

# Texas A&M

## "Tenderstretch"



Fig. 1 Tenderstretch

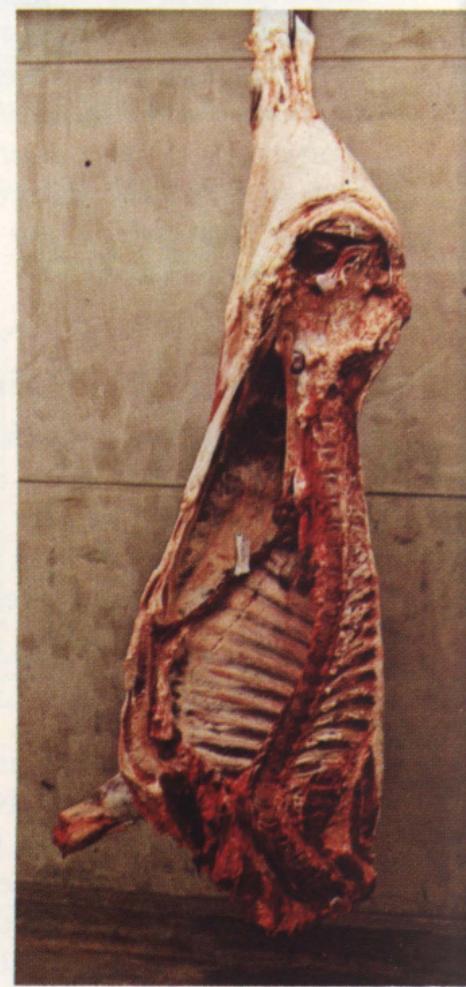


Fig. 2 Normal Suspension

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# “Tenderstretch”

Frank A. Orts, Gary C. Smith, and R. L. Hostetler\*

Tenderness of steaks and roasts is of prime importance to the consumer. Many factors influence tenderness. Some can be manipulated so as to produce desirable changes in tenderness. Meat scientists of Texas A&M University have developed a method that improves the tenderness of many of the larger and economically important muscles of the loin and round from which the most desirable steaks and roasts are obtained.

## CARCASS SUSPENSION

This method consists simply of suspending the carcass from the aitch bone, as shown in figure 1, at the time of slaughter and before the beginning of rigor mortis rather than from the Achilles tendon or hock, as shown in figure 2.

## TENDERIZATION

The basic principle involved in the *Texas A&M Tenderstretch* process is to prevent the shortening of the muscle fibers as the carcass passes into rigor mortis. In living muscle tissue, the smallest unit is the sarcomere just as the cell is the smallest part of the body. Shortening takes place when the sarcomeres contract, figure 3. This occurs by the sliding of the actin and myosin filaments past each other to form actomyosin.

Skeletal muscles of slaughtered animals retain the ability to shorten until rigor mortis begins. Before rigor mortis sets in, the muscles are soft, pliable and if cooked rapidly, are very tender.

After rigor mortis has developed, the muscles become fixed and rigid. Muscle in rigor (or short-

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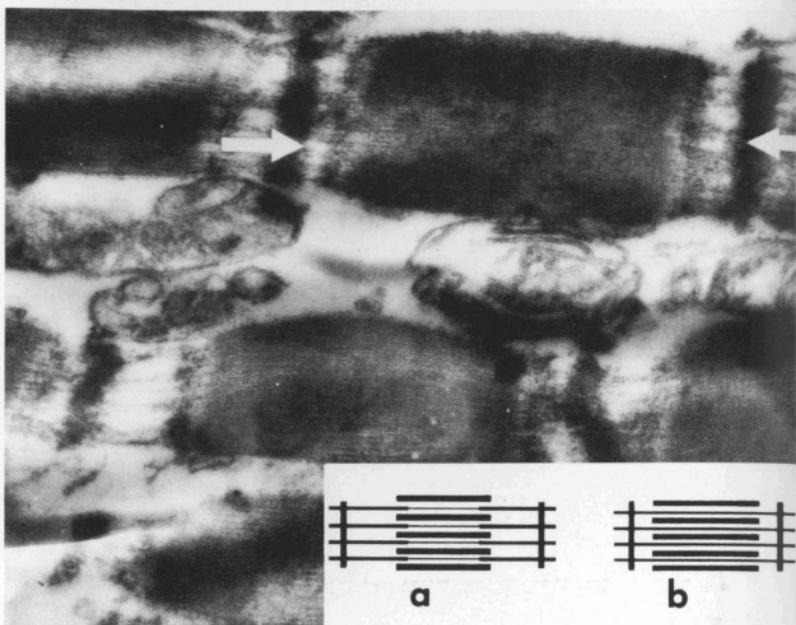


