Zika Virus Disease (Zika)

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(with updated case counts)

Zika Virus

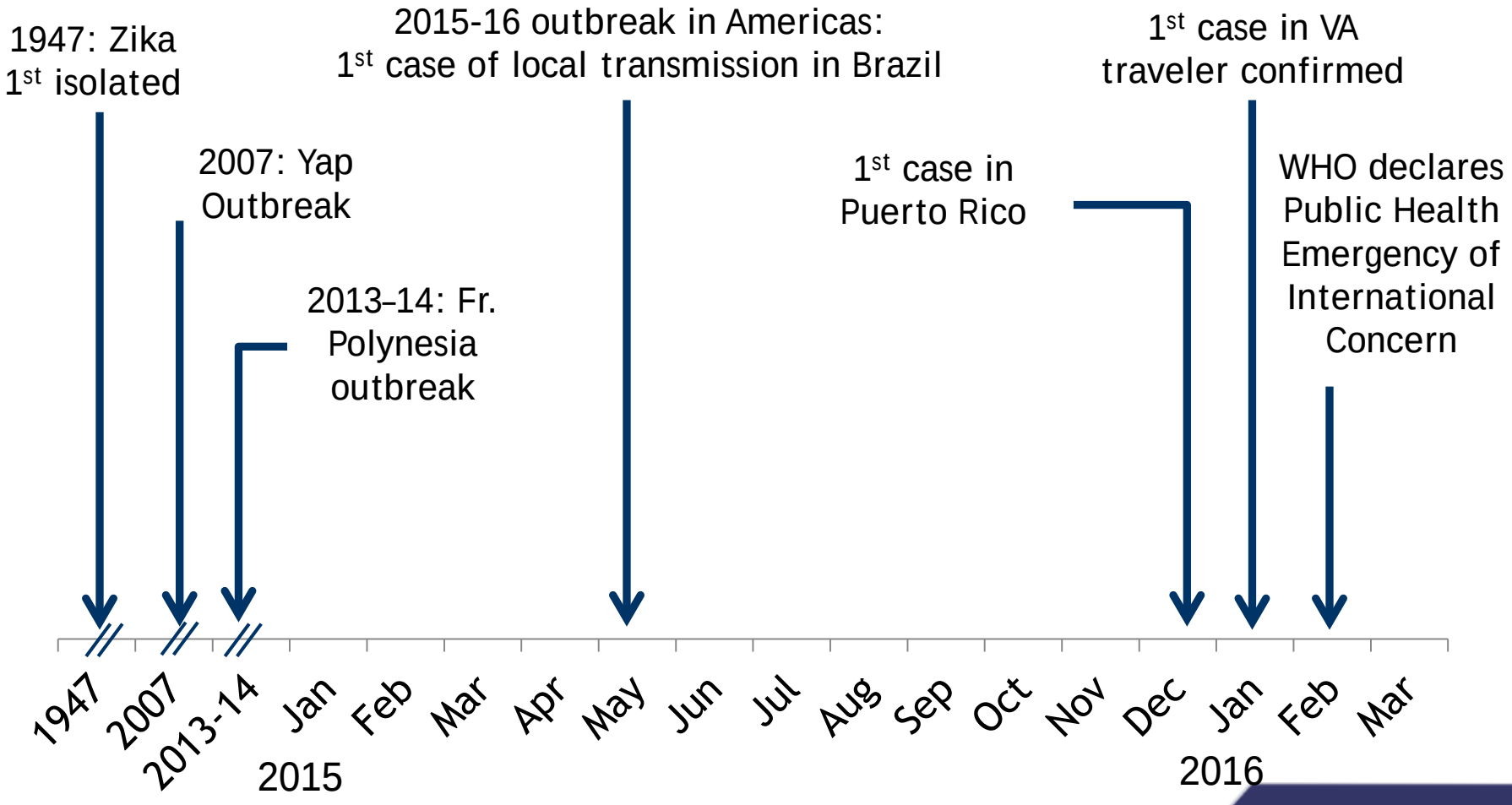
Virus belonging to *Flaviviridae* family, genus Flavivirus

- **Other members include Yellow fever, Japanese encephalitis and West Nile viruses**

