Internal Medicine & Toxicology

K05

Jejunal Hemorrhage Syndrome

Simon Peek.

University of Wisconsin, USA.

Session Objectives: To briefly review the literature on the condition covering the last 30 years (1). Provide retrospective information on approximately 100 cases seen at the University of Wisconsin in the last 20 years to help guide clinical decision making (2). To present information regarding risk factors, herd management and prevention (3).

Introduction: Jejunal hemorrhage syndrome (JHS) is now a worldwide disease of predominantly dairy cattle, first documented in the US in 1992. It has since been identified in other parts of North America, Europe, Asia, and the Middle East. It is characterized by rapid, occasionally substantial, obstructive jejunal clot formation that causes affected individuals to become colicky. The condition can clinically mimic other causes of small bowel obstruction. Most affected individuals will pass blood clots in feces over the ensuing 12-24-hour period but significant bowel devitalization, necrosis and peritonitis may accompany intraluminal hemorrhage and obstruction.

Etiology: Much interest regarding etiology has centered on *Clostridium perfringens* type A, based upon studies identifying the organism in blood clots within the jejunum and feces of affected cattle. Additionally, pathologic investigations have histologically identified large numbers of gram positive rods adjacent to the typical areas of intestinal necrosis. However, attempts to fulfill any of Koch's postulates with isolates obtained from clinical cases, even in immunocompromised experimental animals, have failed and it is worth remembering that this organism is a commensal. There has also been interest in a possible role for the mold *Aspergillus fumigatus*, commonly present in livestock environments and feedstuffs. Similarly, no definitive role has been proven for this organism but mold inhibitors are frequently used as feed additives.

Clinical Signs: Affected cattle usually present with peracute colic ranging from moderate to severe. Two retrospective studies have identified that cows tend to be in the 3rd to 5th month of lactation. Rarely, bulls, dry cows and beef animals are affected. Fecal production and character can be informative and helpful in distinguishing JHS from other causes of peracute colic; initially cattle will have scant to absent manure production but over a few hours often develop "tarry" feces with fresher clots mixed-in. Continued, complete absence of fecal production is uncommon but most cattle become visibly distended. Dilated loops of small intestine are visible on ultrasound examination, sometimes with detectable echogenic material consistent with intraluminal clots. Detectable small bowel distension on rectal examination is an inconsistent finding.

Treatment: Although occasional success using purely medical treatment with flunixin, catharctic laxatives or lubricants (usually Epsom salts or mineral oil), *Clostridium perfringens* type C and D antitoxin and antibiotics (procaine penicillin or ceftiofur) is reported, our approach is to combine medical therapy with surgery. Via a right flank approach, we employ aborad manual massage of the identified clots as the preferred treatment. In over 100 cases we have an approximately 60% discharge rate from the hospital (combining surgery with catharctics, high dose pencillin, flunixin, and fluid therapy). Intraoperatively, if cattle have extensive devitalized intestine, if the clots cannot be broken up and dislodged, or reform almost immediately - these are poor prognostic signs. Most cattle that do well post-operatively produce feces with clots within 1-2 hours (sometimes much less!) of surgery, and importantly continue to do so over the following 12-24 hours. Importantly, there is a lifetime recurrence rate of up to 25% in cattle followed long term.

Prevention: Given the uncertainty over etiology and known risk factors, success with prevention and management continues to be frustrating. Surveys of affected herds in the US reveal that cattle tend to be in the first 5 months post-partum and the median parity is the third lactation. We have observed an increased prevalence in Brown Swiss. Problem farms experience quiet periods interspersed with "outbreaks" when clusters of new cases occur. Energy and protein rich diets that are frequently being adjusted alongside immune and other physiologic stresses associated with early lactation are the predictable scapegoats for these outbreaks. Vaccines against *Clostridium perfringens* type A, commercial or autologous, and mold inhibitors have been used extensively but no controlled studies exist examining their efficacy. However, transition and early lactation cows undoubtedly benefit from optimizing intestinal health as consistently as possible whether one is referring to JHS or other enteric/metabolic diseases.

References: Available on request.

K06

Recent advances in the treatment of calf diarrhea

Geof Smith.

North Carolina State University, Raleigh, USA.

Calf diarrhea remains the leading cause of mortality in both beef and dairy calves prior to weaning. Although farmers need to focus on prevention, some diarrhea is inevitable. Therefore, veterinarians need to be able to work with producers to recognize disease promptly and institute successful treatment programs. Goals of therapy in the diarrheic calf are to **1) restore dehydration; 2) correct acid-base abnormalities; 3) replenish electrolytes and 4) provide nutritional support to prevent starvation**. Key principles of therapy are as follows:

1. A metabolic (or strong ion) acidosis is common in calves with diarrhea- Research has shown that calves produce significant amounts of D-lactate in their gastrointestinal tract during diarrhea and lose large amounts of sodium. Together these produce a decrease in blood pH (acidosis) which is one of the most significant reasons for mortality in diarrheic calves. In contrast, children don't frequently develop acid-base disturbances with diarrhea necessitating different approaches to treatment between calves and humans. Fluid therapy is criti-

cal and the primary goal should be to rehydrate and prevent/correct acidemia.

