Identifying, Managing, Treating, & Preventing Rocky Mountain Spotted Fever in Arizona Native American Youth

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CAPT Marc Traeger, MD

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Presenters’ Names & Credentials

• CDR Stephen R. Piontkowski, MSEH, REHS
  – District Environmental Health Officer
  – Lakeside, AZ (Phoenix Area)
  – RMSF prevention since 2003

• CAPT Marc Traeger, MD
  – Preventative Health Officer
  – Whiteriver SU (Phoenix Area)
  – Clinician & Epidemiologist
Overview

- Learning objectives
- Background
- Symptoms
- Treatment
- Vector
- Environment
- Prevention
- Summary

Clinical-based response

Community-based response
Learning objectives

• Promptly identify signs & symptoms of RMSF
• Effectively treat suspect RMSF patients
• Sagaciously employ evidence-based community-wide Rocky Mountain spotted fever (RMSF) prevention strategies
Background

- RMSF is the most severe tick-borne disease in U.S.
- Only caused by tick bite
- ~ 250-1,200 cases reported annually
- Most cases occur in eastern U.S.

- Sporadic in Rocky Mtn. west (3-5% cases)
- Fatal for 20-80% cases untreated
Incidence among NAs

• Increased 2001-2005
  – NAs annual average rate = 16.8 per million
  – Whites annual average rate = 4.2

• Highest rates for NAs in
  – Oklahoma (113.1)
  – North Carolina (60.0)
  – Arizona (17.2)

In Arizona

- **1988-2002**
  - 8 confirmed cases (all imported)
- **2003-2013**
  - 307 cases; 20 fatal (~6.5%)
- **2014 (preliminary)**
  - 1 confirmed
  - 7 probable
  - 48 suspect

Sources: CDC, RZBDVD; & AZ Dept. of Health Services
AZ human cases

Sources: CDC, RZBDVD; & AZ Dept. of Health Services
AZ human cases – age

Source: CDC, RZBDVD
In Arizona

Source: CDC, RZBDVD

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Clinical manifestations

• Early (first 4 days)
  – fever, headache, gastrointestinal symptoms
  – Respiratory symptoms (cough, nasal congestion, etc.)

• 40% of patients have rash at first visit

• Blood tests
  – Thrombocytopenia (low platelets), hyponatremia (low sodium), elevated liver enzymes around days 3-4

• Late (day 5 or later)
  – petechial rash, altered mental status, seizures, respiratory distress, cardiac, blood pressure drop
The rash

- Typically appears 2-5 days after onset of fever
- Begins as 1 to 5 mm specks
- Typically on extremities, spreads towards trunk; may be found on palms & soles
- Petechial rash on or after day 6, signifies progression to severe disease
- Rash may be asymmetric, localized, or absent
Initial presentation

• Most patients present for medical care w/in 2 days (1.5 in AZ) of onset of fever
  – Most return several times as disease progresses (2.5 visits in AZ)
• 30% of AZ patients reported a tick bite
• PMH: Alcohol history may obscure diagnosis & lead to treatment delay
• All ages at risk; 60% children; 49% of all cases were children age 10 & under
Rashes of RMSF
Fatalities

- Historic case-fatality rate 30%-80% in untreated patients
- Multi-organ failure may begin around day 5
- Disease kills otherwise healthy adults & children
- Median time from symptom onset to death is 8 days
Outcome by day of symptoms that doxycycline was started

<table>
<thead>
<tr>
<th>Day of treatment (N)</th>
<th># Outpatient (%)</th>
<th># Hospitalized (%)</th>
<th># ICU (%)</th>
<th># Fatal (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1 (6)</td>
<td>5 (83%)</td>
<td>1 (17%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Day 2 (11)</td>
<td>8 (73%)</td>
<td>3 (27%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Day 3 (9)</td>
<td>4 (44%)</td>
<td>5 (56%)</td>
<td>1 (11%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Day 4 (7)</td>
<td>3 (43%)</td>
<td>4 (57%)</td>
<td>1 (14%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Day 5 (8)</td>
<td>2 (25%)</td>
<td>6 (75%)</td>
<td>4 (50%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Day 6 (9)</td>
<td>0 (0%)</td>
<td>9 (100%)</td>
<td>5 (55%)</td>
<td>3 (33%)</td>
</tr>
<tr>
<td>Day 7 (11)</td>
<td>0 (0%)</td>
<td>11 (100%)</td>
<td>4 (36%)</td>
<td>3 (27%)</td>
</tr>
<tr>
<td>Day 8 (5)</td>
<td>1 (20%)</td>
<td>4 (80%)</td>
<td>2 (40%)</td>
<td>2 (40%)</td>
</tr>
<tr>
<td>Day 9 (4)</td>
<td>0 (0%)</td>
<td>4 (100%)</td>
<td>4 (100%)</td>
<td>2 (50%)</td>
</tr>
</tbody>
</table>
Severe sequelae
Diagnostic testing

- No readily available test during acute illness
- Rickettsial titers are typically negative during acute illness (1st 10 days)
- Cases are confirmed with a 4-fold change between acute & convalescent titer
- RMSF diagnostic tests are used for case reporting purposes & can not be used to make a treatment decision
Initial diagnosis of fatal cases

• Otitis media x 2
• Pneumonia & thrush
• Pyelonephritis & EtOH withdrawal
• Acute gastroenteritis
• Varicella
• Undifferentiated fever
• Viral upper respiratory infection x 2
• Acalculus cholecystitis
High case fatality rate