Spread to people primarily through bite of infected *Aedes* species mosquitoes

- **Mosquitoes become infected by feeding on infected persons**

Timeline of Major Zika Events



Zika Virus

1st isolated in 1947 in rhesus monkey in Zika Forest in Uganda

- **Isolated in humans in Nigeria in 1954**
- **Sporadic cases throughout Africa and Asia until 2007**
- **2007 outbreak on Yap Islands**
- **2013-2014 outbreak in French Polynesia**

Zika Virus Disease

Spread to people primarily through bite of infected mosquitoes (*Aedes* species in Stegomia group)

1 of 5 infected persons get sick

- Fever, rash, joint pain and conjunctivitis are most common symptoms – usually a mild illness
- Illness lasts several days to 1 week

4 of 5 infected persons do not get sick

No vaccine or medications to prevent or treat

2015–2016 Outbreak in Americas

1st local transmission of Zika virus confirmed in Brazil in May 2015

- **Since then, outbreaks occurring in many countries**

As of Feb 24, 2016, no locally-acquired cases reported in continental US with current outbreak, but 107 travel associated cases have been confirmed

- **1st imported case in Virginia confirmed on Jan 26, 2016 (onset date 12/2/15)**
- **Number of cases among travelers visiting or returning to US will increase**

2015–2016 Outbreak in Americas

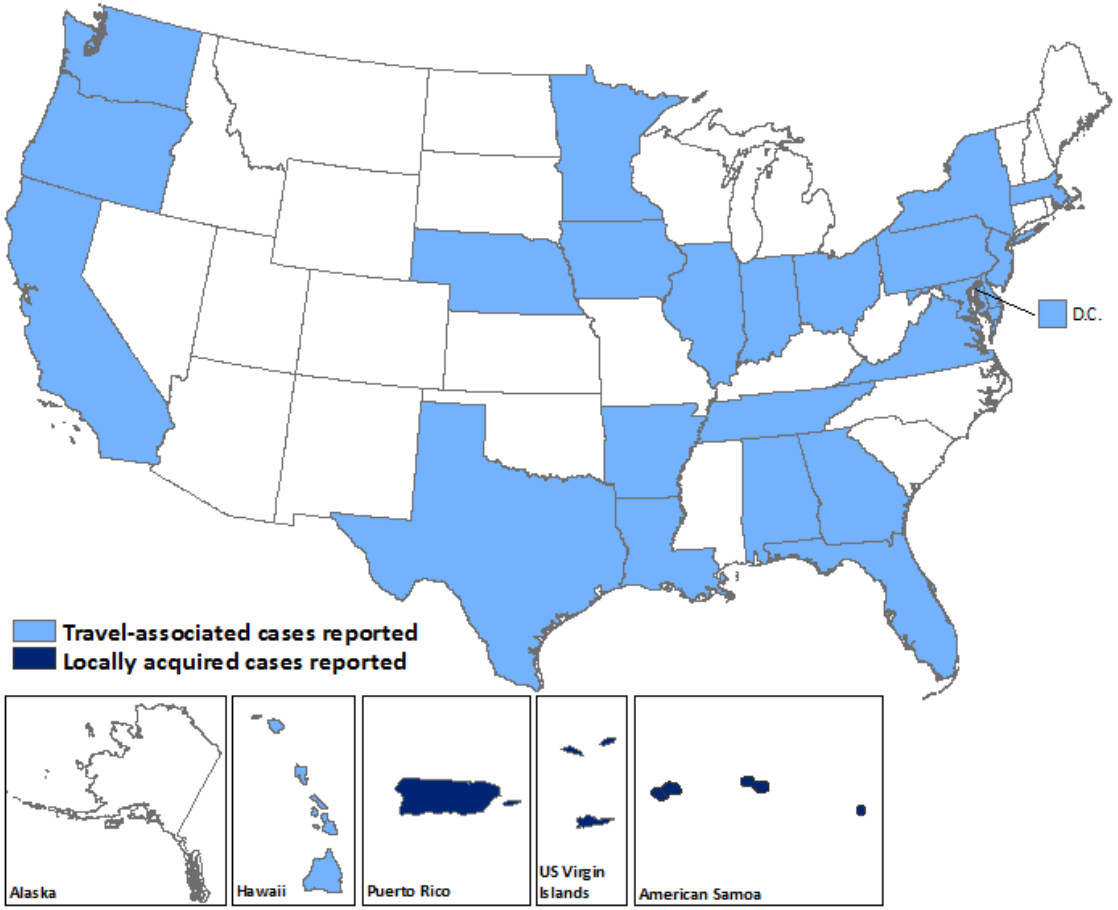
1st case of locally-spread Zika virus in Brazil confirmed in May 2015 and subsequent outbreaks in many countries

