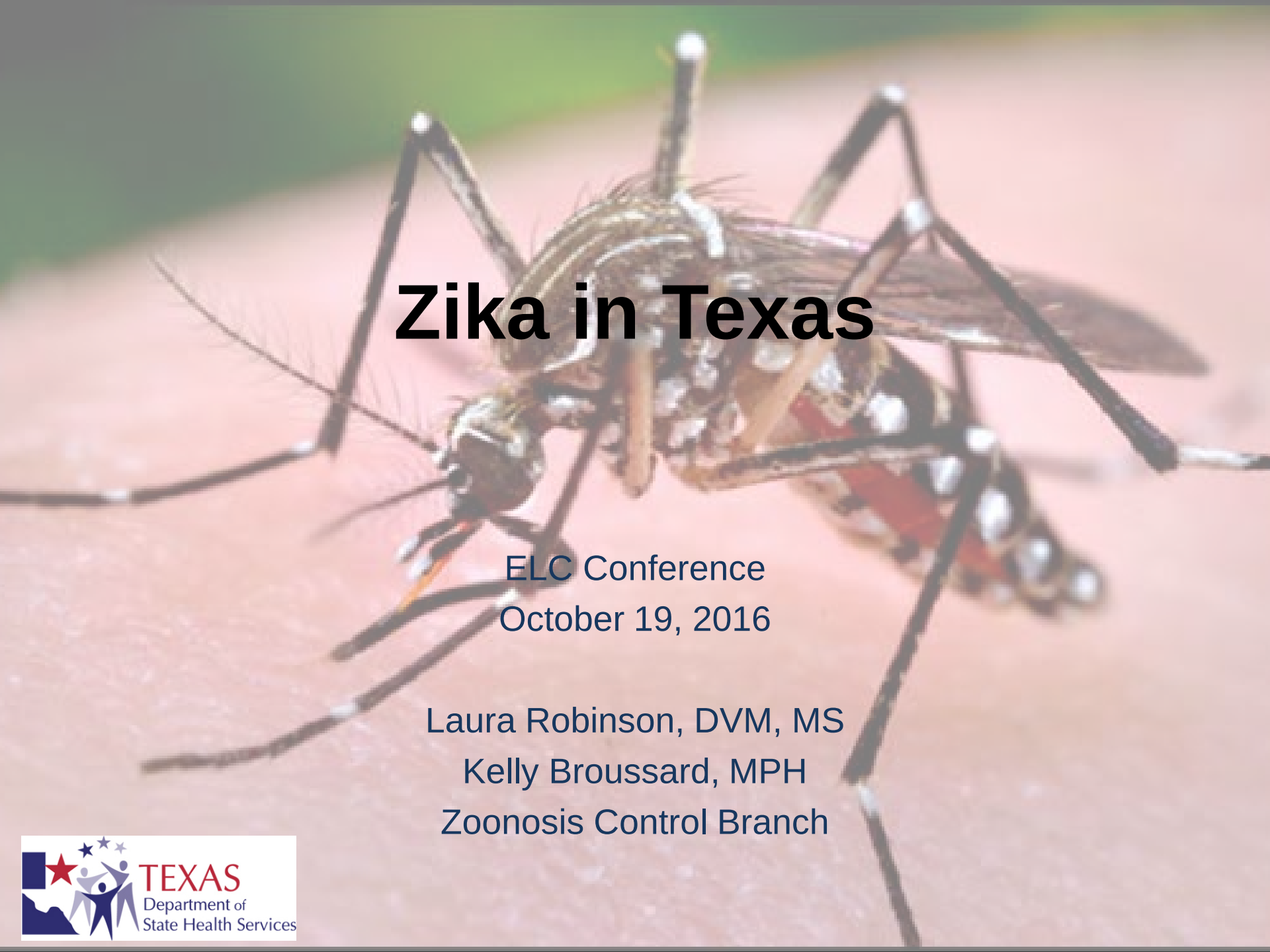


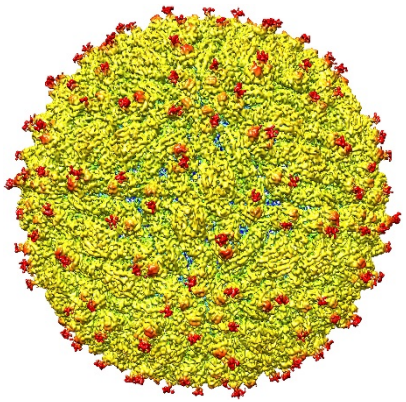
Zika in Texas

ELC Conference
October 19, 2016

Laura Robinson, DVM, MS
Kelly Broussard, MPH
Zoonosis Control Branch

TEXAS Department of State Health Services

Zika Virus



Source: https://news.uns.purdue.edu/images/2016/rossmann-zika.jpg

- Genus Flavivirus
  - Single-stranded RNA virus
  - 3 Lineages: 2 African and 1 Asian
- 1947 – First isolated in Zika forest (Uganda)
- Other Flaviviruses
  - West Nile virus
  - St. Louis Encephalitis virus
  - **Dengue virus**
  - Japanese Encephalitis virus
  - Yellow Fever virus

Zika Transmission

- **Vectorborne:** Zika virus transmitted via bite of an infected *Aedes* species mosquito (*Ae. aegypti* and *Ae. albopictus*)
  - Most likely vector is *Ae. aegypti*
  - Same mosquitoes spread dengue and chikungunya
  - **Viremic** individual → mosquito → next individual
  - Transmitted by mosquito but spread geographically by humans
- **Sexual:** Zika virus can be spread by men or women to their sexual partners before, during, and after symptoms are present or while asymptomatic
- **Congenital:** Zika virus can be passed from a pregnant woman to her baby during pregnancy or at delivery

