Vaccinating Young Calves: What do we know about pre-weaning respiratory disease in beef calves

When we think of bovine respiratory disease (BRD) in beef cattle we often think of the “shipping fever” pneumonias that occur in weaned calves shortly after arrival in the feedlot. Respiratory disease is the most common cause of death of feedlot cattle, and a great deal of the research has been focused on the disease at this stage of production. However, BRD is also the most common cause of death for nursing beef calves over 3 weeks of age and much less is known about the syndrome in this age class.

Researchers from the USDA Agricultural Research Service Meat Animal Research Center tracked the annual incidence of BRD in pre-weaned calves in their research herd. Over a 20 year period, the annual incidence varied from a low of 3% of calves affected to a high of 24%, with an overall annual average of 11%. On average, the mortality rate of calves suffering from pre-weaning BRD was 13%.

A research team led by Dr. Amelia Woolums surveyed cow-calf producers from 3 Eastern states (Florida, Georgia and West Virginia) and from 3 Plains states (Iowa, Kansas and Nebraska) in an attempt to learn more about this poorly understood disease. Approximately one out of every 5 herds reported having some calves with respiratory disease prior to weaning and almost half of these herds with pre-weaning BRD cases reported having at least one calf die from BRD pre-weaning. The most common age group reported as having BRD were calves between one to four months of age.

The survey included questions on a wide variety of management practices and the research was able to identify a number of risk factors associated with the occurrence of pre-weaning BRD. Larger herds were more likely to have calves affected with pre-weaning BRD. The occurrence of diarrhea in the calves and respiratory disease in adult cows was also associated with the occurrence of pre-weaning BRD. The occurrence of diarrhea in calves may be related to a lack of colostrum intake which is a predisposing factor to many infectious diseases in calves including pneumonia and diarrhea. Diarrhea has also been shown to be associated with the development of respiratory disease in dairy calves. Control of diarrhea in beef herds by ensuring adequate colostral intake and through environmental management may also help to control pre-weaning pneumonia.

When Dr. Woolum’s research team examined the incidence of pre-weaning BRD in these herds they were able to identify a number of other risk factors including introducing calves from outside sources, feeding of creep feed to nursing calves, and the use of estrous cycle synchronization programs for cows or replacement heifers.

Introducing calves from outside sources is an obvious biosecurity risk as we may be introducing calves carrying a variety of respiratory disease pathogens into the herd. Bringing young calves into the herd also brings the risk of introducing Bovine virus diarrhea virus (BVDV) into the herd. Bovine virus diarrhea virus can infect other calves and cause severe immune system suppression making calves more likely to pneumonia or other infectious diseases. A number of the outbreaks of pre-weaning BRD that I have had the opportunity to investigate have been related to the introduction of purchased calves that were infected with BVD virus.
Why would feeding creep feed or the use of estrous synchronization programs be a potential risk factor for bovine respiratory disease in pre-weaned calves? Both procedures may bring more contact between calves in the creep feeding area or during confinement while management procedures are carried out for estrous synchronization. Herds that utilize these management procedures may actually increase the opportunities for disease transmission between calves or from cows to calves. It was emphasized that both creep feeding and estrous synchronization programs are useful management tools and that modifications of calf-handling practices or increasing the strength of immunity of calves through appropriate vaccination programs might help to lower the incidence of disease in herds that utilize these management procedures.

The results of this particular research study demonstrate that pre-weaning respiratory disease of beef calves is not an uncommon problem. Some simple biosecurity practices such as not introducing calves from other sources into the herd at this time may help to prevent some of these outbreaks from occurring. If you utilize management procedures that involve concentrating or grouping calves together at multiple times such as creep feeding or estrous synchronization, you should attempt to minimize the confinement of the calves and ensure that the calves immunity is maximized through adequate colostral intake and appropriate vaccinations.

