

# Zika Virus Introduction and Overview

Dr. Christopher Perkins

Dallas County Health Authority

12 January 2017



Transactions of the Royal Society of  
Tropical Medicine & Hygiene

# **Zika Virus. I. Isolations and Serological Specificity**

GW Dick, SF Kitchen, AJ Hadow

September, 1952  
Vol. 46 No. 5

OXFORD  
UNIVERSITY PRESS



■ **Virus first isolated from a monkey in the Zika forest of Uganda in 1947**

1947



Rhesus monkey

Uganda's Zika Forest

1948



Aedes africanus



Pan American  
Health  
Organization



REGIONAL OFFICE FOR THE

World Health  
Organization  
Americas

**ANATOMY OF A ZIKAVIRUS**

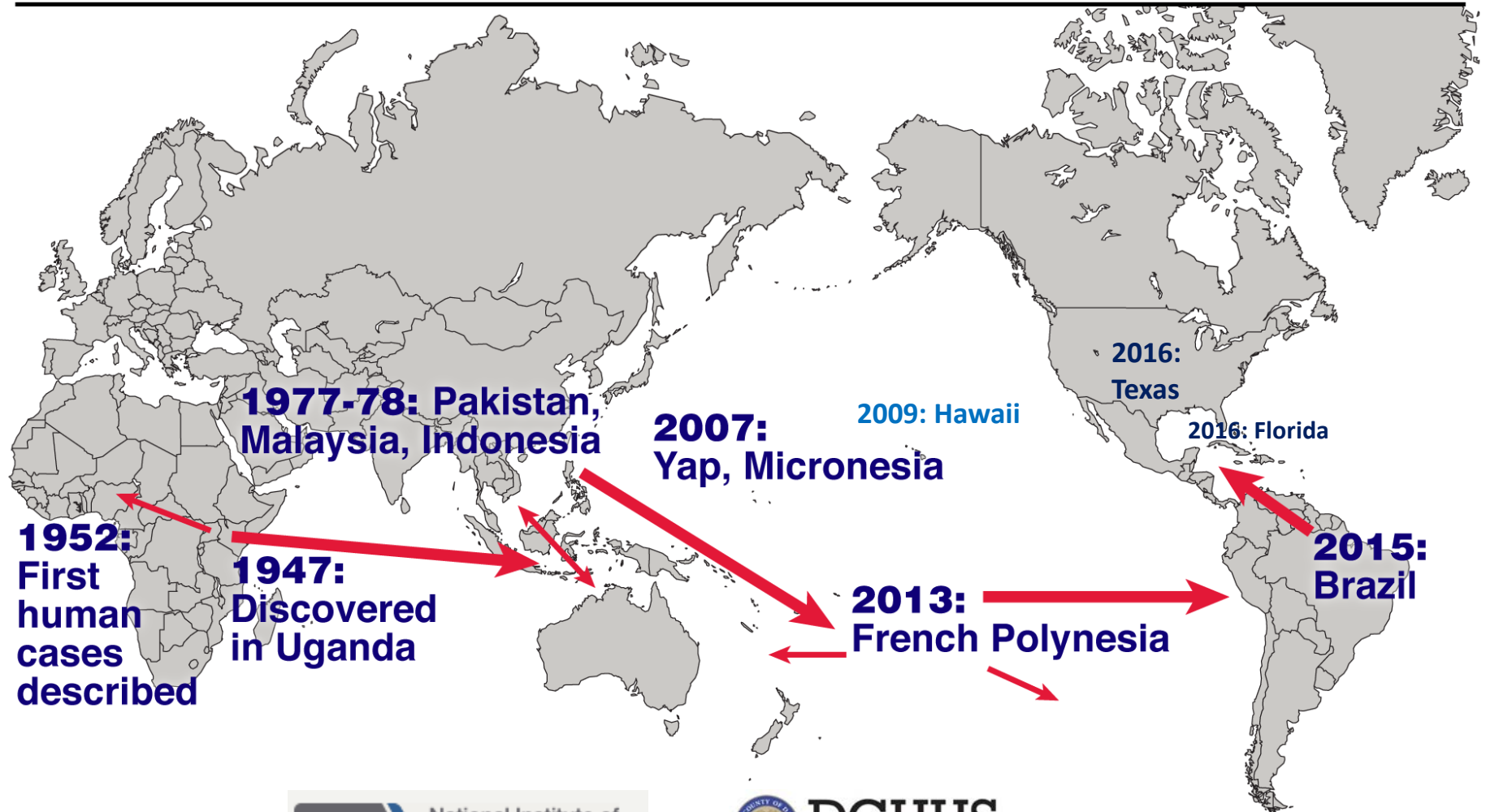
Envelope  
 5 protein spikes  
 M protein  
 Matrix membrane  
 Glycoprotein spikes  
 Nucleocapsid  
 Coat protein  
 Genome (RNA)