Yellow fever mosquito *Aedes aegypti* Asian tiger mosquito *Aedes albopictus*

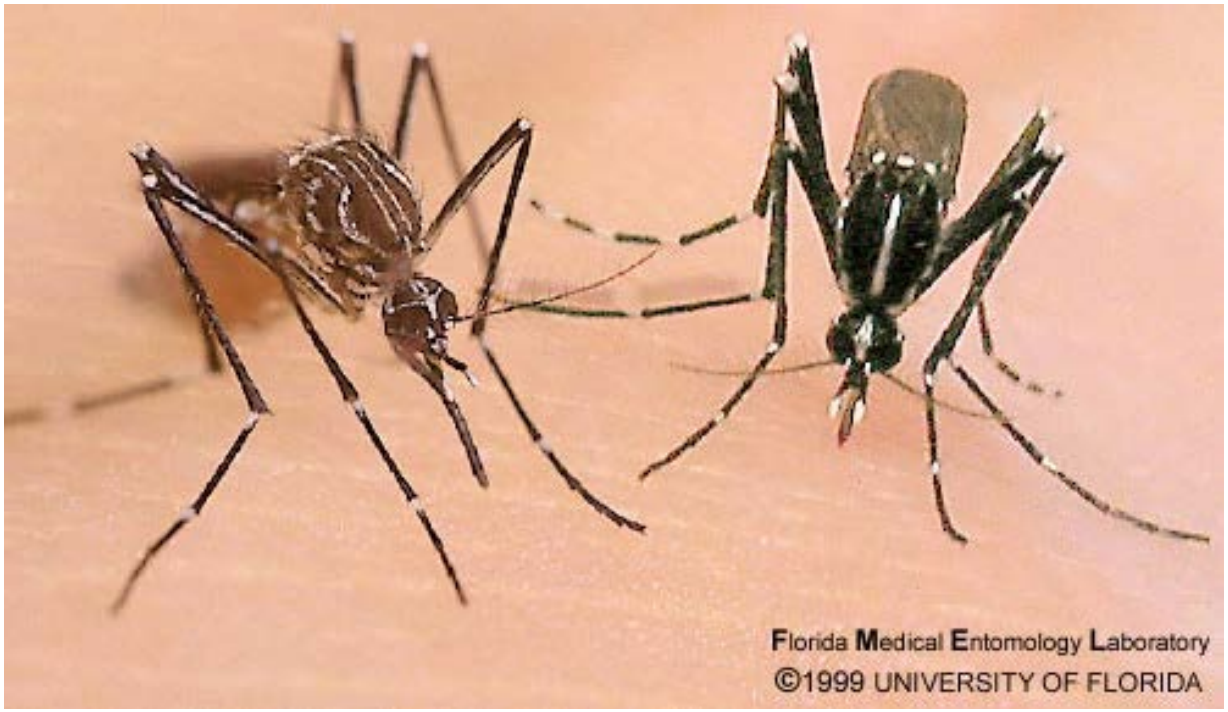
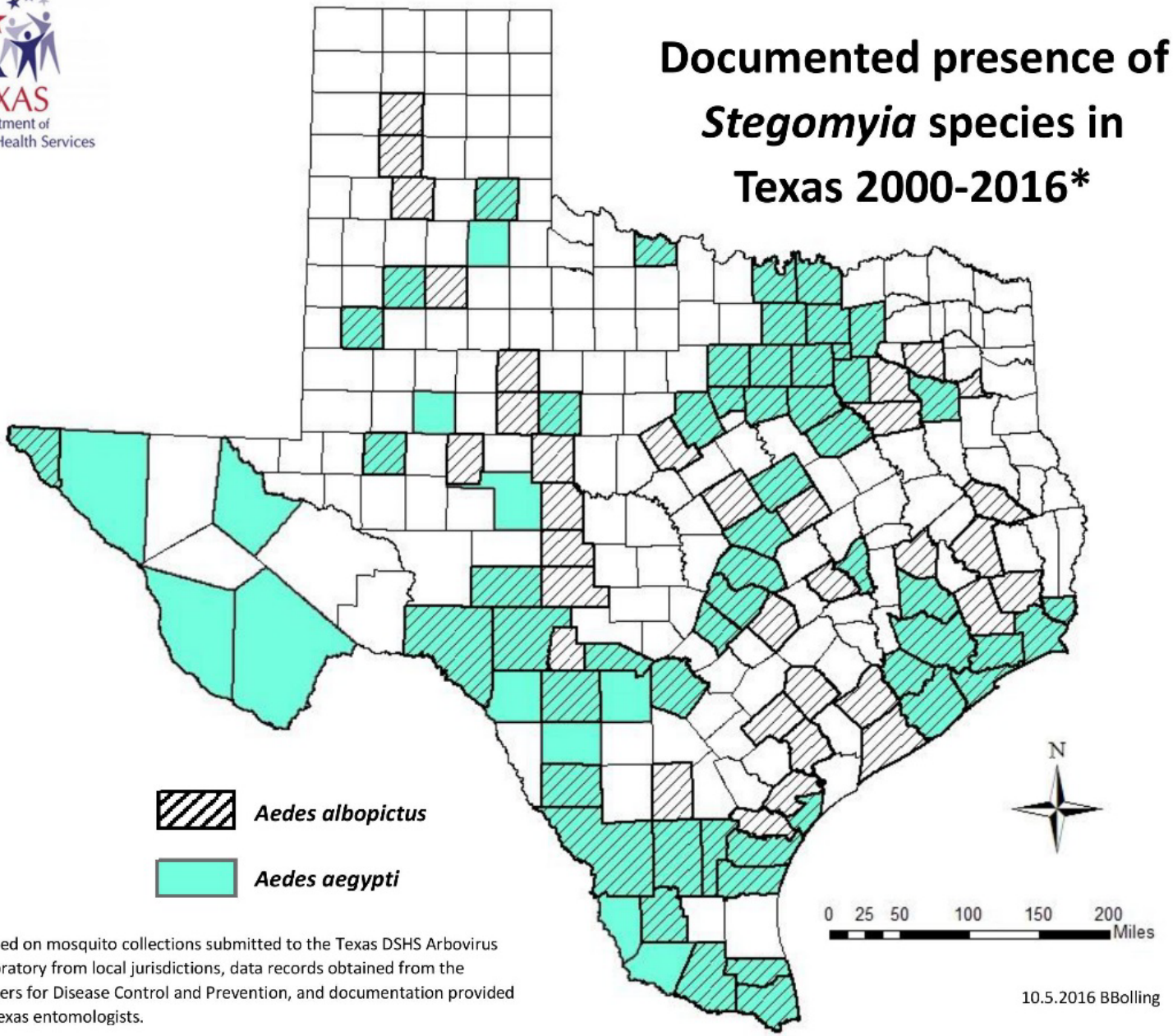


Photo from: http://fmel.ifas.ufl.edu/research/exotic.shtml

- Subgenus *Stegomyia*
- Both are invasive species that are firmly established
- Optimal activity periods for these species are usually 2 hours after sunrise and several hours before sunset, but can be active (and taking blood meals) anytime during the daylight hours
- Flight range is limited to approximately 150 meters from emergence
- *Ae. aegypti* females take blood meals from humans exclusively; *Ae. albopictus* has a broader host range
- Cavity breeders (in evolutionary past); use artificial, water-holding containers for oviposition
- Synathropophilic: close association with humans
- *Ae. aegypti* is the more efficient vector: multiple blood meals/gonotrophic cycle

