Virulence of Re-emerging St. Louis Encephalitis Virus in California

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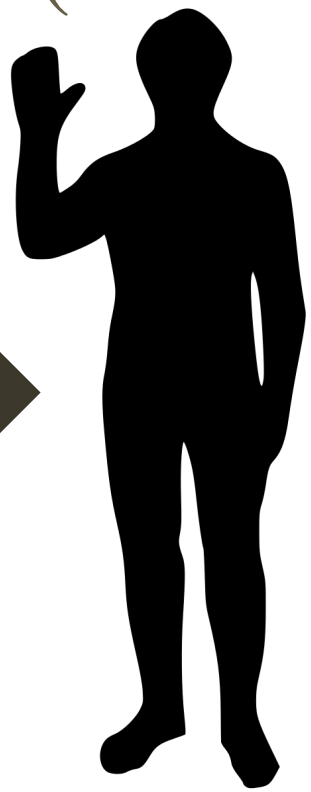
St. Louis Encephalitis virus (SLEV)

- Flavivirus- related to West Nile and Zika viruses

Culex mosquito vector

Dead end host

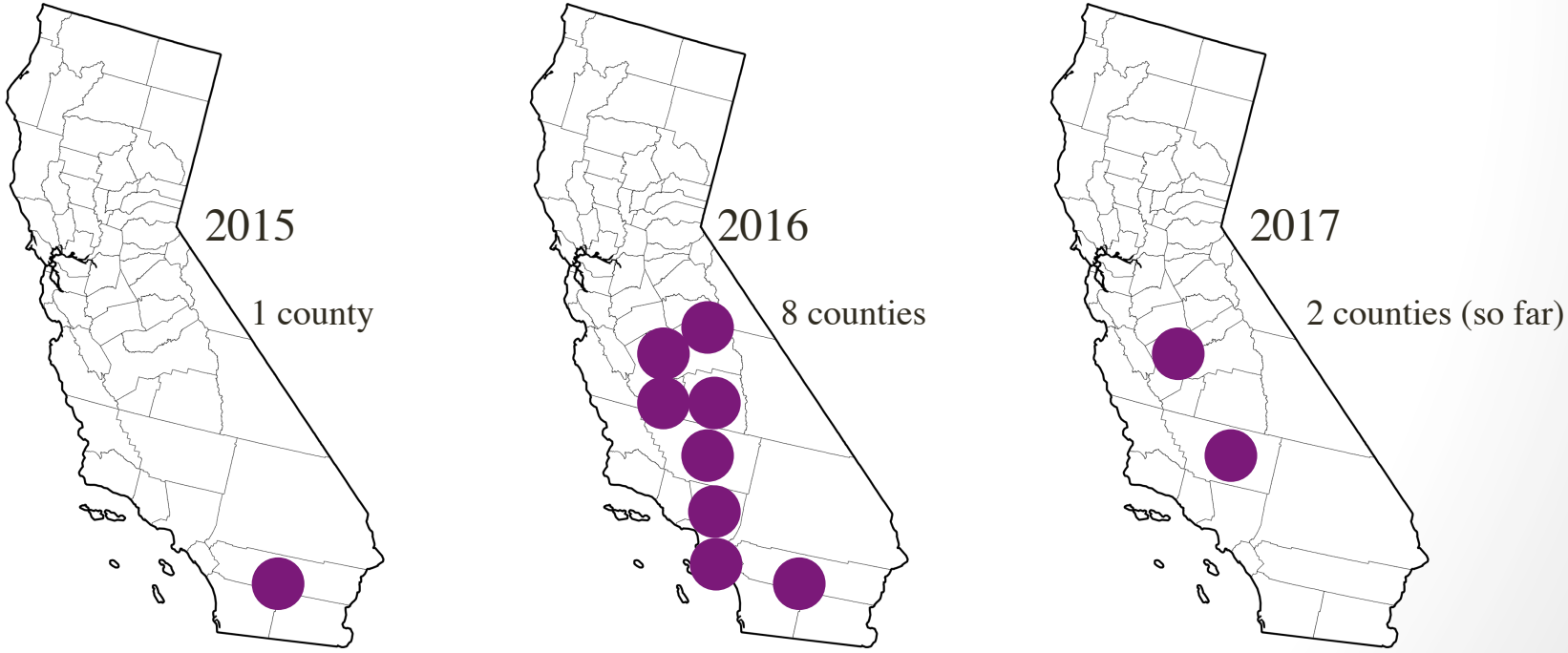
Amplifying host



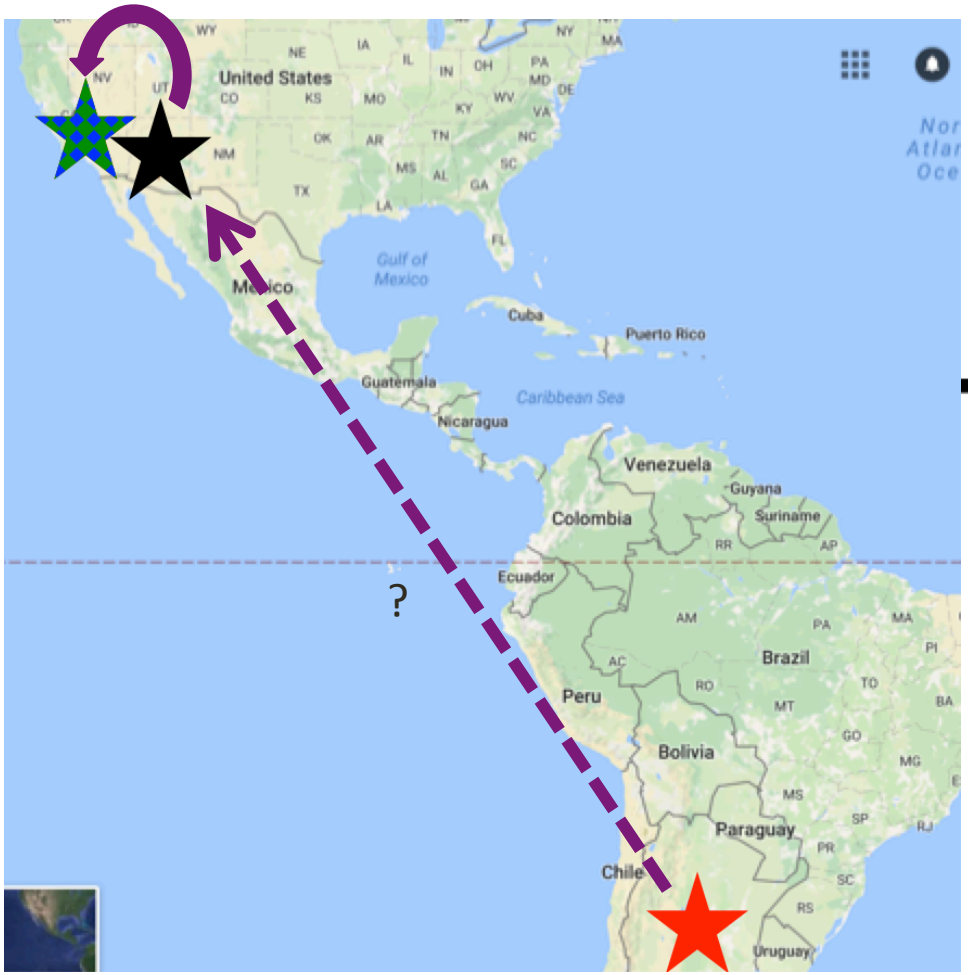
- Asymptomatic
- Flu-like symptoms
- Encephalitis
- Death

