Abortion and premature birth in cattle following vaccination with *Brucella abortus* RB51

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Brucellosis in the GYA

- Endemic in elk and bison-MT, ID, WY
- At-risk areas use adult vaccination
  - Approval of state vet and APHIS vet
Vaccines

- **RB51**
  - Less abortigenic, no clinical signs, cleared rapidly, not secreted
  - Safe in cattle 3 mo +
  - Calves 4-12 mo
  - $1.0-3.4 \times 10^{10}$
Adult vaccination

- Risks, not routinely used
- RB51 infect placenta, mammary gland, fetal tissues
- Losses due to RB51 in field unknown
- 0.52% abortion rate for 40,000 cattle in Spain

Location

- Sublette Co., WY
  - Inside DSA
  - 13/23 feedgrounds
  - 2003 last brucellosis outbreak here
    - 31 reactor cattle

- WSVL
  - 3 herd episodes abortion due to RB51

http://wlsb.state.wy.us/Animal%20Health/Pics/New%20DSA.jpg
Herd A-2007

- 4 herds totaling 1,600 pregnant cattle
- Vacc at 4 mo gestation, full calfhood dose
- Herd A
  - 101 days post vacc
  - Late term abortion, retained placenta
  - Std calfhood vacc in Oct 2006
– Losses continued 49 days
– 9 abortions, 5 stillborn/premature calves, 5 assumed abortions

• Total: 19/360 (5.3 %)
• Historical losses for Herd A = 0.2-0.5%/yr
• Remaining 3 adult vacc herds- no reported loss
  – Near index herd of 2003
  – Unbred cattle addtl vacc in spring 2006
Herd B-2009

- Total loss: 3/475 (0.6%)
  - 2 abortions, 1 premature weak calf
  - 1st calf, 3 yo heifers

- 2 yr + cattle vacc with calfhood dose at 3-5 mo gestation in Nov 2008

- Herd mgmt plan change
  - Old: Calf vacc w/ adult booster in spring
  - New: fall vacc.
  - 3 yo cattle: calf vacc in spring 2006, adult vacc in Nov 2008
Methods

• Aborted fetuses and neonatal calves necropsy
  – 9 animals total + 1 placenta
• Fixed tissues/histopathology
• Bacteriologic culture
• PCR
  – BaSS-PCR using DNA extracted from killed cells
Results Summary

• 5 abortions, 4 premature weak calves (total)
  – Additional abortions (3 + 5 assumed), stillborn (2) and weak calves (2) reported in herds not submitted to WSVL
  – RB51 cultured from:
    • Liver, lung, abomasum, spleen, rumen contents and additional pooled samples, placenta (1 submitted)

– Lesions observed:
  • Lung (8 animals), abomasum, liver, lymph node, thyroid, thymus, umbilicus, placenta, kidney, spleen
Results Summary

• Virology
  – Virus isolation-negative
  – BVDV-1 and 2- IHC negative, ear notch ELISA negative
  – BoHV-1- FA negative
BaSS-PCR results

• All isolates confirmed as RB51
  – Lane 1: neg control
  – Lane 2-6: RB51 control
  – Lane 7-10: DNA from bacterial culture
<table>
<thead>
<tr>
<th>Animal Type</th>
<th>Bacteriology</th>
<th>Histology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abortion</td>
<td>4/4 liver, abomasum, lung, rumen contents</td>
<td>4/21 lung, abomasum, liver, mesenteric LN</td>
</tr>
<tr>
<td>Premature weak calf</td>
<td>3/3 liver, abomasal content, lung</td>
<td>3/21 thyroid, tongue, umbilicus</td>
</tr>
<tr>
<td>Premature weak calf</td>
<td>0/3</td>
<td>5/19 lung, thymus, LN, umbilicus, thyroid</td>
</tr>
<tr>
<td>Abortion</td>
<td>0/3</td>
<td>2/5 lung, liver</td>
</tr>
<tr>
<td>Abortion and 2 premature weak calves-pooled (NVSL)</td>
<td>Positive pooled samples</td>
<td>1/4 lung</td>
</tr>
</tbody>
</table>
## Herd B Results

<table>
<thead>
<tr>
<th>Animal Type</th>
<th>Bacteriology</th>
<th>Histology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abortion</td>
<td>3/3</td>
<td>1/21 Lung</td>
</tr>
<tr>
<td></td>
<td>Lung, spleen, stomach content</td>
<td></td>
</tr>
<tr>
<td>Abortion</td>
<td>3/3</td>
<td>4/7 Placenta, lung, kidney, spleen</td>
</tr>
<tr>
<td></td>
<td>Placenta, lung, stomach contents</td>
<td></td>
</tr>
</tbody>
</table>
Conclusions

• Total losses in Herd A = 5.3%
  – Normal in herd 0.2-0.5%
  – 7 calves died, RB51 isolated
  – 3 other vacc herds=no loss
  – Herd A vacc 1x
  – Other herds vacc 2x

• Herd B = 0.6%
  – 3 dead calves
  – RB51 isolated in 2 (1 NT)
  – 3 yo heifers
  – Calf vacc in spring 2006, booster in fall 2008 midgestation
Conclusion

• Pregnant cattle vaccination
  – One detailed report
  – 14.5 mo heifer
  – Bact isolation, PCR confirm
  – Placentitis, fetal pneumonia
• Iran Yazdi HS, et al. Vet Rec 165:570-571
  – Reduced dose during pregnancy $10^9$
  – 4 abortions, 2 vaccinates
  – RB51 from 1 fetus
  – Horizontal transmission?

  – 78/897 tissues from aborting cattle
  – 14,893 cattle vaccinated
RB51 Safety

• Palmer et al. 1996. Vet Pathol 33:682-691
  – RB51 infects maternal, fetal tissues
  – Placentitis
  – Premature birth

• Lower doses safe in pregnancy?
  – $1 \times 10^9$
  – $2 \times 10^9$ calfhood, RB51 when pregnant
  – $3 \times 10^{10}$ midgestation
  – $4 \times 10^{10}$ day 60 gestation, 2308 challenge

4: Poester et al. 2006 Vaccine 24:5327-5334
RB51 Safety

• Reduced dosages
  – Not field trials
  – Eval prior to breeding
• Size of dose
• Timing
WY Bovine abortion

- Abortion causative agent
  - 30-40% success
- No BoHV-1 or BVDV
- Histology indicative of bacterial infection
- Ranching in WY
  - Carcass recovery
  - Observations
RB51 as causative agent

- Pathology similar to *B. abortus*
- Isolation of RB51 in affected tissues
- Rare occurrence
- Dose? Efficacy? Risks?
- Herd management plans
- Diagnostic testing
Prevention

• Adult vaccination?
  – Vaccinate before breeding
  – Dose?
  – Time of gestation? Earlier?

• Balance risks
  – Herd management
  – Other factors
  – DSA of GYA
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