# TENDERIZATION OF HOG CASING BY ENZYME TREATMENT

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## Introduction

Animal intestines are used as natural casing for sausage preparation, one reason being the better bite-resistance, ("Hagotae" in Japanese), they provide. Hog casing is tougher than that from sheep, but still tenderization at the production plant is advisable[1,2]. Enzymes in combination with organic acids were previously shown to have tenderizing effect on hog casing from China, which is tougher than that from other countries[3].
Using normal food-graded protease, the present study was conducted to examine the effects of enzyme concentration, incubation time, enzyme solution volume and pH on hog casing tenderization. The results were assessed by rheological and sensory evaluation.

## Methods

**Experiment 1:** Desalted Chinese hog casing (32~34mm in diameter) was incubated at 55°C for periods of 30, 60 or 120 min in phosphate buffer (pH 7.5) containing 0.05~0.1% Alkalase (Novo Nordisk Co., Ltd.) with 10 vol. enzyme solution, followed by washing in distilled water. The casing was then maintained in 0.1% acetic acid for 30 min and dipped in water. Casing texture was evaluated using a Rheometer (Fudo Kogyo Co., Ltd.). Sensory evaluation was also conducted for texture assessment.
**Experiment 2:** 2.5~20 vol. 0.075% Alkalase (pH 6.5, 7.5 and 8.5) were applied to hog casing followed by rheological examination. Using the casing treated in this manner, sausage was prepared and sensory evaluation made. For sausage preparation, a meat emulsion was made using cured pork (thigh portion) and introduced into the casing, which was then subjected to smoke and heat treatment. Sensory evaluation was carried out in accordance with Scheffé's paired comparison, with 24 persons at this laboratory participating.

## Results and conclusions

Enzyme treatment was clearly shown to bring about tenderization of hog casing and casing toughness was reduced with increase in enzyme concentration and time of exposure (**Fig.1**). For casing immersed in enzyme solution for 120 min, solubilization was noted subsequent to enzyme treatment. Based on casing breakage tendency during stuffing, solubilization during cooking and the results of sensory evaluation, 30 min incubation and 0.075% enzyme concentration were concluded most effective for bringing about casing tenderization. Toughness decreased with decline in the ratio of casing amount to enzyme solution volume and was least at pH 7.5 (**Fig.2**). With each treatment, the inside curvature of filled casing indicated lesser toughness compared to the outside. Standard deviation was less for treated casing compared to the control. Sensory evaluation indicated greater tenderness than without treatment and at pH 7.5, enzyme tenderizing effect was particularly significant ($P<0.05$) under the experiment conditions of this study.

### Exp.1. Effect of enzyme concentration and the incubation time

5g desalted hog casing ($\phi$ 32~34) were introduced into a plastic tube followed by the addition of 100ml 0.1M phosphate buffer (pH 7.5) containing Alkalase*1.

*1 The concentration of protease was adjusted to 0.05, 0.075 and 0.1%.

⇩

This system was incubated at 55°C for 30, 60, and 120 min.

⇩

Washing with running tap water and dipping in distilled water were conducted.

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and finally, immersion in 0.1% acetic acid (pH 3.4).

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Second washing as above.

⇩

Assessment of texture was carried out with a Rheometer. (plunger diameter: 3mm) (Fudo Kogyo Co., Ltd., Japan)

*2

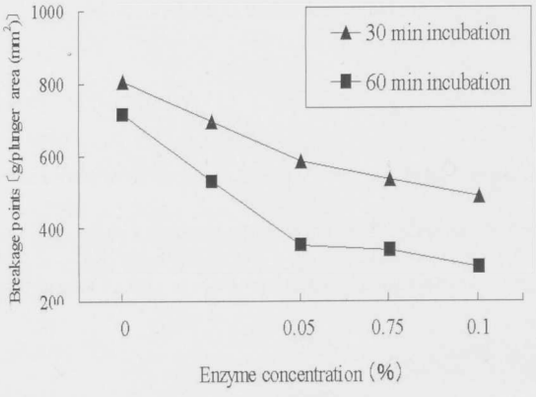


**Fig.1.** Relation of casing breakage point to enzyme concentration and incubation time.

### Exp.2. Effects of enzyme pH and solution volume

10, 20 and 40g desalted hog casing were separately placed in plastic bes followed by the addition of 100ml 0.1M phosphate buffer (pH ljustment : 6.5, 7.5 and 8.5), containing 0.075% Alkalase. Control : epared without enzyme, using 5g casing + 100ml 0.1M phosphate ıffer.

⇩

Incubation at 55°C for 30 min.

⇩

Washing with running water and then distilled water .

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*2 (See Exp.1)

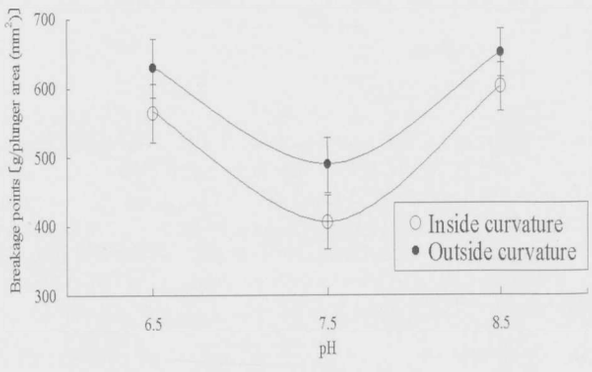


**Fig.2.** Relation of casing breakage point to enzyme solution pH.

**Pertinent literature**

1) Panzer, G. (1998) EU-Forschungsprojekt "Verbesserte Behandlung von Naturdärmen zu Zwecke der Qualitätsverbesserung für ihren Einsatz in automatischen Füllprozessen" Fleischwirtschaft, 78, 1163-1165. **2**) Nishiumi, T. and Sakata, R. (1999) Histological and biochemical evaluation of connective tissue of natural hog and sheep casings. Proceedings of 45th International Congress of Meat Science and Technology, 174-175. **3**) Sakata, R., Segawa, S., Morita, H. and Nagata, Y. (1998) Verbesserung der Zartheit von Schweine-Naturdärmen: Einsatz von organischen Säuren und Proteasen. Fleischwirtschaft, 78, 371-372.

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