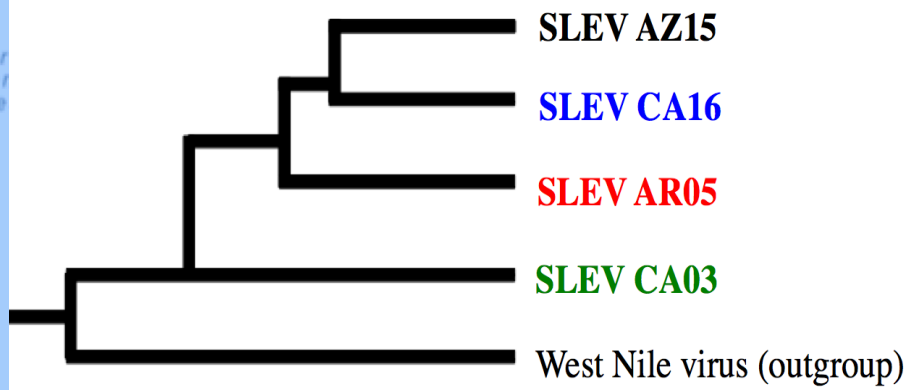
SLEV in California

- First recognized in California in 1937
- From 2003-2015, no SLEV activity was detected despite a 6-fold increase in mosquito-borne virus surveillance
- In 2015 SLEV was detected in mosquito pools from Coachella Valley



Closest relative of re-emerging California 2015 (CA16) SLEV is Argentina 2005 (AR)





White, G. S., **Symmes, K.**, Sun, P., Fang, Y., Garcia, S., Steiner, C., ... & Coffey, L. L. (2016). Reemergence of St. Louis Encephalitis Virus, California, 2015. *Emerging infectious diseases*, *22*(12), 2185.

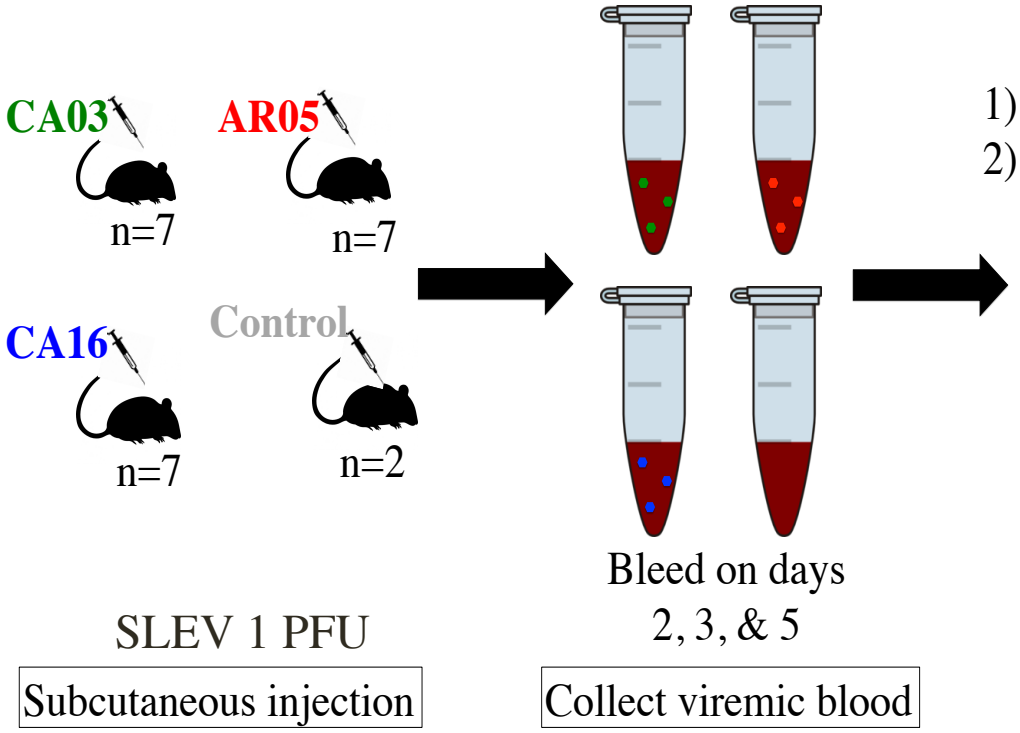
Why did SLEV disappear from California for 11 years?

How and why did it come back?

Hypothesis

Re-emergence of SLEV in California in 2015 after an 11-year absence of activity was promoted by **augmented pathogenicity** resulting in **enhanced murine replication, morbidity, and mortality** compared to ancestral strains from Argentina and historical strains from California.

