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Inside:

Points of Interest

Canada's beef herd is 12.65 million head representing 1.3% of the world's cattle population.

66% of the beef cows in Canada reside in Alberta and Saskatchewan.

Over 66% of Canadian cattle are processed in Alberta.

Canada ranks 4th in the world for beef exports.

Canadians eat approximately 22.7 kg of beef per capita.

Measuring Beef Tenderness Objectively

Tenderness has been identified as the most important factor determining consumer-eating satisfaction of beef. Consumer surveys have shown that 1 in 4 beefsteaks are rated unacceptable. When compared to chicken, turkey, pork and lamb that are seldom tough, beef faces a challenging marketplace.

One aspect of meeting the beef tenderness challenge of having 100% consumer satisfaction with the product is to understand the language used to describe beef tenderness.

Objective measures of meat tenderness have commonly used Warner-Bratzler shear method developed in the 1930's. . This device provides a measure of force required to shear through a uniform piece of meat. Over time, researchers have modified sample preparation procedures (cooking methods, core sizes etc) so that there is a myriad of methods for objectively measuring tenderness. Each method works well if used to compare samples within a study, or among studies at the same institute.

Unfortunately, not everyone recognizes that different methodologies lead to different results, even on similar pieces of meat. In many cases, results have been taken out of context, and rather than comparing apples to apples, they have been used to compare apples to oranges.

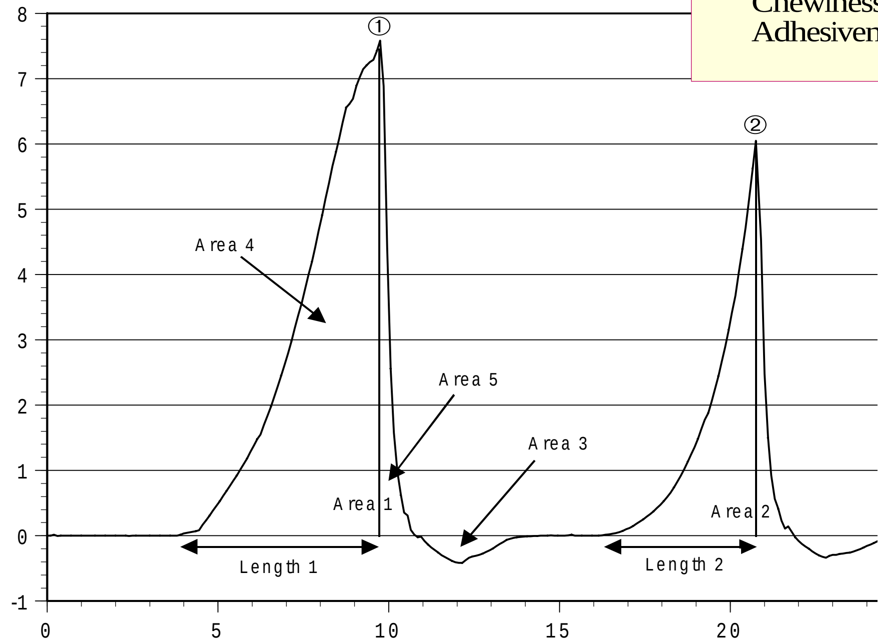
In 1994, a US task force, consisting of members from major meat research institutes, recommended a procedure for sample preparation and calibration to match shears performed at the Meat Animal Research Center in Clay Center Nebraska. The objective was to allow more accurate comparison among results from various institutes.

Much of the meat research conducted in Canada occurs at the Lacombe Research Centre. The shear methodology used here is valid to compare shear values both within and among studies conducted at Lacombe. However, since the US is Canada's largest trading partner, there is a need to know how Canadian beef compares to their US counterpart.

Researchers at the Lacombe Research Centre were tasked with developing a Warner-Bratzler shear methodology comparable to the recommended US procedure, develop conversion factors to maintain continuity between Lacombe's historical shear data and the US-based methodology and develop a texture profile analysis where objective shear data

A typical force-by-time plot produced by an Instron 888 with a Warner-Brazler head.used to determine texture profile charcteristics objectively.

Hardness = Area 1
Cohesiveness = Area 2 / Area 1
Springiness = Length2 / Length 1
Resilience = (Area 1 - Area 2) / 2
Chewiness = Hardness *Cohesiveness*Springiness
Adhesiveness=Area 3



could be associated with subjective taste panel evaluations of overall tenderness and palatability.