Investigating outbreaks of respiratory disease in young calves can be a difficult endeavour. There are often few mortalities and those calves that do die often have chronic lesions that are predominated by secondary bacteria. These lesions may not be indicative of what the initiating problem was in these calves. Secondary infections with Pasteurella multocida and Histophilus somni are common findings in these cases, however the pathogens that initiated the infection may be quite different. Deep nasal swabs may be submitted for viral isolation if taken from new cases and may provide some evidence of the initial viral infection. Acute and convalescent serum samples submitted for serology to BRSV, BVD, PI3 and Coronavirus is often the most useful diagnostic material in these cases, although interpretation of serology results can be confusing at times, especially in vaccinated calves. Several outbreaks of pre-weaning respiratory disease that we have investigated have resulted from exposure to persistently infected BVD calves and serology may help to identify this exposure. Testing for PI’s with ear notches will be necessary in order to find and remove the PI calves.

A careful evaluation of management procedures is an important component of these investigations. Risk factors such as colostrum management, stocking density, dust exposure, time spent in calving barn, and other factors such as group of calves for various procedures such as estrous synchronization should be considered. The vaccination history and vaccine protocols may need updating depending on the results of some of the diagnostic samples.

Vaccinating young calves is filled with more questions than answers and unfortunately the practicing veterinarian does not have a lot of solid evidence in terms of field trials to consider. The development of the immune system progresses in a stepwise progression from conception until about 6 months after birth. The neonate depends significantly on passive transfer from the dam and one of the major challenges in developing an active immune response in young calves has been interference from maternal immunity. Information from dairy calf studies would suggest the prime window for
vaccination could be anywhere from a few weeks to several months of age. This window depends on the level of circulating maternal antibody and the antigen. However, there is some evidence that we can now stimulate an immune response with vaccines in the face of maternal immunity in calves shortly after birth. It would appear that this immune response would appear to be better in calves that are several weeks of age but can even be shown in calves vaccinated at birth.

The bigger challenge is that we have very little evidence to demonstrate the level of protection that these vaccines will provide to protect the calf from pre-weaning respiratory disease on pasture. There are very limited studies that can demonstrate a lowered risk of pneumonia in calves due to vaccination and even fewer that are done in beef calves. We have some evidence that if we vaccinate young calves, they will respond with an anamnestic response when they are vaccinated at weaning upon entry to the feedyard, but even this evidence is quite limited. These field trials are very expensive and difficult to carry out, and it makes it difficult to give definitive recommendations for vaccine protocols with regards to pre-weaning BRD prevention.

Pre-weaning respiratory disease continues to be an economically important disease for some cow-calf herds. Identifying the root causes of these outbreaks can be a difficult enterprise which requires the herd veterinarian to utilize a variety of diagnostic tools, careful history taking and monitoring of management.

REFERENCES


Woolums, Amelia R. Effect of calf age and administration route of initial multivalent modified-live virus vaccine on humoral and cell-mediated immune responses following subsequent administration of a booster vaccination at weaning in beef calves. American journal of veterinary research 74.2 (2013): 343-354.


Early Findings from the Western Canadian Beef Cow Calf Surveillance Network Project

Collaborators

• Dr. Sarah Parker (WCVM)
• Dr. Cheryl Waldner (WCVM)
• Dr. Murray Jelinski (WCVM)
• Dr. Claire Windeyer (UCVM)
• Dr. Eugene Janzen (UCVM)
• Kathy Larson (WBDC)
• Dr. Eric Michaels (Agricultural Economics)
• Dr. Joe Stockley (WCVM)

• Graduate Students/Summer Students/Technical Help
  • Karen Gey (WCVM)
  • Dr. Felicity Wills (WCVM)
  • Dr. Melissa Moggy (UCVM)
  • Mang Lai (Ag Ec, U. of S.)

