Prevention of transfusion-transmitted arboviruses in French Polynesia

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25th Regional congress of the ISBT, London, June 27 – July 1, 2015
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French Polynesia (FP)

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Arboviruses

Arboviruses (ARthropod-BOrne viruses)

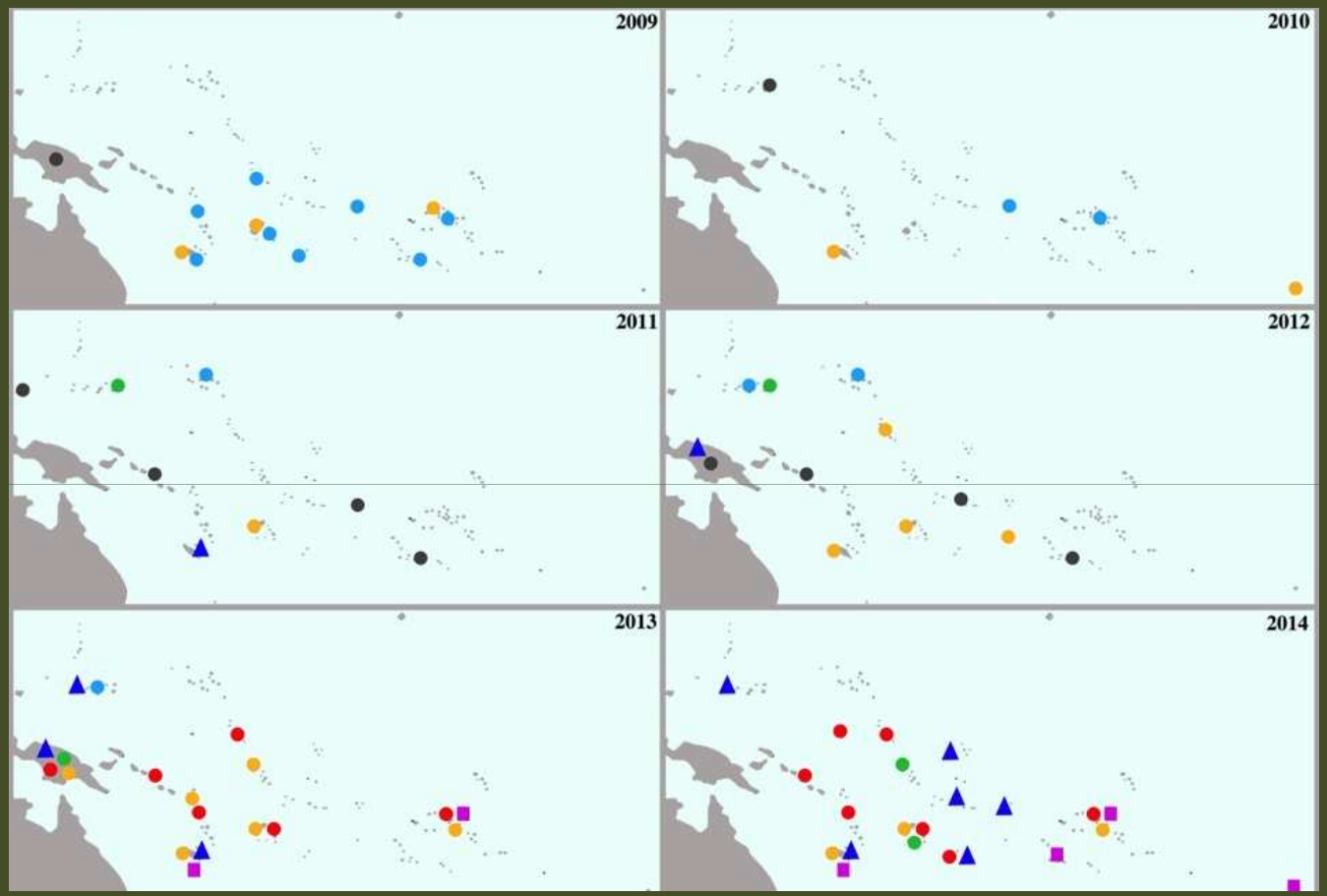
Alphavirus genus

- Chikungunya virus (CHIKV)
- Ross River virus (RRV)
- ….

