



When Broiler Breast Goes Wrong: The Story Behind Wooden Breast, White Striping and Spaghetti Meat

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Modern broilers have been selected for rapid growth, efficient feed utilization and high breast meat yield. While these improvements have increased poultry production, they have also been associated with breast muscle abnormalities. The three important conditions are White Striping (WS), Wooden Breast (WB) and Spaghetti Meat (SM). These conditions mainly affect the *Pectoralis major* muscle. White Striping appears as white lines along the breast muscle fibres, Wooden Breast causes unusual hardness and firmness, while Spaghetti Meat is characterized by separation and weakening of muscle fibre bundles. These abnormalities are associated with rapid growth, large breast muscles and disturbances in muscle metabolism and blood supply. They can reduce meat quality, increase processing losses and create economic challenges. Understanding these conditions and adopting balanced breeding, nutrition and management practices can help reduce their severity.

Keywords: Broiler, breast meat, breast myopathies, Wooden Breast, White Striping, Spaghetti Meat, rapid growth, muscle abnormalities, meat quality.

Introduction

Modern broilers reach market weight much faster than earlier generations and produce a high proportion of valuable breast meat. This progress has greatly improved production efficiency and helped meet the increasing demand for poultry meat. However, rapid growth and excessive breast muscle development can also create problems. Wooden Breast, White Striping and Spaghetti Meat are commonly recognized as broiler breast myopathies. These conditions can affect the appearance, structure, texture and processing quality of breast meat. Their occurrence is strongly associated with rapid growth, high breast yield and extensive breast muscle development. For producers and processors, recognizing these abnormalities is important because affected meat may have lower value and may require alternative processing or utilization.

White Striping: The Visible Change

White Striping is one of the easiest breast abnormalities to recognize. White lines appear on the surface of the breast muscle, running parallel to the muscle fibres. These stripes are associated with changes within the muscle, including increased fat and connective tissue along with muscle fibre degeneration and regeneration. The condition may range from very mild, barely visible stripes to thick and prominent white lines. White Striping is particularly associated with birds having greater breast muscle weight and breast yield. Severe cases can affect both the appearance and technological properties of the meat.

Wooden Breast: When the Muscle Becomes Hard

Wooden Breast is characterized by unusually hard and firm areas in the breast muscle. The affected muscle may appear pale, swollen or bulging and feels much firmer than normal breast

meat. At the microscopic level, Wooden Breast is associated with muscle fibre damage, degeneration and regeneration, inflammation, fibrosis and changes in fat and connective tissue. One possible explanation is that very rapid muscle growth is not adequately supported by the development of blood vessels and supporting tissues. This may contribute to inadequate oxygen supply, oxidative stress and muscle damage. Wooden Breast is particularly important during processing because affected meat may show greater cooking loss, altered texture and increased toughness, especially in severe cases.

Spaghetti Meat: A Stringy Breast Muscle

Spaghetti Meat is a relatively newer breast muscle abnormality. It gets its name because muscle fibre bundles become loosely connected and separate from each other, giving the breast a stringy or spaghetti-like appearance. In normal breast meat, muscle fibre bundles are well organized and tightly connected. In Spaghetti Meat, this structural integrity is reduced. Severe cases can result in soft, fragile meat that is difficult to handle during processing. This condition can substantially affect meat quality, particularly its physical structure and water-holding capacity.

Why Do These Abnormalities Occur?

There is no single cause responsible for all three conditions. They appear to result from several interacting factors.

Rapid Growth and High Breast Yield: Extremely rapid growth and development are important factors. Selection for fast growth and large breast muscles has improved production efficiency but has also increased the metabolic demands placed on breast muscle. When muscle growth occurs very rapidly, the development of supporting blood vessels and other tissues may not keep pace with muscle enlargement. This can contribute to reduced oxygen availability within parts of the muscle.

Reduced Oxygen Supply and Oxidative Stress: Breast muscle requires adequate oxygen and nutrients. When muscle growth outpaces vascular development, some areas may experience inadequate oxygen supply. This can promote oxidative stress, changes in energy metabolism and cellular damage. Over time, these changes may contribute to muscle fibre degeneration, inflammation, fibrosis and abnormal fat deposition.

Genetics: Genetics also influences susceptibility. Different broiler strains can differ in growth rate, breast yield and their tendency to develop breast myopathies. Therefore, genetic selection should consider not only growth and breast yield but also muscle health and meat quality.

