

Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 1 *Cattleman's Day (1993-2014)*

Article 997

1986

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Recommended Citation

Lechtenberg, K.F.; Leipold, H.W.; and Nagaraja, Tiruvor G. (1986) "Bacteriological and histopathological investigations of liver abscesses," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 1. <https://doi.org/10.4148/2378-5977.2400>

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Bacteriological and histopathological investigations of liver abscesses

Abstract

Fusobacterium necrophorum was the predominant bacterial isolate from 49 liver abscesses. Biotype A tended to occur in pure infections and produced a more severe tissue reaction than biotype B, which tended to occur as a mixed infection.

Keywords

Cattlemen's Day, 1986; Kansas Agricultural Experiment Station contribution; no. 86-320-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 494; Beef; Liver abscesses; Bacteria

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Bacteriological and Histopathological Investigations of Liver Abscesses

K.F. Lechtenberg, T.G. Nagaraja,
and H.W. Leipold¹

Summary

Fusobacterium necrophorum was the predominant bacterial isolate from 49 liver abscesses. Biotype A tended to occur in pure infections and produced a more severe tissue reaction than biotype B, which tended to occur as a mixed infection.

Introduction

Abscessed livers in feedlot cattle are a constant concern to both producers and packers. Without feeding of an antibiotic, the incidence of abscesses is approximately 30% and ranges from 5% to 90% depending on management and ration. Adding an antibiotic, such as tylosin (Tylan®, 10g/ton), to the feed significantly reduces the incidence of abscesses. Most liver abscesses in cattle cannot be diagnosed by observation. Cattle with severely abscessed livers have decreased daily gain (3.5-7%) and feed efficiency (7%). Abscessed livers are a direct cost to the packer, since any liver with an active abscess is condemned. The liver accounts for approximately 2% of the live weight of cattle. The packer either passes this cost along to the consumer or discounts the price paid for live cattle. Some packing houses are taking the incidence of abscessed livers into account for individual feedlots that consistently send cattle with a higher than normal abscess rate.

Experimental Procedure

Twenty-eight abscessed livers from feedlot steers and heifers fed in north central Kansas and northwestern Missouri were collected at Iowa Beef Processors Inc., Emporia, KS. Forty-nine abscesses from these livers were evaluated for facultative and anaerobic bacterial involvement and histopathological changes. Facultative bacteria were isolated and characterized with the assistance of the Dept. of Laboratory Medicine, College of Veterinary Medicine. Anaerobic bacteria were isolated, characterized, biotyped, and tested for antimicrobial sensitivity using the anaerobic equipment in the Rumen Microbiology Laboratory, Dept. of Animal Sciences. Histology sections were prepared, stained, and evaluated with the assistance of the Dept. of Pathology, College of Veterinary Medicine.

Results and Discussion

Facultative bacteria were isolated from 44% of the abscesses, with the predominate isolate being *Corynebacterium pyogenes*. Facultative bacterial counts ranged from 1.0×10^4 to 9.2×10^9 colony forming units (CFU) per gram of purulent

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material with a mean of 8.0×10^8 . *Fusobacterium necrophorum*, the predominant anaerobic isolate, was found in 100% of the lesions. Viable anaerobic counts ranged from 1.1×10^6 to 2.5×10^{10} with a mean of 3.0×10^8 CFU/g. Biotyping of *F. necrophorum* revealed that biotype A was isolated from 51% of the abscesses; 76% of it was in pure culture. Biotype B was isolated from 53% of the abscesses; 88% of this biotype was in mixed infections, usually with *C. pyogenes*.

Histologic evaluation revealed that both biotypes of *F. necrophorum* formed typical abscess lesions. However, infections with biotype A tended to cause more severe effects. We found more cellular infiltration, more extensive capsule formation, and more extensive peri-abscess portal triad fibrosis and bile duct proliferation in abscesses containing biotype A than in those containing biotype B alone. Mixed infections of biotype B had a tissue response similar to that of a pure biotype A.

Why do Liver Abscesses Form?

While ruminants are adapting to grain, or whenever they over-consume grain, the pH of the rumen fluid is lowered by acids from the rumen's bacterial fermentation. The low pH irritates the rumen wall and may cause ulcers and abscesses. The blood draining the rumen wall flows toward the liver via the portal vein, carrying absorbed nutrients. If the rumen wall has become ulcerated, the blood may also carry *Fusobacterium necrophorum*, a normal inhabitant of the rumen. Once in the liver, the bacteria can grow rapidly, causing inflammation and killing a large number of liver cells. In an attempt to keep the bacteria from spreading to the rest of the liver, the animal's body walls off the area of damaged tissue, thus forming a liver abscess. Abscesses tend to get larger with time, and will eventually cause the formation of fibrous scar tissue.
