

## PRESLAUGHTER HANDLING WITH WATER SHOWER SPRAY INHIBITS PSE (PALE, SOFT, EXUDATIVE) BROILER BREAST MEAT IN A COMMERCIAL PLANT

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### Background

PSE meat is becoming a problem for poultry meat industries. It has been demonstrated that it is the consequence of myofibril proteins denaturation under physical stress (1). The actual biochemical cause has been shown to be the myofibril proteins denaturation although there is a genetic mutation in pigs not yet observed in birds (2). Recently we have demonstrated that Vitamin E in the chicken diet inhibits development of meat PSE by heat stress and improves meat functional properties (1) probably by inhibiting the PLA2 activity (3). In recent years, it has become a common practice at commercial plants in Brazil to submit these birds under water shower spray during summer season in order to keep a comfortable environment to the animals just before killing avoiding them to be under heat stress.

### Objectives

The objective of this work is to observe the effect of water shower spray before slaughtering on biochemical and structural profiles of *Pectoralis major* m. in a commercial plant.

### Materials and methods

Forty two days old male chicken *Cobb* lineage was used. Upon arrival at the slaughter house, birds were divided into two groups: Untreated Group (UG) (n=608) in which birds showed visual symptoms of being heat stressed such as open beak, difficulties in respiration and Treated Group (TG) (n=611) where birds were treated with water shower spray while in the truck for app. 10 min and they appeared to reach homeostasis since most of them had closed their beak. All birds were sacrificed following the routine procedure of a commercial plant and *Pectoralis major* m. was collected and stored at 4 C before analysis. pH, color and drip loss measurements and cook loss were carried out according to Olivo et al (1).

Histological studies: Light Microscope and Electron Microscope studies were performed as described in Biscontini et al. (4).

Statistical Analysis: Statistical analyses were performed using Statistica software (Oklahoma, USA 1995). Student t test was used to determine level of significance between two treatments, *ie.* UG and TG. Pearson correlations were used for testing correlations between variables.

### Results and discussion

#### Biochemical Determination

Table 1 shows the effect of water spray on the breast meat pH, color, drip loss and cook loss. pH values presented a significantly difference being samples from TG relatively higher than CG ( $p < 0.01$ ). For color measurement, the results showed lower L\* values for TG in comparison to UG ( $p < 0.01$ ) and lower value of pH for UG in relation to TG. The average was L\* 53.11 ( $\pm 1.50$ ) and 48.78 ( $\pm 1.72$ ) for UG and TG respectively, for color and 5.85 ( $\pm 0.08$ ) and 6.06 ( $\pm 0.10$ ) for pH measurement, respectively. These results of pH and L\* values demonstrated that the water spray treatment before slaughtering promoted biochemical and physiological effects during the onset of rigor mortis. It was noticed that there was an inverse relationship between L\* and pH values *ie.* at lower pH higher was L\* values, characteristics of PSE meat as it can be corroborated by the significant Pearson correlation coefficients ( $p < 0.05$ ),  $R = -0.47$  for UG and  $R = -0.72$  for TG. Drip loss was 3.74% for UG and 2.24% for TG whereas cook loss was 32.01% for UG and 28.04% for TG (Table 1). The water spray technique before slaughtering in fact kept the actual meat water holding capacity.

Light microscopy: Fig 1AB shows the TG and UG samples, respectively. A typical fluid-filled channels at the endomysial and perymysial sheaths is seen for TG whereas UG samples presented an enlargement space at these two sheaths. There is loss of water holding capacity thus water moves from the myofibrillar to interfibrillar compartments then to the extracellular compartments and finally drip is formed on the meat surface giving the watery looking.

Electron microscopy. Fig 2A shows longitudinal section of TG muscle that is characterized by a regular tissue structure. The sarcomers are of equal length and width. However, the faint Z-bands indicate that there were some protease activities within the muscle 72h after chicken death irrespective of treatments. In Fig 2B, in UG samples the typical dark and light banding pattern was not evident and Z-bands appeared to be more pronounced. Myosin filaments predominate within the sarcomer even touching the Z-bands and actin filaments are seldom seen. Open spaces are also visible and a hyper muscle contraction is evident. One of the most affected region is at the triad where the sarcoplasm reticulum takes part and is the region where  $Ca^{2+}$  are released promoting this hyper contraction. This contraction attracts some of the sarcomer components towards the Z-bands making them to be comparatively very dense.

