Arthropod-borne viruses and the safety of donated products

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Infectious threats

- Various infectious threats to the safety of donated products exist
- The UK has a generally low background disease burden
- Mandatory screening is performed for those IAs which are endemic in the population and are a general background threat
  - HBV, HCV, HIV, HTLV, syphilis
- Additional threats arise from IAs which are transmissible but not endemic in the population
  - only a threat if they enter the population
  - usually enter either in individuals or via the vectors
  - may then become more widespread

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Arthropod-borne viruses

- Range of viruses transmitted primarily through the bite of an insect
  - mosquitoes
  - ticks
  - sand flies
- Main viruses infecting humans are in the Bunyaviridae, Flaviviridae and Togaviridae families
  - may be referred to as arboviruses
- Usually give rise to acute infections, often asymptomatic and self-limiting
- The most common clinical features are fever, headache, and malaise, but encephalitis and hemorrhagic fever may also occur

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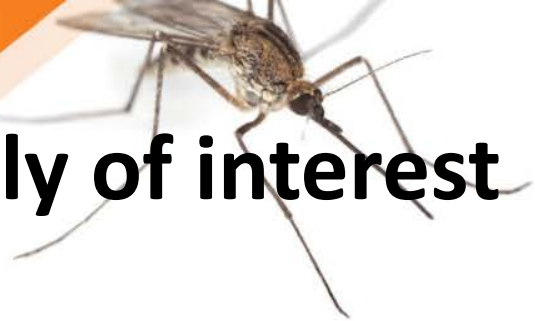
Arthropod-borne viruses currently of interest



- Viruses that UK Blood Services are currently either screening for or for which there assessments in place:
  - West Nile virus
  - Dengue virus
  - Chikungunya virus
  - Zika virus
  - Usutu virus
  - Tick-borne encephalitis virus
  - Crimean Congo Haemorrhagic fever virus

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Onward transmission

- Natural cycle between vector and reservoir for the particular virus
  - birds are a common reservoir
  - any vertebrate whose blood is consumed may be a reservoir
- Humans may be reservoirs for some of viruses but may also be ‘dead end’ hosts
  - a mosquito bite of an infected human would not normally result in further transmission to humans as many viruses do not amplify sufficiently
- Human to human transmission may occur in some situations
  - potential for transmission by transfusion/transplantation
  - healthcare environments from infected patients

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Spread of arthropod-borne viruses

- Risk of transmission through transfusion/transplantation may be low, but the potential for transmission exists
- These viruses have been known about for a number of years but have previously remained largely geographically restricted, mosquitoes were not so widespread
  - changing climate patterns
  - increasing population densities
  - increasing global travel

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Spread of mosquitoes

- Presence of vector provides means for transmission
- Presence of vector and agent required for transmission
  - but there has to be sufficient of both
- Competent mosquitoes are found in UK, agents not (currently)
  - ongoing monitoring of mosquito population
- In some countries where there are competent mosquitoes, the agent does appear (imported) and transmissions occur
  - limited spread, contained within local area, eradication measures implemented
  - ChikV currently in S. France and Italy, previous years ChikV and Dengue cases

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Case numbers in the UK

- Imported cases in the general population, identified because of development of symptoms
- Dengue - 347 cases in 2014
- Zika - 301 cases, 1 likely sexual transmission between 2015-2017
- Chikungunya - 300 cases in 2014
- West Nile - 2 cases between 2004-2013
- Usutu - no cases identified, but first identified in birds in 2001
- TBE - 4 cases between 2011-2012
- CCHF - 2 cases between 2012-2014

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How blood services respond

- Identifying and understanding the risks
- Identifying risk donors/donations
  - donors can be identified through travel history
- Two options: defer Or screen
  - endemicity of the infectious agent will influence the approach taken
  - different blood services may take differing approaches
  - impact of donor deferral (loss of donations) v cost of screening
- Consequences of transmission may impact
  - Zika transmission to a pregnant woman has potentially catastrophic consequences

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How blood services respond

- Risk donors deferred for an appropriate period
  - symptom free - 28 days since return from affected area
  - symptoms or diagnosed with infection - 6 months since return
  - potential for sexual transmission has required additional risk assessment for Zika
  - non-travelling donors who have had sexual contact with a confirmed Zika infected individual - 28 days deferral
- In the case of local outbreaks collections may be suspended in affected areas

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Donor screening

- Donor screening possible but ? appropriate
- As acute infections, viral nucleic acids must be the target
- Numbers of donors involved may not be high so value of screening v. deferral must be considered
- WNV a unique case as requirement for screening enshrined in EU Blood Directive

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Sexual transmission

- Evidence is growing that human to human transmission can occur through sexual contact
- Viruses have short viraemia, but may persist for extended periods in immune-privileged sites
- The recent Zika outbreak first raised this issue, persistence of viral RNA in semen for up to 6 months after onset of symptoms
- Ongoing monitoring of individuals recovered from Ebola has identified persistence of viral RNA in semen for up to 965 days
- However detection of viral RNA is not the same as detection of viable virus

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Future risks

- There is a risk of spread of arthropod-borne viruses into the UK
  - mosquitoes are present
  - IAs are imported and localised transmissions possible
- Current donor selection guidelines are based upon IAs NOT being present in the UK and no locally acquired cases occurring
- Even if cases do occur it is highly unlikely that these will result in the infectious agent becoming established in the UK
- Monthly emerging infectious disease reviews identify potential threats
- Being aware of the risks is critical to maintaining product safety

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