US and in European travelers returning from endemic areas.

Incubation Period:

- Estimated to range from 3 to 12 days, without a prodrome

Likelihood of Clinical Disease:

- No systematic data are available, but it is assumed that inapparent infections are common.

Primary Disease Symptoms:

- High fever (39.5-40°C) rapidly emerges associated with headache, myalgia, and incapacitating joint pain, followed by a pruritic maculopapular rash 4-8 days later, which is concurrent with leukopenia.
- Acute febrile phase usually resolves after 1 week. Residual incapacitating arthralgia may persist for many months in 10-15% of subjects.

Severity of Clinical Disease:

- Meningoencephalitis has been described in the recent epidemic on Reunion Island; 1 in 1000 cases was classified as severe.
- Joint signs and symptoms may persist for months.

Mortality:

- Fatalities are considered to be rare.

Chronic Carriage:

- No

Treatment Available/Efficacious:

- Supportive

Agent-Specific Screening Question(s):

- No specific question is in use; however, the current deferral criteria for travel to at-risk malaria areas encompasses most of the regions affected by the recent outbreaks.
- Not indicated because transfusion transmission has not been demonstrated
- No sensitive or specific question is feasible.

Laboratory Test(s) Available:

- No FDA-licensed blood donor screening test exists.
- Diagnostic tests include virus isolation from serum, IgM-specific antibody by EIA or HI, detection of neutralizing antibody by plaque-reduction neutralization titer assay (PRNT), and demonstrating a rise in IgG antibody titer between acute and convalescent sera.
- A NAT screening test has been implemented on Reunion Island for platelet components by the Établissement Français du Sang.

Currently Recommended Donor Deferral Period:

- No FDA Guidance or AABB Standard exists.
- Some blood collection agencies have implemented a temporary deferral period for donors who have traveled to nonmalarious areas experiencing a CHIKV outbreak. The appropriate deferral period for clinical chikungunya is unknown 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
- 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 the removal of enveloped viruses.

Other Prevention Measures:

- Mosquito control
- Education
- Pathogen inactivation technology and NAT for virus detection were introduced in Reunion Island for platelet components.

Suggested Reading:

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