Initially, three technicians at Lacombe were trained using the US shear method. Of the sample variability only 7.8% could be attributed to the difference between operators. The remaining variation was due to among animal (37.8%), among steak (6.8%) and within steak (44.6%) variation.

The reason that steaks have both tough and tender regions is unclear. However, further research concerning this variation may prove useful towards understanding and perhaps managing tenderness.

Shears values were obtained on sets of steaks from the same animals at Lacombe and at the Meat Animal Research Center, Clay Centre, Nebraska. Overall the Lacombe shear values had a lower range (2.16 to 6.30) compared to Clay Center's shear (2.89 to 9.57). When the ranking of the steaks were compared, Lacombe and Clay Center results were well correlated for tender steaks, but less so for the tougher steaks.

This may be due to the variability within the steaks. Another contributing factor may have been the cooking method used at each institution. Lacombe's steaks were grilled to the same internal temperature while Clay Center's steak were cooked on a belt cooker for a set period of time. From an industry standpoint, this suggests that the variability within tough steaks, may be increased during cooking.

An equation was developed to transform Lacombe shear data into Clay Center equivalent shear values. However, because of the poor correlation between the two institutions for steaks in the tougher range, it can only be used with confidence for Lacombe shear values below a shear force of 4.3 kg.

Objective shear force measured by the Warner-Bratzler method does not relate to mechanical properties associated with chewing meat. The principal of cyclical texture profile analysis is to simulate chewing and obtain more objective information about textural properties.

To determine whether there was a relationship between texture profile analysis (TPA), Warner-Bratzler shears and taste panel evaluations, four rib steaks were cut from the *longissimus thoracis* muscle removed from the left side of 52 market-weight steers. Of the four steaks removed, one was used for the texture profile analysis, one for the Warner-Bratzler shear and two for sensory evaluation.

Texture profiles were obtained on strips of steaks clamped so that a star-shaped, cherry pitter probe penetrates the steak perpendicular to the grain. Displacement values over two cycles and a force-by-time deformation curve is plotted. Characteristics of hardness, cohesiveness, springiness, resilience, adhesiveness and chewiness are determined from the curve.

Textural profile analysis provided more information about the textural properties of the rib steaks than was possible from the Warner-Bratzler shears. For instance, TPA accounted for 51% of the variability in overall tenderness while Warner-Bratzler shears accounted for 35%. While TPA was successful in detecting differences in characteristics like hardness, cohesiveness and chewiness, it did not explain variation for the sensory evaluations of juiciness and flavour. Hence, trained taste panels will continue to be integral to assessing consumer acceptability of meat.

Computer Vision System for Beef Grading Receives FPTT Award

Dr. Alan Tong and his technical team at the Lacombe Research Centre, the Canadian Cattlemen's Association, the Canadian Meat Council and RMS Research Management Systems were recognized by Federal Partners in Technology Transfer for the development, transfer and commercialization of the computer vision system used to determine the grade and saleable lean yield of beef.

The success of the system required collaboration among many parties. The Canadian Cattlemen's Association and the Canadian Meat Council recognized the need for an automated system in Canada and provided support to Dr. Tong to develop the hardware and software of the two component system. RMS worked closely with the developers and Cargill Foods, High River for scale-up trials to assure that the system would stand up to commercial beef packing plant line speeds and conditions. Concurrently, a protocol was developed with the Canadian Food Inspection Agency to assess the accuracy and repeatability of the system.

CVS has now been commercialized worldwide by RMS, with installations in Canada, the United States and Australia. Projected potential sales for the system could reach $50 million by 2005.

Blade Tenderization of Beef

Mechanical blade tenderization of beef has been widely accepted in the hotel, restaurant and institutional trade. Reports on the effect of blade tenderization on palatability, cooking properties and tenderness have been based on research on a few muscles or muscle groups.