© 2016 Science Photo Library

- 



# Zika Virus Spread, 1947-2016



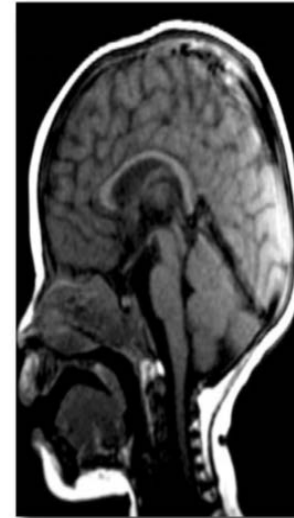


# Clinical Presentation of rash syndrome in Northeast Brazil, May 2015

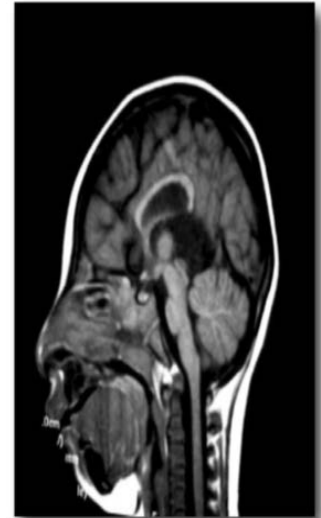
Rash, swollen joints, and conjunctival hyperemia



## Microcephaly Attributed to Zika



Normal infant brain  
and head size



Microcephaly,  
Colombia 2015

Images: LatinAmericanScience.org



Pan American  
Health  
Organization



World Health  
Organization  
Americas

REGIONAL OFFICE FOR THE

# THE LANCET

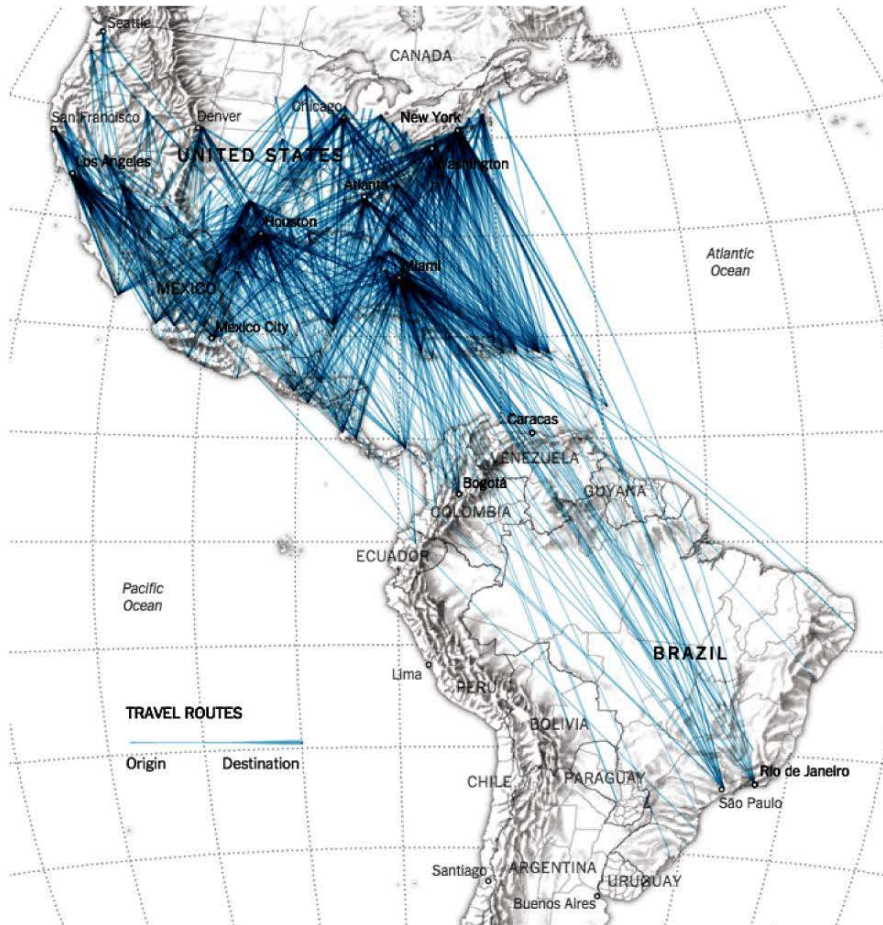
Published Online February 29, 2016

## **Guillain-Barré Syndrome Outbreak Associated with Zika Virus Infection in French Polynesia: A Case-Control Study**

VM Cao-Lormeau, F Ghawché et al.

