OPTIMISING PH / TEMPERATURE DECLINE IMPLEMENTATON OF SMART STIMULATION

G. Williamson[1], J. Birnie[1], R. Law[1], S. Leitch[1], D. Devlin[2] and L. Farmer[2]

[1] Dunbia, Dungannon, Co. Tyrone, Northern Ireland, BT701NJ.

[2] AFBI, 18A Newforge Lane, Belfast, Co. Antrim, Northern Ireland, BT95PX.

“You are what you eat”

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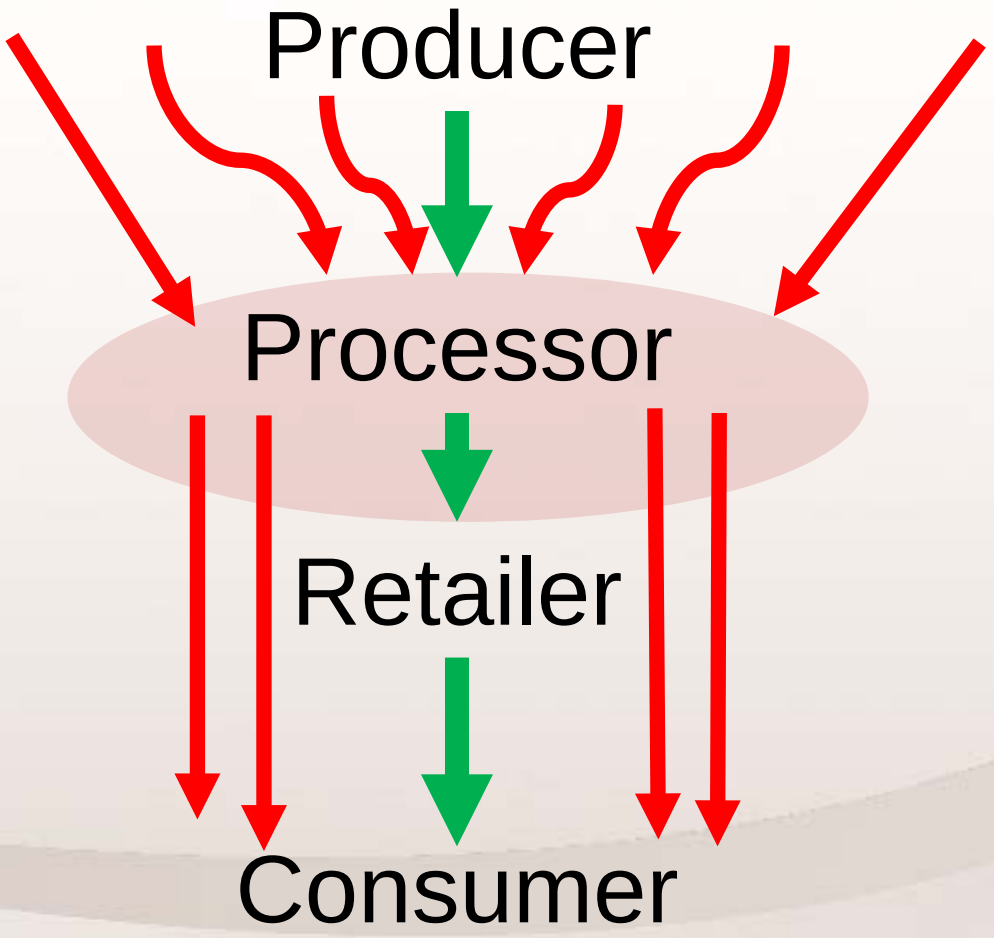
- Consumer demands consistency..
- **“We are what we process”?**