Further spread to other areas with competent *Aedes* vectors is likely

Number of cases among travelers visiting or returning to US will increase

Source: PAHO (as of Feb 19, 2016):
http://www.paho.org/hq/index.php?option=com_content&view=article&id=11669&Itemid=41716&lang=en

Zika Virus Disease in US, 2015-2016



As of Feb 24, 2016, 107 cases reported to CDC's ArboNET from US states

Source: CDC (as of Feb 24, 2016): http://www.cdc.gov/zika/geo/united-states.html

Zika Virus Disease in Virginia, 2015-2016

As of February 24, 2016, Zika infection has been lab-confirmed in three(3) residents of Virginia associated with travel to a Zika-affected country

- **These people pose no risk to anyone else in Virginia**

Additional cases will be lab-confirmed as physicians evaluate ill returning travelers, consider Zika, and work with public health to obtain testing

Zika Virus Transmission

Primarily transmitted by mosquitoes

- **Mainly by *Aedes aegypti* (Yellow fever mosquito)**
- **Also by *Aedes albopictus* (Asian tiger mosquito)**
- **Both also transmit dengue and chikungunya viruses**

Mosquitoes become infected by feeding on infected persons

Zika virus remains in an infected person's blood for about 1 week

No animal reservoir is known to be involved in Zika transmission in the Americas

Zika Virus Transmission

Potentially, transmitted from mother to child:

- During pregnancy or at time of delivery

Potentially, transmitted by blood or sexual contact

- Spread through blood transfusion and sexual contact has been reported
- Some blood donation agencies have requested that recent travelers to Zika-affected areas defer donating blood
- Virus has been found to persist for several weeks in saliva and urine

Sexual Transmission of Zika Virus

- 1 case acquired through sexual transmission reported by public health officials in Dallas, Texas
- CDC continues to emphasize that primary mode of transmission is through bite of infected mosquito
- It is not known how long virus can remain in semen or if semen plays a role in transmission
- Until more known, if pregnant woman has male sex partner who traveled to affected area, then plan together to abstain from sex or use condoms correctly every time during sex for duration of pregnancy

Populations at Risk for Zika

Currently anyone living in or traveling to area with active transmission, including pregnant women

- **Persons who have not traveled to affected country are not currently thought to be at high risk**

Potential: Parts of US, including Virginia, have mosquitoes that could spread virus if they bite infected person

- **Risk of local transmission of Zika virus is currently low because it is not mosquito season**

Signs and Symptoms of Zika

Only 1 in 5 infected with Zika virus will develop symptoms

Symptoms usually develop a few days to a week after mosquito bite

Symptoms are generally mild, but can include fever, rash, joint pain, conjunctivitis

Zika virus remains in infected person's blood for ~ 1 week

Signs and Symptoms of Zika Reported during 2007 Outbreak on Yap Island*

Sign or Symptom	Number of patients (%)
Macular or papular rash	28 (90)
Fever†	20 (65)
Arthritis or arthralgia	20 (65)
Nonpurulent conjunctivitis	17 (55)
Myalgia	15 (48)
Headache	14 (45)
Retro-orbital pain	12 (39)
Edema	6 (19)
Vomiting	3 (10)

*Based on 31 cases from April – July 2007.Source: Duffy MR1, Chen TH, Hancock WT, et al. Zika virus outbreak on Yap Island, Federated States of Micronesia. 2009. NEJM. 360: 2536-43

†Cases of measured and subjective fever are included

Clinical Comparison of Zika with Chikungunya and Dengue*

Features	Zika	Chikungunya	Dengue
Rash	+++	++	+
Arthralgia	++	-	-
Conjunctivitis	++	-	-
Fever	++	+++	+++
Headache	+	++	++
Myalgia	+	+	++
Hemorrhage	-	-	++
Shock	-	-	+

