

RELATIONSHIP BETWEEN THE WHITE STRIPING AND WOODY BREAST MYOPATHIES IN BROILER BREAST FILLETS

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I. INTRODUCTION

The woody breast (WB) and white striping (WS) myopathies that occur in the *Pectoralis major* muscles of broilers are both associated with the fast growth rate and large size of modern broilers. These myopathies often occur in the same breast fillet. The two myopathies seem to have similar effects on the histology and composition of the muscle tissue. However, the relationship between these two myopathies with regards to subjective scoring assessments is not well defined. The objective of this study was to evaluate the relationship between WB and WS occurrence and degree of severity in broiler breast fillets.

II. MATERIALS AND METHODS

Over multiple collection days, more than 2600 boneless skinless breast fillets (*Pectoralis major*) were collected at 3 h postmortem from the deboning line of a commercial processing plant that slaughters large broilers (3.6-4.1 kg live weight). Individual breast fillets were weighed and assessed independent WB and WS scores from 1.0 to 3.0 in 0.5 score increments (normal = 1; moderate = 2; severe = 3) based on criteria similar to previous reports [1,2]. Fillets were also independently scored on a similar 1.0 to 3.0 scale for individual WB-related attributes (hardness, muscle rigidity, prominence of caudal bulginess) and petechial hemorrhaging on the skin-side surface of fillets [3]. Data were analyzed using chi-square, frequency, and correlation analyses. In order to investigate the relationship between fillet weight and subjective scores, data were also analyzed by fillet weight quartiles.

III. RESULTS AND DISCUSSION

Chi-square analysis indicated that there was a significant relationship between WB and WS scores ($P < 0.0001$). Approximately 94% of all WB fillets (WB score ≥ 1.5) also exhibited WS (Table 1). Of the fillets that did not exhibit WB, 54% exhibited WS. Of the fillets that exhibited severe WB, 28% had severe WS, 51% had moderate WS, and 21% had mild or no WS. Approximately 83% of all WS fillets (WS score ≥ 1.5) exhibited WB. Of the fillets that did not exhibit WS, 26% exhibited WB. Of the fillets that exhibited severe WS, 41% had severe WB, 46% had moderate WB, and 13% had mild or no WB.

Table 1. Frequency of breast fillets by WS and WB scores (# of fillets; % of row / % of column)

Myopathy Score	WB 1.0 (no WB)	WB 1.5 (mild)	WB 2.0 (moderate)	WB 2.5 (moderate)	WB 3.0 (severe)	Total (row)
WS 1.0 (no WS)	328 74/46	64 14/16	26 6/4	11 2/3	14 3/3	443
WS 1.5 (mild)	294 37/41	141 18/35	167 21/28	86 11/21	103 13/18	791
WS 2.0 (moderate)	72 10/10	119 17/29	211 30/36	145 21/35	151 22/27	698
WS 2.5 (moderate)	9 2/1	41 11/10	105 28/18	84 23/20	130 35/24	369
WS 3.0 (severe)	10 3/1	40 10/10	84 22/14	90 24/22	154 41/28	378
Total (column)	713	405	593	416	552	2679 (total)

Overall, there was a significant correlation between WS and WB scores ($r = 0.55$, $P < 0.0001$), but the incidence of the myopathies varied by fillet weight (Table 2). Fillet weights were moderately correlated to WB ($r = 0.44$, $P < 0.0001$) and WS ($r = 0.32$, $P < 0.0001$) scores. For fillets < 407 g, 28% of samples had moderate or severe WS and 22% had moderate or severe WB. However, for fillets > 528 g, 70% of samples had moderate or severe WS and 77% had moderate or severe WB. The strength of the correlation between WS and WB scores decreased with fillet weight. As expected, the scores for WB-related attributes of hardness, rigidity, and bulginess were more strongly related to WB ($r = 0.88-0.96$, $P < 0.0001$) than WS scores ($r = 0.44-0.48$, $P < 0.0001$). Tactile attributes were strongly related to one another ($r = 0.83-0.91$, $P < 0.0001$). Although the incidence of severe hemorrhaging was more frequent in fillets with severe WS or WB, the overall relationship between petechial hemorrhaging and myopathy scores was low ($r = 0.26-0.38$).

Table 2. Myopathy score average, correlation, and frequency in breast fillets by weight groups

Trait	<407 g	407-469	469-528	>528 g
WS score	1.6 ± 0.6	1.9 ± 0.6	2.0 ± 0.6	2.1 ± 0.6
WB score	1.4 ± 0.6	2.0 ± 0.7	2.1 ± 0.7	2.3 ± 0.7
WS-WB correlation (r)	0.63	0.51	0.43	0.39
Hardness	1.4 ± 0.6	1.9 ± 0.7	2.2 ± 0.7	2.3 ± 0.6
Muscle Rigidity	1.5 ± 0.6	1.9 ± 0.6	2.2 ± 0.7	2.2 ± 0.6
Caudal Bulginess	1.5 ± 0.6	2.0 ± 0.6	2.3 ± 0.6	2.4 ± 0.6
Petechial Hemorrhaging	1.2 ± 0.4	1.3 ± 0.5	1.4 ± 0.5	1.4 ± 0.6
% of fillets by WS score				
No WS (1.0)	38	16	12	9
Mild WS (1.5)	34	30	26	21
Moderate WS (2.0-2.5)	19	38	46	50
Severe WS (3.0)	9	16	16	20
% of fillets by WB score				
No WB (1.0)	64	24	17	11
Mild WB (1.5)	14	19	15	12
Moderate WB (2.0-2.5)	15	36	38	45
Severe WB (3.0)	7	21	30	32

IV. CONCLUSION

Although the occurrence and severity of the WS and WB myopathies in breast fillets are closely related, breast fillets exhibiting WS without WB are more likely to be observed than WB fillets without WS. The strength of the relationship between the WB and WS myopathies in breast meat from large broilers is also influenced by fillet weight. Data suggest that visual traits such as WS, fillet shape, and hemorrhaging may not be accurate enough indicators of WB occurrence or degree of severity for the purpose of developing imaging based WB sorting technologies. Technologies based on tactile traits may provide a more accurate assessment of the WB myopathy in broiler breast meat.

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