Flavivirus genus

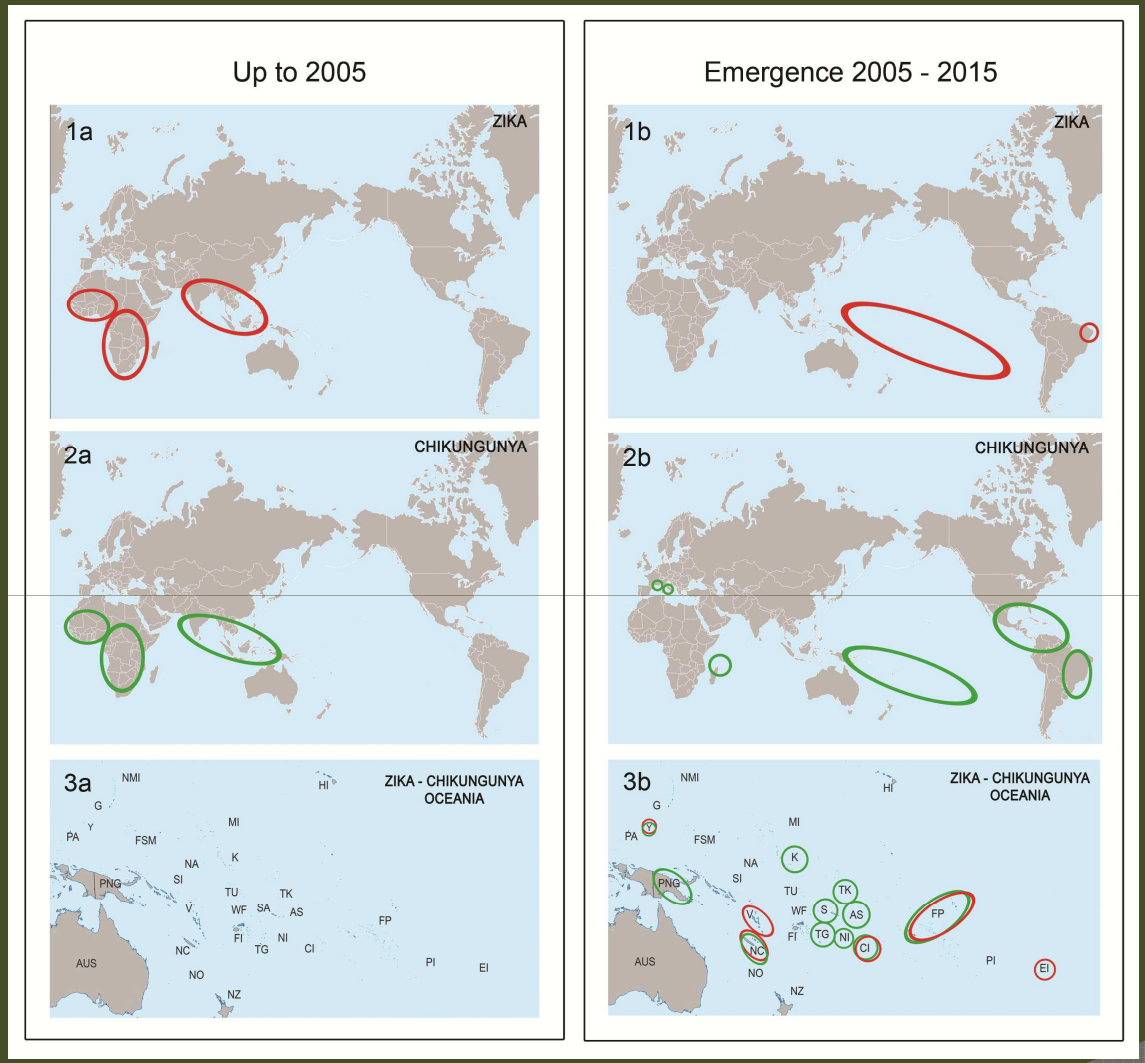
- Dengue virus (DENV-1, DENV-2, DENV-3, DENV-4)
- West Nile virus (WNV)
- Yellow fever virus (YFV)
- Japanese encephalitis virus (JEV)
- Zika virus (ZIKV)
- …

Pacific: a high endemic area for arboviruses



Cao-Lormeau VM, Musso D. The Lancet 2014

Pacific: a high endemic area for arboviruses



Musso D, Cao-Lormeau VM, Gubler DJ. The Lancet 2015, in press

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Arboviruses and blood transfusion

- West Nile virus +++
- Dengue virus (underestimated +++)
- Colorado tick fever virus
- Tick-borne encephalitis virus
- Others ?

