

VARIATION OF THE EATING QUALITY WITHIN THE LONGISSIMUS THORACIS ET LUMBORUM OF PIGS

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Keywords: pork, meat quality, eating quality, longissimus thoracis et lumborum, within muscle variation

Background

To assess the quality of meat of pig carcasses, the longissimus thoracis et lumborum (LTL) is often chosen as reference muscle, although it is known that there exists a large variation in meat quality between the different muscle groups within one carcass (Warner et al., 1993; Wheeler et al., 2000). The LTL muscle is of particular interest to meat scientists, because of the quantitative presence in the carcass and the ultimate role as edible meat. De Smet and Atanasov (1996) and Lundström and Malmfors (1985) proved that also within one LTL muscle there exists a considerable amount of variation in meat quality. However, the results of both studies were in contradiction with each other, in such way that no clear conclusions could yet be drawn. Moreover, no information exists about the variation in eating quality over the longissimus thoracis et lumborum. This knowledge would be extremely helpful when sensory panels are involved in trials. Sensory panel testing demands large amounts of meat and choices need to be made concerning the allocation of different cuts for diverse analyses. In addition, the knowledge about the within LTL muscle variation of meat quality leads to a more valuable interpretation of results of meat quality measurements at different locations on this muscle.

Objectives

This study aims to evaluate the variation in instrumental and sensory meat quality within the longissimus thoracis et lumborum muscle.

Methods

Meat samples of in total 16 animals, belonging to two sexes (half barrows, half gilts) and one genotype (Piétrain x Seghers hybrid), were included in this trial. Four times four pigs were slaughtered, with an average cold slaughter weight of 88 kg and a lean meat percentage of 58. Forty-five minutes post mortem, pH (Knick type 654, with an ingold Xerolyt electrode, Knick, Berlin, Germany), FOP (FOP = Fibre Optic Meat Probe, TBL Fibre Optics Group Ltd., Leeds, UK; measures light scattering via glass fiber optics) and PQM (Pork Quality Meter, Tecpro GmbH, Aichach, Germany; measures conductivity) were determined at the 3th/4th lumbar vertebrae, the 3th/4th last rib and the 9th/10th last rib of the longissimus thoracis et lumborum. Twenty-four hours after slaughter, the longissimus thoracis et lumborum was sampled and sectioned in 3 big pieces (longissimus thoracis - LT, longissimus thoracis et lumborum - LTL and longissimus lumborum - LL), as shown in figure 1. The LTL piece consisted mainly of thoracis muscle. Each piece was subdivided in 5 cuts of 2,5 cm thickness for different meat quality measurements. Cut A was reserved for the determination of drip loss (4°C - 48 hr; Van Oeckel et al., 1999a). Cuts B and C were vacuum packed and stored at -18°C until sensory analysis. Prior to sensory analysis the meat was overnight thawed at 4°C. At each panel session, three cuts of grilled meat (internal temp. 74°C) from the three locations, LT, LTL and LL, of the same animal, were offered to six out of eight selected and trained panel members. They judged the meat on a scale from 1 to 8, from extremely bad to extremely good for tenderness, tastiness and juiciness. Cut D was used for determining cooking loss (75°C - 50 min, followed by 20°C - 40 min) and Warner-Bratzler shear force (standard procedure; Van Oeckel et al., 1999c). Cut E was used for colour determination with LabScan II 0°/45° (Van Oeckel et al., 1999b), followed by mincing for the measurement of water holding capacity by filter paper press method (Van Oeckel et al., 1999a) and for vacuum frozen storage at -18°C for intramuscular fat (IMF) level determination (Soxhlet extraction with petroleum ether; ISO 1443). The meat quality results were tested in a one-way variance analysis (F-statistics) with, as factor, location (LT, LTL and LL) (SPSS, 2000). Means were compared for significant differences between the different locations with the Scheffé test.

