

Beta agonists, animal age and beef quality

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Research Institute: ARC - Animal Production Institute (ARC : API)

Research focus area: Animal Products, Quality and Value

Full Title of the project

The effect of a beta agonist and animal age on beef quality

Aims of the project

- To investigate the effect of a beta agonist on quality (but specifically tenderness) of three muscles with different histological and physiological/biochemical properties of young grain fed beef.
- To determine the effect of animal age (according to permanent incisors) on quality of three muscles with different histological and physiological/biochemical properties of young grain fed beef.
- To determine if age alone is sufficient to accurately describe the quality younger beef produced under grain fed and pasture conditions, by considering the outcomes of objectives 1 and 2.

Executive summary

In this report the effects of age combined with feeding regime and the supplementation of the beta agonist, zilpaterol, on different quality characteristics of 3 beef cuts were discussed. The 4 age/feeding regime/zilpaterol groups were grain fed A age, no zilpaterol, AC, grain fed, A age treated with zilpaterol, AZ, pasture fed AB and B age and the 3 muscles tested were the ST or M. semitendinosus (silverside; high connective tissue), LL or M. longissimus lumborum (loin; low connective tissue) and BF or M. biceps femoris (silverside; high connective tissue).

The effects of age and zilpaterol on tenderness were muscle specific. Tenderness of LL cuts was least affected by age but zilpaterol significantly decreased tenderness and aging potential. LL cuts of AZ carcasses were tougher than all other age groups at 3 days post mortem and equal in tenderness to LL cuts of AB and B age carcasses. Prolonged aging combined with no zilpaterol gave the best results for A-age LL cuts. Tenderness of high collagen cuts (BF and ST) were negatively affected by age due to reduced collagen solubility and did not improve significantly when aged for 14 days. The effect of zilpaterol on these cuts was less significant and BF and ST cuts of AZ carcasses were more tender than the same cuts of AB and B carcasses.

A sensory panel clearly distinguished between cuts of grain fed (AZ and AC) and pasture fed carcasses (AB and B) on the grounds of flavour characteristic. AB and B cuts scored higher for Grassy, Animal-like and Rancid flavour overtones and lower for Roasted flavour and Sourness than AZ and AC grain fed cuts

Subcutaneous fat of pasture fed carcasses was yellower than fat of grain fed carcasses. Colour measured as lightness or light reflection (L^*) and chroma (vividness) was generally darker and duller (darker red) for cuts of pasture fed animals.

Vacuum-packaging contributed to an overall oxidative stability and little variation occurred among muscles, treatments and ageing times. However, samples from pasture fed animals tended to be more stable than grain fed animals.

We conclude that age is a poor predictor of tenderness of low connective tissue cuts when a beta agonist is used. However, age could be used to distinguish effectively between high connective tissue cuts. Apart from tenderness, typical flavours related to the diet of animals define the expected eating quality of beef of different ages and feeding regimes.

List of outputs for the duration of the project

Scientific papers:

- Strydom, P.E., 2011. Quality related principles of the South African beef classification system in relation to grading and classification systems of the world. South African Journal of Animal Science, 41, 177-193.

Four page International Congress proceedings papers with poster included

- Hope-Jones, M., Strydom, P.E., & Moholisa, E. (2012) Sensory evaluation of loin muscles from carcasses of different age classifications and under conditions of extreme aging. Proceedings of the 58th International Congress of Meat Science and Technology, Montreal, Canada, August 12-17. ICoMST2012paper33.pdf. 4 pp

- Schonfeldt, H.C. & Strydom, P.E. (2012) Effect of age on carcass and cut composition of South African beef carcasses. Proceedings of the 58th International Congress of Meat Science and Technology, Montreal, Canada, August 12-17. ICoMST2012paper88.pdf. 4 pp
- Moholisa, E., Strydom, P.E., Hugo, A. and Hope-Jones, M. 2013. Effect of Beta-agonist and Age on Tenderness of Longissimus Dorsi and Biceps Femoris Muscles of Grassfed and Feedlot Steers. Proceedings of 59th International Congress of Meat Science and Technology, Izmir, Turkey, 18 to 23 August 2013. S5-27.
- Strydom, P.E., Sehoole, O.C., Hope-Jones, M. and van Heerden, S.M. 2013. Flavour profiles of loin cuts from carcasses of different age classifications, nutritional backgrounds and aged over two aging periods. Proceedings of 59th International Congress of Meat Science and Technology, Izmir, Turkey, 18 to 23 August 2013. Oral presentation O29.
- Strydom, P.E., Sehoole O.C., Hope-Jones, M. and van Heerden, S.M. 2013. Sensory Tenderness of Three Beef Cuts from Carcasses of Different Age Classifications, Diets and Aged Over Two Aging Periods. Proceedings of 59th International Congress of Meat Science and Technology, Izmir, Turkey, 18 to 23 August 2013. S10B-7

Local Congress proceedings

- Moholisa, E., Strydom, P.E., Hugo, A. and Hope-Jones, M. 2013. Effect of Beta-agonist and Age on Tenderness of Longissimus Dorsi and Biceps Femoris Muscles of Grassfed and Feedlot Steers. Proceedings of 20th SAAFOST Biennial International Congress. CSIR International Convention Centre, Pretoria, 7-9 October 2013. P39-40.

Popular and non-peer- reviewed publications

- Strydom, P.E., 2012. Rooivleis/Red Meat 3, June 2012, pp 69-70
- Strydom, P E, 2011. Classifying carcasses. Rooivleis/Red Meat, September 2011, pp45-47.

Radio Talks

- Strydom, P E, 2014. The meat that we eat. Klankkoerant, Radio Pretoria
- Strydom, P E, 2013. The Beefy Debate. SAFM. 2 March 2013, 09h20

Presentations

- Strydom, P.E., 2011. Age classification: An international view and then: Quo vadis? Red Meat Abattoir Association Congress and AGM. Lord Charles Somerset Hotel, Somerset West. 13 May 2011.
- Strydom, P.E, 2010. Carcass classification: Quo vadis? ARC Beef Cattle Farmers Day, Stellenbosch Western Cape, 29 July 2010.
- Strydom, P E, 2012. Verandering vir volhoubaarheid: Die Veld Steak. Red Meat Workshop, Bien Donn  Agri Cape Week, 19 April 2012

Other means of technology transfers and reporting

- Strydom, P.E. 2013. Presented several reports on 4 projects at Red Meat Carcass Classification committee, 6 December 2013. SAPPO offices Hilside

- Strydom, P.E. 2014. Presented a report on 4 projects at Red Meat Carcass Classification Workshop, 17 March 2014. Meat Science Centre, ARC-API, Irene
- Strydom, P.E., 2013. Progress Report: The effect of a beta-agonist and animal age on beef quality –. Technology and Human Resources for Industry Programme (THRIP, NRF). March 2013.
- Strydom, P.E., 2014. Progress Report: The effect of a beta-agonist and animal age on beef quality –. Technology and Human Resources for Industry Programme (THRIP, NRF). March 2014.