TEXAS
Department of
State Health Services

Documented presence of *Stegomyia* species in Texas 2000-2016*



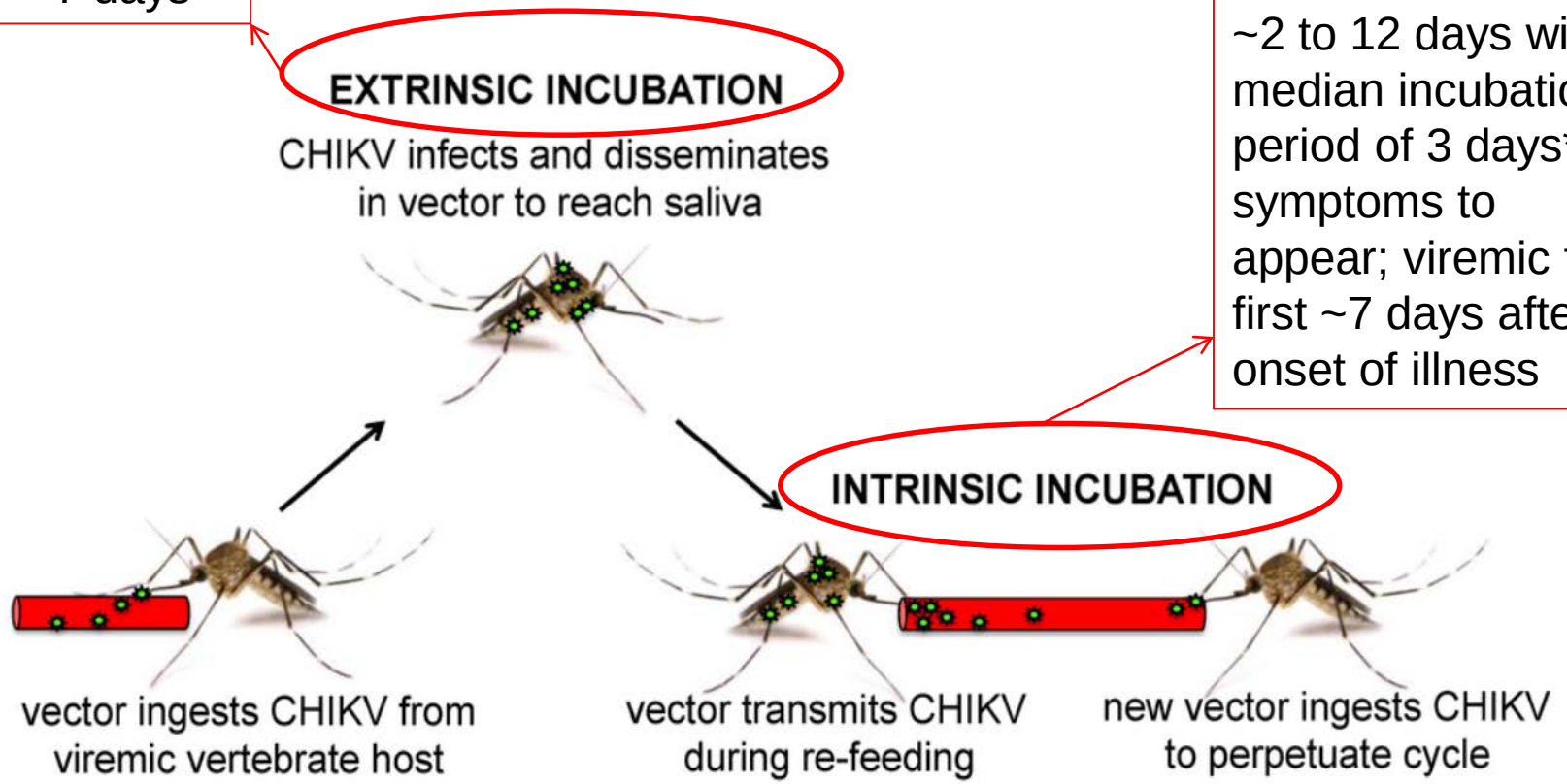
*Based on mosquito collections submitted to the Texas DSHS Arbovirus Laboratory from local jurisdictions, data records obtained from the Centers for Disease Control and Prevention, and documentation provided by Texas entomologists.

10.5.2016 BBolling

Extrinsic and Intrinsic Incubation:

Chikungunya Example

~5 – 7 days**



From: Coffey et al. (2014) Viruses, 6(11), 4628-4663; doi:10.3390/v6114628

* Rudolph et al. (2014) Review Article: Incubation Periods of Mosquito-Borne Viral Infections: A Systematic Review. Am J. Trop. Med. Hyg 90(5): 882 – 891

** Dupont-Rouzeyrol et al. (2012) Chikungunya Virus and the Mosquito Vector *Aedes aegypti* in New Caledonia (South Pacific Region). 12(12): 1036 – 1041

** Vega-Rua et al. (2014) High Level of Vector Competence…, Journal of Virology. 88(11): 6294 – 6306

Zika Virus Infection and Disease

- Both infections and disease are reportable
  - Most Zika infections are asymptomatic (estimated 80%)
  - Symptoms are usually mild
    - Fever, maculopapular rash, joint pain, conjunctivitis; can last several days to a week
    - Rarely causes death or requires medical care
- Once a person has been infected, he or she is likely to be protected from future infections

Zika Virus Disease

- **Microcephaly and other fetal abnormalities**
  - When infection is passed to developing fetus in the womb, Zika can interrupt brain development
- **Guillain-Barré Syndrome (GBS)**
  - Very likely triggered by Zika virus in a small proportion of infections, much as it is after a variety of other infections
  - CDC is investigating a possible link between Zika and GBS

Zika and Pregnancy

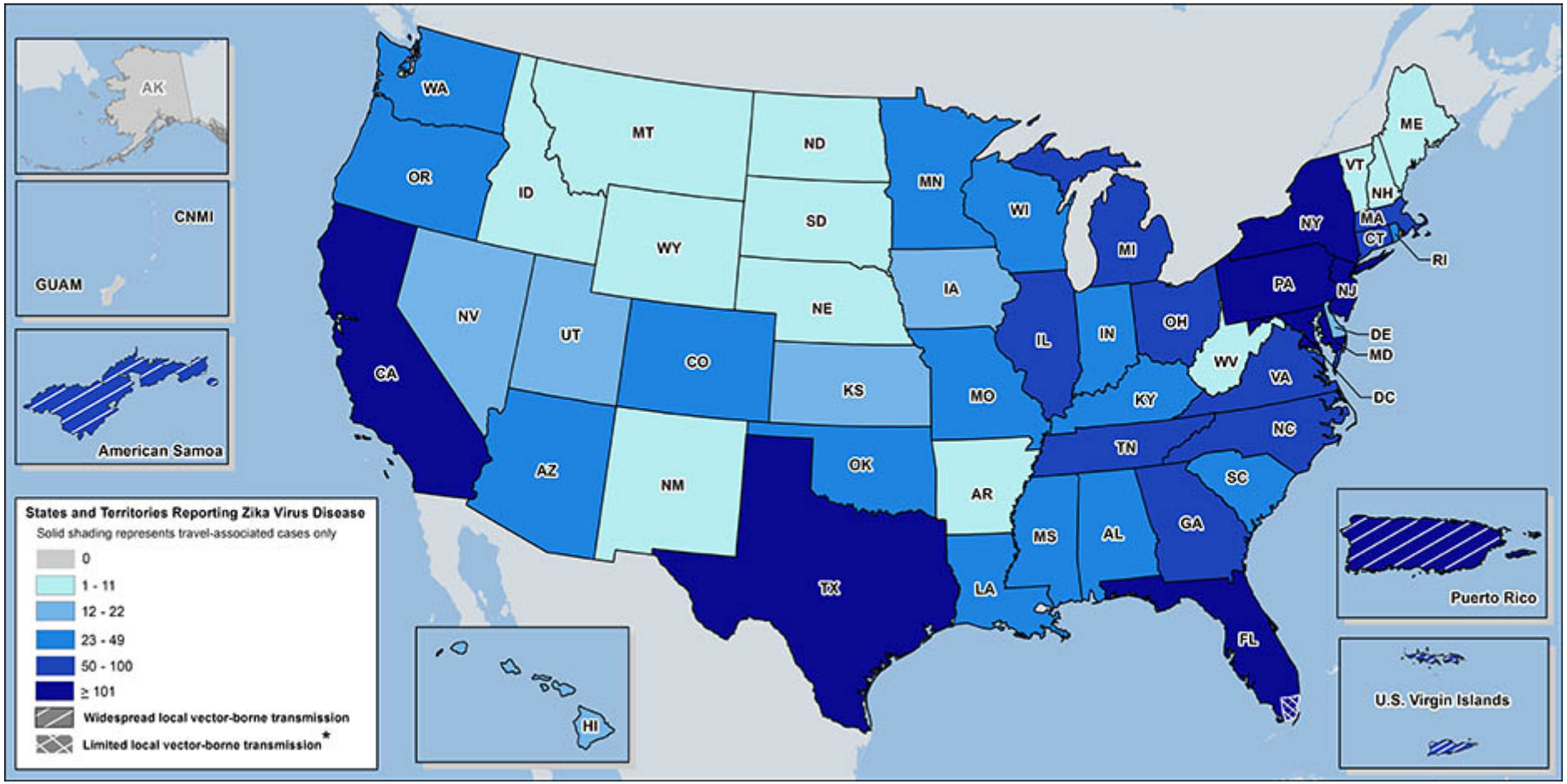
- Infection can occur in any trimester
- Definite causal link between Zika and microcephaly
- Risks of infection difficult to define
  - The timing of infection may have differing impact on the pregnancy
  - Not all pregnant women who are infected with Zika have adverse birth outcomes
  - Percent of infants born with microcephaly to a woman infected with Zika virus during the first trimester of pregnancy is estimated to be between 1% and 13%

