NEW FRESH BEEF PROCESSING PROCEDURES TO ENSURE CONSISTENT EATING QUALITY

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Background
Much of the variability in the eating quality of beef stems from the manner in which muscles (carcass and individual cuts) are treated up to the onset of rigor. Until this time carcasses are generally treated as a whole unit. However within the carcass, muscles will experience quiet different kinetic profiles in terms of pH and temperature profiles which results in variation in contraction, proteolysis, calcium release and denaturation of proteins. The resulting meat will have different degrees of toughness and tenderness. The approach in this project is to examine the beef carcass as a set of individual muscles and commercial cuts and to establish the optimum treatment at the early postmortem period. Interest in boning of unchilled carcasses (hot-boning or hot processing) has arisen as result of economic advantages stemming from savings in space, energy, labour, materials and supplies as well as a result of demonstrated improvements in the functional properties and quality of the product (Kastner, 1983). During hot boning muscles are removed form the carcass which allows them to contract stonger than, muscle conventionally chilled in the stretched state attached to the skeleton. To limit unfavourable properties of contracted hot-boned beef electrical stimulation is used to accelerate the deline of pH to a level critical for development of cold shortening (below 6.2) and thus avoid the toughening effects of cold shortening.

Objectives:
The objective of this research is to reduce the variability in meat eating quality by developing techniques and regimes which control many of the biochemical and physical events which cause inconsistency. Variability will be reduced by application of electrical techniques in combination with hot boning of the carcass.

Methods:
Heifers (n=10) of similar age, size and grade were slaughtered by stunning using a captive-bolt pistol and exanguination. Carcasses (n=5) were hot-boned within 90 mins *pm*. Once excised the left hand side *longissimus dorsi* (LD), *semimembranosus* (SM) and *biceps femoris* (BF) muscles were subjected to low voltage electrical stimulation (LVES) at 90V, 3x 60 secs and 14Hz while the right hand side muscles were not electrically stimulated (NES). The LVES and NES muscles were halved and stored at two different chilling temperatures (1) 2° C until 48 h (2) 10° C for 10 h followed by 2° C until 48 h. A second group of carcasses (n=5) were conventionally dressed and split into two sides. The left hand side of each carcass was chilled at 2° C for 48h while the right hand side of the carcass was chilled at 10° C for 10 h followed by storage at 2° C until 48h postmortem at which time the LD, SM and BF muslces were excised. The rate of temperature and pH fall was monitored up to 2 days. Freshly cut samples (2.5 cm thick) were taken at 2, 7 and 14 days postmortem, vacuum packed and stored at -20°C for Warner-Bratzler shear force, sensory analysis and cookloss determination. Drip loss and colour measurement were carried out on freshly cut steaks. Samples were taken for sarcomere length determination pre-stimulation, post stimulation and again at 2 days post mortem.

Results and Discussion:
This project is in the initial stages. BF and SM muscles are currently being analysed. Results will be thus be discussed for the LD muscle LVES accelerated the pH decline of all muscles stored at 2° C and 10° C compared to the NES muscles (Fig. 1a and 1b respectively). Mean pH values at 4hrs *pm* were 6.02 and 6.06 for LVES LD held at 2° C and 10° C respectively compared to values of 6.76 and 6.77 for NES LD held at 2° C and 10° C respectively. Mean WBSF values decreased significantly ($P<0.05$) in hot boned LD (Fig. 2a) over the 14 day ageing period. Storage temperature had a greater effect on shear force than LVES. Muscles stored at 10° C had a lower shear force than those stored at 2° C. However at 2° C muscles subjected to LVES had lower shear force than NES muscles. NES LD held at 2° C gave highest WBSF readings on days 2, 7 and 14. LVES increased the rate of postmortem glycolysis and avoided the adverse effects of cold shortening.

Conclusions:
Meat stored at 10° C resulted in lowest WBSF measurements for both LVES and NES LD. LVES improved the tenderness of hot boned LD muscle when stored at 2° C i.e when cold shortening was a risk however when stored at 10° C it did not improve the tenderness significantly.

Pertinent literature
Kastner, C.L. (1983). Food Technol., 37, 96.