- 98% of 42 pts with GBS had anti-Zika virus IgM or IgG, and all (100%) had neutralizing antibodies against Zika virus compared with 56% of 98 pts in control group w/nAbs ( $p < 0.0001$ )
- 88% of 42 patients with GBS reported symptoms of Zika virus infection ~6 days before onset of neurological symptoms
- Based on attack rate for Zika virus of 66% in French Polynesia, risk of GBS in the general population during the outbreak was 24 /100,000 infections

# Potential for Imported Cases of Zika in the United States

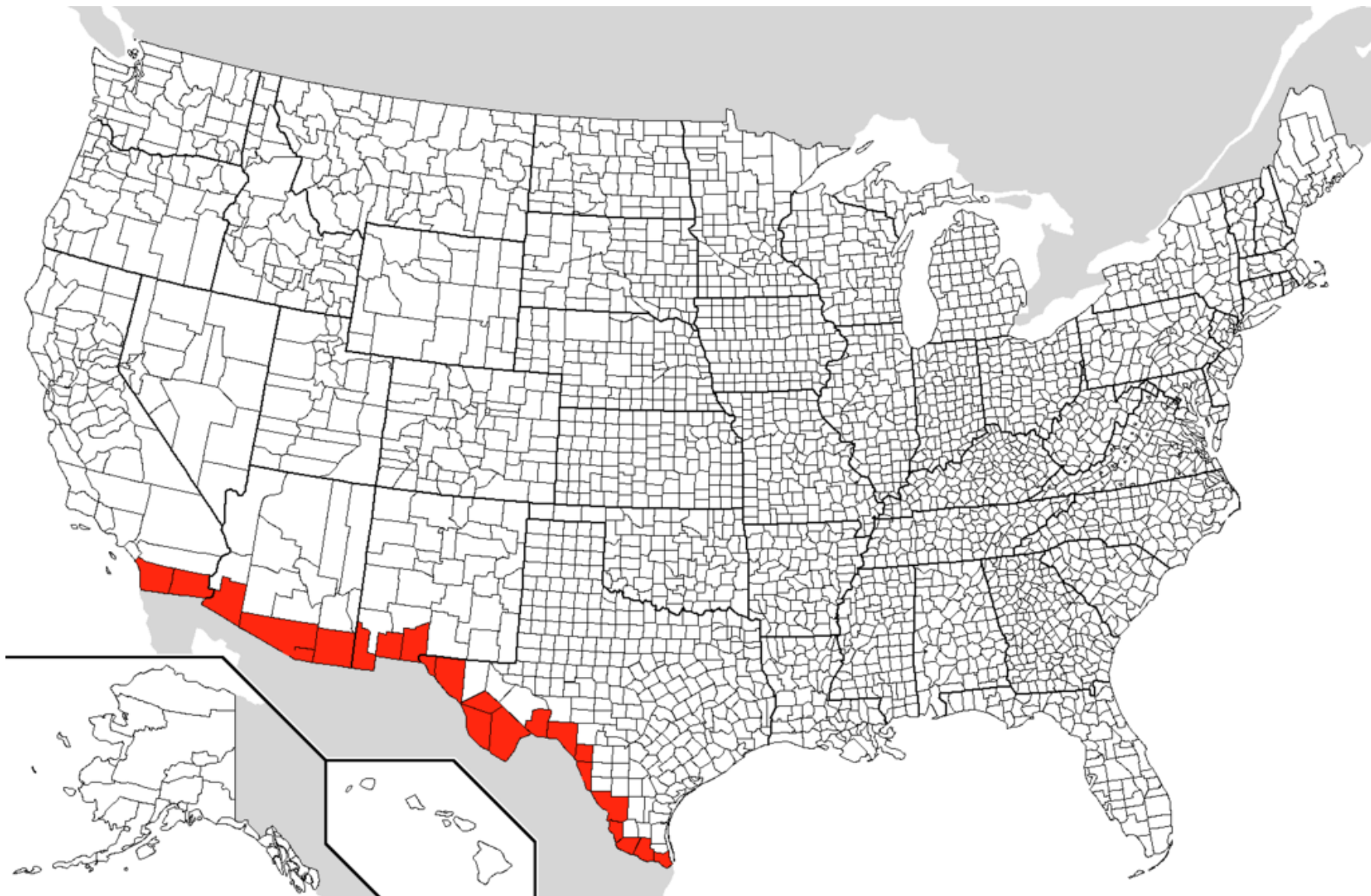


■ ~216 million passenger journeys to U.S. annually from areas with local Zika virus transmission

- 34 M by air
- 173 M by land
- 9 M by sea

Sources: B Nelson et al. *PLoS Currents Outbreaks*, 5/31/2016; NY Times.



