

# IMPACT OF ELECTRICAL STIMULATION ON THE SENSORY PERCEPTION OF NORMAL CHICKEN BREAST FILETS AND IN FILETS AFFECTED BY WOODEN BREAST MYOPATHY

Helena Müller<sup>1</sup>, Tainá Simonetti<sup>1</sup>, Joabel Gossmann da Costa<sup>1</sup>, Liris Kindlein<sup>1\*</sup>

<sup>1</sup> Center of Teaching, Research and Technology on meat (CEPETEC), Faculty of Veterinary Medicine, Federal University of Rio Grande do Sul (UFRGS), Porto Alegre, Brazil.

\*Corresponding author email: [liris.kindlein@ufrgs.br](mailto:liris.kindlein@ufrgs.br)

## I. INTRODUCTION

Promoting high weight gain quickly can result in meat quality problems. Thus, due to the rapid growth of broiler chickens lines to achieve greater meat yield muscle defects such as woody breast myopathy (WB) have emerged, which can affect the texture and quality of the meat of these birds [1, 2]. Electrical stimulation is a procedure that induces muscle contraction, improving glycolytic activity and influencing the drop in pH and *rigor mortis* [3], thus favoring the development of tender meat and may be an alternative to these muscular defects. Therefore, this study aimed to observe the influence of electrical stimulation on the tenderness and juiciness of normal chicken breasts and those affected by Woody Breast Myopathy.

## II. MATERIALS AND METHODS

The electrostimulation device consisted of metal conductors with protection insulation fed by a controlling font Fluxo LFX-500. The potential difference between electric poles: feet = positive (+) and breast = negative (-) of 50V was applied at an alternating current of 20Hz for 50 seconds after the bleeding stage on Cobb 500 Male broilers from the same flock.

The sensory analysis was conducted by 50 untrained panelists, according to the 510/2016 Resolution by Brazil's National Health Council [4], after signing a declaration of free and informed consent.

Paired comparison tests [5] were performed in triplicate, in which the panelist would determine from two cooked samples which one was superior on the tenderness and juiciness attributes. To avoid influencing the tasters, the samples were randomly codified. Electrically stimulated breasts meat were compared with non-stimulated breasts meat, both normal (healthy) breasts and those affected by woody breast myopathy.

The results were subjected to analysis of variance and the difference between electrically stimulated and non-electrically stimulated breasts was tested with the Student's t-test, at a significance level of 5% ( $P < 0,05$ ).

## III. RESULTS AND DISCUSSION

The paired comparison tests suggested that normal electrically stimulated breasts displayed greater tenderness ( $P < 0.05$ ) and greater juiciness ( $P < 0.05$ ), than the non-stimulated ones. Out of the 50 panelists, 40 selected the stimulated samples as more tender and 33 as juicier. Tenderness is a multi-parameter sensory attribute and together with juiciness of meat, defines a large part the consumers' perception of overall quality [6]. Electrical stimulation of slaughtered birds accelerates the development of *rigor mortis*, and consequently, its resolution, inducing a faster pH fall and increasing the sarcomere length, resulting in increased tenderness [7]. Considering that in-mouth sensory tenderness is generally correlated to instrumental textural measurements [8], these results were in agreement with

those found in previous studies, that observed lower Warner-Bratzler shear force values in breasts electrically stimulated after bleeding [7, 9].

The Wooden Breast myopathy affects the texture of raw broiler breast filets, making it firmer upon palpation, with higher compression force compared to normal breast filets [10]. Hence, its occurrence reduces the quality and acceptance of both raw as well as cooked meat and meat products [11]. The application of electrical stimulation improved the texture of woody breasts, making them more tender than the ones that didn't receive the stimulus ( $P < 0.05$ ), according to 39 panelists. However, in the attribute of juiciness, there was no significant difference ( $P > 0.05$ ), with 28 out of the 50 panelists considering the stimulated samples as juicier and 22 the non-stimulated woody breasts.

#### IV. CONCLUSION

Low voltage electrical stimulation after bleeding resulted in improvements in sensory textural traits of cooked broiler filets. Normal breasts subjected to electrical stimulus developed greater tenderness and juiciness. Similarly, electrically stimulated wooden breasts displayed greater tenderness, although there was no significant difference in juiciness. Therefore, electrical stimulation can be a method to aggregate the quality and value of broiler meat products, as well as to minimize undesirable effects of wooden breast on final product quality.

#### ACKNOWLEDGEMENTS

We would like to thank the company Vibra Agroindustrial S/A for their support in carrying out this project. This work was supported in part by a Undergraduate Extension Grant from PROEXT UFRGS 2023 [44641].

#### REFERENCES

1. Petracci, M., Mudalal, S., Soglia, F., & Cavani, C. (2015). Meat quality in fast-growing broiler chickens. *World's Poultry Science Journal*, 71: 363–374.
2. Kuttappan, V. A., Owens, C. M., Coon, C., Hargis, B. M., & Vazquez-Añon, M. (2017) Incidence of broiler breast myopathies at 2 different ages and its impact on selected raw meat quality parameters. *Poultry Science*, 96: 3005–3009.
3. Bhat, Z. F., Morton, J. D., Mason, S. L., & Bekhit, A. E.-D. A. (2018). Applied and Emerging Methods for Meat Tenderization: A Comparative Perspective. *Comprehensive Reviews in Food Science and Food Safety*, 17: 841–859.
4. Free and enlightened assent and consent process, 510 C.N.S. 3 (2016). <https://conselho.saude.gov.br/resolucoes/2016/Reso510.pdf>
5. Khan, M. S., & Shafiur Rahman, M. (2021). *Techniques to Measure Food Safety and Quality*. Springer International Publishing, 345–381p.
6. Warner, R. D., McDonnell, C. K., Bekhit, A. E. D., Claus, J., Vaskoska, R., Sikes, A., Dunshea, F. R., & Ha, M. (2017) Systematic review of emerging and innovative technologies for meat tenderisation. *Meat Science*, 132: 72–89.
7. Zhuang, H., Savage, E. M., & Lawrence, K. (2010). Effect of 3 postmortem electrical stimulation treatments on the quality of early deboned broiler breast meat. *Poultry Science*, 89: 1737–1743.
8. Font-i-Furnols, M., & Guerrero, L. (2014). Consumer preference, behavior and perception about meat and meat products: An overview. *Meat Science*, 98(3), 361–371.
9. Kahraman, T., Bayraktaroglu, A. G., A. Vural, Issa, G., & E. Ergun. (2011). Electron microscopy of contractile bands and quality characteristics in high-voltage electrical stimulation broiler breast meat. *Poultry Science*, 90: 486–490.
10. Che, S., Wang, C., Iverson, M., Varga, C., Shai Barbut, Dorothee Bienzle, & Susta, L. (2022). Characteristics of broiler chicken breast myopathies (spaghetti meat, woody breast, white striping) in Ontario, Canada. *Poultry Science*, 101: 101747–101747.
11. Kuttappan, V. A., Hargis, B. M., & Owens, C. M. (2016). White striping and woody breast myopathies in the modern poultry industry: a review. *Poultry Science*, 95: 2724–2733.