S3P14.WP

AGEING OF VEAL MEAT: EFFECT OF STORAGE TIME ON SENSORIAL CHARACTERISTICS

S. LOUISFERT, F. TURIN and C LOPEZ

Service Qualite des Viandes, Institut de l'Elevage, 14310 Villers-Bocage, France

Please refer to Folio 17.

INTRODUCTION

Sensorial qualities in meat depend on many parameters, whose most important are muscle composition, meat microstructure and degree of meat ageing. Much is known about the effects of theses factors in beef, pork and mutton meat, but the knowledge about these traits in veal meat is reduced.

Thus, in these species it is well known that meat tenderness increases gradually during post-mortem storage of meat. As regards to veal meat, the effects of ageing duration on sensorial traits have been little investigated and most of the experiments were carried out on longissimus (Dransfield, 1981; Ouali, 1987).

Therefore, as reviewed by Ouali (1990), tenderization is a variable process depending on a number of biological factors like age, sex, muscle types and species. In addition, the application of technologies like electrical stimulation and rapid cooling may affect tenderization.

In order to extend the work already carried out on *longissimus thoracis*, an experiment was undertaken to assess the influence of ageing duration on sensorial qualities of veal meat, on three important muscle types and under two first chilling conditions.

MATERIALS AND METHODS

Animals

In each experiment, 10 Friesian-Holstein male calves, from the same fattening batch, of approximately 130 days of age and averaging 120±5kg were transported by batch to the slaughterhouse (40KM far from the farm) and killed just after arriving.

First chilling conditions

Experiment 1
One hour after slaughter, carcasses were held at 10°C for four hours before being put in a chill room at 0/2°C until 24 hours post-mortem.

Experiment 2
Carcasses were held at -2/0°C for four hours before being put in a chill room at 0/2°C until 24 hours post-mortem.

Muscles sampling

On the day following slaughter, *longissimus thoracis*, *triceps brachii* and *semimembranosus* muscles from the left and right sides were dissected from eight carcasses selected by measuring the pH (pH<6).

Each muscle was cut into two equally-sized parts and aged for either 2, 5, 7 or 10 days at 2°C in a vacuum-pack for sensorial measurements.

Analytical techniques

Odour and colour assessment
A two member sensory panel assessed odour and colour on pack opening and twenty minutes after opening on a five point scale evaluation.

Storage loss
Each muscle was weighed before and after storage. Storage loss was expected at lost weight in percentage of weight before packaging.

Myofibril Fragmentation Index
Myofibril Fragmentation was measured as the absorbency of a myofibril suspension of a protein concentration of 0.5mg/ml (Olson *et al.*, 1976). Purified myofibrils used for analysis were isolated from raw samples (weighing about 5g) taken from the three muscle types of three animals (out of eight) at the four post-mortem ageing period.

Sensory evaluation
From each aged muscle, twelve portions of approximately 50g were removed for sensory analysis. The lean was cooked in an oven to an internal temperature of 55°C. Twelve-trained panellists received samples from one animal, one muscle type, but from the four different ageing duration.

Tenderness, juiciness and flavour were scored on a 100-point-scale ranging from 0 (extremely tough) to 100 (extremely tender).

Statistical analysis

On a first step, data were analyzed experiment by experiment and muscle by muscle with Statistical Analysis System (1989), by the method of least-squares (GLM procedure). The statistical model included the fixed effects of ageing duration, while animals and assessors were considered as random. The relationships between storage loss, MFI, sensorial traits and storage time were estimated with different models (linear, quadratic and cubic), using polynomial contrast test.

On a second step, pooled data from the two experiments were used to evaluate the effects of refrigeration conditions on rate and extend of meat ageing.

RESULTS AND DISCUSSION

On a first step, the sensorial qualities of meat were measured on cooked meat by sensory evaluation (tenderness, juiciness, flavour).
As shown in Tables 1 and 2, there was an improvement in sensorial traits as a function of ageing duration. However, this effect was systematically significant only on tenderness ($P<0.001$).

It was observed variation in the speed of tenderization between muscles: It continued up to seven days on *triceps brachii* muscle (linear contrast significant, $P<0.05$) and seemed to stop after (quadratic contrast significant, $P<0.05$), whereas tenderness scores after ageing increased linearly (linear effect significant, $P<0.05$) till 10 days with the duration of storage on *longissimus thoracis* and *semimembranosus* muscles.

Meat tenderness improvement during storage is also affected by muscle type: in experiment 1, 24, 20 and 15 points on a scale evaluation from 0 to 100 on *semimembranosus*, *longissimus thoracis* and *triceps brachii*).

However, the extend of meat tenderization was more important in experiment 1 than in experiment 2 (around 10 points in all three muscles) although this effect was not significant. It means that, on each muscle and under these two fist chilling conditions (which are almost similar), the rate of meat ageing is not affected by first chilling.

On a second step, the sensorial qualities of meat were measured on raw meat by Myofibril Fragmentation Index (MFI).

The results of the MFI are given Table 3 and 4. However there are no systematically significant effects, tendency towards increase of MFI with the duration of ageing was observed in all three muscles and under the two first chilling conditions.

These results are in agreement with papers which indicate that veal and beef age at about the same rate and take about 10 days at 1 °C to achieve 80% of the ageing (Dransfield, 1981).

Therefore, the present study confirms that muscle type is an important factor in tenderization rate and intensity, Dransfield *et al.* (1981) emphasized the major role of muscle type on these kinetic parameters.

ACKNOWLEDGEMENTS

This study was supported by INTERVEAUX. The animals were reared by the Union Laitiere Normande (ULN).

REFERENCES

DRANSFIELD, E., JONES, R.C.D., and MacFIE, H.J.H. 1981b. Tenderising in m.longissimus dorsi of beef, veal,

rabbit, lamb and pork. *Meat Sci.* 5:139-147.

OLSON, D.G., PARRISH, F.C.Jr., and STROMER, M.H. 1976. Myofibril fragmentation and shear resistance of three bovine muscles during post-mortem storage. *J. Food Sci.* 41:1036-1041.

OLSON, D.G., PARRISH, F.C.,Jr., DAYTON, W.R., and GOLL, D.E. 1977. Relationship of myofibril fragmentation index to measures of beef steak tenderness. *J. Food Sci.* 42:506.

OUALI, A. 1987. Etude de la maturation de la viande de veau. Convention. INRA-ULN.

OULAI, A. 1990. Meat tenderization: Possible causes and mechanisms. A Review. *J. Muscle Foods.* 1:129-165.