EVALUATION THE PROTEIN DEGRADATION IN DRIP FROM BEEF SIRLOIN DURING POSTMORTEM AGING

R. Lertpatarakomol[1*], A. Pungsuk[2] and N. Pothising[3]

[1]Faculty of Veterinary Medicine, Mahanakorn University of Technology, Nong Chok 10530, Thailand

[2]Beef Cattle Research and Development Center, Bureau of Animal Husbandry and Genetic Improvement, Department of Livestock Development, Lam Sonthi 15190, Thailand

[3]Prachin Buri Livestock and Breeding Center, Bureau of Animal Husbandry and Genetic Improvement, Department of Livestock Development, Kabin Buri 25110, Thailand

*Corresponding author email: rachakris@gmail,com

I. INTRODUCTION

For many years, meat quality has become a primary focus for meat consumers. Particularly, tenderness is an attribute most demanded by the consumers. Postmortem aging is a natural process which improves the palatability attributes of meat. Two types of commercially postmortem aging processes are dry and wet aging. Aging process changes beef by two means. Firstly, moisture is evaporated from the muscle. This creates a greater concentration of beef flavor and taste. Secondly, the beef's natural enzymes, such as calpains and cathepcins, break down the myofibrillar proteins and connective tissue in the muscle, which leads to more tender beef [1]. Meat tenderization occurs rapidly until 3 to 7 days postmortem. Previous study indicated that some proteins were proposed of predictors for meat quality [2]. Therefore, this study was aimed to evaluate the protein degradation in drip of beef sirloin during postmortem aging.

II. MATERIALS AND METHODS

Five beef sirloins were kept in vacuum polyethylene bag and refrigerated at 0-4°C for analysis. The drip from beef sirloin samples were collected at 4, 9, 20 and 40 days of postmortem aging. Proteins in drip samples were compared by sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE). Whole drip samples (4, 9, 20 and 40 aging days) were centrifuged at 12,000 rpm for 5 min at 4°C. Then 10 µl of supernatants were added with 10 µl sample buffer, and boiled at 100°C for 2.5 min .Proteins were separated by 3% stacking gel and 7.5% running gel at 4°C. Gel was stained with Coomassie stain solution for 10 min and destained overnight (24 h). After that the gel was rinsed twice times with distilled water (dH_2O) and kept in suitable container by soaking in dH_2O for protein analysis.

III. RESULTS AND DISCUSSION

The results of protein degradation analysis was shown in figure 1. The SDS-PAGE patterns showed that the band (MW ~38 kDa) in drip of beef sirloin sample was deceased during aging times, and completely decreased at 40 days postmortem aging. The SDS-PAGE analysis showed that the complete degraded band was identified as glyceraldehyde-3-phosphate dehydrogenase (GAPDH or G3PDH).

GAPDH, sarcoplasmic protein, is an enzyme of ~38 kDa that catalyzes the sixth step of glycolysis. In agreement with researchers who indicated that GAPDH decreased during the postmortem conditioning of beef [3]. And finding of previous reported that GAPDH decreased in soluble fraction of beef for 10 days, and completely decreased after 15 days of storage [4]. Moreover, previous report showed that GAPDH highly correlated with Warner-Bratzler shear force (WBSF) [3]. It was suggested that changed in sarcoplasmic protein profiles may reflect increased proteolysis and might be useful as potential markers for tenderness development. In addition, several studies indicated that some peptides detected in post-mortem aging corresponding to degradation of GAPDH [4, 5]. These peptides may related to flavor and taste of meat [1, 5, 6].

