Mycoplasma ovis
Investigating an under-recognized sheep pathogen in the United State
(Not to be confused with Mycoplasma ovipneumoniae)

American Sheep Industry Annual Convention
Production, Education, Research/Policy Forum
Scottsdale, AZ
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USDA-ARS ADRU
Veterinary Microbiology and Pathology
Washington State University
Pullman, WA
The beginning......

April 11, 2013

Willow  Isabella  Denise  Polly
What is *Mycoplasma ovis*?

(not to be confused with *Mycoplasma ovipneumoniae*)

- *Eperythrozoon ovis* ("Epe") – prior to 2004
- Infects the surface of RBCs (resembles basophilic stippling)

http://www.vet.uga.edu

https://www.agric.wa.gov.au
Mycoplasma ovis

• Worldwide distribution
  – Australia*, NZ, Turkey, Norway, Japan
  – Reports/research of disease/infection in U.S. rare

• Domestic sheep and goats, deer, reindeer

• Transmission: biting insects, needle reuse
Mycoplasma ovis

• Clinical symptoms
  – ANEMIA, jaundice, weight loss, ill-thrift (decreased weight gain, stunted growth), bottle jaw, neurological signs (hypoxia), diarrhea*
  – Similar to:
    • enteric parasites (barber pole worm)
    • Vitamin/mineral deficiency (copper, thiamine, E/selenium)
  – Often subclinical......consequence of this?
    • Meat and fiber production effects in the United States?
Mycoplasma ovis
Current research at ADRU in Pullman, WA

- Distribution and prevalence in the U.S.
- Operation impacts on prevalence (flock size, etc.)
  - NAHMS sera samples from 2001 and 2011

- Seasonal infection prevalence
- Infection and effects on productivity
- Maternal transmission and passive protection
  - USSES provides an optimal source for this work
    - Large number of accessible sheep for blood collection
    - Ability to repeat sample and follow animals lifelong
    - Decades of records and genetic information
USDA-APHIS
NAHMS
(sera samples)
NAHMS Study *Mycoplasma ovis*
(NAHMS 2001 and 2011 sera)

Regional divisions for analysis
1. (West) WA, OR, CA
2a. (Central - north) ID, MT, WY, UT, CO, SD, KS
2b. (Central - south) NM, TX, NV
3a. (East - midwest ) MN, WI, MI, IL, MO, IA, IN
3b. (East - east ) OH, PA, KY, VA, NY, RI
### Mycoplasma ovis Results
(NAHMS sheep sera 2001 & 2011)

#### 3a (Midwest)

<table>
<thead>
<tr>
<th>State</th>
<th>2001</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td># tested</td>
<td>% positive</td>
<td># tested</td>
</tr>
<tr>
<td>MN</td>
<td>367</td>
<td>34.6</td>
</tr>
<tr>
<td>WI</td>
<td>391</td>
<td>22.5</td>
</tr>
<tr>
<td>MI</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>IL</td>
<td>333</td>
<td>25.5</td>
</tr>
<tr>
<td>MO</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>IA</td>
<td>407</td>
<td>24.6</td>
</tr>
<tr>
<td>IN</td>
<td>299</td>
<td>32.1</td>
</tr>
<tr>
<td>TOTALS/AVG</td>
<td>1797</td>
<td>27.9</td>
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</table>

#### 3b (East)

<table>
<thead>
<tr>
<th>State</th>
<th>2001</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td># tested</td>
<td>% positive</td>
<td># tested</td>
</tr>
<tr>
<td>OH</td>
<td>374</td>
<td>24.06</td>
</tr>
<tr>
<td>PA</td>
<td>370</td>
<td>21.62</td>
</tr>
<tr>
<td>KY</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>VA</td>
<td>366</td>
<td>30.60</td>
</tr>
<tr>
<td>NY</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>RI</td>
<td>39</td>
<td>30.77</td>
</tr>
<tr>
<td>TOTALS/AVG</td>
<td>1448</td>
<td>20.2</td>
</tr>
</tbody>
</table>
**Mycoplasma ovis Results**  
(NAHMS sheep sera 2001 & 2011)

### 2a (NorthCentral)

<table>
<thead>
<tr>
<th>State</th>
<th>2001</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># tested</td>
<td>% positive</td>
</tr>
<tr>
<td>ID</td>
<td>315</td>
<td>32.4</td>
</tr>
<tr>
<td>MT</td>
<td>391</td>
<td>31.2</td>
</tr>
<tr>
<td>WY</td>
<td>289</td>
<td>20.4</td>
</tr>
<tr>
<td>UT</td>
<td>190</td>
<td>26.3</td>
</tr>
<tr>
<td>CO</td>
<td>342</td>
<td>30.4</td>
</tr>
<tr>
<td>SD</td>
<td>385</td>
<td>28.8</td>
</tr>
<tr>
<td>KS</td>
<td>337</td>
<td>27.6</td>
</tr>
<tr>
<td>TOTALS/AVG</td>
<td><strong>2249</strong></td>
<td><strong>28.2</strong></td>
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### 2b (SouthCentral)