Comparing the virulence of re-emerging SLEV to ancestral and historic strains

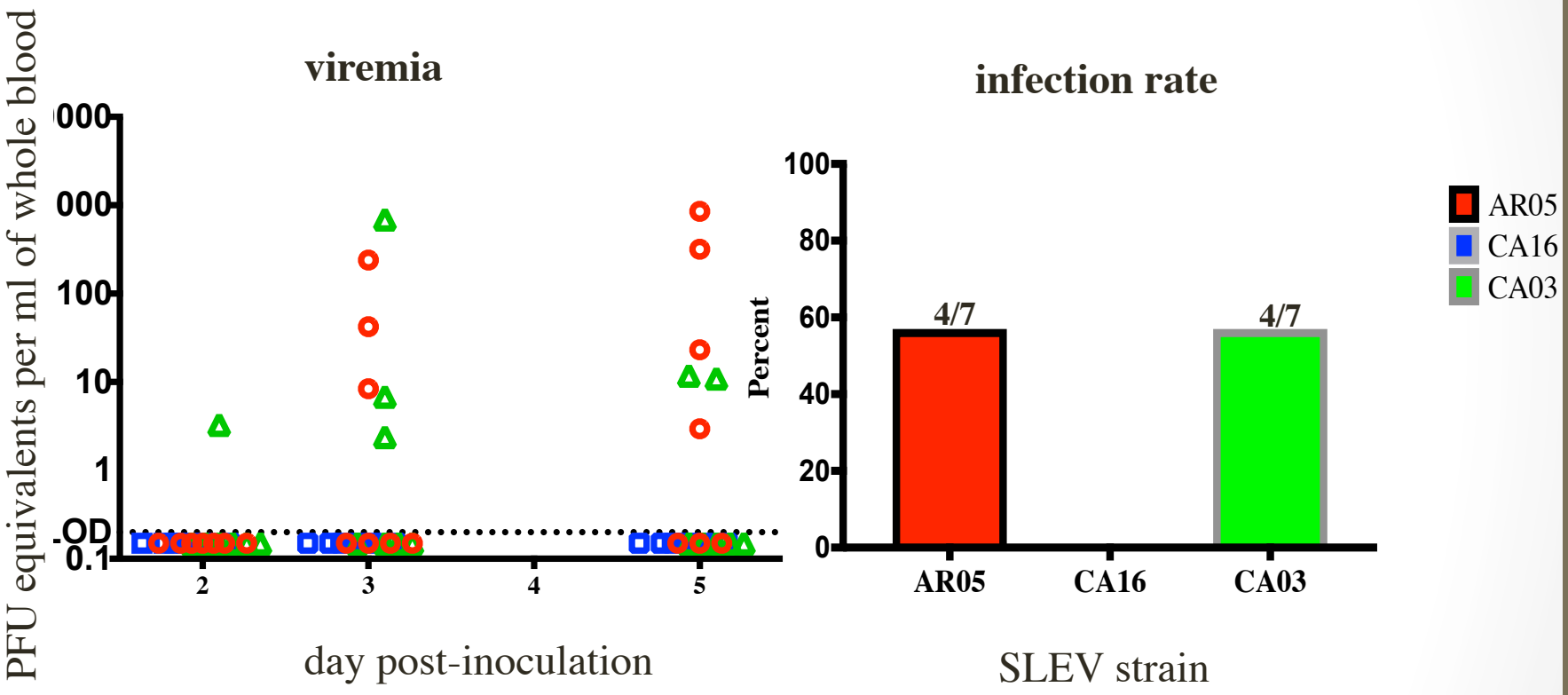


1) qRT-PCR for viral RNA quantification
2) Monitor for clinical signs, including:
   - Lack of grooming
   - Weight loss
   - Lethargy
   - Ataxia
   - Circling
   - Inability to stand upright
   - Response to handling

