RELATIONSHIP BETWEEN OBJECTIVE MEAT QUALITY MEASURES AND SENSORY TRAITS IN ALPACA (*VICUGNA PACOS*) MEAT

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Currently it is unknown if meat quality acceptability thresholds can be established to help provide an indication of consumer acceptability of alpaca meat. A total of 50 *M. longissimus thoracis et lumborum* samples were taken from six treatments (three age groups (18, 24 and 36 months) and two genders (castrated males and females)). Each sample was tested for meat quality parameters including pH, shear force, cooking loss, intramuscular fat content and consumer sensory evaluation. After running a series of regressions on the data it was determined that objective meat quality measures and animal age were not strongly related to sensory traits and only a low level of accuracy was obtained (< 10 %). Therefore, based on the results reported here it is apparent that it is not feasible to reliably use objective meat quality threshold parameters to indicate whether alpaca meat will be acceptable to consumers based on the current sample.

Key Words –tenderness, eating quality, camelid.

I. INTRODUCTION

Recently it was reported that if electrical stimulation (ES) was applied to alpaca carcases pre-rigor eating quality, as judged by consumers, was significantly improved [1]. To further improve the industry with the adoption of new technology it would be helpful to establish the relationship between objective measures of meat quality and sensory traits so that changes in the latter could be assessed indirectly without going to the expense of conducting consumer sensory studies. This approach has been applied in the lamb industry to provide thresholds for acceptability based on objective measures of meat quality [2]. Thus, using data from a previous study [1] the relationship between a number of meat quality measures and sensory traits was investigated.

II. MATERIALS AND METHODS

A total of 50 huacaya alpacas were randomly sampled from six treatment groups comprising three ages (18, 24, 36 months at slaughter) and two genders (females and castrated males). Further detail on experimental design, grazing conditions and processing is provided elsewhere [3]. The animals were slaughtered in two groups (n = 25/group), two weeks apart. After slaughter each carcass was dressed and then split in half down the vertebral column, with the right side of each carcass being ES prior to entering the chillers. After chilling for 24 h the pH (pH24) of the *m. longissimus thoracis et lumborum* (LL) was measured. A cranial section of the LL (~ 80 g) was aged for 10 days and then prepared into a SF block (~ 65 g) and frozen (- 20 ˚C) until analysis. Cooking loss was determined from the SF block using methods for CL and SF described elsewhere [1]. From the caudal section of the LL a 16 cm sample was taken for sensory analysis and an intramuscular fat (IMF) sample was taken from the remaining muscle and frozen (- 20 ˚C) until analysis. The sensory samples were vacuum packed and chilled (average temperature 2.6 ˚C) for 10 days. After ageing, the sensory samples were sliced into five 1.5 cm thick steaks and frozen (- 20 ˚C) until sensory analysis.

The sensory analysis was conducted using the method described by [4] and included a total of 740 grill samples tested by 96 untrained consumer panelists. The sample allocation was based on having each LL tested by ten different consumers, and each consumer testing samples from various treatments. Consumers had to evaluate 5 subjective traits (tenderness, juiciness, flavour, overall liking and satisfaction) that are commonly associated with consumer acceptability and eating quality [4]. Each trait had a separate 100 mm line and was anchored with the following words; tenderness, not tender to very tender; juiciness, not juicy to very juicy; flavour, dislike extremely to like extremely; overall liking, dislike extremely and like extremely. For the eating quality rating, consumers had to tick one of four boxes; unsatisfactory, good every day, better than every day, premium product. For the statistical analysis, the four sensory traits (tenderness, juiciness, flavour, overall liking) were individually regressed against the meat quality traits, SF, CL, IMF, pH24 and animal age using Genstat (18th ed, VSN International, 2016). The relationship between overall liking and the overall rating score was also examined using regression.

III. RESULTS AND DISCUSSION

The data for the objective measures and the sensory traits has been summarised in Table 1. There was a wide range in SF and sensory scores, but a low range for IMF. Overall the objective meat quality measures and age of the animal were not strongly related to sensory traits and only a low level of accuracy was obtained. Of the traits tenderness was predicted by SF as expected with an R^2 of 0.1 and an r.s.d. of 22.3, with a coefficient of -0.43 ± 0.05. There was a marginal improvement if animal age was included in the model. No other traits were related to sensory tenderness. Of the other 3 sensory traits only SF explained variance in those traits, but with levels of accuracy below 10 %.

Table 1 Mean (± s.d) and range for meat and eating quality traits for the *m. longissimus et lumborum*

Traits	Mean ± s.d	Range
Shear force (N)	68.9 ± 18.6	38.3-100.8
Cooking loss (%)	23.3 ± 3.24	11.5-32.7
pH24	5.84 ± 0.13	5.52-6.31
IMF (%)	0.70 ± 0.36	0.22-2.62
Tenderness score	60.3 ± 23.5	2.5-100
Juiciness score	64.2 ± 21.5	4.0-100
Flavour liking score	61.7 ± 21.7	3.0-100
Overall liking score	61.6 ± 21.8	3.0-100

The overall rating score (1-4) was related to the overall liking score (0-100) by a model with an R^2 of 0.65 and an r.s.d. of 12.8. The predicted overall liking score for "good every day" (3 star) was 59, whereas for "better than every day" (4 star) the score was 79. From these results it is clear that there is not a very strong relationship between objectively measured traits and sensory traits for alpaca meat. A previous study in lamb has also shown that the relationship is not strong [2], but is better than in the current study. It must be noted in the current analysis that all sensory data was used in the modelling, but not the average scores for each trait (based on 10 people) for each sample as was used in the studies on lamb.

This would have reduced the number of data points, but at the same time may have reduced the variance for each sample and thus improved the relationship between traits. The low levels of IMF in alpaca meat likely explains why there was no impact on sensory scores, but there was a reduction as animal age increased as previously reported [1]. Although many meat quality tests can be measured objectively in a laboratory, the overall consumption and eating experience of a product can only be tested by sensory assessment. This validates if the differences observed in the laboratory are significant enough to be detected by consumers. Based on the results reported here it is apparent that it is not feasible to reliably use a SF threshold to indicate whether alpaca meat will be acceptable to consumers.

IV. CONCLUSION

Objective meat quality traits only explained a small proportion of consumer sensory evaluations for alpaca meat in this study. As such, objective meat quality threshold values could not be used to reliably predict consumer satisfaction, based on this data set. This is primarily due to the large spread in consumer sensory evaluation scores, as the samples were assessed by 10 different consumers and all data points were included to account for consumer variation, in combination with the effect that ES had on objective meat quality measurements. Further work is required to determine whether, with more data, better predictions can be derived as the cost saving to evaluate the significance of various treatments on eating quality would be significant if indirect objective measures could be used.

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