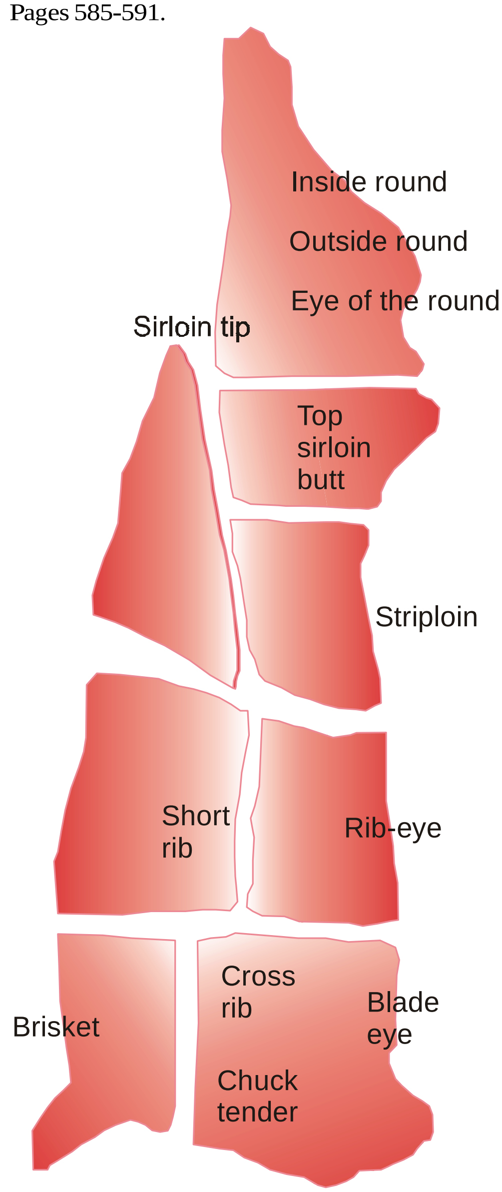
A study at the Lacombe Research Centre was designed to look at the effects of mechanical tenderization on the cooking properties and palatability attributes of 12 different muscles or muscles groups. These muscles were removed from both sides of 25 Canada AA beef carcasses aged for 6 days. Muscles from alternate carcass sides were either mechanically tenderized or used as controls.

Mechanical tenderization increased thaw-drip-losses from the brisket (1.3%) and cooking losses from the blade eye (2.7%). Thaw-drip losses and cooking losses were the same for mechanically tenderized and controls for the other 11 muscles or muscle groups. Mechanical tenderization did not change cooking time for any of the groups.

A trained 6-member sensory panel observed blade tenderization to have its greatest effect on hip muscles. Overall tenderness of the outside round, eye of round and inside round muscles was improved without altering juiciness. The overall palatability of the eye of the round, a notoriously tough steak cut, and also the inside round was improved.

The magnitude of improvement achieved using mechanical tenderization was relatively small, suggesting the blades didn't disrupt connective tissue enough to permit tenderized muscles of lower value to replace higher value cuts with less connective tissue.

Further details can be found in: *Food Research International* 2000 Vol. 32 Pages 585-591.



Muscle and muscle groups studied

WE'RE ON THE WEB!
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Microbiological Sampling of Carcasses

Microbiological sampling of carcasses is increasing as meat packing plants are implementing total quality management systems for their products.

Key to the development of HACCP (Hazard Analysis Critical Control Point) systems is routine and methodical assessment of the microbiological states of carcasses and equipment. As standard procedures for assessing carcass contamination have not been implemented across the industry, it is not easy to compare the numbers of bacteria recovered by different methods.

Bacteria can be recovered from carcasses by either excising some of the tissue or swabbing the carcass surface. It has been stated that more bacteria will be recovered from a carcass surface using excision procedures than by swabbing. The numbers of bacteria recovered by swabbing have been reported to range from 1% to 89% of those recovered by excision. The large range suggests that the condition of the carcass surface i.e. air-cooled or spray cooled, fat, muscle or membrane may affect the numbers that swabbing will recover. The literature also suggests that the abrasiveness of the swabbing material will alter the recovery of bacteria as well.

Recently, samples were collected from 25 pig and beef carcasses at the ends of each of eight commercial processes for the dressing or cooling of carcasses. Sites on each carcass were randomly selected, and either excised (10 cm^2), or swabbed with a sponge (100 cm^2), medical gauze (100 cm^2) or cotton wool (5 cm^2).

The data on total aerobic bacterial counts indicated that there was no difference in recovery between excision or swabbing with sponge or gauze, while cotton wool recovered about 30% of the bacteria obtained by the other methods. These findings were similar on both beef and pig carcasses. The state of the carcass i.e. whether it was sampled while warm, immediately after dressing or after air or spray cooling didn't affect the numbers of bacteria recovered by the sampling methods.

Further details can be found in: *Journal of Food Protection* 2000 Vol. 63 Pages 167-173.

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