

RESEARCH NEEDS IN MEAT QUALITY

Jeff W. Savell
Professor and E.M. Rosenthal Chairholder
Department of Animal Science
Texas A&M University
College Station, TX 77843-2471

INTRODUCTION

Significant improvements in average daily gain and feed conversion make the economic incentive for using growth promotants irresistible for most cattle feeders. Although live performance is enhanced by growth promotants, carcass characteristics are either unaffected or, in some cases, negatively affected. I will outline research needs concerning possible effects of implants on the beef carcass.

USDA Yield Grade and composition

Fat measures. Neither measure of fat in the carcass — fat thickness and kidney, pelvic, and heart fat — are influenced by the use of implants. Typically, cattle are being finished to the same endpoint with or without the use of growth promoting implants.

Carcass weight. Weights are impacted by growth promoting implants, and it appears that what really happens is that the growth curve of the animal is altered slightly so that it is heavier without necessarily being fatter. Weight is added until the desired degree of finish is achieved.

Ribeye area. Ribeye area is increased, but only in proportion to the increase in carcass weight. No evidence has been found that use of growth promoting implants increases muscling.

Carcass composition. Relative carcass composition — proportions of muscle, fat and bone — are not impacted by growth promoting implants. More volume of all of these are produced because of the increased carcass weights, but the relative percentages are not changed.

Research need: To find a way to obtain added weight with less fat as external, seam and kidney fat.

USDA Quality Grade and palatability

Marbling. Without question, the most negative effect of using some classes of growth promotants is the reduction in marbling that in turn reduces USDA

quality grade. This is coming at a time in history when the overall ability of cattle to grade U.S. Choice and Prime is at an all-time low. The economic penalty for not grading U.S. Choice (the Choice/Select price spread) seems to increase every year.

The research literature is full of comparisons of carcass characteristics of bulls versus steers. In almost all cases, bulls have substantially lower marbling scores and USDA quality grades than steers. Some growth promoting implants cause similar effects. What is needed is a clearer understanding of the mechanisms by which implants reduce marbling. Most research has shown what happens rather than why it happens.

Maturity. Lean and skeletal maturity are used to determine the approximate age of the animal at the time of slaughter. In theory, meat from an older animal is less tender than that from a younger animal. There is some indication that growth promotants may cause these maturity indicators to be more advanced than control animals that are not implanted. This issue will become more important in 1997 as the USDA implements a grading change that will result in those carcasses that have "B" maturity and have marbling scores of Slight or Small to be graded U.S. Standard. With this change in grade standards, even a few carcasses that would fall into this category could eliminate financial gains from enhanced live performance with implants.

Palatability. Research has shown either no change or a slight increase in Warner-Bratzler Shear force (tougher lean) with some classes of compounds. This slight reduction in tenderness as measured by shear force could translate into reduced customer satisfaction for beef products. Whether this increase in shear force is correlated with the reduction in marbling or some other mechanism is not clear.

Dark cutters. Today, some in the packing industry believe that some growth promotants, especially those that contain trenbolone acetate, cause an increased incidence of dark cutters in cattle. This thought was a more common in the early 1990s; it surfaced during the surveys of packers taken during

the National Beef Quality Audit -- 1991 (Smith et al., 1992). During the 1995 repeat of the audit (Smith et al., 1995), this purported relationship was mentioned less often.

Dark cutting is a phenomenon whereby muscle glycogen, which is converted to lactic acid in postmortem muscle resulting in the development of the bright cherry red color of beef, is depleted in the living animal due to long-term stress. Because there is less glycogen present at the time of death, less lactic acid is generated postmortem resulting in darker colored lean. Stress can be induced by many factors or a combination of factors such as sudden temperature fluctuations (especially cold fronts), excitement, mixing of cattle and other events where the animal, through the release of adrenaline, must draw on its glycogen reserves for energy.

No research has found that the use of growth promotants causes dark cutters directly. It is believed, however, that if use of a growth promotant is correlated with an increase in dark cutting, other stress factors may be at work; any additional aggressiveness caused by the implant would contribute to this condition.

Research need: To better understand why carcass quality traits and tenderness are negatively impacted by the use of certain classes of growth promoting implants.

Where do we go from here?

Future direction of research. To date, most research has focused on the results of using growth

promoting implants, not on their mechanisms of action. Although many theories exist for how implants accomplish their positive effects, few studies have been reported that support these theories. Without question, more mechanistic research is needed to better reflect how and why growth promoting implants make animals grow more rapidly.

New endpoints of concern. Some compounds should be developed that improve the quality — marbling and tenderness — of beef. With a move to more formula-based selling where carcass characteristics determine the value and the price paid for carcasses, and to more branded beef products, the focus on carcass traits will increase over time. We should begin now to find compounds that could be used to improve carcass and palatability traits of cattle. The financial incentive for doing so will become more evident in the future.