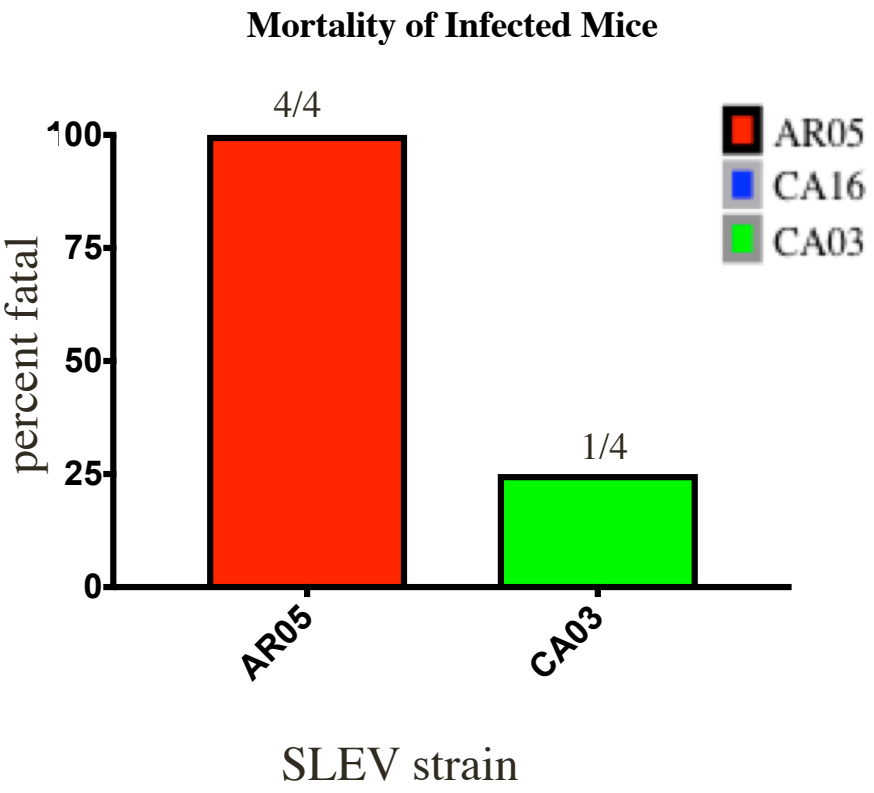
Quantify Disease

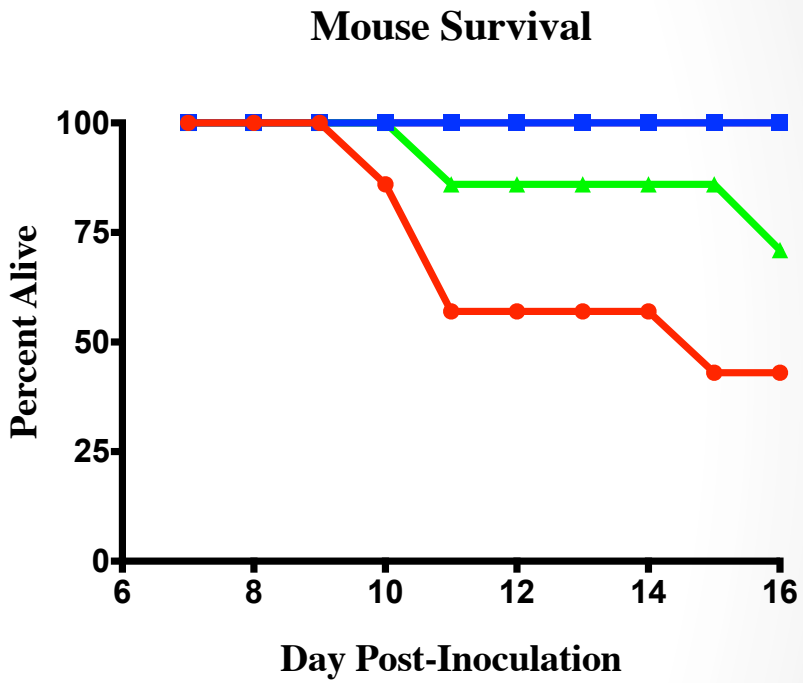
Swiss albino mice are susceptible to neuropathologic SLEV and are a model for human disease (Rivarola et al., 2014, 2017).