Countries and Territories with Active Zika Virus Transmission as of October 17, 2016

http://www.cdc.gov/zika/geo/active-countries.html accessed 10/17/2016

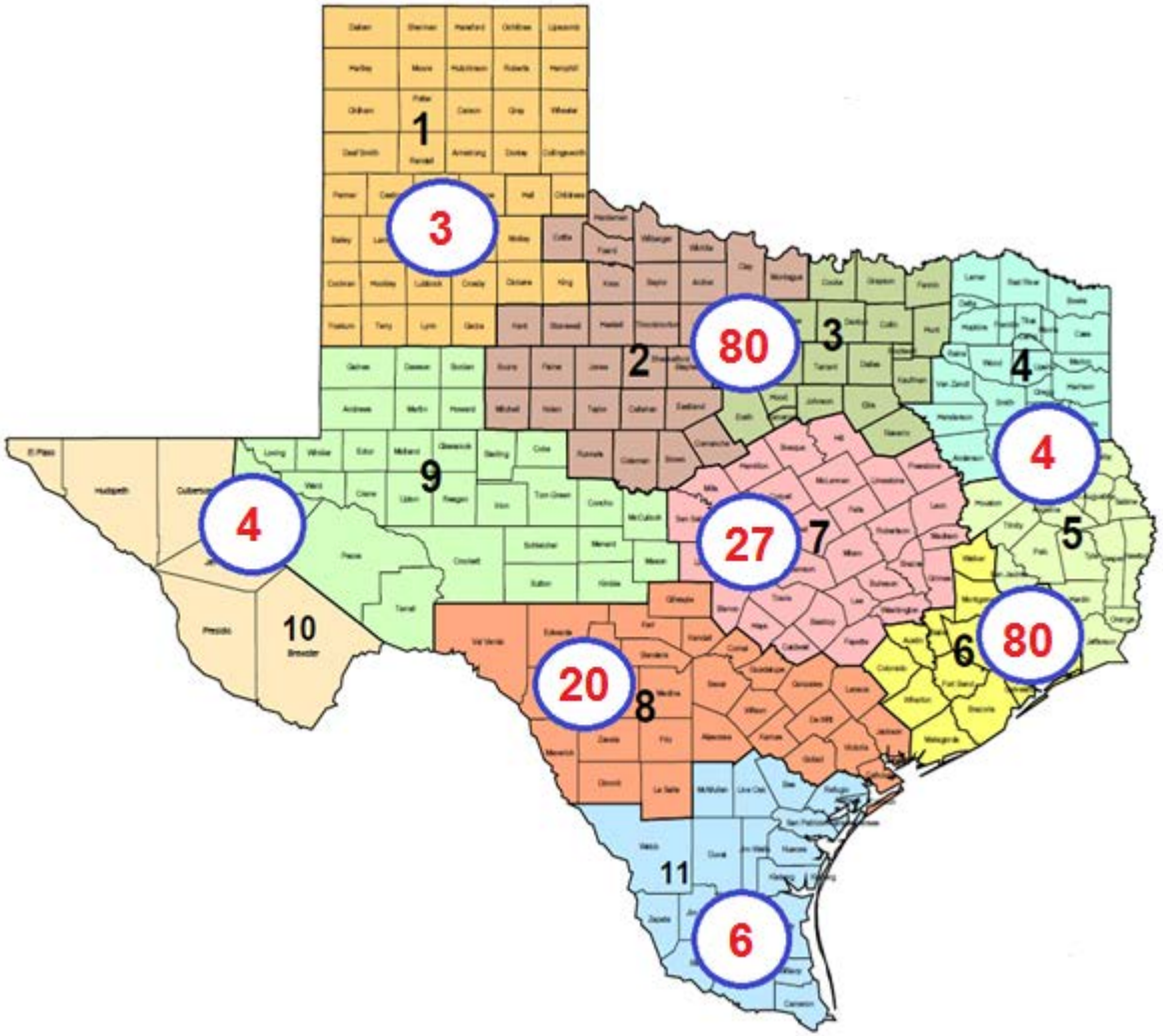
Zika Cases in U.S.