Fig. 3. Electron micrograph of two fibrils of a muscle fiber showing the basic units, the sarcomere. One sarcomere (between arrows) is about 2 microns (1/13,000 inch) in length. Stretched, tender, (a) and contracted, less tender (b) sarcomeres are illustrated in the insert.

ened state) is stiff, firm to the touch and in its least tender state. For example, when a calf is killed one day and cut the next, the meat normally will be tough, regardless of the condition of the animal at slaughter.

After rigor has set in, the muscle gradually becomes more soft and pliable. This is known as the aging period. The meat becomes more tender during this period of postmortem tenderization, before spoilage has occurred, when the carcass is normally processed. This is usually 10-14 days after slaughter, depending upon the fat cover on the carcass.

Since the longer sarcomeres tend to be more tender, meat scientists at Texas A&M were led to examine the anatomy of the beef carcass in search of a more practical means to hold as many of the large muscles as possible in a stretched position. Thus some of the shortening during the process of rigor mortis could be prevented.

## APPLICATION

The methods which were successful were those in which the carcass simulated a normal standing position of the live animal. Beef sides with the fore or hind shanks tied together were suspended by the

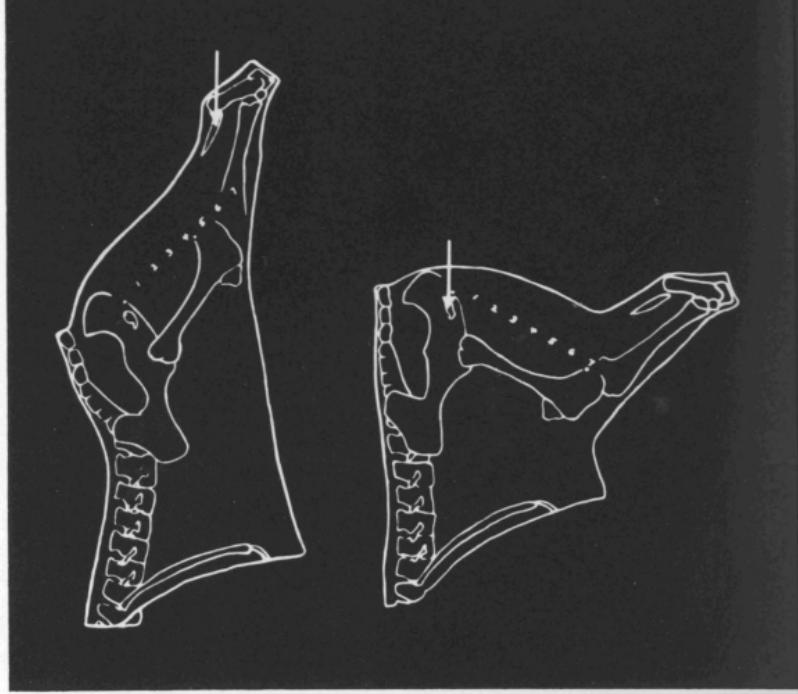


Fig. 4. An illustration of the skeletal position in beef hindquarters suspended by the usual method (left) and the Texas A&M Tenderstretch method (right). Arrows indicate points of suspension; Achilles tendon (left) and the obturator foramen of the aitch bone (right).

neck, the aitch bone, or laid horizontally. The most feasible, the Texas A&M "Tenderstretch" method, consisted of merely suspending the side from the obturator foramen of the aitch bone as illustrated, figure 4. By doing so, the weight of the hind shank pulls downward thus preventing the muscles in the round from shortening, as is the case in the usual suspension. The forequarter also functions as a weight to straighten and stretch the spine, keeping the loin eye muscle from shortening. The tenderloin was found to have shorter sarcomeres by this treatment and thus was less tender than when carcasses were suspended in the normal manner. However, the tenderloin is still tender even though the sarcomeres are shorter.

