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## Assessment Of Breast Myopathy By Different Texture Devices (#446)

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### Introduction

Breast myopathy is an important quality problem that causes big economical losses in the poultry industry [1]. The development of modern broilers has provoked the appearance of three different myopathies in recent years: wooden breast (WB), white striping (WS) and spaghetti meat (SM), depending on the substitution of the muscle fibre by connective tissue, by adipose tissue or the disintegration of the structure, respectively [2,3]. The origin of these myopathies is being studied since they occur more often as the weight of the animal increases, but different husbandry strategies (feed presentation, nutritional composition) have being used without much success [3]. The aim of this study was to assess differences between degrees of breast myopathies in broiler with different texture devices.

### Methods

Through five different trials, the meat quality of 300 broiler breasts has been assessed. Carcass breast yield and pH at the caudal portion of the left side were obtained at 24h after slaughtering, and the degree of WB, WS and SM was visually assessed on a 3 points scale (0, absence; 1, moderate; 2, severe) [4]. None of the breasts was found severe for SM. Then, both breast sides were vacuum packaged and kept at -18º C until texture analyses were performed. The left side was used for raw meat analyses and the right side for cooked meat analyses. In both cases, meat was thawed under vacuum conditions at 4º C for 24h. Cooking was performed in a water bath at 75º C until reaching an internal temperature of 70º C measured with an internal thermocouple, without vacuum but without direct contact between the meat and the water. Starting from the cranial part of the *Pectoralis major* muscle, 1 cm-thick slices were obtained from each breast. In these slices, 1-$cm^2$ section parallelepipeds were obtained. In raw meat, they were analysed through a compression test with 1-$cm^2$ contact surface, in which the muscle fibres can only expand longitudinally [5]. In cooked meat, a Warner-Bratzler device was applied, in both cases with an INSTRON 4301. Some of the parallelepipeds were used to obtain 1-$cm^3$ samples, analysed in both, raw and cooked meat, with a Texture Profile Analysis (TPA) in a TA-XT2i, with the direction of the compression force perpendicular to the direction of the fibres, as happened in the previous texture analyses. A General Lineal Model was used with SPSS 22.0 to assess differences in texture variables in the different tests, with the degree of myopathy as a fixed effect and trial as a block effect. Duncan test has been used to find differences between mean values.

### Results

The degree of wooden breast increases as the slaughter weight increases and, together with white striping, as the breast carcass yield increases (Table 1). A modified compression test in raw meat [5] has been widely used in beef meat to assess the contribution of the muscle fibre (at 20% of compression rate) or the connective tissue (at 80% of the compression rate) to the hardness of the meat [6]. The highest degree of WB showed higher resistance at both 20 and 80% of compression rate, which implies that both muscle fibre and connective tissue are tougher with the increase of this myopathy. However, this device has not found differences between degrees of white striping. On the other hand, although with a low number of observations, spaghetti meat would show no affection of the muscle fibre but a low integrity of the connective tissue that would reduce the resistance at high compression rates.

Although it is a widely used texture procedure, Warner-Bratzler shear force has not been able to find differences between degrees of WB when meat is cooked, probably because after cooking, most of the connective tissue that causes this problem has solubilised, considering that the fast growing rate of broilers promotes the formation of soluble collagen that is a main part of the connective tissue. A tendency ($P$=0.09) was observed in the highest degree of WS to show lower shear force, probably due to the higher lipid content that might contribute to a higher tenderness.

The influence of cooking in reducing differences between degrees of myopathies is evident when TPA has been used. In raw meat, hardness increased in wooden breast and cohesiveness decreased in both WB and WS with the highest degree of myopathy. However, in cooked meat, only cohesiveness in WB could be differentiated between degrees of myopathy.

Table 1. Carcass quality, pH and texture characteristics of broiler breast with different degree of myopathies by different texture devices.

### Conclusion

Analysis of raw breast texture gives better differentiation of myopathy degrees than cooked breast meat. A modified compression device gives reliable results of the contribution of both fibre and connective tissue to the final texture of the breast when analysing myopathies.

Notes

| | Wooden Breast | | | White Striping | | | Spaguetti Meat | | RMSE | Significance | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 1 | | WB | WS | SM |
| *n* | *133* | *133* | *34* | *175* | *90* | *35* | *284* | *16* | | | | |
| pH | 5.86 | 5.90 | 6.05 | 5.86b | 5.92ab | 6.01a | 5.90 | 5.92 | 0.24 | 0.10 | 0.02 | 0.98 |
| Carcass weight kg | 1.92b | 2.01a | 2.06a | 1.92 | 2.04 | 2.06 | 1.98 | 1.90 | 0.19 | <0.01 | 0.76 | 0.97 |
| Carcass breast yield % | 31.3c | 32.1b | 33.2a | 31.3c | 32.4b | 33.6a | 31.8 | 32.7 | 2.03 | <0.01 | <0.01 | 0.44 |
| Compression (raw meat) | | | | | | | | | | | | |
| C20 N/cm$^2$ | 11.4b | 11.7b | 13.1a | 10.9 | 12.9 | 12.8 | 11.8 | 10.3 | 3.18 | <0.01 | 0.54 | 0.26 |
| C80 N/cm$^2$ | 15.3 | 15.3 | 16.1 | 15.3 | 16.0 | 14.2 | 15.6a | 12.1b | 5.51 | 0.30 | 0.20 | 0.03 |
| Ctotal N/cm$^2$ | 22.1b | 22.8ab | 24.7a | 22.1 | 24.1 | 22.5 | 23.0a | 18.7b | 6.78 | 0.02 | 0.38 | 0.03 |
| Warner-Bratzler (cooked meat) | | | | | | | | | | | | |
| WBSF kg/cm$^2$ | 1.50 | 1.48 | 1.52 | 1.51 | 1.52 | 1.36 | 1.49 | 1.53 | 0.35 | 0.29 | 0.09 | 0.62 |
| TPA (raw meat) | | | | | | | | | | | | |
| Hardness N/cm$^2$ | 11.3b | 12.1ab | 12.9a | 11.1 | 12.8 | 13.2 | 11.9 | 10.8 | 3.74 | 0.02 | 1.00 | 0.24 |
| Cohesiveness | 0.42a | 0.41a | 0.37b | 0.42a | 0.40a | 0.39b | 0.41 | 0.39 | 0.04 | <0.01 | 0.01 | 0.79 |
| Springiness cm | 0.69 | 0.68 | 0.68 | 0.66 | 0.70 | 0.73 | 0.68 | 0.70 | 0.07 | 0.53 | 0.11 | 0.08 |
| TPA (cooked meat) | | | | | | | | | | | | |
| Hardness N/cm$^2$ | 12.9 | 12.9 | 13.1 | 12.7 | 13.3 | 13.2 | 12.9 | 13.3 | 3.01 | 0.99 | 0.40 | 0.48 |
| Cohesiveness | 0.52a | 0.50a | 0.48b | 0.51 | 0.50 | 0.51 | 0.51 | 0.50 | 0.04 | 0.04 | 0.74 | 0.86 |
| Springiness cm | 0.56 | 0.56 | 0.57 | 0.57 | 0.56 | 0.56 | 0.56 | 0.55 | 0.03 | 0.40 | 0.26 | 0.06 |

**Table 1.**
Carcass quality, pH and texture characteristics of broiler breast with different degree of myopathy by different texture devices .

## Notes