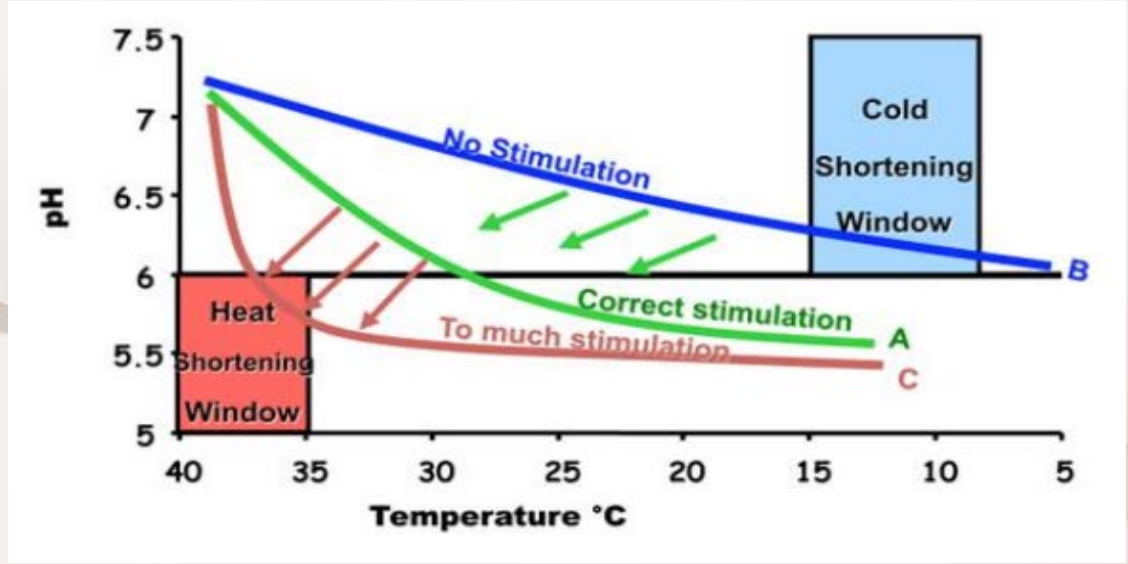


Background

Muscle → **Meat**

Glycogen → Anaerobic → Lactic Acid

- The two main determinants of meat quality post slaughter are the rate of pH fall and the rate of muscle chilling.
- These two variables are not independent as temperature will affect pH fall. However, pH fall can be manipulated independently by the level of electrical inputs applied to the carcass



Objectives

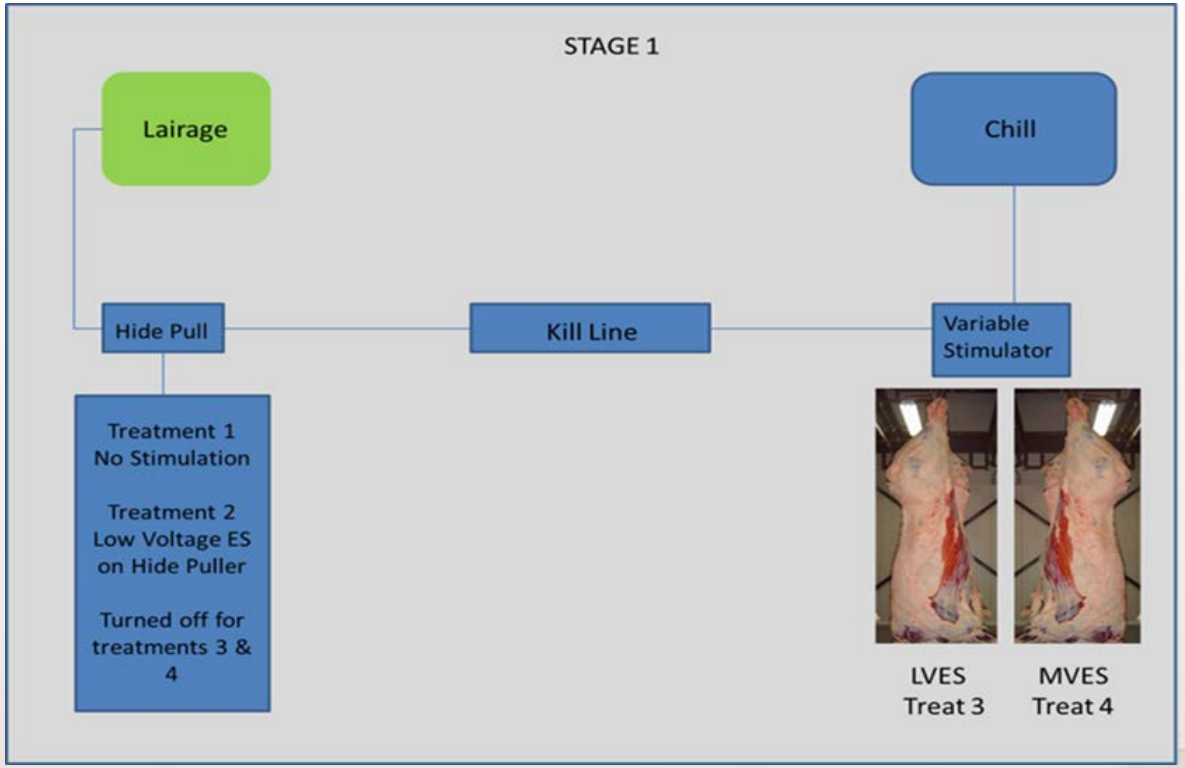
- Evaluate four different types of electrical stimulation on the variation in carcass quality; defined by ultimate pH, of animals post a 48 hour chilling period.
    - Establish the effect of electrical stimulation on:
        - Rate of pH decline,
            - Effect on pH / temperature decline
        - Ultimate pH
        - Drip and cooking loss
        - Meat tenderness
- Evaluate the correlation between Warner-Bratzler Shear Force and MIRINZ tenderometer in evaluating meat tenderness.