Source: CDC COCA Call. Jan 26, 2016. Available at http://emergency.cdc.gov/coca/ppt/2016/01_26_16_zika.pdf

Zika Virus Diagnostic Testing

Testing currently available at CDC and few public health labs, but not commercial labs

- Expanding to more labs, including DCLS

Testing includes

- RT-PCR testing in serum collected ≤7 d after onset
- Serology for IgM and neutralizing antibodies in serum collected ≥4 d after onset
- Plaque reduction neutralization test (PRNT) for ≥4-fold rise in virus-specific antibodies in paired sera
- Immunohistochemical (IHC) staining for viral antigens or RT-PCR on fixed tissue

Serology Cross-Reactions with Other Flaviviruses

IgM testing can produce false-positives due to cross-reactions with antibodies against related flaviviruses (e.g., yellow fever, dengue and West Nile virus)

Difficult to differentiate between those currently infected and those recently vaccinated against related flaviviruses (e.g., vaccines for yellow fever or Japanese encephalitis viruses)

Neutralizing antibody tests may discriminate between cross-reacting antibodies and current infections

Differential Diagnosis

- Dengue
- Chikungunya
- Malaria
- Rickettsia
- Measles
- Leptospirosis
- Rubella
- Group A streptococcus
- Parvovirus
- Enterovirus

Infection Control for Zika

Patient care: Standard precautions

Lab safety: Zika is classified BSL-2, which means those handling Zika samples should follow all standard precautions, including:

- **Lab personnel have special training on this virus specifically**
- **All procedures are conducted with appropriate safety equipment**
- **Access to the laboratory is restricted during testing**

Treatment for Zika

No specific vaccine to prevent or specific medicine to treat

Supportive treatment includes these recommendations:

- **Get plenty of rest**
- **Drink fluids to prevent dehydration**
- **Take medicine, such as acetaminophen, to reduce fever and pain**
- **Do not take aspirin or other non-steroidal anti-inflammatory drugs**

Infected persons should stay indoors or wear protective clothing and mosquito repellent during 1st week of illness to prevent local transmission

Special Concerns for Pregnant Women and Zika

Zika virus can spread from pregnant woman to fetus

There have been reports of microcephaly (smaller than normal head size) and other poor pregnancy outcomes in babies of mothers who were infected with Zika virus while pregnant

Link between Zika and these outcomes is not understood, but is under investigation

Special Concerns for Pregnant Women and Zika

Until link between Zika and poor pregnancy outcomes is better understood, CDC advises that pregnant women avoid travel to Zika-affected countries

