Vector Borne Diseases
What Texas School Nurses Need to Know

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Introduction
Roughly 3 out of 4 (Re)Emerging Infections are Vector-Borne or Zoonotic
The new Texas

- Has profound pockets of intense poverty (Blue Marble Health)
- Poverty highest in the south along Mexico border (Colonias)
- Poverty in major urban centers: Dallas and Houston
- Children poverty rate >33%

The new Texas

• One of the fastest growing US states with population projected to exceed 30 million by 2020

• Contains 11 fastest growing small cities & 5 of 8 fastest growing large cities

• Growth is due to immigration & economic opportunities

• 3rd among US states in % foreign-born populations
Fig 2. Colonia Mi Sueño, Rio Grande Valley, Texas. Photo by Shaghayegh Tajvidi.
Geographic distribution of the major Texas NTDs

Fig 3. Approximate geographic distribution of the major Texas NTDs. The major diseases include the vector-borne NTDs (blue) located in South Texas, Gulf Coastal Texas, North Central Texas, the Panhandle, and West Texas, as well as non-vectorborne NTDs (green) that concentrate in the three urban areas that constitute the “Texas triangle”, i.e., Dallas, Houston, and San Antonio. NCC, neurocysticercosis; WNV, West Nile virus.
**Culex quinquefasciatus**
Primary vector of St. Louis Encephalitis (SLE) and West Nile virus (WNV) in Texas

**Aedes albopictus**
Vectors of Yellow fever, Dengue, Chikungunya, and Zika viruses

**Aedes aegypti**

...Day and Night!
Environments That Favor More Mosquitoes

- Stored water and discarded containers accumulate rainwater and create abundant mosquito development sites
Mosquito Breeding Sites
Mosquito Breeding Sites
Assess Screen Conditions
Malaria Worldwide

• 3 to 4 Billion People at risk
• Prevalent in tropical and subtropical areas
• 300 to 500 Million Cases & 1 to 3 Million Deaths
• Every 30 seconds, one person dies from Malaria
Malaria in the United States

• 1,500 to 2,000 cases reported every year
• Usually immigrants or travelers
• “Airport Malaria”
• Local Mosquito-Borne Transmission
• Congenital Malaria
• Transfusion Transmitted Malaria
Dengue Virus Types 1-4: Approximate Geographic Distribution
Chikungunya Virus:

GLOBAL DISTRIBUTION OF CHIKUNGUNYA VIRUS*

- Countries currently, or previously, with local transmission of the Chikungunya virus
- Islands with local transmission

SOURCE: Centers for Disease Control (CDC)  *as of December 2, 2014
OTHER VECTORS

• Mosquitoes are not the only vector-borne threat

• Other vectors capable of transmitting pathogens to humans in TX are:
  • Kissing bugs
  • Ticks
  • Sand flies, fleas, gnats, etc...
Common Ticks Found in Texas
Tick-Borne Diseases in Texas

- Rocky Mountain Spotted Fever (RMSF)
- Lyme Disease
- Human Ehrlichiosis
- Tularemia
- \textit{Rickettsia parkeri} rickettsiosis
- Anaplasmosis
- Babesiosis
- Heartland virus disease
- Southern tick-associated rash illness (STARI)
- Q fever
- Tick-borne relapsing fever
States along US-Mexico border have highest risk
• Triatomine species (10 in US)
• Autochthonous cases (20 since 2013 in TX) (Wozniak et al. 2015, TX DSHS)

kissingbug.tamu.edu
Chagas disease in Texas

- States along US-Mexico border = highest risk

- 8 species of kissing bugs have been recorded in Texas
  - Peridomestic and sylvatic
  - Harris County: *Triatoma sanguisguia*

- Estimated burden in US: 300,000 – 1,000,000
  - Difficult to detect
  - 20-30% develop life-threatening symptoms

Bern et al (2011)
Kjos et al (2009)
Topical Repellents
Common Effective Repellents in the US

- Deet
- IR 3535
- Picaridin
- PMD
- 2-Uncanone
Deet
N,N-diethyl-3-methyl benzamide
N,N-diethyl-m-toluamide

- USDA & DoD Collaboration in 1940’s
- Released commercially in 1956
- Broad-Spectrum
- Gold Standard Repellent
- Safety
Picaridin
2-(2-hydroxyethyl)-1-piperidine Carboxylic acid 1-methylpropyl ester

- KBR, icaridin, bayrepel, Saltidin
- Modern Efficacy & Safety Tests
- Registered in over 50 countries
- Excellent Effectiveness
- Safe repellent
IR 3535
ethyl butylacetylaninopriopionate
or EBAAP

• Beta-alanine, a naturally occurring amino acid
• Merck & Co. developed it by molecular modeling of other repellent compounds in 1970’s
• Used in over 150 consumer products sold worldwide
• US registered it in 1999
• Repels a wide variety of biting pests
• Excellent against ticks
• Very Safe
PMD
p-menthane-3,8-diol

- Major component of Chinese repellent, Quwenling which is the steam distillate from lemon eucalyptus

- Effective against mosquitoes

- 2005 – CDC added it to the list of repellents for use against WNV mosquito vectors

- Safety: skin sensitization & eye irritation
Area or Spatial Repellents

- Mosquito Coils
- Electrically Heated, Butane powered mats/pads impregnated with insecticides
- Candles
- Chemically impregnated Curtains & Screens
- Wrist-band impregnated with Deet
- Deet Anklets
Example of Spatial Repellents

- ThermaCELL Patio Lantern

- Therma CELL Mosquito Repellent System
Example of Spatial Repellents

- OFF! Powered Pad Lamp
- OFF! Clip-on with metofluthrin
Example of Spatial Repellents

- Mosquito Beater
- Terminix ALL CLEAR Tabletop Mosquito Repellent
Arthropod Repellent Clothing

• Permethrin

• Impregnated Bed Nets

• Insect Shield
Thank You For Listening
QUESTIONS?
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