

THE RELATION BETWEEN THE POSTMORTAL DEVELOPMENT AND THE CONSISTENCY OF PIGMEAT

W. SYBESMA

Research Institute for Animal Husbandry "Schoonoord", Zeist, Netherlands

Several meat quality parameters were measured in an experiment with 520 pigs belonging to the same carcass quality group (AA). A visual assessment was made, and the rigor mortis development of the ham and the pH-values of the ham and the loin were determined in the slaughterline. The quality of the m. long. dorsi was judged, by using a visual scoring system, the G8fo colour method and a consistency measurement, twentyfour hours after slaughtering. The consistency was measured with the same apparatus which had been used for the rigor mortis development determination. As is known a rapid postmortem development affects unfavourably the meat quality. Therefore it seems rather controversial that the consistency improved with a rapid postmortem development. It strikes the close relationship between rigor mortis and consistency regardless of other quality parameters.

LA RELATION ENTRE LE DEVELOPPEMENT DE LA RIGOR MORTIS ET LA CONSISTANCE DE LA VIANDE DE PORC

W. SYBESMA

Institut de recherches de la zootechnie "Schoonoord", Zeist, Pays-Bas

Le but d'une étude sur 520 porcs de la même catégorie de la qualité de carcasse (AA) était de lier quelques paramètres différents de la qualité de la viande mesurée 24 heures et 45 minutes post mortem. Le pH, le rigor mortis et une notation visuelle sont utilisés pour estimer la qualité 45 minutes post mortem dans le jambon et en même temps le pH de la longe. 24 Heures après l'abattage le qualité de la noix de cotelette a été déterminée par une notation visuelle, la méthode de G8fo et par une détermination de la consistance (méthode rigor). Il est bien connu qu'une évaluation assez rapide de la rigor mortis fait détériorer la qualité de la viande. Dans cette étude une relation étroite et positive est démontré entre le développement rapide de la rigor mortis et la consistance de la noix de cotelette.

A11:2

DIE BEZIEHUNG ZWISCHEN DEM POSTMORTALE ABLAUF DER TODESTARRE UND DIE KONSISTENZ VON SCHWEINEFLEISCH

W. SYBESMA

Institut für Tierzuchtforschung "Schoonoord", Zeist, die Niederlande

In einem Experiment mit 520 Schweinen aus derselbe Karkasqualitätsgruppe (AA) wurden verschiedene Fleischqualitätsmerkmale gemessen. Während des Schlachtens wurden die Schinken (und Lenden) optisch beurteilt und auch die pH und Rigor Mortis Entwicklung gemessen. Nach 24 Stunden wurde die Qualität der M. Long. Dorsi festgestellt durch ein visuelles System, die G6fo Methode und eine Konsistenzmessung fand statt. Die Konsistenzmessung geschah mit demselben Gerät wie es für die Rigor Mortismessung gebraucht wurde. Wie bekannt ist, verschlechtert sich die Fleischqualität durch eine zu schnelle Post Mortem Entwicklung. Deswegen war es ziemlich unerwartet dass die Konsistenz besser war beim schnellen Rigor Mortis Ablauf. Es zeigte sich eine Beziehung zwischen dem Auftreten der Todesstarre und der Konsistenz des Fleisches 24 Stunden später, unbeeinflusst durch die anderen gemessenen Qualitätsmerkmale.

СООТНОШЕНИЕ МЕЖДУ ПОСТ-МОРТАЛЬНЫМ ИСХОДОМ СМЕРТЕЛЬНОГО ОКОЧЕНЕНИЯ И ПЛОТНОСТЬЮ СВИНИНЫ

В.Сибесма, НИИ животноводства "Схоонорд", г.Зейст, Голландия

В условию эксперимента с поголовьем 520 животных одинаковой качественной скелетной группы (AA) были произведены измерения различных отличительных качеств мяса.

Во время убоя окорок (и ляжку) подвергают оптической аттестации, а также производят измерение разворачивания pH и Rigor Mortis.

После истечения суток производят определения качества M. Long. Dorsi при помощи наглядной системы диагностики, метода G6fo и измерения плотности.

Для изменения плотности получил применение тот же самый прибор, который был использован для измерения Rigor Mortis. Качество мяса, как известно, в условиях чересчур быстрого исхода Post Mortem ухудшается и поэтому было вполне неожиданным, что плотность была лучше в условиях быстрого исхода Rigor Mortis. Было установлено некоторое соотношение между наступлением смертельного окоченения и плотностью мяса после истечения суток без того, чтобы другие измеряемые черты качества оказали какое бы то ни было влияние на этот процесс.

