MECHANICAL TENDERIZATION OF MEAT IN THE HRI TRADE*

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In the years since World War II the Hotel, Restaurant and Institutional (HRI) trade has seen a series of ever quickening changes. With each passing year, fewer HRI houses age beef cuts in the traditionalist's manner, fewer hotels and restaurants portion their own steaks and many former purveyors are now distributors for portioned items produced in the specialized plants of others. The acceptance of frozen meats by the Food Service operator and improvements in transportation systems started this trend. The more recent development of the barrier bag to hold red meat items under vacuum brought fresh items into previously inaccessible markets. Today the HRI trade is increasingly one of boxed beef, fresh portioned items and specialized houses rather than full line producers. As the technology of packaging and distribution advanced, another technology, tenderization, also developed. One of the newer and widely applied advances in tenderization is the use of the blade tenderizer. Whether called "Jaccarding" needling, pinning or blade tenderizing, it has been estimated by one manufacturer that over 90% of all HRI houses now utilized this equipment.

Though now widely used, blade tenderization did not meet with immediate universal acceptance. Before a HRI house could utilize the technique, the food service operators it serviced had to be convinced that it was a workable and practical method. Many of the "white tablecloth" restaurants were immediately wary of products that were mechanically manipulated to improve tenderness. To these food service operators it was an admission that somehow they were serving a less desirable product if the meat was blade tenderized. The various claims of proponents of blade tenderization that eating qualities equivalent to the best table grades could be had by simply passing a less desirable grade through the treatment did nothing to reduce this emotional block.

Proponents also claimed more rapid and uniform cooking, new uses for less desirable and lower value cuts, more uniformity of tenderness by either dissapating connective tissue or shortening of muscle fibers, both leading to reducing resistence to shear force and/or mastication and swallowing. In a few instances, improvements in flavor and juiciness were claimed.

Resistance by food service operators also took other forms besides the emotional one previously mentioned. Higher cooking losses, loss of weight during processing and storage, loss of flavor and poor plate appearance were often mentioned by both food service operators and HRI houses.

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Formal research to either confirm or repute the claims pro and con started to appear in the literature in 1974. Huffman discussed most at Meat Industry Research Conference. My remarks will be directed to the areas of concern of the F. S. operator. To this point, work by the Nebraska, Alabama and Texas stations have found tenderness in various beef cuts, pork loins and lamb and goat legs and loins to be increased by blade tenderization. These data (table 1) represent some recent work on beef cuts done by the Texas station (Smith, 1975). They show a trend toward greater tenderness with repeated passes through a blade tenderizer for various good and choice cuts. As all cuts were not equally represented in all three of the good grade treatments, the magnitude of change is not as great for the 3X treatment but all were more tender than the controls. The choice cuts do, however, show the advancing tenderness pattern with repeated tenderization. Huffman (1975) has pointed out that blade tenderization is of little utility if the cut is already of desirable tenderness. For this reason, repeated tenderizing may not be economically desirable in some cases.

Table 1. Shear force values for blade-tenderized muscles from beef carcasses

U.S.D.A. Grade	Treatment	Effect	Change	
			Actual	Percent
Good	1X Tenderization	Decrease	1.7 lb	19.4%
	2X Tenderization	Decrease	2.1 lb	24.8%
	3X Tenderization	Decrease	1.6 lb	19.8%
Choice	1X Tenderization	Decrease	1.5 lb	16.6%
	2X Tenderization	Decrease	2.1 lb	24.2%
	3X Tenderization	Decrease	3.1 lb	33.7%

Regarding cooking losses, the results are somewhat mixed. Schwartz and Mandigo (1974) reporting no significant cooking losses due to blade tenderization of beef inside rounds. Similar results were reported for pork loins (Goldner and Mandigo, 1974) and lamb and goats cuts (Bowling et al., 1975). Davis et al. (1975) has reported a significant cooking loss due to blade tenderization of the USDA top good loins steaks. These data, (table 2) again represent work by the Texas Station, indicate increased losses for cuts from USDA Choice beef steaks when compared to control. Note that repetition in each instance did increase the cooking losses.

Table 2. Cooking losses for blade-tenderized muscles from beef carcasses

U.S.D.A. grade	Treatment	Effect	Change Actual	Change Percent
Good	1X Tenderization	None	0.0%	0.0%
	2X Tenderization	Decrease	0.8%	2.5%
	3X Tenderization	Increase	1.7%	4.9%
Choice	1X Tenderization	Increase	0.9%	2.7%
	2X Tenderization	Increase	2.3%	7.5%
	3X Tenderization	Increase	7.2%	23.6%

No adverse effect has been reported for flavor and juiciness in any of the available studies. Some Texas work does show a 1.6 to 2.1% increase in evaporative and purge losses for blade tenderized beef strip loins and inside rounds which were vacuum packaged and stored at 2°C for 14 days. To the food service operator, cooking shrink loss and storage evaporation and purge may be of little effect, if the factors of flavor and juiciness are not diminished and if cooking losses do not affect the significant parameter of plate coverage for portioned steaks.

As previously stated, a large segment of the HRI trade has embraced the technique of blade tenderization. It did so without the benefit of definitive studies to support the claims made for the technique. Most HRI houses used feedback from food service operators and recommendation of equipment manufacturers to determine what cuts and grades, how much and when blade tenderization should be used.

