Woody Breast Meat: Causes & Utilization

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Woody Breast Definition

Woody or wooden breast (WB) myopathy, first described by Sihvo et al. (2014), is characterized by pale, bulging, and hardened chicken breast muscle (Pectoralis major) [1]. The degree of WB can be mild, moderate or severe, as depicted in Figure 1 [2, 3]. Initially hard and rigid, WB may turn mushy, juicy and/or crunchy when cooked.

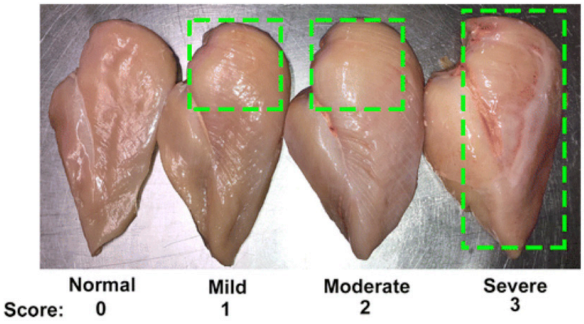

Fig. 1 Woody breast (WB) score and categories. 0, normal breast (NB, flexible throughout); 1, mild (cranial area is hard, but the rest is flexible); 2, moderate (breast muscle is hard throughout, but flexible in the mid to caudal region); 3, severe (extreme stiffness from the cranial to the caudal region)

Factors Affecting WB Development

Woody breast starts developing in broilers at as early as two weeks of age, with chronic myofibrillar degradation appearing at three to four weeks [4]. Various factors affect WB development, including gender, broiler's diet, genetic strain, growth rate, body weight, and breast meat yield [2, 5-8]. Males have a higher WB incidence than females. As the diet density, growth rate, broiler size, and breast meat yield increases, WB incidence also increases. One factor that has been consistently associated with WB incidence is heavier body weight and thicker fillets [4, 7]. When broilers weigh over 4 kg by 8-9 weeks, severe WB incidence increases. Conversely, broilers under 3 kg have a low incidence of severe WB, about 10% [9].

WB Symptoms and Causes

Woody breast exhibits typical inflammation symptoms, including vein vasculopathy, perivenous lipid deposition, myofiber degeneration and inflammatory cell invasion; the degenerated myofibers are then replaced by connective and adipose tissues [10]. Woody breast myopathy is also associated with increased hypoxia, oxidative stress, intracellular calcium concentration, and crosslinked collagen, leading to decreased glycogen content and metabolic alterations [11, 12].

Related Myopathies

White striping (WS) and spaghetti meat (SM) are myopathies that often coexist with WB but can also occur independently. WS is similar to WB with muscle fiber necrosis, but differs by forming fat in the perimysium tissue, creating white striations in the chicken breast. In contrast to WB, SM generally occurs in breast meat from smaller birds than that of WB meat. Spaghetti meat is characterized by altered collagen synthesis and turnover, leading to the separation of muscle fiber bundles within the perimysium, which may be facilitated by defeathering and deboning.

Woody Breast Meat Quality

Woody breast meat has a greater pH, less protein, more fat, more connective tissue, and reduced water holding capacity when compared to normal breast (NB) meat [6]. The altered texture of WB fillets likely results from the high connective tissue content and damaged muscle fiber structure [2]. These quality issues do not pose a food safety risk but have a negative economic impact on the poultry industry since WB is downgraded or even discarded in more severe cases due to its unappealing appearance and impaired nutritional quality [4, 6, 13].

Utilization of WB Meat

WB meat's severity dictates where it can be utilized in the value stream. Normal breast and mild WB can be used as whole or portioned chicken breast in any application, either marinated or non-marinated. Moderate WB chicken breast can be marinated with salt and phosphate to be acceptable, but it will have less yield and a slightly crunchy texture when baked or grilled. Marinating moderate WB with potassium carbonate and sodium chloride leads to drier product with less yields and slight metallic and soapy tastes [14]. Applications for moderate WB meat include fajita meat or ground products.

For severe WB meat, marination does not effectively mask the undesirable texture [15, 16], and off-flavors (sour and dirty), making it unsuitable for baked or fajita applications. Therefore, whole muscle marination is not a viable solution for severe WB. Portioning and frying can mitigate the undesirable texture attributes like crunchiness and cohesiveness. Examples for inclusion of severe WB meat are ground products such as patties, deli loaves, nuggets, and sausages. An inclusion level of 33% or less severe WB meat, marinated with water, phosphate, and salt does not significantly affect consumer acceptability despite lower cook yields [15, 16].

As long as the consumer demand for chicken continues to increase, WB and other muscle myopathies are unlikely to be eliminated since these myopathies occur as a result of rapid muscle growth in chickens to meet this ever-increasing consumer demand.

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