• Participating Producers and Veterinarians

Outline of the Project

• Establish a western Canadian cow-calf surveillance network
• Recruit approximately 120 beef cow-calf herds from across Canada
• Herds recruited would attempt to reflect the most important regional, demographic and size characteristics of the national herd
• Create a “living laboratory” for ongoing beef cow-calf research
• Periodic surveys on a variety of production/disease topics (3/yr)
• Biological sampling at least every other year from each herd with the help of local veterinary practices
• Creation of a serum bank for use in future projects
• “NAHMS North”
Objectives

- Provide Baseline information on a variety of topics including:
  - Productivity Levels
  - Economics and Marketing
  - Nutrition
  - Animal Welfare Practices
  - Biosecurity Practices
  - Antimicrobial Use

- Be able to provide a critical resource that could be readily accessed to provide timely answers to emerging research questions

Current status of the project

- Funding of the project is primarily through Beef Cattle Research Council through the Beef Cluster Funding of Growing Forward
- Substantial additional funding from Saskatchewan Agriculture and Food in each year of the project
- Alberta Beef Producers and Alberta Livestock and Meat Agency have provided funding for parts of additional projects
- Nearing end of year 3 of a 5 year project

Geographic Location of Participating Herds
Some Herd Demographics

- 95.5% of herds have commercial cattle
- 22.7% have purebred cattle
- 37.5% background calves
- 9% of herds also have a feedlot
- Alberta Herds: 53
- Saskatchewan Herds: 32
- Manitoba Herds: 19
- Average Herd Size: 346 cows

Age distribution of herd managers

Distribution of Herd Size of Nominated Participants
Reproductive Management

- 91% of herds calve between April and July
- 32% start calving in June
- 93% utilized veterinarians for breeding soundness examination of bulls
- 24% of herds tested bulls for Trichomoniasis
- 90% had a defined breeding season
  - Average length of breeding season was 77 days
- 20% utilized artificial insemination in at least a portion of their herd
- 38% of herds utilized estrus synchronization programs
- Mean pregnancy rate was 90% in cows and 88% in heifers

Some Productivity Measures

- Abortion Rate: 1.7%
- Stillborn Percentage: 2.0%
- Calf death loss (birth to weaning): 3.5%

Antimicrobial Use Survey

- Dr. Waldner designed a paper-based survey that was pilot tested with a group of 20 producers and veterinarians
- Created an antimicrobial handbook that included drug names and photographs of packaging material to serve as a reference
- Utilized a survey with questions divided into 2 sections
  - Antimicrobial use practices in 4 classes of animals
    - Unweaned calves
    - Weaned calves
    - Cows
    - Bulls
  - Attitudes towards antibiotic use and decision making strategies
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Reasons for Treatment

• Unweaned Calves: Respiratory disease, diarrhea and navel ill
• 37% of producers reported using 2 or more antimicrobials for diarrhea (35% for respiratory disease)
• Weaned Calves: Respiratory disease and ocular infections
• Adult cows and bulls: Lameness
• Disease Prevention
  • 17% of producers utilized antimicrobials in unweaned calves
  • 28% in weaned calves
  • 14% in adult cows
  • 6% in bulls

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Top 2 drugs used for bulls and cows

• Bulls
  • Oxytetracycline 52% (76/145)
  • Penicillin G Procaine 12% (17/145)
• Cows
  • Oxytetracycline 48% (166/349)
  • Penicillin G Procaine 15% (54/349)

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Top Drugs for calves

• Unweaned calves
  • Florfenicol/flunixin 26% (114/439)
  • Oxytetracycline 19% (83/439)
  • Sulfamethazine 12% (53/439)
  • Florfenicol 11% (49/439)
• Weaned calves
  • Oxytetracycline 33% (88/268)
  • Florfenicol/flunixin 18% (48/268)
Welfare and Pain Mitigation Survey
(Melissa Moggy, Claire Windeyer, UCVM)

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Extent to which respondents were familiar with the "Code of practice for the care and handling of beef cattle" n=89.

