CHAPTER ONE

BEEF BASICS: FACTS AND FUNDAMENTALS

Welcome to your personal crash course in beef. Get ready to learn everything from simple definitions and types of beef to the grading system and carcass separation process—complete with illustrations. Don't worry, there is no final exam!

According to the U.S. Department of Agriculture (USDA), there are about 800,000 beef producers in this country, located in all 50 states. The common goal is to supply high-quality, safe, nutritious, and flavorful meat products for meals served around the world.

Although beef is the most popular protein among American consumers, the industry is always researching and testing new ways to meet the growing needs of today's consumers and foodservice operators. Just by reading this book, you are a part of this effort and have the opportunity to make a difference.

Whether you are a trained butcher or meat professional, a chef, or an interested foodie, I think you will find this information to be a great review and maybe even enlightening. In any case, let's begin.

OPPOSITE
Cattle grazing

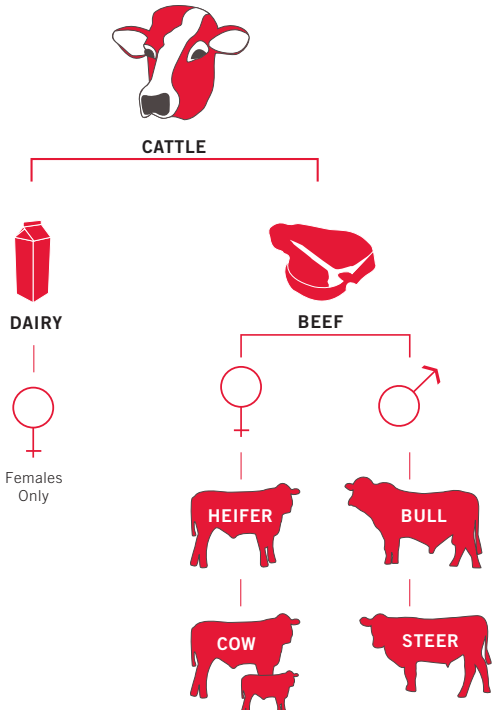
Kari's Quick Tips

Check the Country of Origin Label (COOL) if you are not sure of the origin of the beef you are purchasing or if your customers have questions.

THE SOURCE OF BEEF

Beef is one of the principal meats used in U.S. cuisine and is also a staple meat in Australia, Europe, South and North America, Africa, and Asia.

The word "beef" is the culinary term for meat derived from full-grown bovines, mainly cattle. Cattle are a group of bovines regardless of sex and age. Typically, there are two categories of cattle: beef cattle and dairy cattle. Cattle raised for human consumption are called beef cattle, while dairy cattle are raised for milk and dairy. Only females are kept in production and used as dairy cows. Males cannot produce milk and are sold as calves for veal or beef.



A COW IS A COW. OR IS IT?

Terms such as "cow" and "bull" or other words are often used interchangeably, but the differences are significant. When a cattle herd produces offspring or calves, they are either female or male.

The male calves fall into two categories: bulls and steers. Calves with superior genetics are selected for breed stock, are not castrated, and are classified as bulls. Usually, there is only one bull per herd so selecting the right genetics is extremely important in beef and dairy production.

A steer is a male calf that was not selected for genetics. This steer will be castrated at birth and enter the beef production cycle.

A heifer is a female calf that is typically 2½ years old and has not been bred. Heifers, like bulls, are selected for their genetics and breeding stock. Once a heifer becomes a new mom, she is referred to as a "cow," and can then be selected to enter the beef production cycle.

CARING FOR CATTLE

Most cattle are raised on family farms, grazing on pastures, range acreage, or in fields after crop harvest. These farms or ranches are referred to as either "cow-calf" producers or "seed-stock" producers. They both raise cows and calves for breeding stock or to sell to other cattle producers who need younger cows or calves to send to pasture. Cow-calf producers may have crossbreeds in the herd based on the ease of calving or tradition. Seed-stock producers raise purebred or registered cattle for branded or specialized beef programs.

In general, cow-calf producers sell cattle to stockers, producers looking to place light, weaned yearling calves on pasture. The cattle will remain on pasture, often moving to new pastures to sustain the proper nutritional value of the forage and refresh the fields. The herd grazes until each cow weighs approximately 750 to 900 pounds. They are then either sold to enter the food chain or sold to "feeders" where cattle are moved into custom feedlots or finishing yards.