2. Oral electrolyte therapy is the backbone of a treatment program- Significant advances in our understanding of oral electrolytes has occurred in the past 10 years. We know now that oral electrolytes designed to treat calves with diarrhea should look significantly different than those used in children. We have learned a lot about the importance of including an alkalinizing agent (such as bicarbonate or sodium acetate) and having a product with a proper strong ion difference (SID).

3. Intravenous fluid therapy can be done easily on farms- Even with the widespread use of quality oral electrolytes, some calves will still need intravenous fluids to survive. While this is traditionally difficult to accomplish on farms, the advent of hypertonic saline and hypertonic sodium bicarbonate has simplified fluid therapy protocols. Veterinarians and producers can effectively rehydrate calves and restore a normal blood pH without placing intravenous catheters and administering smaller volumes (200-400 ml) of fluids IV.

4. Nutrition is important- Many calves with diarrhea starve to death. While milk is expensive, multiple studies have shown that increased rates of milk feeding within the first week of life are critical to not only reduce the incidence of diarrhea but reduce the duration of diarrhea and improve survival rates. Farmers can improve the plane of nutrition their calves receive either by increasing the volume of milk calves receive or by improving the quality (protein) of milk replacer (or both). Not only will calves be in better body condition and better able to tolerate diarrhea, but they have a more robust immune response to the pathogen causing disease.

5. Antibiotics have been overused with calf diarrhea in the past- For years the dairy industry would feed antibiotics such as tetracycline and neomycin to treat and/or prevent diarrhea. Although there is little scientific evidence to support this practice, most countries now prohibit the routine feeding of antimicrobials to young calves in an attempt to practice judicious use of drugs and limit the emergence of resistant bacteria. It is also important to point out that rotavirus and *Cryptosporidium parvum* remain the leading causes of diarrhea around the world and are not susceptible to antimicrobials. Therefore, most calves with diarrhea don't need antibiotics to be treated successfully. However, a certain percentage of calves with diarrhea will develop septicemia (usually E. coli), which can be a significant cause of mortality. In conclusion, antimicrobials are indicated only in selected calves that indicate diarrhea plus other clinical signs suggestive of septicemia (for example fever, blood in the manure, severe depression, etc).

6. Manipulating the gut-brain axis- The next frontier in treating calf diarrhea will be effectively exploiting the gut-brain axis to develop therapeutic strategies for preventing and/or treating diarrhea. Although probiotic research to this point hasn't been extremely successful in treating diarrhea, studies with fecal microbiota transplantation or feeding rumen fluid to calves have shown promise in reducing the severity and duration of diarrhea. Moving forward, research to figure out how to effectively and economically manipulate the gut-brain axis or microbiome of calves to limit diarrhea will be critical. Or said another way – what can I feed a calf to prevent or treat diarrhea effectively.

K07

Flotation Tank Use in the Management of the Down Cow

Simon Peek.

University of Wisconsin, USA.

Session Objectives: To briefly review the causes of recumbency and indications for flotation tank use in dairy cattle, providing context for downer cow management on US dairies (1). Provide retrospective information on approximately 200 recumbent dairy cattle managed by flotation tank over the last 20 years at the University of Wisconsin in the last 20 years (2).

Introduction: Over roughly the last two decades, flotation tanks have become more widely available as a management tool for non-ambulatory cattle. Multiparous dairy cattle are the most common candidates for flotation, in whom the well-known peri and post-parturient metabolic conditions are the most significant causes of recumbency. Dystocia related injury to the pelvis, spine and lumbosacral spinal cord, especially in primaparous heifers, in addition to musculoskeletal injury in cattle of any age are also potential causes of initial recumbency that can result in an individual becoming non-ambulatory. Whereas flotation tanks were once the exclusive province of university teaching hospitals they are now widely available through private practices, and commercial businesses, especially in dairy dense areas of the US. Their appeal lies in the buoyant, evenly distributed support that water provides. Of direct relevance to the topic of non-ambulatory cattle are concerns over animal welfare. Non-ambulatory dairy cattle can be a major challenge on any dairy farm, particularly on larger facilities where their housing and nursing needs make them labor intensive. Surveys on health and management practices across the United States highlight that whilst approximately 70% of all dairy operations had at least one down cow (defined as a non-ambulatory individual for greater than 24 hours), that proportion increased with size of operation; 81% of operations between 100 and 499 head, and 97% of farms with greater than 500 head had at least one individual so affected. Collated data from owner responses report that approximately 60% of cattle recumbent for more than 24 hours fail to survive, consistent with other studies that identify recumbency as not only a health and welfare issue but a significant contributor to culling losses.