<table>
<thead>
<tr>
<th>Familiarity</th>
<th>N</th>
<th>Very familiar</th>
<th>Somewhat familiar</th>
<th>Not too familiar</th>
<th>Not at all familiar</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>20.2% (18)</td>
<td>32.6% (29)</td>
<td>34.8% (31)</td>
<td>12.4% (11)</td>
</tr>
</tbody>
</table>

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Extent to which respondents perceived procedures as painful if no pain mitigation was performed.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Strongly agree</th>
<th>Somewhat agree</th>
<th>Neither agree</th>
<th>Somewhat disagree</th>
<th>Strongly disagree</th>
<th>No opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Castration</td>
<td>31%</td>
<td>40%</td>
<td>19%</td>
<td>2.3%</td>
<td>0%</td>
<td>5.8%</td>
</tr>
<tr>
<td>Dehorning</td>
<td>58%</td>
<td>28%</td>
<td>8%</td>
<td>3.4%</td>
<td>0%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Branding</td>
<td>56%</td>
<td>29%</td>
<td>8%</td>
<td>0%</td>
<td>0%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Dystocia</td>
<td>45%</td>
<td>45%</td>
<td>5%</td>
<td>1.2%</td>
<td>1.2%</td>
<td>3.5%</td>
</tr>
<tr>
<td>Caesarean section</td>
<td>71%</td>
<td>20%</td>
<td>3%</td>
<td>0%</td>
<td>2.3%</td>
<td>3.3%</td>
</tr>
</tbody>
</table>
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Age at Castration: % of all bull calves

- < 1 week: 51%
- 1 week – 3 months: 44%
- 3 – 6 months: 4%
- 6 – 9 months: 1%
- > 9 months: 1%

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Pain mitigation strategies at castration

<table>
<thead>
<tr>
<th>Age at time of castration</th>
<th>&lt; 1 week old (%</th>
<th>1 week – 3 months old (%</th>
<th>3 – 6 months old (%</th>
<th>6 – 9 months old (%</th>
<th>&gt; 9 months old (%</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSAID at time of castration</td>
<td>2.3%</td>
<td>4.6%</td>
<td>18.5%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>NSAID &gt; 24 hours after castration</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sedation</td>
<td>0</td>
<td>0</td>
<td>10%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Local anesthetic</td>
<td>0</td>
<td>0</td>
<td>10%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Epidural</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>7.1%</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No pain mitigation given</td>
<td>96.1%</td>
<td>95.4%</td>
<td>80%</td>
<td>85.7%</td>
<td>100%</td>
</tr>
</tbody>
</table>

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Weaning strategies used by respondents

- Abrupt weaning: 71.9% (64)
- Fence-line weaning: 19.1% (17)
- Two-stage weaning: 2.2% (2)
- Other*: 6.7% (6)

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Biological Sampling
• 20 pregnant cows randomly selected at pregnancy testing for blood sampling
• Pooled fecal samples also taken from 20 cows
• Samples were also collected from bulls in the spring of the year for T. foetus and Campylobacter testing
• Second year of sampling will begin this fall
• Samples have been evaluated for trace mineral levels and Johnes disease to date

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Johne’s Disease

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Johne’s Disease Prevalence
• Overall prevalence of Johne’s disease was 28 serologically positive or suspect out of 1811 cows tested (1.55%)
• 23.6% of herds (93 in total) had at least one cow test serologically positive for Johnes disease
• 5.4% of herds had at least two cows test serologically positive for Johnes disease
• How does this compare to other studies?
PLDC Mycobacterium paratuberculosis Serology

Results

- 4778 cows tested from 179 herds in total
- 37 Positive cows (0.77%)
- 21/179 herds had at least one cow test positive (11.7%)
- 8/179 herds had at least two cows test positive (4.47%)
- Waldner et al (2002) sampled Saskatchewan community pastures and found a cow level prevalence of 0.8%