FINISHING OPTIONS

Most cattle are finished on grains, mainly corn. This high-carbohydrate diet increases marbling and palatability. Beef from the United States is preferred around the world because of this marbling and the resulting great taste. We set the standard in high-quality beef.

Cattle feed is specially designed to meet the nutritional needs of cattle. There are at least 17 minerals that beef cattle need in their diet, most of which can be found in forage. Vitamin and mineral supplements are used for grain-finished cattle, as well as grass-finished cattle to ensure that nutritional needs are met. This process usually takes place in a feedlot and is referred to as grain-fed or grain-finished.

Some cattle remain grass-fed on pastures until harvest and are not grain-finished. This is considered "grass-fed" beef. In the United States, it is extremely expensive to hold the cow on open pastures for a long period of time. Land is expensive, and large areas of open pasture are hard to support. Therefore, a majority of the grass-fed beef in the United States is imported from Uruguay, Brazil, New Zealand, or Australia.

When the cattle reach the desired weight or age (30 months of age or less), they go to a packing house or meat packer for harvesting. A live bovine weighs about 1,000 pounds and yields approximately 450 pounds of edible meat. In this stage, cattle are processed into smaller manageable sections such as primals and subprimals for further processing.

CHARACTERIZING BEEF CATTLE BREEDS*

There are at least 50 breeds of beef cattle, but fewer than 10 make up most cattle produced. The most popular breeds of beef cattle in the United States and Canada originated in Europe.

British breeds

Angus (Black and Red), Hereford (Horned and Polled), and Shorthorn are the primary British breeds. They were brought to the United States in the late 1700s through the late 1800s. British breeds are generally smaller than Continental European breeds in mature size, reach mature size at an earlier age, have less growth potential, excel in fertility and calving ease, and attain higher-quality grades.

Continental European breeds

Considered "exotic" breeds, the Continental European cattle include Charolais, Chianina, Gelbvieh, Limousin, Maine Anjou, Salers, and Simmental. These are relatively new breeds to the United States, arriving in the late 1960s and early 1970s primarily to improve the growth rate and leanness of existing breeds. Continental European breeds are generally larger than British breeds in mature size, reach mature size at a later age, produce carcasses with less fat, have lower-quality grades, and have more calving difficulty when mated to the British breeds.

* SOURCE: *Beef Cattle Breeds and Biological Types*, Author: Scott P. Greiner, Extension Animal Scientist; Virginia Tech. Publication Number 400-803, Posted November 2002

Did you know…

Polled cattle are those that are born without any buds that grow into horns. Instead they have a knobby area in the middle of their head called a poll, which is why hornless cattle are called "polled."

TYPES OF BEEF

Beef is marketed in several different categories ranging from conventional to kosher. According to Cattle-FAX, a cattle marketing information service, about 85 percent of all U.S. beef is grain-finished.

Conventional beef	The majority of beef sold in the United States is conventional beef. In this program, the cattle are grass-fed on pastures and finished on a corn-and-grain diet. The cattle are given the required vaccinations, as well as antibiotics when sick, and may have been given growth hormones. Although cattle producers are raising fewer cattle, beef production has increased. Due to modern management practices and advancements in technology, the beef production system in the United States is highly efficient.
Branded or breed-specific	Branded beef is generated from cattle that have been raised with clear specifications from the the brand company and carries a specific brand name on the label. Size and age are just two criteria. Breed-specific beef is generated from specific breeds. Breed-specific cattle may also have brand specifications to differentiate themselves from the same breed competitors. Examples of breed cattle are Angus, Hereford, and Wagyu, to name a few. Check with your suppliers on the details of the brand specifications or breed you are purchasing.
Natural beef	All fresh meat qualifies as natural. The USDA defines “natural beef” as a product that contains no artificial ingredients or added colors and is only minimally processed, a process that does not fundamentally alter the raw product. The label must explain the use of the term “natural” (such as “no added colorings or artificial ingredients”; “minimally processed”). Natural beef comes from cattle that have been raised on conventional pastures and are given vaccinations at birth (similar to the vaccines we give our own children). Feeding cattle organic corn or grains is not required. Antibiotics and hormones usage varies and is categorized as: **Never received:** The animal was given the required vaccinations but never received antibiotics or growth promotants. When purchasing, look for a never-ever statement on the label or a “certified no antibiotics, no added hormones” statement. **Withdrawal program:** Some beef programs advertise that their cattle do not receive antibiotics or growth hormones/implants within 100 days of harvest. This is considered a withdrawal program. Consumers can look for label statements such “Cattle do not receive antibiotics or growth hormones within 100 days of harvest.”

