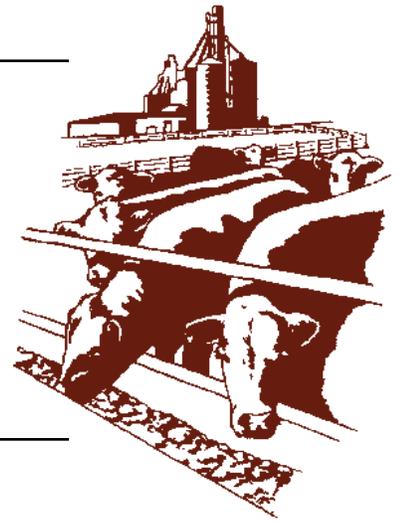




Beef Cattle Handbook



BCH-4100

Product of Extension Beef Cattle Resource Committee

Implications Of Injection-Site Damage Go Beyond Trim

CSU Study Illustrates Educating Producers is Essential

The cattle industry has become increasingly aware of the costs of trimming associated with injection-site blemishes. But the impact doesn't stop there, according to a new study¹ conducted by Colorado State University (CSU) researchers which illustrates that damage can go far beyond trim loss. The researchers investigated how the quality of the meat surrounding an intramuscular (IM) injection site was impacted by the injection, and the results show that beef tenderness and quality are compromised when cattle are injected into the muscle. The following information illustrates how veterinarians and producers can cooperate on drug options that do not negatively impact muscle quality. These decisions can make a difference in the end product produced by the cattle industry.

Dr. Matthew George, DVM and meat science researcher at CSU who has examined over 20,000 injection-site lesions in over 150,000 subprimals and conducted the research, points out that the study was designed to encompass several segments of the beef industry. "We worked with both retailers and purveyors along with our lab experiments to truly examine the impact of intramuscular injections on beef eating quality." The findings of the three-part study were presented to the Beef Quality Assurance Task Force of the National Cattlemen's Association in December, 1994.

"During nationwide quality audits conducted three times annually since November 1991, we talked with steak cutters, who knew where to look for hidden injection problems and surrounding muscle defects," says Dr.

Brad Morgan, assistant professor of animal science at Oklahoma State University, who assisted on the study while serving as an assistant professor at CSU. "These experiences got us thinking about the possibility of not only the blemish being a problem, but wondering if the muscle around the injection site was also being compromised."

The first experiment of the study encompassed two phases designed to accurately quantify the national incidence and severity of injection-site lesions in the beef round (as compared to other national audits which looked at top sirloin butts). Visits to three federally inspected steak-cutting facilities were conducted to measure injection-site damage. A three point classification system was used to characterize lesions according to estimated chronological stage of the healing process; one being an old, woody scar (injected as a calf), two being a clear scar and three being a fluid-filled, more recent injection blemish. The second part of experiment one consisted of retail audits conducted in Seattle, Chicago and Denver. The weight and classification of the injection-site blemishes in round subprimal cuts were recorded for a one month period.

Audits in the steak-cutting facilities, where 15,464 bottom rounds were individually examined, revealed a blemish incidence of 10.0 percent (± 6.5) with an average blemish trim of 6.8 oz. (± 1.3). The retail audits also show how much injection-related trimming is costing the industry, with a blemish incidence of 8.5 percent (± 2.7) and an average blemish trim of 11.1 oz (± 1.3). Also interesting, George notes, is that classification of the injec-

tion-site lesions found at the retail level showed 93.2 percent of the lesions were chronologically older, while 6.7 percent were more recently administered.

According to Morgan, “We were a little surprised by the fact that the older lesions have the most trim, but when you think about it, the injection is going in a small calf muscle (like the inside portion of the back leg where a lot of shots are given) that is pretty reactive to the foreign substance being injected. Also, the blemish grows with the muscle, like a brand grows with the animal. What we’ve found in previous studies is that regardless of the IM product type, trim required from injections given to calves is greater, than trim from injections given to yearlings or feedlot cattle.”

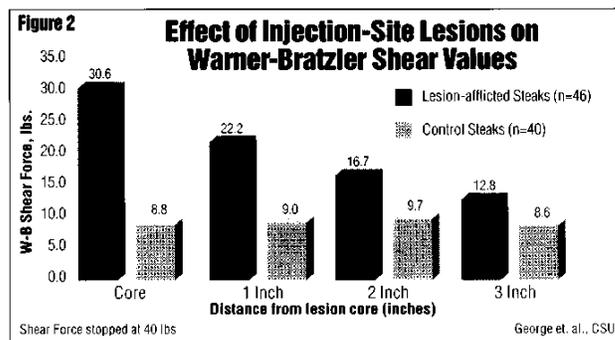
Overall, the classification of 93.2 – 99.9 percent of lesions detected in the retail and purveyor audits, respectively, supports recent national top sirloin butt audits reported by Dexter et al, 1994². These reports show 90 percent of the injection-site lesions can currently be classified as “older,” originating early in the cow-calf, stocker or early feeding periods, Morgan notes.

Experiment two examined toughness related to beef round injection-site blemishes. Normal and lesion-afflicted round steaks were collected, cooked, and cores of .50 inch diameter were cut out at various distances from the location of the injection-site blemish and put on a Warner-Bratzler shear evaluation machine to measure toughness.