Dairy Prevalence: Canada

- 1986: 304 Ontario dairy herds
  - Infection rate of 6.1% based on ELISA
- 1999: 53 Alberta dairy herds
  - 7.3% of cows positive on ELISA
  - Adjust to 14% based on test performance
  - 58% of herds had positive cows
  - 24% of herds positive by fecal culture
  - 1.3% of cows positive by fecal culture

PLDC Studies: Dairy, 1999

- ELISA based testing
- Ontario
  - 37% of herds positive
  - 2.2% of cows positive
- Maritimes
  - 43% of herds positive
  - 2.6% of cows positive
Trace mineral analysis

Trace Mineral Results
- Trace mineral analysis performed on individual serum samples
- Vitamin analysis also performed but results may be questionable (storage issues)
- Approximately 2050 cows sampled across the entire herd network

Suggested serum reference values for adult beef cows (ppm)

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Deficient</th>
<th>Marginal</th>
<th>Adequate</th>
<th>Toxic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>0.002-0.050</td>
<td>0.10-0.20</td>
<td>0.30-0.80</td>
<td>--</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>0.36-2.0</td>
<td>2.0-3.0</td>
<td>4.0-22.0</td>
<td>--</td>
</tr>
<tr>
<td>Cobalt</td>
<td>0.09-0.15</td>
<td>0.15-0.20</td>
<td>0.4-1.5</td>
<td>--</td>
</tr>
<tr>
<td>Copper (no supplemental Selenium)</td>
<td>0.02-1.0</td>
<td>0.5-1.2</td>
<td>0.6-2.5</td>
<td>2.5-4.0</td>
</tr>
<tr>
<td>Copper (with supplemental Selenium)</td>
<td>0.10-1.2</td>
<td>0.30-1.2</td>
<td>0.32-1.2</td>
<td>0.5-2.5</td>
</tr>
<tr>
<td>Iron</td>
<td>0.15-1.3</td>
<td>1.3-2.5</td>
<td>4.0-6.0</td>
<td>18.0-25.0</td>
</tr>
<tr>
<td>Magnesium</td>
<td>1-11</td>
<td>6-8</td>
<td>18-30</td>
<td>40-75</td>
</tr>
<tr>
<td>Manganese</td>
<td>--</td>
<td>0.005-0.006</td>
<td>0.006-0.070</td>
<td>0.08-0.080</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>--</td>
<td>--</td>
<td>0.01-0.10</td>
<td>0.08-10.0</td>
</tr>
<tr>
<td>Selenium (natural)</td>
<td>0.002-0.025</td>
<td>0.03-0.06</td>
<td>0.08-0.30</td>
<td>2.5-3.5</td>
</tr>
<tr>
<td>Selenium (Selenite Se supplement)</td>
<td>--</td>
<td>0.020-0.060</td>
<td>0.025-0.150</td>
<td>0.80-3.5</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.20-0.40</td>
<td>0.50-0.60</td>
<td>0.80-1.4</td>
<td>1.3-16.0</td>
</tr>
</tbody>
</table>

Range of individual serum copper values

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Range of individual serum molybdenum levels

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Widespread Copper Deficiency

- 75.6% of all cows sampled (1550/2050) were classified as deficient
- <0.6 ppm used as cutoff point for deficient versus adequate
- Alberta: 74.0% of cows deficient
- Saskatchewan: 76.7% of cows deficient
- Manitoba: 78.3% of cows deficient
- Very similar to previous studies (75% in community pasture study by Vanderweyer et al, 2011)
- Are these cut points for classifying deficiency appropriate?
- Are there clinical impacts?
- Serum copper prior to breeding may be more useful predictor of pregnancy outcome (Vanderweyer et al, 2011)
High Molybdenum Prevalence
- 13.1% of cows with high Molybdenum levels
  - Alberta: 12.2% of cows
  - Saskatchewan: 17.5% of cows
  - Manitoba: 7.8%

