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Effect of Freeze-Thaw Process on Myoglobin Oxidation of Pork Loin During Cold Storage

Jin-Yeun Jeong, Gu-Boo Park and Seon-Tea Joo

Meat Science Laboratory, Division of Animal Science, College of Agriculture and life science, Gyeongsang National University

To determine whether β -hydroxyacyl CoA- dehydrogenase(HADH) activity increased by freeze-thaw process affects myoglobin oxidation without lipid oxidation in pork loin during cold storage; After making steaks (3 cm thickness) from 10 pork loins, samples were packaged in a polyethylene bag, and samples were subjected to fresh group (Control), on cycle freeze-thaw group (Treatment 1) and two cycles freeze-thaw group (Treatment 2), respectively. Samples were stored at 4°C for 7 days to measure meat color (CIE L*, a*, b*), percentage of MetMb, thiobarbituric acid reactive substance (TBARS) value and HADH activity at 0, 3, and 7 days of storage. Samples of control showed significantly ($p < 0.05$) higher CIE a* value compared to those of treatments at 7 days of cold storage. Moreover, the a* value of Treatment 1 was higher than that of Treatment 2. On the contrary, MetMb percentages of Treatments were significantly ($p < 0.05$) higher than those of control at 3 and 7 days of cold storage. Treatment 2 showed significantly ($p < 0.05$) higher MetMb percentage compared to Treatment 1 at 3 days of storage. There were no significant ($p > 0.05$) differences in TBARS values between control and treatment during cold storage. however there were significant ($p < 0.05$) differences in HADH activity between control and treatments at 3 days of cold storage. Samples of treatments showed higher HADH activity compared to those of control. there was no significant ($p > 0.05$) difference in HADH activity between Treatment 1 and Treatment 2. These results suggested that the freeze-thaw process could accelerate meat color deterioration, i.e. decreased redness and increased MetMb percentage in pork loin during cold storage. This also implied that autoxidation of Mb in Freeze-Thaw pork loin was influenced by somehow except oxygen in the tissue that would lead to decreased OxyMb. The damage to cellular and sub-cellular compartments form

physical disruption by ice crystals during freezing and thawing could release enzymes into sarcoplasm, and the enzymes could potentially be involved in MetMb formation in thawed meat finally. In this research, the increasing of HADH activity by freeze-thaw process was confirmed, and the results suggested that the rapid Mb oxidation without lipid oxidation might be affected by partially the increased HADH activity during freezing and thawing of pork loin. Finally, it was concluded that freeze-thaw process of pork loin accelerated color deterioration during cold storage and the oxidation of Mb was not related to lipid oxidation. Also the released HADH into sarcoplasmic from mitochondria could be involved in the autoxidation of Mb in freeze-thaw pork loin.