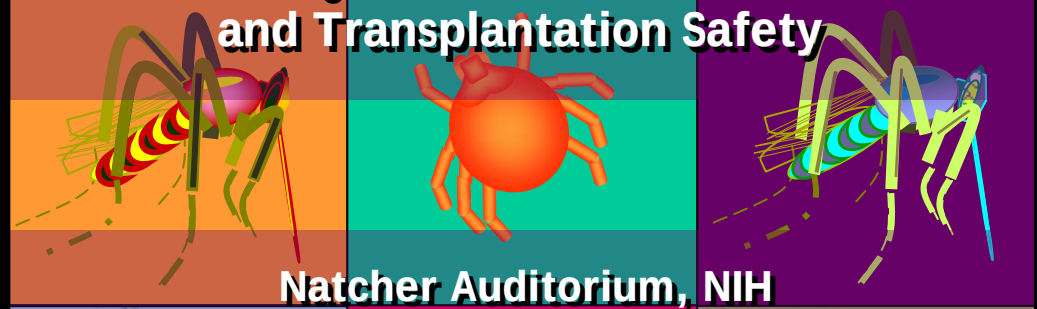
U.S. Food and Drug Administration

U.S. Department of Health and Human Services

Emerging Arboviruses:
Evaluating the Threat to Transfusion and Transplantation Safety



Natcher Auditorium, NIH
Bethesda, Maryland

America's Blood Centers
NHLBI National Institutes of Health
Department of Health & Human Services
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Dec. 14 – 15 Workshop update

Emerging Arboviruses: Evaluating the Threat to Transfusion and Transplantation safety

Maria Rios & Deborah Taylor

Division of Emerging Transfusion Transmitted Diseases

OBRR/CBER/FDA

Arbovirus Associated Emerging Diseases

- Arthropod-borne diseases are becoming increasingly widespread
  - in part due to increased global travel/trade and possibly climate change.
- Arboviruses **(ar**thropod-**bo**rne virus) are found around the world
  - most commonly spread by blood-sucking insects (in the US mostly by mosquitoes)
  - circulation depends on the presence of transmitting vector and amplifiers vertebrate hosts.
- Global concern: Den, JE, ChikV, TBE and WNV.

Arthropod-borne virus: Arbovirus

- For most arboviruses humans are not the amplifying host and humans infections are rare.
  - Some have urban cycle (dengue and yellow fever), and humans are necessary for transmitting infection.
- Arboviral infections occur mostly during warmer months.
  - In parts of the country with mild weather, cases can occur into the winter months.
- Human infections with arboviruses have an asymptomatic viremic phase during which they may pose a threat to transfusion and transplantation.

Arbovirus and Public Health

- Human infections have an asymptomatic viremic phase posing a threat to transfusion and transplantation
- Arbovirus transmitting vectors are present in the U.S.
  - Den & CHIKV in the US
    - mostly reported among travelers
    - Den autochthonous transmission has occurred
    - human is the amplifying host
    - can be transmitted by blood transfusion
  - JE is also reported among travelers and life cycle is similar to WNV

Arbovirus and Public Health

- Gaps in knowledge
- The potential another arbovirus, like WNV, reach and establish epidemic in the US is of concern and demands:
  - preparedness
  - risk assessment
  - strategic actions plan
- Considerations of consequences of an impending epidemic
  - costs
  - public health burdens

Scope of the Workshop

- To facilitate dissemination of scientific knowledge among Government, Academia, Blood Establishments and other industry such as test kit manufacturers.
  - A) Biology and pathogenesis of vector-borne viruses of public heath relevance;
  - B) Epidemiology in the U.S. and around the world;
  - C) Potential risk for transmission by transfusion of blood and impact on transfusion and transplantation safety;
  - D) Strategies for prevention of vector-borne virus transmission.
- To promote discussion on strategies to address public health needs:
  - potential emergence of these pathogens
  - impact on transfusion and transplantation safety.

Highlights of the Workshop

- Relevant risks for arbovirus infection are:
  - travel, trade, demography (people moving from rural to urban areas & deforestation) and
  - climate change.
- The transmitting vector for Dengue ChikV YF, RVF is present in the US.
- Hosts in the sylvatic cycle are very important (monkeys in DV, ChikV & YF)

Highlights of the Workshop

- Dengue is the real problem since epidemics are occurring in the US (namely PR and Key West)
  - outbreaks have been previously reported in South Texas and Florida.
- ChikV has been reported in the US among travelers returning from endemic areas
  - of concern is the fact that transmitting vector is abundant in extensive areas of the country.
- JEV is also important but there is licensed vaccine available

Highlights of the Workshop

About vaccination for arbovirus

- Although vaccine may affect outcomes of infection, it may not prevent infection.
- Vaccine protection against these viruses is limited because it wears off in one year or so.
  - If there is an approved DV NAT assay for blood screening it will probably be implemented in endemic areas
- ARC is planning to screen blood in PR using Bio-Rad NS1 antigen assay under IND.

Highlights of the Workshop

- The use of resources to protect the blood supply during was questioned
  - Due to the fact that in an outbreak so many people naturally infected and in greater need for resources.
- Rebuttal: Dengue patients need transfusions and are at risk of receiving blood containing a serotype different and worsen picture
- The recent outbreaks in PR had multiple co-circulating serotypes.
- About vaccine development: although vaccine may affect outcomes of infection, it may not prevent infection.

Highlights of the Workshop

- CDC staff stated that there are effective mechanisms for arbovirus surveillance and reporting through ArboNet.
  - Zika virus, ChikV and JE have been found as result of the surveillance.
- Monitoring of arbovirus circulation through ArboNet, has been recently affected by the reduction of funding by state health departments and CDC and is suboptimal (lower than before the WNV outbreak).
  - State department surveillance reports feed into Arbonet, the lack of proper funding affects the accuracy of activity reports.

Highlights of the Workshop

- The threshold for tolerance of risk in the blood supply was also discussed.
- While threshold for risk associated with natural exposure seems not to be a problem (people continue to perform outdoor activities during epidemics) there is a low tolerance threshold for risk associated with blood. THAT is a great challenge.
  - The difficulty in defining an acceptable risk depends on public perception and acceptance of risk involving medical practice (transfusion & transplantation)

Highlights of the Workshop

- Test kit manufacturers indicated that they have prototype assays for DV1-4 and ChikV. Those are useful tools that could be of great help in an emergency.
  - Although firmly stated that there are no plans for development of these assays in the near future even for research purposes.
- Pathogen reduction technologies, if successful, will ensure the safety of blood in the absence of tests for known and unknown viruses.
  - Resources should put in to make pathogen reduction realized.

Highlights of the Workshop

- Vector control was argued to be the most appropriate and efficacious measure for prevention of infection in public health and that it will impact also on the safety of the blood supply.

Regarding Tissues:

- The National Marrow Donor Program indicated that *bone marrow* and *peripheral blood stem cells* are collected in PR and shipped to the continent.
- There are matches for specific individuals and there is great need for these products.
- Since the first year mortality among recipients of BM may reach 40%, the incremental risk of arbovirus is much smaller and considered insignificant.

Workshop Take-home Message

- The success of measures adopted to mitigate WNV transmission by blood should be used as a model for future needs.
- The cooperation and communication among stakeholders was critical for WNV and will be critical for success in dealing with other potential epidemics.