Range of individual serum selenium levels
Deficient <0.08 PPM

Selenium Deficiency
- Defined at <0.08 ppm
- 21.7% of all cows sampled were classified as deficient (445/2050)
  - Alberta: 32.7% of cows deficient (NW Alberta = 42.5%)
  - Saskatchewan: 8.2% of cows deficient
  - Manitoba: 13.1% of cows deficient
- Clinical impact?
- Reasons for regional differences?
Issues with the Project

- Recruitment and maintenance of network herds remains a constant issue
- Survey fatigue with producers despite honorarium payments
- Majority of producers still want to do paper surveys over internet based electronic surveys
- Time lag for data entry, data checking and analysis is too long to create an "early warning" system
- However, the network has provided an easily accessible group of herds that can be used for multiple projects over the 5 year span of the project

Funding Acknowledgements
Dealing with Johne’s Disease in the Beef Herd: A simplified approach

John Campbell DVM DVSc

As practitioners, we are all comfortable with diagnosing Johne’s disease in an individual animal either via clinical signs or by gross pathology. The characteristic symptoms of progressive weight loss, chronic watery diarrhea are easily identifiable and as the disease progresses and plasma protein concentrations drop, subcutaneous edema may develop especially in the submandibular area or the brisket. On postmortem, the thickened mucosa and prominent Peyer’s patches of the ileum and the granulomatous infiltrate can extend from the ileum into the cecum, jejunum and even sometimes the colon.

The major challenge is not usually the individual animal diagnosis in the beef cow. The dilemma most practitioner’s face is what to do next with the rest of the herd. The choices of a variety of diagnostic tests and approaches can be overwhelming and there is a little guidance available for dealing with the disease in the cow-calf herd as most of the research has been focused on the dairy herd. This presentation will attempt to simplify the approach for the veterinarian who has a client with a recent diagnosis of Johne’s disease in their herd.

Chronic watery diarrhea and significant weight loss in cattle greater than two years old are features of Johne’s disease, caused by persistent infection with *Mycobacterium avium* subspecies *paratuberculosis* (MAP). Young calves or previously unexposed mature cattle may become infected by oral ingestion of the bacterium due to environmental contamination by an infected herd mate shedding MAP in manure. Typically, clinical signs of infection only become apparent at least two years, or longer, after failing to clear the primary infection. Chronically infected individuals may intermittently shed bacteria in manure and milk in the absence of clinical sings for several years, increasing the risk of exposure and infection for calves and MAP-naive herd mates.

Past estimates of MAP seroprevalence in Alberta and Saskatchewan cow-calf herds ranged from 0.8% to 1.5% (1-3), while US sero-surveillance studies have reported greater variation in MAP prevalence from 0.4% to 9.0%. Current knowledge of exposure rates in North American dairy herds estimates cow-level exposure to MAP around 5-10% while nearly 70% of herds are considered positive based on at least one positive composite fecal culture result for MAP. Although the estimated prevalence of MAP seropositivity in Western Canadian beef herds is low, recent evidence suggests infection of dams with MAP can result in negative cow and calf production consequences. Bhattarai *et al.* determined calves born to MAP seropositive dams were more likely to have a significantly lower 205-day adjusted weaning weight versus herd mates born to seronegative dams. Studies on Angus/Brahman mixed beef herds in the Southeastern US have shown that MAP seropositive cows were more likely to have increased days open post-calving and weaned lighter calves versus their seronegative herd mates.

Our most recent estimate of MAP seroprevalence in Western Canada comes from our recent Western Canadian Cow-Calf Surveillance Network Project. In this study, local practitioners collected blood samples from a total of 1811 cows from 93 herds in Alberta, Saskatchewan and Manitoba. Serum from blood samples collected from participating herds was tested by an ELISA for the detection of MAP antibodies (IDEXX, Westbrook, ME). Results were used to establish a positive or negative exposure status for individual cows according to a sample to positive ratio (S/P) > 0.60. Serologic evidence of infection as determined by MAP antibody ELISA was observed in 28 of 1811 cows sampled, translating to
a 1.55% (1.1 – 2.2, 95% CI) apparent disease prevalence. If test sensitivity and specificity are considered the true prevalence is estimated to be 0.8% (0 – 1.7, 95% CI). No significant difference was noted for individual cow MAP exposure rates between provinces. Herd were classified as positive herds if two or more cows tested serologically positive. Using this definition, 5.38% of herds tested in the surveillance network were positive.

