

Meat technology update

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Tenderstretch

Almost all consumers who buy beef expect it to be tender. Disappointed consumers react adversely to tough meat and, in extreme cases, cease to consume beef. This publication discusses 'Tenderstretch' (also called 'aitchbone hanging'), which influences meat tenderness and is used in one of the pathways prescribed by Meat Standards Australia (MSA).

Toughness is linked to five major factors - advancing age of the animal, 'cold shortening' (the muscle-fibre contraction that can occur during chilling), animal stress (unfavourable meat acidity [pH]), ageing and breed. This Update primarily discusses Tenderstretch, which is used to prevent cold shortening.

Cold Shortening

A major cause of meat toughness is the contraction of muscles during chilling. Carcasses are required to be chilled rapidly soon after slaughter to prevent growth of microbial pathogens and spoilage bacteria, and to reduce carcass weight loss during chilling. If a muscle is chilled rapidly before the onset of rigor mortis ('setting'), the muscle fibres contract. In those muscles that are free to shorten, this contraction may be sufficient to cause commercially significant toughness. Lean, light carcasses chill

more rapidly than do fat, heavy carcasses and yield tougher meat in muscles free to shorten. Toughness caused by this muscle contraction can be prevented by accelerating the onset of rigor mortis using 'electrical stimulation', or by hanging the carcass in a way that will both stretch the muscles and not allow them to contract (hence the name 'Tenderstretch').

There are many muscles of the intact carcass which are, in fact, stretched considerably and held in the elongated form by attachment to the skeleton while the body is hanging in the usual way after slaughter. These muscles (such as the fillet) will remain tender (other factors permitting) through chilling or freezing while they are still attached to the carcass. However, many of the major muscles of the body are capable of very appreciable shortening despite the muscle-skeleton attachments.

The process of electrical stimulation (ES) involves the application of an electrical current to the carcass of an animal soon after it has been killed. The purpose of ES is to speed up the onset of rigor mortis so that by the time the carcass starts to chill, rigor mortis is well advanced and the muscles are 'set'. Once they are set (in rigor mortis), the muscle fibres are unable to contract (cold shorten) and toughen as the carcass chills.

Variations in tenderness caused by differences in weight, fat cover (an important factor because of its effect on

cooling rate), the position of the carcasses in the chillers, and the temperatures in the chillers, are eliminated by the use of ES. All of these factors would otherwise affect the chilling rate, cause shortening of many expensive cuts and, therefore, affect their tenderness.

Electrical stimulation is available to achieve a pH and temperature relationship within the MSA window for various rates of chilling.

Tenderstretch

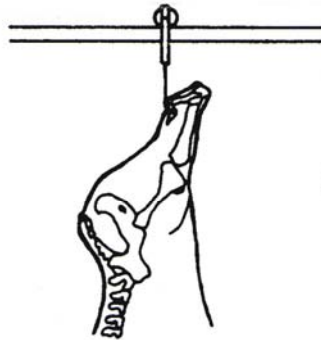
In this method, many of the valuable muscles of a carcass are restrained and prevented from cold shortening during the rigor process by changing the suspension point of the side from the achilles tendon to the sacrosciatic

ligament (the thick ligament around the anus), or to the eye of the aitchbone (obturator foramen). For whole carcasses, suspension is from the pelvic girdle.

This process leads to a tenderness improvement in most of the commercially important primal cuts, e.g. rump, thick flank, topside, silverside, striploin and cube roll, but not the blade.

