Injection site surveys in Canadian yearling cattle and cull cows and bulls: Fall 1997

Joyce Van Donkersgoed, Sue Dixon, Mary Vanderkop

Abstract — In subprimals from yearling cattle, lesions were found in 16% top butts, 23% blades, 6% eye of rounds, 3% inside rounds, and 8% outside rounds, costing $9.58/head processed ($21 million annually). In cull cows and bulls, lesions were found in 35% outside rounds, costing $6.34/head processed ($4.1 million annually).

Résumé — Diverses enquêtes concernant le site d'injection ohez les jeunes bovins, les vaches de réforme et les taureaux : automne 1997. Des coupes primaires de jeunes bovins, où des lésions furent localisées; la croupe (16 %), de la pointe de l'épaule (23 %), de l'œil de ronde (6 %), de l'intérieur de ronde (3 %), et de l'extérieur de ronde (8 %), encourent une perte de 9,58 $/tête abattue (21 $ millions annuellement). Chez les vaches de réforme et les taureaux, les lésions furent localisées dans l'extérieur de ronde (35 %), encourent des pertes de 6,34 $/tête abattue (4,1 $ millions annuellement).

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Injection site lesions are quality defects in beef that are preventable by changes in animal health management practices. The *Canadian Cattlemen's — Quality Starts Here Program* has been working collaboratively with veterinarians and producers across the country in the last 3 y to promote better injection techniques to reduce economic losses from trim, downgrading of cuts, and increased toughness of beef due to injection scars. Additionally, pharmaceutical companies have been developing animal health products that can be administered SC, PO, or by pour-on, rather than IM.

The results of 2 previous injection site surveys in Canadian yearling cattle (1,2) were similar to those studies in the United States (3–5) and showed that injection scars in subprimals were common and cost the industry millions of dollars annually. A comparison of lesions observed in the fall of 1996 with those observed in the spring of 1997, suggested a reduction in the number of lesions in the top butt. However, it was unknown if this was due to the success of extension programs aimed at moving injections from the butt or round to the neck, or to a seasonal trend.

The results of 2 new surveys are reported here, one in yearling cattle and one in cull cows and bulls. The purpose of the survey in yearling cattle was to monitor, over time, the level of injection site lesions in fed beef carcasses to see if continued extension efforts had been successful in further reducing the prevalence of lesions. The survey of cull cows and bulls was conducted to determine the prevalence of injection site lesions in the outside rounds, as no previous such injection site surveys had been conducted in Canada. In the United States, injection site lesions have been found in 23% to 29% of rounds from similar beef (4,5).

Four purveyors, 2 of whom participated in the previous surveys, were visited in the fall (September to December) of 1997 to assess the level of injection site lesions in top sirloin butts, rounds (eye, inside, outside), and boneless blades from yearling cattle. These 4 purveyors were located in Alberta and Ontario, and thus the fed beef evaluated are most likely representative of the industry. Based on the previously reported prevalences for different cuts, ranging from 1% to 23% (1,2), between 99 and 1771 of the various subprimals were required to reliably estimate the prevalence within 2% (6).

In the survey of cull cows and bulls, 3 purveyors were visited in Ontario, Quebec, and New Brunswick. Although most purveyors of non-fed beef from cull cows and bulls are located in eastern Canada, they receive subprimals from all over Canada and, thus, are most likely representative of the industry. Using a reported estimated prevalence of 23% to 29% in the round of non-fed beef (5,6), approximately 1771 to 2050 subprimals were needed to estimate the prevalence within 2%.

Injection site lesions were counted, trim was weighed, and then all samples were placed in formalin and examined histologically to classify lesions according to the Colorado system (7), and as previously described (1,2). In the survey in yearling cattle, injection site lesions were identified in subprimal cuts that had been sliced

Alberta Agriculture, Food and Rural Development, 11 Bruns Road, Lacombe, Alberta T4L 1P1 (Van Donkersgoed); Box 571, Carstairs, Alberta T0M 0N0 (Dixon); and Alberta Agriculture, Food and Rural Development, Animal Health Laboratory, 3115-5 Avenue North, Lethbridge, Alberta T1J 4C7 (Vanderkop).