Based on this type of informal research many HRI purveyors and food service operators believe the major benefits or justifications for using blade tenderization fall into three primary categories. The first is the insurance of acceptable tenderness when utilizing cuts from the normal table grades. Because the current USDA grading standards do not precisely segregate carcasses, primal or sub-primal cuts into uniform tenderness groups, blade tenderization is valuable, even if a majority of the carcasses and thin cuts were acceptable without it. No restaurateur relishes the return of a steak that is not acceptable in tenderness and a possible dissatisfied customer. The blade tenderizer makes this possibility more remote.

The second benefit is that of more closely equalizing tenderness in portioned items which contain two or more muscles of differing tenderness. Good success has been reported in blade tenderizing short loins before their fabrication into T-bone and Porterhouse steaks, particularly in the lower grades where the L. dorsi may be significantly less tender and unacceptable when compared to the Psoas major. The

Sirloin Top Butt is also widely pinned to insure that the tenderness of the Biceps femoris is similar in acceptability to that of the Gluteus medius.

The third major factor in usage of blade tenderization is the upgrading of cuts and/or grades not previously utilized for steaking without enzymatic tenderization or other treatment. As blade tenderization is more easily controlled, can be more uniformly applied than enzyme dipping, and requires less floor space and clean-up, it has a distinct advantage. Items such as the beef chuck rolls and shoulder clods have found acceptance in some markets when blade tenderized and press formed and sliced. Utilization of steak cuts from manufacturing grade carcasses also have been enhanced and make them more desirable to family priced steakhouses and institutional facilities.

A brief discussion is in order, relating the application of blade tenderization to some of the cuts commonly fabricated by the HRI trade, starting with the sirloin top butt, the mainstay of most steakhouse operations menues. USDA Choice top butts are usually blade tenderized one time. Using the Bettcher TRII, this gives approximately 18 punctures per square inch. The military services also buy Choice top butt steaks as one of the components of their grill steak specification. The specification requires not less than 35 punctures per square inch per pass. Three passes are required. This is an extreme example of insurance of tenderness. USDA Good grade top butts are usually needled two or more times. Standard and commercial grades often receive three or more passes. One pass is usually sufficient.

Choice grade strips are often blade tenderized also. USDA Good and lower grades almost always are treated twice or more. Many houses also use multiple pinnings on the hip end of the choice strip to negate the heavy connective tissue between the L. dorsi and the G. medius. Generally this does not sufficiently disperse this tissue to give the same tenderness qualities found in the center cut strips. The excess tenderization to sufficiently disrupt this tissue would cause undesirable texture of surrounding muscle tissue.

Choice and good grade bottom butt cuts are usually blade tenderized twice or more before steaking. Round cuts, chuck rolls and clods also require multiple passes to be acceptable for steaks.

A few HRI operators will blade tenderize heavy good grade ribeyes for steaks and roasts. Cow ribeyes are almost always pinned if they are not enzymatically tenderized. Other cuts such as blade or lifter meat, knuckles and flanks are becoming more widely used thanks to blade tenderization.

In summary, the successful HRI purveyor has realized that only by providing products which meet the menu objectives of the food service operator and that will satisfy the desires of the consumer, will the HRI operator be assured of repeated sales. To meet this objective, the blade or needle tenderizer has been widely accepted as a tool in the HRI trade. At present, there is only a small body of scientific information to support claims made for this method or to explain its modes of operation. Practical experience has been favorable and its wide acceptance and continued usage will continue until other methods may be developed.

LITERATURE CITED

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Unidentified speaker: What percent of meat under today's inflated prices is being tenderized in the purveying industry?

S. G. Miller: My company tenderizes 97% of the choice top cuts, 100% of the good grades and 50% of the strip steaks.

Unidentified: What are some of the complaints or criticisms about blade tenderizing meat?

S. G. Miller: Many people are concerned about purge loss during shipment with fresh product. A few people are concerned with the appearance on the plate, particularly with those cuts which may be cooked to a well-done state. If you stay in the medium range, you do not notice the needle marks quite as much as you do in the well-done range. Most institutions stay away from needle or blade cut roast items, but they will take steaks that are blade cut.

Unidentified speaker: What does blade tenderization do to storage life of the meat?

S. G. Miller: It has been our experience that it does not have any effect on frozen meat. The storage life of fresh meat, packaged in a barrier bag, would probably be reduced 4 to 6 days.

Ron Rea, Armour: I would like to comment that retailers who have these blade tenderizers have found it is very difficult to control microbial problems inherent with these machines, at the store level, even though they have very acceptable sanitation procedures. They've also noticed some reduction in case life because of increased purge in the trays.

H. B. Hendricks, Nebraska: With that amount of increase in tenderness, what percent of the restaurants are decreasing the quality grade that they're purchasing?

S. G. Miller: I don't think this is governed by the amount of tenderness. It's more of an economic factor, when you start talking dollar differences between high good vs. choice grade. People who have blade tenderizers realize that tenderness is not a clearly defined line, dependent upon quality grade. The percentage of people utilizing the lower grades is quite small at this time. As the supplies of choice cattle decrease, perhaps we'll see more blade tenderization.

Reba Staggs, National Live Stock and Meat Board: In the work that we have done with the blade tenderized cuts using good and choice grades, we found that there was greater loss in juiciness. This was not only related to the degree of doneness, but also to the cooking method used. I think research should be directed toward comparing the effect of different kinds of equipment upon the cookery of these pretenderized cuts. I refer specifically to conventional ovens and HRI food preparations because it would be difficult for anyone to conclude that there is not an effect upon the juiciness and the cooking loss as well as the tenderness.

S. G. Miller: I concur whole-heartedly with your observations. The preparer of the meat probably has more to do with how the meat looks on the plate than the producer, feeder, the packing house and the purveyor.