

# Effect of Freezing Condition and Wooden Breast Severity on Cooked Chicken Quality

Caroline R. Gregg<sup>1</sup>, Dawn A. Koltes<sup>1</sup>, Rodrigo Tarté<sup>1</sup>  
<sup>1</sup>Department of Animal Science, Iowa State University, Ames, IA

## INTRODUCTION

Wooden breast (WB) is a myopathy commonly found in the pectoralis muscle of broiler chickens. It is characterized by hard, pale, and inflexible muscle tissue. WB severity is generally associated with larger and faster-growing birds<sup>1</sup>. This condition is economically detrimental for the broiler industry due to loss of consumer appeal and- in severe cases- downgrading of the meat<sup>2</sup>.

In commercial-scale meat processing plants, retail cuts are frozen at extremely cold temperatures using air blast freezers prior to storage in a conventional freezer. Air blast systems are designed to freeze products rapidly, resulting in smaller ice crystals within products. Slower freezing rate producing larger ice crystals can damage the cells within a meat product and reduce the quality<sup>3</sup>.

**This study aims to examine the combined effects of WB severity and freezing condition on the texture of chicken breast fillets.**

Normal Breast Fillet

Severe Wooden Breast Fillet



Photos courtesy of the University of Arkansas

## OBJECTIVES

- Determine if there is a correlation between severity of wooden breast and freezing condition on the instrumental texture of a chicken fillet
- Determine if the effects of wooden breast on eating quality can be altered by the freezing method

## ACKNOWLEDGEMENTS

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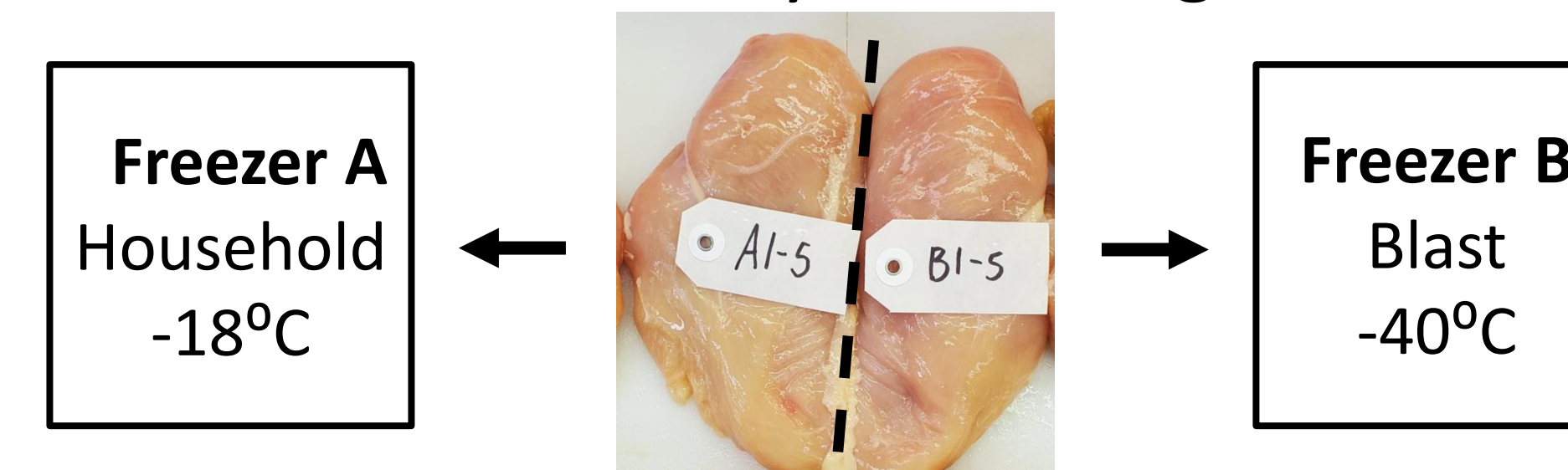
## MATERIALS AND METHODS