Suspending carcasses by the aitch bone does not take up any more space in the cooler during chilling since the hind leg hangs into the space between the rails which is normally sufficient to accommodate the leg. This method of suspension may be the answer in some plants where rail heights are a problem since the carcass normally hangs 18 to 24 inches higher above the floor than in the normal suspension methods. *However, the trolley hooks must be sterilized immediately before inserting in the aitch bone on the kill floor.*

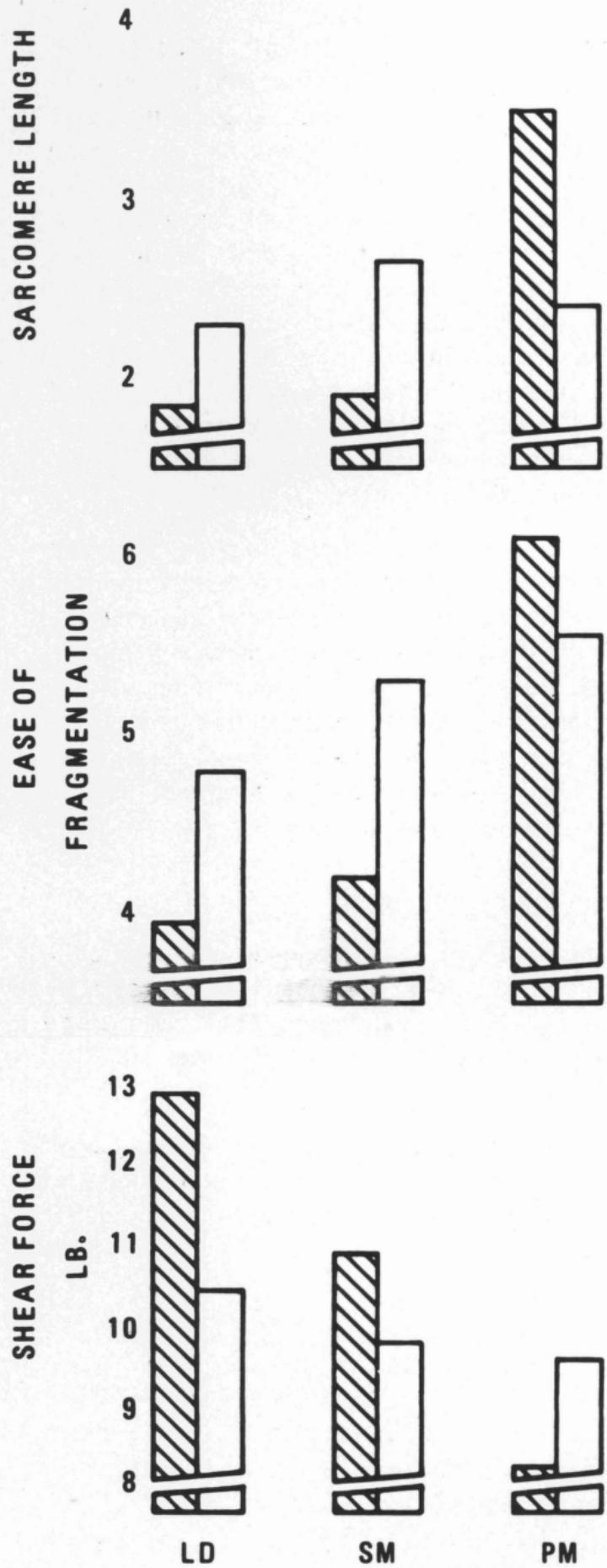


Fig. 5. Examples of sarcomere and tenderness differences between Achilles tendon and aitch bone (Texas A&M Tenderstretch) suspension for three muscles (LD — Longissimus; SM — semimembranosus; PM — psoas major). Longer sarcomeres, higher taste panel scores and lower shear values indicate greater tenderness.

## RESULTS

Both the objective measurement of tenderness, *Warner-Bratzler shear*, and the subjective measurement, *scoring by a trained taste panel*, indicated that suspending the carcass from the aitch bone increased the tenderness of the longissimus, gluteus medius, rectus femoris, semimembranosus, semi-tendinosus, adductor, figure 5, and retained the tenderness of the triceps brachii, psoas major and biceps femoris in a satisfactory range. These large muscles are found in loin and sirloin steaks, the sirloin tip, the round and the arm roast. This method of suspending the carcass has been used on beef only; however, improvement in tenderness should occur also in pork and lamb.

Variation in tenderness among animals still exists but by increasing the tenderness of these important muscles by the method of suspension, called *Texas A&M Tenderstretch*, the variation between animals is reduced. The Texas A&M Tenderstretch method also does not produce over-tenderization as is sometimes the case with enzyme-tenderized meat. Furthermore, tenderizing can be accomplished without the use of added substances.