A RELATIONSHIP BETWEEN THE POSTMORTAL DEVELOPMENT AND THE CONSISTENCY OF MEAT IN PIGS

WATSE SYBESMA

Research Institute for Animal Husbandry "Schoonoord", Zeist, Netherlands

INTRODUCTION

In the literature the relationship between postmortem metabolism and the ultimate meat quality is often described (Verdijk, 1971) (Martin et al, 1975). PSE meat (i.e. the paleness, softness and the extent of exudation) is frequently linked with rapid pH fall and a fast rigor mortis development. DFD meat is observed in stiff carcasses with a very limited pH fall. By measuring the consistency of the m.long.dorsi 24 hours post slaughter we checked the hypothesis that a rapid rigor mortis development would also affect unfavourably the consistency. Another aim of this experiment was to investigate if it was possible and practical to predict the ultimate meat quality of the loin by judging the carcass visually on meat quality (colour, rigor) at the m.semimem. 45 min. post mortem.

MATERIALS AND METHODS

In 520 pigs of about 100 kg (consisting of the Dutch Landrace breed or crossings between the Dutch Landrace and the Large White (Great Yorkshire)) at 5 slaughterhouses several meat characteristics were measured during the slaughtering and 24 hours post mortem. In order to prevent the introduction of variation due different types and conformation all animals were chosen to belong to the very meaty carcass (AA classification according to the Common Market classification system). During the slaughtering (45 min. post mortem) the pH of the ham and the m.long.dorsi, and the rigor according to Sybesma (1966) of the ham were determined. Also the ham was judged visually according to a four class scoring system. The following day a visual four class scoring system of the m.long.dorsi, the G8fo colour method and a consistency measuring was used. The consistency was measured with the same apparatus as was used for the rigor mortis development determination. The principle of this method is that the counter pressure of the meat against the pressure of the apparatus gives reliable information about the consistency. The apparatus is placed on the transversal cut of the m.long.dorsi.

RESULTS AND DISCUSSION

The animals of the different slaughterhouses were pooled together on the assumption that the intra animal comparison had not been influenced by the slaughterhouses. In table I the distribution of the carcasses over the visual quality classes of the m.long.dorsi is given.

Table I. Visual score of the m.long.dorsi 24 hours post mortem related to meat quality characteristics measured 45 min. and 24 hours post-slaughter

Long. dorsi Visual score* 24 hrs post m.	N	45 min. post slaughter ham muscle		pH measurement (σ)		24 hours post slaughter	
		rigor**	visual score	m.semim.	m.long.dorsi	G8fo value (σ)	Consistency value (σ)
1	12	I	1	6.58 (0.20)	6.48 (0.16)	71.3 (6.6)	6.7 (1.9)
	45	II	1, 2, 3 + 4	6.44 (0.25)	6.40 (0.29)	75.7 (6.8)	8.0 (2.1)
	73	III	1, 2, 3 + 4	6.23 (0.28)	6.27 (0.40)	75.0 (6.4)	8.4 (2.1)
2	14	I	1	6.51 (0.22)	6.50 (0.14)	61.1 (8.1)	5.6 (1.7)
	64	II	1, 2, 3 + 4	6.34 (0.25)	6.31 (0.26)	61.5 (8.0)	6.6 (1.7)
	86	III	1, 2, 3 + 4	6.14 (0.21)	6.10 (0.22)	61.6 (8.7)	7.1 (2.1)
3	4	I	1	6.35 (0.10)	6.20 (0.18)	40.8 (3.9)	4.8 (0.5)
	36	II	1, 2, 3 + 4	6.14 (0.29)	6.05 (0.30)	45.5 (12.1)	5.7 (0.7)
	90	III	1, 2, 3 + 4	5.86 (0.34)	5.82 (0.21)	49.6 (9.0)	6.4 (2.0)
4	0	I	1	-- --	-- --	-- --	-- --
	25	II	1, 2, 3 + 4	5.82 (0.33)	5.80 (0.26)	44.1 (10.8)	5.0 (1.9)
	71	III	1, 2, 3 + 4	5.76 (0.23)	5.70 (0.19)	38.6 (9.8)	5.7 (2.0)

*
1 = normal or slightly DFD
2 = normal
3 = slightly PSE
4 = PSE

**
I = no Rigor
II = onset of Rigor
III = Rigor

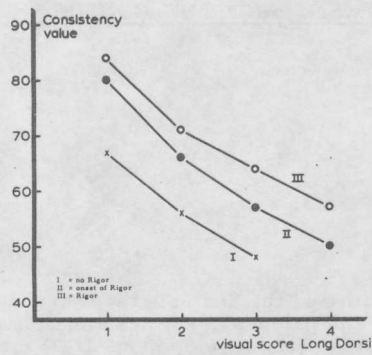


Figure III (table I) Relation Rigor development, consistency and visual score m.long.dorsi.

I = no Rigor
 II = onset of Rigor
 III = Rigor

Table II gives the distribution of the number of animals over the long.dorsi quality classes and the rigor classes. This distribution is significantly different in the separate groups. Most carcasses are already in rigor 45 min. post mortem. There is a very clear indication that non rigor carcasses give the best meat quality.