The decisions on how to approach controlling this disease at the herd level must be taken in context with the economic impact. There are two basic scenarios to consider: 1) the diagnosis of Johne’s disease within a commercial cow-calf herd versus 2) the diagnosis of Johne’s disease in a purebred or seedstock herd. Obviously scenario 2 has a much greater potential economic impact and the seedstock producer has much more motivation to control or attempt to eliminate this disease from their herd. At the very least, they should be seen to be making every effort to control this infectious disease and not spread it by selling infected individuals to other herds. In the commercial herd, it may not even be economically viable to attempt to do extensive diagnostics because the clinical impact of the disease in most commercial cow-calf herds is relatively minor unless they are heavily infected.

The ELISA antibody blood test is often maligned for its relatively poor sensitivity and imperfect specificity. The fecal culture or fecal PCR with a relatively higher sensitivity and excellent specificity is clearly the superior test. However, this superiority comes at a price. Fecal PCR can be pooled in groups of 5 which make it somewhat more cost effective, however, in most cases after positive pools are retested the cost of testing an entire herd becomes prohibitive for fecal PCR or fecal culture. Regardless of which diagnostic test is chosen, the imperfect sensitivities of the tests will not find all of the positive animals and therefore the veterinarian must be prepared that any form of control program will be a 5-7 year project. The advantage of the slightly higher sensitivity of fecal PCR is usually not worth the increased cost of utilizing this test on a herd basis.

The more cost-effective approach is to utilize serum ELISA testing to identify positive animals. In seedstock herds, where producers may be concerned about culling high genetic value animals, positive ELISA results can be confirmed by follow up fecal PCR’s or fecal culture. Alternatively, the ELISA S/P ratio can be evaluated on individual animals and only those animals with high S/P values are culled. Animals with low to medium ELISA values can be retested in subsequent years. The seedstock herd will probably require annual ELISA testing, but the commercial herd may not require such intensive yearly sampling and may skip a year or two depending on the prevalence of infection.

Regardless of the testing protocol, biosecurity principles need to be in place to limit the spread of the infection. This is based on two main principles:

1) Minimize the exposure of susceptible calves to the feces of infected cattle
2) Reducing the environmental contamination by eliminating animals that shed MAP

The basic principles of minimizing fecal exposure for young calves that are implemented for control of neonatal diarrhea are essentially the same management principles for the control of MAP infections. Using systems such as the Sandhills calving system or the Lacombe system, spreading out the calving environment and minimizing fecal contamination are important aspects of MAP control. Testing and culling alone will prove to be a wasted effort if attempts are not made to minimize spread through biosecurity and management. In commercial herds with a low prevalence of MAP infected cows, it may not be cost effective to utilize whole herd diagnostic testing. In these herds, early culling of clinical
cases and the implementation of biosecurity principles which reduce the exposure of susceptible calves to adult feces may be enough to minimize transmission.

The control of Johne’s disease in beef cow-calf herds has not been studied as extensively as in dairy herds. In those herds where it is economically advantageous to implement control programs, a long term approach to control should be considered. None of the diagnostic tests offer a high enough sensitivity to identify all of the carriers of MAP infection and thus economics need to be considered when implementing diagnostic testing strategies.

