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Color of *longissimus thoracis et lumborum* of Danish pork at 24 h and 48 h postmortem (#204)

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Introduction

As part of a larger study evaluating the quality of Danish pork anno 2018, color of *Longissimus thoracis et lumborum* was determined visually and instrumentally at 24 and 48 h postmortem (*pm*). The purpose was to determine any color difference between the two time points and the abattoirs, and if differences could be explained by other quality parameters.

Methods

In total 120 (5x24) pigs were slaughtered at five abattoirs. Sex, hot carcass weight, lean meat%, and temperature were measured at 45 min *pm*. Loin pH_{24} was measured when sampling color at 24 h.

Samples (2.5 cm) were taken from *longissimus thoraciset lumborum* between the 6th and 7th vertebra from the hip. Color measurements were done on bloomed samples (surface exposed to air 60±10 min at 5-9 °C).

Visual color measurements were according to the Japanese pork color standard (JPCS) developed by (Nakai, Saito, Ikeda, Ando, & Kamatsu, 1975) ranging from 1=extremely pale to 6=extremely dark. All JPCS evaluations were done by the same trained employee.

Instrumental color measurements (4 per sample) used a Minolta Chroma Meter (CR-300, Konica Minolta, Japan), illuminant D_{65}, observer angle 0°, aperture size 8 mm.

Pigment content (ppm hemin) was determined by a modified procedure after (Hornsey, 1956).

Total color change (ΔE*) was calculated according to (Choe et al., 2008) *ΔE*=(ΔL*^2+Δa*^2+Δb*^2)^½.*

Student's t-test compared smaller sets within the whole dataset, incl. differences between abattoirs.

Results

There was no visual color difference, but a significant difference in L* and a* (Table 1).

Variables	t_{24h}	t_{48h}	P
JPCS	3.34	3.38	NS
L*	52.23	55.21	***
a*	6.25	6.53	***
b*	3.92	3.98	NS

Table 1. Color at t24 vs. t48 compared via t-test.
P>0.05=NS (not significant), P<0.05=*, P<0.005=** P<0.0005=**

There was a discrepancy between abattoir E and the other four abattoirs (Table 2). Abattoir E had a significantly smaller increase in L* and smaller ΔE*. L* was higher for abattoir E at t_{24h} but the difference was evened out at t_{48h} (Fig. 1).

All abattoirs									
						Significance vs. abattoir E			
Abattoirs	A	B	C	D	E	A	B	C	D
ΔL*	2.91	3.47	3.57	3.34	1.60	*	**	**	**
Δa*	0.33	0.12	0.19	0.30	0.44	NS	NS	NS	NS
Δb*	0.14	-0.21	0.01	-0.02	0.37	NS	**	*	*
ΔE*	3.16	3.75	3.78	3.59	1.95	*	***	***	**
pH_{24h}	5.64	5.70	5.69	5.57	5.69	NS	NS	NS	**
Hot carcass weight (kg)	88.51	86.56	85.80	87.82	83.00	*	NS	NS	*
Meat%	60.30	60.75	60.55	61.56	59.85	NS	NS	NS	NS
$T_{(°C)}^{45min}$	39.10	39.53	39.93	39.71	39.48	**	NS	*	NS
Hemin (ppm)	24.88	23.75	22.71	23.83	24.13	NS	NS	NS	NS
ΔJPCS	0.08	0.33	-0.27	-0.06	-0.29	NS	**	NS	NS

Table 2. Instrumental and visual color change (t_{48h}-t_{24h}), hemin, weight, meat%, T_{45min}, and pH_{45min}; and abattoirs A-D vs. abattoir E.
P>0.05=NS, P<0.05=*, P<0.005=**, P<0.0005=***

There was no systematic explanation of the color differences, though significant effects of pH_{24h}, hot carcass weight, and T_{45min} between abattoir E and some but not all other abattoirs were found. There was no difference in hemin (Table 2). A significantly larger ΔE* was found for males than for sows and castrates, possibly explaining part of the difference, as males were only found in abattoirs B and C.

Conclusion

The significant instrumental color difference between 24 h and 48 h *pm* must be taken into account when building color-monitoring equipment for the slaughter line. Slightly different slaughtering procedures are a plausible cause for the color difference between abattoirs (MacDougall, 1982). The significant color changes observed between t_{24h} and t_{48h} are probably caused by changes in muscle structure. An increase in L* can be caused by increased light scattering, e.g. as water-holding capacity is reduced

Notes

and protein denaturation increased during conversion from muscle to meat (Pérez-Alvarez & Fernández-López, 2008). Myoglobin chemical form affects L*a*b* (Lindahl, Lundström, & Tornberg, 2001). The change in a*, though significant, was quite small, hence, changes in muscle structure are likely a more significant contributor to the increase in L*.

References

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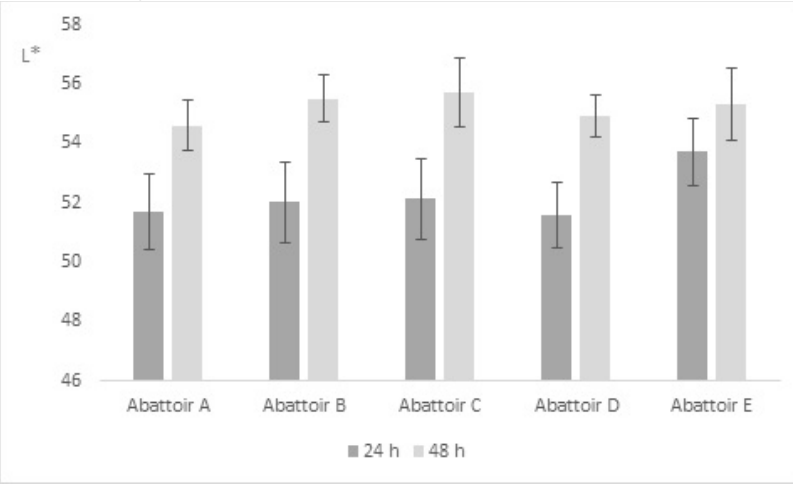

Figure 1.

L* at 24 h and 48 h pm.

Notes