Travel-Associated 3,807; Sexual Transmission 32;
Mosquito-Transmission 128; Guillain-Barré syndrome 13
(as of Oct 12, 2016 – not inclusive of U.S. Territories)



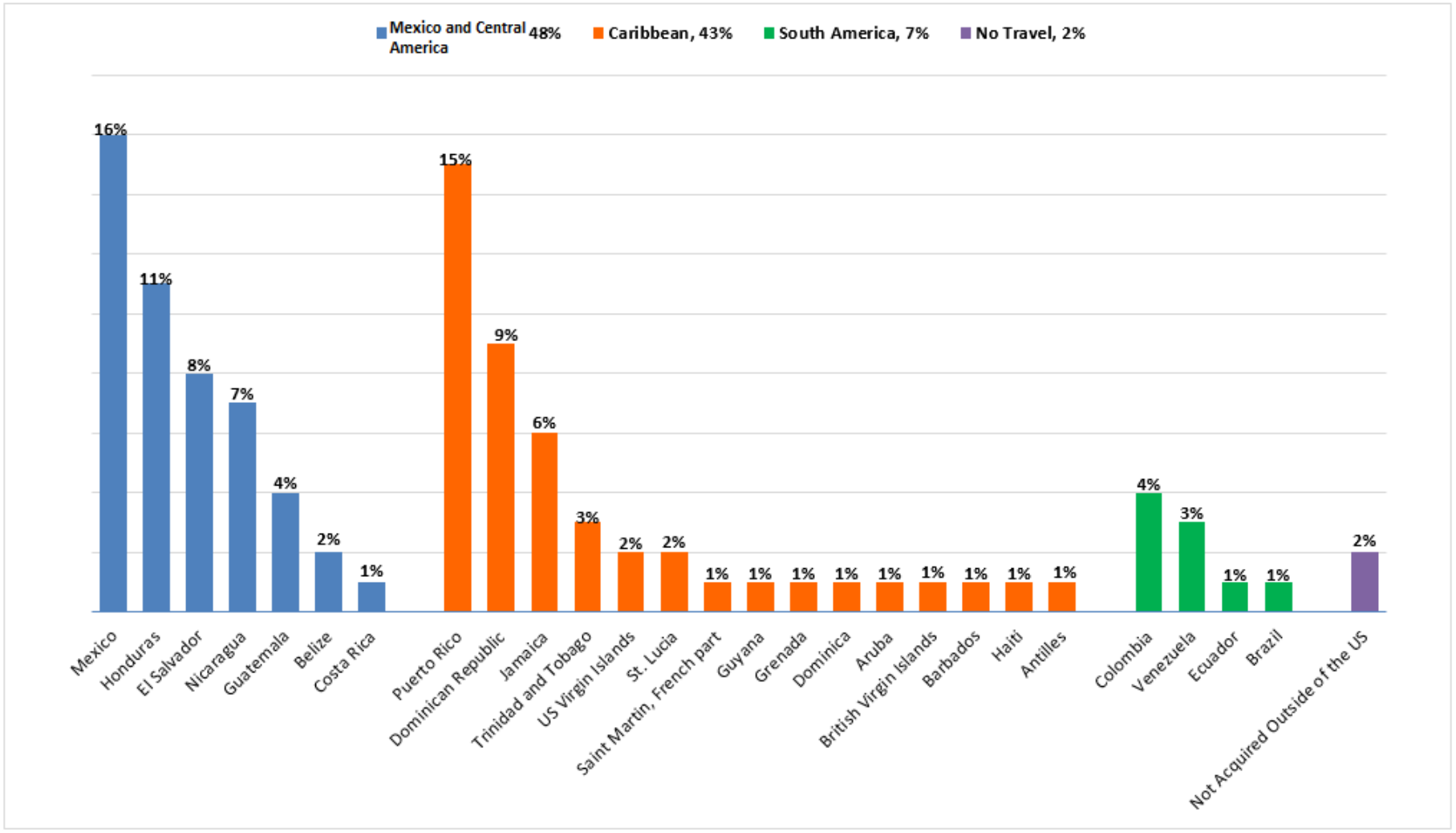
http://www.cdc.gov/zika/geo/united-states.html accessed 10/17/2016

Reported Zika Disease Cases by HSR, 2015-2016*



*as of 10/5/2016

Reported Cases of Zika** by Region and Country of Travel, Texas 2015 – 2016*



*as of 10/5/2016

**includes Zika disease cases only

Reported Arbovirus Cases by Region of Travel, 2015-2016*

Region	Chikungunya	Dengue	Zika**	Total
Africa	1	0	0	1
Asia/Pacific	11	28	0	39
Caribbean	2	13	100	115
Central America	44	20	104	168
South America	5	4	16	25
US, Florida	0	0	2	2
US, Texas	1	0	0	1
Sexual Transmission	0	0	2	2

*as of 10/5/2016
**includes Zika disease cases only

Reported Symptoms among Arbovirus Cases in Texas, 2015-2016*

Symptoms	Chikungunya	Dengue	Zika**	West Nile
Fever	100%	100%	70%	94%
Headache	58%	78%	56%	72%
Arthralgia	89%	55%	70%	30%
Conjunctivitis	<1%	<1%	37%	0%
Rash	72%	66%	93%	27%
Myalgia	61%	52%	47%	44%
Nausea/Vomiting	34%	43%	16%	62%
Neurological	0%	0%	0%	69%

*as of 10/5/2016
**includes Zika disease cases only

Zika Testing: Who is Eligible in Texas?

Zika risk category		
Symptomatic (Major symptoms are **fever, rash, conjunctivitis,** or **arthralgia**; additional compatible symptoms include headache and myalgia)	One or more of the four major symptoms	Onset during or within 2 weeks of **travel to area of active transmission**
		Onset within 2 weeks of **sexual exposure** to a partner with possible Zika exposure
	Rash and at least one other of the other three major symptoms	No travel or sexual exposure, but a known **epidemiologic link** to a viremic Zika or unspecified flavivirus case (residence in same area, etc.)
	Two or more of the four major symptoms	No travel, sexual exposure, or epidemiologic links but is a **pregnant female** residing in Cameron, Hidalgo, Starr, Webb, Willacy, or Zapata counties
	Three or more of the four major symptoms	No travel, sexual exposure, or epidemiologic links

Zika Testing: Who is Eligible in Texas?

Zika risk category	
Asymptomatic (or not clinically compatible with Zika)	**Pregnant female‡** with no travel to an area of active transmission who had **sexual exposure** to a partner with possible Zika exposure
	Pregnant female‡ with **travel** to an area of active transmission
Infant whose mother had **Zika exposure during pregnancy**	Evidence of **Zika-associated abnormalities** (including but not limited to microcephaly, intracranial calcifications, and ventriculomegaly) or adverse birth outcome (fetal loss, miscarriage)
	No evidence of Zika-associated abnormalities, but **mother has laboratory evidence of Zika virus infection**

‡Also include women who were not pregnant during travel or sexual exposure but became pregnant within 8 weeks of exposure (within 6 weeks of last menstrual period)