Correspondence and reprint requests to Dr. J. Van Donkersgoed.

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Table 1. Summary of injection site lesions observed in beef subprimals from fed cattle at 4 Canadian purveyors during the fall of 1997

Outcome	Boneless blade	Top butt	Eye of round	Inside round	Outside round
No. of subprimals	303	872	748	269	391
% lesions	23	16	6	3	8
95% CI[a]	19–28	14–19	4–7	1–5	5–10
Trim weight (g)[b]	51	106	128	58	89
range	36–75	70–150	74–207	19–117	17–266
Type of scar[c]					
% clear scar	0	21	0	29	29
% woody callus	37	38	79	57	53
% mineralized scar	0	1	0	0	0
% scar with nodules	63	39	19	14	12
% cystic	0	0.7	0	0	0
% normal fat	0	0.7	2	0	6
Economic loss $/head[d]	2.77	3.23	0.91	0.85	1.82

[a]95% confidence intervals
[b]Median weight (g) and range of trim from injection site lesions
[c]Distribution % of injection site lesions based on the following histological classifications: clear scar = scars with predominantly a fibrous response that had mature fibroblasts, but less mature collagen, with a mucinous appearance and usually minimal fat infiltration and inflammation; woody callus = scars with mature fibrous tissue, intermingling of adipose infiltrates, and generally mild, nonfocal inflammation; mineralized scar = scar with fibrous tissue containing sufficient mineralization to be a prominent feature of the scar; scar with nodules = scar with variable fibrosis and fatty infiltration, and the required element was nodular, multifocal inflammation with macrophages and lymphocytes and generally small numbers of multinucleate cells; cystic = scar with necrotic cellular debris in an area of focal granulomatous inflammation; none = normal muscle and fat infiltration with no evidence of fibrosis or inflammation
[d]Total loss was $9.58 per head processed or $21 million annually

to produce steaks. In the survey in cull cows and bulls, scars, where identified as outside rounds, were trimmed on the surface for further processing. These pieces were not cut into steaks, so some internal IM lesions could have been missed.

The pathologist from the previous 2 surveys (1,2) examined all tissues, in order to reduce diagnostic variability. While samples from the cull cows and bulls were being examined, it became apparent that the woody callus category of lesion had a broad range of differences in fibrous tissue, fatty infiltration, and inflammatory lesions. Therefore, to more completely document the lesions in outside rounds from cull cows and bulls, the category woody callus was subdivided into 3 subcategories. When fibrous tissue predominated, the lesion was called "fibrous woody callus"; when fatty infiltration predominated, the lesion was called "fatty woody callus"; and when the lesion was poorly circumscribed, with fibrous tissue interlacing between muscle bundles rather than in broad dense bands, and characterized by marked proliferation of both sarcolemmal cells of muscle and immature fibroblasts, the lesion was called "regenerative woody callus." This additional classification system for "woody callus" may be helpful in studies that attempt to age the lesions and determine their cause.

All data were analyzed in an analytical software package (STATISTIX for Windows, Analytical Software, Tallahassee, Florida, USA). Prevalence, 95% confidence intervals (CI), and median weights of trim were calculated by subprimal and type of lesion. For the economic analysis in yearling cattle, calculations similar to those in the previous surveys were made by using the average International Surveys Limited retail prices for September, 1997 (1,2). For cull cows and bulls, the calculations were made as follows: the average trim (186 g) was multiplied by the retail price ($4.16/kg) to obtain the trim loss ($0.77). The average weight of the meat from the outside round remaining following trim (7.727 kg–0.186 kg = 7.541 kg) was devalued by $1.10/kg, as suggested by purveyors, for a loss of $8.30. The total loss per damaged subprimal was $0.77 + $8.30 = $9.07, and the estimated prevalence of lesions from the survey was 35%, for an estimated loss of $3.17 per outside round processed or $6.34 per head processed. The estimated number of cull cows and bulls in Canada processed in 1996 was 649 702, for a total of 1 299 404 outside rounds, resulting in an estimated loss of $4.1 million annually.

