2019 Reciprocal Meat Conference– Meat and Poultry Quality and Composition-Measurement and Prediction

Meat and Muscle Biology™

Impact of Sampling and Storage Techniques on Beef Muscle Measurements During Aging

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Keywords: aging, beef, sampling
Meat and Muscle Biology 3(2):117

Objectives

This objective was to determine if variations in beef sampling techniques utilized by meat researchers have a significant impact on beef muscle measurements during aging.

Materials and Methods

Ten beef short loins (IMPS 180) were purchased from a commercial packing plant within 48 h of slaughter. Loins were transported to the NDSU Meat Science laboratory where they were mapped into four sections from most anterior (1) to most posterior (4). Within sections, two, 40-g samples were removed; one sample was vacuum packaged (SMALL-VAC) and the other sample was stored in a wire-closure sealed bag (SMALL-BAG). The remaining whole short loin was vacuum packaged. All samples and whole short loins were stored at 4°C for 10 d. At 10 d, the short loins were sampled again where one, 40-g sample was removed from each mapped section (WHOLE-VAC). Purge loss was measured by weighing each sample prior to packaging treatment and at the end of the 10-d aging period; percentage change in weight was calculated. Troponin-T degradation was determined by western blot. Briefly, protein was extracted in an SDS-phosphate buffer, separated by SDS-PAGE under reducing conditions, and transferred to PVDF membranes. Western analysis was done using an anti-troponin-T antibody (clone JLT 12), and immunoreactive bands (Band 1 = doublet ~42 to 45 kDa; Band 2 = doublet ~ 36 to 38 kDa, Band 3 = 30 kDa) were analyzed for differences in density. Sarcomere length was determined using HeNe laser diffraction. Thinly sliced samples (~50 to 100 mg) were placed in a sucrose-phosphate buffer and subjected to beadmill homogenization. A drop of the homogenate was placed on a glass slide, diffraction patterns were measured, and sarcomere length was calculated. Thiobarbituric acid reactive substances (TBARS) were assessed using a colorimetric assay. Analysis was conducted using Proc Mixed procedure of SAS where storage type, section location, and their interaction were used as fixed effects.

Results

There was a storage type by section interaction (P = 0.017) that occurred with purge loss. SMALL-VAC samples released more purge than SMALL-BAG from the more posterior samples. Troponin-T Band 1 tended to be less (P = 0.07) in WHOLE-VAC samples compared with SMALL-VAC and SMALL-BAG. There was a storage type by section interaction (P = 0.02) where the most posterior SMALL-BAG samples had greater Band 2. There were no differences ($P \geq 0.25$) in Band 3 between treatments. There was no difference (P = 0.29) in sarcomere length due storage type. However, there was a difference (P = 0.01) in sarcomere length between sections, where the shortest sarcomeres were in the center of the strip loin and longest sarcomeres on either end. There was a storage type by section interaction (P = 0.02) for TBARS where concentration was greatest in the most posterior portion of SMALL-BAG compared with WHOLE-VAC.

Conclusion

Collection of smaller samples for aging studies may not be representative of samples aged in a whole primal cut and may influence research outcomes.