ANSC/FSTC 607
Physiology & Biochemistry of Muscle as a Food
WOODEN CHICKEN BREAST

I. Appearance

Figure 1. Breast muscles from 42 d old broiler exhibiting deep pectoral myopathy as shown by the green discoloration of the pectoralisminor muscle (see arrows).

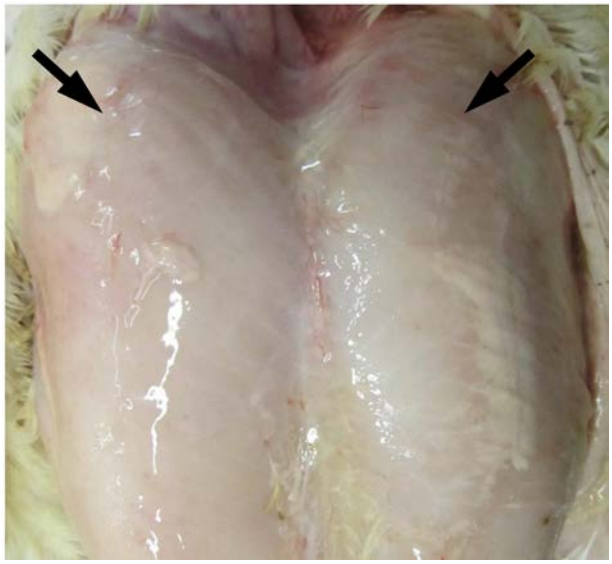

Figure 2. Breast muscle from 42-day-old broiler exhibiting wooden breast. Muscle is pale with an exudate over the surface. Arrows indicate where muscle is typically firm to the touch.

Figure 3. Modified visual scoring scale (modified from Kuttappan et al., 2012c) for WS in broiler breast fillets where 0 = normal, 1 = moderate, 2 = severe, and 3 = extreme. Normal – No distinct white lines. Moderate – Small white lines, generally < 1 mm thick, but apparently visible on the fillet surface. Severe – Large white lines (1 - 2 mm thick) very visible on the fillet surface. Extreme – Thick white bands (> 2 mm thickness) covering almost entire surface of fillet.

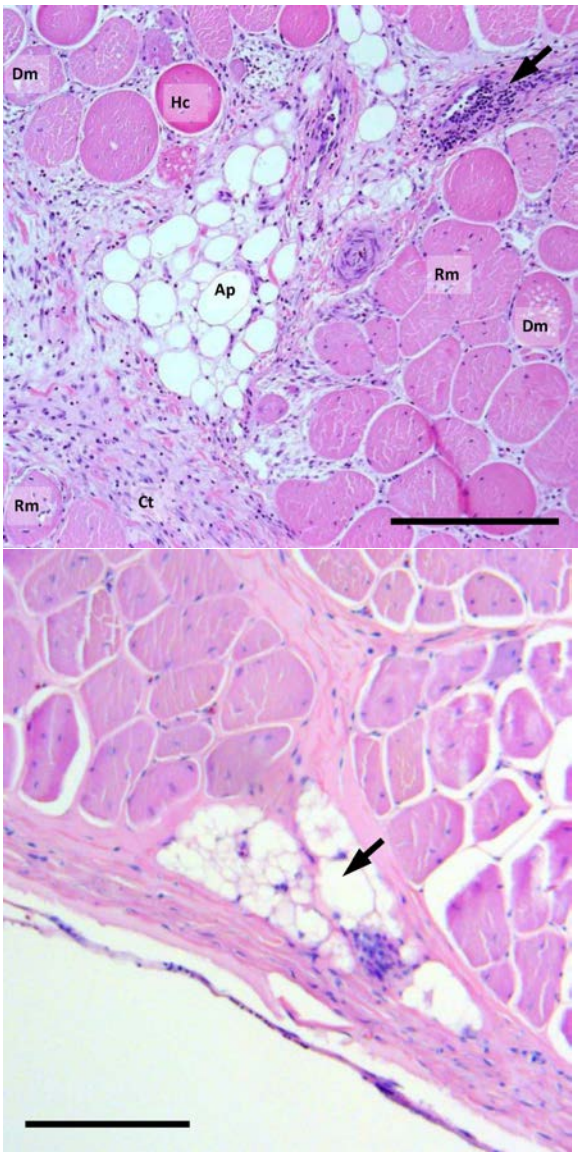

Figure 4. Histomicrograph of breast muscle affected by wooden breast. Features of the muscle include degenerating muscle fibers (Dm), regenerating fibers (Rm), adipose tissue (Ap), hypercontracted fibers (Hc), increased connective tissue (Ct) and cellular infiltration (arrow). Black bar shows scale (100 **µ**m).

