Over the next few months you will note revision and updating of the website (http://cmsa.ca). I thank Gabriel Piette, Luc Jacques and their co-workers for their efforts in this regard.

The CMSA, the CMC, the American Meat Institute and the American Meat Science Association are co-sponsors of the Meat Industry Research Conference which will be held in Chicago, October 25-27th. This looks like a good program, especially for those interested in keeping the meat supply safe for consumption.

I recently came across a quote by Talleyrand, a French statesman who lived a couple centuries ago: "I am more afraid of an army of a hundred sheep led by a lion than an army of a hundred lions led by a sheep." It occurred to me that there are just over 100 CMSA members and there don't seem to be many sheep. My initial response to that is "baaaaa". Roar, lions, roar, in harmony, and your industry/organization, will be strong.

Sincerely,

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CARCASS PRODUCTION: THE CROSS-BORDER STUDY: APPLICATION OF BEEF GRADING PROCEDURES IN CANADA AND THE US

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Background:

In 1992, Canada introduced marbling as part of the quality assessment for Canada A grade carcasses. The marbling standards were developed in consultation with the USDA and designed to be equivalent to the US marbling standard. Three levels of marbling were initially defined: traces (Canada A equivalent to US Standard), slight (Canada AA equivalent to US Select) and small or greater (Canada AAA equivalent to US Choice). The average incidence of the Canada AAA grade in the first year after its introduction was a little over 20%. Feedlot operators reported that Canadian cattle shipped to the US routinely graded 40-60% US Choice. Subsequently, efforts focused on the Canadian marbling standards, which were found in practice to be set slightly above the corresponding US marbling standards.

The US marbling standards were then adopted in the Canadian grade standards, but average grading results for 1997 showed the Canadian incidence of the AAA grade to be slightly under 30% (Canfax, 1997). Feeders were still reporting much higher % US Choice grading when cattle assumed to be similar were shipped to the US. Thus a study was proposed to determine the assignment of

beef quality grades (assessment of marbling) by comparing plants in Canada and the US.

There have been several studies conducted in the past which have attempted to define the equivalence between Canadian and US grading standards and these have focused on both quality and yield grades (Jones *et al.*, 1995; Talbot and Campbell, 1989). These studies have found a high association between the Canadian and US grading systems particularly in the assessment of marbling. In the 1994 study over 90% agreement was found between US and Canadian graders in the application of marbling scores. One of the major limitations of these studies is that the Federal graders in both countries were fully involved in the conduct of these studies and assessed carcasses in both countries at the same time and at the same place on the grading stand. Under these conditions it might be argued that the grading standards would be carefully applied with the result that no differences were apparent. It was therefore vital to the success of this study that its existence not be known to the graders in both countries.

Experimental procedure:

This study was conducted in two phases. In each phase, a domestic plant was compared to a sister US plant. Pens of cattle were split with half shipped to each plant. Prior to the initiation of Phase 1, five replications were conducted in which split lots of cattle were shipped to the same domestic plant to obtain an indication of the variability inherent in the selection process and to validate the testing protocol. It was concluded that a satisfactory sort was being achieved by the sorting procedure in terms of grades and carcass weights. The first phase consisted of 12 replications of approximately 160 steers shipped to each plant, for a total of approximately 1900 head shipped to each plant. Carcasses in the US plant were subjected to high voltage stimulation, while those in the Canadian plant were not. Grading in both plants was conducted 24 h post-mortem.

Phase 2 consisted of six replications totaling approximately 900 head of steers to each facility. The size of replications varied from 32 to 264 animals. Carcasses at both facilities were subjected to high voltage stimulation, and all carcasses in the initial six replications were graded following a 48 h chill. Heifers were shipped to both plants in a follow-up validation trial, in which the US carcasses were graded following a 48 h chill and the Canadian carcasses were graded at 24 h post-mortem.

Marbling levels assigned and the corresponding grades from each plant are as follows:

Canada		USA	
Minimum marbling	Grade	Grade	Minimum marbling
Slightly abundant^0	Prime	Prime	Slightly abundant^0
Small^0	AAA	Choice	Small^0
Slight^0	AA	Select	Slight^0
Trace^0	A	No roll	Practically devoid^0

Data analyses

Carcasses downgraded for lack of finish or due to dark cutting, and thus not assessed for marbling level, were excluded from the data set prior to analyses. Quality grade was reduced to a yes or no proposition. Y = Canada AAA or Canada Prime in the Canadian plant and USDA Choice or USDA Prime in the US plant. N = Canada A or Canada AA and USDA Select or no roll in the Canadian and US plants respectively. Chi-square analyses were conducted using SAS statistical software (SAS, 1989) to test whether the distribution of Y/N was different between sister plants.