Experimental Design

- 120 animals were used in the study.

❖ **Four Treatments**

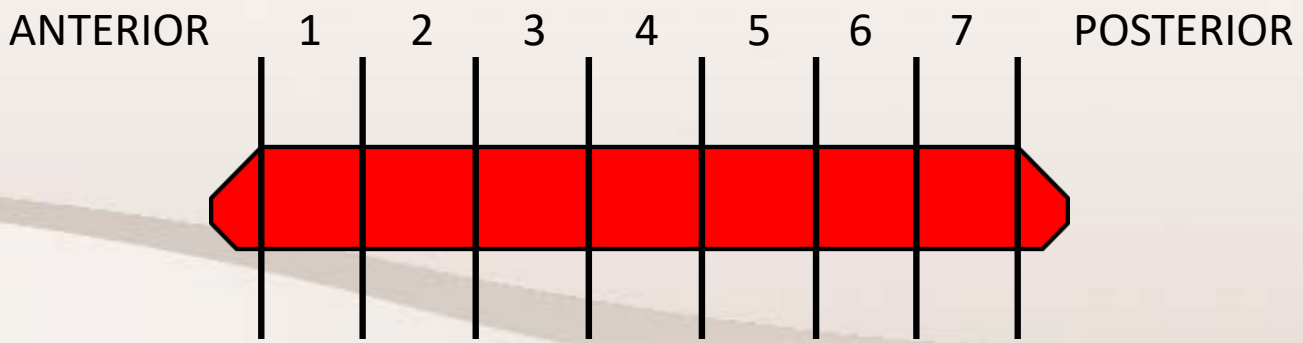
1. No electrical stimulation (negative control)
2. Low voltage electrical stimulation at the hide puller
3. No stimulation at hide puller and low voltage electrical stimulation at end of line
4. No stimulation at hide puller and medium voltage electrical stimulation at end of line



Experimental Design

❖ **Chill Settings**

- Carcasses entering the chill were not trimmed after being weighed.
- All chills were on a pre-setting; 10^{O}C for 10 hours followed by 0^{O}C for a further 38 hours.
- Post chilling, all sides were de-boned and loins were divided into 7 segments
- Once samples were aged for the designated time, they were placed in a deep freeze until further processing.



Measurements

❖ Pre-slaughter
- Nutrition, finishing group size and housing type.