“Warner and Bratzler were two meat scientists who developed the machine in the 1930’s. It has been improved over the years to accurately measure the amount of force it takes to cut, or simulate the motion of teething biting into a steak. The tougher the steak, the harder it is to shear across the muscle fibers. The machine measures, in pounds, the amount of force required to do this,” Morgan says.

A shear force reading of 8.5 pounds or less is indicative of restaurant quality steak, while 10 pounds is the upper limit of tenderness for retail trade. Warner-Bratzler shear values for cores from sites located at the blemish as well as one, two and three inches away from the blemish site were 30.6 lb., 22.2 lb., 16.7 lb. and 12.8 lb., respectively, for lesion-afflicted steaks. This compares to the normal steaks in the study with shear force values

of 8.8 lb., 9.0 lb., 9.7 lb. and 8.6 lb. (measurements were taken at anatomical locations similar to the lesion-afflicted steaks). Figure one illustrates the sampling locations. “While we were looking at cuts of meat a little lower in quality than the 8.5 pound expected, it is still obvious that the shear force values were very high (tough) at the blemish and decreased with distance (away from blemish), but the lesion-afflicted steaks were still very tough,” Morgan says. Figure two illustrates the disparity in tenderness.



“What we’ve seen is an increase in the collagen content of the injected muscles, which indicates an inflammatory reaction has occurred,” says George. The third part of the study confirms this activity.

Experiment three examined chemical changes in tissue surrounding injection sites. Using lab work, the researchers were able to determine differences in collagen at various distances from the injection site.

“Collagen in a soluble state doesn’t have chemical bonds formed within it, meaning it is more tender. As the bonds form and mature, they won’t break down in the cooking process. This is why we put a roast in a pot with water to make it tender instead of grilling it, you need moist heat to break down collagen. If the bonds are too strong, that won’t occur,” Morgan says.

The research showed high amounts of insoluble collagen around the injection site, indicating the effect an IM injection has on meat tenderness by causing severe disruption of muscle tissue. “The muscle does change after an IM injection, and continues to change throughout the animal’s life,” Morgan says.

Morgan summarizes the impact injection-site problems pose for the entire industry. “The problem with injection-site blemishes is that you can’t find all of them at the packing plant because they are so deep or hidden in the muscle. As you break a carcass down going into the box you’ll find less than 10 percent of the deep blemishes. As the blemishes get passed from packer to retailer, that is putting them one step closer to the consumer,” he says. “Combined with the information on steak toughness due to injections, the impact on consumer satisfaction is substantial.”

Thus, industry efforts to keep injections out of the muscle must continue. “Veterinarians are one of the most reputable sources of information for cattle producers. They are in a position to deliver this type of information to producers and drive home the implications for

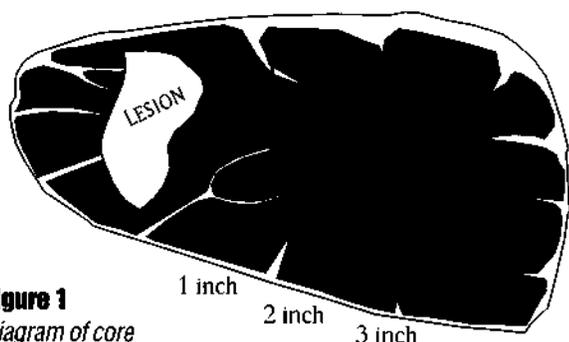


Figure 1
Diagram of core sampling technique for Warner-Bratzler shear evaluation of lesion-afflicted and control bottom-round steaks.

the industry. They can influence the programs producers are using and help them develop ones which emphasize beef quality," George says.

Micotil[®], a leading antibiotic that effectively treats Bovine Respiratory Disease in a single, subcutaneous injection, can be an important part of such a program.

"When we conducted injection-site inspections during the dose titration trials for Micotil's approval, we knew exactly where the injections had been given and we looked closely for injection-site problems at processing," says Dr. Dennis White, Cattle Technical Advisor for Elanco Animal Health. "There were no blemishes present. If a subcutaneous injection is given correctly, we wouldn't expect to see any problems."

Morgan agrees that subcutaneous products keep problems from being hidden in the muscle. "With products that are subcutaneous, any problems are pulled off with the hide and aren't hidden to later affect the meat quality," he says.

Veterinarians and producers can work together to gather information like the CSU study and subsequently adapt management strategies, such as utilizing subcutaneous products to preserve beef quality. This is key for the cattle industry to move forward in achieving its quality goals.

"We need to help people realize that they need to be accountable for the animals they are producing and try to meet the demands of the consumer," George says.

"It's an all too common experience to be eating a good steak and all of a sudden come to a bite that's tough. We can't afford to have injection-site blemishes affect the beef eating experience," Morgan says. "Now with tenderness on the line, we all have to do our part to preserve beef quality."

1. George, M.H., J. B. Morgan, R. D. Glock, J. D. Tatum and G. C. Smith. 1995. "Injection-site Lesions: Incidence, Tissue Histology, Collagen Concentration, and Muscle Tenderness in Beef Rounds" Colorado State University 1995 *Beef Program Report*. 133-143. Also, *J. Anim. Sci.*
2. Dexter, Dr. R., G. L. Cowman, J. B. Morgan, R. P. Clayton, J. D. Tatum, J. N. Sofos, G. R. Schmidt, R. D. Glock and G. C. Smith. 1994. "Incidence of Injection-site Blemishes in Beef Top Sirloin Butts. *J. Anim. Sci.* 72:824.

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