Table II. The distribution of the 24 hours visual score of the m.long.dorsi over the different rigor mortis classes (number and percentages)

Long.dorsi Visual score* 24 hrs post mortem	Rigor development**			Number (%)
	I	II	III	
1	12 (9) (40)	45 (35) (26)	73 (56) (23)	130 (100)
2	14 (9) (47)	64 (39) (38)	86 (52) (27)	164 (100)
3	4 (3) (13)	36 (28) (21)	90 (69) (28)	130 (100)
4	- (0) (0)	25 (26) (15)	71 (74) (22)	96 (100)
	30 (100)	170 (100)	320 (100)	520

*
 1 = normal or slightly DFD
 2 = normal
 3 = slightly PSE
 4 = PSE

**
 I = no Rigor
 II = onset of Rigor
 III = Rigor

The distribution of the pH of the m.semimembr. and m.long.dorsi (table III) shows the familiar relationship of a progressing rapid pH fall together with a faster rigor towards the development of PSE meat.

Table III. The 24 hours visual score of the m.long.dorsi related to the rigor development in the carcass and the pH measurement in the m.semimembranaceus and the m.long.dorsi 25 min. post slaughter.

Long.dorsi Visual score 24 hrs post mortem	pH ₁ m.semimembr.			pH ₁ m.long.dorsi		
	Rigor I	Rigor II	Rigor III	Rigor I	Rigor II	Rigor III
1	6.58	6.44	6.23	6.48	6.40	6.27
2	6.51	6.34	6.14	6.50	6.31	6.10
3	6.35	6.14	5.86	6.20	6.05	5.82
4	-	5.82	5.76	-	5.80	5.70

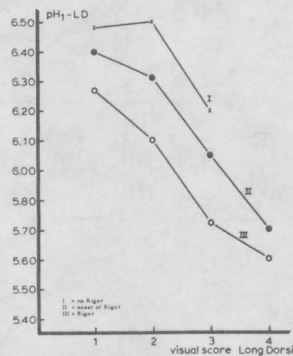


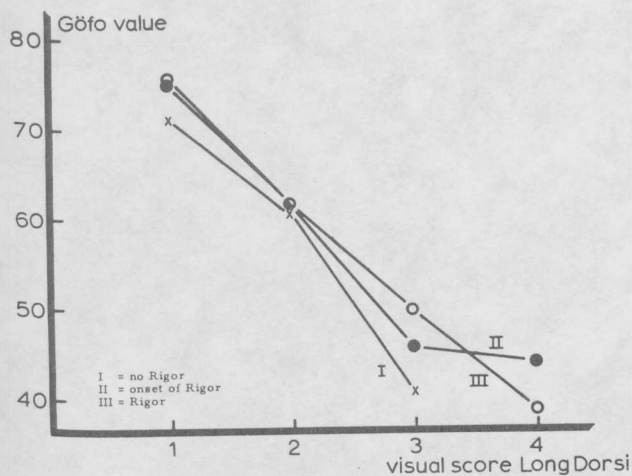
Figure I (table III) Relation Rigor development, pH₁ and visual score m.long.dorsi.

I = no Rigor
 II = onset of Rigor
 III = Rigor

When we relate colour (Göfo) and consistency we see the following distribution (table IV).

Table IV. The 24 hours visual score of the m.long.dorsi related to the rigor development of the carcass 45 minutes post slaughter, the Göfo colour values and the consistency values of the m.long.dorsi 24 hours post slaughter.

Long.dorsi Visual score 24 hrs post mortem	Göfo values m.long.dorsi			Consistency values m.long.dorsi		
	Rigor I	Rigor II	Rigor III	Rigor I	Rigor II	Rigor III
1	71.3	75.5	75.0	6.7	8.0	8.4
2	61.1	61.5	61.6	5.6	6.6	7.1
3	40.8	45.5	49.6	4.8	5.7	6.4
4	-	44.1	38.6	-	5.0	5.7



From this table the evidence is clear that the colour is hardly affected by the rigor development. Statistically no difference could be assessed. More surprising is the outcome of the consistency measurement. Contrary to our assumption, within the same quality class the rapid rigor development affects favourably the consistency. These differences proved to be statistically significant. According to visual judgement and colour measurement meat of the same quality will show a better consistency if it is originating from stiff carcasses. The explanation might be that the rapid onset of rigor is more likely to induce a shortening of the sarcomeres than when rigor develops more slowly. This would mean that within the quality classes one could also expect a difference in tenderness. No sarcomere length was measured however.

In future studies of post mortem metabolism the connection between consistency, rigor development and tenderness deserves further attention.

LITERATURE

- Martin, A.H., Fredeen, H.T. and L'Hirondelle, P.J. - Muscle temperature, pH and rate of rigor development in relation to quality and quantity characteristics of pig carcasses, *Can. J. Anim. Sci.* 55 : 527-532, 1975
- Sybesma, W. - Die Messung des Unterschiedes im Auftreten des Rigor mortis in Schinken, *Die Fleischwirtschaft* 46 : 637-639, 1966
- Verdijk, A.T.M. - The relation between pH and rigor as criteria for the meat quality and carcass quality of Dutch Landrace pigs, *Proc. 2nd international Symposium on Condition and Meat Quality Pigs*, Zeist, 1971, publ. Pudoc, Wageningen.