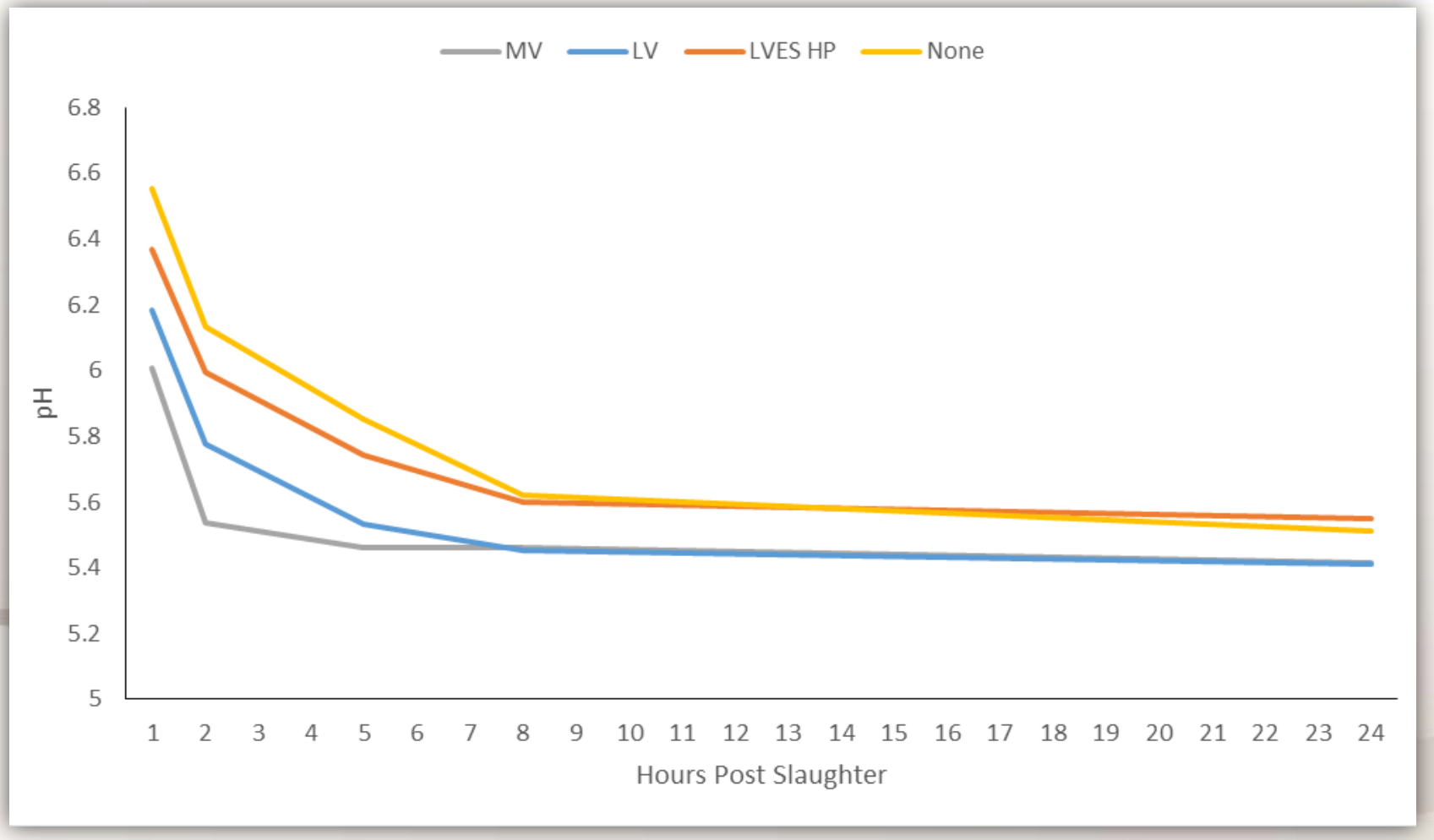
❖ Post slaughter
- Carcass weight, carcass grade (conformation score & fat classification), sex, age, breed and time of kill.

- pH and temperature measurements were collected at 1, 2, 5, 8 and 24 hours after slaughter.
- Steaks were thawed at 2-5 ^{O}C until internal temperature reached 2-5 ^{O}C.
- Drip loss before cooking and cooking loss was measured.
- Once samples were cooked they were then analysed for tenderness using Warner-Bratzler Shear Force and MIRINZ Tenderometer.