- Whole chicken breasts were scored for WB severity



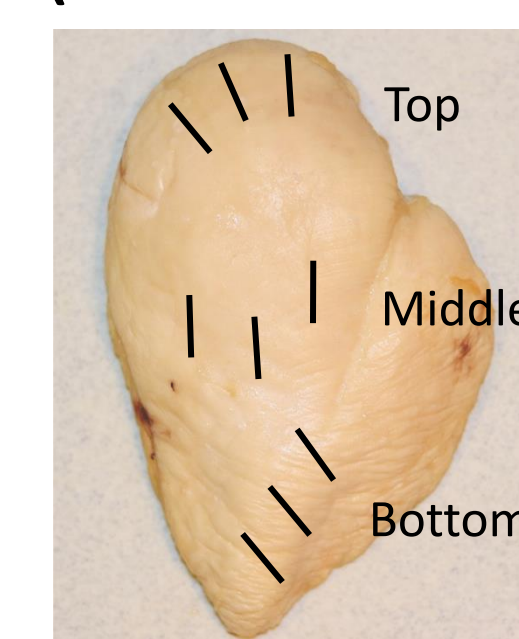
0 (Normal)	1 (Mild)	2 (Moderate)
Muscle is completely flexible with no abnormal hardness	The cranial third of the muscle is inflexible with some abnormal hardness	Hardness in the cranial portion extends further, and there is a clearly defined ridge in the caudal end of the fillet

- Six fillets of each WB severity were assigned to a freezer



- Fillets placed in the blast freezer were equilibrated for 4 h before being transferred to the household freezer for storage
- All fillets remained frozen for 4 d before further testing
- Fillets were randomized and cooked from frozen for 1.67 h in a 185°C household oven followed by a total of 3 h of cooling to room temperature

- Texture analysis was performed using a TA-45 incisor probe (Stable Micro Systems) to measure puncture force



- This diagram shows three distinct sampling regions on the ventral side of the cooked breast
- Probe was positioned perpendicular to muscle fibers
- Each region was sampled in triplicates
- Peak force and area under the curve were taken
- Data were analyzed using a generalized linear mixed model (PROC GLIMMIX) in SAS. For all variables, freezing temperature, wooden breast condition, and the interaction of freezing temperature and wooden breast condition were fit as fixed effects and replication and its interactions with fixed effects were fit as random effects. Raw fillet weights were included as a covariate for all variables except raw breast fillet weights. Significance was set at  $P < 0.05$ .

## RESULTS

**Table 1.** Effect of Freezing Temperature

Trait	Units	-18 Freezer	-40 Freezer	SEM	P-value
Raw Weight	g	343.7	341.5	8.50	0.761
Freezing Loss	%	2.10 <sup>a</sup>	1.31 <sup>b</sup>	0.04	0.005
Cook Loss	%	29.43	29.82	1.36	0.854
Top Peak	N	23.31	22.94	1.14	0.679
Middle Peak	N	19.78	19.27	0.67	0.427
Bottom Peak	N	2.97	2.95	0.03	0.462

**Table 2.** Effect of Wooden Breast Severity

Trait	Units	Normal	Mild	Moderate	SEM	P-value
Raw Weight	g	311.4	333.8	382.7	12.7	0.037
Freezing Loss	%	1.74	1.71	1.66	0.05	0.632
Cook Loss	%	27.86 <sup>a</sup>	29.59 <sup>a</sup> <sub>b</sub>	31.42 <sup>b</sup>	1.11	0.039
Top Peak	N	21.52	22.77	25.09	1.82	0.451
Middle Peak	N	19.11	19.67	19.80	1.04	0.878
Bottom Peak	N	2.94	2.97	2.97	0.05	0.862

For all variables, the interaction between WB condition and freezer were not significant ( $P > 0.327$ ).

## CONCLUSIONS

- Chicken breast puncture force is not affected by freezing conditions or WB severity
- Freezer loss is reduced with rapid freezing
- Cook loss is greater in fillets affected by WB
- Further research is needed to examine differences in texture and consumer preference in WB fillets between freezing conditions

## REFERENCES

- <sup>1</sup>Soglia, F., et al. (2016). *Poultry Science*, 95:651-659. DOI: 10.3382/ps/pev535  
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