Clinical Aspects of Veterinary Listeriosis

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Listeria monocytogenes

- All livestock species
- Cattle, sheep, goats
- Three clinical manifestations
  - Encephalitis
  - Abortion
  - Septicemia
Listeriosis cases 2000-2007
ISU Veterinary Diagnostic Lab

Number of Cases

- Abortion
- Bacterial Iso
- Encephalitis
- Septicemia

Bovine | Ovine | Camelid | Caprine
---|---|---|---
0 | 0 | 0 | 0
0 | 0 | 0 | 0
0 | 0 | 0 | 0
120 | 0 | 0 | 0

Courtesy of Randy Berghefer, ISU
Figure 5. Composite histogram showing the distribution of listeriosis cases submitted to Iowa State University, 1993–2000.

Diagnostic flow chart

Ruminant

Encephalitis

Brain into 10% buffered formalin

Hematoxylin and Eosin stain brain stem sections

Histopathology (Light Microscopy)
- Listeria lesions (mononuclear and neutrophil cuffing of vessels and microabscesses in brain stem)

Gram Stain and/or Immunohistochemistry to see Listeria in lesions

Bacteriology

May need to culture at 4°C (cold enrichment)

Wesley et al. 2002. Microbial Food Safety In Animal Agriculture pp.233-241
Encephalitis: Clinical Symptoms

- Depressed/disoriented
- Head pressing
- Circling
- Ataxia
- Head tilt
- Facial paralysis
- Facial hypoalgesia
- Paresis of jaw muscles
Differential Diagnosis

Listeriosis
Rabies
Thromboembolic meningoencephalitis (TEME)
Polioencephalomalacia
Transmissible Spongiform Encephalopathies (TSE)

etc.
### Methods Comparison

<table>
<thead>
<tr>
<th></th>
<th>Bact Isol</th>
<th>Gram (+)</th>
<th>IHC (+)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YES</strong></td>
<td>17/25</td>
<td>17</td>
<td>9/17</td>
</tr>
<tr>
<td><strong>NO</strong></td>
<td>8/25</td>
<td>8</td>
<td>3/8</td>
</tr>
<tr>
<td><strong>NO ATTEMPT</strong></td>
<td>13/38</td>
<td>13</td>
<td>6/13</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>17/25</td>
<td>13/38</td>
<td>31/38</td>
</tr>
<tr>
<td></td>
<td>(68%)</td>
<td>(34.2%)</td>
<td>(81.5%)</td>
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</table>

Immunohistochemistry (IHC)

Listeria in brain micro-abscess

Gram stain of ovine brainstem

IHC of *Listeria* in bovine brainstem

Case Histories

- Clinically healthy carriers!
- Bovine
- Sheep
- Alpaca
Encephalitis

- No gross lesions in brain
- Pervascular cuffing of vessels in brain stem
- Microabscesses in the neuropil
- Leptomeningitis may be present
- Ocular iritis and keratoconjunctivitis RARE
Species: Gov  Breed: Hol  Age:  Weight: 1000  Sex: Steer  ID(s): #11

No. At Risk: 50  No. Sick:  No. Dead: 1  Date Purchased: Winter 2006  Home raised:  

Housing:  Confinement  Pasture  Feedlot  X  Other housing (specify):  

Clinical Signs (onset, temperatures, etc)
Sun pm okay, Mon circling to right, no blink on right eye, tongue out a few inches, not squatting. Tues seemed weak and disoriented, stands at water, but not drinking. Wet down, paddling, died over night.

Ration / Feeding / Management  

Vaccination and Treatment History  Resp & Gi normal  

Date/Time of Death: 8 hrs  
Postmortem Decomposition: Minimal  Moderate  Severe

Post Mortem Findings  
Removal brain, tongue was normal (nothing wrapped around it.)
Microscopic Examination:
   The brain had scattered microabscesses in the brainstem.

