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The Steer's Last Sigh

How does meat come to taste the way it does?

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THE INSTANT A STEER IS SHOT and hoisted up on the butcher's hook, a new era of life begins inside the animal. As light and heat emit from a dying star, as King Kong reached his iconic height in his last moments, so does meat's taste begin to peak with the denouement of every cell.

"Once the animal is harvested, the chemistry in the muscle doesn't stop," says Dr. Davey Griffin, of Texas A&M. "A lot of the processes are happening just as if the animal was alive, but it's just not replenished. Some of it we know some things about and some of it we don't know about, honestly."

We do know that a carcass consists of muscle, fat, and bone. The muscle — the matter of concern to a carnivore — is 70 percent water, 19 percent protein, with the final one percent a combination of inner-muscular fat, minerals, and non-protein nitrogen. But aging, the process that makes meat taste like, well, meat, will change these ratios, depending on how, and where, it's done.

Within three hours of the steer's last sigh, rigor mortis begins to stiffen the muscle. The sarcomeres (the smallest known units of muscle contraction) shorten, toughening the meat. With the onset of rigor mortis, enzymes naturally present in the muscle begin to degrade the protein, which tenderize the meat. Within the sarcomeres are two proteins: myosin and actin. As meat ages, the proteins undergo proteolytic degradation, breaking down into peptides or amino acids, which are savory. Glycogen, a sugar that provides muscle energy during life, becomes glucose, which is sweet. Another energy provider, ATP, becomes a savory called ITP. Fats become fatty acids, which are aromatic. What is tough or tasteless in life transforms naturally after death into something tender, savory, and sweet.

"As scientists, we know much more about the chemistry of beef tenderness than we do about flavor," says Dr. Chris Calkins of the University of Nebraska. "It's generally accepted that the flavors come from oxidation of fats." But where science falls short, technique steps in. Over the centuries, humans have refined ways to hone the aging process, and improve taste.

AGING GRACEFULLY

Dry aging is the traditional method. Carcasses are left to hang intact or in primal cuts in the butcher's cooler for up to a month. During dry aging, about five percent of moisture and 18 percent of weight disappear, which is one reason dry-aged meat costs more: You're paying for what the butcher bought *before* the dry aging process began, as well as for technology, storage facilities, and time. But there's a tradeoff: As moisture content drops, flavor concentration rises. Climate is vital. If the humidity's too low, the meat will dry faster than these flavors can develop. At just the right humidity, taste blossoms. Flavors are more concentrated toward the surface, where more dehydration has taken place, while the moister, softer flesh within is more mild.

> ***Wet or dry, the art of aging seems to be in finding the best way to allow biology to simply unfold naturally.***

Meanwhile, a wide array of flavor-active volatiles, like acids, alcohols, and aromatic compounds develop. They're responsible for beef's distinct flavor and its caramelized aroma. A Kansas State University study revealed that dry aging intensifies two flavors. Dr. R. E. Campbell and his colleagues found that at least two

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weeks of aging increased both a full-on beef flavor, and a brown, caramelized aroma. Dry-aged prime steaks have less moisture, more protein, and a richer, more complex flavor than wet-aged prime steaks. Wet-aged prime steaks have more fat. In effect, dry-aging affects flavor like a reduction sauce, while wet-aging is more like a crock pot stew.

Rich, caramelized flavor is prized by those who enjoy dry-aged meat, but not all consumers crave them. Decades of wet-aged meat have accustomed the American palate to a slightly different set of tastes.

For the most part, wet aging is a byproduct of shipping and convenience. Meat is vacuum-wrapped, so it loses no moisture at all. Basking in its own fluids and kept just above freezing, wet-aged meat can land in the market any time from two to 50 days after it was cut.

Unlike dry aging, which can rely on elaborate measures to stay sanitary, such as bathing the meat in ultraviolet light, wet aging requires far less hassle: Packed in its sealed environment, wet-aged meat is walled off from anything that might affect its taste or safety. Of course, not all bacteria is bad — in fact without it, there would be no aging process at all. But wet aged meat relies on a different set of bacteria than dry. Wet aging uses anaerobic bacteria, which don't need air. Dry aging involves aerobic bacteria, which do.

Whether Americans prefer mild or strongly flavored meat, they all want tenderness, which wet- and dry aging provide in equal measure. Tenderness isn't only a matter of human perception; it can be measured scientifically with something called Warner-Bratzler shear force values. These values rate, in pounds or kilograms, how much pressure is required to cut a half-inch core of meat.

So what tastes better? Griffin says most consumers can barely tell the difference. Those who know meat, however, know what they're biting into. "We do seminars for chefs sometimes, with blind taste tests, and the chefs will almost always pick the dry-aged steaks," Griffin says. "They prefer the nuttier, the more intense taste. They'll pick that almost every time. But their palates are more refined, and consumers are more used to putting a lot of seasonings on [their meat]."

Much of the tenderness and flavor of meat comes from the cellular exhalations of life over the course of a month or so. Human interference is a surprisingly small part of the process. Wet or dry, the art of aging seems to be in finding the best way to allow biology to simply unfold naturally.