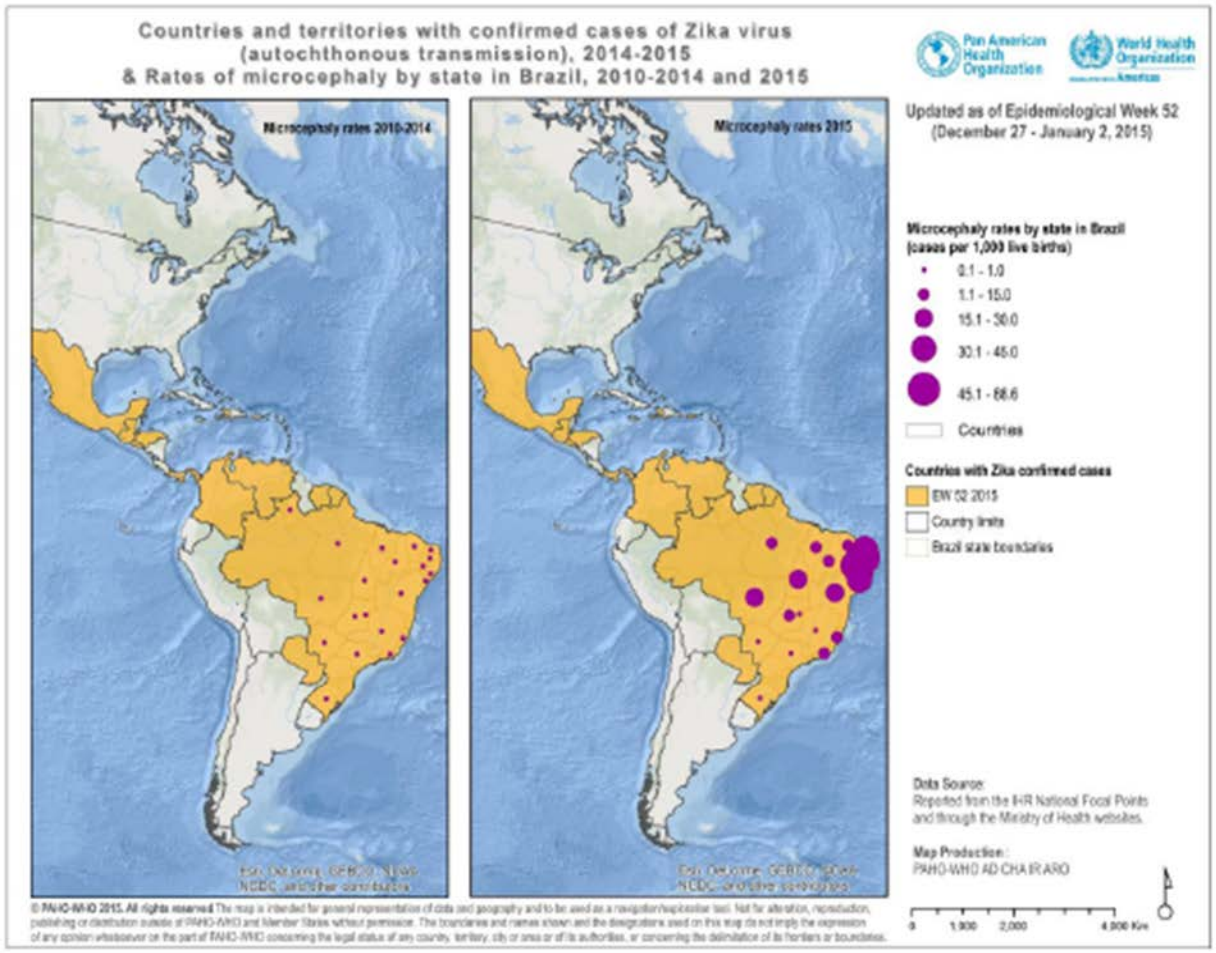
- If travel unavoidable, protect against mosquito bites

Testing is available for pregnant women who traveled to affected area at any time during pregnancy

If pregnant woman has male sex partner who traveled to affected area, then abstain from sex or use condoms correctly every time during sex for duration of pregnancy

No evidence that Zika virus affects future pregnancies if fetus conceived after Zika infection leaves body

Rates of Zika and Microcephaly in the Americas



Microcephaly and Zika

- Defined by having a smaller than normal head or brain circumference
- Prognosis varies depending on severity of microcephaly
- Brazil reporting increase in number of babies with microcephaly and some have had lab-confirmed Zika


AP Photo/Felipe Dana

- Association between Zika and microcephaly is under investigation

Guillain-Barré Syndrome (GBS) and Zika

- GBS is rare disorder where person's own immune system damages nerve cells, causing muscle weakness and sometimes paralysis
- Symptoms can last a few weeks or several months
- Most people fully recover, but some have permanent damage and, in rare cases, have died
- It is unknown if Zika causes GBS, but this is under investigation
- Brazil and other countries are reporting increased number of GBS cases

Zika Prevention Strategies: Travel for Pregnant Women

On January 15, 2016 CDC issued travel alert for people traveling to regions where transmission is ongoing

Until more is known, CDC recommends special precautions for pregnant women and women trying to become pregnant

- **Pregnant women consider postponing travel to Zika-affected area**
- **Women trying to become pregnant should consult with HCP before traveling to Zika-affected area**
- **If have male sex partner who traveled to or lives in affected area, abstain from sex or wear condoms during pregnancy**

Zika Prevention Strategies: Avoid Mosquito Bites

All travelers, especially pregnant women, should take steps to avoid mosquito bites

- Choose an EPA-registered insect repellent and use according to product label
- Use permethrin-treated clothing
- Cover exposed skin by wearing long sleeves, pants, and hats
- Sleep indoors in rooms screened windows or air-conditioning, or use bed net if sleep in rooms exposed to outdoors

Infected persons should stay indoors or wear protective clothing and mosquito repellent during 1st week of illness to prevent local transmission

Distribution of Competent Mosquito Vectors in Virginia

Asian tiger mosquitoes are found throughout Virginia and are the most common nuisance mosquito in urban and suburban areas.

