



END PRODUCTS



The Process of Aging Beef

Hannah Devall, Instructor, Agriculture Awareness/Literacy and Animal Science

Overview

Aging beef refers to the process of storing meat under refrigerated conditions after slaughter, not the age of the animal itself. This controlled storage period allows natural changes to occur in the meat, improving both tenderness and flavor.

Lactic Acid and Muscle Chemistry

In living animals, lactic acid produced during anaerobic (without oxygen) metabolism is removed via the circulatory system. After slaughter, this system is no longer functional, so lactic acid accumulates in the muscle until glycogen (a form of stored energy) reserves are depleted. This buildup contributes to the postmortem changes such as decreased tenderness or change in meat color that overall influence meat quality.

Postslaughter Changes in Muscle

Once an animal is harvested, one of the first major changes is the onset of rigor mortis, a process where muscles contract and stiffen. Initially, muscle tissue is quite tender, but as rigor mortis progresses, typically over six to 12 hours in beef, the meat becomes firmer.

To prevent spoilage, carcasses are chilled immediately. However, cooling too quickly can cause cold shortening of muscle fibers, which results in tougher meat. This happens when muscle temperature drops below 60 F before rigor mortis is complete. If the meat is frozen prematurely, thaw rigor can occur, leading to extreme toughness. Neither cold shortening nor thaw rigor can be reversed through aging, so it's important to avoid rapid chilling, especially in home-processed animals.

The Aging Process

Once rigor mortis is complete, beef begins to naturally tenderize during storage. This period, known as aging, can occur with whole carcasses, vacuum-packaged subprimals, or retail cuts kept in refrigeration. The tenderization is driven by enzymes within the muscle that break down structural proteins.

Beef held at around 35 F will continue to tenderize for approximately seven to 10 days. While higher temperatures can accelerate this process, they also increase the risk of spoilage and undesirable flavors.

Impact on Meat Quality

The transformation from muscle to meat affects several quality traits, including tenderness, juiciness, flavor and color. Processing characteristics, such as water retention, binding ability and cooking performance, are also influenced. These postmortem changes vary widely and can be managed to improve the final product.

Tenderness is at its lowest when rigor mortis is fully developed but improves significantly during the early stages of aging, especially within the first 72 hours. The rate of tenderization slows over time and is influenced by factors such as temperature, electrical stimulation and genetic differences among animals. Much of the aging process occurs while meat is being transported from processing facilities to retailers or food service providers.

Types of Beef Aging

There are two primary methods for aging beef: wet aging and dry aging.

Wet aging involves sealing meat in vacuum-packed bags and storing it at refrigerated temperatures (32 F to 34 F) for up to three weeks, although some processors may age for longer periods. This method, introduced in the 1970s, is now the industry standard due to its efficiency and cost-effectiveness. Wet aging helps preserve moisture, reduce weight loss and extend shelf life without compromising tenderness. However, flavor outcomes can vary. While wet aging typically produces a traditional beef taste,

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Dry aging beef carcasses. Photo provided by the LSU Meat Science Laboratory

some cuts may develop metallic, sour or “serumy” notes, which are generally considered undesirable.

Dry aging is a more specialized process where beef is stored uncovered in a temperature-controlled environment (32 F to 34 F) with regulated humidity and airflow for up to four weeks, though it is becoming increasingly popular to age cuts for longer periods. This method enhances flavor complexity, producing a distinctive profile described as brown-roasted, nutty, buttery and brothy. Dry aging can be done using whole carcasses or individual subprimal cuts. Although it delivers superior flavor and tenderness, it also involves higher costs due to moisture loss, trimming requirements and longer storage times.

Consumer Preferences

Taste, aroma, juiciness and especially tenderness are key factors consumers use to judge beef quality. Research shows that nearly 95% of consumers prioritize tenderness above all other traits, followed by flavor and juiciness. While dry aging may offer a premium eating experience, wet aging remains the dominant method due to its practicality and affordability[AE1.1].



Wet aging beef strip steaks in a vacuum sealed bag. Photo by Hannah Devall

Summary

Overall, the aging process plays a vital role in transforming beef from freshly harvested muscle into a tender, flavorful product that meets consumer expectations. By understanding how postmortem changes occur, as well as how factors like temperature management, rigor mortis and enzymatic activity influence tenderness, producers and processors can ensure high quality results. Whether beef is wet aged or dry aged, each method offers distinct advantages that contribute to the texture and flavor consumers enjoy, with tenderness consistently ranking as the most important quality trait. Careful handling throughout the aging period helps maximize eating satisfaction and supports the continued production of safe, flavorful and desirable beef products.

Sources

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