

Determination of Cattle Age (20 Months or less)

The U.S. Beef Production System

The highly efficient U.S. beef production system is characterized by three major stages: calves are weaned from their mothers at approximately six months of age; placed on grass pastures for six to eight months for further growth and weight gain; and finally placed in feedlots for a three to four month finishing phase. This system results in the vast majority of the steer and heifer population, which fit into the A maturity classification, being born, raised and slaughtered within 15 to 18 months.

USDA/AMS Grading

The official standards for grades of steer and heifer beef were revised in 1965 to place added emphasis on physiological skeletal maturity (ossification) in grading carcasses. As cattle get older, physiological maturity causes the amount of collagen cross-linkage in the muscle to increase, resulting in tough meat. Therefore, cattle with advanced physiological skeletal maturity also have advanced physiological muscle maturity, and thus should be excluded from the premium grades of USDA Prime, Choice, Select and Standard.

Since the inclusion of physiological maturity into the grading standard, skeletal maturity has been used to classify maturity and to assist graders in the determination of the quality of beef carcasses. While this system has not traditionally been used as a tool to determine the age of cattle, it has often been used as a de facto marker for establishing age of animals in both market standards and research. This long experience provides the confidence that the correlation between physiological maturity and age can be clearly established.

At the time of grading, which occurs 36 to 48 hours after slaughter, USDA/AMS graders evaluate each carcass in order to determine the quality grade. The graders evaluate both skeletal maturity and amount (degree) of marbling to assist them in determining the final USDA Quality Grade. This grading system thus allows graders to identify quality differences within the U.S. beef population, which ultimately sends market signals in both directions of the marketing chain resulting in higher quality beef in a value-driven marketing system.

Since 1985, USDA/AMS has been conducting audit reviews to maintain accuracy and integrity of the grading system. Reviews are conducted to characterize the current carcass population and to evaluate the performance of the graders. These reviews are conducted randomly and each major processing facility is evaluated each year. In addition, these reviews provide an accurate description of the approximately 475 million cattle slaughtered since 1985. Since these intensive reviews began, more than 30,000 carcasses have been evaluated for both USDA Quality and Yield grades. A statistical evaluation of the physiological maturity of the carcasses in these reviews showed that 90.5% of the carcasses were between A⁵⁰ and A⁷⁰ skeletal maturity (Table 1). The cattle in those skeletal ossification groups were estimated to be less than 20 months of age, based on the production systems used in the United States and the population frequency distribution (Table 2).

Table 1. Distribution of cattle with A maturity in the population of fed steers and heifers presented for slaughter in the United States

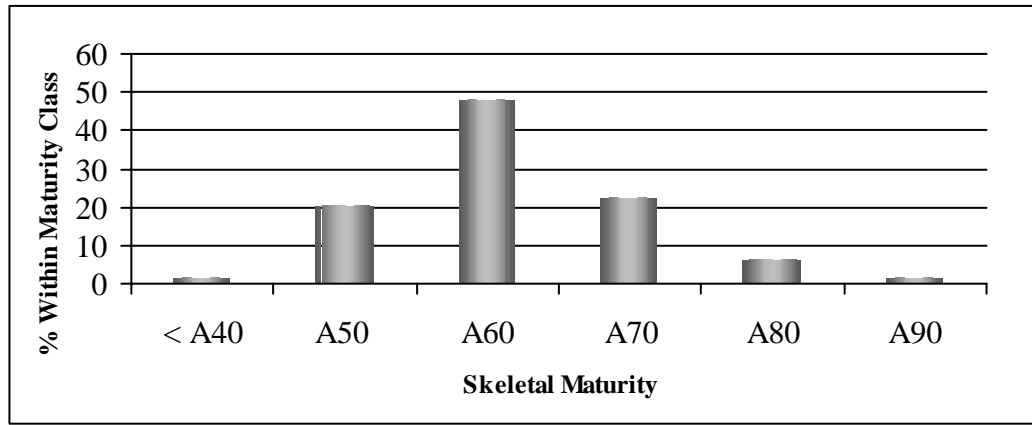


Table 2. Frequency distribution of cattle with A maturity in the steer and heifer population presented for slaughter in the United States

Frequency Distribution of Cattle in A Maturity	Skeletal Maturity	Age
1.7	$\leq A^{40}$	9-14 mo
90.5	$A^{50} - A^{70}$	15-20 mo
7.9	$A^{80} - A^{90}$	21-29 mo

¹ An estimation of months of age based on the production system and the population frequency distribution.

Description of A⁷⁰

For steer and heifer beef, maturity of the carcass is determined by evaluating the size, shape, and ossification of the bones and cartilages -- especially the split chine bones -- and the color and texture of the lean flesh. In the split chine bones, ossification changes occur at an earlier stage of maturity in the posterior portion of the vertebral column (sacral vertebrae) and at progressively later stages of maturity in the lumbar and thoracic vertebrae. The ossification changes that occur in the cartilages on the ends of the split thoracic vertebrae are especially useful in evaluating maturity and these vertebrae are referred to frequently in the grading standards. Unless otherwise specified in the standards, whenever reference is made to the ossification of cartilages on the thoracic vertebrae, it is construed to refer to the cartilages attached to the thoracic vertebrae at the posterior end of the forequarter. The size and shape of the rib bones also are important considerations in evaluating differences in maturity. The color and texture of the lean also undergo progressive changes with advancing maturity. In the very youngest of carcasses, the lean flesh will be very fine in texture and light grayish red in color. In progressively more mature carcasses, the texture of the lean becomes more coarse and the color of the lean will become darker red.

