Cooked Roasts Made From Turkey Have Different Processing Characteristics Than Roasts Made from Roasts Beef

K.M. Groenlund, J. A. Boles, C. J. Bergner, and K. Clawson
Animal and Range Sciences Department
Montana State University, Bozeman, MT 59717

Introduction

Recently some researchers have reported that processing characteristics of beef are different from other species especially pork and poultry. Xargayó and Lagares (1999) reported that beef needed more pressure in the pre-massaging stage of processing to get similar results to pork and poultry. This suggests that processing procedures need to be modified when manufacturing beef products to achieve similar results to pork and poultry. Furthermore, Boles and Shand (2001) reported that different meat cuts responded differently to processing, when used to manufacture roasts. With the large increase in processed beef products it is becoming more important to determine if new processing procedures are needed to get results from beef that are similar to poultry. The objective of this study was to evaluate different functional properties of both beef and turkey and determine how these properties affect the processing characteristics.

Material and Methods

- *Meat*
  - *Semimembranosus* muscle from beef
  - *pectoralis major* muscle from turkey
- Meat was cut into 1 kg roasts. Roasts were randomly assigned to one of two treatments.
  - Not injected
  - Injected 125% of green weight
    - Brine was formulated to give 1.8% salt and 0.3% phosphate in the product
- Raw meat characteristics
  - protein solubility
  - pH (before and after injection)
  - proximate analysis.
- Roasts were tumbled and steam cooked to an internal temperature of 75°C.
- Processing parameters and tenderness were measured on each roast.
  - cook yield
  - expressible moisture
  - Warner-Bratzler shear force
- **Protein Solubility** (Boles et al., 1992).
  - LIS proteins extracted with 0.03 M potassium phosphate (pH 7.4) (LIS)
  - HIS proteins extracted with 0.5 M potassium chloride, 0.1 M potassium phosphate (pH 7.4) solution
  - Total proteins extracted with 1.1 M potassium iodide (pH 7.4) solution.
  - The supernatant from each tube was sampled for protein content using Biuret protein determination
- **Expressible Moisture of Cooked Product**
  - Moisture lost from cooked product after centrifugation (Shand, 2000).
- **Statistics**
  - Data was analyzed using SAS in a completely randomized design with 5 replicates. Simple correlation coefficients were also calculated

Results and Discussion

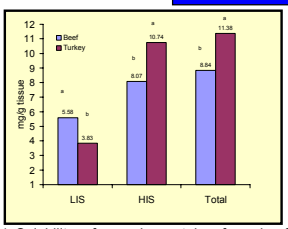

Fig. 1. Solubility of muscle proteins from beef and turkey (LIS – low ionic strength soluble proteins, 0.03 M K_2PO_4, pH 7.4; HIS – high ionic strength soluble proteins, 0.5M KCl in 0.1 M K_2PO_4, pH 7.4; Total – total proteins soluble in 1.1M KI in $0.1K_2PO_4$, pH 7.4)

Beef had more proteins that were soluble in low ionic strength than turkey. This is mostly due to the higher myoglobin content in beef. However, turkey had more proteins that were soluble in the high ionic strength and total protein buffers. This suggests that the myofibrillar proteins from turkey are easier to extract than myofibrillar proteins from beef.

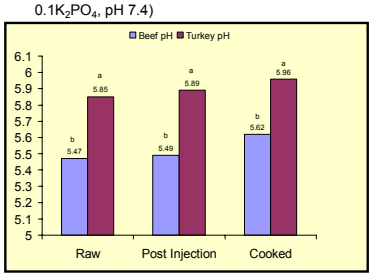

Fig. 2. Treatment and species effect on the pH of raw and cooked meat.

Turkey meat had a significantly higher pH than beef. This was repeated in the injected meat as well as the cooked meat. Injection of salt and phosphate increased the pH of the meat only slightly, with a slightly higher increase when turkey was injected.

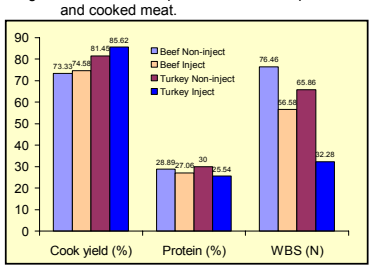

Fig. 3. Interaction of species and treatment on cook yields, protein composition and WBS of cooked roasts.

An interaction trend (P=0.07) for cook yield was observed between species and treatment. Roasts made from turkey tended to have a greater increase in cook yield with injection than those roasts made from beef. A significant interaction was seen between species and treatment for cooked protein content. Protein content was reduced more in injected turkey roasts than in injected beef roasts. This reflects the changes in cook yield. Cooked beef roasts were less tender than turkey roasts. Injection reduced WBS values for both beef and turkey roasts

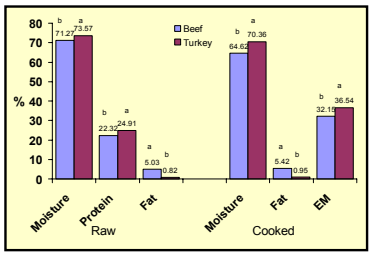

Fig 4. Species effect on the proximate composition of raw and cooked meat and expressible moisture.

Raw beef had significantly lower moisture and protein content with a higher fat content than did raw turkey. This was also seen in the cooked roasts. Furthermore, beef roasts had less expressible moisture than did turkey roasts. This reduction in expressible moisture follows the reduction in cook yields.

Table 1. Simple correlation coefficients between selected meat measurements

	Raw pH	LIS	HIS	Total
Cook Yield	0.84***	-0.75***	0.34	0.52**
Expressible Moisture	0.46*	-0.34	0.04	0.13
WBS	-0.43*	0.37	-0.12	-0.31

***P<0.05; **P<0.01; ***P<0.001**

Basic meat characteristics had some effects on processing parameters. Cook yield of roasts was positively correlated to raw meat pH and total protein solubility. Expressible moisture had a low positive correlation to raw meat pH but was not related to protein solubility. Tenderness (WBS) had a weak negative relationship to raw pH.

Conclusions

- Roasts made from turkey have higher cook yields than roasts made from beef.
- Injection with brines containing salt and phosphate increased cook yields of both turkey and beef roasts.
- Myofibrillar proteins in turkey are more soluble than those in beef. This could be associated with the higher pH of turkey.
- Total protein solubility was associated with cook yields but initial raw pH of the meat seems to be a better predictor of cook yield.

References

AOAC. (1990) Official Methods of Analysis, 15th ed. Association of Official Analytical Chemists, Arlington, VA

Boles, J.A., & Shand, P.J. (2001). Meat cut and injection level affects the tenderness and cook yield of processed roast beef. *Meat Science 59*, 259-265.

Boles, J.A., Parrish, F.C Jr., Huiatt, T.W. & Robson, R.M. (1992). Effect of porcine stress syndrome on the solubility and degradation of myofibrillar/cytoskeletal proteins. *Journal of Animal Science 70*, 454-464.

Shand, P.J. (2000). Textural, water holding, and sensory properties of low-fat pork bologna with Norman or waxy starch hull-less barley. *Journal of Food Science, 65*, 101-107.

Xargayo, M. & Lagares, J. 1999. Pre-massage to slice processing time. *Meat International 9*, 22-24.