Vector Borne Diseases – What Texas School Nurses Need to Know
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Symptoms, treatments
- Prevention strategies
  - EPA-registered repellents
  - Safety and efficacy information
  - Proper application
  - Urban legends
- Messages that work
- Helping special audiences

West Nile Fever

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Total Patients, n (%)</th>
<th>95% CI</th>
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</thead>
<tbody>
<tr>
<td>Symptom†</td>
<td></td>
<td></td>
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<tr>
<td>Fatigue</td>
<td>94 (96 [90-99])</td>
<td></td>
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<tr>
<td>Fever</td>
<td>79 (81 [72-87])</td>
<td></td>
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<tr>
<td>Headache</td>
<td>70 (71 [62-79])</td>
<td></td>
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<tr>
<td>Muscle pain or aches</td>
<td>61 (62 [52-71])</td>
<td></td>
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<tr>
<td>Muscle weakness</td>
<td>60 (61 [51-71])</td>
<td></td>
</tr>
<tr>
<td>Rash</td>
<td>56 (57 [47-66])</td>
<td></td>
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<tr>
<td>Neck pain or stiffness</td>
<td>54 (55 [45-65])</td>
<td></td>
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<tr>
<td>Difficulty concentrating</td>
<td>52 (53 [44-63])</td>
<td></td>
</tr>
<tr>
<td>Joint pain or aches</td>
<td>58 (57 [48-67])</td>
<td></td>
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<tr>
<td>Vomiting</td>
<td>27 (28 [20-37])</td>
<td></td>
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<tr>
<td>Diarrhea</td>
<td>26 (27 [19-36])</td>
<td></td>
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<tr>
<td>Sensitivity to light</td>
<td>27 (27 [14-31])</td>
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</table>

34% of cases reported to CDC in kids are neuroinvasive (N=2397 1999-2016)
- Same incidence as in all other age groups
- Adults present with encephalitis, kids with meningitis in the more severe cases
- Fatality rate in older adults is 14%...1% in children
- More cases in kids than for all ages for SLE, LAC, EEE, and WEE combined!
Zika

- No cure
- Travel-related
- Everyone returning from endemic areas needs to use repellent to prevent infecting local mosquitoes
  - Asymptomatic but still infectious
- Sexually transmitted
  - Men should abstain or use condoms for at least 3 months
  - Women, 2 months

Source: Centers for Disease Control

The TYPE of Mosquito is Important

- Important to remember the behavior of the mosquito that transmits it
  - Day time biter
  - Knees to ankles
- Lives in urban settings
- Difficult to repel
- AGGRESSIVE people biter

Lyme Disease Geography

- Found in 13 states – Virginia to Minnesota
- Not a factor in Texas
- A concern for students who travel elsewhere

The Deer Tick (Blacklegged Tick)

- Lyme disease
- Anaplasmosis
- *B. miyamotoi* disease (a form of relapsing fever),
- Babesiosis
- Powassan virus disease (related to WNV)
  (transmits in 15 minutes of attachment)
**Lyme Disease**

- Transmission time: 24–36 hours after attachment
- Onset: 7–14 days after attachment
- Bull’s eye
- Painless, doesn’t itch
- Identified in 60–80% of cases
- Usually no associated symptoms

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**Atypical Erythema Migrans**

- Smith RP et al. Ann Intern Med

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**Powassan (Not in Texas)**

Transmission occurs within 15 minutes of attachment

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**Human Ehrlichioses By County 2000–2013**

- Blacklegged Tick
- Lone Star Tick
- Anaplasmosis (HGA)
- Ehrlichiosis (HME)
Rocky Mountain Spotted Fever Rickettsioses

- Rocky Mountain Spotted Fever
- *R. parkeri*
- Pacific Coast tick fever
- Rickettsial pox

Incidence of SFR by County, 2000–2013

Rocky Mountain Spotted Fever

- >50% recall prior tick encounter
- Tick attachment ≥6 hours required for injection of bacteria

American Dog Tick

Rocky Mountain Spotted Fever

- Symptom onset 7 days (range, 2–14 days) after tick bite
- Reported throughout the lower 48
- FIVE states account for 60%+ of all cases
- NC, OK, AR, TN, MO

RMSF RASH

Early (d2–4) Late (> day 4)
Children <10 years =6% of RMSF diagnoses, but 22% of RMSF deaths
“If you don’t treat by Day 5, they are DEAD by Day 8”—CDC MD
Before antibiotics, fatality rate was 80% for all cases

**Case Fatality Rate, RMSF 2008–2013**

- NOT bacterial
  - Pathogen as yet unknown
- Same symptoms as Lyme
- Also called Masters’ Disease
- Lone Star ticks

**Tick–Associated Red Meat Allergy**

Lone Star Ticks are the Culprits

- Galactose–alpha1,3–galactose (alpha gal) present in tick saliva and red meat
- Reaction to meat consumption
- Symptoms:
  - Hives or skin rash
  - Nausea, stomach cramps, indigestion, vomiting, diarrhea
  - Stuffy/runny nose, sneezing
  - Bronchospasm
  - Headaches
  - Anaphylaxis

**Tick Removal**

What TO DO
- REMOVE the tick ASAP
- Time is of the essence
- Clean wound area with soap and water, antiseptic
- Put the tick in alcohol to kill it

What NOT to do...
- Burn it (gasoline, kerosene)
- Smother it (petroleum jelly)
- Poison it (fingernail polish)
- Annihilate it (hot match tip)
- Crush it
- Use Dove soap
Treatment For Tick–borne Diseases

