ARBOVIRAL RISKS TO BLOOD SAFETY IN AUSTRALIA

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Transfusion significant arboviral threats

- Dengue - epidemic
- Ross River virus - endemic/epidemic
- West Nile virus Kunjin strain – endemic, low virulence/transmission
- Other endemic Australian arboviruses (Barmah Forest virus, Murray Valley encephalitis virus etc) - endemic/epidemic, low virulence/transmission
- Chikungunya virus - occasional imported cases; vector present
- Zika virus - occasional imported cases; vector present
Dengue in Australia

- Seasonal outbreaks in NE Australia
  - Vary from <50 to >1,000 cases

- All four DENV types can occur
  - Occasionally together (last in 2009)

- Rapid public health response -> Very effective in minimizing impact

- Transfusion risk
  - Implement supplementary donor questioning
    - Restriction to plasma for fractionation only for residence in or travel to outbreak area
  - Restrictions lifted 28 days after last case onset date

Ross River virus (RRV)

- Alphavirus (*Togaviridae*)
  - Same antigenic family as CHIKV

- Most common arboviral disease in Australia
  - ~5,000 cases notified annually

- Endemic throughout coastal regions of northern and central Australia; epidemic throughout rest Australia

- Causes non-fatal epidemic polyarthritis or RRV disease
  - Asymptomatic/mild infections in 50-75% of cases

- Incubation period 2-21 days – average 7-9 days
RRV - transfusion transmission risk

- Virus first isolated in early 1970’s – TT-RRV suggested in mid 1990’s

- Asymptomatic viraemia (mouse model) - typically 5, but up to 9 days\(^1\)

- Potential TT-RRV risk estimated:
  - For 2004 outbreak in Cairns -> \(~1\) in 13,000 \(^1\)
  - After increased rainfall -> \(~1\) in 7,333 \(^2\)

- Maintain close watching brief


First probable case of TT-RRV

RBC recipient - symptoms consistent with RRV

- IgM detected
- Haemagglutination inhibition (HI) positive

Imputability and risk assessment

- Imputability - probable case
  - No molecular matching BUT RNA positive donation transfused to recipient who later developed symptoms consistent with RRV
  - No other RRV notifications in recipient’s public health unit
  - Recipient had no recollection of mosquito bites & spent majority time indoors

- EREEID* risk framework
  - Escalate from ‘yellow’ to ‘red’ status
  - Notify regulator (TGA) & conduct risk assessment

* Emerging, Re-emerging & Emerged Infectious Disease
Risk analysis

- Risk Analysis (Western Australia [residence of case], Jan – Mar 2014)
  - Blood Service model: 1 in 26,177 (7,729 to 103,628)
  - EUFRAT: 1 in 14,943 (5,094 to 48,593)

[predicted issue of 1 (0.3-2.9) infectious donation (WA, Jan-Mar 2014), or 11 (4-39) annually, Australia-wide]

- Key risk considerations
  - Transmission risk from transfusion very minor when compared to ~5,000 vectorial notifications annually
  - High proportion of asymptomatic infections
  - Clinical illness generally mild and self-limiting
    - No mortality
  - Scope and continuity of RRV outbreaks
Risk management options

1. Enhanced donor education/post-donation illness reporting
   **Recommended**

2. Geographically based fresh component restrictions during high transmission periods (as per the current strategy for local dengue outbreaks)
   **Not recommended – donor/product sufficiency concern**

3. RRV donor testing
   **No licensed blood screening tests available**

4. Pathogen reduction for clinical plasma and platelets (assuming future licensing of PRT)
   **Not currently available**
Research - RRV

- Risk is proportional to rate of RRV viraemia among donors – unknown

AIM: Determine rate of RRV RNA carriage among Australian donors

- Samples (n=7,500) from high-risk areas, during higher risk seasons
- RT-PCR (based on pathology laboratory methods)
  - MS2 phage (extraction and amplification control)
  - QIAsymphony (automated RNA extraction and RT-PCR plate set-up)
  - TaqMan chemistry; StepOnePlus Real-Time PCR System
Conclusions

- Australia has a number of arboviral threats to blood safety
- Of these dengue, WNV proven TT and now strong evidence for RRV
- Dengue TT risk effectively minimised by rigorous public health response and activating supplementary donor measures during local outbreaks
- RRV TT recently confirmed
  - Very low risk compared to vectorial transmission given 5,000+cases per year
  - Contrasting dengue - lacks severe clinical consequences for recipients
  - Scope and size of outbreaks precludes geographical deferral strategy
- RRV risk management – enhanced post-donation symptom reporting messaging (under development)
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