Blood transfusion during arbovirus outbreaks in FP: the challenges

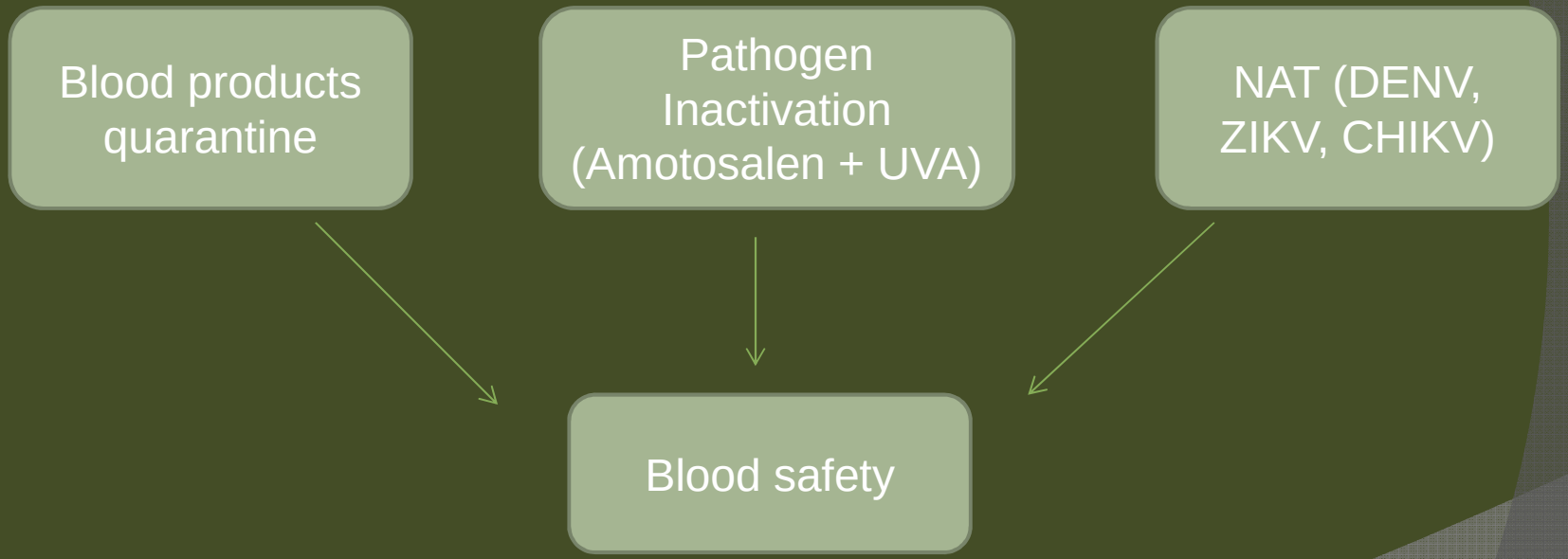
The challenges of blood transfusion in FP and other remote areas:

- Geographic isolation
- Impossible to be supplied by other blood bank centers
- Impossible to stop blood collection during an outbreak
- Increased need of blood products during outbreaks

Specific challenges during arboviruses outbreaks

- Lack of a licensed diagnostic test for arboviruses screening
- Lack of recommendations
- Low reliability of clinical blood donor screening: asymptomatic forms +++
  - DENV ≥ 75%
  - ZIKV ?

