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Denaturation mode of myofibrillar protein in salted fish meats as affected by Ca, Mg, or K concentration

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Summary

Sodium chloride (NaCl) is an essential additive for seafood processing through contributing to extension of the self life by reduction of water activity as well as improvement of the flavor and the texture of the products. On the other hand, denaturation of myofibrillar protein caused by high concentration of NaCl damages the quality of the seafood. Thus, to control the salt-induced protein denaturation of fish meat is indispensable process in seafood processing.

A number of studies have been done to elucidate the mechanism of salt-induced protein denaturation by using isolated protein preparation such as actomyosin or myofibrils. However, little information is available about the denaturation mode of myofibrillar protein in salted fish meats. In this study, we investigated the extractability and the biochemical properties of actomyosin extracted from salted fish meat to reveal the denaturation mode of myofibrillar protein in fish meat by salting comparing with those of salt-treated myofibrils.

Soaking of fish meats in NaCl solution significantly decreased the extractability of actomyosin, while the salt solubility of myosin in salt-treated myofibrils barely changed at the same salting intensity, suggesting that extensive aggregation of myofibrillar proteins proceeded in salted fish meat. The extent of Ca-ATPase inactivation of actomyosin extracted from salted fish meat was also larger than those of salt-treated myofibrils at the same salting intensity. Furthermore, actin in salt-treated myofibrils lost the resistance for chymotryptic digestion in the earlier stage of salt treatment, indicating the actin denaturation prior to the Ca-ATPase inactivation. On the other hand, actin in actomyosin extracted from salted fish meats was still resistant for chymotryptic digestion. No free myosin was detected in terms of thermal inactivation process of Ca-ATPase, confirming that actin in extracted actomyosin was still intact. Addition of Ca, Mg or K ion at 10 mM to soaking solution gave little effect on aggregation of myofibrillar protein.

It was, thus, concluded that the Ca-ATPase inactivation of myosin binding to actin in salted fish meats was followed by the extensive aggregation to lose the salt solubility. Higher protein concentration and pH decrease in salted fish meat would be implicated in the denaturation mode of myofibrillar protein in salted fish meat.