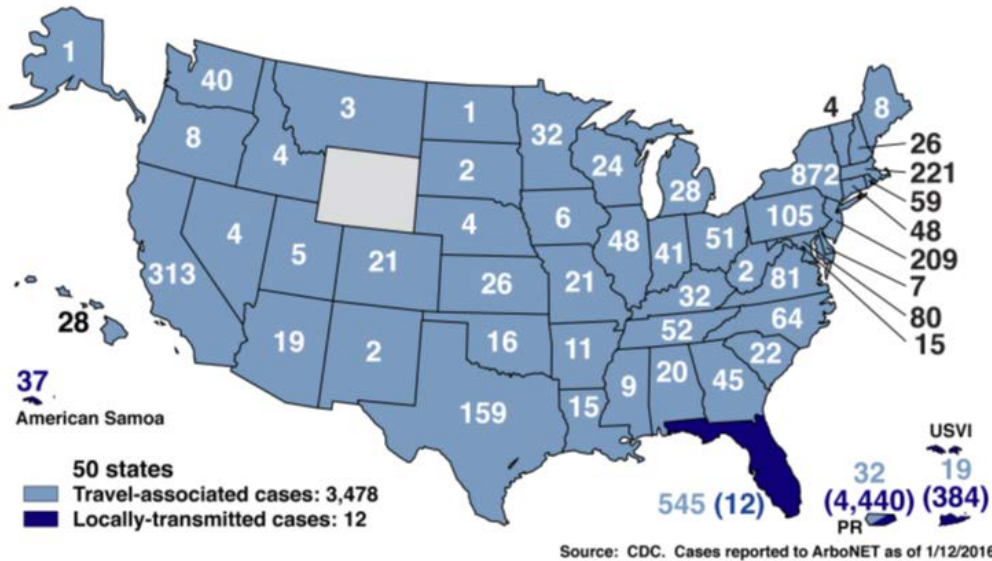


Pan American  
Health  
Organization

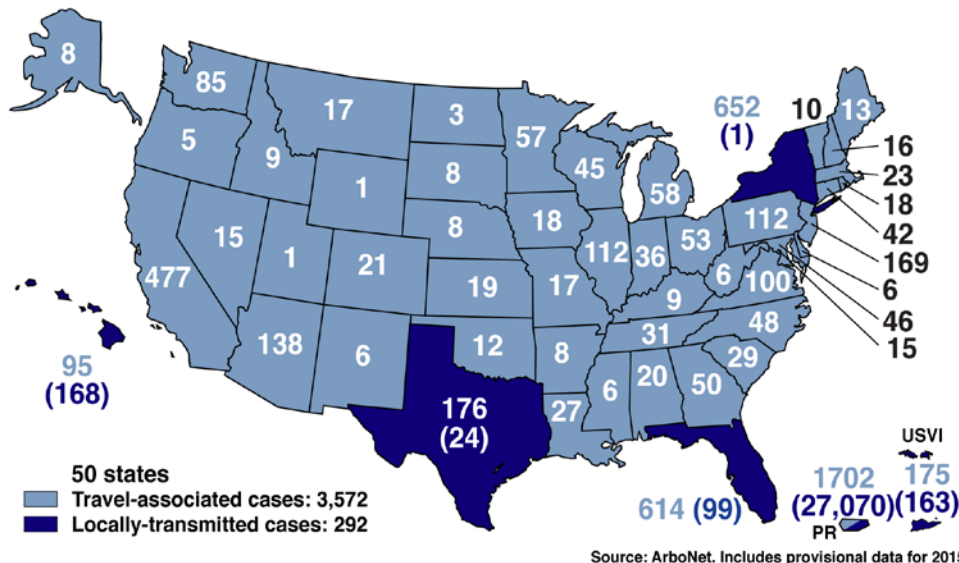


World Health  
Organization  
REGIONAL OFFICE FOR THE  
Americas

## Chikungunya Cases in the United States, 2014-2015



## Dengue Cases in the United States, 2010-2015



# Modalities of Transmission of Zika Virus

---

- Mosquito bites
- Sexual transmission