Grass-fed beef or pasture-raised	Grass-fed beef is beef harvested from grass-fed cattle that have only been allowed to nourish on their mothers' milk or forage on fresh grass or grass-style hay. Pasture-raised cattle are raised in a more traditional method and are allowed to roam on high-quality grass and forage.
Organic beef	The Organic Foods Production Act (OFPA) and the National Organic Program (NOP) assure consumers that the organic agricultural products they purchase are produced, processed, and certified to consistent national organic standards. The labeling requirements of the NOP apply to raw, fresh products and processed products that contain organic agricultural ingredients. Agricultural products that are sold, labeled, or represented as organic must be produced and processed in accordance with NOP standards. Except for operations whose gross income from organic sales totals $5,000 or less, farm and processing operations that grow and process organic agricultural products must be certified by USDA-accredited certifying agents. Certified organic beef is generated from cattle that have been raised on pastures without pesticides. The cows must be fed grain from crops that have been properly rotated, have not used pesticides, and are considered 100% organic. Since there are a limited number of pastures that meet these criteria, organic beef is more expensive. These particular cows are not allowed to receive an injection of any kind, antibiotics, or hormones to promote growth. If the animal becomes sick, it is given antibiotics (just like you when you become sick) but is removed from the herd and placed into the conventional beef program.*
Kosher beef	Kosher is a Hebrew word meaning "fit and proper" or "properly prepared." With regard to beef, kosher means that the beef is processed under the supervision of a rabbi but still must meet the requirements for federal and state meat inspection. According to kosher standards, only cuts from the forequarter can be eaten. When all criteria are met, the Kosher Triangle can be affixed to the product.
Halal beef	Halal is an Arabic word meaning "lawful" or "allowed" in accordance with Islamic law. This beef must be processed by butchers who follow strict Islamic guidelines in a ritual called "Zabiha" where animals are blessed with the name of Allah. Only a respected Muslim can perform this ritual. To meet Islamic guidelines, animals must be healthy at time of harvest. All requirements for federal and state meat inspection must still be met. "Halal" or "Zabiha Halal" labels must be handled according to Islamic law under Islamic authority.

* SOURCE: "Pre-harvest cattle management practices enhance beef tenderness" by Bridget Baird, Associate Director, Product Enhancement Research — NCBA, July/August 2006

BEEF INSPECTION PROCESS

To ensure quality, the Food Safety and Inspection Service, or FSIS, part of the U.S. Department of Agriculture (USDA), requires meat inspection for all beef sold at foodservice and retail levels. These programs are funded by U.S. taxpayers; therefore, the cost of inspection is not included in the cost of meat purchased. Since the USDA is responsible for regulating the safety and development of food and agriculture, cattle and their carcasses are examined for wholesomeness before, during, and after the harvesting process by an in-plant USDA inspector.

USDA-inspected beef is stamped with an inspection symbol along with an establishment number that tells the purchaser what plant or facility processed or produced the beef.

THE GRADING SYSTEM

Many of your customers have probably asked, "Does the grade of meat affect the taste? What's a select cut?" This information will arm you with clear, concise answers. The grading system comes from the standards set by the USDA. It is a voluntary system paid for by the beef industry or packers.

During processing, USDA inspectors analyze the carcass between the 12th and 13th ribs, where the ribeye has been exposed. The ribeye is then evaluated for its kernel fat, intramuscular fat, and the age or maturity of the animal. Marbling is white flecks and strips of fat within the meat. The greater the amount of marbling in beef, the higher the grade because marbling makes beef more tender, flavorful, and juicy.

U.S. Quality Grades
Ranked from highest to lowest

1	Prime
2	Choice
3	Select
4	Standard
5	Commercial
6	Utility
7	Cutter
8	Canner

Because the chronological age is virtually never known, physiological maturity is used. Indicators of "age" are bone characteristics, ossification of cartilage, color, and texture of ribeye muscle.* Desirable ribeyes will display an adequate amount of marbling. The ribeye will be firm with fine muscle texture, and the lean, a bright-cherry red.*

Grades are used by marketers to predict palatability. It isn't easy to anticipate Mother Nature, but this system is as close as we can get. There are eight distinct grades of beef recognized by the USDA. Studies show that only the top three grades are preferred by consumers. Most beef offered for sale in grocery stores and markets is graded choice or select. Prime beef is sold to upscale restaurants and high-end butcher shops.

