

PORK FLAVOUR: CONSUMER LIKING AND SENSORY INVESTIGATIONS OF COOKED PORK

E. A. Bryhni¹, D. V. Byrne², M. Rødbotten³, S. Møller⁴, C. Claudi-Magnussen⁴, A. Karlsson⁵, H. Agerhem⁶, and M. Martens²

¹Norwegian Meat Research Centre, P.O. Box 396 Økern, N-0513 Oslo, Norway, ²The Royal Veterinary and Agricultural University, Rolighedsvej 30, DK-1958 Frederiksberg C, Denmark, ³MATFORSK, Norwegian Food Research Institute, Osloveien 1, N-1430 Ås, Norway, ⁴The Danish Meat Research Institute, Maglegaardsvej 2, DK-4000 Roskilde, Denmark, ⁵Danish Institute of Agricultural Sciences, Research Centre Foulum, P.O. Box 50, DK-8830 Tjele, Denmark, ⁶SIK, The Swedish Institute for Food and Biotechnology, Ideon, SE-223 70 Lund, Sweden.

Background

Knowledge of consumer preference for pork is of great importance to the meat industry in order to produce pork products that satisfy consumers' demand. To consumers, the sensory experience imparted during consumption is a very important aspect of food quality (Agerhem & Tornberg, 1993). Consumers consider flavour to be one of the most important sensory traits of pork (Bryhni et al., 2002a), and the absence of off-flavours is expected to be critical for acceptance (Risvik, 1994). Meat quality of pork is dependent on ante- and post-mortem treatment. Different treatments have been found to influence sensory quality of pork detected by trained panel, but how this influence consumer's preference is still a question of debate. For consumers it is the combination of treatments such as pH, ageing, cooking temperature and WOF that make up the final eating quality experience of pork.

Objectives

The purpose of the present study was to investigate consumer and profiling data to gain insight into the sensory reasons for consumer liking and consumption of pork in the three Scandinavian countries Denmark, Norway and Sweden in relation to; Consumer liking of pork samples varying in sensory properties due to a) pre-slaughter stress resulting in elevated ultimate pH_{24h}, b) meat ageing, c) cooking temperature and d) warmed-over flavour.

Methods

A total of 8 different treatments (Table 1) including 12 animals for each treatment (totally 96 animals, Danish Duroc boars mated with Danish Large White-Danish Landrace sows) were utilised in the consumer and sensory profiling investigations. Sensory profiling of *M. longissimus dorsi*=LD was carried out according to the international ISO standards. In sensory profiling 8 assessors used 17 terms to describe the 8 different samples treatment. The samples were evaluated in duplicates in a randomised order. Consumers were asked to indicate their liking after tasting each of the 8 pork samples, and were to mark a cross in one of nine boxes graduated from "like very little" to "like very much". The second part of the questionnaire included questions about consumption frequency of pork, age and gender of the respondents. The consumer panel consisted of 96 persons in each country (Denmark, Norway and Sweden) equally distribution of males and females, aged between 16 and 75 years old, who ate pork meat.

Results and Discussion

The overall liking score for the 8 sample treatments (Table 1) are shown in Figure 1. Pork with high pH, cooked to 65°C without ageing and reheating (no WOF) (B7) obtained the highest consumer liking score. The highest liking was found for no WOF samples and lowest liking for WOF (PC1 in Figure 2a). Meat with high pH got higher liking than the normal pH meat ($P<0.05$). There was also a significant ($P<0.05$) difference in liking between core cooking temperature to 65°C and 80°C, with highest liking for 65°C. The difference between aged and not aged pork is not significant ($P>0.05$), but Figure 2b, PC3 indicates the higher liking for aged meat. More details are shown in Bryhni et al. (2002b).

The results from sensory profiling (results not shown) show that WOF samples had more off-flavours and off-odour, among them pig flavour, metallic taste and warmed over flavour, and less meat flavour, than the no WOF samples ($P<0.05$). Meat with high pH was judged to contain more sweet, less acidic and less meat flavour in addition to be more juicy and tender than normal pH meat. The trained panel in accordance with the consumers clearly differentiated the two cooking temperatures, with higher sweetness, juiciness and tenderness associated with 65°C than for 80°C ($P<0.05$). When looking at all single sensory attributes separately, WOF is the single treatment showing most significant differences detected by both trained panel and consumer.

Eating frequency of pork between consumers in Denmark, Sweden and Norway varied. Highest consumption frequency was found in Sweden and Denmark and lowest consumption frequency in Norway (Figure 2). As illustrated in Figure 3, consumer liking of the tested samples is related to consumption frequency. Consumers with the higher score for liking reported to eat pork more often (3 times a week or more), while those who had lower liking score seldom eat pork.

Finding the optimal combination of sample treatments is important to fulfil consumer satisfaction. According to the present study non-reheated samples (no WOF), heated to a core temperature of 65°C and with elevated pH are preferred. The sensory panel characterised these samples with low off-flavour and high score for tenderness and juiciness. The difference between WOF samples and non-reheated samples was the major source of variation in this study. The present study strengthens the conclusion that the meat industry has to be aware of WOF and off-flavour related to WOF, especially when making ready to heat products. Otherwise the liking and probably also the frequency of pork purchase will decrease, because the consumer can detect off-flavour and WOF, which they disliked.

The higher consumer liking for pork cooked to 65°C compared to 80°C was related to the sensory description of a more sweet taste, and a more tender and juicy meat, which is in accordance with Agerhem & Tornberg (1993). A more optimal cooking may contribute to pork being served more often as a party dish. Today most consumers consider pork as an everyday food (Bryhni et al., 2002a).

