

## PROCESSING YIELD, pH, AND TENDERNESS CHANGES IN BROILERS WITH FEED WITHDRAWAL AND POSTMORTEM DEBONING TIMES

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### BACKGROUND

The demand for more convenient meat and poultry products continues to increase, particularly for boneless and skinless broiler breast meat (*Pectoralis major*; PM). Productivity is hindered by requirements for refrigerated storage space and energy usage during holding of meat while waiting for acceptable tenderness to develop before deboning (Lyon and Lyon, 1993), approximately four hours post-mortem (Koonz *et al.*, 1954). Lyon *et al.* (1985) and Thompson *et al.* (1987) also confirmed that PM was more tender after four to six hours post-mortem chilling and aging than when hot deboned. Rate of pH decline can also affect the PM tenderness (Peterson and Lilyblade, 1979). Feed withdrawal times prior to slaughter influence the processing yield of broilers with 8 to 12 hours withdrawal resulting in highest yields (Rasmussen and Mast, 1989; Farr, 1979), but changes in processing yields due to withdrawal times did not result in differences in cooking loss or tenderness of PM (Rasmussen and Mast (1989). The objective of this study was to examine interactions of feed withdrawal times and postmortem deboning times on PM yield, pH, tenderness and cooking loss.

### MATERIALS AND METHODS

Male 42-day old broiler chickens (n=36) were obtained from a commercial operation and housed for three days at the LSU Agricultural Center Poultry Farm prior to treatment. Chickens were randomly assigned to 3 groups with a withdrawal schedule of feed was withheld for 24 hr, feed replaced for 12 hr, and withdrawal from feed for 10, 15 or 20 hours before slaughter. Birds remained penned during feed withdrawal periods with free access to water. Birds were cooped and transported 5 miles to the LSU Agricultural Center Poultry Abattoir  $\approx$  1 hr before slaughter and reweighed. Birds were sacrificed, scalded (61°C), picked, eviscerated, weighed with intact leaf fat (carcass weight), and deboned at 2, 4, or 24 hr after bleeding. Carcasses were split into fore and hind quarters before manual deboning of breasts and thighs. Right skinless, boneless breasts were used for cooked measurements; pH at PM dorsal, middle and caudal extremities in triplicate (Extech Oyster pH meter with surface probe) and temperature measurements at the thickest portion in duplicate were measured on left breasts. Breasts for four hr deboning treatments were chilled in an ice slurry with circulating water until 4 hr postmortem. Breasts deboned at 24 hr were chilled in the ice slurry until internal temperature reached 4°C (24 hr). Carcasses were packed on ice for the remainder of the appropriate aging period and weighed (chilled uptake weight). PM samples were sealed in vacuum pouches (99.5% vacuum), frozen with powdered CO<sub>2</sub>, and stored at -20°C. Frozen deboned breasts were weighed and microwave cooked (model R-8320, Sharp Corporation) on full power (650 watts) for 5 min/side. Breasts were cooled to room temperature before obtaining cooked weight. A 6.4 x 1.8 cm piece was cut, weighed, and sheared (Kramer cell, model 4501 Instron; Lyon and Lyon, 1993). Data were analyzed for main treatment effects (deboning time and feed withdrawal time) using the General Linear Models procedures (SAS, 1988). Treatment means were separated using Duncan's Multiple Range Test (SAS, 1988).

### RESULTS AND DISCUSSION

Broiler yields and PM properties are shown in Table 1. Carcass yield was not different ( $P > 0.05$ ) for 15 or 20 hr of feed withdrawal, while 10 hr withdrawal resulted in lower ( $P < 0.05$ ) carcass yield and higher ( $P < 0.05$ ) chilled weight uptake. pH of PM was lower ( $P < 0.05$ ) with 10 hr withdrawal and decreased ( $P < 0.05$ ) with increased time of deboning. Cooking loss was not changed with time

of withdrawal and was increased ( $P < 0.05$ ) with 24 hr deboning compared with 2 or 4 hr deboning. Kramer shear force was decreased by feed withdrawal at 15 hr compared with 10 hr. Deboning time did not cause tenderness differences, which disagreed with previous reports (Cantrell and Hale, 1974; Stewart et al., 1984; Sams and Janky, 1986). However, freezing will increase rate of rigor mortis (de Fremery and Pool, 1960), which might explain the similarities in tenderness with deboning time in this study.

## CONCLUSIONS

Appropriate feed withdrawal times and rates of pH decline may allow deboning at 2 hr postmortem in breasts that will then be quickly frozen and result in acceptable tenderness of boneless, skinless breasts upon subsequent cooking.

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TABLE 1. Properties of broilers and Pectoralis major with differing feed withdrawal and deboning times.

Treatment	Carcass yield, %	Uptake yield, %	pH	Cooking loss, %	Kramer shear, kg/g
Withdrawal, hr					
10	62.6 <sup>b</sup>	2.95 <sup>a</sup>	5.77 <sup>c</sup>	27.27 <sup>b</sup>	8.93 <sup>a</sup>
15	65.3 <sup>a</sup>	1.96 <sup>b</sup>	5.89 <sup>a</sup>	27.25 <sup>b</sup>	6.17 <sup>b</sup>
20	65.3 <sup>a</sup>	2.52 <sup>ab</sup>	5.92 <sup>a</sup>	27.48 <sup>b</sup>	7.37 <sup>ab</sup>
Deboning time, hr					
2	-	-	5.92 <sup>a</sup>	25.72 <sup>b</sup>	7.24 <sup>b</sup>
4	-	-	5.84 <sup>ab</sup>	25.56 <sup>b</sup>	7.61 <sup>ab</sup>
24	-	-	5.81 <sup>bc</sup>	30.71 <sup>a</sup>	7.62 <sup>ab</sup>
s.e.m. <sup>d</sup>	0.6	0.31	0.03	1.21	0.82

<sup>abc</sup>Least squares means in same column with different letters are different ( $P < 0.05$ ).

<sup>d</sup>Standard error of the mean.