UF-Gainesville Beef Cattle News Corner

Meat quality in beef cattle: is the marbling score the best indicator we can use?

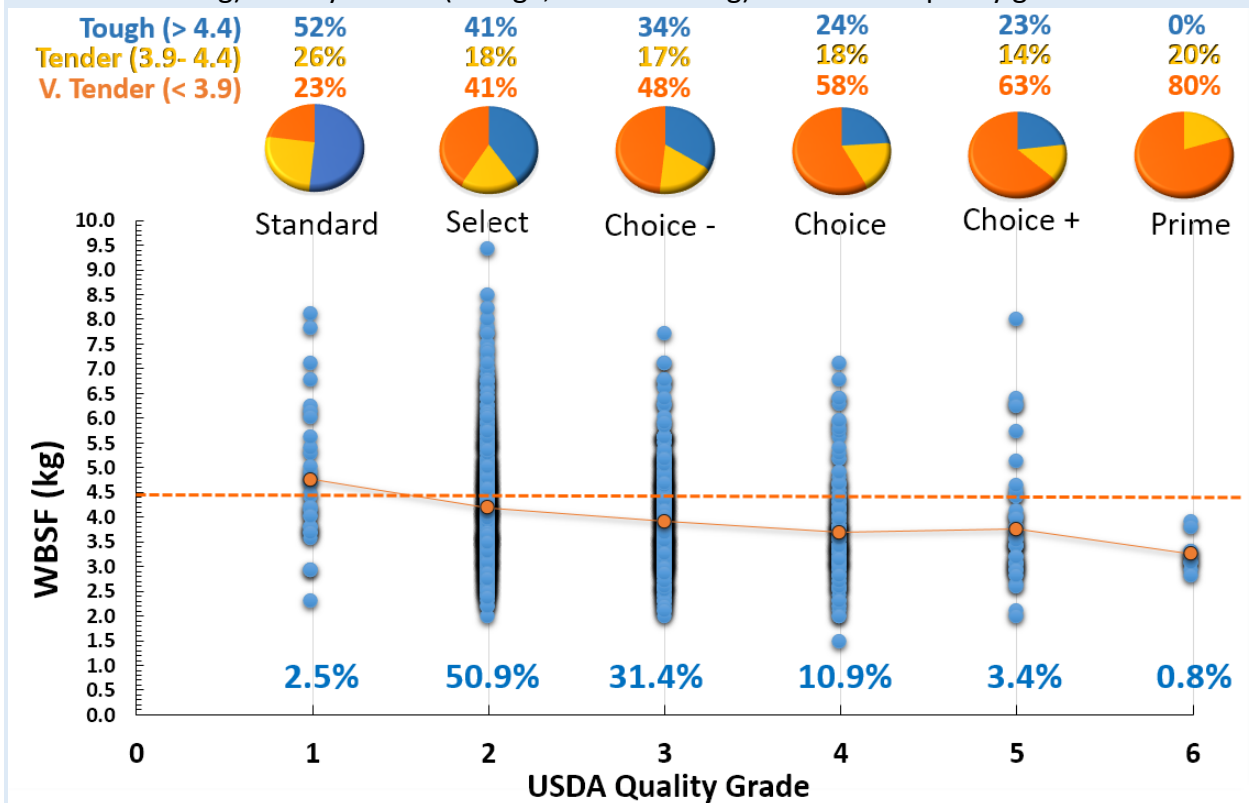**Raluca Mateescu,** Department of Animal Sciences, University of Florida

The strength shown by the high-quality branded beef market in the last few years confirms that a sizable proportion of consumers are willing to pay for assured quality, i.e., tender, flavorful, and juicy beef. This segment of consumers will continue to be important going forward and meeting and exceeding quality expectations will be needed to maintain or even increase their brand loyalty. Even more important for the future of the industry is expanding the consumer base. As the average income increases, new consumers will enter the beef market and the eating quality these new consumers experience will largely determine if they will continue to demand beef. Improving eating quality is critical to convince both habitual and new consumers of the superior value they are getting from the money spend on beef. Tenderness is the most important sensory attribute by which consumer judge beef quality and is a major focus in my research program.