BEEF YIELD GRADE

Yield grades estimate the amount of boneless, closely trimmed cuts that can be generated from the high-value parts of the carcass—the round, loin, rib, and chuck. Meat graders assign a yield grade to a carcass by evaluating:

- the amount of external fat
- the hot carcass weight
- the amount of kidney, pelvic, and heart fat
- the area of the ribeye muscle

There are five yield grades: 1 is the leanest and 5 represents higher fat coverage or a lower cut yield factor. Typically primals and subprimals are stamped with the yield grade.

* SOURCE: Department of Animal Science, Texas Agricultural Extension Service

TOP THREE USDA GRADES

There are eight degrees of marbling within the top three USDA-quality grades.

USDA PRIME

Prime

This grade is the highest in intramuscular fat and is known for tenderness and juiciness. Currently, only 3% of the steaks sold are USDA-certified prime.

Degree of marbling

- very abundant
- abundant
- moderately abundant
- slightly abundant

USDA CHOICE

Choice

This is the most popular grade of beef, typically sold at retail and in the foodservice marketplace. It contains moderate to small marbling, which adds to good taste and tenderness, but it costs less than prime.

Degree of marbling

- moderate
- modest
- small

USDA SELECT

Select

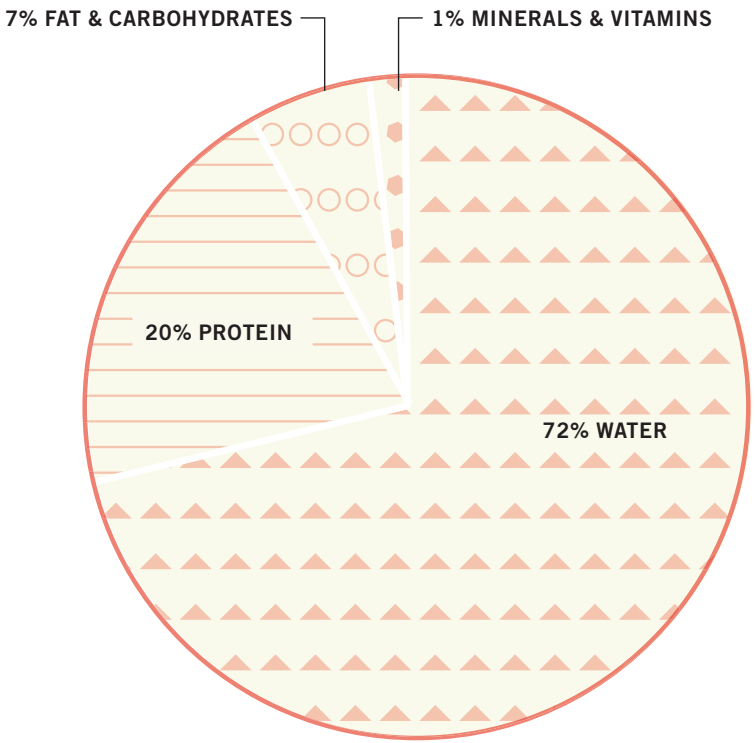
These cuts of beef have the least marbling of the three, making this grade leaner, but often not as tender or flavorful as the other two grades. About a third of beef graded falls into this category.

Degree of marbling

- slight

RAW BEEF COMPOSITION

A carcass is made up of muscle, fat, bone, and connective tissue. Beef usually refers to the muscle tissue and is made up of water, protein, lipids (fat), carbohydrates, minerals, and vitamins. Specifically, beef is composed of:



There are three types of meat proteins found in beef:

1 Myofibrilla proteins

These include actin and myosin, the most abundant muscle proteins. They are important for muscle fiber structure and the relaxing and contracting of muscle.

2 Stromal proteins

Also known as connective tissues, these appear in muscle as collagen, elastin, and in much smaller amounts, reticulin.

Collagen: This white, thin, and transparent material is tough and has a major impact on muscle tenderness after cooking since it does not break down easily. Collagen needs moist-heat cooking methods to convert it to a tender gelatin or should be removed if using dry-heat cooking methods.

Elastin: This yellow connective tissue cannot be broken down with any amount of heat and should be removed prior to cooking.

3 Sarcoplasmic proteins

Also known as water-soluble proteins, these include hemoglobin and myoglobin, which contain pigments that give beef its red color. They contain a variety of enzymes that contribute to the aging process.