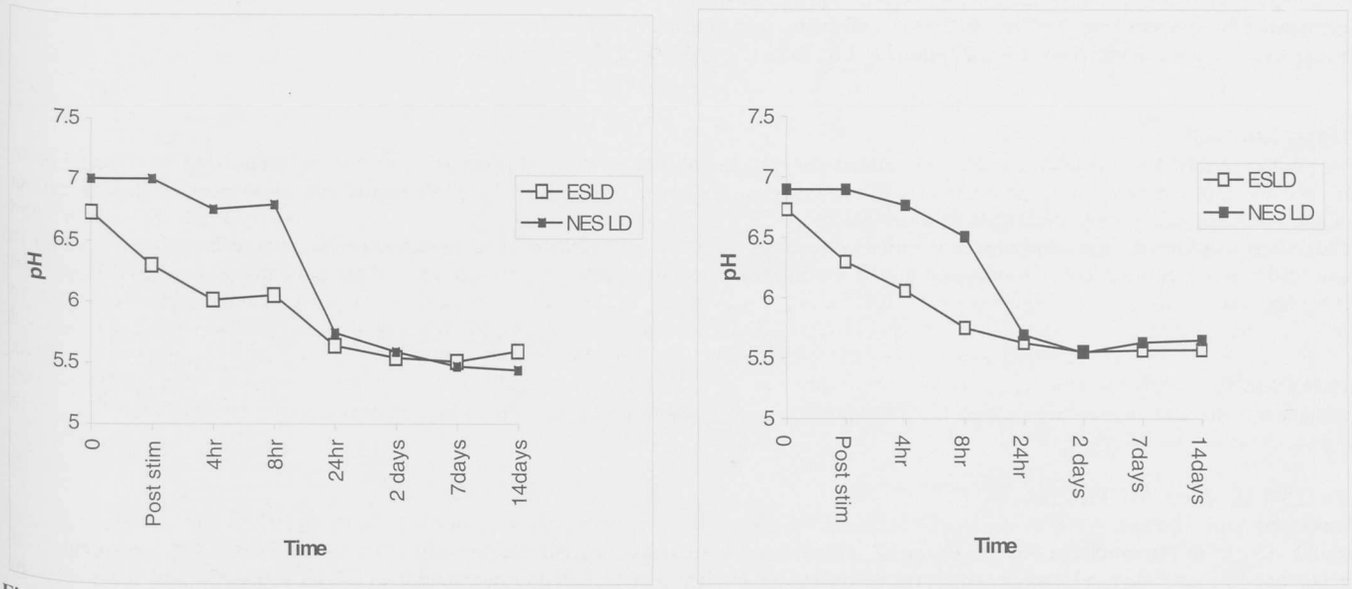

Fig. 1. Mean postmortem pH decline of hotboned M. *longissimus dorsi* stored at a) 2°C and b) 10° over 14 days postmortem

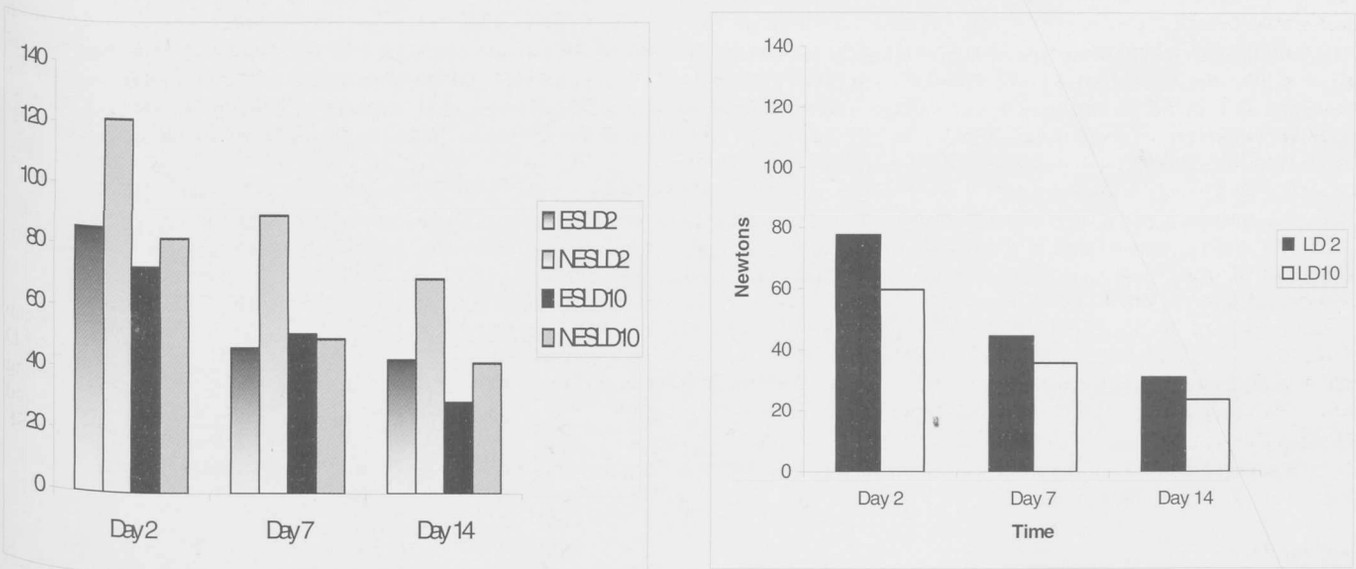

Fig. 2. Mean Warner -Bratzler Shear force of a) hot-boned LD muscle and b) cold-boned LD stored at 2°C and 10°C