Vector Borne Diseases
What Texas School Nurses Need to Know

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Introduction

Source: AVMA and One Health Initiative

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-borne 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
Aedes aegypti
Vectors of Yellow fever, Dengue, Chikungunya, and Zika viruses

Day and Night!
Environments That Favor More Mosquitoes

- Stored water and discarded containers accumulate rainwater and create abundant mosquito development sites.
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
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

- Rocky Mountain Spotted Fever (RMSF)
- Lyme Disease
- Human Ehrlichiosis
- Tularemia
- *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)
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 sanguisuga*
- Estimated burden in US: 300,000 – 1,000,000
  - Difficult to detect
  - 20-30% develop life-threatening symptoms

Topical Repellents

Common Effective Repellents in the US

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

Deet

- USDA & DoD Collaboration in 1940’s
- Released commercially in 1956
- Broad-Spectrum
- Gold Standard Repellent
- Safety
**Picaridin**
2-(2-hydroxylethyl)-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 butylacetylanionopriopionate or EBAAAP

- 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
- ThermaCELL 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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