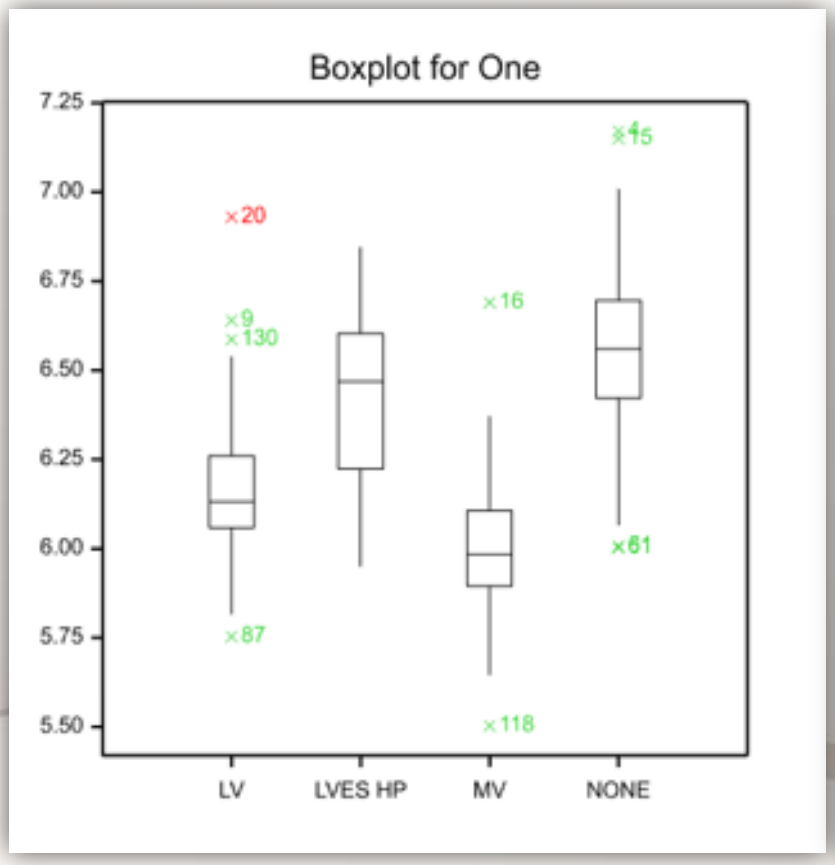
Statistical Analysis

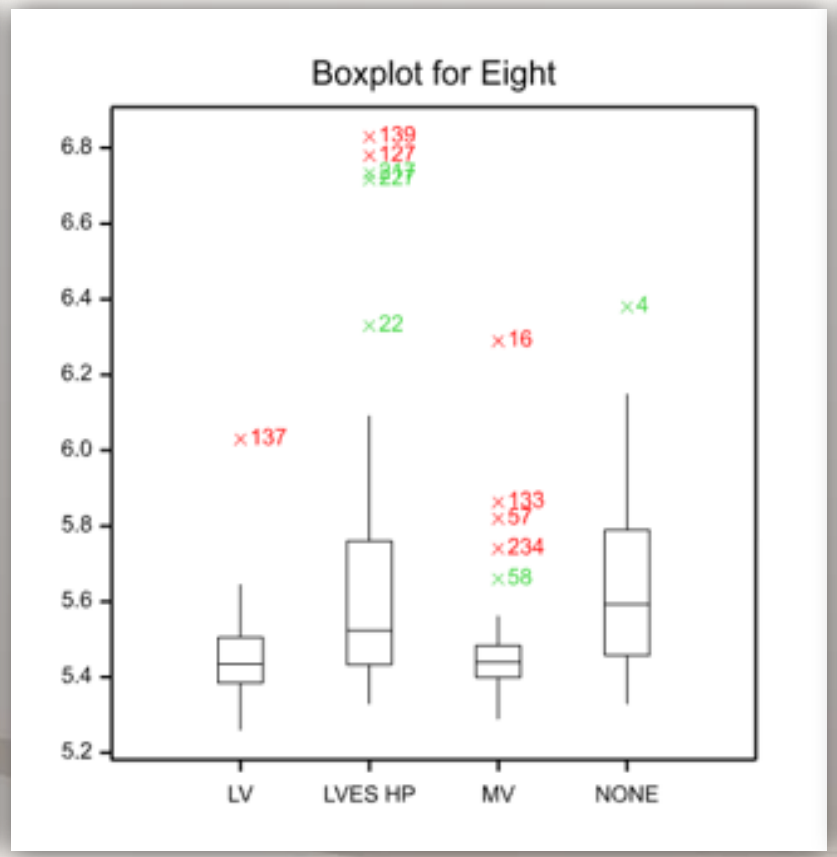
- Data were analysed by linear mixed models using the Residual Maximum Likelihood (REML) procedure in GenStat.
- The model fitted fixed effects; ageing period, loin segment and Treatment.
- Random factors included animal age, carcass weight, grade, run, carcass side and kill date.
- All interactions were included within the model.
- Regression analysis was also conducted to evaluate the correlation between tenderness assessment methods.