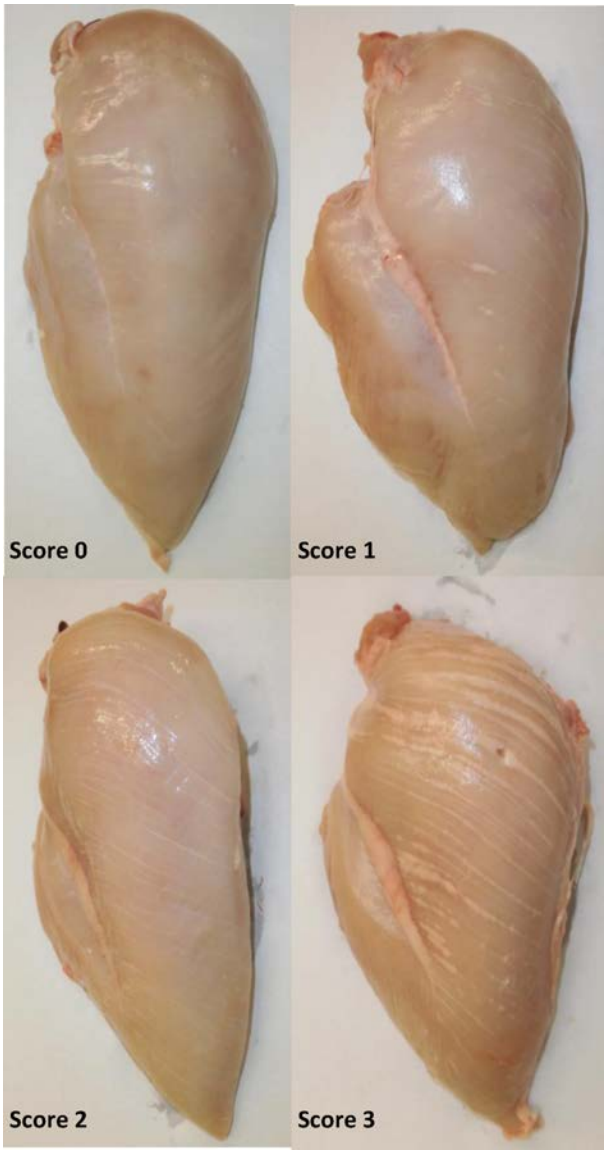

Figure 5. Breast fillets displaying different degrees of white striping. Score 0 indicates no white striping and score 3 indicates severe white striping.

II. General description – myopathies

A. White striping

1. Studied since 2009.

2. Characterized by white lines of intramuscular deposits in raw meat, parallel to muscle fibers in breast meat (pectoralis major).

3. Adipocytes apparently replace damaged muscle fibers, and is associated with type II muscle fibers (different from marbling in beef cattle).

B. Wooden (Woody) Breast

1. Studied since 2014.

2. Affects tactile properties of the breast filet, making in firmer.

3. Associated with irregular muscle fiber diameters.

3. White Striping and Wooden Breast have overlapping histological lesions, myodegeneration and necrosis, lymphocyte and macrophage infiltration, fibrosis, lipidosis (steatosis), and fibrosis.