All dressing procedures are carried out normally on the carcass suspended from the achilles tendon. Transfer of the beef side suspension point to the ligament or aitchbone can be carried out at any point providing it is done within one-and-a-half hours of sticking. The equipment required for

Figure 1: Transfer procedure; Achilles tendon to aitchbone

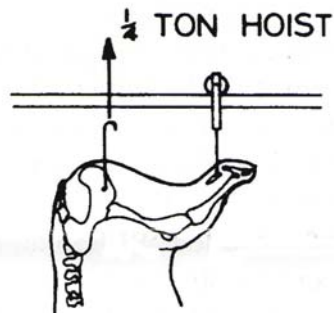


STEP 1

ACHILLES TENDON SUSPENSION

STEP 2

HOOK INSERTED IN EYE OF AITCH BONE
RAISED AND TAKE FULL WEIGHT AND
ACHILLES TENDON SUSPENSION REMOVED



STEP 3

SIDE IS LOWERED AND OTHER END
OF HOOK IS HOOKED TO CONVENTIONAL
SLIDE OR ROLLER ON THE RAIL

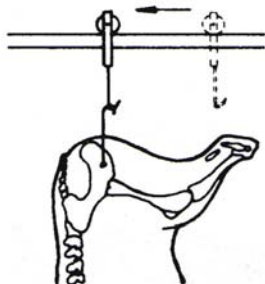
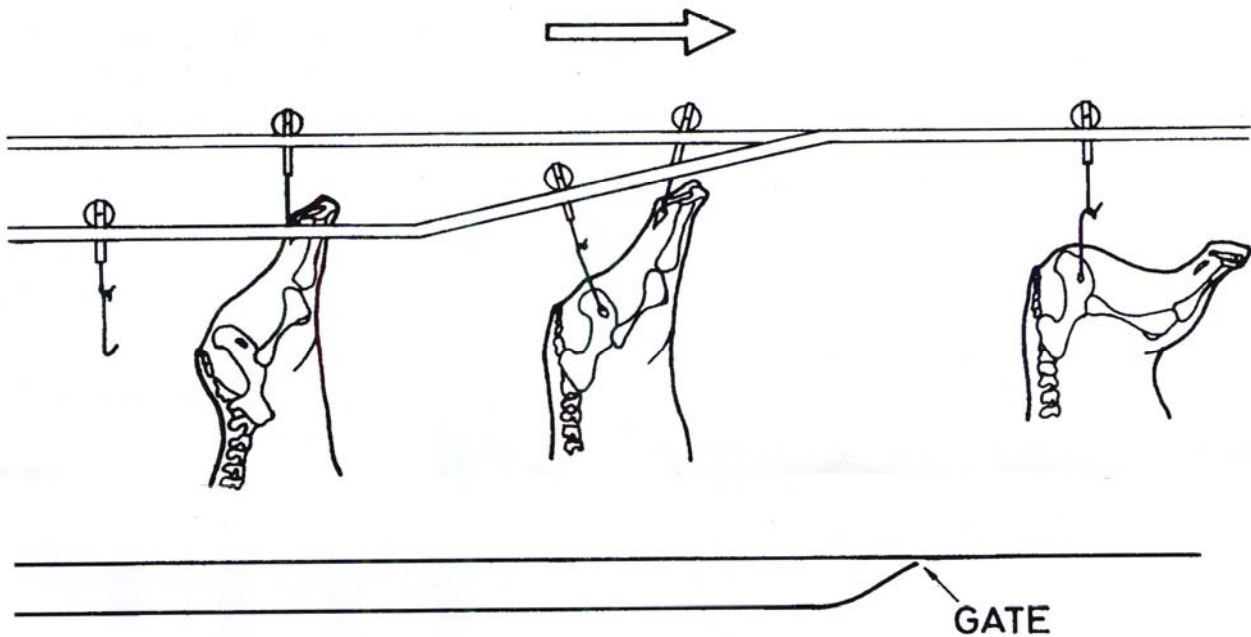


Figure 2: On-line transfer procedure



transfer is minimal, consisting of extended 'S' hooks, a 1/4-tonne capacity electric hoist and a high-level work platform. Suggested details of the transfer procedure are given in Figure 1. A suggested on-line procedure is shown in Figure 2.