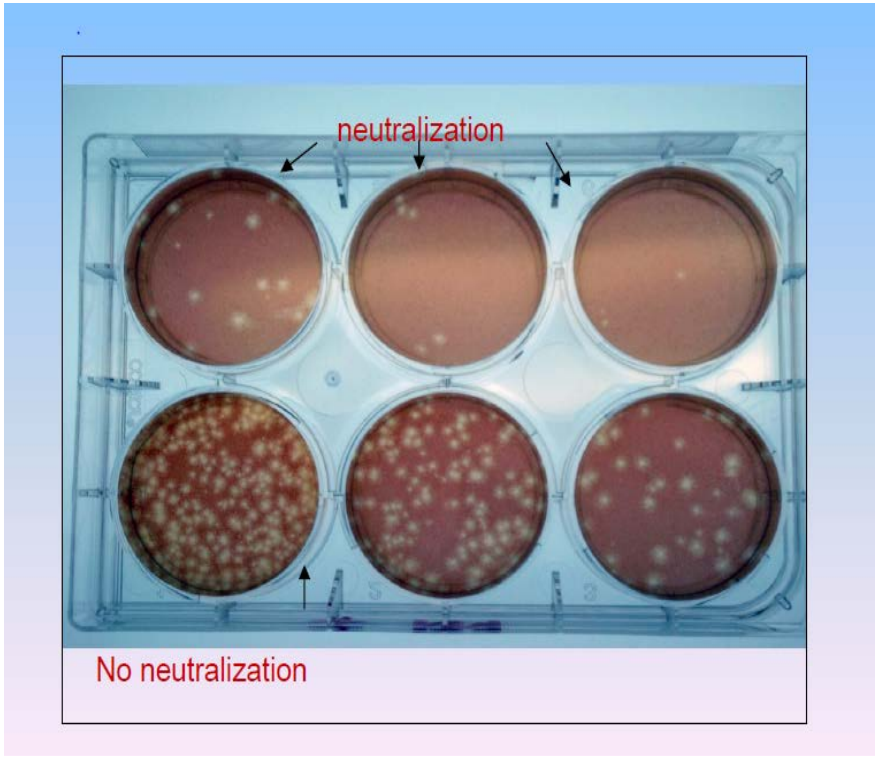
Note: Testing of asymptomatic males or asymptomatic, non-pregnant women for the purpose of pregnancy planning after a possible Zika exposure is not recommended at this time, per CDC guidance

Zika Diagnostics

- Reverse Transcriptase-Polymerase Chain Reaction (RT-PCR)
  - Determines if RNA is present in the specimen
  - Indicates that the patient is viremic
- Zika-specific IgM EIA
  - Presence of IgM antibody suggests recent infection has resulted in the production of antibodies
  - False positive IgM results common with Zika and dengue due to cross-reactivity
- Plaque-Reduction Neutralization Test (PRNT)
  - Necessary to interpret non-negative IgM results

Plaque-Reduction Neutralization Test (PRNT)

- Requires mixing the patient's serum with live virus to determine how effective it is at neutralizing the virus
- Measures <u>total</u> neutralizing antibody rather than IgM specifically
- Cross-reactivity issues with similar viruses
  - Zika, dengue, WNV



Source:
http://www1.paho.org/hq/dmdocuments/2010/p4.lanciottiCHIK%20PAHO%20mtg%20Peru%202010_1_1.pdf

Arbovirus Testing Availability

Arbovirus	DSHS	CDC Fort Collins[1]	CDC Dengue Branch[1]	Commercial Lab
Chikungunya (CHIK)				
*PCR**	Yes[2]	Yes	Yes (last resort)	Yes, Focus Diagnostics
IgM/IgG	No	Yes	Yes (last resort)	Yes, Focus Diagnostics and ARUP
PRNT	No	Yes	Yes (last resort)	No
Dengue (DEN)				
*PCR**	Yes[2]	No	Yes	Yes, Focus Diagnostics
NS1	No	No	Yes	Yes, Mayo Medical Lab and Focus Diagnostics
IgM/IgG	Yes[2]	Yes	Yes	Yes, Viracor-IBT, Focus Diagnostics, Mayo and ARUP
PRNT	No	Yes	Yes	No
Eastern/Western Equine Encephalitis				
PCR	No	Yes	No	No
IgM/IgG	No	Yes	No	Yes**, most commercial labs
PRNT	No	Yes	No	No
Japanese Encephalitis	No	Yes	No	Yes, ARUP
St. Louis Encephalitis (SLE)				
PCR	No	Yes	No	No
IgM/IgG	Yes[2]	Yes	No	Yes**, most commercial labs
PRNT	No	Yes	No	No
West Nile (WN)				
PCR	No	Yes	No	Yes, most commercial labs
IgM/IgG	Yes[2]	Yes	No	Yes, most commercial labs
PRNT	No	Yes	No	No
Yellow Fever	No	Yes	No	No
Zika				
PCR*	**Yes[2]**	**Yes**	**Yes (last resort)**	**Yes, CPL, Focus Diagnostics (Quest) and LabCorp**
IgM/IgG*	**Yes[2]**	**Yes**	**Yes (last resort)**	**Yes, Focus Diagnostics (Quest), Viracor-IBT, Mayo and LabCorp**
PRNT	**No**	**Yes**	**Yes (last resort)**	**No**

***May also be performed at select LRNs, military bases and hospitals (contact your local LRN, military base or hospital for information on which tests are being performed).**

**Arbovirus testing for SLE, Western/Eastern equine encephalitis included in a panel at Focus Diagnostics.

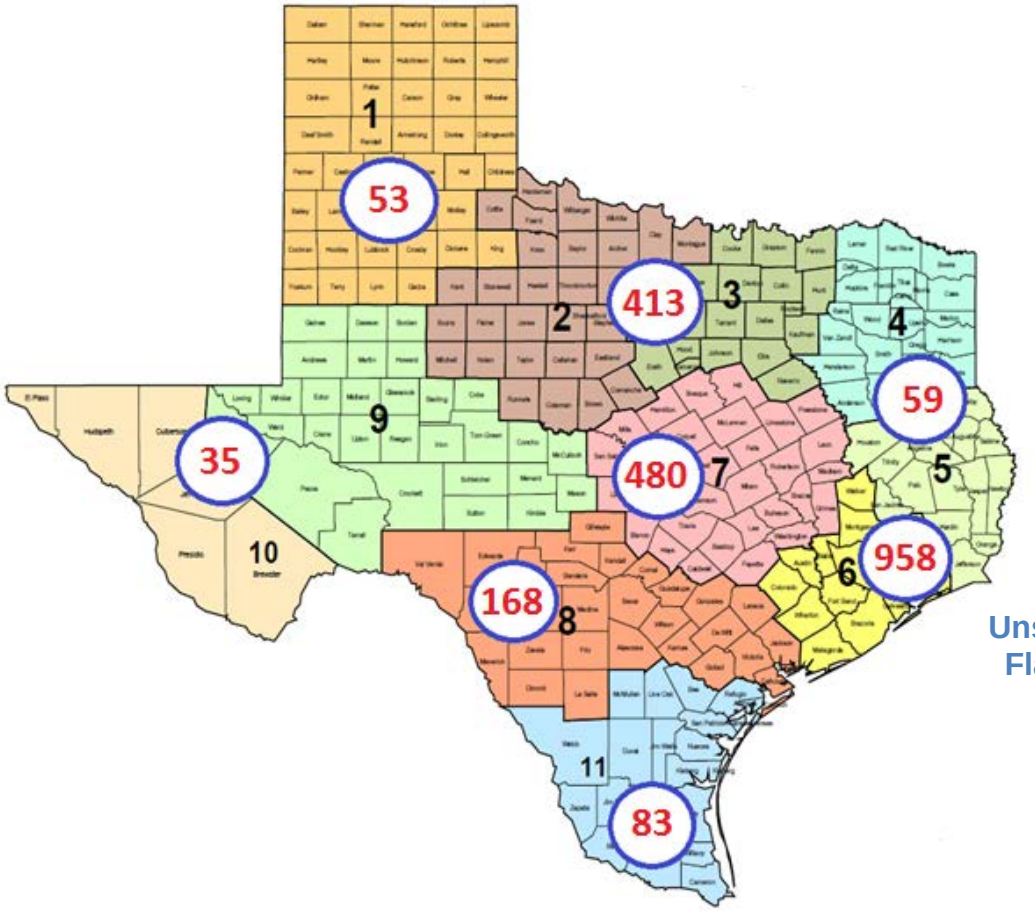
[1]Samples that require CDC testing should be sent through DSHS.

