Genetic Basis for Beef Tenderness and Electrical Stimulation Interaction

Electrical stimulation (ES) has been implemented in the beef industry since the late 1970s. It has been a valuable tool to speed the conversion of muscle to meat, improve meat color, and allow marbling to be more adequately evaluated during grading. ES also improves beef tenderness, especially in cattle that produce tougher meat; very little improvement in tenderness is seen in cattle that are inherently tender. In a recent genetic study at Texas A&M University, an interaction was found in which steers from some families responded more positively to ES, and steers from other families had a minimal effect due to ES. It was previously thought that the ES interaction (big effect for tough meat and minimal effect for tender meat) was a result of environmental factors such as carcass fat thickness, rate of gain prior to harvest, marbling level, total carcass weight, or mass and subsequent carcass chilling rate, or other biochemical factors that affect the conversion of muscle to meat. However, recent data from the McGregor Genomics Project showed that there was a genetic component to the response of steers to ES.

If cattle could be selected for a positive ability to maximize their response to ES, the beef industry would have a selection tool that could directly impact beef tenderness. The Agricultural Marketing Service of USDA is moving toward development of regulations of marketing claims for guaranteed tender beef. For some beef producers, use of existing genetic markers will provide tools for selection, in combination with production factors that maximize beef tenderness. However, variation in beef tenderness will still exist. Producers will continue to ask, “If cattle are selected using genetic tools for tenderness and managed to maximize tenderness, why do some cattle still not qualify for ‘tenderness’ claims?” Part of the answer may be that some cattle do not respond positively to ES, or the tenderness response to ES may be partially responsible for some tough meat. Understanding the potential genetic effect of ES is important as the beef industry moves toward automated grading for beef tenderness and more aggressive marketing of beef for tenderness.

Objectives

- Examine the genetic effect of electrical stimulation to improve beef tenderness.
- Develop genetic markers or tools to identify cattle that will respond positively to electrical stimulation to improve overall beef tenderness and reduce variability in beef tenderness.

Outcomes

- Provide the beef industry with a genetic marker or genetic tool to select cattle based on their ability to positively respond to electrical stimulation.
- As a result of this selection tool, beef will be less variable in tenderness and over all more tender.
- This technology may assist beef producers to make tenderness claims for more effectively merchandizing of beef.