

Title: Taste, Tenderness, and the Muscle Fiber

Agriscience Standards

STANDARD 9.0 ANALYZE ANIMAL SCIENCE PRINCIPLES

9.4 Explain basic anatomy and external parts of production animals

9.5 Apply principles of comparative anatomy and physiology to use within animal systems (e.g., circulatory, endocrine, immune, integumentary, musculoskeletal, nervous, reproductive, respiratory, and urinary)

STANDARD 10.0 DEMONSTRATE CONCEPTS OF ANIMAL MANAGEMENT

10.3 Differentiate between major wholesale/retail meat cuts of beef, pork, lamb, and poultry and compare the value of various meat cuts

10.5 Analyze the nutritional roles and needs of animals

10.6 Analyze feed rations to meet the nutritional needs of animals

10.8 Differentiate among animal selection, reproduction, breeding, and genetics

10.9 Demonstrate animal selection based on reproduction, breeding, and genetics

Culinary Arts Standards

STANDARD 8.0 PREPARE HOT FOODS

8.1 Identify and prepare various meats, seafood, and poultry

Student Learning Objectives

1. Identify and interpret how muscle fibers are made and how that effects the eating experience of beef.

Time: 30 minutes

Tools, Equipment and Supplies:

- Provided power point presentation
- Provided video (if needed)
- Pull-apart licorice, like *Twizzlers pull 'n' peel*
- Marshmallows
- Parchment paper (Precut sheets are easiest)
- Scissors

Resources:

- PowerPoint Presentation
- *Beef. It's What's for Dinner.* website cooking method section:
<https://www.beefitswhatsfordinner.com/cooking>

Vocabulary



Grading: After beef is inspected for wholesomeness, producers and processors may request to have it graded. Grading of beef is voluntary and a plant must pay for the service. The United States Department of Agriculture's (USDA) Agricultural Marketing Service is the agency responsible for grading beef. Grading for quality means evaluation of traits related to tenderness, juiciness, and flavor. USDA-graded beef sold at the retail level is Prime, Choice, and Select. Lower grades (Standard, Commercial, Utility, Cutter, and Canner) are mainly ground or used in processed meat products. The protein, vitamin, and mineral content of beef are similar regardless of the grade. Retail stores may use other terms different from USDA grades. Resources on [Beef Grades here](#).

Prime: USDA Prime has abundant marbling (flecks of fat within the lean) which enhances both flavor and juiciness.

Choice: USDA Choice has less marbling than Prime but is of very high quality.

Select: USDA Select is very uniform in quality and normally leaner than the higher grades. It is fairly tender, but, because it has less marbling, it may lack some of the juiciness and flavor of the higher grades.

Introduction:

Taste continues to be the number one reason consumers choose beef, so it's incredibly important that we understand what makes that taste so desirable. Taste is equal to eating satisfaction which is made up of palatability, tenderness, flavor, and juiciness. Beef farmers and ranchers as well as retail stores and restaurants must be committed to every beef eating experience being a great one so consumers continue to choose beef.

Eating experience is like a stool. There are three legs, tenderness, flavor, and juiciness, that hold it up. If one of those legs isn't present, the eating experience decreases in favorability. If more than one of these legs fails, the whole experience becomes a negative one.

As mentioned previously, this is something everyone who is involved in the beef production chain has to think about, including farmers and ranchers. There are many things which affect the eating quality and experience that must be looked at prior to harvesting the beef animal. Genetics play a pivotal role in the potential of how that animal will feed out and grade. Breeds such as Brahmans, Piedmontese, and Corrientes all have excellent genetic characteristics for things like maternal instinct and hardiness, but they do not typically marble and then grade as well as an Angus or Hereford.