Nutrition and Management: Nutrition is not the sole solution, but balanced nutrition is essential for normal muscle development and tissue repair. Adequate protein, amino acids, vitamins, minerals and energy are important. Good management is equally important. Environmental stress, poor litter conditions, inadequate ventilation and other management problems should be minimized to support bird health and performance.

Effects on Meat Quality: Breast myopathies are more than visual defects. They can affect texture, water-holding capacity, cooking loss, colour and processing characteristics. Severe Wooden Breast can increase cooking and drip losses and make meat harder. Spaghetti Meat can substantially weaken the physical structure of the fillet. These changes create challenges for processors because breast meat is one of the most valuable products obtained from broilers. When appearance or texture is unacceptable, affected meat may be downgraded or diverted towards processed products. Importantly, these abnormalities may also occur together, making their management more challenging.

Can These Problems Be Prevented?

There is currently no single method that completely prevents Wooden Breast, White Striping or Spaghetti Meat. Since several factors are involved, prevention should focus on maintaining a balance between growth, breast meat yield, nutrition, bird health and meat quality.

Important approaches include:

- Avoiding excessive emphasis on extremely rapid growth alone.

- Maintaining balanced nutrition throughout production.
- Providing adequate amino acids and micronutrients for normal muscle development.
- Maintaining good ventilation and environmental conditions.
- Reducing unnecessary stress.
- Monitoring flock growth and breast muscle development.
- Considering meat quality along with growth and feed efficiency in breeding programs.
- Identifying affected meat during processing and adopting appropriate processing strategies.

What Does This Mean for the Poultry Industry?

The emergence of breast myopathies highlights an important lesson: more growth is not always better if meat quality is compromised. The objective should be to produce birds that grow efficiently while maintaining good muscle health and high-quality meat. Breeding companies, nutritionists, veterinarians, farmers and processors all have important roles. Greater monitoring of breast abnormalities at processing plants can also help identify relationships between farm performance, growth rate, genetics and meat quality. Future broiler production should therefore aim for a balance between growth rate, feed efficiency, breast meat yield, bird health and final meat quality.

Conclusion

Wooden Breast, White Striping and Spaghetti Meat are important abnormalities affecting the breast muscles of modern broilers. White Striping is characterized by visible white lines, Wooden Breast by abnormal hardness and firmness, and Spaghetti Meat by weakened and separated muscle fibre bundles. These conditions are closely associated with rapid growth and extensive breast muscle development, although genetics, metabolism, vascular development and other factors also contribute. They can negatively influence meat appearance, texture, water-holding capacity and processing quality. The solution is unlikely to come from a single feed additive or management practice. Instead, the poultry industry needs a balanced approach in which growth and production efficiency are achieved without compromising muscle health and meat quality. Understanding these abnormalities is an important step toward producing healthier, more consistent and higher-quality broiler meat.

References

1. Petracci, M., Soglia, F., Madruga, M., Carvalho, L., Ida, E., & Estévez, M. (2019). Wooden-breast, white striping, and spaghetti meat: Causes, consequences and consumer perception of emerging broiler meat abnormalities. *Comprehensive Reviews in Food Science and Food Safety*, 18(2), 565–583. <https://doi.org/10.1111/1541-4337.12431>
2. Soglia, F., Gao, J., Mazzoni, M., Puolanne, E., & Cavani, C. (2021). A critical review of the mechanisms involved in the occurrence of growth-related abnormalities affecting broiler chicken breast muscles. *Poultry Science*, 100(6), 101180. <https://doi.org/10.1016/j.psj.2021.101180>
3. Wang, C., Che, S., Susta, L., & Barbut, S. (2023). Textural and physical properties of breast fillets with myopathies (wooden breast, white striping, spaghetti meat) in Canadian fast-growing broiler chickens. *Poultry Science*, 102(2), 102309. <https://doi.org/10.1016/j.psj.2022.102309>
4. Barbut, S., Mitchell, R., Hall, P., Bacon, C., Bailey, R., Owens, C. M., & Petracci, M. (2024). Review: Myopathies in broilers: Supply chain approach to provide solutions to challenges related to raising fast growing birds. *Poultry Science*, 103(8), 103801. <https://doi.org/10.1016/j.psj.2024.103801>
5. Bošković Cabrol, M., Xiccato, G., Marangon, C. M., & Trocino, A. (2024). Nutritional composition, technological quality, and sensory attributes of chicken breast meat affected by white striping, wooden breast, and spaghetti meat: A comprehensive evaluation. *Foods*, 13(24), 4007. <https://doi.org/10.3390/foods13244007>