OPTIMISING THE EZ-DRIP METHOD FOR AGED BEEF DRIP LOSS DETERMINATION

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I. INTRODUCTION

Industry stakeholders consider the drip loss (DL) of beef as important because it underpins product yield, shelf-appeal and organoleptic traits, such as juiciness, tenderness and consumer liking. Meat scientists are aware of this association and have applied several different approaches to its quantification, for example the bag method, where 100 g of meat is suspended in a bag and weight loss over the storage period is calculated [1] or the filter paper method, wherein filter paper is placed on the surface of freshly cut meat and the amount of fluid loss visually scored [2]. An alternative method for DL determination is the EZ-DripLoss method. This is a variant of the bag method with samples instead placed within a specially designed container, eliminating the labour intensity required in preparation of the bag method and the method also requires less sample. As a result, the EZ-DripLoss method can be considered a simple and repeatable option.

The usefulness of the EZ-DripLoss method has predominantly been confirmed with pork [3], but the transferability of their outcomes to beef have not been confirmed. For instance, Christensen et al [4] defines a 24 h holding period as sufficient to determine pork DL; whereas Rasmussen et al [5] instead suggests 48 h as the better option. This divergence prompts the necessity to confirm the holding duration that best reflects DL in beef, and consequently we aim to fulfil this paucity using aged beef.

II. MATERIALS AND METHODS

Experimental samples were sourced from beef loins (*n* = 40; M. *longissimus lumborum;* LL*)* randomly collected from the boning room of an Australian abattoir. LL were divided into 8 equal portions, vacuum-packaged and assigned to 1 of 72 unique temperature time combinations (TTC; *n* = 4 per TTC). Temperatures (A: 3 ^{o}C, B: 5 ^{o}C, C: 7 ^{o}C, Control: 1 ^{o}C) remained constant over age class (T1: 4 d, T2: 6 d, T3: 8 d, T4: 10 d, T5: 12 d, and Control: 14 d), and TTCs were constrained so that there was, at most, one temperature change during the ageing period. No sampling occurred at T1. Temperatures were applied using different temperature control units (TCU), with samples being moved between TCU as required. Control TTCs (*n* = 32) were applied within duplicate TCU, and held at 1.0 ^{o}C for 14 d. At the completion of assigned TTC, cylindrical cores of approximately 2.5 cm thick and 2.5 cm diameter were taken from the aged sample using a cork borer, weighed and then placed in EZ-DripLoss tubes. These were placed under refrigeration (2-4 °C) and their weights were recorded at 24 h, 48 h and 72 h (holding time). DL was calculated as the percentage weight difference from initial weight at these holding times. Parallel samples were freeze dried at – 50 ^{o}C (ScanVac CoolSafe^{TM}, KaboGene ApS., Lynge, DEN) so that total moisture content could be calculated as a percentage weight change. Data were analysed using a linear mixed model fitted with the fixed effects of TTC and random effects of repeat and loin, and their interactions with TTC. TTC effects (73 DF, including controls) were decomposed into the following contrasts: control vs treatment (1 DF); storage time (3 DF); control TCU (1 DF) and temperatures within each storage time (8, 14, 20 and 26 DF respectively). Level of significance was set at $P < 0.05$.

III. RESULTS AND DISCUSSION

No significant effects of TTC were observed on moisture content across age class. It is generally hypothesised that water-holding capacity increases with *post-mortem* storage [6,7], however the results from this study disagree with this hyopthesis with samples exhibiting consistent moisture content regardless of ageing period. The lack of variation may potentially be due to loss of moisture during the ageing period; as the samples were vacuum packaged, any water capable of being lost as drip might have already been released from the muscle structure during ageing.

Furthermore, there were no significant effects of TTC on DL, but a significant decrease in DL across age class was observed (Fig 1), with DL increasing in the controls. This increase between T5 and controls may be due to lower temperatures being used to hold controls, as observed by den Hertog-Meischke [8]. Farouk [6] suggested a “sponge effect” to explain the apparent increase in WHC over the course of ageing and storage of meat, wherein the cytoskeletal breakdown during ageing disrupts the channels through which fluid loss occurs, thus supporting the trend shown of increased WHC as both ageing period and measurement interval increased.

Independently, the influence of holding time proved significant (P = 0.027). DL exhibited a consistent trend as ageing time increased, with a clearer distinction in age categories at 72 h, thus inferring that 72 h after ageing is the ideal time to measure DL for beef.

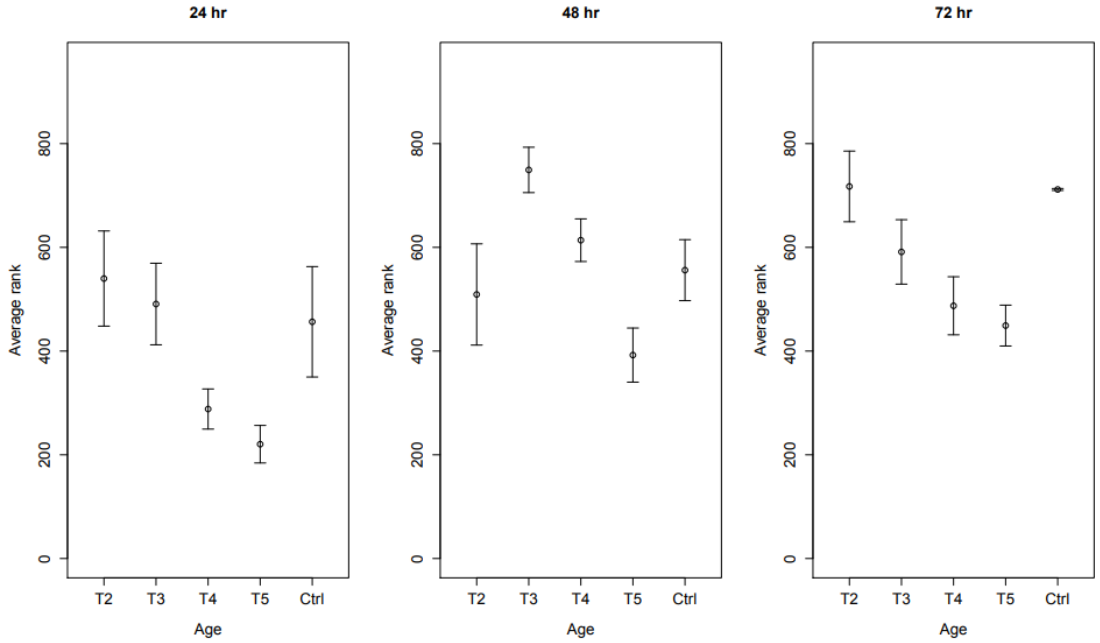

Figure 1: Summary of predicted rank drip means from rank analysis, grouped by age class. Shown is the average of the TTC means for each age class, with error bars ± 2 SE

IV. CONCLUSION

Based on these results, we suggest a holding time of 72 h as ‘best practice’ to determine DL when using the EZ-DripLoss method for beef – but acknowledge the unique TTC applied to the samples and their potential implications.

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