- Blood transfusion

# Zika At-A-Glance

## **Pregnant Women with Any Lab Evidence of Zika Virus Infection\***

- US States and DC: 1,246
- US Territories: 2,701

- \*Source: Pregnancy Registries as of December 13, 2016

## **Zika Virus Disease Cases Reported to ArboNET\***

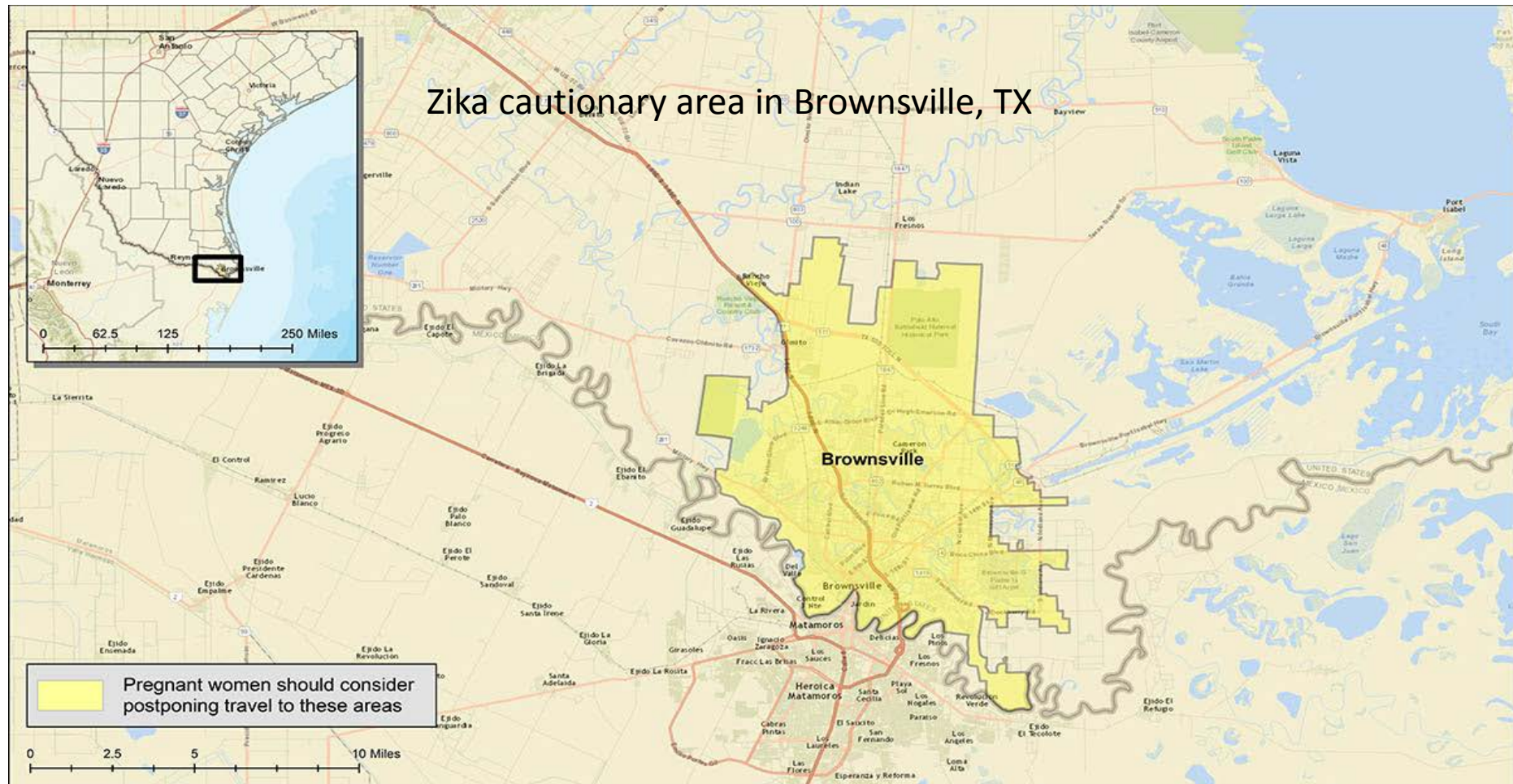
- US States and DC: 4,809
- US Territories: 34,973

