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John T. Richeson and Ty E. Lawrence

Pathogenesis of Liver Abscesses in Cattle **335**

Raghavendra G. Amachawadi and T.G. Nagaraja

Liver abscesses are a bacterial infection, which occurs because of entry, via portal vein, of pyogenic bacteria into the hepatic parenchyma. Liver abscesses are a polymicrobial infection; however, Fusobacterium necrophorum, a ruminal bacterium, is the primary etiologic agent. Ruminal acidosis disrupts the protective barrier function of the ruminal epithelium and facilitates entry and colonization of F. necrophorum in the ruminal wall and subsequent entry into the portal circulation. Virulence factors of F. necrophorum contribute to the evasion of host defense mechanisms and cause tissue damage to set up an infection in the liver. The potential role of the hindgut in pathogenesis remains to be investigated.

Liver Abnormalities in Cattle: Effect of Liver Abscessation on Growth and Productivity of Cattle **347**

Luiz Fernando Batista and Ben P. Holland

Liver abscess has been identified in multiple classes of cattle, but cattle consuming higher energy diets may have greater prevalence of abscessation. The presence and severity of liver abscess has been associated with reduced dry matter intake, daily gain, and gain efficiency of individually fed animals, and as the prevalence of abscesses within pens of animals increases, growth performance worsens. Because of the importance of the liver to metabolism, damage due to abscess could negatively affect energy utilization. A preliminary analysis indicates severe liver abscess incidence increases the requirement of metabolizable energy for maintenance.

Effect of Liver Abscessation on Carcass Outcomes **361**

Ty Ellis Lawrence

For more than 80 years, liver abscesses have been documented to reduce beef system value. These infections of liver tissue result in poorer growth performance as evidenced by diminished live and carcass weights, leaner and lesser muscled carcasses, and greater rates of trim. Those negative outcomes are compounded by reduced animal and carcass value. As technology advances, methods to reduce and prevent liver abscesses should be a goal of scientists and producers worldwide.

The Microbial Ecology of Liver Abscesses in Cattle 367

Lee J. Pinnell and Paul S. Morley

Emerging evidence regarding the microbiome of liver abscesses (LAs) and the gastrointestinal tract of cattle suggests that a reexamination of the etiopathogenesis of LAs is warranted. Microbiome studies using 16S rRNA gene sequencing have demonstrated that LAs are highly polymicrobial, and hundreds of bacterial taxa are typically found in these lesions at slaughter. Fusobacteria and Bacteroidetes are equally dominant phyla within LAs, followed by Proteobacteria. The gut-liver axis (ie, bidirectional crosstalk between the gut and liver) is linked with a variety of liver diseases in humans, and investigation of host-microbiome interactions in cattle may lead to improved methods of prevention.

Antimicrobial and Biological Methods to Control Liver Abscesses 383

Miles E. Theurer and Raghavendra G. Amachawadi

Antimicrobial products are approved for the control of liver abscesses with varying amounts of data. When compared to negative controls, tylosin has the most data to support a reduction in total (risk ratio 0.34) and severe A+ (risk ratio 0.31) liver abscesses. Due to the reduction in the use of antimicrobials, vaccination to control liver abscess prevalence is intriguing. However, available vaccines do not appear to be effective in controlling the prevalence of liver abscesses, especially when the disease prevalence is high.

Non-Antimicrobial Methods to Control Liver Abscesses 395

Michael Galyean and Kristin Hales

Beef feedlots have few non-microbial approaches available to decrease the incidence of liver abscesses. Decreasing the degree of grain processing might be useful, but methods that decrease dietary starch (eg, feeding digestible fiber sources such as distillers grains) have limited effects. Managing feed intake to decrease daily variation has little effect on abscesses, as do feed additives such as essential oils and tannins. Live yeast and yeast fermentation products provide some benefits, but further research is needed. Lack of reproducible in vitro and in vivo models for rapid screening of potential non-antimicrobial methods has limited progress.

Roughage and Dietary Influence on Liver Abscesses 405

Tony C. Bryant and Jenny Jennings

Many researchers have evaluated different nonantibiotic, dietary interventions to reduce liver abscessation including degree of grain processing, roughage particle size, ionophore inclusion level, and supplemental prebiotics or probiotics; however, these alternatives have been inconsistent in outcomes and have not proven to be successful. New technologies and methodologies that allow for description and characterization of the microbiome within cattle, their environment, and liver abscesses themselves may help elucidate the etiology of liver abscess formation and allow for targeting interventions that will provide solutions to replace or reduce antimicrobial use that is currently used for the reduction of liver abscess prevalence.

Toxicologic Insults to the Bovine Liver 421

Benjamin W. Newcomer

The liver is subject to toxic insult due to its role in the metabolism of exogenous substances and the direct filtration of blood from the portal circulation, which carries absorbed toxins from the gastrointestinal system. Metabolism of xenobiotics in the liver is facilitated by high concentrations of cytochrome P450 enzymes, which catalyze biotransformation of foreign substances; conjugation of toxin metabolites increases their solubility and enhances excretion. An understanding of the common hepatotoxins and the circumstances that lead to their exposure in cattle will aid the clinician in recognizing clinical syndromes and submitting appropriate diagnostic samples for confirmation of suspected diagnoses.

Liver Disorders Associated with Metabolic Imbalances in Dairy Cows 433

Pablo Pinedo and Pedro Melendez

This article discusses the complex interrelationships that originated from metabolic stress, triggering unbalances that result in suboptimal liver health. The severe changes occurring around parturition require drastic incrementation in lipolytic activity, leading to significant adipose tissue remodeling. This increased activity ultimately exceeds the liver's normal function. The inability of the liver to perform proper metabolic regulation, together with concurrent inflammatory states, altered immune status, and physiologic imbalances, results in greater risk for disease, lower milk production and fertility, and compromised well-being and lifespan in the herd.