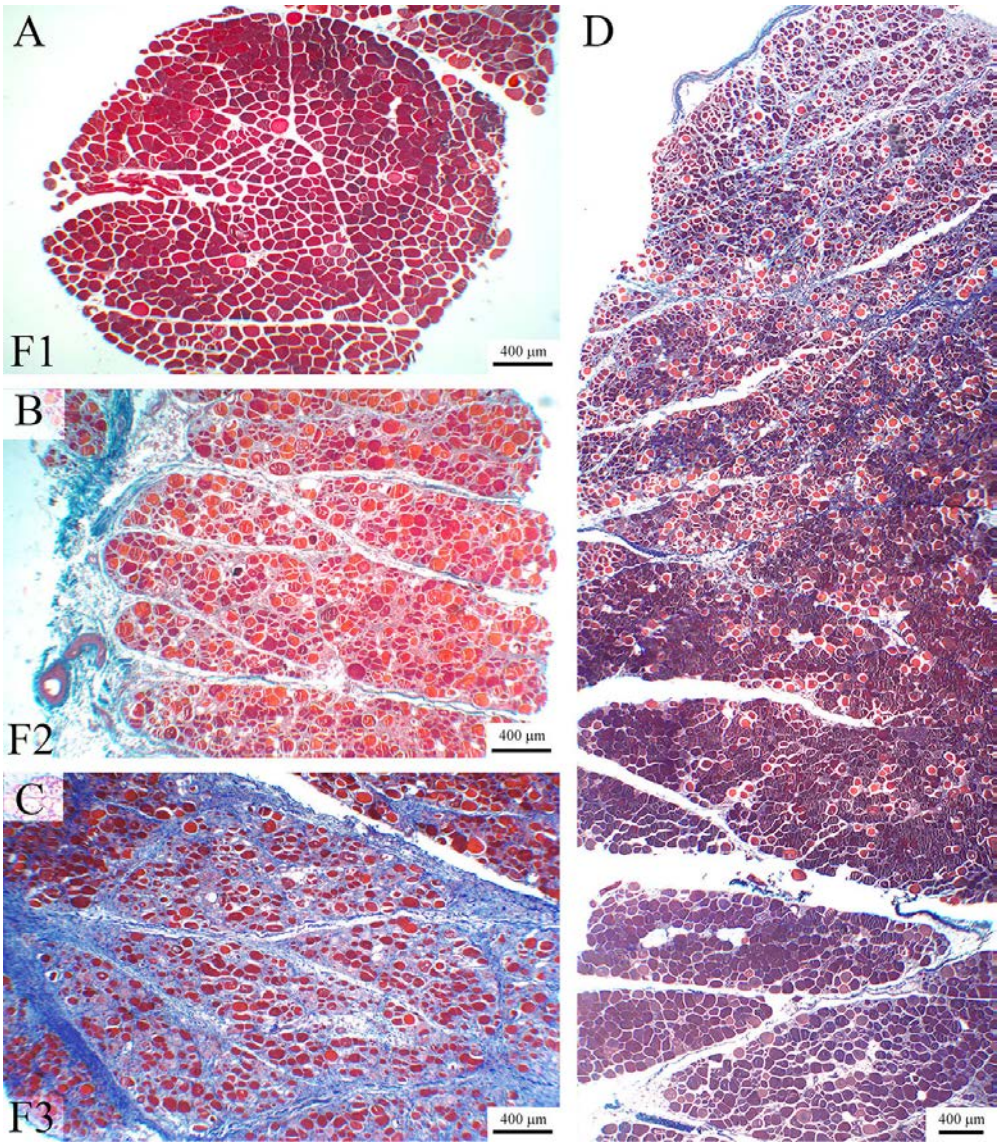

Figure 6. Images of mild (A), moderate (B), and severe (C) samples in the histological scale (ranging F1 to F3) used to score the levels of myodegeneration (Masson's Trichrome). A = The polygonal muscle fibers in an F1 score are well packaged and relatively of the same size. B = The fibers show different diameters and the perimysial connective tissue is thickened. C = The number of muscle fibers is reduced; variably sized muscle fibers are rounded and separated or replaced by a loose or more organized connective tissue. In (D) a sample is represented (score F3) with gradual progression of the histopathological lesions. From the surface (upper part image) up within the muscle (lower part of the image) the histological lesions are gradually disappearing (Masson's Trichrome). Score F1 – mild: abnormal fibers ranging from 2 to 4 for each PMF (Figure 6A); Score F2 – moderate: abnormal fibers ranging from 5 to 10 for each PMF (Figure 6B); Score F3 – severe: abnormal fibers represent the majority of the fibers for each PMF (Figure 6C).

II. Possible causes, possibly related to heavier body weights

A. Higher levels of intracellular calcium

B. Localized hypoxia

C. Oxidative stress (reactive oxygen species)