Previous Literature and Retrospective Study: There have been two notable previous retrospective studies from North American teaching hospitals (Cornell University (Burton et al 2009) and University of Montreal (Puerto-Parada et al 2021) examining the use of flotation tanks in the management of down cows. These identified survival rates to discharge of 37% and 55% respectively with comparable referral dairy cattle caseloads to our own at the University of Wisconsin. Other important findings in these papers included the observation that cattle who could stand after the first flotation event were 5 times more likely to survive as those that could not (Burton et al 2009), alongside an increased odds of non-survival when cattle were referred only after an extended period of recumbency, or when they demonstrated specific clinical or clinicopathologic abnormalities suggestive of a worsened status including tachycardia, tachypnea, hypothermia, elevated muscle enzymes or increased creatinine (Puerta-Parada

2021). Our own recent investigation into almost 200 cases identified a comparable survival rate of 47% to discharge from our hospital. We were also able to identify differences in outcome according to cause, specifically cattle recumbent due to calving paralysis or metabolic derangements (hypocalcemia and ketosis for example) being approximately 10 and 22 times more likely to survive respectively than those with certain orthopedic/musculoskeletal conditions. Appetite and the ability to walk out of the flotation tank after the first floatation session were variables retained in a final multivariate variable model in our study.

Conclusion: In many countries worldwide, intensification of the dairy industry is leading towards a smaller number of larger dairy farms. The US experience suggest that this increases the likelihood that non-ambulatory cattle will be encountered – one method of management includes the use of flotation tanks. This equipment has dramatically increased in availability in the US within the last 25 years. Prompt and appropriate use, alongside timely identification of cattle with poor prognostic indicators can reduce unnecessary animal suffering and treatment costs. Large referral based studies suggest that survival rates of 40-55% are achievable, and that relatively easy to identify parameters within the first 24 hours of flotation can be used to guide decision making.

References: Available on request.

K08

BRD Diagnostic and Treatment Approaches in Dairy Calves

Geof Smith.

North Carolina State University, Raleigh, USA.

BRD remains an economically significant disease in dairy calves and multiple studies have shown that it has a significant long-term economic impact on the future productivity of that heifer. Calves that have been treated for pneumonia have a greater age at first calving, a higher cull rate and lower milk production than calves from the same herd that were not treated for BRD. While prevention of respiratory disease is critical, veterinarians need to be able to work with producers to recognize disease promptly and institute successful treatment programs. This presentation will highlight research over the past 10 years on key approaches to diagnosing and treating respiratory disease in the dairy calf. Key principles are as follows:

1. Early diagnosis is critical- The earlier BRD can be recognized, the higher the chances of treatment success. With early treatment we also hope to minimize the long-term damage done to lung tissue which may further reduce the animals' potential for milk production in the future. There have been a number of clinical scoring systems developed that farmers can use to identify calves that need treated. In addition, lung ultrasound of dairy calves has been developed which can easily be implemented on farm. Ultrasound can be utilized to answer several questions such as which calves need treated for pneumonia, how effective are farm employees at identifying pneumonia, what age is BRD beginning in the herd, are calves responding appropriately to treatment and which calves have chronic lung damage and need to be culled. Ensuring that veterinarians work with farmers to establish some type of system to recognize pneumonia early is critical to ensure a good outcome.

2. Culture and sensitivity data from nasal swabs or calves that have died from BRD are likely unreliable- For years we have used culture and sensitivity data to help establish treatment protocols for various farms which often come from nasal swabs or lung cultures taken from dead calves previously treated with antimicrobials. It's becoming clear that these data may be unreliable. Studies show that bacteria in the upper airway may be quite different than what is actually in the lungs and either transtracheal wash or bronchoalvelolar lavage techniques are much more reliable. Furthermore, the practitioner often finds resistant pathogens in lung cultures from calves treated with antimicrobials, however these organisms are often not representative of the actual bacteria causing disease within the herd. There is extremely limited data present in calves that shows diagnostic testing and susceptibility results are positively correlated with treatment outcome. While determining which pathogens are present in a herd is still helpful, establishing goals for treatment success and monitoring outcomes of therapy may be more effective than relying on susceptibility testing to design protocols.

3. We need to consider treating calves longer for BRD- Several studies using ultrasound have shown that many calves treated for BRD continue to have lung lesions despite an apparent resolution of clinical signs. There is also an increasing prevalence of *Mycoplasma bovis* found in dairy calves associated with BRD. We know that Mycoplasma is able to persist for weeks after calves are initially infected. It is able to evade the immune system and survive in necrotic areas of the lung. With the development on long-acting macrolide antibiotics, it has become common that calves receive a single antimicrobial treatment lasting 7-10 days. New research would suggest that many of these calves would do better with 2-3 weeks of therapy and perhaps as long as 30 days.

4. Minimizing stress is critical- There is a significant body of data showing that various causes of stress including weather, transport, nutrition, overcrowding and other diseases (like diarrhea) significantly increase the risk for BRD. Data also indicates that some calves are able to tolerate stress better than others. For example, one study demonstrated that calves with elevated cortisol concentrations upon arrival to a veal farm had a significantly increased risk of developing severe pneumonia as compared to calves with lower levels of cortisol upon arrival. We can use this information to limit stress but also as a way to potentially genetically select for calves that may be more resistant to developing BRD over time.