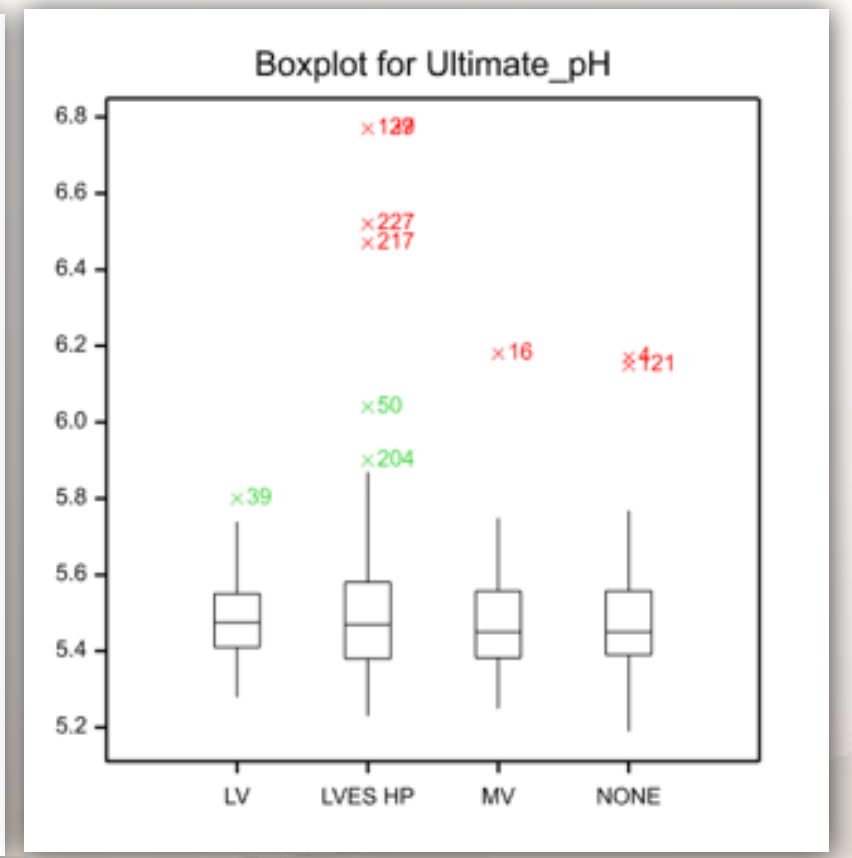
pH Decline


MV
LV
LVES HP
None
6.8
6.6
6.4
6.2
6
5.8
5.6
5.4
5.2
5
pH
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Hours Post Slaughter

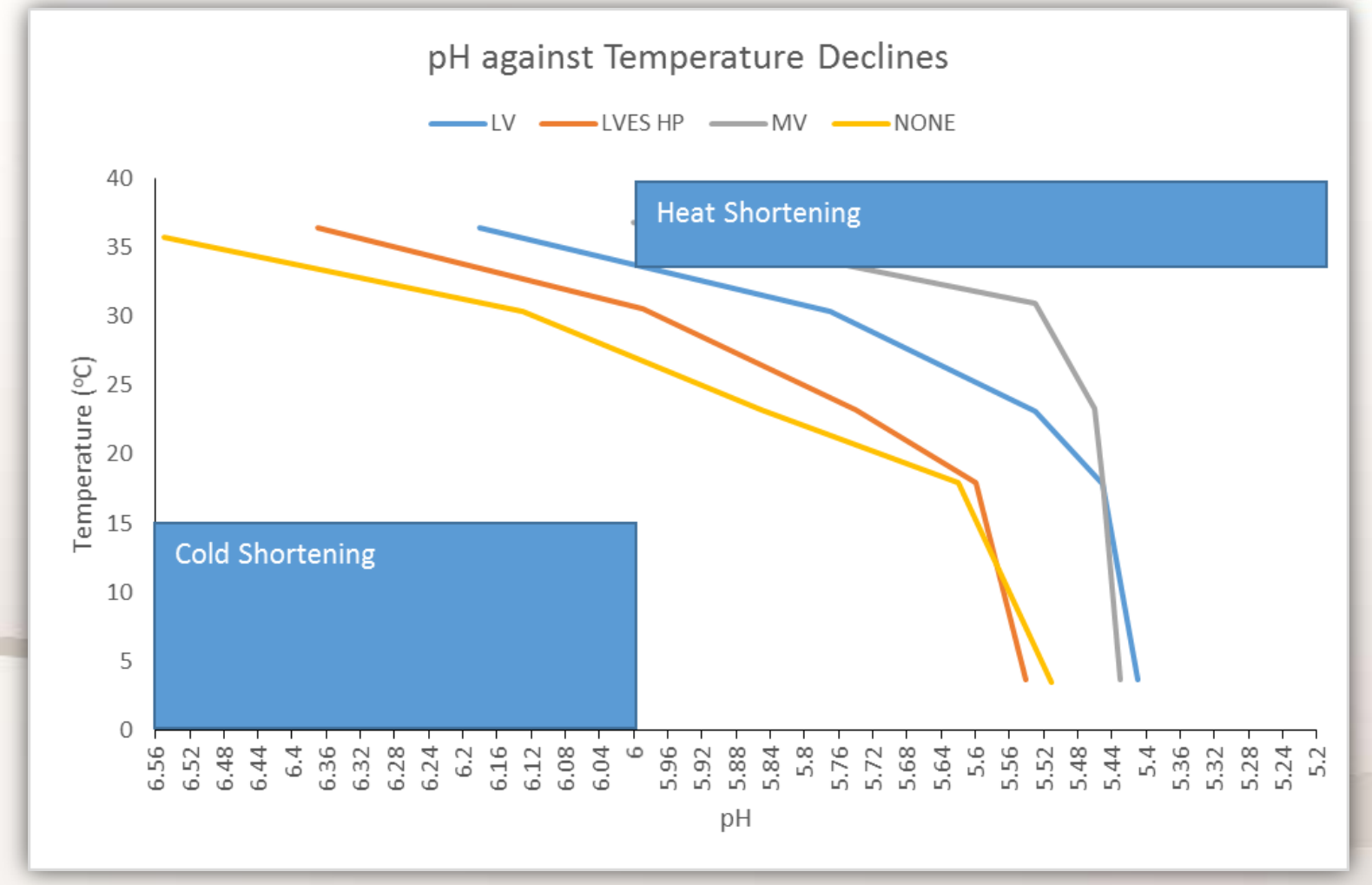
pH Decline


Boxplot for One
7.25
7.00
6.75
6.50
6.25
6.00
5.75
5.50
×20
×9
×130
×87
×16
×118
×15
×61
LV
LVES HP
MV
NONE