The USDA grading system established in 1996 was designed to separate beef carcasses into groups with uniform quality. In the absence of any other system, the beef industry is using the USDA grading system based on marbling and maturity to determine premium and discounts and also as an indicator of palatability of the meat from a beef carcass and communicate it to the consumers. Although the USDA grading system has served the industry well, changes in consumers' preferences, limitations in the ability of the system to predict eating quality and limited consumer understanding of how the system works are some of the problems associated with using this system as indicator of palatability. By comparison, beef is an expensive animal protein and what sets it apart are distinctive sensory attributes, or high palatability. Programs to improve eating experience when consuming beef and the ability to better predict the eating quality level for marketing purposes are critical to increase consumers' confidence that quality expectations are met. If practices or traits that positively or negatively affect eating experience are identified, then the beef industry can develop management and genetic programs designed to address these issues.

To analyze the relationship between the USDA quality grade and the degree of tenderness, we used 1,253 animals from the Angus-Brahman multibreed herd (cattle spanning the range from 100% Angus to 100% Brahman) developed at the University of Florida Beef Research Unit. Phenotypic and pedigree records have been collected on these cattle as well as tissue samples for DNA analyses. The phenotype of interest for this project was tenderness assessed by Warner-Bratzler shear force (WBSF) and the USDA quality grade. The WBSF is an objective measure of tenderness and it measures the force required to shear a cooked steak (in kg) – the lower the number, the less force is required to shear the steak indicating a more tender product. The USDA - Agricultural Marketing Service is engaged in designing a tenderness standard for beef and in this program a product with a WBSF < 4.2 kg is considered tender and a product with WBSF < 3.7 kg is considered very tender. In our population, the average WBSF was 4.04 kg and using the USDA-AMS standard 32.5% of our animals would be considered tough, 21.4% are tender and 46.1% would qualify as very tender.

Based on the degree of marbling, cattle were classified as *Standard* (2.5%), *Select* (50.9%), *Choice-* (31.4%), *Choice* (0.9%), *Choice+* (3.4%) and *Prime* (0.8%). The chart in **Figure 1** shows the distribution of our cattle across these quality grades and their respective toughness/tenderness measured by WBSF. For example, 2.5% of the cattle graded *Standard,* and the tenderness of the animals in this group ranged from 2.3 kg to 8.1 kg.

Figure 1. Cattle (n = 1,253; from 100% Brahman to 100% Angus) classified USDA quality grade (1 = *Standard*, 6 = *Prime*) and WBSF (low WBSF = tender meat, high WBSF = tough meat). High level of variation in tenderness is present within each quality grade indicating that marbling accounts for just a small portion of the variation in tenderness. The orange dot in each quality grade is the average WBSF for that quality grade and the horizontal line represents the threshold for a steak to be considered tender (steaks below the threshold are tender and very tender steaks, steaks above the threshold would be qualified as tough). Circles in the top panel describe the distribution of steaks qualified as tough (blue, WBSF > 4.4 kg), tender (yellow, WBSF 3.9 - 4.4 kg) or very tender (orange, WBSF < 3.9 kg) within each quality grade.

There are three important points to take from this figure:

1. There is a lot of variation in the degree of tenderness within each quality grade. The average WBSF (orange dot) decreases from the *Standard* to the *Prime* quality grade, however steaks graded *Select* or *Choice* (the majority of our animals) varied from very tender to very tough. This highlights the limitation of the USDA grading system to predict eating quality or tenderness.

2. On the right side of the graph, for steaks graded higher (*Choice* and *Choice+*), about 24% are in fact "tough" based on WBSF. Consumers buying these steaks are paying a premium and they expect a high quality product, but 24% of the time they will end up with a tough steak and therefore a less then desirable eating experience. This in the long run will translate into decreased beef demand, and will have a negative effect on all sectors of the beef industry.

3. On the left side of the graph, 49% (26% + 23%) of the steaks which graded *Standard* are in fact tender or very tender. Consumers buying these steaks are paying a lower price and they end up with a very tender steak which will for sure translate into a positive eating experience. Although this is great from the consumer standpoint and will help increase beef demand, this is an opportunity loss for the producers as they are selling a high quality product for a lower (or even discounted) price.

Programs to improve eating experience when consuming beef and the ability to better predict the eating quality level for marketing purposes are critical to increase consumers' confidence that quality expectations are met. Collection of tenderness data on a routine basis is difficult and expensive because it requires collecting rib-steak samples, ageing, cooking, coring, and shearing steaks. This makes improving this trait through traditional selection more difficult and genomic selection appears the only practical route to make significant genetic improvement. Our research will generate genomic information which can be used to develop effective selection and management genomic tools and will offer the opportunity to change the economic position of the beef industry through improved demand for beef products.