There are three types of fat found in beef:

1 External or subcutaneous fat

This fat covers the outside of the carcass, just beneath the skin.

2 Seam or intermuscular fat

The fat running between muscles is seam or intermuscular fat.

3 Intramuscular fat

Also referred to as marbling. Marbling, or the visible flecks of fat within muscles, is directly related to the palatability, flavor, and juiciness of cooked beef. Choice and prime grades of beef taste best thanks to their greater marbling.

TYPES OF AGING

Beef is aged to develop additional tenderness and flavor. It is done commercially under controlled temperatures and humidity. Since aging can take from 10 days to four weeks, the USDA does not recommend aging beef in a home refrigerator. There are two types of aging:

Dry aging

This refers to the longer storage of carcasses or beef wholesale primal and subprimal cuts at refrigerated temperatures with no protective packaging. It is critical with dry aging to carefully control refrigeration conditions to minimize microbial growth and dehydration losses. Aging in a refrigerated room at 32°F to 34°F (0° to 1°C) and 80% relative humidity, with air velocity/air movement of 0.5 to 2.5 m/sec, is typical. Dry aging under these conditions is sometimes continued for 21 to 28 days and may impart a distinct aged flavor considered desirable by some consumers.

Dry-aged beef is more expensive because the primals or subprimals have been exposed to air in a humidity-controlled environment. Since beef is 72% water, the meat basically evaporates. This loss of water in the composition of the muscle increases the flavor of beef and makes it more intense. Some refer to the taste of aged beef as being "nutty." The meat cutter will have to remove the dark and possibly moldy portions to generate visually appealing cuts. This trim loss also increases the cost of the steak or cut. But the distinctive taste does deserve a higher price and has a high perceived value by consumers.

Wet aging

This refers to storage at refrigerated temperatures in a sealed vacuum package—"in the bag." While relative humidity and air movement are not factors with wet aging, strict temperature control is important and should be maintained at 32°F to 34°F.

All beef benefits from wet aging, especially lower grades such as select, which do not have as much intramuscular fat or marbling. I recommend aging all beef a minimum of 14 days and a maximum of 28 days.

Wet aging is cheaper because you do not have to control or maintain humidity levels, which often requires a special aging cooler. In wet aging, the primals or subprimals lose water while resting in the bag. After the product has been aged, you will experience moisture loss referred to as "purge." Expect an "off" or gassy smell when opening the bag (it should not smell rancid or sour). This is perfectly normal from the natural decaying process.

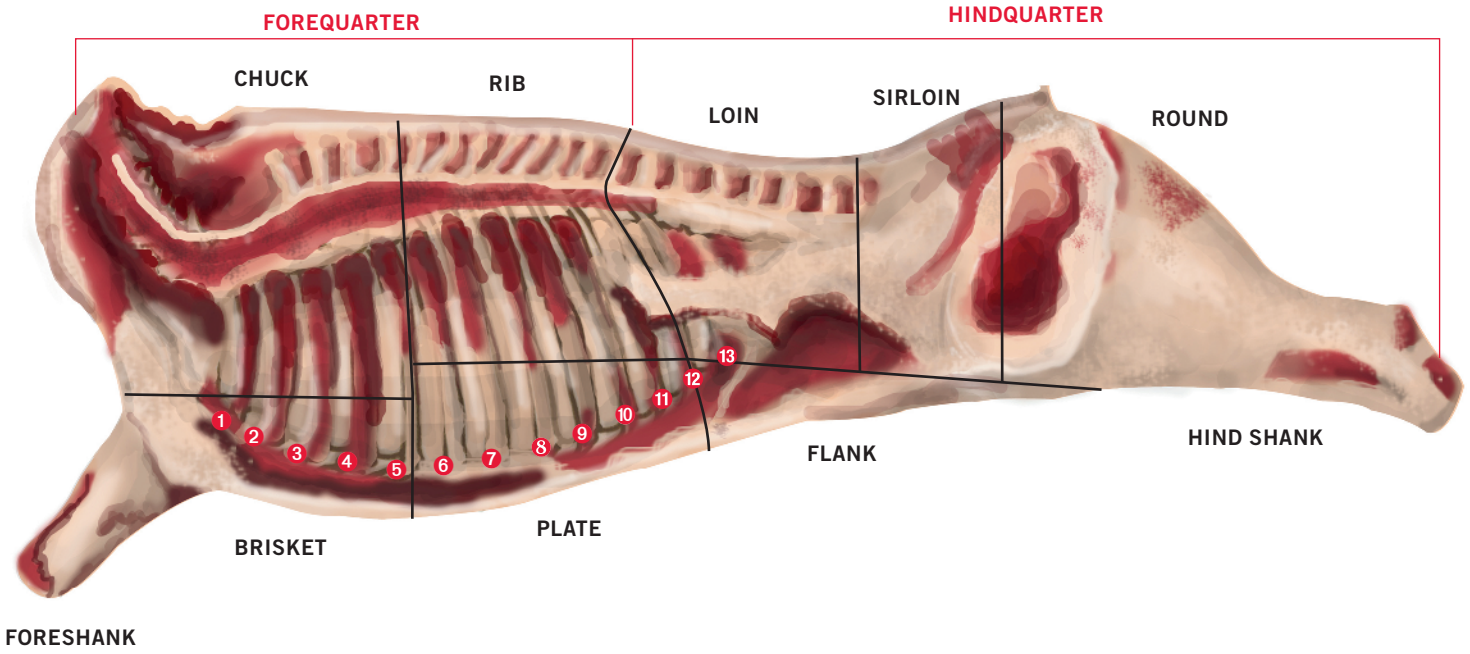
Wet and dry aging methods have the same effect on tenderness. Wet aging is the typical method of aging beef today. Aging beyond 28 days has little benefit in enhancing beef palatability, and in dry-aged products, it may be detrimental because microbial growth and dehydration losses increase. Aging can be affected by individual muscle and by USDA-quality grade.

