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Cryochemistry of animal tissue: Biochemical changes in poultry muscle during freezing and storage *

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Summary

The nature of biochemical changes occurring in chicken muscle tissue as a result of freezing and frozen storage was studied to aid in understanding the mechanism of freezing damage and quality deterioration. Comparative studies on freshly frozen muscle showed that slow freezing caused a larger loss of drip on thawing and a larger loss of nitrogenous constituents and nucleic acid derivatives in the drip as well as a larger loss of waterholding capacity than fast freezing. Quantitative examination of muscle proteins showed that protein extractability decreased during frozen storage because of loss of solubility of the actomyosin fraction. This decrease accompanied a loss of adenosine triphosphatase activity and a decrease in the sulfhydryl group content of muscle proteins. The stroma protein fraction remained unaffected, and the sarcoplasmic protein fraction decreased only after long storage. In the nonprotein nitrogen fraction, protein

breakdown products increased as a result of proteolysis. The extent of these changes depended directly on storage temperature and time. The results indicate that slow freezing causes greater damage and greater release of proteolytic enzymes to the muscle tissue than fast freezing, and that during frozen storage muscle proteins undergo denaturation and limited proteolysis. The significance of these changes in freezing damage and quality deterioration was discussed.



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