Growth promotants in a total integrated system of beef production. For too long, the use of growth promotants has been an activity of interest to only the cattle feeding segment of beef production. Because of this, compounds were created that addressed the most important aspects for that segment of the industry: average daily gain and feed efficiency. Unfortunately, some compounds that may maximize these important components of the cattle feeding segment of the industry may result in a final product that is less desirable for the consumer. In the future, a systems approach should be used when evaluating growth promotants. Compounds should be developed and used that enhance feedlot performance without causing negative effects on the carcass or meat quality.

LITERATURE CITED

- Smith, G. C., J. W. Savell, R. P. Clayton, T. G. Field, D. B. Griffin, D. S. Hale, M. F. Miller, T. H. Montgomery, J. B. Morgan, J. D. Tatum, and J. W. Wise. 1992. Improving the consistency and competitiveness of beef — A blueprint for total quality management in the fed-beef industry. The final report of the National Beef Quality Audit -- 1991, conducted by Colorado State University and Texas A&M University, for the National Cattlemen's Association on behalf of the Cattlemen's Beef Promotion and Research Board.
- Smith, G. C., J. W. Savell, H. G. Dolezal, T. G. Field, D. R. Gill, D. B. Griffin, D. S. Hale, J. B. Morgan, S. L. Northcutt, and J. D. Tatum. 1995. Improving the quality, consistency, competitiveness and market-share of beef — The final report of the second blueprint for total quality management in the fed-beef (slaughter steer/heifer) industry. National Beef Quality Audit -- 1995, conducted by Colorado State University, Texas A&M University, and Oklahoma State University, for the National Cattlemen's Association on behalf of the Cattlemen's Beef Promotion and Research Board.

QUESTIONS AND ANSWERS

Q: You talked about tenderness and said that it has been documented that consumers are willing to pay more for tender meat. Just quickly talk about that because I think that it is important for people to know.

A: One of the challenges you face as a researcher in the meat science area is that when someone asks you about measuring or sorting carcasses on their tenderness level by some instrument, you must answer by saying how much is it worth for tender beef? In the marketplace, brisket and tenderloin have the same yields from the carcass yet their values range from \$.79 for brisket to \$6.79 for tenderloin. Obviously, people are willing to pay more for tender cuts than for tougher cuts. What we do not know is within cuts, how much more are they willing to pay. Take the top sirloin butt for instance. Twenty years ago, it sold for about \$2.00 per pound. Today, it sells for less than that because it does not deliver the customer satisfaction of the other middle meats — ribeye, strip loin, and tenderloin — which have all gone up in value in the same time period.

We conducted a study that sorted beef based on its shear force value and color-coded it for in-home consumer use. After that phase of the study, we invited consumers into a simulated retail store to ask them to purchase the product at the same price per pound. They purchased more of the product from the lower shear force category. We invited them back at a later time and then priced the product where the "tender" group was \$.50 per pound more than the "average" and the "average" was \$.50 more than the "tough" group. Consumers still purchased more of the "tender" group than either of the remaining two groups.

These kinds of studies are important to see what the price/value threshold is for beef. Our other alternative is for diminishing quality and eating satisfaction which will eventually result in reduced prices and market share for beef. We need to find ways of improving the quality of the product and the demand will take care of itself.

Q: Would you speak more on what you meant by finding compounds that really increase carcass characteristics?

A: What I meant was what would be the opportunity for a growth promoting implant that instead of diminishing quality, increased it. It is very easy to determine what a compound is worth if you can increase average daily gain and feed efficiency, but it is more difficult to determine what a compound would be worth if it increased USDA quality grade. The only way to be rewarded for this is to sell cattle "on the rail" on some sort of grid-based system.

As I mentioned earlier, cattle are losing their ability to grade U.S. Choice. This is very important because of where the growth in beef consumption is coming from the high-end restaurant trade. Programs such as Certified Angus Beef demonstrate the value there is for even slight increases in marbling in the marketplace. If we are genetically losing marbling ability, and with the further loss in marbling due to the use of very aggressive growth promotants, the beef industry stands to lose more market share because it does not have the product that the market is demanding.

Q: What do you think realistically would have some objective grading system in place to do electronically or mechanical or ultrasonic assessment of marbling or maturity in the feedlot?

A: There is simply not enough effort in this area to be making any headway into developing an instrument to use on live animals. Several years ago, the University of Illinois was awarded a grant to study this, but it was terminated because of a lack of progress. This area is very expensive to investigate and will take both time and money to accomplish. Under the present system we have in the U.S., we are not making enough progress in this area for this to be a viable approach to the evaluation of live animals.