FAT PREDICTION OF LAMB USING DUAL ENERGY X-RAY ABSORPTIOMETRY IS PRECISE THROUGH CHANGING PROCESSING FACTORS

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I. INTRODUCTION

Dual Energy X-ray Absorptiometry (DEXA) has demonstrated a high level of precision when predicting fat composition of lamb carcasses (R^2=0.88, RMSE=1.46) [1] when used at chain speed in an abattoir. During postmortem chilling, carcasses lose up to 2% of their hot weight over a period of 48 hours [2], which can be offset by spray-chilling. Despite this, research by Gardner *et al.* [1] has shown that spray chilling, time postmortem and carcass temperature have no impact on the precision of DEXA for predicting computed tomography carcass fat % (CT Fat %). DEXA hardware has since been modified to increase its sensitivity, hence the impact of processing factors required re-testing. Therefore, we hypothesised that the precision of DEXA for predicting CT Fat % in lambs will not be influenced by time post-slaughter, carcass temperature or spray chilling.

II. MATERIALS AND METHODS

Lamb carcasses (n=30) randomly selected across a diverse weight range were scanned using an online prototype DEXA, installed at an abattoir in Bordertown, SA, to predict carcass fat %, with half (n=15) spray-chilled, and half (n=15) chilled normally. These carcasses were scanned repeatedly at 1, 12, 24, 36, 48 and 72 hours post-slaughter. 12 hours after the final DEXA scan, the carcasses were scanned using computed tomography to determine CT Fat %. General linear models were trained within each time group predicting carcass CT Fat % using the DEXA output to establish a predicted CT Fat %. This same DEXA value was then used to predict actual CT Fat % in a linear mixed effects model with spray chill status as a fixed effect, and time of scan post-slaughter, and carcass temperature as covariates.

III. RESULTS AND DISCUSSION

Across the 6 time groups, the precision for predicting CT Fat % was similar (Figure 1), with an average RMSE and R-square value of 1.27 and 0.94 (Table 1). There was no effect of carcass temperature within any of the scanning times, nor was there any effect of spray chilling (Figure 1).

Table 1. R-square and Root Mean Square of the Error (RMSE) of each fitted time group

Time group	R-square	RMSE
1 hour	0.94	1.28
12 hour	0.92	1.41
24 hour	0.94	1.25
36 hour	0.95	1.17
48 hour	0.93	1.31
72 hour	0.94	1.20

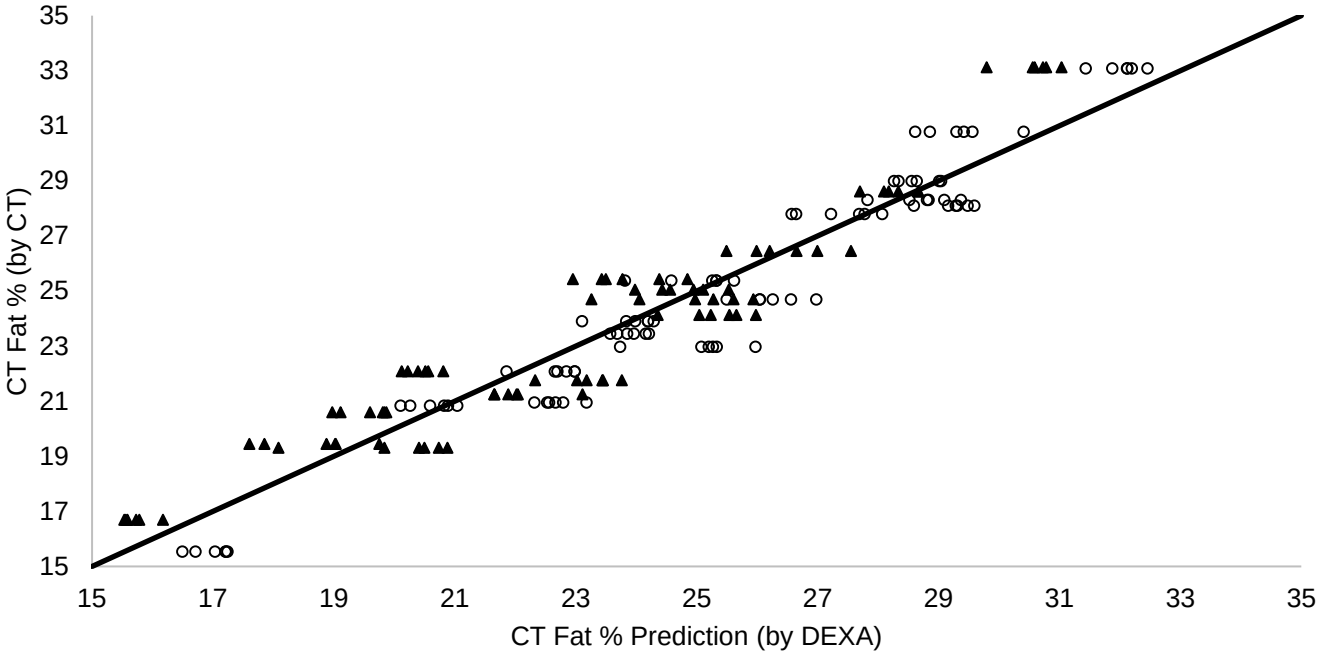

Figure 1. CT Fat % vs. Predicted CT Fat % from each time group, with individual predictions as spray-chilled (O) and not spray-chilled (▲)

IV. CONCLUSION

These results support our hypothesis that various processing factors, including time post-slaughter, carcass temperature and spray-chilling, do not significantly alter the precision of DEXA in predicting the CT Fat %. Further research, using calibrated validation data from the DEXA fat prediction algorithm within the prototype, will need to be conducted to assess the accuracy of the time groups. However, these current results will provide confidence for processors and producers that they will receive precise data for their lamb carcasses; regardless of when they were scanned, or how they were chilled.

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