THE EFFECT OF MUSCLE TYPE AND STORAGE ON BINDING STRENGTH AND COOKING LOSS OF RESTRUCTURED PORCINE MEAT

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Introduction

The functional properties of meat in the production of meat products is mainly determined by the amount and properties of the salt soluble myofibrillar protein. The solubility of myofibrillar proteins is influenced by pH, ionic strength, animal species, post mortem history and muscle fibre type (Asghar *et al.*, 1985; Samejima *et al.*, 1992). It has also been shown that storage time increases the WHC of meat (Kristensen and Purslow, 2001).

In restructured meat products the salt soluble proteins (SSP) are extracted with brine during the tumbling process. The SSP will afterwards cover the surface as a sticky substance of all the meat pieces which have been tumbled. When the meat pieces are lightly compressed and heat treated, the SSP denature and bind the pieces together, i.e. SSP act as a glue. In the production of the restructured meat product cooked ham, different muscles from the ham are used. These muscles vary in fibre type composition, which probably influence the functional properties. The muscles also vary in pH, connective tissue characteristics and sarcomere length, which also might influence the functional properties.

The aim of the work was to investigate if muscle type and storage time affects the functional properties of meat. The functional properties were determined by measuring the binding strength and cooking loss of a model of a restructured cooked ham produced from a single muscle type.

Materials and Methods

Samples of *Semitendinosus* (ST), *Psoas Major* (PM) and *Vastus Intermedius* (VI) from 8 different animals 24 h post mortem were cut into 3 pieces, which were stored at 5°C for either 1, 3 or 6 days post mortem. All samples were afterwards stored at -18°C.

From each sample two 0.5cm thick slices were cut across the fibre direction. These were placed in a vacuum bag with 20% brine (2 M NaCl and 0.01M sodium pyrophosphate, pH 9.12). The bags were vacuum packed at 0.5 bar and placed in a vacuum tumbler. The samples were tumbled for 3h using a cycle of 5min tumbling and 5min rest. Then the slices were placed on top of each other and vacuum packed. Each sample was placed between two acryl plates and cooked at 75°C for 1h in a water bath. The samples were cooled in ice-water and left overnight at 5°C. Three pieces (1cm x 1cm) from each sample were glued between two aluminium blocks. The aluminium blocks were then mounted on an Instron Texture Analyser and the binding strength was determined by pulling the blocks apart. Only samples that separated between the 2 slices were used, i.e. samples separating between the aluminium block and the meat, were discharged.

The following measurements were made: pH prior (pH 1) and post (pH 2) storage and after tumbling (pH 3), drip loss post freezing, sarcomere length post freezing (only day 1 samples), weight gain during the tumbling process, total protein concentration in the tumbling exudates, cooking loss and binding strength. Data were analysed with SAS 8.2 using the Proc Mixed procedure.

Results and Discussion

Muscle type had a significant influence on both binding strength and cooking loss (Table 1Fout! Verwijzingsbron niet gevonden.). There was no difference in binding strength between VI and PM ($p = 0.14$), however, there was a clear difference between ST and the two other muscles ($p < 0.0001$).

Muscle and the interaction between muscle and storage had an effect on cooking loss (Table 1). PM has the lowest cooking loss followed by ST and VI. This is the opposite of what was expected from the pH of the meat since PM has the lowest pH (5.45) followed by ST (5.52) and VI (5.68). A higher pH normally results in higher water holding capacity.

Table 1: Least squares means of binding strength and cooking loss for cooked ham produced of *Semitendinosus* (ST), *Psoas Major* (PM) and *Vastus Intermedius* (VI) as affected by muscle, storage time and their interaction.

	Muscle			*P* - values		
	ST	PM	VI	Muscle	Storage	M × S
Binding strength, N	3.7	1.8	2.4	***	-	-
Cooking loss, %	34	28	38	***	-	***

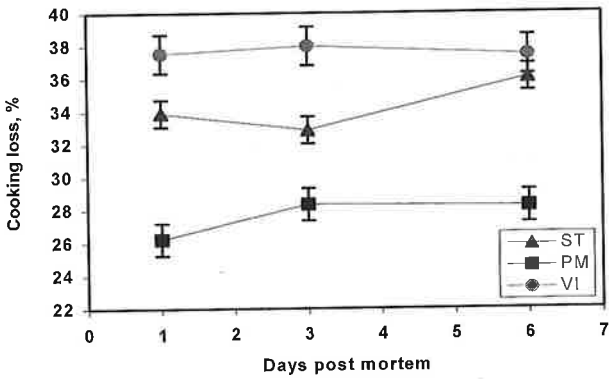

Figure 1: Effect of storage time on the cooking loss of cooked ham produced of *Semitendinosus* (ST), *Psoas Major* (PM) and *Vastus Intermedius* (VI). Error bars represent SEM.

Storage has no effect on cooking loss but there was an interaction with muscle ($p = 0.0012$). Cooking loss increased with storage for ST and PM, however was stable for VI (Figure). The value of pH 3 also increased with storage for ST and PM indicating loss of buffer capacity of the muscles. These effects may result from proteolytic activity during storage.

Storage time did not have any effect on either binding strength or cooking loss ($p > 0,.05$). There was no random effect of animal and also, there were no effects ($p > 0.05$) of any of the following covariates pH 1, pH 2, drip loss, weight gain, and total protein.

Conclusions

The results show a clear effect of muscle type on the functional properties of meat when producing restructured cooked ham. No main effect of storage time was observed, however the cooking loss of ham produced from ST and PM seems to increase with storage time of the meat before processing. The results suggest that muscle fibre type composition of muscles has a large influence on the functional properties of meat.

References

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