Blood transfusion during arbovirus outbreaks in FP: global strategy



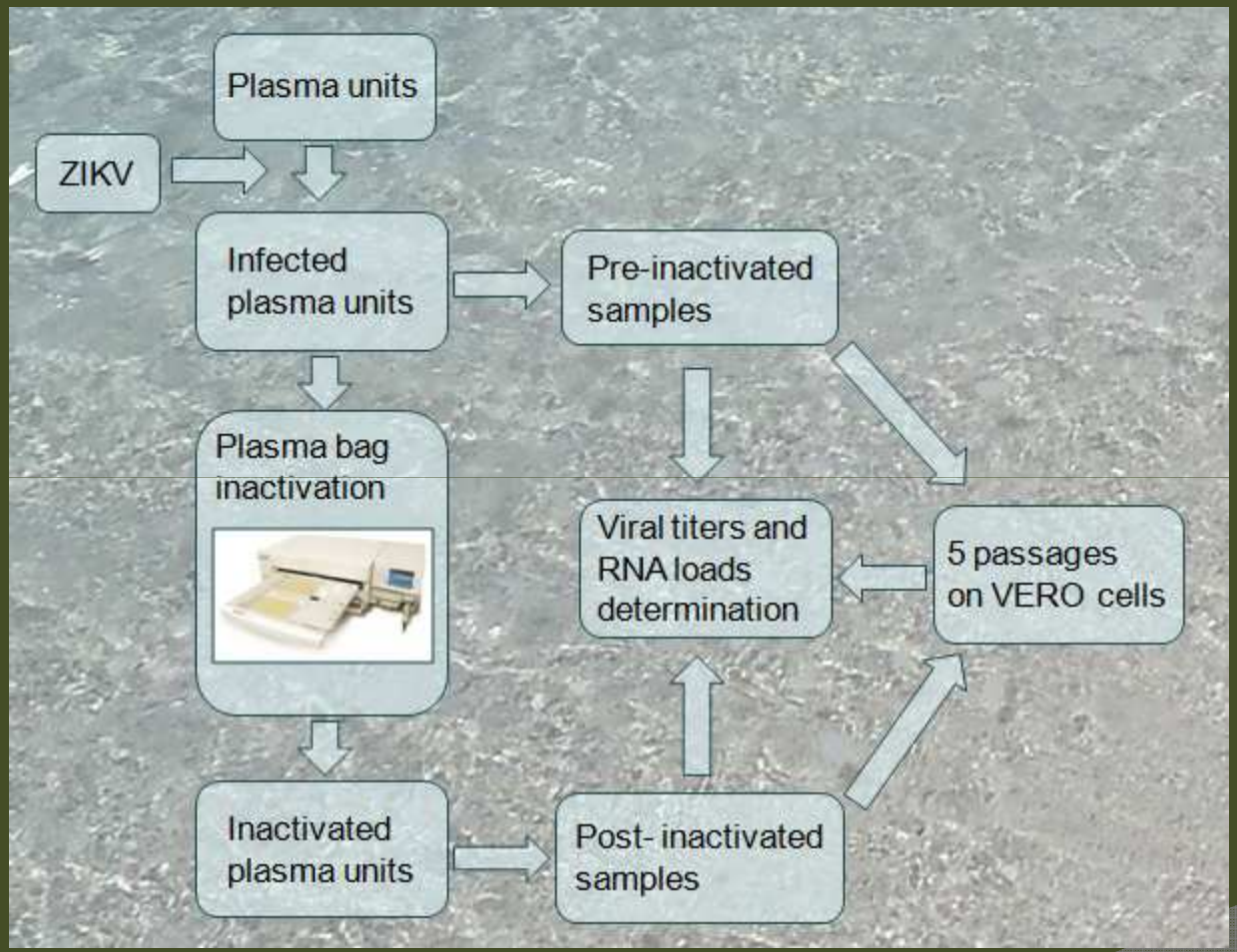
Pathogen inactivation by amotosalen + UVA (Intercept) applied to arboviruses

	Platelet (log reduction)	Plasma (log reduction)
WNV	> 6	> 6.8
CHIKV	> 6.4	> 7.6
DENV	> 5 (DENV 2,3,4)*	> 5.7** (DENV-1)
ZIKV	-	-

* Dupuis, K, Arnold, D, and Sawyer, L. Transfusion 2012, 52: 225A

** Musso D, Richard V, Broult J, Cao-Lormeau VM. Amotosalen and ultraviolet A illumination inactivation of dengue virus inactivation. Transfusion. 2014; doi: 10.1111/trf.12713

Validation of Intercept inactivation for ZIKV in plasma units



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Validation of Intercept inactivation for ZIKV in plasma units