Laboratory Results:
Bacteriology:
   Significant bacteria were not isolated from brain
   Listeria IHC: POSITIVE

Virology:
   Rabies FA: negative

Conclusions and Comments:
   A) Microscopic lesions and IHC results would support a diagnosis of Listeria encephalitis. (7/3/06 mjylcs)
<table>
<thead>
<tr>
<th><strong>HISTORY</strong></th>
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<tr>
<td>ID numbers</td>
<td>Number at risk</td>
<td>Source / Site</td>
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<tr>
<td>Species</td>
<td>Number sick</td>
<td>In confinement</td>
<td></td>
<td>yes</td>
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<tr>
<td>Breed</td>
<td>Number dead</td>
<td>On pasture</td>
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<td>yes</td>
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<tr>
<td>Age</td>
<td>Home raised?</td>
<td>Feedlot</td>
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<td>yes</td>
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<tr>
<td>Weight</td>
<td>Sex</td>
<td>Other (specify)</td>
<td></td>
<td>yes</td>
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<thead>
<tr>
<th><strong>CLINICAL SIGNS</strong></th>
<th>Please indicate which of the following clinical signs were observed:</th>
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<tbody>
<tr>
<td>CNS signs</td>
<td>Enteric</td>
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</table>

**Clinical signs (please describe)**

**Feeding and management**

**Vaccination**

**Treatments**

**Date/Time of death** 3/24 [Unknown]

**Post mortem decomposition**  ☑ Minimal  □ Moderate  □ Severe

**POST MORTEM FINDINGS**
Microscopic Examination:
Sections of brain and brainstem were evaluated. The brainstem had multifocal microabscesses and mild lymphoplasmacytic cuffs surrounding adjacent vessels.

Laboratory Results:
*Bacteriology.*
*Listeria* was isolated from brainstem. Sensitivity results are enclosed.
*Listeria IHC:* POSITIVE.

*Virology.*
Rabies FA: negative.

Conclusions and Comments:
Microscopic lesions, culture and IHC results would support a diagnosis of *Listeria* encephalitis. (3/31/06 mjy/vlt)
### HISTORY

<table>
<thead>
<tr>
<th>ID numbers</th>
<th>Number at risk</th>
<th>Source / Site</th>
<th>Species</th>
<th>Number sick</th>
<th>In confinement</th>
<th>Breeds</th>
<th>On pasture</th>
<th>Number dead</th>
<th>Feedlot</th>
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**Home raised?**  
- [ ] yes  
- [x] no

**Sex**  
- [ ] Fe

### CLINICAL SIGNS

Clinical signs (please describe)

Sat early p.m. Animal found down in feedlot, animal would not get up 104.8°F (Black hide in sun). A tx schedule was developed & animal died Monday late p.m.

### Feeding and management

### Vaccination

### Treatments

Exenel, Long Pericillin, Baramine, Thiamine, Sat Summar

### Date/Time of death

9/20/15 1100PM

### Post mortem decomposition

- [x] Minimal  
- [ ] Moderate  
- [ ] Severe

### POST MORTEM FINDINGS

Fatty liver, otherwise unremarkable

### DIFFERENTIAL DIAGNOSIS (if DDx includes rabies, attach completed Rabies Exam Submission Form)

Polio, TME, Listeriosis
**Microscopic Examination:**
Brain, heart, lung, liver, intestine and kidney were evaluated. Lesions were confined to the brainstem and consisted of mild lymphoplasmacytic perivascular cuffs and scattered aggregates of degenerate neutrophils within the neuropil.

**Laboratory Results:**
*Bacteriology.*
Brain and brainstem were cultured. Significant bacteria were not isolated.
*Listeria* IHC: negative.

