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THE ROLE OF INSOLUBLE FRACTION IN MEAT ON HEAT-INDUCED GEL STRENGTH OF PORCINE ACTOMYOSIN

Makoto Ishioroshi, Takahiro Kitagawa and Kunihiko Samejima

Department of Food Science, Rakuno Gakuen University,

Ebetsu, Hokkaido, 0698501, Japan

Keywords: actomyosin, gel formability, insoluble fraction

Background:

Gelation of proteins is an important phenomenon, which takes place in all structured meat products during thermal processing. In the meat processing, meat is treated with brine. As a result, myofibrillar proteins are solubilized and form a gel upon heating. The main component of salt-soluble proteins that form a gel is myosin. Myosin molecules form thick filaments in myofibrils and disperse as monomer by addition of salts. A myosin molecule has α -helical conformation in the tail portion termed "rod" and two pear shaped head termed "S-1". Tree-dimensional network formation of rod through helix-random coil transition by heating is a main factor in gelation process[1]. S-1 plays a role to strengthen the network structure by head-head aggregation. Actin is the major constituent of thin filaments in myofibrils. Actin affects considerably the heat-set gel strength of myosin though itself does not form a gel upon heating. Thus, gelation properties of salt-soluble proteins, myosin and actomyosin, by heating have been investigated extensively.

Objective:

Meat proteins are roughly divided into three groups, water-soluble, salt-soluble and insoluble, according to their solubility. Main components of salt-soluble proteins are myosin and actin, and come from myofibrils. Heat-induced gel formability of myosin plays an essential role in the development of binding ability in meat processing. It is thought that water-soluble and insoluble-proteins do not affect the rheological properties of meat products. For this reason, there are no reports on the role of these proteins in binding ability of meat, though the characterization of heat-induced gel formability of myofibrillar proteins such as myosin and actomyosin has been well established. Therefore, we examined the effect of insoluble fraction on heat-induced gel formability of porcine actomyosin.

Methods:

Porcine Longissimus dorsi(LD) and semimembranosus(SM) muscles and chicken breast and thigh muscles were used for preparation of actomyosin and insoluble fraction. Actomyosin was extracted with Weber-Edsall solution and purified by repeating of precipitation and solubilization three times. Insoluble fraction was prepared from residual precipitates after extraction of actomyosin. The precipitate was washed with five volumes of 0.6M NaCl and distilled water three times, respectively and freeze-dried. Heat-induced gel strength of actomyosin in 0.6M NaCl at pH6.0 was measured by using of a band-type viscometer[2] after heating at 65℃ for 20 min. The gel strength was represented as rigidity.

Results and discussion:

The effect of insoluble fraction on heat-induced gel strength of actomyosin was shown in Fig.1. The rigidity of LD actomyosin elevated with increasing of insoluble fraction from LD muscle added in the system and maximally reached about twice in the range of 5-7mg/ml of insoluble fraction. In SM muscle also, the similar effect was obtained in lesser extent. An exchange of insoluble fraction did not affect the change in rigidity of each actomyosin, indicating the enhancing effect on the rigidity is not dependent on the source of insoluble fraction. Fig.2 shows the effects of insoluble fractions prepared from muscle with various cutting time on the rigidity of LD actomyosin. With increasing of cutting time, insoluble fractions have different effects. When cutting time is prolonged, particle size of insoluble fraction become smaller. It is thought that the size of insoluble fraction affects the enhancing effect on gel strength of actomyosin.

These results suggest that the amount and the size of connective tissue have an effect on development of binding ability of meat.

Conclusion:

The addition of an appropriate amount of insoluble fraction from meat did strengthen the heat-induced gel strength of actomyosin. This effect was independent on source of muscle and dependent on the amount and the quality(size) of insoluble fraction.

Literature:

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2) K.Samejima, M.Ishioroshi and T.Yasui, *J.Food Sci.*,46,1412(1981)

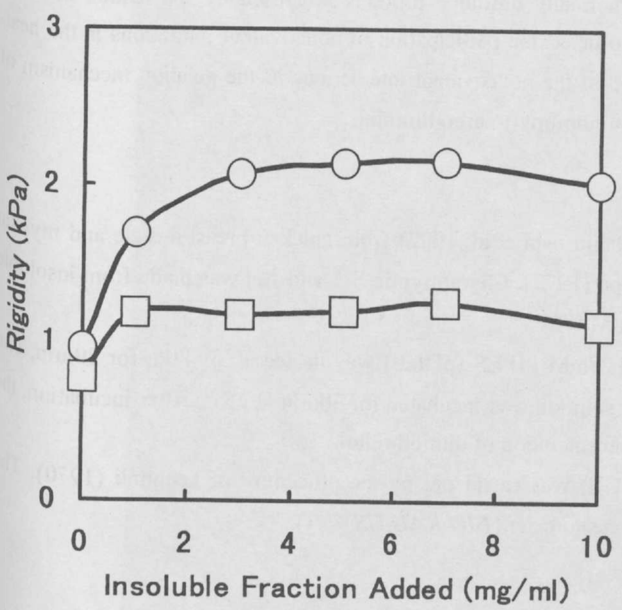

Fig.1 Effect of insoluble fractions on heat-induced gel formability of porcine actomyosin.
Actomyosin(10mg/ml) in 0.6M NaCl at pH 6.0 containing various amount of insoluble fractions was heated at 65℃ for 20min. (○);LD muscle, (□)SM muscle.

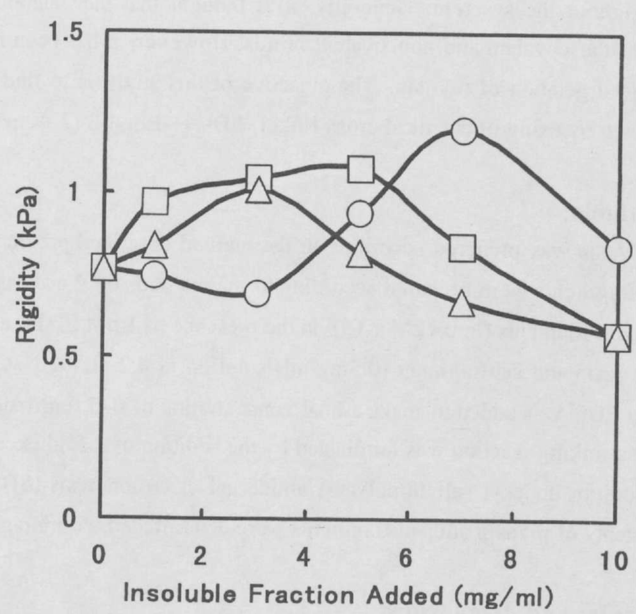

Fig.2 Effects of insoluble fractions and cutting time on heat-induced gel formability of porcine LD actomyosin.
Conditions are the same as in Fig.1.
Cutting time are 3(○), 6(□) and 10(△)min.