Animal welfare, stress biomarkers and meat quality

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Pre-slaughter stress, animal-related factors, stress biomarkers, nanostructure and technological properties of beef

Industry Sector: Cattle And Small Stock

Research Focus Area: The Economics Of Red Meat Consumption And Production In South Africa

Research Institute: Fort Hare

Researcher: Dr. Voster Muchenje PhD

The Research Team

Title	Initials	Surname	Highest Qualification
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Aims Of The Project

- 3.1 To determine the expression of heat shock proteins, cortisol and glucose and the quality of beef in slaughtered bovine species. 3.2 To determine the activities of stress enzymes in relation to carcass and physico-chemical characteristics of beef from cattle slaughtered under practical 3.3 To determine the effects of pre-slaughter stress and inborn characteristics carcass of beef quality

Executive Summary

The main objective of the study was to determine the effects of transportation, distance travelled, lairage duration and animal-related factors on pre-slaughter stress indicators, carcass characteristics, nanostructure and technological properties of beef from six genotypes of cattle. Transportation and handling of slaughter animals is associated with a series of events that expose animals to stressful and unfavourable conditions, compromising their welfare and meat quality. Stress experienced by animals in unfavourable environmental conditions increases the synthesis of stress proteins. In a heat-shocked cell, the proteins begin to unfold and denature, resulting in the production of heat-shock proteins (HSP). HSPs are a subgroup of molecular chaperones, which are classified into five families (HSP100, HSP90, HSP70, HSP60 and small HSPs [sHSPs]) according to thein molecular weights. During this process, HSPs may bind to heat-sensitive proteins and protect them from degradation. Under normal growth, HSPs maintain homeostasis by regulating the folding quality control of proteins. It includes stressed and non-stressed proteins that accompany unfolded polypeptides.

The study showed that exposing cattle to longer hours of transportation with reduced lairage period did not only decrease glucose levels, but also increased the expression of heat shock proteins, cortisol, creatine kinase and lactate dehydrogenase which are good indicators of animal welfare. Furthermore, pre-slaughter stress negatively affected the beef nanostructure and technological properties, and heifers had the best muscle fibres, sarcomere length and visible intercalated discs with improved tenderness, colour and pH.

Popular Article

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Please contact the Primary Researcher if you need a copy of the comprehensive report of this project – Dr Voster Muchenje on vmuchenje@ufh.ac.za