An Evolving Environmental Health Services Role in the Zika Response

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Zika Virus Vectors: *Aedes* Mosquitoes

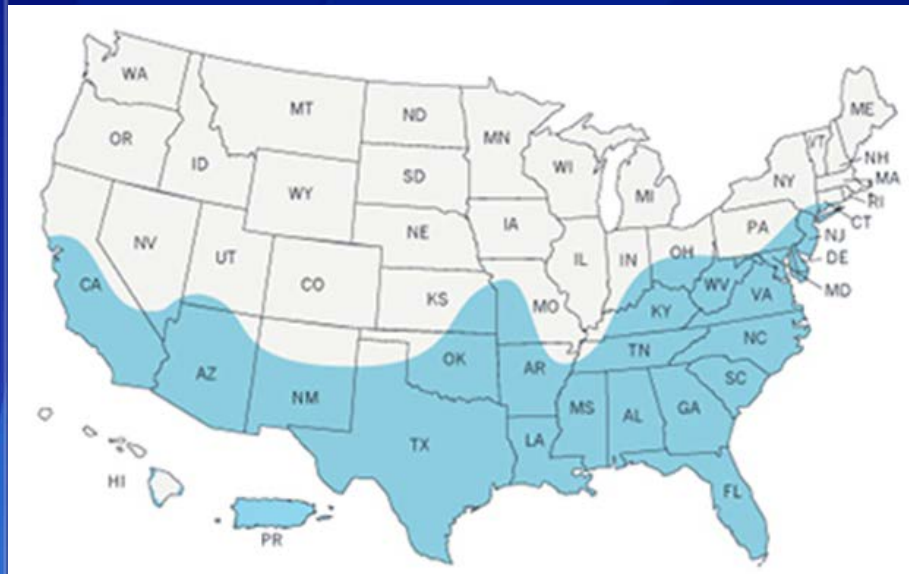
- ***Aedes* (*stegomyia*) species mosquitoes**
  - **– *Ae. aegypti***
  - **– *Ae. albopictus***
- **Also transmit dengue and chikungunya viruses**

Aedes aegypti

Aedes albopictus

Aedes aegypti and *Aedes albopictus* Mosquitoes:

Estimated Range in the United States*



Aedes aegypti

Aedes albopictus

***Maps have been updated from a variety of sources. These maps represent CDC's best estimate of the potential range of *Aedes aegypti* and *Aedes albopictus* in the United States. Maps are not meant to represent risk for spread of disease.**

Specific Potentially Impacted Sub-Populations

- Pregnant Women
- Infants and Children
- Residents in Areas with Official Landfills
- Residents in Areas with High Volumes of Litter such as Tires that can Serve as Mosquito Habitat
- Residents in Areas with Abandoned Housing that may have Unmaintained Pools and Other Mosquito Habitat

CDC's Top 10 Zika Response Planning Tips for State and Local Health Officials

1. **Vector control and surveillance**
2. Public health surveillance and epidemiological investigation
3. Laboratory testing and support services
4. Prevention of sexually transmitted Zika virus infections
5. Prevention of blood transfusion-transmitted Zika virus infections
6. Maternal and child health surveillance and response
7. Rapid birth defects monitoring and follow-up
8. Travel health news
9. Clinician outreach and communication
10. Risk communication/community education

