



PROJECT SUMMARY PRODUCT QUALITY

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Effects of Liver Abscess Severity and Quality Grade on Meat Tenderness and Sensory Attributes in Commercially Finished Beef Cattle Fed without Tylosin Phosphate

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Study Completed

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Background

Liver abscesses are a significant problem in the United States' cattle feeding industry, costing the industry an estimated \$15.9 million annually in liver condemnation, trim losses, and reduced carcass weights and quality grades (Brown and Lawrence, 2010; Hicks, 2011). The 2011 National Beef Quality Audit reported the average prevalence of liver abscesses in cattle surveyed was 13.7% (McKeith et al., 2012) with incidence rates ranging from 10% to 20% in recent literature (Amachawadi and Nagaraja, 2016). Previous reviews have reported liver abscess incidence may be influenced by a number of factors including: breed, gender, diet, days on feed, cattle type, season, and geographical location (Nagaraja et al., 1996; Reinhardt and Hubbert, 2015).

Brown and Lawrence (2010) showed a reduction in hot carcass weight (HCW), dressing percentage, yield grade, *Longissimus* muscle (LM) area, and marbling scores for carcasses with liver scores of A+ when compared to those with normal livers. Brown and Lawrence (2010) also reported decreased marbling scores for severe liver abscesses with adhesions when compared to their counterparts with normal livers. Although the effect on carcass characteristics has been researched, no previous work has evaluated effect of liver abscess status on meat tenderness and sensory attributes.

Objective

The objective of this study was to determine the effect of liver abscess severity on meat tenderness and sensory attributes of beef from USDA quality grades of Select and Low Choice.

Methods

Steaks were used in a 3 × 2 factorial treatment structure using a completely randomized design and were collected at a commercial abattoir located in northwest Texas. All cattle were sourced from a single feedlot and fed a common diet that did not include Tylosin Phosphate. Treatments were USDA quality grades of Select (**S**) and Low Choice (**C**) and liver abscess scores of normal (**N**; healthy liver, no abscesses), mild (**M**; 1 abscess less than 2 cm in diameter to 4 abscesses less than 4 cm in diameter), and severe (**SV**; 1 abscess greater than 4 cm in diameter or greater than 4 small abscesses). All steak samples were collected on the same day and were cut from the left side of the carcass at the 13th-rib by a trained abattoir employee. Steaks were vacuum-packaged, and aged at 3 ± 1° C for 14-d post-mortem. Warner-Bratzler Shear Force (**WBSF**) and Slice Shear Force (**SSF**) analyses were conducted and cook-loss percentage was measured. A trained sensory panel analyzed samples for juiciness, tenderness, and flavor attributes.

Important Findings

There were no differences among liver abscess scores for WBSF or SSF ($P > 0.52$). Warner-Bratzler Shear Force was lower for C-SV than S-SV ($P = 0.04$). Sensory attributes of initial and sustained juiciness, and overall tenderness were all greater for C than for S steaks ($P < 0.04$) and connective tissue amount was less for C steaks when compared to S ($P = 0.03$). Liver abscess score had no effect on any sensory attributes ($P > 0.70$); however, there was an interaction between quality grade and liver score for myofibrillar tenderness ($P = 0.03$). Within C steaks, liver abscess score had no effect on myofibrillar tenderness ($P > 0.05$), however, in S steaks, M steaks were more tender than SE steaks ($P < 0.03$). These results indicate that within quality grades, meat tenderness or sensory attributes were not influenced by liver abscess score.

Implications/Industry Impact

Currently, the beef industry uses the macrolide antibiotic Tylosin Phosphate as a daily feed additive for liver abscess prevention in feedlot cattle. As antimicrobial use in the beef industry becomes less accepted by consumers and more heavily regulated, it is important for us to realize the implications of removing Tylosin from feedlot diets. Liver abscess prevalence will likely increase, but as this research indicates, meat tenderness and sensory attributes will not become less desirable due to this increase.



Graphs/Tables

Table 1. Least squares means and SEM for effect of liver abscess score on Warner-Bratzler Shear Force, Slice Shear Force, and cook-loss for USDA Low Choice and Select beef strip loin steaks.

^{ab}Means within a row with different superscripts differ at the $P \leq 0.05$ significance level.

¹None- healthy liver, no abscess

Item	Treatments									
	Quality Grade				Liver Abscess Score ¹				QG×LA	
	Select (<i>n</i> = 57)	Low Choice (<i>n</i> = 62)	SEM ¹	<i>P</i>	None (<i>n</i> = 43)	Mild (<i>n</i> = 40)	Severe (<i>n</i> = 36)	SEM	<i>P</i>	<i>P</i>
WBSF ² , kg	4.53	4.22	0.13	0.09	4.42	4.34	4.35	0.17	0.91	0.38
SSF ³ , kg	28.48	26.93	0.39	0.39	29.02	26.69	27.41	1.62	0.52	0.61
Cook Loss, %	15.96	16.03	0.87	0.87	16.42	15.57	16.00	0.37	0.21	0.15

Mild- 1 abscess less than 2 cm in diameter to 4 abscesses less than 4 cm in diameter

Severe- 1 abscess greater than 4 cm in diameter or greater than 4 small abscesses

²WBSF = Warner-Bratzler Shear Force

³SSF = Slice Shear Force

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