- Asian tiger mosquitoes fly and bite during daylight hours when people are likely to be outdoors
- They will enter homes through unscreened windows or open doors and bite inside day and night
- They lay eggs exclusively in containers of water; do not originate from puddles, ditches or natural bodies of water on the ground

Mosquito Control and Surveillance in Virginia

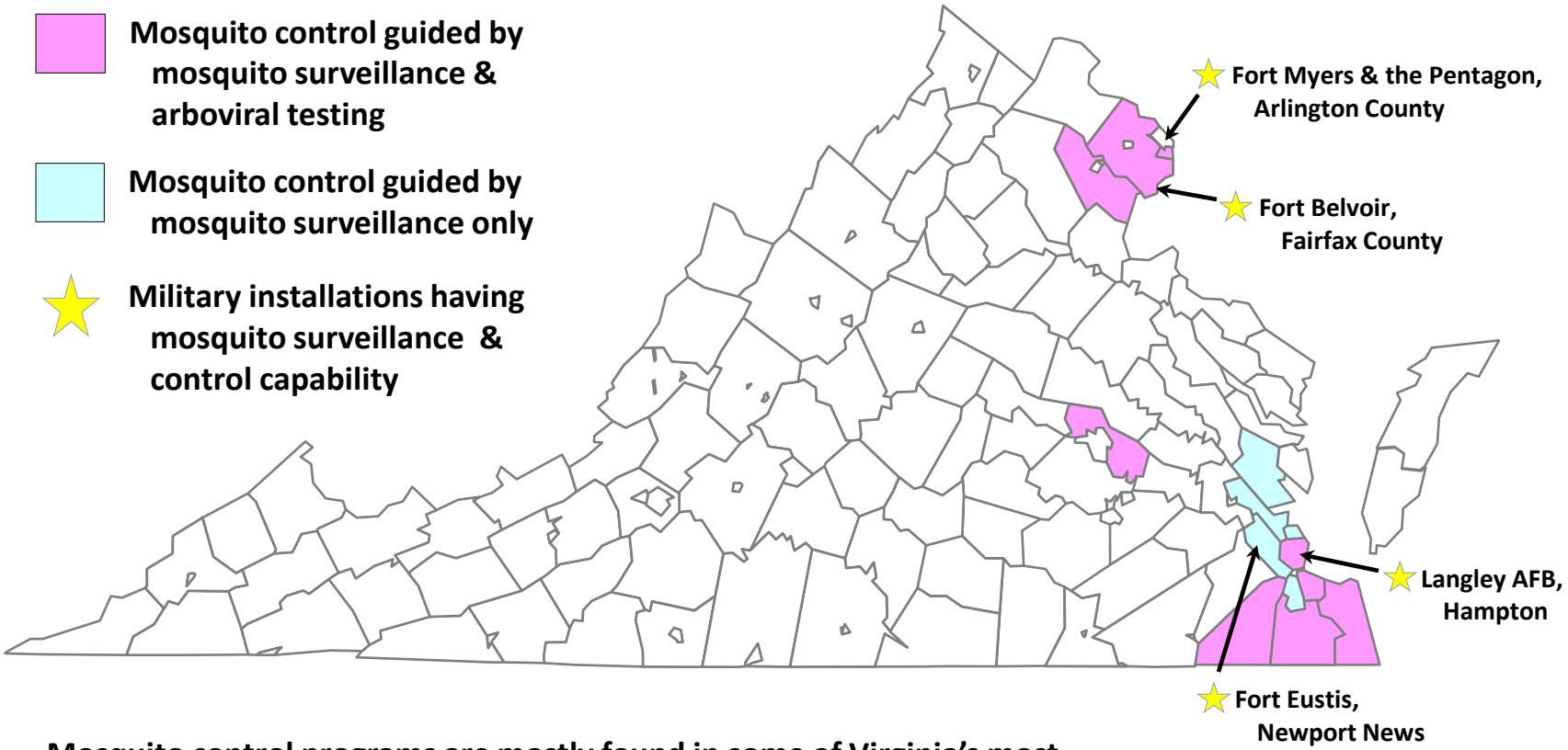
Mosquito control in Virginia - locally funded and limited to some densely populated counties and cities

