

<b>Project Title:</b>	Standardization of Slice Shear Force Measurements Across Research Institutions and Evaluation of Repeatability of Slice Shear Force Measurement at Multiple Institutions
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### Background

Beef industry leaders assembled by the National Cattlemen's Beef Association (NCBA), a contractor to The Beef Checkoff, at the National Beef Industry Assessment Plan II Meeting recommended that slice shear force be used as the standard method of tenderness measurement. Thus, numerous institutions have or are considering adopting slice shear force for routine longissimus tenderness measurement. To facilitate standardization across institutions, most institutions conducting SSF use a standard kit of equipment for slice shear force measurement (includes sampling boxes, double-bladed knife, and shearing blade). The present experiment was conducted to standardize slice shear force measurement across 7 research institutions and to determine if each institution can accurately and repeatedly measure slice shear force.

### Methodology

The ribeye roll and strip loin were obtained from the left side of 154 U.S. Select beef carcasses. To ensure ample variation in tenderness, cuts from one-half of the carcasses were frozen at 2 days postmortem and cuts from one-half of the carcasses were frozen at 14 days postmortem.

Eight 2.54-cm thick steaks were obtained from the posterior end of each frozen ribeye roll and six 2.54-cm thick steaks were obtained from the anterior end of each frozen ribeye roll. Sampling was limited to the center of longissimus to avoid potential location problems identified previously.

Steaks were assigned for measurement of slice shear force in duplicate pairs in such a manner that each institution tested two steaks from each carcass. Institutions were assigned to locations within each carcass using a randomized block design. That is, each institution was assigned to each location 22 times.

*Statistical Analysis.* Mean differences in slice shear force among institutions were compared using the GLM procedure of SAS (SAS Inst. Inc., Cary, NC). For each institution, the repeatability of slice shear force was calculated as the proportion of the total variance that could be attributed to animal variance:  $\text{repeatability} = \sigma^2_{\text{animal}} / (\sigma^2_{\text{animal}} + \sigma^2_{\text{error}})$ . Variance components were estimated with the MIVQUEO option of the VARCOMP procedure of SAS (SAS Inst. Inc., Cary, NC).

### Findings

Repeatability estimates for slice shear force for the seven institutions were 0.91, 0.90, 0.89, 0.89, 0.83, 0.76, and TBD (one institution has not yet completed data collection). In comparison, when we evaluated repeatability of Warner-Bratzler shear force among



institutions, we observed a range in repeatability from 0.39 to 0.87. Inspection of the raw data revealed that differences among institutions in the repeatability of SSF were partially attributable to differences among institutions in the consistency of steak thawing and cooking procedures. In addition to MARC, the repeatability of slice shear force was  $\geq 0.89$  for three other institutions. The mean slice shear force value for each of those institutions was similar ( $P > 0.05$ ) to the mean slice shear force value for MARC. The mean slice shear force value for each of the other two institutions was higher ( $P < 0.01$ ) than the mean slice shear force value for MARC. This appeared to be a function of cooking method as cooking loss was higher for each of those institutions. This result stresses the importance of cooking in measurement of tenderness. Clearly, some institutions need to improve cooking methods.

## **Implications**

Beef industry leaders assembled by the National Cattlemen's Beef Association (NCBA) at the National Beef Industry Assessment Plan II Meeting recommended that slice shear force (SSF) be used as the standard method of tenderness measurement. Thus, numerous institutions have or are considering adopting slice shear force for routine ribeye and strip loin steak tenderness measurement. The objective of this check-off funded study was to determine whether research institutions could conduct SSF with a high degree of repeatability after they were trained and equipped for the standard SSF protocol. Scientists from the U.S. Meat Animal Research Center trained six research institutions to conduct the standardized slice shear force measurement. It was determined that slice shear force measurement was conducted with a very high degree of repeatability ( $\geq 0.89$ ) by most institutions. This experiment clearly shows that slice shear force can be used for routine beef ribeye and strip loin tenderness evaluation with substantial labor/time savings.