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USE OF A NYLON-LINED, NOISE-SUPPRESSED RESTRAINT BOX FOR STUNNING CATTLE MAY PROVIDE INCREMENTAL IMPROVEMENTS IN MEAT QUALITY

Adam Fitzgerald[1*], Ciara Mc Donnell[1], Hamideh Keshavarzi[2], Alison Small[2]

[1] Agriculture and Food, Commonwealth Scientific and Industrial Research Organization (CSIRO), Coopers Plains, QLD 4108, Australia

[2] Agriculture and Food, Commonwealth Scientific and Industrial Research Organization (CSIRO), Armidale, NSW, 2350 Australia

*Corresponding author email: adam.fitzgerald@csiro.au

I. INTRODUCTION

Minimizing stress immediately pre-slaughter is essential to avoid unnecessary detrimental effects on meat quality. Loud noise preslaughter can add to the stress, hence Jarvis ANZ (Richmond, QLD Australia) have designed a restraint box for noise reduction dubbed “The Stealth Box” (SB). The design uses a nylon lining and directs noise from the air actuated door rams away from the box. SB has recently been installed in several Australian beef processing plants for assessment and validation of the effects on animal welfare and meat quality. It was hypothesized that carcasses processed using the SB would have improved meat quality attributes (reduced shear force, reduced lipid oxidation and improved water holding capacity) specifically due to a reduced rate of pH decline as compared to carcasses processed using conventional restraint boxes at the processing plant. This paper reports on the findings related to SB and its impact on objective meat quality attributes.

II. MATERIALS AND METHODS

Animals were processed at three processing sites according to Table 1. pH declines were measured on all carcasses as per Hopkins et al [1]. Objective meat quality parameters were assessed on ten vacuum-packaged *longissimus lumborum* (LL) and *semitendinosus* (ST) muscles, which were collected from carcasses (dentition 0 – 4 tooth, hot standard carcass weight 359.4 – 445.8 kg) approximately 24 h after slaughter from processor C and aged for 14 days at -0.5 °C. Modified Warner-Bratzler shear force (WBSF), cook loss (CL) and pH were measured as per McDonnell et al [2]. Thiobarbituric acid reactive substances (TBARs) and objective color measurements were measured as per Frank et al [3]. Expressible moisture (EM) was measured by centrifugation [4] by spinning the samples at 5000 g for 15 minutes at 18 °C. The mean results were analyzed by t-test, using GraphPad Prism version 10.4.1 for Windows (GraphPad Software, Boston, Massachusetts USA, www.graphpad.com). P-values < 0.05 were considered to be significant.

Table 1 – Experimental design for the assessment of Stealth-Box on pH decline and meat quality

Processor	Pre-Stealth Box Installation[a]	Post-Stealth Box Installation[b]
A	20	20
B	60	60
C	20^	20^

[a] number of cattle processed pre-Stealth-Box installation, using a conventional restraint box
[b] number of cattle processed post-Stealth-Box installation, using the Stealth-Box
^ 10 animals were assessed for objective meat quality

III. RESULTS AND DISCUSSION

Figure 1 shows the mean pH relative to temperature decline data from processors A, B and C. pH decline data indicated that carcasses pass through pH 6.0 during the optimal temperature window (12-30°C) [5], both pre- and post- SB installation, however, the three data sets revealed distinctly different pH decline outcomes. In two data sets, A and B, following SB installation, carcass pH appeared to fall more rapidly relative to temperature than post-SB installation while the decline was slower for processor C. The more rapid decline may be due to electrical inputs such as stimulation or other underlying animal or processing differences that have not been recorded and

considered. The slower pH declines relative to temperature at processor C may result from animals being calmer and less agitated at the restraint box, however, further research is required to investigate this.

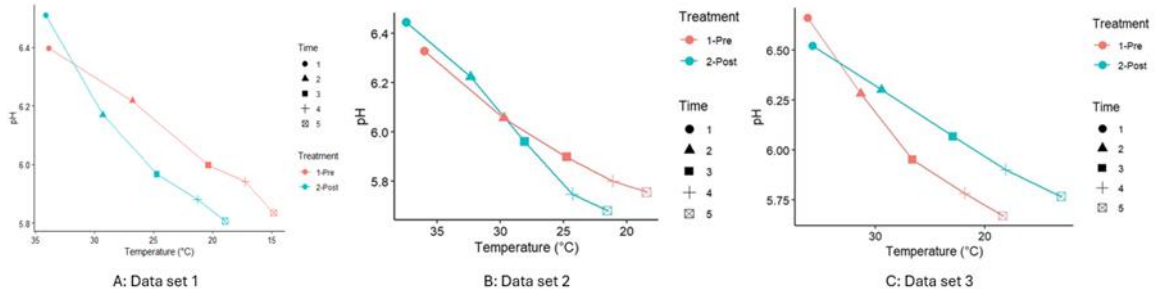


Figure 1. Mean pH relative to temperature declines from three processors A, B and C, pre- and post- Stealth Box installation

As can be seen in Table 2, WBSF was lower in both LL and ST muscles which had been SB-treated however, only results for ST were significant. pH was significantly lower in SB-treated LL but was not significant in the ST. Results for EM were not significant in the LL samples but there was a significant decrease of EM in the ST. No differences in objective color and CL were found in this study for either muscle pre- or post- SB installation. For both the LL and ST there was a significant increase in TBARs values post- SB installation. While the increases were significant, values for both muscles are well below reported consumer sensory thresholds of ≥ 2 mg/kg [6].

Table 2 – Meat quality results, pre- and post- stealth box installation for the *longissimus lumborum* and *semitendinosus*. Mean values are reported ± standard deviation

	Longissimus Lumborum			Semitendinosus		
Parameter	**Pre-install**	**Post-install**	***p value***	**Pre-install**	**Post-install**	***p value***
WBSF (N)	59.95 ± 13.14	54.52 ±1 0.34	ns	51.64 ± 4.18	46.42 ± 4.88	0.0192
pH	5.57 ± 0.05	5.48 ± .03	0.0003	5.48 ± 0.03	5.46 ± 0.02	ns
Cook loss (%)	27.3 ± 1.6	28.3 ± 2.1	ns	30.3 ± 1.3	29.3 ± 1.9	ns
EM (%)	16.97 ± 1.17	16.86 ± 1.58	ns	17.56 ± 1.18	15.64 ± 0.90	0.0007
TBARs MDA eqv. (mg/kg)	0.0394 ± 0.027	0.105 ± 0.024	<0.0001	0.062 ± 0.017	0.100 ± 0.020	0.0002

IV. CONCLUSION

Incremental meat quality benefits may be achieved through the use of the Stealth Box but further research will be needed with a larger number of animals to validate these findings.

ACKNOWLEDGEMENTS

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