- Most efforts focus on surveillance and control of nuisance mosquitoes and mosquitoes that transmit West Nile or Eastern Equine Encephalitis viruses
- Generally use truck-mounted aerosol spraying on public streets and/or treat water catchments/storm drains on public lands

Asian tiger mosquito control methods require house-to-house inspections and treatments

- Most mosquito control programs in Virginia do not have the resources or legal authority to conduct inspections or control efforts on private land

Virginia Jurisdictions and Military Installations having Mosquito Control Capabilities



Mosquito control programs are mostly found in some of Virginia's most heavily populated jurisdictions.

Virginia Preparedness and Response

Coordinate with partners

Raise awareness among clinicians and general public

- Sent Dear Colleague Letter
- Developing resources including VDH websites for healthcare providers and general public, brochure for pregnant women, fact sheets

Expand lab testing capability at DCLS

- DCLS is currently facilitating Zika testing at CDC and also testing for chikungunya and dengue for approved specimens
- DCLS anticipates conducting Zika virus PCR testing

Virginia Preparedness and Response

Conduct disease surveillance

- All suspected and confirmed cases are required to be reported to local health department
- Local health department can provide consultation and facilitate lab testing at CDC/DCLS if needed
- Lab testing is prioritized for pregnant women who traveled to affected area

VDH and DCLS are pursuing funding opportunities to enhance mosquito surveillance and preparedness

References and Resources

- Besnard M, et al. Evidence of perinatal transmission of Zika virus, French Polynesia, December 2013 and February 2014 . Euro Surveill 2014;19(13):20751. http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20751
- Duffy MR, et al. Zika virus outbreak on Yap Island, Federated States of Micronesia. N Engl J Med 2009;360:2536-2543. http://www.nejm.org/doi/pdf/10.1056/NEJMoa0805715
- Foy BD, et al. Probable non-vector-borne transmission of Zika virus, Colorado, USA. Emerg Infect Dis 2011;17(5):880-882. http://wwwnc.cdc.gov/eid/article/17/5/pdfs/10-1939.pdf
- Hayes EB. Zika virus outside Africa. Emerg Infect Dis 2009;15(9)1347-1350. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2819875/
- Kusana S, et al. Two cases of Zika fever imported from French Polynesia to Japan, December to January 2013. Euro Surveill 2014;19(4):20683. http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20683
- Kwong JC, et al. Case report: Zika virus infection acquired during brief travel to Indonesia. Am J Trop Med Hyg 2013;89(3):516–517. http://www.ajtmh.org/content/89/3/516.long
- Lanciotti RS, et al. Genetic and serologic properties of Zika virus associated with an epidemic, Yap State, Micronesia, 2007. Emerg Infect Dis 2008;14(8):1232–1239. http://wwwnc.cdc.gov/eid/article/14/8/08-0287_article
- Musso D, et al. Potential for Zika virus transmission through blood transfusion demonstrated during an outbreak in French Polynesia, November 2013 to February 2014. Euro Surveill 2014;19(14):20761. http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20761
- Oehler E, et al. Zika virus infection complicated by Guillain-Barre syndrome – case report, French Polynesia, December 2013. Euro Surveill 2014;19(9):20720. http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20720
- Tappe D, et al. First case of laboratory-confirmed Zika virus infection imported into Europe, November 2013. Euro Surveill 2014;19(4):20685. http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=20685
- CDC: http://www.cdc.gov/zika/index.html
- PAHO: http://www.paho.org/hq/index.php?option=com_content&view=article&id=11585&Itemid=41688&lang=en
- WHO: http://www.wpro.who.int/mediacentre/factsheets/fs_05182015_zika/en/
- VDH: http://www.vdh.virginia.gov/epidemiology/Zika/index.htm

Questions?

Thank you