



## REDUCING THE INCIDENCE OF DARK CUTTING BEEF IN JUNIOR LIVESTOCK SHOWS

Lyle N. Holmgren and Dale R. ZoBell

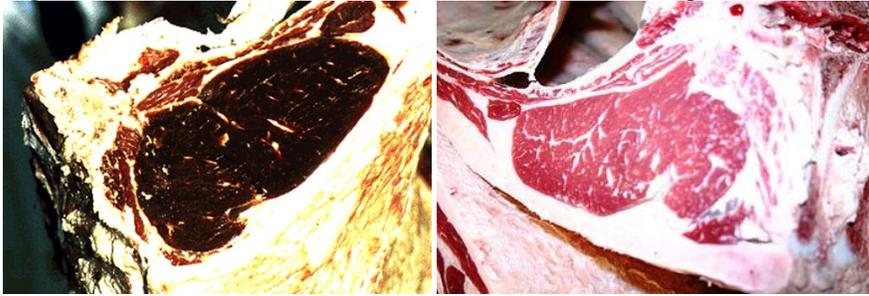


4-H and FFA livestock shows place cattle in a surrounding where they are stressed physically and psychologically. They are exposed to physical exertion, unfamiliar smells, tastes, sounds, people, cattle and other animals. Owners of beef cattle who place them in these situations need to understand that stress can be reduced or eliminated with proper care and management. Many cattle are stressed to the point where they may even go off feed and water. Cattle may appear agitated and exhibit abnormal behavior at the show but often a more serious condition appears once the animal has been sold and harvested. This is known as dark cutting beef (DCB) and can be a serious problem in junior livestock shows. In some junior livestock shows, instances of DCB can be 10 to 20 times that of the commercial beef industry.

### **What Causes Dark Cutting Beef?**

The pH of living muscle is just above 7.0 in well fed and rested cattle with glycogen concentrations from 0.8% to 1.0%. When the animal is harvested, pH in normal muscle falls to 5.5. If the animal is stressed for any reason then glycogen concentration can fall to less than 0.6% and normal acidification of the muscle tissue from lactic acid does not occur and pH will remain high (above 6.0). This abnormally high pH (>6.0) increases the light-absorption and water binding abilities of postmortem muscle resulting in an undesirable, dark, firm, and dry cut lean surface (Lister, 1988). This causes the muscle to turn a darker color of red, hence the term dark cutter. There also appears to be a relationship between muscle pH and (or) muscle color and meat tenderness (Purchas, 1990). Dark cutting beef is undesirable because it is aesthetically unpleasant and because it is more susceptible to microbial growth (Lawrie, 1998). Dark cutting is an expense to the beef industry but can be managed.

**Figure 1.** Beef carcasses with and without dark cutting characteristics.



**Factors Contributing to Dark Cutting Beef**

Weather, growth promotants, genetics, disposition and handling practices before harvest all may play a role in creating the dark cutting condition (Hedrick et al., 1959; Smith et al., Voisinet et al., 1997).

1. *Weather:* Heat can be a factor, especially when temperatures are very high or when cattle are subjected to fluctuations in temperature which occur over short periods of time (Skanga et al., 1999). Many junior livestock shows are held during the summer. Care should be given to ensure that cattle have comfortable surroundings including bedding, shade and plenty of water.
2. *Growth Promoting Implants:* Steers treated with combination on-feed implants followed by combination reimplants showed higher percentage of DCB than steers given on-feed estrogen type implants followed by estrogen type reimplants. Also, as the number of days between harvest and the last final implant increases the incidence of DCB declines (Scanga et al., 1999). This requires further research as we do not advocate nonuse of growth promoting implants. Implants can positively influence muscle growth and daily gain resulting in greater efficiencies. However, their use must be understood and managed so that misuse does not occur. There are many excellent Extension publications and resources on implants that can be obtained through internet searches or your County Agent.