### Conclusions

Water shower spray just before birds slaughtering prevents chicken PSE meat development as determined biochemically and ultrastructurally.

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References

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Table 1 – pH, color (L\*), drip and cook loss of *Pectoralis major* m. PSE (UG) and non-PSE (TG)

	UG (n=611)	TG (n=608)
pH	5.85 <sup>b</sup> ± 0.08	6.06 <sup>a</sup> ± 0.10
L*	53.11 <sup>a</sup> ± 1.50	48.78 <sup>b</sup> ± 1.72
Drip loss (%) (n=29)	3.74 <sup>a</sup> ± 1.70	2.24 <sup>b</sup> ± 0.40
Cook loss (%) (n=25)	32.01 <sup>a</sup> ± 1.49	28.04 <sup>b</sup> ± 1.09

Mean within each line with different superscript is significantly different (p 0.01)

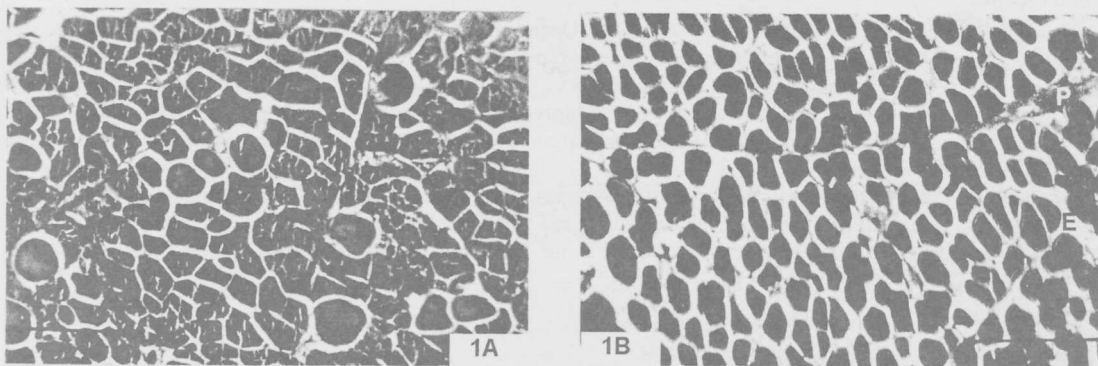


Fig 1. Photomicrograph of *Pectoralis major* m. Cross sections of Treated group (A) and Untreated group (B). P – perimysium, E – endomysium. Note in 1B the shrinking of muscle cells as well as an increase of endomysium spaces. Magnification: 131.25 x

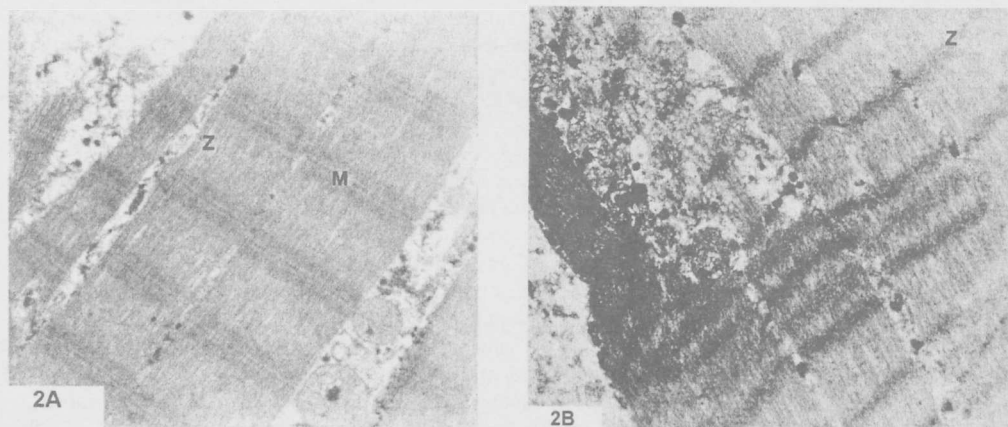


Fig 2. Electron micrograph of *Pectoralis major* m. from (A) Treated group and (B) Untreated group. Note in (B) a disorganization of A and I bands. The M-bands disappeared and a hyper contraction is evident. Magnification: 23 000 x