- \*Source: ArboNET as of December 28, 2016





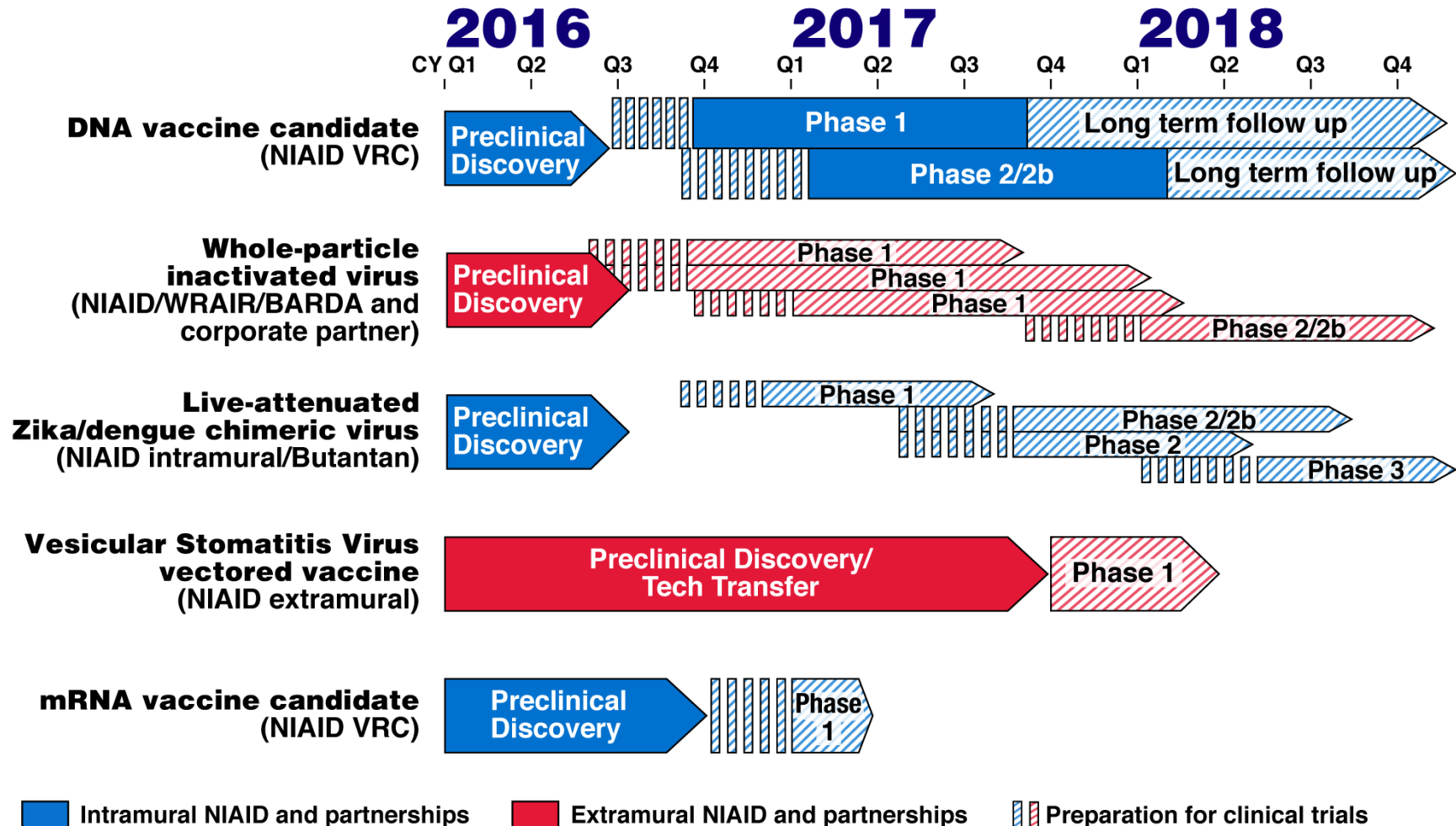
# Zika Cases in Texas







# Zika Vaccine Development Timeline

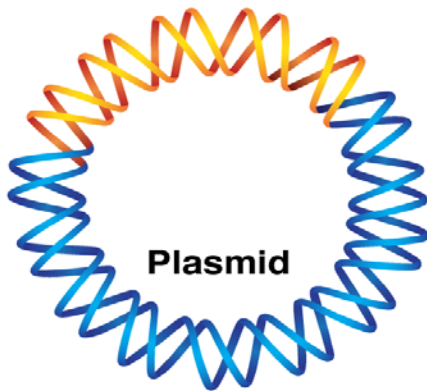




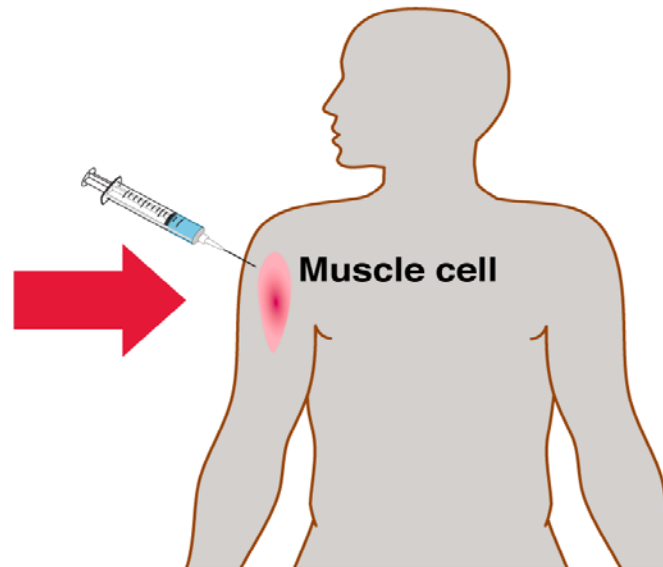
A healthy volunteer receives the NIAID Zika virus investigational DNA vaccine as part of an early-stage trial to test the vaccine's safety and immunogenicity. This encounter pictured above was the first administration of this vaccine in a human.

# DNA Vaccine Approach

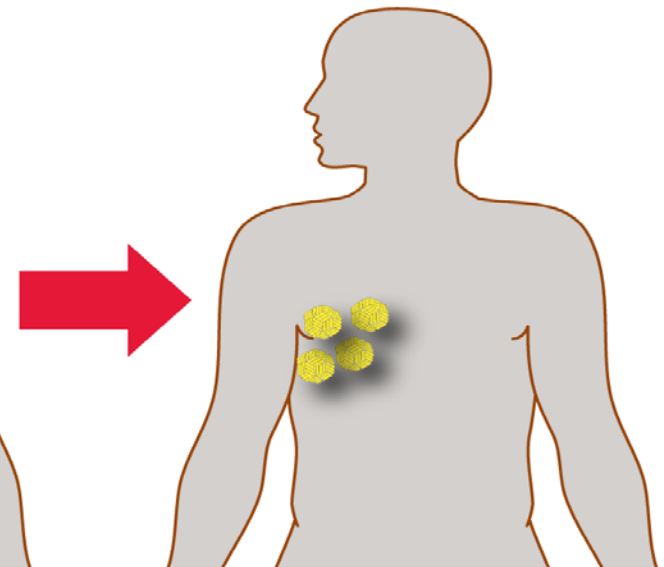
Gene encoding  
surface protein  
from Zika virus



