

The “spaghetti meat” myopathy influences the composition and functionality of broiler breast meat (#403)

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Introduction

Spaghetti meat (SM) is an emerging myopathy observed in the *Pectoralis major* muscles of large, fast-growing broilers. The SM abnormality is characterized by the breast muscle exhibiting excessive muscle fiber bundle separation on the skin-side surface. This results in a soft/mushy breast fillet with a stringy consistency that cannot be used as an intact muscle product. Relatively little is known regarding the effects of the SM myopathy on breast meat quality. The purpose of this study was to investigate the effects of the SM myopathy on the composition and functionality attributes of chicken breast meat.

Methods

Broiler breast fillets (30 normal, 30 SM) were collected from the deboning line of a commercial processing plant at approximately 3 h post-mortem on two separate trial days. Fillets were weighed, packaged, and stored overnight at refrigerated temperatures. Breast fillets selected for this study exhibited neither the white striping nor woody breast myopathies. At 24 h post-mortem, fillets were reweighed, measured for color and pH, and portioned horizontally into superficial (SUP) and deep (DEEP) portions. The SUP and DEEP portions were evaluated for proximate composition, collagen content, salt-induced water uptake, protein solubility, and emulsifying properties. Myofibrillar and sarcoplasmic protein fractions were isolated and subjected to SDS-PAGE analysis. Data measured on the intact fillets were analysed as a one-way ANOVA using a mixed model with muscle condition (normal, SM) as a fixed effect and trial day as a random effect. Data measured on portioned fillets were analysed as a two-way ANOVA using a mixed model that included muscle condition, portion (SUP, DEEP), and their interaction as fixed effects and individual bird and trial day as random effects.

Results

Compared to normal fillets, SM fillets were heavier (normal = 483 vs SM = 564 g, $P < 0.0001$) and exhibited greater drip loss (normal = 1.22% vs SM = 1.44%, $P < 0.05$) despite having a higher ultimate pH (normal = 5.84 vs SM = 5.99, $P < 0.0001$). Minimal color differences were observed between normal and SM fillets. With regards to proximate composition there was a significant interaction between muscle condition and fillet portion. The DEEP portions

of normal and SM fillets exhibited similar proximate compositions. However, the SUP portions of SM fillets exhibited greater moisture (normal-SUP = 75.6% vs SM-SUP = 76.8%, $P < 0.01$), lower protein (normal-SUP = 22.1% vs SM-SUP = 20.3%, $P < 0.0001$), greater fat (normal-SUP = 1.2% vs SM-SUP = 1.8%, $P < 0.05$), and lower ash (normal-SUP = 1.13% vs SM-SUP = 1.01%, $P < 0.05$) compared to normal fillets. Soluble and insoluble collagen contents were similar between normal and SM fillets. However, collagen contents were greater in the SUP portion of the fillets compared to the DEEP portion (soluble: SUP = 1.34 vs DEEP = 1.09 mg/g muscle, $P < 0.0001$; insoluble: SUP = 3.78 vs DEEP = 3.28 mg/g muscle, $P < 0.0001$). Salt-induced water uptake was not significantly different between normal and SM fillets (normal = 67.6% vs SM = 53.7%, $P = 0.1864$). Myofibrillar protein solubility was lower in SM fillets than normal fillets (normal = 142 vs SM = 124 mg protein/g muscle, $P < 0.001$). Sarcoplasmic protein solubility was greater in the DEEP portion of the fillet than the SUP portion (DEEP = 84.9 vs SUP = 82.3 mg protein/g muscle, $P < 0.0001$) but was not significantly influenced by muscle condition ($P = 0.1876$). The emulsion stability of myofibrillar proteins extracted from the SUP portion was lower in SM than normal fillets (normal-SUP = 17.4 vs SM-SUP = 14.7, $P < 0.01$), but similar in the DEEP portion of the fillets. The emulsion stability of extracted sarcoplasmic proteins was greater in normal fillets (normal = 18.3 vs SM = 16.9, $P < 0.05$). SDS-PAGE analysis indicated that the protein profiles of the myofibrillar and sarcoplasmic protein fractions of the *Pectoralis major* were similar between normal and SM fillets with only minor differences in protein banding patterns and relative band densities.

Conclusion

These data indicate that the SM myopathy alters the proximate composition and some of the functionality attributes of broiler breast meat. The SM myopathy had a more severe impact on the superficial portion of the *Pectoralis major* muscle than the deep portion. Observed differences in functionality attributes were more likely due to differences in the total amount of muscle proteins relative to tissue weight rather than differences in the inherent properties and profiles of the muscle proteins. Further research is needed to determine if the observed differences in SM are enough to impact the technological and quality attributes of further-processed meat products.

Notes