Re-emerging CA16 SLEV is not as infectious in mice as AR05 or CA03



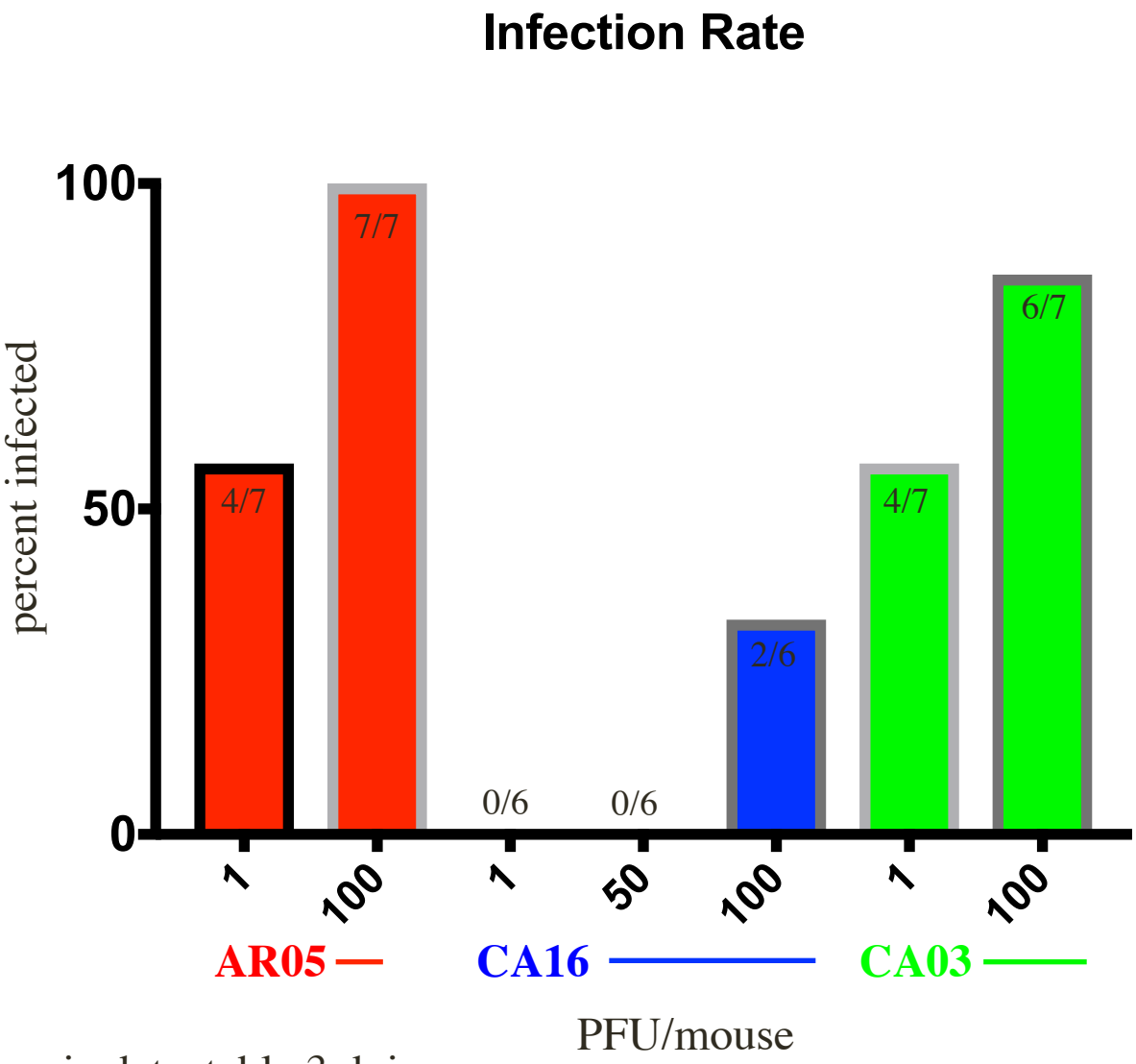
SLEV AR05 is more virulent in mice than CA03





Refutes hypothesis that re-emergence was accompanied by increased infectivity or virulence

Dose escalation study in progress confirms that infectious dose of CA16 is higher than AR05 and CA03



*based on viremia detectable 3 dpi

Conclusions

Data to date refutes hypothesis that SLEV re-emergence in California was accompanied by increased murine infectivity or virulence

Other factors affecting transmission dynamics or ecology may be responsible for re-emergence:

Increased infection and or transmission rates?

Culex mosquito vector

Dead end host

increased infection or disease in murine model

Increased infection and or transmission rates?
Waning cross-reactive WNV immunity?

Amplifying host

Acknowledgements

- NIH
- STAR
- DART Lab
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