

## **MEAT COOKING AND PREPARATION OF SAMPLES FOR SHEAR FORCE TESTING USING A TENDEROMETER**

### **Basis of cooking procedure in preparation for shear force tenderness testing**

An end-point cooking temperature of 75°C is recommended as this represents medium-well done in consumer terms. This temperature is also used as it is the point at which heat induced myofibrillar toughening is at its maximum and therefore is a 'worse-case' scenario.

It is critical that each sample is cooked in a consistent manner and the following guidelines assist with this:

1. To reduce cooking time variability ensure samples are of a similar size, however samples must be cooked to the end-point temperature.
  - For chilled product trim each sample to around 200g for cooking.
  - For bone-in frozen product cook portions of equivalent size.
2. Place the sample in a bag (200 x 250 mm, or larger), with a 100 -150 g weight to assist in submerging the meat sample in the boiling water.
3. Place the bag into a 100°C waterbath so that the meat sample is completely submerged. Attach the bags to a rail across the waterbath by bulldog clips, to ensure that the open end of each bag is held above the surface of the water.
4. Monitor the temperature of the samples during cooking with a thermocouple and remove each sample as soon as it reaches 75°C at the centre of the meat.

5. After cooking, weights should be removed and the samples should be cooled rapidly to  $<4^{\circ}\text{C}$ : Samples should be plunged into an ice-slurry to halt the cooking process quickly. Generally, for bone-in product it is easier to remove the muscle while still hot although this will mean that cook loss calculations will not be possible.
  - For bone-in loins (short or long); gently remove (so as not to tear fibres) the muscle from the bone while still hot (wearing thick rubber gloves, slice between the backbone and the meat and scoop out the muscle). Transfer to an ice-waterbath. Individual chops can be put directly into the ice-bath.
6. Cooled samples can be stored at  $\leq 2^{\circ}\text{C}$  for up to 48 hours before assessing meat tenderness.

### **Meat Tenderness Measurement**

The basic principle in assessing meat tenderness is to determine the force required to shear through a 10 x 10 mm square cross-section sample at right angles to the fibre axis. Sample preparation must be accurate as it will affect the shear force results.

1. Cut a slice off the outside of the meat to enable identification of the grain (the direction of the muscle fibres).
2. Score the meat with the tenderometer guide knife. Cut slices exactly 10 mm wide along the muscle using a sharp knife.
3. Cut ten rectangular samples (bites) from each loin sample (Figure 1) using the 'Tenderometer knife as a guide. There should be no outer edges, excessive fat or any connective tissue within each 'bite' that is cut. Discard the edge pieces that have been cut away.

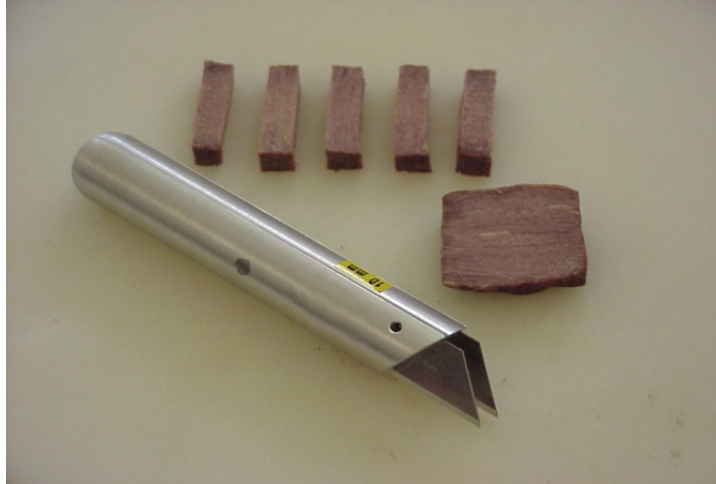


Figure 1. Sample preparation

**These samples must be cut exactly to specification: 10 mm X 10 mm cross section, and a length, parallel to the fibre axis, of at least 25 mm.**

4. The resulting meat sample 'bite' is a 10 x 10 mm cross section piece about 30 mm long that is then sheared at right angles to the fibre direction.
5. Place each sample (bite) into the sample holder of the Tenderometer, operate and record the value given by the Tenderometer according to the Tenderometer user manual
6. Record 10 bites per sample, for smaller samples record as many bites as possible.

### Shear force data analysis

The Tenderometer values are given as Kgf or kilograms force. One Kgf is equivalent to 9.8N.

The relationship between New Zealand Consumers perception of tenderness/toughness and shear force has been established over several large-scale trials. Based on these data, the following categories are suggested:

**Up to and including 3.9 Kgf**

**'Very Tender'**

**4 to 6 Kgf**

**'Tender'**

**6.1, to 8.9 Kgf**

**'Acceptable'**

**Greater than or equal to 9 Kgf**

**'Unacceptable'.**

The minimum recommended commercial specification is:

**Mean of 6 Kgf or less with 95% bites having a shear force of less than 9 Kgf**