• No fatalities treated w/ doxycycline in first five days of illness
• Treatment delay was usually due to delayed diagnosis
• Atypical presentations, history of alcoholism, symptoms consistent w/ other diseases played a role
• Following proper testing guidelines also led to confirmation of deaths & exclusion of non-cases
Symptoms of fatal cases

<table>
<thead>
<tr>
<th>Symptom</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>100</td>
</tr>
<tr>
<td>Rash</td>
<td>93</td>
</tr>
<tr>
<td>Fever &amp; tick</td>
<td>29</td>
</tr>
<tr>
<td>Rash &amp; tick</td>
<td>29</td>
</tr>
</tbody>
</table>

- Tmax in fatalities was 100.4-105.7 (fever starts on median day 1, but often subjective)
- Median day of rash onset for fatalities was day 5.5 of symptoms (too late)
Treatment

- Doxycycline is drug of choice: clinical response within 24-72 h
  - In rare situations Chloramphenicol may be an alternative, but it is less likely to prevent death

- Other broad-spectrum antibiotics are not effective
Doxycycline & children

- Doxycycline is drug of choice to treat suspected RMSF in children.
- Doxycycline, at the recommended dose & duration for RMSF, has not been shown to cause dental staining.
- Recommended by AAP & CDC for suspected RMSF.
- Withholding doxycycline may result in the death of a child.
Antibiotics that failed to treat RMSF & results in fatalities

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>3 Cases worsened on Azithromycin &amp; death avoided after doxycycline was initiated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceftriaxone</td>
<td></td>
</tr>
<tr>
<td>Ceftazidime</td>
<td></td>
</tr>
<tr>
<td>Vancomycin</td>
<td></td>
</tr>
<tr>
<td>Ampicillin/Sulbactam</td>
<td></td>
</tr>
<tr>
<td>Clindamycin</td>
<td></td>
</tr>
<tr>
<td>Amoxicillin</td>
<td></td>
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<tr>
<td>Gentamicin</td>
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Vector – United States

- RMSF caused by the bacteria *Rickettsia Rickettsii*

- *Dermacentor* tick

![Rocky Mountain wood tick](image1)

![American dog tick](image2)

Yellow indicates approximate distribution area
Vector – Arizona

Brown Dog Tick
(Rhipicephalus sanguineus)
Vector

- *Rickettsia rickettsii* transferred from tick to tick, & tick to animal at all stages of tick development.
Vector

- Females lay thousands of eggs

Source: Dantas-Torres, F. *Parasites and Vectors*, 3(26), 2010
Engorged brown dog ticks
AZ human cases – seasonality

Source: CDC, RZBDVD
Environment

- **Vector** = brown dog tick
  - Dog preferred blood meal
  - Ticks on dogs
  - Free-roaming dogs (70%)
- **Ideal tick habitat**
  - Elevated homes
  - Tall grasses
  - Mattresses, clothes, furniture
- **Contact between people, dogs, & ticks**
Integrated pest mgmt.

Managing the environment to manage the pest
Prevention

• Tick control
  – Treatment of houses (pesticide around homes)
  – Treatment of dogs (tick collars)
• Animal control
  – Development
  – Ordinances
• Education
  – Check yourself for ticks
  – Prompt medical attention
Tick control at houses

- Apply pesticide
- Remove tick habitat
Tick control on dogs

- Tick collars
- Spot-on treatment
- Dips
Animal control programs

- Development considerations
- Ordinances
Spay & neuter

- Why?
  - 1 year = 16
  - 2 years = 128
  - 3 years = 512
  - 4 years = 2,048
  - 5 years = 12,288
  - 6 years = 67,000 dogs
Spay & neuter

- Free clinics
  - RAVS/HSUS
  - HS of Southern AZ
  - Others
- Contract
  - Cost $35-50/dog
Education

- Community presentations
- Newspaper
- T.V./YouTube
- Schools
- Flyers/Pamphlets
- Radio
- Health Fairs
- Home visits
- Coloring Books/Calendars

August 2012

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Education messages

- Use repellent containing permethrin (for clothes) or DEET (for skin)
- Wear light-colored clothes covering arms & legs
- Tuck pant legs into socks
- Perform tick-checks after outdoor activities
Prevention messages

• Remove attached ticks promptly
  – Use tweezers to grasp tick close to skin
  – Gently pull straight up until all tick removed; do not crush tick
  – Flush tick in toilet
  – Wash bite w/ soap & water
Education – children

- Educators: PHN, CHR, EHO, Health Ed
- Target audience: K-6
- Materials
  - Coloring books/calendars
  - Curriculum/flip book
Education – children

This is a tick collar.

This is a tick spray.

This is a dead tick.
Summary

• Decline of RMSF in AZ requires sustained
  – Early treatment of suspect pts w/ Doxy
  – Tick control
  – Animal control
  – Education

• Partnerships
Resources for clinicians

- CDC
  [http://www.cdc.gov/rmsf](http://www.cdc.gov/rmsf)
- IHS Clinical Rounds, May 2012
  [http://ihs.adobeconnect.com/p1pd3wc1adc/](http://ihs.adobeconnect.com/p1pd3wc1adc/)
- CDC webinar
- Diagnosis & Management of Tickborne & Rickettsial Diseases... *(MMWR, 55(RR04); 1-27, 2006)* (update expected in 2015)
Resources

• CDC
  http://www.cdc.gov/rmsf
• ADHS
• NEHA – CDC1201: Control of Rocky Mtn Spotted Fever & other Tick-Borne Diseases through IPM
• Public Information Video
  www.youtube.com/watch?v=jdnCdM98oCA
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