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# Potential Variation in Determination of Longissimus Muscle Area in Carcasses from Heifers Fed With or Without Zilpaterol Hydrochloride

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## Summary with Implications

*This study was conducted to evaluate some sources of potential variation in determination of longissimus muscle area between the 12<sup>th</sup> and 13<sup>th</sup> ribs of carcasses from heifers fed with or without zilpaterol hydrochloride. Cross sections of the rib-loin were taken cranial to the 11<sup>th</sup> rib and caudal to the 13<sup>th</sup> rib, about 3–4 millimeters thick at 90 degrees perpendicular to the long axis of the longissimus muscle. Potential variation of longissimus muscle area can arise from the natural variation of muscle size when cutting between the 12<sup>th</sup> and 13<sup>th</sup> ribs (up to 9%). Deviation in cutting perpendicular to the long axis of the muscle could contribute 6.9% error. There were no differences in the mean or range of longissimus muscle area among carcasses from heifers fed zilpaterol hydrochloride and controls. These data reinforce the written directions of the USDA to separate the longissimus muscle between the 12<sup>th</sup> and 13<sup>th</sup> ribs by a cut as close to 90 degrees as possible.*

## Introduction

In order to determine yield grade in beef, sides are split between the 12<sup>th</sup> and 13<sup>th</sup> ribs to expose the longissimus muscle. The total longissimus muscle area (LMA) at that location is used in calculating a final yield grade. Yield grade impacts carcass value. This study was conducted to evaluate some of the potential variation that could arise when determining LMA.

Table 1. Average longissimus muscle area measurements (in sq. in) from heifers fed with or without zilpaterol hydrochloride ( $P > 0.10$ ).

Treatment	Mean LMA between 12 <sup>th</sup> and 13 <sup>th</sup> ribs	Mean LMA standard deviation between 12 <sup>th</sup> and 13 <sup>th</sup> ribs	Mean maximum within a carcass	Mean minimum within a carcass	Mean LMA range within a carcass	Mean LMA range standard deviation
Control	14.7	0.8	15.3	14.0	1.2	0.4
Zilpaterol Hydrochloride	16.1	1.7	16.8	15.3	1.5	0.3
All Treatments	15.4	1.2	16.0	14.7	1.4	0.4
P-value	0.12		0.11	0.15	0.22	

## Procedure

Rib-loin sections were cut caudal to the 13<sup>th</sup> rib and cranial to the 11<sup>th</sup> rib from 10 carcasses: 5 from heifers supplemented with zilpaterol hydrochloride (ZH) (8.33 mg/kg of dry matter) and 5 from heifers not supplemented with ZH (CON). Consecutive slices (3–4 mm thick) from each rib-loin section were cut at 90 degrees to the long axis of the longissimus muscle on a band saw. To ensure structural integrity, the sections were frozen and tempered so that the muscles remained firm during cutting. Each slice was placed on a stationary platform below a camera stand and images were captured using a digital Nikon D5100 camera (Lens: Nikon AF-S DX VR Zoom-Nikkor 55–200mm f/4–5.6G IF-ED). An image of a USDA beef ribeye grid was also obtained to ensure accurate calibration of LMA. The LMA was traced using a tablet computer, allowing image magnification to ensure accurate tracings were made. The LMAs were determined for those slices that were cranial to the 13<sup>th</sup> rib and caudal to the 12<sup>th</sup> rib. Rib angles were measured on carcasses in the Loeffel Meat Lab at the University of Nebraska-Lincoln using a protractor.

the mean or range of LMA among carcasses from heifers fed ZH and CON ( $P > 0.10$ ). Depending upon the location of the cut between the 12<sup>th</sup> and 13<sup>th</sup> ribs, the LMA could vary by as much as 9.0%. This equates to approximately 0.4 yield grade units. That is, a carcass that should receive a yield grade of 3.2 could present a LMA supporting a grade of 2.8.

Additional inaccuracy could occur by failing to cut “across the ribeye muscle perpendicular to the outside skin surface of the carcass at an angle toward the hindquarter which is slightly greater (more nearly horizontal) than the angle made by the 13<sup>th</sup> rib”, as stated in section 54.104 of the *United States Standards for Grades of Carcass Beef* by the USDA. An angle of 68 degrees (22 degrees from the desired 90 degree angle) can be created by closely following the curvature of the 13<sup>th</sup> rib, potentially overestimating LMA by 7.9%. In this study, an incorrect cutting angle could overestimate LMA as much as 1.2 sq. in, an additional 0.4 yield grade units. Collectively, variation of muscle size and improper ribbing could alter LMA as much as 2.6 sq. in (16.9%), the equivalent of 0.8 yield grade units.

## Results

Mean LMA was 15.4 sq. in. The mean range in LMA between the 12<sup>th</sup> and 13<sup>th</sup> ribs was 1.4 sq. in. There were no differences in

## Conclusions

Due to the variation of longissimus muscle size and improper ribbing tech-

Acknowledgment

nique, LMA could vary by as much as 16.9%. These data reinforce the written directions of the USDA to separate the longissimus muscle between the 12<sup>th</sup> and 13<sup>th</sup> ribs by a cut as close to 90 degrees as possible. Feeding ZH to heifers had no effect on LMA variation between the 12<sup>th</sup> and 13<sup>th</sup> ribs in this study.

Chris Calkins has disclosed a significant financial interest in TenderSpec, LLC. The University of Nebraska-Lincoln's Conflict of Interest in Research Committee had determined that this must be disclosed.  
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