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EFFECTS OF DEBONING AND ELECTRICAL STIMULATION ON POST MORTEM BIOCHEMICAL CHANGES IN CHICKEN BREAST *P. major*

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BACKGROUND

The hot boning of chicken carcasses have been proposed to speed up slaugther operations (HAMM, 1982). Electrical stimulation (E.S.) has been suggested as a technique to tenderize conventionally or hot boned chicken (CONTRERAS, 1993; THOMPSON et al. 1987 ; BIRKHOLD & JANKY, 1989; SAMS *et al.* 1989).
The beneficial effects of electrical stimulation is considered to depend on the processing stages (DRANSFIELD, 1985; FRONING & UIJTTENBOOGAART, 1988) that would reflect the stage of rigor mortis that the carcass is at critical operations like scalding and chilling.

In previous work CONTRERAS *et al.* (1994) found that high frequency stunning had some tenderizing effect on chicken breast meat and that electrical stimulation definitely contributed to tenderize both hot or conventionally deboned meat.

It has been reported that pH values are decreased by E.S. (FRONING & UIJTTENBBOGAART, 1988; SAMS, 1990; WALKER (1991), while R values are increased by both high (THOMPSON *et al.*, 1987; LYON *et al.* 1989) and low voltage E.S. (SAMS , 1990). We have not found any report on glycogen decrease on breast meat during slaughter operations. All these biochemical changes are related to muscle rigor mortis stages.

OBJECTIVES

1) To establish changes in pH value , R value and glycogen content of breast muscle during chicken slaughtering operations.
2) To find any influence of boning, stunning and electrical stimulation on the rate of changes in pH, R value and glycogen content of breast muscle.

METHODS

In a trial 72 chickens were divided in 24 lots selected at random from a population of 45 day old Cobb breeding weighing 2.2 -2.5 kg . The birds were submitted to six treatments: 1) stunning at 60 Hz, 40V and E.S. 45V, 13Hz, and 2) E.S. 80V, 13Hz; 3) stunning at 1000Hz,40V and E.S. 100V, 13 Hz., and where either conventionally or hot boned, at different stages of slaughtering.

Samples were collected at the different stages, frozen in liquid nitrogen and stored at -60 C.
pH was determined according to BENDALL (1973).
R value was determined using the methodology proposed by HONIKEL & FISCHER, 1977.

Glycogen was measured by the procedure developed by SIU *et al.* (1970) with samples of 35 - 50 mg of muscle.

RESULTS AND DISCUSSION

pH values at each slaughtering stage is presented in Table 1. There was no statistically significant difference between treatments, but pH values dropped along the slaughtering stages from around 6.0 after bleeding to 5,6 at 24h post mortem. For the same stunning conditions non-stimulated breast had higher pH from 6,1 after bleeding to 5,7 after 24h (CONTRERAS & BERAQUET, 1995).

The R value (Table 2) increases along the slaugthering stages from 1.09 after bleeding to 1.5 at 24h post mortem. There was no significant difference between treatments. According to KHAN & FREY (1971) a R value larger than 1,0 indicates the onset of rigor, therefore the results from Table 2 indicates that the carcasses are on rigor resolution after defeathering. For breast muscle stunned at the same condition but not stimulated rigor resolution occurs after chilling. SAMS (1990) also found that low voltage E.S. increases R values.

Glycogen (Table 3) was also not affected by treatments. Values decreased along the slaugthering stages from 3.8 - 6.1 mg/g after bleeding to 0.05 - 0.40 mg/g 8h post mortem. At 24h post mortem all glycogen was depleted. For non stimulated breasts values were initially around 7,0 mg/g being totaly depleted after 24h post mortem.

CONCLUSIONS

1) pH, R value and glycogen contents of muscle were not af fected by the ES conditions neither by the frequency of stunning or type of boning.
2) For all treatments with electrical stimulation rigor seems to occur before defeathering whereas for non stimulated muscle it seems to occur during chilling..

LITERATURE

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TABLE 1. **POST-MORTEM CHEANGES OF pH VALUES IN *P. major* FOR ELECTRICAL STUNNING AND DEBONING**

Slaughtering stage	Hot boned			Conventionally boned		
	Stunning[A]	1	2	Stunning	3	2
After bleeding (0.13h)	6.12	5.95[a]	5.90[a]	6.12	6.01[a]	5.90[a]
After picking (0.17h)	6.09	5.83[a]	5.87[a]	6.09	5.98[a]	5.87[a]
After spin-chill (Q 0.83h; C 1.17h)	5.91	5.80[a]	5.84[b]	5.88	5.86[a]	5.83[a]
After 4h aging	5.74	5.72[a]	5.71[a]	5.73	5.70[a]	5.68[a]
After 8h aging	5.75	5.60[a]	5.59[a]	5.66	5.63[a]	5.60[a]
After 24h aging	5.73	5.58[a]	5.59[a]	5.70	5.62[a]	5.61[a]

1. Stunning 60 Hz, 40V; E.E. 80V
2. Stunning 1000 Hz, 40V; E.E. 100V
3. Stunning 60 Hz, 40V; E.E. 45V

[a,b]Means with different superscripts in the same half row are significantly different ($p<0.05$).
[A] = birds stunned at 60 Hz,40V - CONTRERAS, C.C. & BERAQUET, N.J. (1995).
E.E. = Electrical stimulation
Q = hot boned, C = conventionally boned

TABLE 2. POST-MORTEM CHANGES OF R VALUES IN *P. major* FOR ELECTRICAL STUNNING, STIMULATION AND DEBONING

Slaughtering stage	Hot boned			Conventionally boned		
	Stunning[A]	1	2	Stunning	3	2
After bleeding (0.13h)	0.88	1.09[a]	1.09[a]	0.88	1.09[a]	1.09[a]
After picking (0.17h)	0.94	1.29[a]	1.31[a]	0.94	1.22[a]	1.31[a]
After spin-chill (Q 0.83h; C 1.17h)	1.11	1.31[a]	1.38[a]	1.28	1.27[b]	1.38[a]
After 4h aging	1.30	1.30[a]	1.39[b]	1.35	1.39[a]	1.46[a]
After 8h aging	1.36	1.36[a]	1.42[a]	1.40	1.42[a]	1.47[b]
After 24h aging	1.40	1.39[a]	1.46[a]	1.47	1.43[a]	1.49[a]

TABLE 3. **POST-MORTEM CHANGES OF GLYCOGEN CONTENT (mg/g) IN *P. major* FOR ELECTRICAL STUNNING, STIMULATION AND DEBONING**

Slaughtering stage	Hot boned			Conventionally boned		
	Stunning[A]	1	2	Stunning	3	2
After bleeding (0.13h)	6.86	5.37[a]	3.78[a]	6.86	6.14[a]	3.78[a]
After picking (0.17h)	4.58	3.90[a]	2.93[b]	4.58	2.61[a]	2.91[a]
After spin-chill (Q 0.83h; C 1.17h)	3.39	2.92[a]	2.16[a]	2.49	2.11[b]	1.74[a]
After 4h aging	2.09	1.52[a]	1.56[a]	1.05	0.98[a]	0.82[a]
After 8h aging	0.93	0.37[a]	0.13[a]	0.57	0.06[a]	0.05[b]
After 24h aging	0.04	-	-	0.02	-	-

1. Stunning 60 Hz, 40V; E.E. 80V
2. Stunning 1000 Hz, 40V; E.E. 100V
3. Stunning 60 Hz, 40V; E.E. 45V

[a,b]Means with different superscripts in the same half row are significantly different ($p<0.05$).
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