**Conclusions and Comments:**
The type of lesion (microabscesses and perivascular cuffing) and location would be most consistent with *Listeria* encephalitis. (9/23/05 mjy/vlt)

**SUPPLEMENTAL REPORT**
Cold enrichment was negative for *Listeria*. (1/31/06 clm)
Species: Olive  Breed: Suffolk  Age: 10
Weight:  Sex:  ID(s): 
No. At Risk: 0  No. Sick: 1  No. Dead: 1  Date Purchased:  Home raised: 
Housing: Confined  Pasture:  Feedlot:  Other housing (specify) 
Clinical Signs (onset, temperatures, etc): Found down in pasture - owner thought overheated - couldn't right himself - today - Rigid, dysphagia - Tetany - Head pulled back 

Ration / Feeding / Management: Owner: Gave Banamine & Antibiotics yesterday 

Vaccination and Treatment History: 

Date/Time of Death: 7/14/05  Postmortem Decomposition: Minimal & Moderate & Severe 
Post Mortem Findings: Lungs: 

Differential Diagnosis: Enterovirus, Polio, Gross tetany - Overheating.
Client Phone: 1-641-482-3265  
Client Fax: 1-641-482-3271  
Client Account#: 401768  
Date Received: 7/20/2005  
Species: Ovine  
Breed: Suffolk  
Sex: Female  
Previous Case:  
Age: NA  
Weight: NA  
Received:  
1 head, fr/fxd tissue-Rabies/Other HE

Preliminary Results: Test results are listed below. Further laboratory examinations on the animal submitted are in progress as per your request. Laboratory findings will be forwarded when available. This report supplements the call to your clinic (Tonia) on July 20, 2005.

Microscopic Examination:  
Sections of cerebrum and brainstem have perivascular aggregates of lymphocytes, fewer macrophages and rare neutrophils. The brainstem also contains many variably-sized aggregates of neutrophils and lymphocytes randomly scattered in the neuropil.

Laboratory Results:  
Bacteriology:  
Culture - *Listeria monocytogenes* and *Mannheimia haemolytica* are isolated from brain.  
*Listeria* IHC - Positive.

Conclusions and Comments:  
- Rabies testing is NEGATIVE.

- Encephalitis with vasculitis and microabscesses.

- Histologic lesions are highly suggestive of *Listeria monocytogenes* infection. Bacterial culture results support this with positive growth of *Listeria monocytogenes*.

- IHC is Positive for *Listeria monocytogenes* organisms within lesions. (7/27/05 cml/clm)
IHC of *Listeria* in ovine brainstem

Septicemia (generalized listeriosis)

Most common in neonates
Fever
Depression
Emaciation
Diarrhea
Nystagmus
Opisthotonos
Courtesy of Deb Hoyt, ISU
**HISTORY**

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<thead>
<tr>
<th>ID numbers</th>
<th>Number at risk</th>
<th>Source / Site</th>
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<table>
<thead>
<tr>
<th>Species</th>
<th>Number sick</th>
<th>In confinement</th>
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<td>Bovine</td>
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<table>
<thead>
<tr>
<th>Breed</th>
<th>Number dead</th>
<th>On pasture</th>
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<td>Angus</td>
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<th>Home raised?</th>
<th>Feedlot</th>
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<tr>
<td>1 hr old</td>
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<thead>
<tr>
<th>Weight</th>
<th>Sex</th>
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<tr>
<td>60 lbs.</td>
<td>no</td>
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**CLINICAL SIGNS**

Please indicate which of the following clinical signs were observed:

- [x] CNS signs
- [ ] Enteric
- [ ] Respiratory
- [ ] Reproductive
- [ ] Other

Clinical signs (please describe):

Calves are only one to two hours old and are weak and having opisthotonos and cold.

**Feeding and management**

Bred Heifers are on Alfalfa Hay, Silage, & mineral.

**Vaccination**

**Treatments**

**Date/Time of death**

Post mortem decomposition
- [x] Minimal
- [ ] Moderate
- [ ] Severe

**POST MORTEM FINDINGS**

None

**DIFFERENTIAL DIAGNOSIS** (If DDx includes rabies, attach completed Rabies Exam Submission Form)

- Hypothermia
- Hypoglycemic
- Listeriosis
Client Phone: 1-641-842-2437  
Client Fax: 1-641-842-2524  
Client Account#: 401934  
Date Received: 2/12/2007  
Previous Case:  
Species: Bovine  
Breed: Angus  
Sex: NA  
Age: 1 Hours  
Weight: 60 Pounds  
Received:  
Fr/fxd tissue

Tissues were received from a live-born angus calf.