Beef in dry-aging process

FROM CARCASS TO CUT

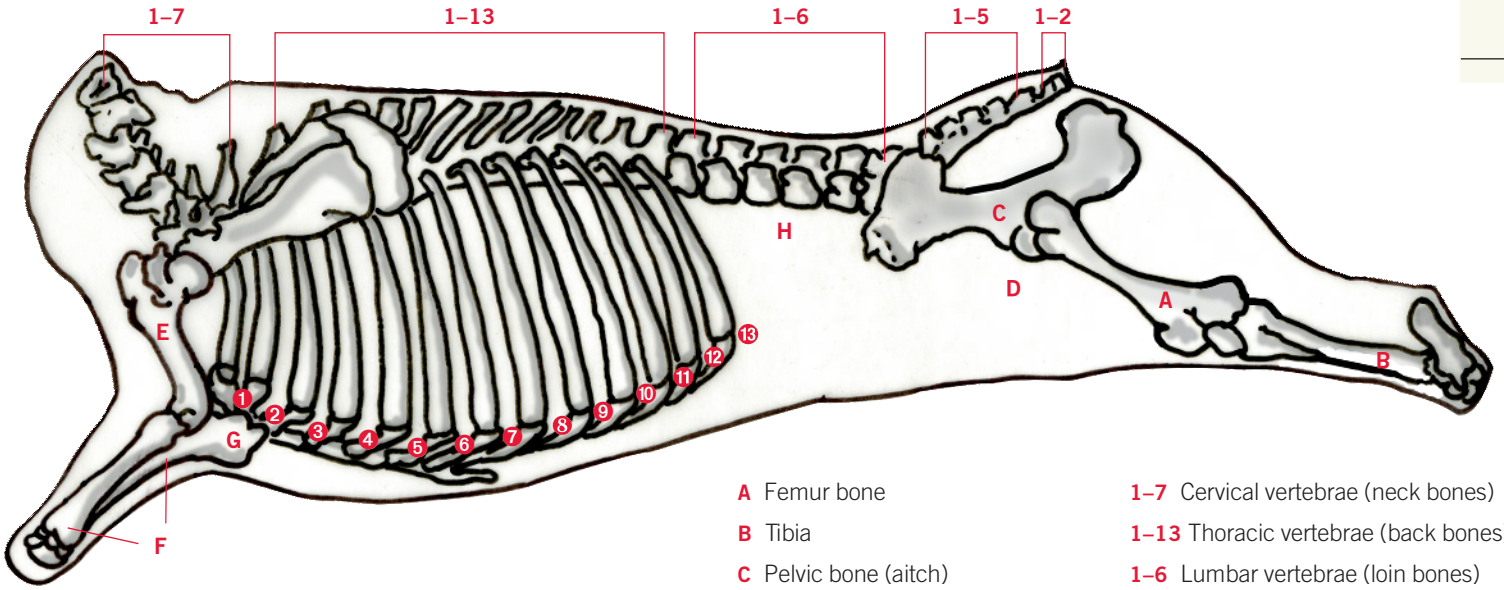
To fully understand and appreciate where beef comes from, you have to start with a whole carcass. A carcass is two matched sides containing the forequarter and hindquarter. A side of beef is simply half a carcass, split down the back.

