Vector Borne Diseases – What Texas School Nurses Need to Know

Libby Carver, DNP, FNP-BC, CNE
Duke University Medical Center
November 2, 2019
VBD Learning Outcomes

- Symptoms, treatments
- Prevention strategies
  - EPA–registered repellents
  - Safety and efficacy information
  - Proper application
  - Urban legends
- Messages that work
- Helping special audiences
<table>
<thead>
<tr>
<th>Outcome</th>
<th>Total Patients, n (%) [95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue</td>
<td>94 (96 [90–99])</td>
</tr>
<tr>
<td>Fever</td>
<td>79 (81 [72–87])</td>
</tr>
<tr>
<td>Headache</td>
<td>70 (71 [62–79])</td>
</tr>
<tr>
<td>Muscle pain or aches</td>
<td>61 (62 [52–71])</td>
</tr>
<tr>
<td>Muscle weakness</td>
<td>60 (61 [51–70])</td>
</tr>
<tr>
<td>Rash</td>
<td>56 (57 [47–66])</td>
</tr>
<tr>
<td>Neck pain or stiffness</td>
<td>54 (55 [45–65])</td>
</tr>
<tr>
<td>Difficulty concentrating</td>
<td>52 (53 [43–63])</td>
</tr>
<tr>
<td>Joint pain or aches</td>
<td>36 (37 [28–47])</td>
</tr>
<tr>
<td>Vomiting</td>
<td>27 (28 [20–37])</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>26 (27 [19–36])</td>
</tr>
<tr>
<td>Sensitivity to light</td>
<td>21 (21 [14–31])</td>
</tr>
</tbody>
</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
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
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 Geography

Reported Cases of Lyme Disease — United States, 2017

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

1 dot placed randomly within county of residence for each confirmed case

Courtesy of the Centers for Disease Control
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
# Atypical Erythema Migrans

<table>
<thead>
<tr>
<th>Variable</th>
<th>Patients, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphologic characteristics</td>
<td></td>
</tr>
<tr>
<td>Predominant pattern</td>
<td></td>
</tr>
<tr>
<td>Homogeneous</td>
<td>56 (59)</td>
</tr>
<tr>
<td>Central erythema</td>
<td>30 (32)</td>
</tr>
<tr>
<td>Central clearing</td>
<td>9 (9)</td>
</tr>
<tr>
<td>Punctum present</td>
<td>29 (31)</td>
</tr>
<tr>
<td>Vesicular or ulcerated</td>
<td>7 (7)</td>
</tr>
<tr>
<td>Blue center</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Total</td>
<td>95 (100)</td>
</tr>
</tbody>
</table>

![Images of atypical erythema migrans](image1.jpg)
Transmission occurs within 15 minutes of attachment
Human Ehrlichioses
By County 2000–2013

Anaplasmosis (HGA)

Ehrlichiosis (HME)

Blacklegged Tick

Lone Star Tick
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
Southern Tick Associated Rash Illness (STARI)—IN TEXAS

- 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–alpha 1,3–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
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
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
The higher the concentration the LONGER the repellent helps protect
- More isn’t BETTER, it’s 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 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 *MONTHS* of age in concentrations up to 30%
- EPA has NO age limitations on any of the registered actives
  - EXCEPT Oil of Lemon Eucalyptus—children must be 3 *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
HOW You Apply Is Important

WRONG!
Got It 50% Right...

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
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.
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 misuse and NOT related to age

- **Causes death**
  - Ingestion of substantial amounts

- **Label directions are “scary” (wash, etc.)**
  - SAME directions on *all* EPA-registered repellents
“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)

Spray a fog around themselves and others

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

THERE ARE NO CURES – PROTECTION IS CRUCIAL
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
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?