**Microscopic Description:**
There were no remarkable lesions in the tissues examined.

**Bacteriology:**
*Listeria monocytogenes* was isolated from the liver.

**Diagnosis:**
*Listeria monocytogenes* septicemia (2/16/07 dmj/kw)
Abortion

• Sporadic or up to 15% of herd

• Usually in last trimester without clinical signs (~280 day gestation-bovine)

• Fetus dies *in utero*, stillbirths, neonatal deaths

• Dystocia, retained placenta
Species: bovine
Breed: Angus
Age: 2 yr
Weight: 
Sex: 
ID(s): 
No. At Risk: 60
No. Sick: 
No. Dead: 2
Date Purchased: 14 Jan 03
Home raised? 

Housing: 
Confinement 
Pasture 
Feedlot 
Other housing (specify): 
stalls

Clinical Signs (onset, temperatures, etc): 
2 of 14 purchased life
aborted 
6 other fetuses on 2/20/03
5-6 live fetuses on 2/22/03

Ration / Feeding / Management: 
Vaccination and Treatment History: 
dams of purchased unknown
did "all shots"

Date/Time of Death: 
Postmortem Decomposition: Minimal / Moderate / Severe:

Post Mortem Findings: 
8 1/2 mo. fetuses down dead
renegade kidneys, nothing else

Differential Diagnosis: BVD / Lepto
Microscopic Examination:
Sections of heart, spleen, liver and kidney were evaluated. Scattered colonies of bacteria were identified in the liver, spleen, and kidney.

Laboratory Results:

Bacteriology:
A heavy growth of *Listeria* was isolated from liver.
FA negative for *Leptospira*.

Virology:
IHC negative for BVDV – fetal tissues.
IHC’s negative for BVDV – all four skin specimens.
FA negative for IBRV.

Conclusions and Comments:
A) Microscopic lesions and culture results would support a diagnosis of *Listeria* abortion.
B) All four ear notches were negative for BVD. (2/26/03 mly/inw)

SUPPLEMENTAL REPORT
Serology results are appended. (3/3/03 na)
Species:  
Breed: Alpaca  
Age: 4 months  
Weight: Sex:  
ID(s):  
No. At Risk: 9  
No. Sick: 0  
No. Dead: 0  
Date Purchased:  
Home raised?  
Housing: Confinement:  
Pasture:  
Feedlot:  
Other housing (specify):  
Clinical Signs (onset, temperatures, etc):  
Aborted fetus - dam healthy, no concerns with her.

Ration / Feeding / Management:  
Vaccination and Treatment History:  

Date/Time of Death: 12 hrs.  
Postmortem Decomposition: Minimal  
Moderate  
Severe  
Post Mortem Findings:  

Differential Diagnosis:  

ADDITIONAL REMARKS / OTHER SPECIFIC INSTRUCTIONS:  
Microscopic Examination:
Sections of lung, liver, spleen, GI and placenta are unremarkable.

Laboratory Results:

Bacteriology:
Culture - *Listeria monocytogenes* and *Staphylococcus epidermidis* are isolated from fetal tissues.
Cultures for Chlamydia - Negative.
Chlamydia ELISA - Negative.

Conclusions and Comments:
Abortion due to *Listeria monocytogenes* (12/6/04 cml/cml)

**KEY:** Tests: iHC=Immunohistochemistry, FA=Fluorescent Antibody, VI=Virus Isolation, PCR=Polymerase Chain Reaction, EM=Electron Microscopy.

<table>
<thead>
<tr>
<th>Test Ordered</th>
<th>Order Date</th>
<th>Current Status</th>
<th>Complete Date</th>
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Histopathology

Hematoxylin and Eosin Slides

<table>
<thead>
<tr>
<th>Animal ID</th>
<th>Specimen</th>
<th>Slides</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abortion</td>
<td>Assorted</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Conclusion

• Progress since 1926!
• Molecular methods complement diagnostic assays
Acknowledgements

James Fosse, Visual Services
Randy Berghefer, Computer Specialist
Deb Hoyt, Medical Technologist
Dr. Amir Hamir, Pathologist