REFERENCES


Beef Cattle Investigations from the WCVM Disease Investigation Unit

Dr. John Campbell, WCVM, University of Saskatchewan

This session will focus on an interactive slide and video quiz with many of the cases taken from examples from the WCVM Disease Investigation Unit. The WCVM Disease Investigation Unit (DIU) has been in existence for over 20 years. Dr. Eugene Janzen and Dr. Carl Ribble were the founders of the unit and investigations were originally funded by the Horned Cattle Trust Fund. Dr. Cheryl Waldner became an integral member of the group and helped source additional funding from industry and government. Since 2007, the WCVM DIU has had stable funding through the Saskatchewan Ministry of Agriculture and Food.

Since 2007, approximately 150 investigations have been carried out. Each investigation must be initiated by a local veterinarian who contacts a member of the DIU. Investigations can be very detailed utilizing herd visits with faculty and students from WCVM or in some situations we will simply provide additional funding to assist the local practitioner to pursue additional diagnostics at little or no cost to the client. Approximately 85% of our funding goes directly to pay for diagnostic work which is primarily through the Prairie Diagnostic System Laboratories. A wide variety of faculty members have been involved in the DIU and we rely heavily on the diagnostic support from our colleagues in Pathology, Microbiology, Toxicology and PDS.

Although we investigate a wide variety of cases among many farm animal species, over 85% of our cases involve beef cattle. In the last number of years, the majority of cow-calf investigations could be grouped under four predominant themes as follows:

1) Poor nutrition, body condition, mineral deficiencies
   Many of these cases may border on animal welfare issues. Nutritional welfare of beef cattle has received relatively little attention by the scientific community. Many of these situations are exacerbated by severe cold weather and are related to inadequate protein or energy during the winter feeding. Nutritional welfare problems tend to be chronic, long term problems that may affect a large proportion of the affected herd. Some of the causes of these predicaments include absentee owners, economic hardship, psychological problems and in some cases simple ignorance. They often present a challenging circumstance for local veterinarians and animal welfare officers. Often, the owner of the herd will not want to admit the problem is nutritional in nature. In some cases, nutritional deficiencies may initially present as reproductive failure.

2) Variety of toxicities including plant toxicities, ergot and lead toxicity.
   Examples of some of the toxicity cases will be presented during the presentation. Ergot toxicity seems to be more common and may present in a variety of ways. Lead toxicity continues to be an important food safety risk and significant resources have been dedicated to diagnostic work in these cases.

3) Respiratory disease in young calves
   Beef cow-calf herds with outbreaks of respiratory disease in young calves could be classified as some of the most difficult outbreaks to diagnose and prevent. Many of these herds have good
vaccination programs and continue to have yearly problems with calf pneumonia. We may not understand all of the factors or pathogens that cause calf pneumonia as many of these outbreaks remain somewhat of a mystery. Challenges with diagnostics will be discussed in the presentation. One of the most significant challenges is that bacterial cultures from post mortem material is often of limited value. The secondary bacteria that are grown from these chronic cases do not necessarily represent the etiologic agents that initiated the pneumonia.

4) Infertility in cow herds

A number of infertility cases will be presented as part of the presentation. A significant number of outbreaks each year are initiated because of low pregnancy or low calving rates. Many of these may relate to point #1 in terms of nutrition, however, infectious causes of infertility such as trichomoniasis and campylobacter remain prevalent.

The Disease investigation unit is an important source of case material for our faculty and students. Many of these case investigations may provide material for scientific publications or in some cases, these investigations have led to further research opportunities. The DIU also provides a neutral “non-government” organization to provide some ability to investigate unusual outbreaks. Any surveillance system requires a response capability to be effective. If in this case, the local veterinarian is providing the sentinel surveillance system for unusual outbreaks, the DIU provides one method of responding to these outbreaks. There is no doubt, that the vast majority of cases will be “false positives” and will not be outbreaks of foreign animal disease or new emerging diseases, however, this should be expected as part of a surveillance system. In addition, the DIU also provides another alternative for dealing with potential animal welfare cases. It also provides a response capability for issues that may not fit precisely within the mandate of the CFIA or Provincial Agriculture authorities and provides support for veterinary practitioners within the province.