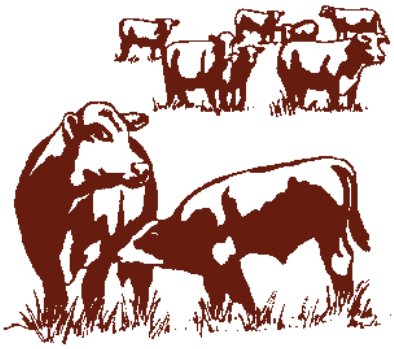
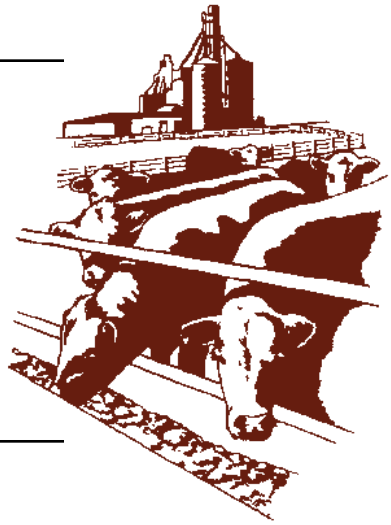


Beef Cattle Handbook



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Reducing The Incidence Of Dark-Cutting Beef

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Losses generated by dark cutting beef (DCB) accounted for $5.00 of the $279.82 in "quality" shortfalls in the 1991 National Beef Quality Audit, but that monetary loss equates to a $132.5 million price tag for a year's supply of US fed-cattle. Most of the loss in carcass value occurs because current USDA Quality Grade standards provide for progressive discounts for dark-cutting beef from one-third, to as much as a full grade; however, if the DCB condition is severe enough, the entire carcass is converted to ground beef. Realizing that the cattle industry could achieve significant gains by preventing the problem; students and faculty members in the Department of Animal Sciences at Colorado State University (CSU) prepared a review of pertinent information and scientific literature about the DCB condition and syndrome. From that, the following bulletized synopsis was derived.

Incidence:

- The incidence of DCB differs by report, year and time of year.
- Occurrence of DCB is not reported regularly, completely, or uniformly by all US packers.

Causes:

- DCB is a result of depletion of muscle glycogen (the primary storage carbohydrate in skeletal muscle fibers) prior to processing.
- Muscle glycogen stores can be depleted by stress associated with physical activity, emotional excitement, or acute changes in environmental conditions.
- During the first 24 hours following slaughter, under normal conditions, glycogen is metabolized, forming lactic acid as an end-product, causing muscle pH to decline.
- The pH in "normal" beef is approximately 5.6 at slaughter. Dark-cutting beef occurs when the post-mortem pH of muscle is 6.0 or higher.
- Because of high pH in dark-cutting beef, water is retained, acting as a barrier to oxygen and preventing the development of the bright cherry-red color of fresh beef.
- Replenishment of glycogen stores in living muscle requires sufficient rest (reports indicate, from three to eight days) and adequate feed intake by the animal.
- All muscles — not just the ribeye — have the ability to exhaust glycogen stores and thereby, to have abnormally high ultimate pH values and dark red to purple or even an almost-black color.

Environmental Factors:

- Interaction of pre-slaughter stressors, including transportation and handling conditions, can lead to DCB.
- Occurrence of DCB is highest during very warm or very cold weather, but especially when wide fluctuations in ambient temperature occur over very short periods of time.
- "Dark-Cutting Beef Seasons" in the US are considered to be the periods of February to April and September to November.

Genetic Factors:

Animal Gender

- The incidence of dark-cutting beef is usually lowest in steers and heifers and highest in young bulls.
- The mixing — prior to processing — of different lots of male cattle (steers from different pens, bulls, stags and bullers) may result in above normal utilization of glycogen due to fighting and/or homosexual activity.
- Heifers that are "in heat" can have a high incidence of DCB.

Breed of Cattle

- Continental European Breeds (the so-called "Exotics") usually have muscles with a higher percentage of white (glycolytic) muscle fibers than do the British Breeds.
- White muscle fibers use glycogen as their primary substrate for energy. Therefore, animals with high percentages of white muscle fibers may be more susceptible to DCB.
- The perceived increase in DCB occurrence during the last decade may be related to changes in the breed types of US slaughter cattle populations.

Management Practices:

- Stress is the probable trigger that causes occurrence of DCB in a specific animal.
- Attention to all pre-processing stressors as a means for controlling DCB incidence, is recommended:
    - inadequate facility construction/housing or poor pen conditions
    - allowing homosexual (riding/bulling) activity
    - inappropriately designed holding pens and loading chutes
    - rough-handling during loading/unloading
    - mixing different weight/frame classes of cattle in the same shipment
    - over-crowding and unsafe footing during shipment
    - lack of protection from adverse weather
    - prolonged shipping time
    - inappropriate use of an electrical prod
    - lack of rest, feed and/or water at market/packing plant facilities
    - prolonged holding at the packing plant prior to processing

Influence of Growth Promotants:

- Face-to-face interviews during the National Beef Quality Audit identified a packer concern about the use of growth-promoting implants. Packers thought that inappropriate use of the growth promotants might lead to : (1) lower marbling scores, (2) advanced skeletal maturity, (3) increased incidence of DCB, and/or (4) decreased beef tenderness.
- Literature reviews have indicated that use of growth promotants and /or gender modification causes some negative effect on USDA Quality Grade, little effect on USDA Maturity Score, and mostly no effect on darkness of muscle color.
- Some research reports suggest that growth promotant implants, including those that contain trenbolone acetate, can — under certain conditions — be associated with increased incidence of DCB. As examples, though, of the disparity of results across the complete spectrum of such reports, consider these findings: (1) Data composited from six separate heifer studies revealed DCB incidences of 0.83, 2.23, and 2.88 percent for control (no implant), treated (with estradiol benzoate) and treated (trenbolone acetate) heifers, respectively. Percentage of DCB in individual trials ranged from 0-10 percent; and (2) Data from five steer trials (1,950 head, five sites, all with a similar protocol), utilizing treatments with estradiol benzoate, trenbolone acetate, or a combination of both revealed that only 5 steers (an incidence rate of 0.25 percent) were classified as DCB in the cooler.
- The proper use of growth promotants is an essential component of improving the performance of cattle, increasing leanness of the carcass and reducing the cost of beef cuts to end users. A conservative estimate is that implanting of feedlot cattle results in a minimum net return to the industry of $25.00 per head.
- In order to balance improved growth performance with desired carcass traits, cattle feeders must understand that growth promotants can be used improperly, inappropriately and excessively, and must do all that is necessary to prevent such misuse.

Dark-cutting beef is a significant industrywide problem in the US beef industry because of the lowered value of the carcass and cuts when DCB occurs. Dark-cutting beef is created by unique circumstances involving interactions of genetic, environmental and management practices. With proper management practices and cautious handling techniques — paying appropriate attention to effects of all pre-processing stressors — the amount of stress placed on cattle can be reduced, thereby reducing the potential for, and incidence of, dark-cutting beef.

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