**Table 1.** Common Types and Brands of Growth Promoting Implants

<b>Growth Promotant</b>	<b>Androgen</b>	<b>Estrogen</b>	<b>Combination</b>	<b>Estrogen Combination</b>	<b>Double Androgen</b>
	Synovex-H <sup>®</sup>	Synovex-S <sup>®</sup>	Revalor-H/S <sup>®</sup>	Synovex-S <sup>®</sup> / Revalor <sup>®</sup>	Finaplix <sup>®</sup>
	Implus-H <sup>®</sup>	Ralgro <sup>®</sup>			Synovex-H <sup>®</sup>
	Finalplix-H/S <sup>®</sup>	Implus-S <sup>®</sup>			
	Heiferoid <sup>®</sup>	Compudose <sup>®</sup> Steroid <sup>®</sup>			

3. *Physical Activity*: Cattle can experience increased activity and stress when exposed to a new environment. Standing for long periods of time, frequently getting up and down, and other strenuous activity common to a livestock show should be limited as much as possible. Loading and unloading cattle should take place during cooler times of the day.
4. *Psychological Stress*: Cattle can experience increased stress when they are exposed to new surroundings, people, smells, and sounds they are not familiar with, but are typical to a livestock show. Feed rations should not change after bringing the animal to a livestock show. Some cattle will not drink chlorinated water if they are not familiar with the taste. As an example, one year at the Box Elder County Junior Livestock Show, more than 50% of youth (38 out of 62) reported their steer's drinking habits changed after being brought to the show. If the calf has never been exposed to the taste of chlorinated water, beforehand get them familiar with the water by using it routinely prior to the show. Make the animal's stay at the livestock show as comfortable as possible.
5. *Yield Grade*: Yield grade is a strong indicator of whether a steer may become DCB. Higher yield grade (>3.0) steers have more finish and more energy reserves to carry them through a stressful event like a livestock show. Try not to select cattle with very low yield grade characteristics.

### **Why Is this a Concern?**

The greatest problem with dark cutting beef is consumer rejection because of its color. Consumers associate dark color beef with old cattle, toughness, poor flavor and short shelf life. Although the incidence of DCB has declined in recent years, from 2.7% to 2.5% (NBQA – 2000), packers must still discount DCB carcasses between 20% and 40%. The most recent quality audit calculated that dark cutters cost the industry \$6.08 per head on every fed steer and heifer slaughtered. The percentage of DCB presented is for the overall beef industry. The percentage of calves from livestock shows that exhibit DCB often is much higher such as 25 - 50% in unusual circumstances. This can vary extensively and is a real concern for packers.

### **Conclusion**

Raising a steer as a 4-H or FFA project provides youth with a unique opportunity to use live animals to develop valuable life long skills. However, youth need to understand that they are not just raising a project for the county fair; they are in the business of producing a food product for the consumer. Reducing the incidence of DCB in project beef will help ensure that youth continue to experience this unique educational opportunity and that the consumer is assured that the best product possible is delivered.

### **References:**

Holmgren, L.N. 2004. Photo of Beef Carcass. Utah State University Extension.

Hendrick, H. B., J. B. Boillot, D. E. Brady, and H. D. Naumann. 1959. Etiology of dark-cutting beef. Research Bulletin 717. University MO, Agric. Exp. Stn., Columbia.

- Lawrie, R. A. 1998. Lawrie's Meat Science. 6th ed. Technomic Publishing Co., Lancaster, PA.
- Lister, D. 1988. Muscle metabolism and animal physiology in the dark cutting condition. In: Dark-cutting in cattle and sheep -- Proceedings of an Australian workshop. Australian Meat & Livestock Research and Development Corporation, Sydney South, NSW, Australia.
- NBQA, Executive Summary of the 2000 National Beef Quality Audit, Improving the quality, consistency, competitiveness and market share of beef. National Cattlemen's Beef Association.
- Purchas, R. W. 1990. An assessment of the role of pH differences in determining the relative tenderness of meat from bulls and steers. *Meat Science*. 27:129-140.
- Savell, J.W., Photo of Dark Cutting Beef. Texas A&M University.  
<http://savell-j.tamu.edu/conversion.html> (permission granted)
- Scanga, J.A., Belk, K.E., Tatum, J.D., Grandin, T., and Smith, G.C. 1998. Factors contributing to the incidence of dark cutting beef. *Journal of Animal Science*. 1998. 76:2040-2047
- Smith, G.C., Tatum, J.D., Morgan, J.B. Reducing the Incidence of Dark-Cutting Beef. Beef Cattle Handbook. University of Wisconsin Extension. BCH-4350.
- Voisinet, B. D., T. Grandin, S. F. O'Connor, J. D. Tatum, and M. J. Deesing. 1997a. Bos indicus-cross feedlot cattle with excitable temperaments have tougher meat and a higher incidence of borderline dark cutters. *Meat Science*. 46:367-377.

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