Zika virus and blood safety – an Australian perspective

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Australian governments fund the Australian Red Cross Blood Service for the provision of blood, blood products and services to the Australian community.
Zika virus: THE emerging infectious disease agent of the 21\textsuperscript{st} century?

The aim of this presentation is to:

- Review the criteria for when emerging infectious disease (EID) agents represent a potential threat to blood safety
- Summarise the 21\textsuperscript{st} century Zika virus (ZIKV) outbreaks
- Assess whether ZIKV represents a potential threat to blood safety in Australia.
When do emerging infectious diseases represent a threat to blood safety?

EID agents may represent a threat to blood safety if:

- they can establish infection in humans and spread within a local population
- they are transfusion–transmissible
- infection includes an asymptomatic blood phase
- competent vector(s) are present for those agents that are vector-borne
- they are able to survive during blood processing and subsequent blood storage conditions
- they are associated with a clinically apparent disease in at least a proportion of recipients.
ZIKV – in the beginning

- Isolated in 1947 from the blood of a sentinel Rhesus monkey in the Zika forest, near Lake Victoria in Uganda.
- First reported case of ZIKV isolation from a human in Nigeria in 1954.
- Prior to 2007, only about 14 human cases of human ZIKV infection were reported.
ZIKV – in the headlines

The Zika Pandemic - A Perfect Storm?

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Zika virus: who’s next?

The ongoing Zika virus epidemic in Latin America and the Caribbean has led WHO to declare a Public Health Emergency of International Concern, triggered by the (probably causal) association of Zika virus infection with the occurrence of neurological complications such as Guillian-Barre Syndrome and vertical transmission resulting in severe fetal neurological disorders, particularly microcephaly.

The potential of Zika virus to spread beyond southern America has been shown in several case series describing imported infections in various countries around the world. A major concern is whether and to what extent these importations will result in subsequent outbreaks. The authors identify India, China, the Philippines, Thailand, and Indonesia as high-risk countries, whereas in mainland Africa, Angola is at particularly increased risk because of its historical ties with Brazil.

An important prerequisite for the occurrence of large-scale epidemics is the presence of an immunologically naive human population. This is a big unknown in the high-risk countries identified, because urgently needed reliable seroprevalence studies are in short supply. Bogoch and colleagues assume low levels of pre-existing immunity, which in their study translates into a worst-case scenario. This assumption might be true and therefore, vigilance is needed. A best-case scenario may occur if future seroprevalence studies show that immunity is much higher in the general population than expected.

Search and one will find: Zika virus everywhere

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The mysterious Zika virus: Adding to the tropical flavivirus mayhem

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ABSTRACT

Until now, known as the demure cousin of dengue virus (DENV) inhabiting Africa, Zika virus (ZIKV) has reinvented itself to cause explosive epidemics captivating the Western hemisphere. The outbreak causing potential for...
ZIKV: major outbreaks in the 21st century

- Yap Island in 2007 - estimated 5,000 cases

- Western Pacific in 2013-15, beginning in French Polynesia - estimated 30,000 cases in French Polynesia.

  - As at the 22 September:
    - at least 49 countries/territories in the Americas had reported local ZIKV transmission.
    - 500,557 suspected and 120,785 confirmed cases notified.
    - Highest number of suspected/confirmed cases reported in Brazil (196,976/78,421) and Colombia (94,724/8,826).
ZIKV virus marches on

Countries, territories and areas showing the distribution of Zika virus, 2013 - 2016

Some recent developments

- **July, 2016:** locally acquired mosquito-borne ZIKV cases reported in the continental US
  - 43 mosquito-borne cases to 21 September 2016, all in Florida

- **August, 2016:** locally acquired cases ZIKV reported in Singapore
  - 329 cases reported to 11 September 2016 (first reported, number of cases, strain)

- **September, 2016:** locally acquired cases reported in Malaysia
  - 6 cases reported to 14 September

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ZIKV is a threat to public health
– but is it a threat to blood safety?

Yes, but.....
ZIKV – how is it transmitted?

- ZIKV is primarily transmitted to humans by certain species of *Aedes* mosquitoes.

- Sexual transmission
  - Predominately male to female, but also
  - female to male
  - male to male

- In utero

- Blood transfusion
  - 3 cases reported in the literature

Transfusion-transmission of ZIKV: ticking the boxes

- Can establish infection in humans and spread rapidly in non-immune populations
- Competent mosquito vectors (Aedes species) are present in many countries
- Infection includes an asymptomatic viraemic period (albeit brief with relatively low viral load)
- The related flaviviruses, dengue and West Nile viruses, are transfusion-transmissible
- It is associated with clinically apparent disease in humans including microcephaly in newborns and Guillain-Barre syndrome (GBS)
- 3 transfusion-transmitted cases have now been reported in the literature

Closer to home: assessing the risk of Zika virus to blood safety in Australia

Local transmission of ZIKV has not been reported in Australia but cannot be excluded:

- Although relatively small, a number of imported cases are notified annually in Australia.
  - The number of reported cases has increased substantially in 2016 with 46 confirmed cases as at 23 September; annual case numbers of 1, 1, 13 and 8 for the years 2012 to 2015, respectively.
  - Of these 46 cases, 28 (63.6%) were acquired in the Pacific region and 18 (36.4%) in the Americas.
  - The highest number cases in 2016 have been reported in Queensland with 45.7% (21/46) of all Australian cases.

- *Aedes* mosquito vectors are present, although primarily restricted to northern Queensland.

The risk of a ZIKV outbreak in Australia

The risk of a local outbreak of ZIKV in Australia is considered low:

- The *Aedes* mosquito vectors are primarily restricted to northern Queensland
- Active mosquito surveillance and control programmes
- The Australian Government Department of Health’s recommendations to prevent the sexual transmission of ZIKV and advice for travellers to outbreak areas
- Ongoing monitoring of outbreaks.

Taylor KA et al. Zika virus from a Pacific perspective: What are the risks to Australians? Travel Med Infect Dis 2016;14: 159-61.
The Blood Service’s risk mitigation strategies

- To date (29 September, 2016), all countries that have reported local ZIKV transmission in the recent outbreaks in the Western Pacific and Americas are already subject to donor travel deferrals, i.e. returning donors are temporarily ineligible to donate or donation use is restricted:
  - Ineligible to donate for 120 days if returning from a malaria-endemic area
  - Donations are restricted to fractionated plasma products for 4 weeks if returning from DENV or chikungunya virus endemic regions that are not also endemic for malaria.
- 4-month donation deferral from date of recovery for donors with a current ZIKV infection
- 6-month deferral from date of last contact for donors who have had sexual contact with someone infected with ZIKV.
Conclusion

In summary, the transfusion-transmission risk of ZIKV in Australia is considered to be low:

- The absence of reported local transmission to date
- Relatively few imported cases are reported
- The risk of a local outbreak is low and would be geographically restricted to parts of northern Queensland
- The Blood Service as implemented a number of risk mitigation strategies
- Transfusion-transmission appears to be an inefficient mode of ZIKV transmission
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