Results and discussions

In table 1 the meat quality results in function of the location in the longissimus thoracis et lumborum are presented. There were considerable differences between means of meat quality characteristics according to the location of measurement. Analogous as found by De Smet and Atanasov (1996), the pH1 was lowest at the LTL location. The colour attributes show that the meat was most pale at the LT location. The LT location revealed the most favourable results for juiciness and cooking loss. The means of the results obtained with the other water binding capacity methods did not differ significantly between the different anatomical locations. In agreement with Lundström and Malmfors (1985), the FOP and drip loss values were lower (not significantly) at the LTL location than at the LT and LL sides. In contradiction to these results, De Smet and Atanasov (1996) found higher CIE L* and drip loss values in the mid-loin parts compared with the anterior and posterior parts. For tenderness, the LT location showed the highest sensory scores and the lowest shear force values in comparison with the LTL and LL location. The tastiness scores and IMF levels were not significantly different over the whole muscle. According to Girard et al. (1988), however, the IMF level is considerable higher at the 5th thoracic vertebrae (2,75%) in comparison with the 2nd lumbar vertebrae (2,1%). Similar variations in meat quality attributes were obtained by analysing sub-populations of samples with PSE characteristics separately from the samples with a normal meat quality (results not shown).

Conclusions

Meat at the anterior thoracic vertebrae side was paler, but had a more favourable pH1 and cooking loss result and was more juicy and tender than at the mid-loin part. The values for the meat quality characteristics of the LL side were more or less in between these of the other locations, but closer to those of the mid-loin part than to the LT part. In agreement with De Smet and Atanasov (1996), it can be concluded that the mid-loin (at the first thoracic vertebrae) is best suited as a reference place for meat quality assessment, if one wants to sort out unacceptable meat.

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Table 1. Meat quality results in function of the location in the longissimus thoracis et lumborum

	LT	LTL	LL
pH1	5.98 ^a	5.57 ^b	5.73 ^{ab}
FOP1	43.8 ^a	30.4 ^{ab}	32.2 ^b
CIE L*	60.9	58.4	56.8
CIE a*	8.0 ^a	8.3 ^{ab}	9.7 ^b
CIE b*	13.9	14.1	14.6
Juiciness	4.9 ^a	4.1 ^b	4.7 ^{ab}
PQM1	6.4	10.2	8.3
Filter paper press method (cm ²)	4.2	4.0	3.7
Drip loss (%)	5.9	5.4	5.6
Cooking loss (%)	31.0 ^a	33.3 ^b	32.7 ^b
Tenderness	6.0 ^a	4.3 ^b	4.7 ^b
Max. shear force (N)	23.5	28.0	27.1
Tastiness	5.4	5.2	5.3
IMF level (%)	1.55	1.41	1.56

Means in the same row with unlike superscripts are significantly different ($P \leq 0.05$).

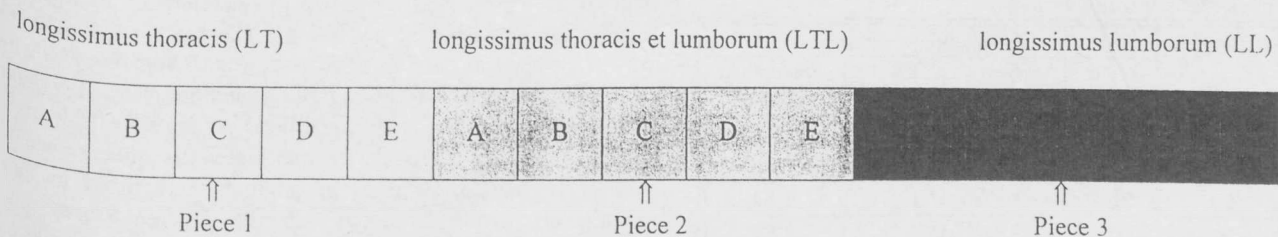


Figure 1. Dissection of the longissimus thoracis et lumborum