Available at: http://www.cdc.gov/zika/public-health-partners/tips.html

CDC's #1Tip for State and Local Health Officials

1. Vector control and surveillance

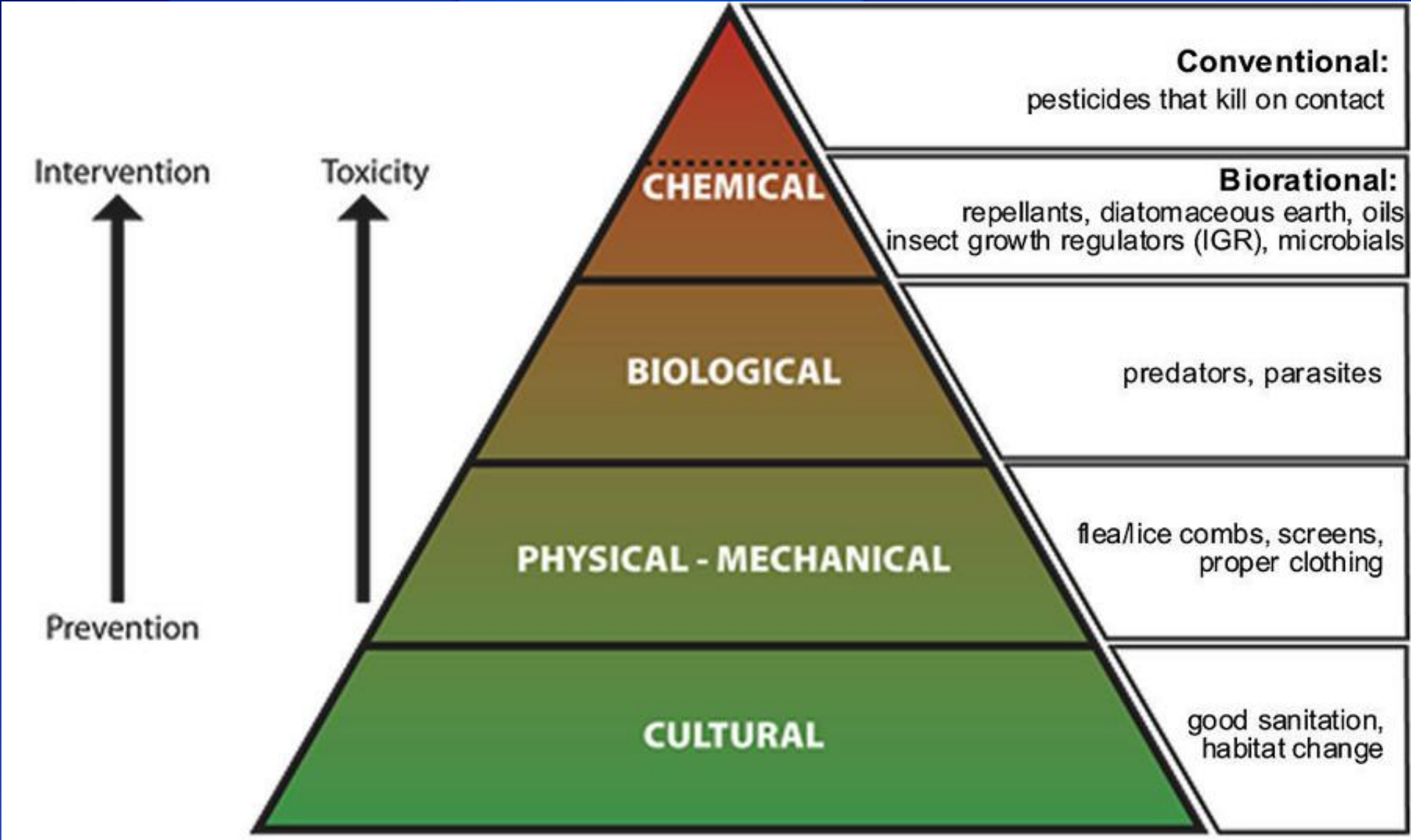
Goal: To target vector control programs in priority areas/at-risk populations to suppress Zika virus transmission if local cases or an outbreak are detected.

Available at: http://www.cdc.gov/zika/public-health-partners/tips.html

What is Environmental Health & What Does it Have to Do with Mosquito Control

- Environmental Health (EH) comprises those aspects of human health, disease, and injury that are determined or influenced by factors in the environment – including disease vectors such as mosquitoes and their habitats.
- EH employs a strategy called Integrated Pest Management (IPM), which includes the elimination of environmental conditions that lead to pest infestations.
- One of most basic tactics in an integrated pest management strategy, known as Source Reduction, involves eliminating the habitat or modifying the aquatic habitat to prevent mosquitoes from breeding.

http://www.healthypeople.gov/2010/Document/tableofcontents.htm#volume1
http://www.cdc.gov/nceh/ehs/elearn/ipm.htm