Conclusions

Consumer liking of pork was influenced by quality characteristics such as WOF development, cooking temperature and pH. Pork samples with no WOF were liked more than samples with WOF. Meat with a core temperature of 65°C was preferred compared to 80°C, and "high pH_{24h} meat" preferred compared to meat with normal pH. The present study shows the importance of pre- and post-mortem factors in relation to the fulfilment of consumers' demands for pork quality. Consumers do detect quality differences, and it does influence their liking and consumption of pork.

Acknowledgements

The project is supported by the Nordic Industrial Fund and the meat industry of the three countries.

Pertinent literature

- Agerhem, H. & Tornberg, E. (1993). Eating quality of pig meat. *Meat Focus International*, 2, 159-161.
- Bryhni E. A., Byrne D.V., Rødbotten M., Claudi-Magnussen C., Agerhem, H. Johansson, M. Lea P. & Martens M. (2002a). Consumer perceptions of pork in Denmark, Norway and Sweden. In press, *Food Quality and Preference*.
- Bryhni, E. A., Byrne, D. V., Rødbotten, M., Møller, S., Claudi-Magnussen, C., Karlsson, A., Agerhem, H., Johansson, M., & Martens, M. (2002b). Consumer and sensory investigations in relation to physical/chemical aspect of cooked pork in Scandinavia. Submitted for publication in *Meat Science*.
- Risvik, E. (1994). Sensory properties and preferences. *Meat Science*, 36, 67-77.

Table 1. Description of the 8 treatment groups

Treatment	B1	B2	B3	B4	B5	B6	B7	B8
Ultimate pH _{24h} ¹	5.5 ^a	5.6 ^a	5.5 ^a	5.5 ^a	5.5 ^a	5.6 ^a	5.9 ^b	6.0 ^b
Ageing time (days)	0	0	6	6	6	6	0	0
Core temperature °C	65	80	65	65	80	80	65	80

WOF²

	-	-	-	+	-	+	-	-
--	---	---	---	---	---	---	---	---

¹ Pigs in group B7 and B8 were given adrenaline (0.3 mg/kg body weight) 15 hours prior to stunning. Different letters differ ($P < 0.05$).

² The warmed-over flavour (WOF) samples (B4 and B6) were roasted to either 65°C or 80°C, then chill-stored at 4°C for 2 days and reheated before being served for sensory analyses.

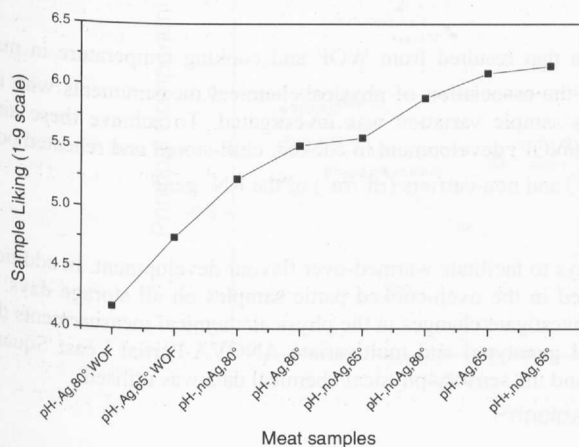


Figure 1. Consumer liking for 8 different samples in average.

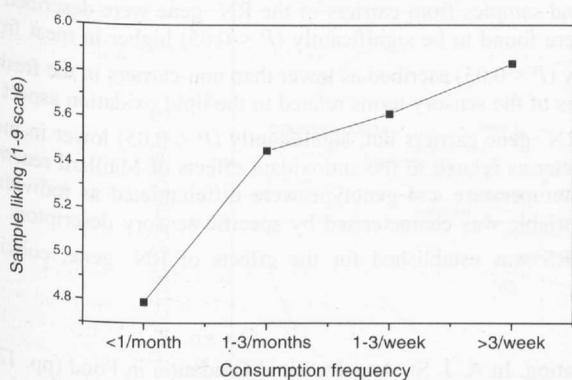


Figure 3. Frequency and liking for pork in average between countries and treatments.

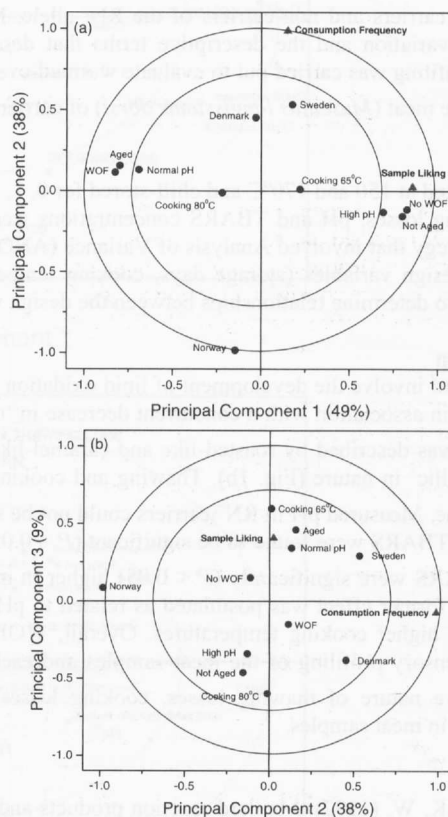


Figure 2 (a) and (b). APLSR including average over liking and consumption frequency (Δ) versus main design variables (●).