Means ZIKV titers and RNA loads before and after inactivation		
Plasma samples	Mean viral titers (log_{10} $TCID_{50}$/mL)	Mean RNA loads (log_{10} copies/mL)
Pre-inactivated	6.57	10.25
Post-inactivated	N	9.51
Post-inactivated after 1st passage	N	3.86
Post-inactivated after 2nd passage	N	N
Post-inactivated after 3rd passage	N	N
Post-inactivated after 4th passage	N	N
Post-inactivated after 5th passage	N	N

N: no virus detected by IF or no RNA detected by PCR

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Intercept and arbovirus update

	Platelet (viral titer log reduction)	Plasma (viral titer log reduction)
WNV	> 6	> 6.8
CHIKV	> 6.4	> 7.6
DENV	> 5	> 5.7
ZIKV	-	➢ 5.6 ➢ (10 $\log_{10}$copies /ml)

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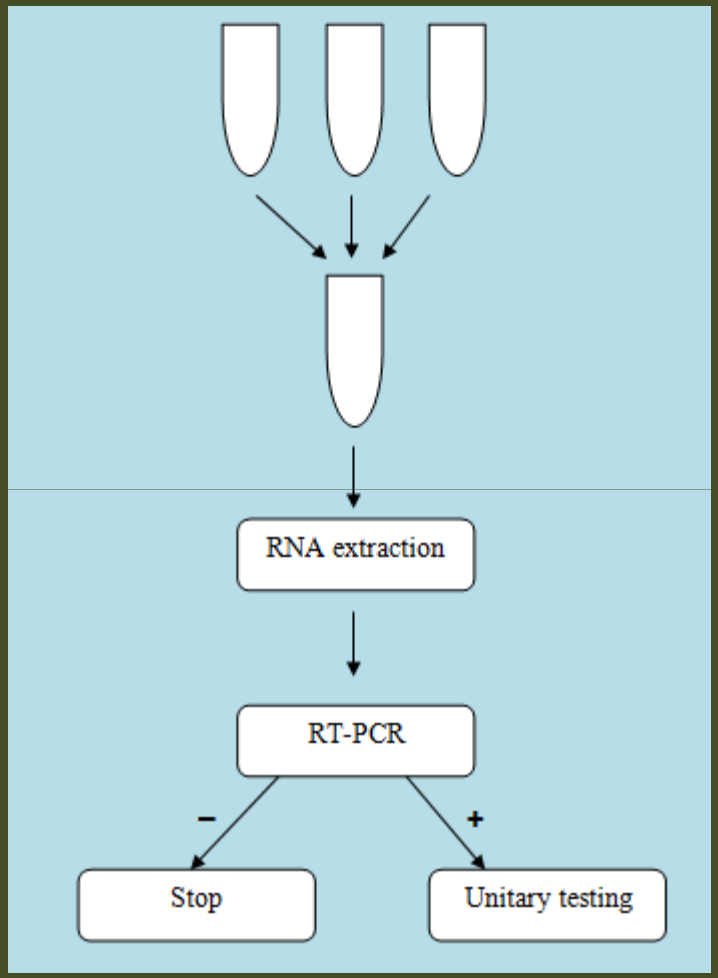
Nucleic acid testing for DENV, CHIKV and ZIKV



Nucleic acid testing for DENV, CHIKV and ZIKV

ZIKV
- 42 positives / 1,505 blood donors (2.8 %)
- Viral loads in asymptomatic blood donors : 3.40 to 6.91 log_{10} copies/mL (mean 4.85 log_{10} copies/mL)
- Intercept inactivate $\geq$ 10 log_{10}copies /ml +++

CHIKV
- 34 positives / 3,656 blood donors (0.9%)

DENV
- 2 positives / 6.142 blood donors (0.03%)

PI versus NAT, the French Polynesia experience

- When only 1 « emerging » or « atypical » pathogen is circulating : Including NAT in the panel of pathogen screening is possible, but it requires a center to have a molecular lab facility

- When 2 « emerging » or « atypical » pathogens are circulating : NAT is complicated, PI is certainly the best solution

- If more than 2 « emerging » or « atypical » pathogens are circulating : routine NAT is unreliable, PI is the only solution

The need for remote areas +++

A pathogen inactivation system that works in the same manner for red cells + plasma + platelets

You are welcome in French Polynesia: we have more than viruses !