The prevalence of injection site lesions in yearling cattle is shown in Table 1. One practical limitation of this survey was in being able to examine enough subprimals for a more precise estimate of prevalence. The number of pieces observed at each plant was highly variable and could not be predicted. The reliability of each estimate is shown by the range of the 95% CI, and it varies depending on the prevalence and sample size. The prevalence of lesions was 16% in the top butt, which is not significantly different ($P > 0.05$) from the prevalence in our first and second surveys, based on the overlap of the 95% CI (1,2). Assuming that the use of animal health products is similar over time, we would expect an increase in the lesions in the boneless blade and a decrease in the lesions in the top butt and round, provided that the products were being administered in the neck, as recommended. However, the prevalence of lesions in the blade and round was largely unchanged since the fall of 1996.

A total of 2980 outside rounds from cull cows and bulls were examined. The prevalence of lesions was 35% (95% CI, 34% to 37%), and the trim averaged 186 g, similar to what was found in 2 surveys conducted in the United States (4,5). Thus, injection site scars are also prevalent in cull cows and bulls, which is not surprising. In this survey, the proportion of cull cows that were beef or dairy was not known. Purveyors estimated that 70% of the outside rounds were from cull dairy cows.

It may have been assumed incorrectly by some veterinarians and beef and dairy producers that all rounds from cull cows and bulls are ground for hamburger. Therefore, they may judge that there is no need to change injection practices. According to industry

representatives, approximately 60% of the rounds in cull cows and bulls are used for table meat, as steaks, roasts, stew meat, kabobs, and fancy sandwich meats. Consequently, it is critical to avoid injections in the top butt or round of cull beef and dairy cows and bulls, because the scars from injections persist, causing trim, devaluation of the meat and consumer dissatisfaction from unsightly lesions and associated tough beef (3).

The distribution of lesions in outside rounds from cull cows and bulls was 15% clear scar, 1% mineralized scar, 1% scar with nodules, 25% fatty woody callus, 34% fibrous woody callus, 22% regenerative woody callus, 0.6% cystic, and 0.8% normal fat. In the survey in yearling cattle, 1% of the gross lesions was normal fat, indicating a low level of misclassification bias. There were very few scars with nodules in the outside rounds from cull cows and bulls, suggesting that this is an early stage of the lesion, when antigenic stimulation is still present. The few scars with nodules were quite mild, relative to those in beef from yearling cattle. The regenerative woody callus resembled an intermediate stage between a scar with nodules and a more chronic fibrous or fatty woody callus. Research is underway to develop methods that may lead to better procedures to age these lesions to determine when the injection occurred, during early calf-hood or in the feeding period. Additional studies are in progress to assess the impact of various animal health products on the prevalence, character, and severity of injection-site lesions and on the tenderness of beef.

Economic losses were estimated at $9.58/head processed for yearling cattle and $6.34/head processed for cull cows and bulls. The results of these 2 surveys indicate that injection site scars continue to present a major quality improvement challenge to the beef industry, costing the industry millions of dollars in lost revenue. In the short term, the entire beef industry loses from injection site scars, because all quality losses are averaged across cattle prices. In the long term, the losses may be more significant, due to declining beef demand at the retail level because of poor and inconsistent quality. As animal health professionals, veterinarians have a responsibility to identify and eliminate the obstacles that have prevented a reduction in injection site lesions. We must help to identify solutions to the problem, whether these are changes in cultural mind-set, additional education and extension programs, or improvements in handling facilities and injection techniques. Some of the changes in handling facilities may be as simple as using a pole behind an animal in the chute, proper use of the squeeze in the chute, good head catching techniques in the chute, the use of head bars or nose chains on the head gate to prevent animals from lunging, or the use of a halter. It is hoped that equipment manufacturers will respond quickly to the need for chutes that facilitate neck injections.

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