<table>
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<tbody>
<tr>
<td></td>
<td># tested</td>
<td>% positive</td>
</tr>
<tr>
<td>NM</td>
<td>168</td>
<td>12.5</td>
</tr>
<tr>
<td>TX</td>
<td>407</td>
<td>31.7</td>
</tr>
<tr>
<td>NV</td>
<td>200</td>
<td>34.5</td>
</tr>
<tr>
<td>TOTALS/AVG</td>
<td><strong>775</strong></td>
<td><strong>26.2</strong></td>
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</tbody>
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**Mycoplasma ovis Results**  
(NAHMS sheep sera 2001 & 2011)

<table>
<thead>
<tr>
<th>1. Western</th>
<th>2001</th>
<th>2011</th>
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</thead>
<tbody>
<tr>
<td>State</td>
<td># tested</td>
<td>% positive</td>
</tr>
<tr>
<td>WA</td>
<td>391</td>
<td>15.1</td>
</tr>
<tr>
<td>OR</td>
<td>369</td>
<td>24.1</td>
</tr>
<tr>
<td>CA</td>
<td>362</td>
<td>21.3</td>
</tr>
<tr>
<td>TOTALS/AVG</td>
<td>1122</td>
<td>20.2</td>
</tr>
</tbody>
</table>

**Overall Summary**

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>7391 24.5%</td>
<td>6668 (~1/2 done) 27.3%</td>
</tr>
<tr>
<td>1a West</td>
<td>1122 20.2</td>
<td>1008 17.0</td>
</tr>
<tr>
<td>2a Central – north</td>
<td>2249 28.2</td>
<td>3088 39.5</td>
</tr>
<tr>
<td>2b Central – south</td>
<td>775 26.2</td>
<td>283 28.5</td>
</tr>
<tr>
<td>3a East – midwest</td>
<td>1797 27.9</td>
<td>1646 32.6</td>
</tr>
<tr>
<td>3b East - east</td>
<td>1448 20.2</td>
<td>643 18.6</td>
</tr>
</tbody>
</table>
ARS-Range Sheep Production Efficiency
Research Unit
U.S. Experiment Sheep Station
**Mycoplasma ovis**

USSES Sheep Research Update

Overall *M. ovis* detection at USSES
% positive (number tested)

<table>
<thead>
<tr>
<th>Date sampled</th>
<th>EWES</th>
<th>LAMBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct-13</td>
<td>29.4</td>
<td></td>
</tr>
<tr>
<td>Feb-14</td>
<td>45.6</td>
<td></td>
</tr>
<tr>
<td>Apr-14</td>
<td>58.6</td>
<td>(319)</td>
</tr>
<tr>
<td>Jul-14</td>
<td>2.48</td>
<td>(322)</td>
</tr>
<tr>
<td>Sep-14</td>
<td>49.7</td>
<td>(380)</td>
</tr>
<tr>
<td>Feb-15</td>
<td>31.4</td>
<td>(347)</td>
</tr>
<tr>
<td>Apr-15</td>
<td>35.5</td>
<td>(355)</td>
</tr>
<tr>
<td>Jul-15</td>
<td>2.5</td>
<td>(315)</td>
</tr>
<tr>
<td>Sep-15</td>
<td>4.7</td>
<td>(192)</td>
</tr>
</tbody>
</table>
**Mycoplasma ovis**

USSES Sheep Research Update

**Ewes samples from lamb to adult (n=40)***
Mycoplasma ovis
USSES Sheep Research Update

Same ewes followed over time (n=143)

21% consistently positive
21% consistently negative
Mycoplasma ovis
Summary

• Widespread distribution in US (NAHMS)

• Seasonal prevalence variation not apparent at this time (USSES)

• Very low prevalence in lambs (USSES)

• Patterns of infection in ewes repeatedly sampled at USSES
  – Subsets of consistently (+) and (-) ewes (repeat sampling over 19 months)

• Records and repeat sampling of USSES sheep will allow for understanding potential effects of infection on production
Assess potential effects of infection on:

- Lamb average daily weight gain (limited by low # of infected lambs)

- Ewe infection/exposure status on lamb infection status
  - No association identified thus far (limited by low # of infected lambs)
  - Still need to investigate ewe antibody titers to *M. ovis* (infection benefit?)

- Lifetime production of infected ewes (wool, offspring)

Effect of flock size and operation type on prevalence
Thanks to.....

ADRU-ARS-USDA and WSU
- Don Knowles
- Nic Durfee
- Marley Iredale, Paige Grossman, Vince Delossantos
- Ralph Horn & James Allison
- Stephen White & Michelle Mousel

U.S.S.E.S. Dubois, ID
- Bret Taylor
- Animal Care Staff

USDA-APHIS (NAHMS)
- Katherine Marshall