A side of beef is sometimes sold in a forequarter or hindquarter format. This just means that a side of beef has been cut into two sections, separated between the 12th and 13th ribs. You can order sides already split from local meat lockers and specialty processors and enjoy a nice quality beef.



INSIDE A BOVINE

To be a master cutter, you need an in-depth understanding of the bovine bone structure and how it relates to what you are processing. This diagram will help you better comprehend the anatomy and structure of a bovine and add to your personal knowledge base. The bone/skeletal structure will be your guide to separating the carcass into quarters and primals.

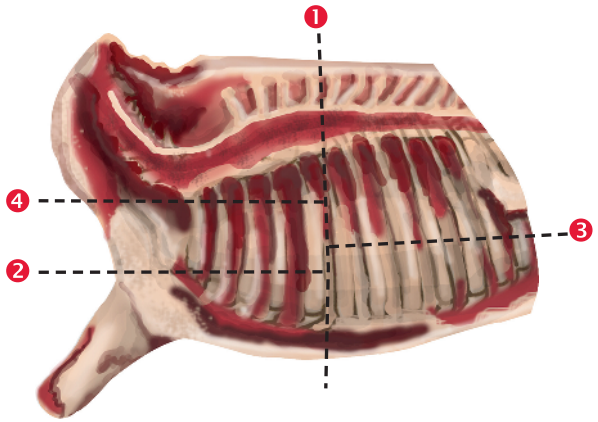


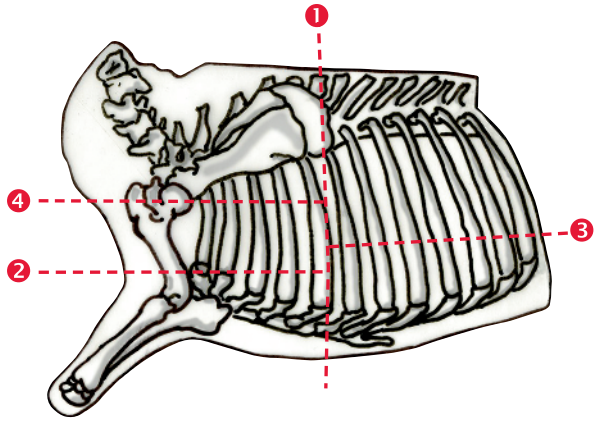
A Femur bone
B Tibia
C Pelvic bone (aitch)
D Ball of femur
E Humerus (arm bone)
F Ulna, radius (for shank bones)
G Ulna (elbow)
H Chine bones

1–7 Cervical vertebrae (neck bones)
1–13 Thoracic vertebrae (back bones)
1–6 Lumbar vertebrae (loin bones)
1–5 Sacral vertebrae
1–2 Caudal vertebrae (tail bones, 2 bones)
❶ – ⓭ Rib bones

DEFINITION OF COMMON TERMS

Anterior	Toward the head; sometimes known as "cranial."
Posterior	Toward the tail; also referred to as "caudal."
Ventral	Toward the plane of support—the "bottom side"; sometimes referred to as "inferior."
Dorsal	Away from the plane of support—the "top side." Often known as "superior."





PRIMAL SEPARATION

What is a primal? A side of beef is separated or divided into seven somewhat more manageable sections called primals. These primals are still quite heavy and large.