- If the child is symptomatic, DO NOT wait for test results
- Doxycycline is AAP’s and CDC’s recommendation
- National survey 2012
  - 35% of providers would not give to patients younger than 8 years old due to concern for dental coloration

**KEY MESSAGE:** FOLLOW AAP/CDC GUIDELINES AND GIVE DOXYCYCLINE REGARDLESS OF THE PATIENT’S AGE

Tick–Bite Prevention Messages

- USE REPELLENT ALWAYS
- Let clothing be a barrier
- Use permethrin treatment on clothing
- Do a tick check– before going inside
- Nymphs emerge in early Spring…they’re one of the most dangerous life–forms—hard to spot, can be infected vertically (from mother)

Tick–Bite Prevention Messages

- When coming inside, put clothing into the dryer on high for 20 minutes
- Do a tick–check when you’re in the shower
  - Check all nooks and crannies
  - Look for moving freckles
- Estimated disease transmission time 24–36 hours
  - except Powassan 15 minutes
  - Rocky Mountain Fever 6 hours

What to Use?

- Always use a repellent with an EPA–registered active ingredient
  - Tested for safety and efficacy
  - Tested for specific vectors
Concentration is the Key

- The higher the concentration the \textbf{LONGER} the repellent helps protect
  - More isn’t BETTER, it’s \textbf{LONGER}
- Duration of efficacy is comparable at comparable concentrations for the EPA-registered actives
  - 5\% picaridin lasts an hour – same FOR DEET-based products
- Pick the concentration that matches your time of exposure
- Protection times are \textit{SHORTER} for ticks than mosquitoes

GUIDANCE for Use on Kids

- CDC/Am. Academy of Pediatrics
  - Use DEET, picaridin, IR3535 on kids as young as 2 \textit{MONTHS} of age in concentrations up to 30\%
- EPA has NO age limitations on any of the registered actives
  - \textbf{EXCEPT} Oil of Lemon Eucalyptus—children must be 3 \textit{years} of age
- Adults apply to their own hands, smoothing repellent evenly on child’s exposed skin
- Avoid fingers in very young children
- Keeps repellent out of eyes and mouths

\textbf{HOW} You Apply Is Important

\textbf{WRONG!}

\textbf{Got It 50\% Right…}

\textit{OVER APPLICATION IS NOT NEEDED…APPLY SPARINGLY}
Repellent Use for Mosquitoes

- Apply sparingly to exposed skin, smooth on like sunscreen or body lotion
- CDC and other experts: Use a 25% or higher product for Aedes species (carry Zika, dengue, chikungunya)
- Apply sparingly to clothing or under clothing if mosquitoes can bite through fabric
- Repellent washes off with perspiration/swimming/rain, so reapply as needed

Repellent Use for Ticks

- Apply to exposed skin AND clothing, shoes, socks, pants
- Use permethrin–treated clothing –KILLS on contact
- CDC and other experts: Use a 20% or higher concentration for ticks
  - LOWER concentrations don’t work well or very long
- A 25% concentration DEET product may last 5–6 hours for mosquitoes BUT 3–4 for ticks, so REAPPLY
- Dress appropriately—long pants tucked into socks.

Sunscreen and Repellent

- Apply sunscreen first, then repellent
- Reapply sunscreen often
- Reapply repellent when bugs return

DEET Urban Legends

- Causes seizures
  - Extensive independent meta–analysis and other reviews show this is not true
- Higher concentrations are more dangerous
  - No relationship between adverse events and concentration when used according to directions
- Children are at greater risk
  - Serious adverse events are exceedingly rare, associated with mis–use and NOT related to age
- Causes death
  - Ingestion of substantial amounts
- Label directions are “scary” (wash, etc.)
  - SAME directions on all EPA–registered repellents
Lessons from Those for Whom English is a Second Language

- “Repellent” may not be a familiar product
- Think it is RAID
  - Spray it at mosquitoes, on screens, in the air—but not on their skin
- Use it AFTER a mosquito bite to stop the itch. (It doesn’t)
- Afraid to use repellent

Mosquito Take-Aways

- Use a concentration to match your time of exposure (5%=60 minutes, 30%=8 hours)
- 25%+ concentration (on exposed skin and clothing for Aedes (Zika-carriers) protection
- Use permethrin only on clothing
- Dress appropriately
- Protection times VARY via perspiration, humidity, wind conditions, other variables

Tick Take-Aways

- Put ticks in alcohol to kill them (hand sanitizer works)
- If you removed a tick and the head remains, don’t panic
  - The body is the part that really matters
- Use an antibiotic ointment/spray on the bite area
- For some tick-borne diseases, there are no cures—protection is the ONLY option
- If bitten by a tick and you have NO symptoms, there is no need to see a healthcare professional and no need for antibiotics
  - Many fearful of Lyme disease do so anyway

If Symptomatic—Prompt Treatment Crucial

- Children may present different symptoms than adults to the same disease
- Bacterial infections respond to doxy
- Some infections (Ehrlichiosis and others) can be fatal quickly without prompt treatment
  - RMSF—“If you don’t treat by day 5, the patient may be dead by day 8”
RESOURCES

- CDC.gov
- 800–789–3300
  info@deeteducationprogram.org
- Tick Encounter (University of Rhode Island) – In depth information about ticks [https://tickencounter.org/](https://tickencounter.org/)
- Repellent Products – American Mosquito Control Association

Questions?