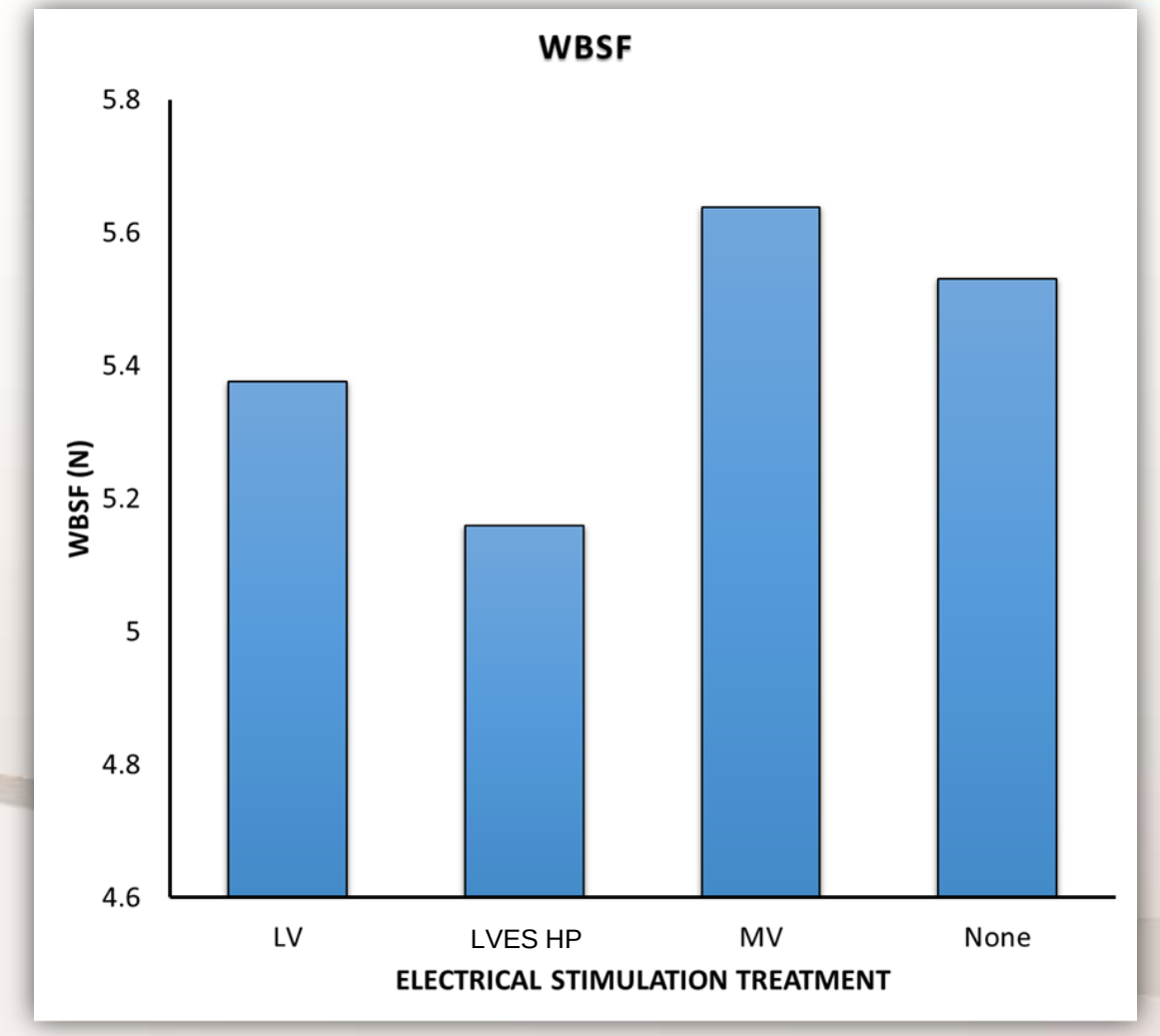

Boxplot for Eight
6.8
6.6
6.4
6.2
6.0
5.8
5.6
5.4
5.2
×139
×127
×137
×22
×16
×4
×133
×57
×234
×58
LV
LVES HP
MV
NONE


Boxplot for Ultimate_pH
6.8
6.6
6.4
6.2
6.0
5.8
5.6
5.4
5.2
×227
×217
×16
×50
×204
×39
LV
LVES HP
MV
NONE

