CHANGES OF HADH ENZYME ACTIVITY, MUSCLE PROTEIN, AND OTHER CHARACTERISTICS OF PORCINE MUSCLE CAUSED BY DIFFERENT FREEZING RATE

MING-TSAO CHEN, PING-PING TSAI AND WEI-DER YANG
Department of Animal Science, National Chung-Hsing University, 250 Kao-Kung Road, Taichung, Taiwan 40227, ROC

SUMMARY : *Longissimus dorsi* of pork was cut into 2 cm thick and packed in vaccum. The samples were placed in -30°C, -20°C, -3°C, 0 to 4°C and liquid nitrogen randomly. The samples for -30°C, -20°C and liquid nitrogen were lowered to internal temperature at -20°C then stored at -20°C storage room.

The results were as follows : The changes of pH values of procine muscle were very stable during cold storage. After 3 weeks of storage, the pork samples obtained from 0 to 4°C and liquid nitrogen freezing had lowest in drip loss, then -30°C and -20°C were highest. No significant difference was found between 0-4°C, -3°C and liquid nitrogen samples. Color was muasured by the Hunter colorimeter and express with L, a, b values. The result indicated the samples of -3°C and 0-4°C had highest L-values (lightness), liquid nitrogen and -20°C were next, -30°C was the lowest. a/b ratio was no significant difference between pre and post-treatment samples, but -3°C and 0-4°C had higher ratio after 3 weeks of storage.

Water holding capacity (WHC) was found highest in the sample of 0-4°C and then as the following order -3°C > -30°C > -20°C > liquid nitrogen at o time. Then after 3 weeks of storage, WHC of the five treatments was as the following order 0-4°C > -3°C > -30°C, -20°C liquid nitrogen, and there was significant difference between 0-4°C and liquid nitrogen. After one-day storage, emulsifying capacity (EC) was found highest in the sample of 0-4°C, then -30°C and -3°C, lowest in the liquid nitrogen treated sample. After 3 weeks of storage, EC was found highest in the samples of 0-4°C and -3°C, lowest in -20°C and liquid witrogen treated samples.

Sulfhydryl group content was found that no significant difference exist between all samples, but 0-4°C and -3°C treated samples were higher than others after 3 weeks of storage. During frozen storage liquid nitrogen treated sample had highest β-HADH activity, -20°C next, and then -30°C, -3°C and 0-4°C were lowest. In tenderness, there was no significant difference among all samples throughout the storage period.

INTRODUTION : Freezing is one of the method to prolong shelf life of human food. We always try to choose the best conditions of freezing for keeping meat quality. Some pepars proved that quick freezing can reduce the hurt of meat tissue and the changes in the biochemical characteristics (1, 2, 3, 4). However, partial freezing is the fasion method for fish storage (5), but it isn't sure whether this method be suitable for meat or not. The purpose of this study is attempt to investigate the changes of biochemical and histological properties of porcine muscle under different freezing methods.

MATERIALS AND METHODS : *Longissimus dorsi* of pork obtained from local slaughterhouse in one hour postmortem was cut in thickness of 2 cm and vaccum-packed. They were randomly divided into A, B, C, D, E groups with difference treatments. The changes of biochemical and histological properties of the samples were tested in the day before freezing and 1 day, 7 days, 14 days and 21 days after freezing. Group A , B were frozen at -30°C and -20°C until the internal temperture of meat to -20°C, then removed to store at -20°C. Group C was frozen and storaged at -3°C. Group D was stored in 0-4°C. Group E was dipped in liquid uitrogen to lover the temperature to -20°C, then stored at -20°C. The biochemical and histological tests, including pH value, L. a. b values, water holding capacity (WHC), β-hydroxyacyl-C_oA dehydrogenase (HADH) activity (6), tenderness, drip loss, sulfhydryl group content, emulsifying capacity, scanning electron microscopy (SEM) and light microscopy (LM), were determined to study the effects of different freezing rates.

RESULTS AND DISCUSSION : There was a little difference in pH value change between fresh and thawed pork, it decreased after frozen, but no singnificant difference was found among the five treatments during frozen storage. HADH acitivity of five treatments was as the following order : E > B > A > C > D groups during storage. Drip loss percentage of five treatments was B > A> C > D > E groups and increased with storage time. In earlier frozon stages, WHC for five treatments was E > B > A > C > D group, then after 3 week storage WHC was as in the following order E> A , B > C > D. Treatment B , D had the highest in a/b value of final stages. There was difference between fresh and thawed pork in emulsifying capacity. It significantly decreased after frozen. Treatment E had the lowest emulsifying capacity during storage. After 3 weeks of storage, treatments C and D had the highest emulsifying capacity then A. B. E in order. Sulfhydryl group content of treatments C and D was the highest and treatment E was the lowest among the treatments. In tenderness, there were no significant differences among all samples during fozen storage.

REFERENCE : (1) Carroll, R. J., Cavanaugh, J. R., and Rorer, F. D. 1981. Food Sci. 46 : 1091-1094. (2) Nusbaum, R. P., Sebranek, J. G., Topel, D. G., and Rust, R. E. 1983. Meat Sci. 8 : 135 ~ 146. (3) Rahelic, S., and Puac, S. 1985. Meat Sci. 14 : 63 ~ 72. (4) Hanenian, R., Mittal, G. S., and Vsborne, W. R. 1988. 34TH International congress of Meat Sci. and Technolgy congress proceedings part A pp.222 ~ 225. (5) Miguel, A. P., Kakuda, K., and Uchiyama, H. 1982. Bull. Tokai. Reg. Fish Res. Lab. 106 : 11 ~ 26. (6) Gottesmann P., and Hamm R. 1986. Flesichwirtsch International (1) : 41-44.