[2]Use G2-V form to indicate CHIK, ZIKA and DEN PCR and IgM are being requested. Use G2-A form to indicate DSHS Arbovirus panel (SLE/WNV) is being requested.

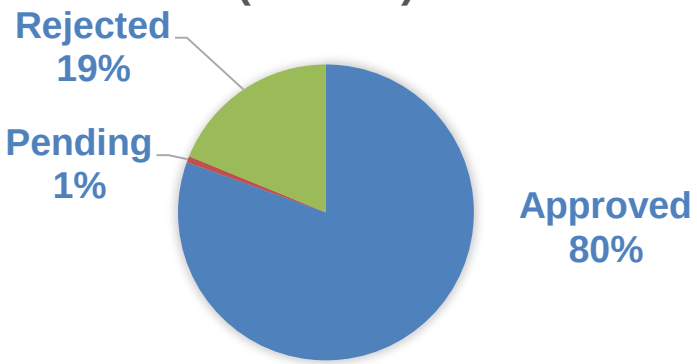
Laboratory Response Network

DSHS Laboratory Testing

APPROVED SPECIMENS BY REGION (N=2249)

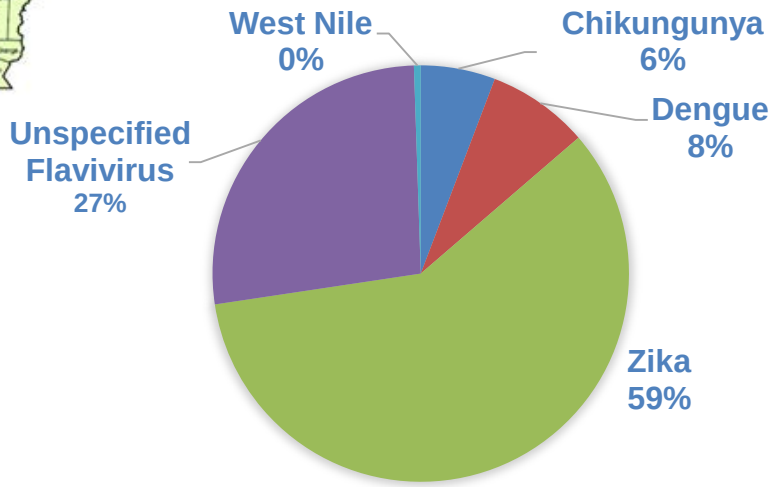


STATUS OF SPECIMENS RECEIVED (N=3095)



→ 80% of approved specimens have results – out of those, **1608 (71%) are negative!**

POSITIVE RESULTS BY VIRUS



(Numbers as of 10/5/16)

Message for Providers

- We rely on medical providers for accurate and timely disease recognition, testing, and reporting
  - Zika presents extra challenges as an emerging infectious disease
- Providers are asked to:
  - Stay on top of the latest information and CDC guidance
  - Talk to patients about travel, other exposure risks and whether testing is warranted
    - **Pregnant patients** and their partners need even more consultation about travel plans and the need to strictly follow sexual transmission prevention precautions
  - Quickly report suspect cases to the health department
  - Stay educated about how to collect, store and transport specimens for testing
    - Guidance at www.TexasZika.org

Arbovirus Investigation Expectations

- All arbovirus infections now reportable by state law
  - Cases should be reported to ZC within 30 days


TEXAS Department of State Health Services

Arboviral Case Investigation

☐ West Nile ☐ St. Louis
☐ Chikungunya ☐ Zika
☐ Other Arbovirus: _____

NBS Patient ID: _____

PLEASE PRINT LEGIBLY

- Arbovirus investigations should include:
  - Assessment of patient's geographic area of risk for exposure
  - Assessment of alternate routes of exposure
    - Blood donors are reportable!
  - Identification of others in household with similar symptoms
    - Encourage evaluation and testing by provider
  - Education on mosquito avoidance
    - Stay indoors in screened and/or air-conditioned areas
    - Use of personal repellents
    - Mosquito reduction activities around home

2016 Texas Zika Case Definitions

- Zika Disease: lab and clinical criteria are met
  - Congenital
  - Non-congenital
- Zika Infection: lab criteria are met but clinical criteria are not met
  - Congenital
  - Non-congenital
- NEDSS adjustments underway to facilitate the use of the four condition codes
- Reclassification of 2016 cases underway, on a case-by-case basis, by DSHS ZCB

Clinical Evidence of Zika Disease

Zika Disease, Non-Congenital	Zika Disease, Congenital
• Clinically compatible illness that includes: – acute onset of **fever** (measured or reported), or – **rash**, or – **arthralgia**, or – **conjunctivitis** • **Complication of pregnancy** – fetal loss, or – fetus or neonate with congenital microcephaly, congenital intracranial calcification, other structural brain or eye abnormalities, or other congenital central nervous system-related abnormalities including defects such as clubfoot or multiple joint contractures • **Guillain-Barrė syndrome** or other neurologic manifestations	A neonate with one or more of the following not explained by another etiology: • congenital **microcephaly** • congenital intracranial calcification • other structural brain or eye abnormalities • other congenital central nervous system-related abnormalities including defects such as clubfoot or multiple joint contractures

Laboratory Confirmation of Zika Disease or Infection

Non-Congenital	Congenital
• **Detection of ZIKV** by culture, viral antigen or viral RNA in serum, CSF, tissue, or other specimen (i.e. amniotic fluid, urine, semen, saliva), OR • **Positive ZIKV IgM** antibody test in serum or CSF with positive ZIKV neutralizing antibody titers and negative neutralizing antibody titers against dengue or other flaviviruses endemic to the region where exposure occurred	• **Detection of ZIKV** by culture, viral antigen or viral RNA in fetal tissue, umbilical cord blood, or amniotic fluid; OR • **Detection of ZIKV** by culture, viral antigen or viral RNA in neonatal serum, CSF, or urine **collected within 2 days of birth**; OR • **Positive ZIKV IgM** antibody test in umbilical cord blood, neonatal serum or CSF collected within 2 days of birth with **positive ZIKV neutralizing antibody** titers and negative neutralizing antibody titers against dengue or other flaviviruses endemic to the region where exposure occurred.

Zika Disease: Case Status Determination

	Zika Disease, Non-Congenital	Zika Disease, Congenital
Confirmed	A clinically compatible individual with laboratory confirmation.	A clinically compatible neonate with laboratory confirmation.