## CUTTING PROCEDURES

Matched sides of tenderstretched and normally suspended carcass were fabricated by the meat market of J. Weingartens, Bryan, Texas. A method of breaking the carcass is illustrated in the following figures.

Table 1 shows that there was a difference of 2.6 percent in the yield of cuts from the hindquarter of the tenderstretched beef compared to a regular suspended hindquarter in this test. The gross value

Table 1 Cutting test results.

Cuts	% Yield of hindquarter	
	Tenderstretch	Normal
Round	25.61	24.13
Loin	20.10	19.57
Sirloin tip	3.74	3.24
Sub total	49.45%	46.40%
Flank steak	.99	.75
Boneless stew	1.90	1.98
Trim	14.35	15.39
Cutlets	5.49	5.14
Total	72.18%	69.66%

# Cutting Procedures



Fig. 6.

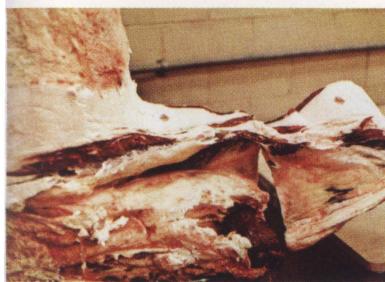


Fig. 7.

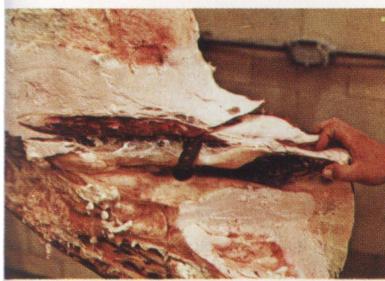


Fig. 8.

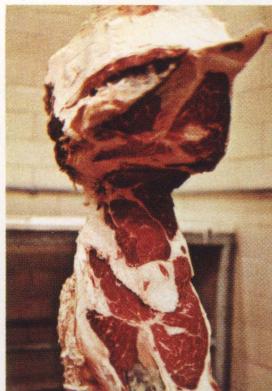


Fig. 9.

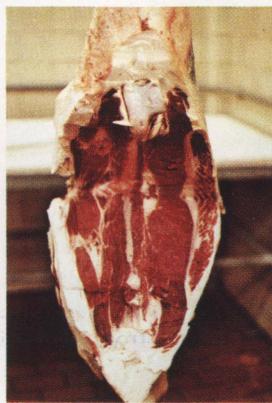


Fig. 10.

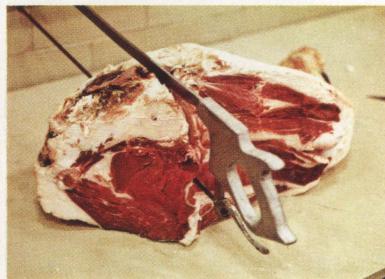


Fig. 11.

Fig. 6. Suspend the hindquarter in the normal manner.

Fig. 7. Remove flank by following curvature of round over its inside face exposing the lymph node and removing the flank at the tip of the 13th rib.

Fig. 8. Remove the loin from round by starting the cut parallel to the floor beneath the exposed lymph node and angling the cut slightly downward to contact the pelvic shaft 1 inch below the aitch bone.

Fig. 9. Extend the cut straight out separating loin from round by sawing through the caudal vertebra.

Fig. 10. Remove the knuckle starting the cut from stifle joint and exposing the femur to completely remove the knuckle.

Fig. 11. Separate the round and rump by cutting adjacent to the aitch bone at an angle that will result in a relatively square round. This cut should be perpendicular to the shaft of the femur so that the round steaks will be cut across the grain.

difference will depend upon the retail prices prevailing at the time the cutting test is being conducted.

Suspending carcasses by the aitch bone will not adversely affect the percentage of cuts obtainable from the hindquarter.

In this test a little more time was required to break the tenderstretch hindquarter; however, with repeated use of tenderstretched quarters this would be eliminated.

There will be some alteration of the positions of the bones in the sirloin but they are minor and, if a problem, perhaps should be removed.

## SUMMARY

Suspending carcasses by the aitch bone (Texas A&M Tenderstretch method) will improve the tenderness of muscles in the area of the round and in the ribeye. The tenderloin will be slightly less tender than in the normally suspended carcass.

There should be no difference in the percent yield of cuts from the tenderstretch method compared to regular suspension as shown by the cutting tests. Any differences should be in favor of the tenderstretched beef.