

# INFLUENCE OF IMMUNOCASTRATION ON CUTTING YIELD, FATNESS AND MEAT QUALITY OF LAMB CARCASSES

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**Abstract** –This study determined the influence of varying intervals between second vaccination and slaughter of immunocastrated rams on carcass cutting yield and meat quality. Two booster vaccination intervals were investigated, namely six (IC6) and four (IC4) weeks prior to a fixed slaughter age. Burdizzo-lambs (B) were castrated at the start of the trial, and an intact control group (R) was maintained. No differences were found for cutting yield; however, all castration treatments resulted in increased backfat thickness. Both methods of castration decreased CIE a\* colour values, with no effect observed for the other meat quality parameters. Thus, immunocastration of rams can be used as a means to manipulate carcass fatness with no influence on carcass weight, cutting yield and meat quality.

**Key Words** – Castration, colour, rams

## I. INTRODUCTION

In lamb meat production systems, rams are castrated to aid in fattening during finishing, and to assist with the management of sexual and aggressive behaviour. Typically, bloodless castration by means of rubber rings is used; however, this may result in infection and chronic pain. The Burdizzo technique leads to acute stress [1], and low success rates. Immunocastration presents a potential means to prevent castration-induced pain and the accompanying loss in production. However, no commercial recommendations are available in terms of vaccination protocol for rams. When various intervals between first and second vaccination (2, 3 and 4 weeks) were investigated, it was reported that these intervals did not influence the efficacy of Improvac® in rams, with no negative effects on growth and slaughter performance [2]. However, the interval between second vaccination and slaughter could potentially influence carcass characteristics and meat quality traits. The objective of this study was therefore to determine the effect of the interval between second vaccination and slaughter on the cutting yield, fatness and meat quality of immunocastrated ram lambs, compared to that of both physically castrated and intact males.

## II. MATERIALS AND METHODS

Ethical clearance was obtained from the Research Ethics Committee: Animal Care and Use of Stellenbosch University (SU-ACUD15-00073). Forty Dohne Merino ram lambs were stratified according to initial weight ( $45.4 \pm 3.68$  kg), and randomly allocated to four treatments, with 10 animals per treatment group. Immunocastrated rams received two doses of 2mL Improvac® per ram, administered two weeks apart, with the last vaccination being either six (IC6) or four (IC4) weeks prior to slaughter. The Burdizzo castration treatment (B) involved the castration of the lambs at the beginning of the trial, using a Burdizzo clamp after Metacam® was administered. The control treatment rams were kept intact (R). The duration of the growth trail was 57 days, after which all animals were slaughtered. Carcasses were processed into commercial cuts 24 hours *post mortem*, which were weighed and expressed as a percentage of the cold carcass weight. The last three thoracic-ribs-section was removed and used to determine the loin eye cross-sectional area and backfat thickness using Image Processing and Analysis in Java. The *Longissimus thoracis* (LT) section was removed from the three-rib-cut and used for meat quality (Honikel) and cut surface colour analysis (Color-guide 45°/0° colorimeter, BYK-Gardner GmbH, Gerestried, Germany) following a 45 minute blooming period. Statistical analysis was performed using one-way analysis of variance and Fisher's LSD was the chosen *post-hoc* test (STATISTICA 13.2, StatSoft Inc.). Significant differences were reported at a significance level of 5 %.

## III. RESULTS AND DISCUSSION

Treatment did not influence average slaughter live weight ( $53.7 \pm 0.76$  kg), carcass weight ( $22.7 \pm 0.38$  kg), hindquarter ( $22.7 \pm 0.38$  %), hindleg ( $5.8 \pm 0.06$  %), shoulder ( $28.2 \pm 0.19$  %), foreleg ( $4.7 \pm 0.07$  %), back ( $18.0 \pm 0.20$  %), rib ( $8.2 \pm 0.07$  %) and average neck percentages ( $5.2 \pm 0.09$  %), which is in accordance with previous

research [4]. The B treatment had the thickest ( $P < 0.001$ ) backfat depth, with the leanest values reported for R (Table 1).

**Table 1.** The influence of castration treatment on the mean backfat thickness and CIE colour parameters of carcasses of ram lambs

Parameter	Treatment Groups					
	Burdizzo	IC6	IC4	Rams	SEM	P-value
LT muscle:						
<i>Backfat thickness (mm)</i>	4.3 <sup>a</sup>	3.2 <sup>b</sup>	3.3 <sup>ab</sup>	2.1 <sup>c</sup>	0.33	< 0.001
LT CIE Lab Colour:						
<i>L* value</i>	39.6 <sup>a</sup>	38.3 <sup>b</sup>	40.9 <sup>a</sup>	39.2 <sup>ab</sup>	0.46	0.005
<i>a* value</i>	20.3 <sup>c</sup>	16.5 <sup>d</sup>	24.0 <sup>b</sup>	26.8 <sup>a</sup>	0.32	< 0.001

<sup>a,b</sup> LSM means within rows with different superscripts differ significantly ( $P < 0.05$ )

LT = *Longissimus thoracis*

SEM = standard error of the mean

IC6 = immunocastrates receiving their booster 6 weeks before slaughter

IC4 = immunocastrates receiving their booster 4 weeks before slaughter

Treatments did not differ in terms of the average LT area ( $174.4 \pm 5.77 \text{ mm}^2$ ), pH ( $5.7 \pm 0.01$ ), drip loss ( $1.0 \pm 0.03 \%$ ), cooking loss ( $26.9 \pm 0.27 \%$ ) or Warner-Bratzler shear force ( $44.7 \pm 1.34 \text{ N}$ ). The meat from both the IC6 and R rams had lower ( $P = 0.005$ )  $L^*$  values, relative to the IC4 and B lambs. The intact rams had the highest  $a^*$  values ( $P < 0.001$ ), followed by IC4, B and IC6 (Table 1). No differences were reported between the treatment groups for the  $b^*$  values ( $12.7 \pm 0.15$ ).

#### IV. CONCLUSION

Immunocastration can be used to manipulate carcass fatness depending on the market demand, without negatively affecting carcass weight, cutting yield, LT muscle area or meat quality traits. Although both booster intervals investigated resulted in intermediate backfat thickness, shortening or lengthening this interval may result in leaner or fatter carcasses, respectively. The influence on meat colour warrants further investigation; however, it is debatable whether the consumer will be able to detect these differences.

#### ACKNOWLEDGEMENTS

The authors would like to thank the staff and students who were involved, Prof. Martin Kidd for the assistance with the statistical analysis and the Meat Industry Trust for their financial support. This research was funded by the South African Research Chair's in Meat Science Initiative.

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