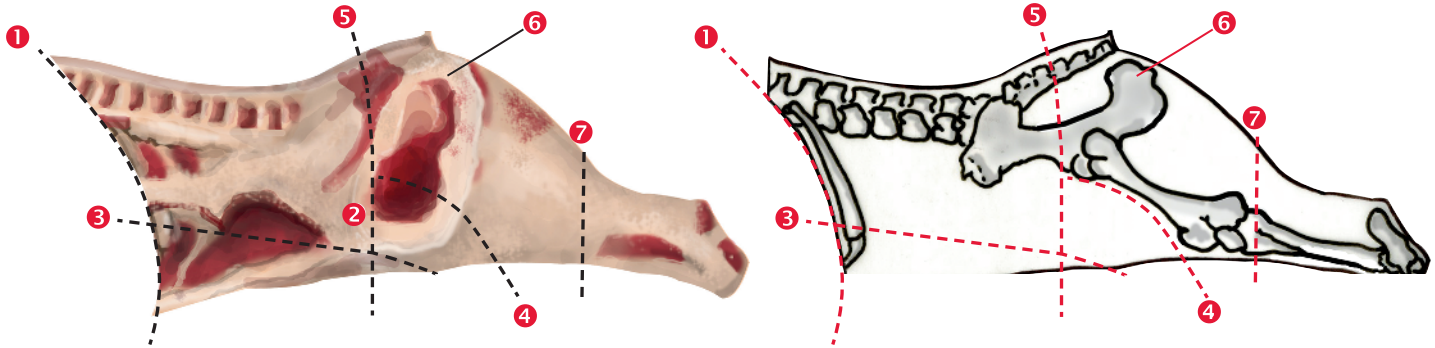
There are seven primals: chuck, rib, loin, round, brisket, plate, and flank. The primal designations are key to understanding how the cow is processed. Consider this your road map.

The following information is for illustration purposes, and I do not recommend that you try breaking down a carcass on your own unless you are supervised by an experienced meat cutter or professional with the proper processing and safety equipment.

A side of beef is made up of a forequarter and a hindquarter. The forequarter is separated from the hindquarter between the 12th and 13th ribs.

The forequarter is processed into four major primals: chuck, rib, brisket, and plate. The key to processing a quarter is knowing the importance of counting ribs. The front quarter should be flat on a cutting table with the internal surface facing up or fat side down, or it should be hanging on a rail.

1. To separate the forequarter into primals, start by locating the ribs on the internal surface of the quarter. Count five ribs from the front end—this is the separation point. Make a straight cut with your knife all the way through. Use a handsaw to completely separate the quarter into two large sections: Chuck and brisket are one, and the rib and plate are the other.
2. Remove the brisket from the chuck by locating the arm or shank, and make a straight cut just above the elbow joint and through the cartilage at the first rib.
3. To separate the plate primal from the rib, use a saw to cut a straight line through ribs 6–12, approximately 10 inches from the backbone.
4. Cut the chuck into two sections; the blade half and the arm half. Use a handsaw to make a straight cut through the head of the humerus bone, just below the ridge or socket of the scapula.



The hindquarter is processed into three major primals: loin (sirloin), round, and flank. The hindquarter should be flat on a cutting table with the internal surface facing up or fat side down, or it should be hanging on a rail.

1. The hindquarter is separated from the forequarter between the 12th and 13th ribs. Remove any heavy cod or kidney fat, being careful not to score the lean muscle.
2. To separate the flank, measure and mark the desired length of the loin tail from the loin eye with a knife cut, typically 2 to 3 inches from the edge of the loin eye. Locate the heavy cod fat, and cut around the round up toward, or ventral, to the head of the femur bone.
3. Continue cutting the flank by following the natural seam toward the 13th rib or your knife mark. Pull the flank and bottom sirloin from the fat and carefully trim them.
4. To remove the sirloin tip or knuckle from the round, first locate the knee joint. Cut slightly above until you hit the femur bone. Run the knife up until you feel the aitch or pelvic bone. Angle your knife out to complete the separation.
5. In order to remove the round from the loin, you must identify the fifth sacral vertebra. Start at the tailbone and count two vertebrae; the next six vertebrae are the sacral. Use a saw to separate the round from the loin between the fourth and fifth sacral vertebrae. It's OK if you clip part of the head of the femur joint—that means you nailed it!
6. Next, remove the aitch or pelvic bone.
7. Finish by removing the shank at the knee joint.

Purchasing primals is not recommended for today's typical retail and foodservice operators. They are large, offer lower yield, and cannot be cooked properly.

Subprimals

Primals that are further processed into more manageable parts are called subprimals. Subprimals are smaller and more cost-effective to transport and handle. Almost all grocery stores and restaurants and steak processors purchase subprimals. Subprimals cost more than primals because more waste has been removed and more labor has gone into fabricating the meat into usable form. See Chapter Four for information on specific subprimals.

Block or tray-ready subprimals

Block or tray-ready subprimals are further processed subprimals. These cost more than the regular subprimals because almost all the fat and trim has been removed. Simply open the bag, cut it, and tray it. Today many subprimals can be purchased in a single muscle format.

Congratulations! You have completed your basic beef instruction. Read on to learn more specific information on cutting techniques, merchandising, and more.