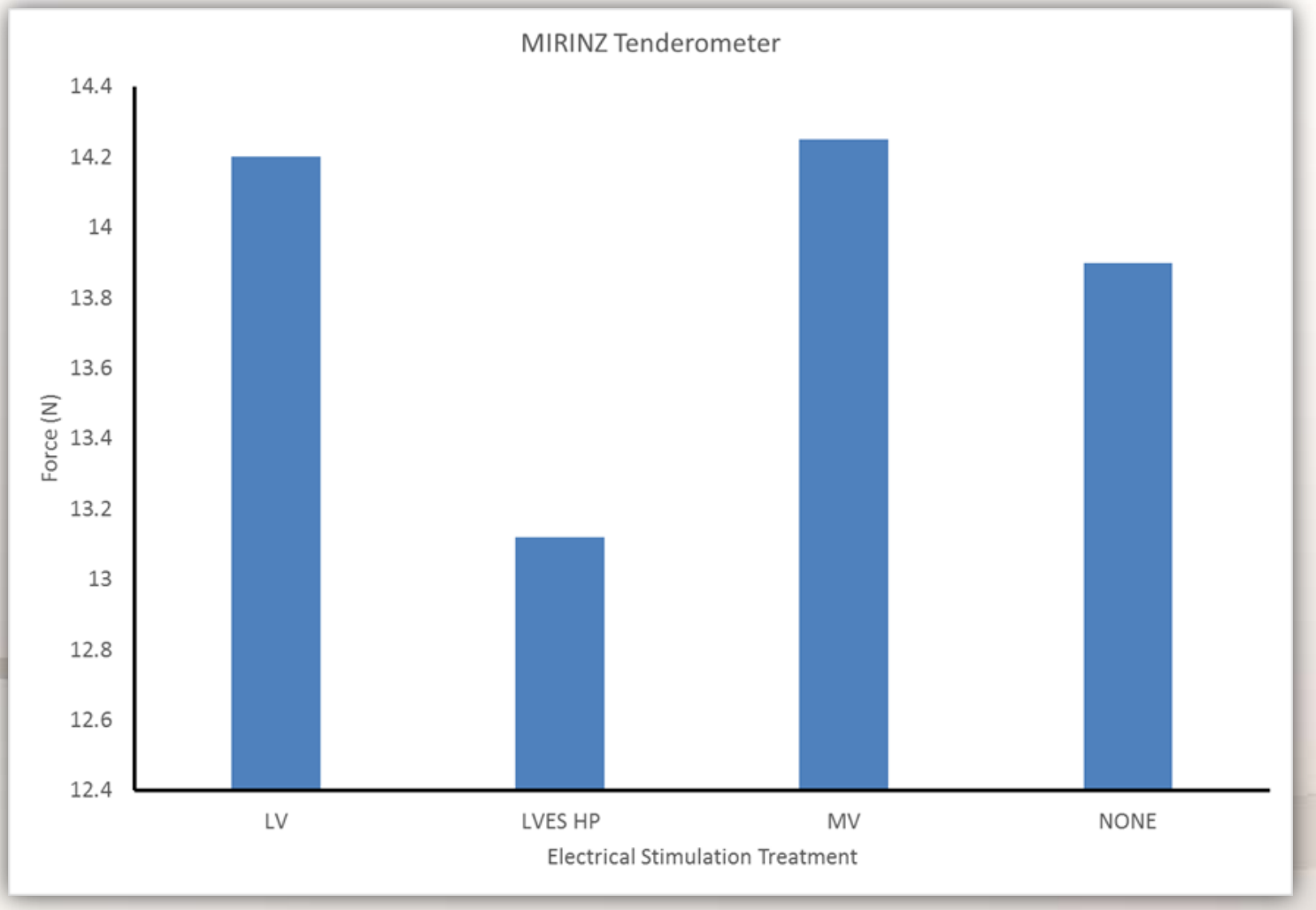
pH against Temperature Decline



WBSF Results



MIRINZ Results



Thaw & Cooking Loss

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Electrical Stimulation Treatment	Cooking Loss %	Thaw Loss %
LV	28.70	4.73
LVES HP	27.65	4.36
MV	28.91	4.78
NONE	28.48	4.74

Drip & Thaw Loss- P= 0.086

Conclusions

- Potential for improved stimulation methods to be introduced in the future
- Electrical stimulation has been shown to improve the consistency of carcasses leaving the chill
- Tenderness measurements reflected the on-set of heat shortening in the end of line stimulated carcasses.
- Tenderometer vs WBSF analysis- strong correlation between the two instruments.
- Cooking and drip loss also increased with end of line stimulation

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Thank you for your attention
Any Questions?