Probable	A clinically compatible individual with an **epidemiologic link** AND laboratory evidence of recent ZIKV or flavivirus infection by:
	• **Positive ZIKV IgM** antibody test of serum or CSF with:
	  • **positive neutralizing antibody** titers against ZIKV and dengue or other flaviviruses endemic to the region where exposure occurred; OR
	  • **negative dengue virus IgM** antibody test and **no neutralizing antibody test** performed
		A clinically compatible neonate whose **mother has an epidemiologic link OR meets laboratory criteria** for recent ZIKV or flavivirus infection; **AND** the neonate has laboratory evidence of recent ZIKV or flavivirus infection by:
		• **Positive ZIKV IgM** antibody test of serum or CSF within 2 days of birth; **AND**
		  • **positive neutralizing antibody** titers against ZIKV and dengue or other flaviviruses endemic to the region where exposure occurred; **OR**
		  • **negative dengue virus IgM** antibody test and **no neutralizing antibody test** performed

Zika Infection: Case Status Determination

	Zika Infection, Non-Congenital	Zika Infection, Congenital
Confirmed	An individual who does not meet clinical criteria for non-congenital Zika disease, BUT who meets confirmatory laboratory criteria.	A neonate who does not meet clinical criteria for congenital Zika disease, BUT who meets confirmatory laboratory criteria.

Probable	Individual has an **epidemiologic link** AND laboratory evidence of recent ZIKV or flavivirus infection by:
	• Positive ZIKV IgM antibody test of serum or CSF with:
	  • positive neutralizing antibody titers against ZIKV and dengue or other flaviviruses endemic to the region where exposure occurred; **OR**
	  • negative dengue virus IgM antibody test and no neutralizing antibody test performed
		Neonate whose **mother** has either an **epidemiologic link OR meets laboratory criteria** for recent ZIKV or flavivirus infection; **AND** the neonate has laboratory evidence of recent ZIKV or flavivirus infection by:
		• Positive ZIKV IgM antibody test of serum or CSF within 2 days of birth; **AND**
		  • positive neutralizing antibody titers against ZIKV and dengue or other flaviviruses endemic to the region where exposure occurred; **OR**
		  • negative dengue virus IgM antibody test and no neutralizing antibody test performed

Zika Pregnancy Registry
Texas 2015-2016

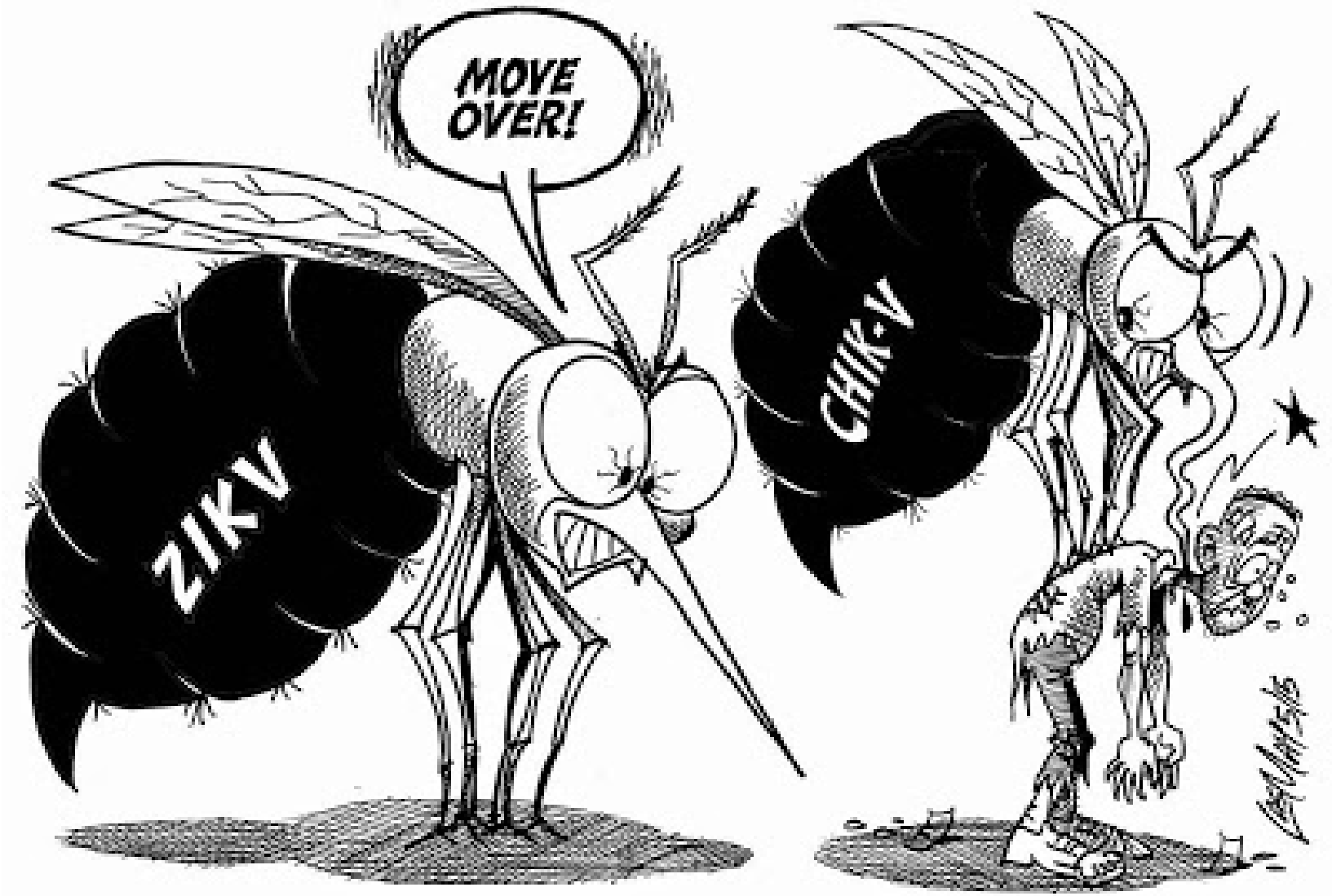
- DSHS participation
  - **Zoonosis Control Branch**
    - Send all data available for eligible women and neonates
    - As of 10/12/2016, 79 individuals enrolled for Texas
  - **Birth Defects Epidemiology and Surveillance Branch**
    - Conduct rapid ascertainment of cases of microcephaly
    - Based upon funding, may conduct follow up data collection for CDC
- Local Health Departments
  - Each will decide whether they will conduct follow up data collection for CDC

Acknowledgements & Further Resources

- Thank you!
  - Nicole Evert, ZCB Epidemiologist
  - Regional Zoonosis Control program staff
  - Local health department epidemiologists

- Web resources for continuous updates
  - CDC: http://www.cdc.gov/zika/index.html
  - PAHO: http://www.paho.org/hq/
  - DSHS: http://www.texaszika.org/

Questions?



Source: http://mythoughtsontechnologyandjamaica.blogspot.com/2015/05/Zika-Virus-Jamaica-Zero-MOH-Preparedness-Chikungunya-Mosquito-Repellant-Vitami