Research Progress in Hemorrhagic Bowel Syndrome

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Hemorrhagic Bowel Syndrome (HBS), also known as (Jejunal Hemorrhage Syndrome, bloody gut, or dead gut) is a newly emerging, highly fatal intestinal disease of adult dairy cows in the United States. HBS is characterized by sudden, progressive, and occasionally massive hemorrhage into the small intestine, with subsequent formation of clots within the intestine that create obstruction. Affected segments almost inevitably die, causing release of toxins into the cow’s bloodstream and abdominal cavity.

Successful treatment of HBS is difficult. Occasional, anecdotal reports exist of successful treatment with fluids, laxatives, anti-inflammatory drugs, antibiotics, and surgery; however, it appears that such treatment successes are quite rare. With or without treatment, death of affected cattle usually occurs within several hours or 1 to 2 days after the onset of clinical signs. At the Colorado State University Veterinary Teaching Hospital, only about 10 percent of cows affected with HBS have survived.

The disease is seen most commonly in adult dairy cows early in lactation. Thus, factors specific to fresh cow management, nutrition, or the physiologic stress of peak lactation could be playing a role in the development of this disease. Occasional cases occur in late lactation or the dry period, and heifers are rarely affected.

Although HBS usually occurs as a sporadic disease on most dairies, several cows in a herd may be affected in a relatively short period of time (i.e. “clusters” of cases can occur). Anecdotal reports exist of dairies that struggle with this disease on virtually a continual basis.

Research on Potential Causes

Clostridium perfringens type A is a bacterial organism that has been associated with HBS. This organism has been documented to cause disease in a variety of birds and mammals, including cattle. The primary virulence (disease-causing) factor for this organism is a potent, lethal toxin called alpha toxin. This toxin is released from the organism during rapid growth. The alpha toxin acts as an enzyme that destroys cell membranes. It is lethal to a variety of cells, including intestinal cells and red blood cells.

Some strains of C. perfringens type A also carry the beta2 toxin gene; these strains are designated as A-beta2. This gene codes for beta2 toxin which is also a lethal toxin for intestinal cells. The distribution of C. perfringens strains that carry this toxin gene is not well-described, but this strain has been identified in the intestinal tract of most mammals. In

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Sole Pathogen Unlikely

Despite these observations, there are many reasons why we hesitate to consider C. perfringens as the sole pathogen that could cause HBS. C. perfringens is widely distributed in the environment and is considered to be a member of the normal bacterial flora of the gastrointestinal tract of most mammals. In

growth of one or both of these organisms.

4. Other enteric pathogens associated with hemorrhagic enteritis have, to date, been rarely identified in tissues or intestinal contents of affected cows.

In addition, based on anecdotal evidence, reduced monthly incidence of HBS has occurred after giving an autogenous C. perfringens vaccine to adult cows on certain dairies. At present, data from controlled studies are not available for evaluation of the effect of such vaccines on the incidence of, or survival rate for, HBS.

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the past, veterinary microbiologists have been more interested in considering C. perfringens type A as an important disease-causing pathogen of livestock because it can be readily cultured from the intestine of healthy cattle.

Furthermore, this organism proliferates rapidly in the intestine after death, making isolation from necropsy specimens of questionable diagnostic significance. If the lethal toxins of C. perfringens can be detected in gastrointestinal contents and/or blood of diseased animals, it is considered more likely that the organism is causing disease, rather than simply acting as a part of the normal gut flora. Until recently, the toxins produced in vivo by C. perfringens in HBS cases had not been identified, and the genotype and density that can be found in livestock feeds, and/or blood of cows affected with HBS. Do the toxins that C. perfringens produces contribute to the degra-
dation of the intestinal wall that is so characteristic of HBS.

Fungus May Play Role
An alternate investigation of HBS, headed up by investigators at Oregon State University, has focused on characterizing the role of Aspergillus fumigatus, a mold (fungus) that can be found in livestock feeds. Genetic material of this fungal agent can be detected in the blood and intestine of affected cows. A research project involving dairy cows with HBS and dairy cows that have died of other gastrointestinal diseases (the control group) is currently being conducted by investigators in Wisconsin, Minnesota, and Oregon. In this study, the rates of isolation of C. perfringens, Salmonella, and bovine viral diarrhea virus are being compared among cows of these two groups. In addition, the rate of detection of Aspergillus fumigatus DNA by polymerase chain reaction in the tissues is being compared among cows of the two groups. Statistical analysis of preliminary data has revealed a significant association between HBS and the presence of A. fumigatus DNA in the tissues. In other words, the DNA of this fungal organism was present in the tissues of a significantly greater proportion of cows with HBS than of cows that died of another gastrointestinal disease. However, because C. perfringens type A was isolated from cows of both groups, isolation of this organism was not significantly over-represented in HBS cows versus the control group. In other words, no statistical disparity was found among the two study groups for the presence of C. perfringens, although the authors indicated that future data may produce different results on this issue. To date, the BVD virus and Salmonella are the only pathogens identified from only a small fraction of cows affected with HBS. Aspergillus fumigatus is clearly associated with HBS, and there are currently two hypotheses regarding its participation in this disease:

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Summary
It is apparent that both Aspergillus fumigatus and C. perfringens types A and A-beta2 can be demonstrated in the tissues and/or blood of cows affected with HBS. Do these bacterial and fungal agents act together or independently? These questions are under investigation, and, hopefully, greater understanding of the pathogenesis of this troublesome disease is forthcoming. Clearly, the funding provided to the ILM by dairy producers has helped us to make progress in our research on HBS, and the authors wish to express their sincere appreciation for that support.