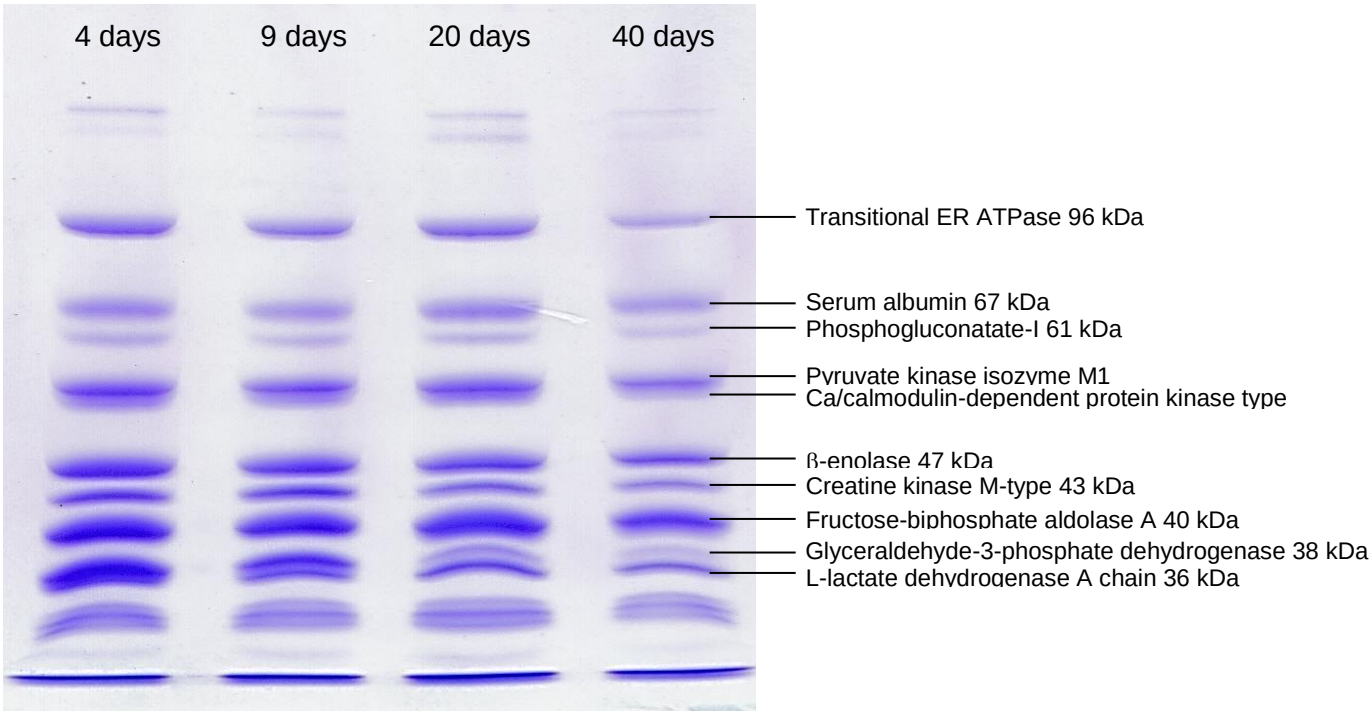

Figure 1. SDS-PAGE gel of proteins in drip of beef sirloin during postmortem aging

IV. CONCLUSION

The results of this study might be concluded that sarcoplasmic protein, especially GAPDH (MW ~38 kDa), completely degraded during postmortem aging. It might be used as markers/indicators to determine aging and meat quality.

ACKNOWLEDGEMENTS

The author thanks all managements and personnel involved in this study for facilitating and assisting with the collection of data.

REFERENCES

1. Toldrá, F. (2005). Meat: chemistry and Biochemistry. Handbook of food science, technology and engineering. Hui, Y.H. editor. CRC press, New York, USA.
2. Della Malva, A., Marino, R., Grubbs, J. K., Fritchen, A. N., Lonergan, S. M. & Huff-Lonergan, E. (2011). Effect of low voltage electrical stimulation on changes in proteome of *Bovine Longissimus* muscle during postmortem aging. Online available: http://www. beefresearch.org/CMDocs/BeefResearch/PE_Project_Summaries/FY10Effect_of_ low_voltage_electrical_stimulation.pdf.
3. Bowker, B. C., Fahrenholz, T. M., Paroczay, E. W. & Solomon, M.B. (2008). Effect of hydrodynamic pressure processing and aging on sarcoplasmic proteins of beef strip loins. Journal of Muscle Foods. 19: 175-193.
4. Ishikawa, S., Ohata, M., Arihara, K. & Itoh, M. (2009). Proteomic analysis of Bovine skeletal: change in soluble proteins with minerals during storage. Annual research report 2009 II. Online available: http://www.saltscience.or.jp/general_research/2009/200913.pdf.
5. Troy, D. J. (1999). Enhancing the tenderness of beef. Research and training for the food industry. Research report no. 11. Online available: http://www.teagasc.ie/research/reports/ foodprocessing/3916/eopr-3916.pdf.
6. Traore, S., Aubry, L., Gatellier, P., Przybylski, W., Jaworska, D., Kajak-Siemaszko, K. & Santé-Lhoutellier, V. (2012). Higher drip loss is associated with protein oxidation. Meat Science 90: 917-924.