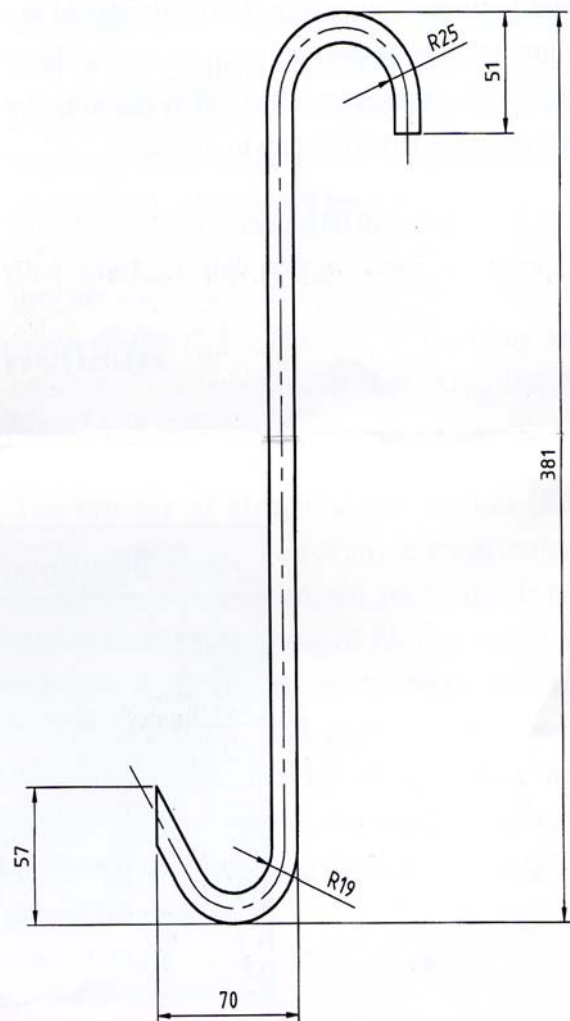
Suggested details of the 'S' Hook are given in Figure 3.

The sides must be left hanging, suspended by the ligament or aitchbone, for at least 20 hours or until rigor mortis is established. After this period, the side or quarter can be hung again by the achilles tendon.

An indication of the improvement in tenderness in beef is shown in Figure 4.

Ageing of Tenderstretch meat effectively increases the degree of tenderness over aged conventionally hung meat. Improvements in tenderness following ageing occur more rapidly in meat which is tenderstretched than in that which is conventionally hung. The findings from a recent Cooperative Research Centre (CRC) experiment supported those of earlier Commonwealth Scientific & Industrial Research Organisation (CSIRO) research - that ageing beyond seven days for

Figure 3: Extended 'S' Hook (measurements in mm)



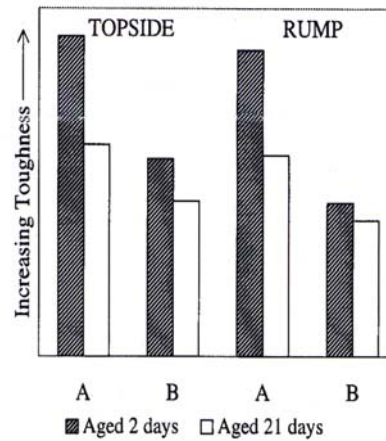
Tenderstretch carcasses will result in negligible improvement in tenderness. The MSA window requires aged Tenderstretch for some cattle production systems.

Cooking loss in tenderstretched meat is less than that in conventionally hung meat.

Similar improvements in the tenderness of the commercially important primal cuts in sheep and lamb carcasses are obtained by hanging the hot carcasses from the pelvic girdle.

Tenderstretch also introduces two distinct side/carcass changes. It yields sides/carcasses with the hind leg(s) protruding at about right angles from the backbone (compared with the reasonably symmetrical hanging position achieved with conventional achilles-tendon-suspension); and it changes the shape of some cuts, thus requiring a modified boning technique.

Figure 4: The force required to shear topside and rump muscles removed from carcasses:
A – hung normally from the Achilles tendon;
B – hung from the aitchbone alone.



NOTE:

1. The smaller the column, the less is the force required and the more tender is the meat.
2. In each case, meat aged for 2 days – the dark column, is contrasted with meat aged for 21 days – the clear column.

Contact us for additional information

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