IPM for Pests of Animals & Humans

PENNSTATE College of

Environmental Health Services

FIGURE 6.9 LHDs Providing Select Environmental Health Services (by Population Served)

Environmental Health Services	All LHDs	Size of Population Served				
		<25,000	25,000–49,999	50,000–99,999	100,000–499,999	500,000+
Food Safety Education	72%	63%	76%	83%	79%	78%
Vector Control	48%	39%	51%	55%	57%	62%
Groundwater Protection	40%	31%	40%	44%	57%	53%
Surface Water Protection	33%	25%	34%	37%	43%	46%
Indoor Air Quality	31%	27%	29%	35%	34%	45%
Pollution Prevention	22%	14%	20%	26%	29%	44%
Hazmat Response	17%	13%	13%	19%	25%	32%
Collection of Unused Pharmaceuticals	16%	15%	21%	16%	16%	15%
Air Pollution	16%	12%	14%	19%	19%	32%
Hazardous Waste Disposal	15%	13%	12%	15%	19%	29%
Land Use Planning	14%	11%	13%	20%	17%	17%

What are the Primary Environmental Health Issues Related to Mosquito Control

- **Preventing, to the greatest degree possible, the emergence of a Zika-infected mosquito population through:**
  - Surveillance,
  - Source Reduction,
  - Water Management Strategies To Encourage Indigenous Natural Enemies To Immature Mosquitoes, and
  - Larval and Adult Mosquito Control Strategies.

- **Ensuring that prevention and mitigation efforts stay as close to the base of the pyramid to limit the potential negative effects that of the toxicity of pesticides, etc.**

http://www.healthypeople.gov/2010/Document/tableofcontents.htm#volume1
http://www.cdc.gov/nceh/ehs/elearn/ipm.htm

Source Reduction

- Determine abundance, distribution, and type of water-holding containers; large numbers of containers may translate into high mosquito abundance and high risk
- Initiate a community wide source reduction campaign
- Provide public education focusing on reducing or eliminating larval habitats
- Incorporate breeding site identification and educational efforts into routine activities

http://www.cdc.gov/chikungunya/resources/vector-control.html

Control-Larvicide

- **Chemicals or biologic agents to kill or prevent development of mosquito immature stages**
  - **Chemical larvicides: temephos**
  - **Biological larvicides: *Bacillus thuringiensis* var. *israelensis* (B.t.i.), spinosad, and Insect Growth Regulators (IGR's)**
  - **Monomolecular films and oils: spread on the water surface forming a thin film that causes suffocation of immature mosquitoes by preventing gas exchange**

http://www.cdc.gov/chikungunya/resources/vector-control.html

Control-Adulticide

- Decision to use chemical adulticides should be based on surveillance data and the risk of human disease
- Used in combination with other IPM strategies
- Includes targeted outdoor residual spraying, indoor residual spraying, widespread outdoor application
- Residual insecticides used on surfaces that adult mosquitoes frequently visit and land on
- Follow pesticide use and application regulations
- Maintain applicator certifications for staff
- May require contracting with a licensed pest control firm

http://www.cdc.gov/chikungunya/resources/vector-control.html
http://www.cdc.gov/zika/public-health-partners/vector-control-us.html

Challenges Ahead

- **Although the 2nd most common Environmental Health Service, Vector Control is only directly supported in 48% of local health departments (LHDs)**

- **Across the country, at the state and local levels, there is a wide variety of activities and practices performed, including:**
  - State-supported entomology technical assistance &vector surveillance/control
  - Local environmental public health delivery of IPM activities
  - Creation of separate Mosquito Control Districts
  - Absence of any mosquito control efforts at all
  - A combination or hybrid version of one or more of these models

There is Hope

- **CDC started in 1942 as, in part, a mosquito control organization called Office of Malaria Control in War Areas**

- **The potential EH workforce is the second largest component of the public health workforce, including public and private workers in the following direct and related areas:**

  - Environmental Science Specialists, incl. Health: 94,600
  - Environmental Science Technicians, incl. Health: 36,200
  - Environmental Engineers: 55,100
  - Community Health Workers/Educators (can be cross-trained): 115,700

Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, 2016-17 Edition, at http://www.bls.gov/ooh

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