Other pre-harvest factors that will influence eating experience include the diet of the animal. Most cattle begin their lives grazing on grass, but the next step in their lifecycle will help to determine the marbling, tenderness, and juiciness of the beef they produce. Feeding cattle a combination of forage, grains, and vitamins and minerals will generally produce a more marbled and tender beef animal, while maintaining an all-grass diet doesn't allow for much energy thus reducing the marbling and fat deposits that contribute to the taste many consumers are looking for. There is a place and market for grass-finished beef and cooking these beef products low and slow and with marinades or tenderizers. More on [grass- and grain-finished beef here](#).



Behavior, health status, and care are all contributing factors to how the beef produced by an animal will taste. Genetics can help contribute to an inherently calmer animal, but the care and handling of this also greatly effects the animal. Also, as most beef cattle are, caring for an animal properly ensures they can put all their energy to making beef. *If you'd like to learn more about animal care programs like Beef Quality Assurance, [visit here](#).*

Age is another factor. As an animal ages, their muscles become tougher meaning eating experience will go down.

There are many factors that influence the eating quality within the carcass such as marbling, cut properties, aging, packaging, and storage. Even as beef gets to the end user there are factors which will help someone to have a good eating experience. These factors include cut selection (size and type), cooking method and choosing the best method for the cut you choose, and finally the end point temperature.

Depending on where a cut of beef comes from on the animal will most often determine how it is cooked. More tender cuts are found towards the middle of the animal in the loin and rib areas. These cuts are generally cooked at a faster rate at higher temperatures and dry conditions. Cooking methods can range from grilling to pan frying and retail cut examples include sirloin and T-bone steaks. *For more information on cooking methods, [visit here](#).*

The properties of each muscle are what ultimately determine how a beef cut is cooked. Meat is made up of muscle tissue, fat, and connective tissue with the myofibril making up the muscle. The proportion of each is going to determine the eating quality. For example, a cut with greater connective tissue like a chuck roast will be best when cooked low and slow to allow the cut to become more tender.

Slide 13 in the presentation: Left are [Tenderloin Steaks](#) to talk about marbling, tenderness, and the opportunity to do a hotter faster cooking method (grilling).

On the right are [Eye of Round](#) steaks to talk about larger muscle fibers, greater connective tissue, and less fat with the discussion being around what makes it not as grill friendly and the need to add moisture when cooking.

Summary of Content and Teaching Strategies

Bell work question: What is the number one reason consumers choose beef?

Interest Approach: What causes you to have a good or bad eating experience? Encourage the students to think outside the box. Write it down and then have students share with the class before starting the PowerPoint presentation.

PowerPoint Presentation – Taste, Tenderness, and the Muscle Fiber: This presentation is a slide show. Please review the presentation before using it so you are familiar with the content.



Build Your Own Muscle Fiber: Students are asked to create a muscle fiber using the provided materials listed: pull-apart licorice, like Twizzlers pull 'n' peel, marshmallows, and parchment paper. The licorice represents the muscle, the marshmallows are the fat, and the parchment paper is the connective tissue. Each student or group is given enough of each supply to make one muscle fiber. They can choose to include as much fat, muscle or connective tissue as they like. Once the muscle fiber is complete, the fiber can be cut in half to show the composition of the fiber. Ask students to share if their muscle fiber is tender or tough and what would be a good cooking method for it to show their understanding of how muscle fibers are constructed and how they affect the eating experience.

Extension: Purchase two different cuts of beef, one which is tender (sirloin, strip, etc.) and tougher cut (round, shoulder, etc.). Salt and pepper each steak the same and then cook using the same cooking method (pan frying or grilling works well). Then ask students to observe similarities and differences between the two cuts including how they look, smell, feel, taste. Discuss as a class.

Lesson Conclusion

Have students revisit the activity from the lesson's interest approach where they discussed what causes a good or bad eating experience. Now have them give examples of ways beef and how it's raised can cause a good or bad eating experience.

In the margin of their note sheet, students can answer one or all of these questions:

1. List something new you learned.
2. Write one question you still have.
3. Describe something you still don't understand.
4. List one thing you plan on sharing with a friend or family member.