Carcasses qualifying for any particular maturity may vary with respect to their relative development of the various factors. There will be carcasses that qualify for a particular maturity, some of whose characteristics may be more nearly typical of another maturity. For example, in comparison with the descriptions of maturity contained in the standards, a particular carcass might have a greater relative degree of ossification of the cartilages on the ends of the lumbar vertebrae in comparison to other evidences of maturity. In such instances, the skeletal maturity of the carcass is not determined solely by the ossification of the lumbar vertebrae, but neither is this ignored. Thus, all of the maturity-indicating factors are considered. In making any composite evaluation of two or more factors, it must be remembered that they seldom are developed to the same degree. Because it is impractical to describe the nearly limitless number of recognizable combinations of characteristics, the standards describe only beef which has a relatively similar degree of development of the various factors affecting maturity.

In the very youngest carcasses considered as beef (A^0 maturity), the cartilages on the ends of the chine bones show no ossification, cartilage is evident on all of the vertebrae of the spinal column, and the sacral vertebrae show distinct separation. In addition, the split vertebrae usually are soft and porous and very red in color. In such carcasses, the rib bones have only a slight tendency toward flatness. In progressively more mature carcasses, ossification changes become evident first in the bones and cartilages of the sacral vertebrae, then in the lumbar vertebrae, and still later in the thoracic vertebrae (Table 3).

Table 3. Classification of carcass maturity (A^0 to A^{100}) by evaluating the vertebrae, ribs and lean

	A^0	A^{70}	A^{100}
All Vertebrae	Some evidence of cartilage in all vertebrae	Some evidence of cartilage in all vertebrae	
Sacral Vertebrae	Show distinct separation	Some evidence of cartilage, separation evident	Completely fused

Lumbar Vertebrae	No ossification	Moderately ossified	Nearly completely ossified
Thoracic Vertebrae	No ossification	No ossification	Some evidence of ossification
Split Vertebrae Surfaces	Soft, porous and very red	Moderately soft, porous and moderately red	Slightly red and slightly soft
Ribs	Only slight tendency toward flatness	Moderate tendency toward flatness and narrow	Slightly wide and slightly flat
Lean Texture and Color	Very fine, light grayish red	Tends to be very fine , and tends to be moderately light red	Fine, moderately light red

Overview Data

The most current data available indicate segregating carcasses greater than A⁷⁰ will eliminate 15% of the cattle presented for slaughter, thus eliminating any cattle greater than 20 months of age (Table 4). A recent review of data collected for expected progeny differences by the American Angus Association showed that of more than 77,000 head of steers and heifers presented for slaughter, 97.1% were less than 600 days (20 months) of age, and 75.0% were less than 480 days (16 months) of age.

Table 4. Frequency distribution of the overall maturity of fed beef carcasses presented for slaughter (N=12,750).

Overall Maturity	Percentage of Population
A ¹⁰	0.0
A ²⁰	0.1
A ³⁰	1.2
A ⁴⁰	7.3
A ⁵⁰	23.8
A ⁶⁰	30.5
A ⁷⁰	22.2
A ⁸⁰	8.0
A ⁹⁰	4.0
B	2.0
C	0.2

Determining A Maturity

Beef produced under the US system routinely undergoes meat grading evaluation shortly after slaughter by USDA Agricultural Marketing Service (AMS) graders. These graders apply the US meat standards uniformly, accurately, and consistently in all slaughter facilities nation-wide, no matter the size or speed of production. Using the US standards for grades of carcass beef, these individuals grade 95% of the steer and heifers that are slaughtered (28.5 million head annually).

Meat Grading and Certification (MGC) Branch employees of the USDA are required to receive extensive training and have their evaluations reviewed both through internal and external methods. In order to attain the level of expert Grader, an employee must first receive more than 4,000 hours of training. During periods of beef grading, each grader is required to participate in correlations with his immediate supervisor at least once per month in order to assure uniformity and accuracy in line with the evaluations of his supervisor for grade factors. In addition to the correlation, supervisors conduct on the job discussions relative to factor evaluations during detailed individual review periods for each grader.

Random samples of graders evaluations are selected on a monthly basis, evaluated by a supervisor, and the results charted to evaluate accuracy and provide feedback to individuals as well as, groups of employees at multi-grader locations.

Supervisors also conduct internal accuracy audits in different regions of the country on a monthly basis. This activity involves supervisors that are out of the direct chain of command for the selected region reviewing the accuracy of evaluations performed by graders in that location. These observations are documented and presented to the supervisor of direct responsibility, in addition to the technical oversight chain of supervision within the MGC Branch.

Additionally, an independent evaluation of grading accuracy is conducted by a completely independently run Review Team that reports directly to the Deputy Administrator of the Livestock and Seed Program. This review is conducted in an unannounced fashion and targets specific plants for a week long review.

All quality grading reviews (both internal and external) have to meet a set performance measurement standard with their official evaluations. Corrective and preventative measures must be designed, implemented, and documented if the performance falls below this level in any single review.

Typical U.S. Beef Cattle Production Systems