Inject DNA  
containing  
Zika gene

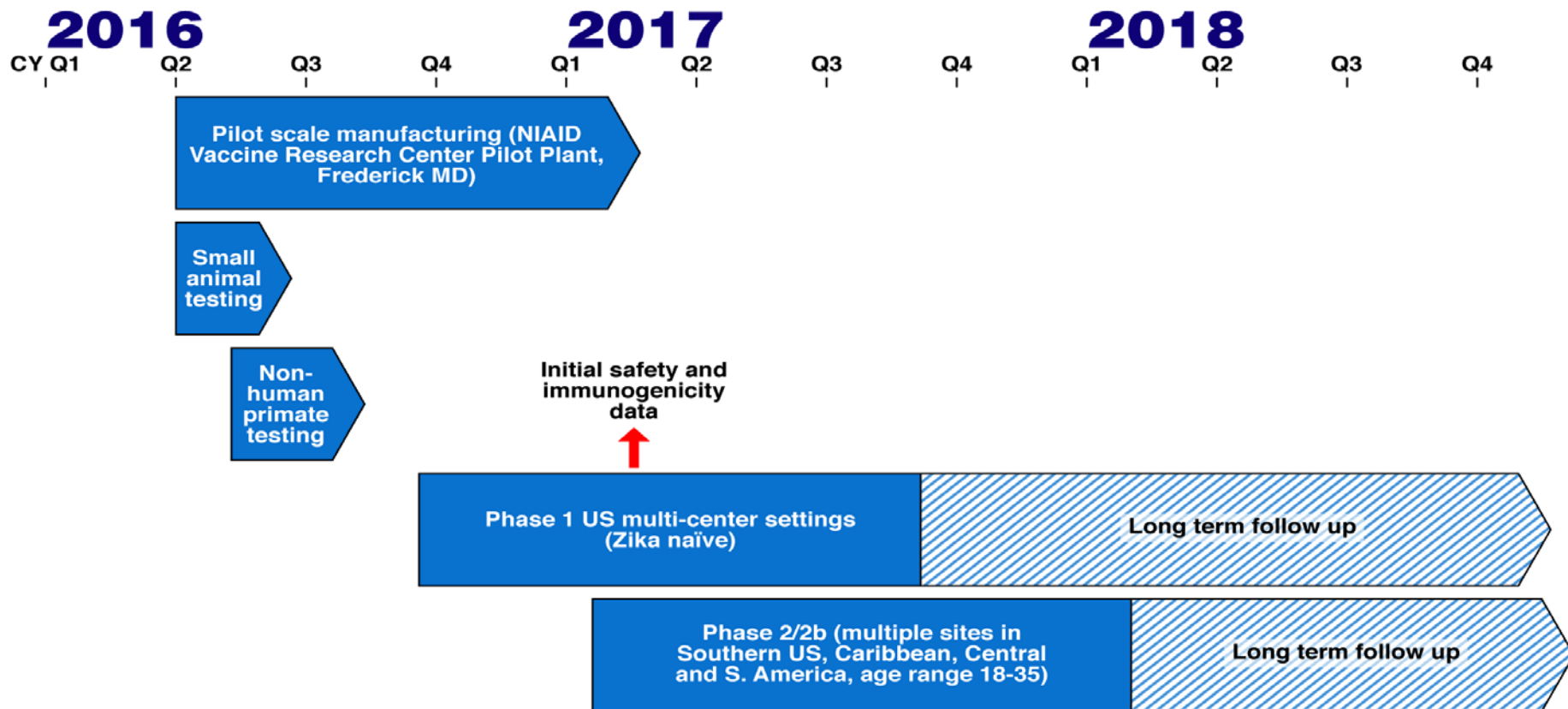


Body's cells  
produce virus-like  
particles, the basis  
of the vaccine





# DNA Vaccine Development Timeline





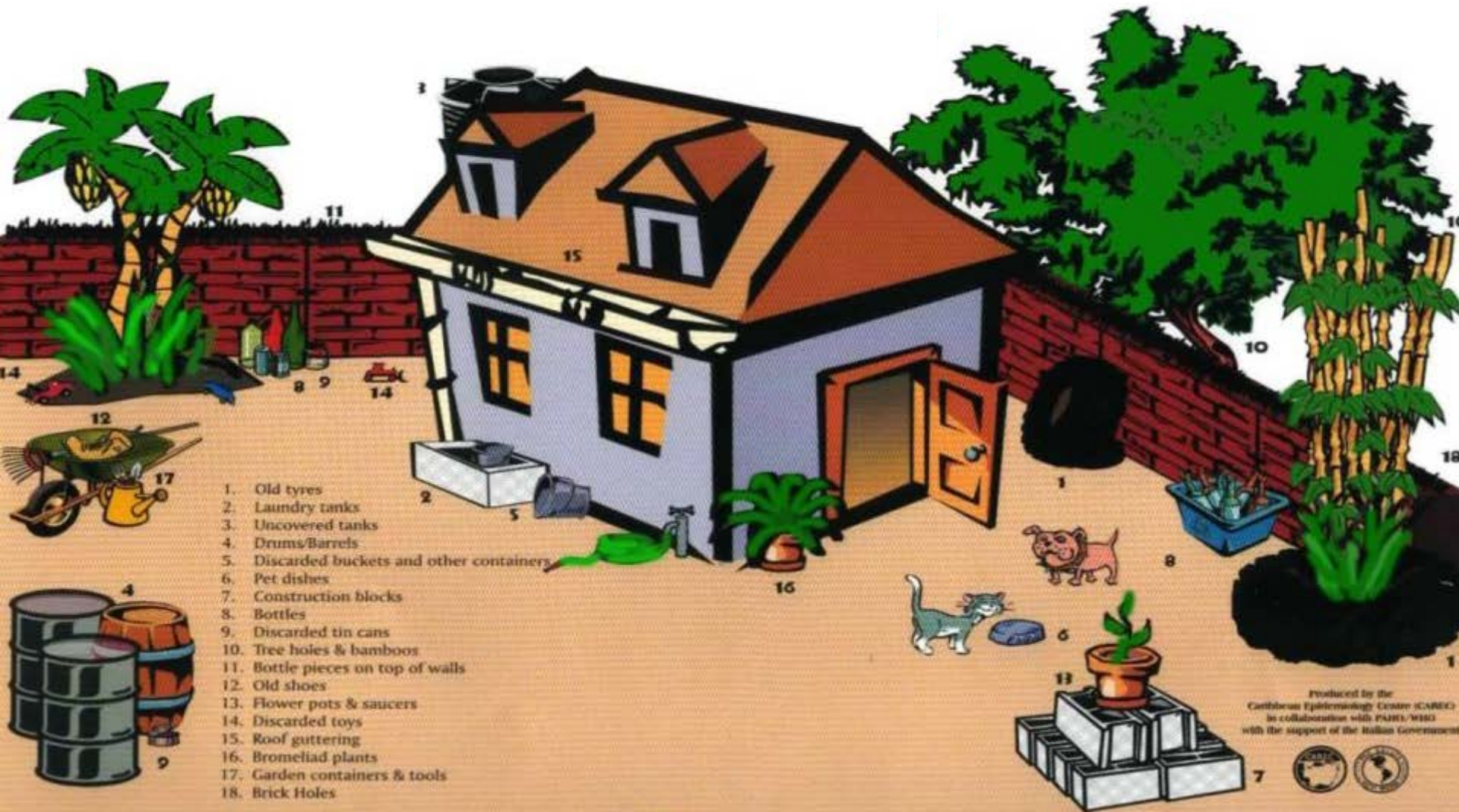
# Vaccination for Congenital Infections: Lessons from Rubella

- 1964-65 U.S. rubella epidemic
  - 11,000 miscarriages, 2,100 newborn deaths, 20,000 babies born with congenital rubella syndrome (CRS)
- CRS causes deafness, cataracts, heart defects, often microcephaly
- With MMR vaccine, CRS eliminated in U.S. in 2004



National Library of Medicine

# Prevent mosquitos breeding in and near your home and neighborhood





# References

- <http://costa-rica-guide.com/travel/health-safety/scientific-perspective-on-zika-virus/>
- [http://www.ecoca.ro/meteo/tutorial/climate/older/tropical\\_climate.html](http://www.ecoca.ro/meteo/tutorial/climate/older/tropical_climate.html)
- [www.everbridge.com/wp.../1The-Zika-Virus-An-Emergency-Management-Panel.pptx](http://www.everbridge.com/wp.../1The-Zika-Virus-An-Emergency-Management-Panel.pptx)
- <https://www.niaid.nih.gov/diseases-conditions/zika-virus>
- Interim CDC Zika Response Plan, October 2016
- [http://www.dallascounty.org/departments/hhs/documents/DCHHSEpiWNVWeeklyReport\\_10\\_29\\_2016.pdf](http://www.dallascounty.org/departments/hhs/documents/DCHHSEpiWNVWeeklyReport_10_29_2016.pdf)
- <http://www.who.int/csr/disease/zika/en/>
- <https://www.nih.gov/news-events/news-releases/nih-begins-testing-investigational-zika-vaccine-humans>
- <http://www.nytimes.com/2016/11/20/business/testing-the-limits-of-biotech-in-the-race-for-a-zika-vaccine.html>
- <http://dshs.texas.gov/news/releases/2016/20161222.aspx>
- <https://www.nih.gov/news-events/nih-research-matters/dna-vaccines-protect-monkeys-against-zika-virus>
- <https://www.texastribune.org/tribpedia/texas-mexico-border/>
- <https://damontucker.com/2016/12/28/zika-found-in-hawaii-years-before-caribbean-outbreak/>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5071320/pdf/fmicb-07-01667.pdf>