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POULTRY MEAT DOWNGRADING: INSIGHT ON THE UNDERPINNING FACTORS TO IMPROVE THE SUSTAINABILITY OF THE PRODUCTION

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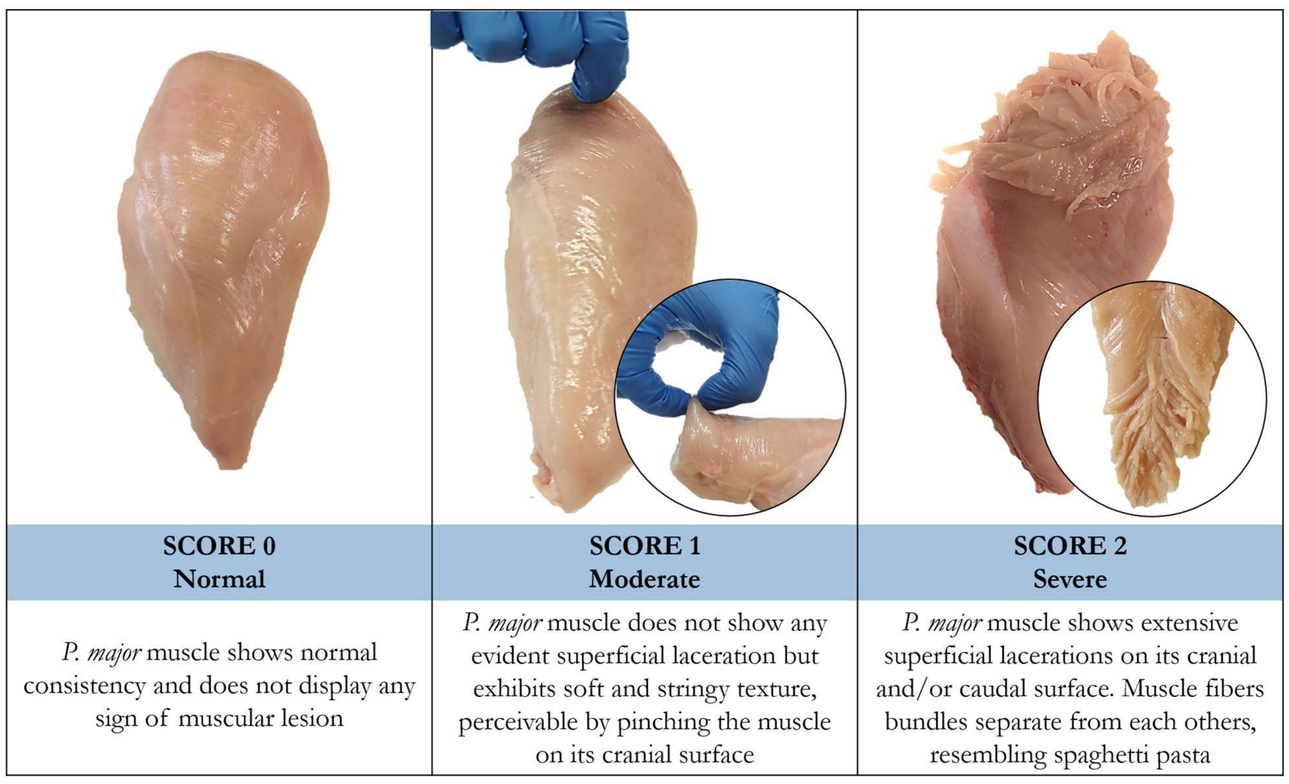
State of the Art

Poultry meat production increased over the past 50 years and, due to its efficiency and sustainability, currently represents the most consumed meat type globally (Tallentire *et al*., 2018; FAOSTAT, 2023). **Intense selection programs** have been performed to develop fast-growing and high breast yield commercial hybrids exhibiting a hypertrophic growth of the *Pectoralis major* muscle (Tixier-Boichard, 2020). However, a greater susceptibility to the onset of meat defects associated with stress (*e.g.*, PSE-like) or growth-related (**white striping**, **wooden breast** and **spaghetti meat** abnormalities) was observed (Petracci *et al*., 2017). Economic and environmental issues are related to the onset of these conditions which can reach incidence rates of about 30% in some flocks showing then detrimental sensory and technological properties of the forthcoming meat (Barbut *et al*., 2024). Given the above, it is possible to hypothesize that the incidence and severity of these defects may be influenced by some *peri-mortem* factors.

Aims of the study

Evaluating the **main quality traits** and **technological** properties of chicken breast affected by **muscle abnormalities**, with particular reference to the **spaghetti meat defect** (Figure 1).
Improving the **knowledge** concerning the **factors** which may influence its occurrence and draw up **guidelines** for the poultry industries to reduce economic losses and the resulting environmental impact.

Figure 1. Representative images of chicken breast fillets with normal (score 0), moderate (score 1) and severe (score 2) degrees of Spaghetti Meat defect.



SCORE 0 Normal	SCORE 1 Moderate	SCORE 2 Severe
P. major muscle shows normal consistency and does not display any sign of muscular lesion	*P. major* muscle does not show any evident superficial laceration but exhibits soft and stringy texture, perceivable by pinching the muscle on its cranial surface	*P. major* muscle shows extensive superficial lacerations on its cranial and/or caudal surface. Muscle fibers bundles separate from each others, resembling spaghetti pasta

PhD Thesis Objectives and Milestones

This PhD thesis project can be divided into the following activities according to the Gantt diagram below (Table 1).

A1) **Assessment of the potential involvement of collagen type IV in the onset of the growth-related abnormalities (white striping and wooden breast)** affecting broilers' *Pectoralis major* by investigating its possible role as one of the primary causes underlying their occurrence.
A2) **Evaluation of the implications of pre-slaughter and slaughtering factors** on the main quality characteristics of poultry meat and to ascertain their possible involvement in the development and/or worsening of the severity of breast meat abnormalities (*e.g.,* spaghetti meat).
A3) **Molecular analysis** to investigate the possible involvement of endogenous enzyme systems of the *Pectoralis major* muscle in the development of the Spaghetti meat defect.
A4) **Statistical analysis:** univariate and multivariate data analysis.
A5) **Writing and Editing** of the PhD thesis, scientific papers, and oral and/or poster communications.

Table 1: Gantt diagram for this PhD thesis project

Activity	Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A1)	**Investigating COL IV involvement in the onset of WS and WB**																								
	1) Classification and meat quality analysis																								
	2) COL IV quantification (Western Blot analysis)																								
A2)	**Evaluation of the effect of pre-slaughter and slaughtering factors**																								
	1) Evaluation of abnormalities																								
	2) Qualitative analysis and technological properties																								
A3)	**Molecular analysis**																								
	1) Evaluation of collagenase activity																								
	2) Extraction and characterization of collagen																								
A4)	**Statistical analysis**																								
	1) Univariate and multivariate approches																								
A5)	**Thesis and Paper preparation**																								

References

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Tallentire CW, Leinone I & Kyriazakis I (2018) Artificial selection for improved energy efficiency is reaching its limits in broiler chickens. Sci Rep 8, 1168.