Results

Results from phase 1 demonstrated that, on average, one could expect an increase of 34% in the frequency of carcasses assessed as having small or greater marbling when shipping similar lots of cattle to the US plant compared to the domestic plant (Table 1). The frequency of AAA and Prime carcasses in the Canadian plant averaged 25.1% while the average

frequency of Choice or Prime carcasses in the sister US plant was 33.6%. The differences in quality grade distribution between the two plants were statistically significant in 5 of the 12 replications, and in two replications the difference exceeded 100%.

In phase 2, which compared a different Canadian plant to a sister US operation, the differences in quality grade distribution were of greater magnitude (Table 2). The average frequency of AAA and Prime over the six replications in the domestic plant was 30.1% compared to a frequency of 55.2% for Choice and Prime in the US counterpart. Ignoring the second replication, which had a small number of animals, of the remaining five replications, there was more than double the frequency of carcasses assessed with small or greater marbling in three replications, in favor of the US plant.

In the final replication of phase 1 and the seventh, validation replication of phase 2, study personnel visited the respective plants to observe and record plant to plant differences in grading procedures and conditions. In phase 1, the US carcasses were subjected to high voltage electrical stimulation which was not the case in the Canadian plant. Electrical stimulation has been shown to improve subjective marbling scores at 24 h post-mortem, and increase brightness and redness of muscle color compared to non-stimulated sides (Aalhus *et al.* 1992; Pearson and Dutson, 1985). In a Lacombe study in which alternate sides of beef carcasses were subjected to high voltage electrical stimulation, there was an increase of one third of a marbling unit in the stimulated sides compared to the control sides. This increase in perceived marbling translated into an increase of carcasses which were scored small or greater of 22.0% and 29.0% in the two years over which the study was conducted (Table 3). It should be noted that the study was conducted in a research abattoir under trial conditions and does not necessarily reflect the impact of high voltage stimulation on marbling scores under commercial conditions. In phase 2, differences in the type and color rendering properties of the grade stand lighting had a profound effect on the perceived color of the rib eye muscle such that the US carcasses were much brighter and paler red in appearance. No data is available concerning the impact of different lighting systems on marbling assessment, but it is well known that improved marbling scores are associated with improved rib eye muscle color such as occurs with high voltage stimulation or increased carcass chill times.

Conclusion:

The results of this study clearly confirm that a difference in grade distribution can be expected when similar lots of cattle are shipped to US or Canadian sister plants. A much higher proportion of Choice or Prime carcasses was recorded in the US plant compared to AAA or Prime carcasses in the Canadian plant. The study was necessarily designed so that the graders were unaware of the existence of the study, and therefore the same carcasses were not graded under the same conditions by both domestic and foreign graders. Therefore, it is impossible to quantify what portion, if any, of the difference in grade distribution can be ascribed to interpretation of the marbling standards, or to other factors which are known to have a bearing on assessment of marbling.

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Table 1. Phase I Results

	Canada	US		Chi-square[1]	
Rep	% AAA+[2]	% Choice+[2]	Difference	Value	P
1	23.8	30.6	6.8	1.910	0.167
2	30.0	36.0	6.0	1.317	0.251
3	13.9	23.3	9.4	4.922	0.027
4	22.8	28.7	5.9	1.566	0.211
5	33.9	35.9	2.0	0.142	0.706
6	19.3	39.1	19.8	14.91	0.001
7	13.2	30.4	17.2	13.89	0.001
8	32.1	33.8	1.7	0.101	0.750
9	18.8	33.3	14.5	9.058	0.003
10[3]	41.2	38.4	-2.8	0.196	0.658
11	25.6	37.8	12.2	5.341	0.021
12	29.9	37.8	7.9	2.301	0.129
Overall	25.1	33.6	8.5	33.89	0.001
Std. Dev.	8.42	4.76			

[1]Chi-square for Y/N distribution in each plant (Y = AAA+/Choice+)
[2] Percentage of total grade, excluding off-grades or ungraded carcasses.
[3] Rep 10 excludes split lots which received a 48 h chill in Canada but 24 h in the US.
P = probability. Observed difference is statistically significant when P<0.05.

Table 2. Phase II Results

Rep	Canada % AAA+[2]	US % Choice+[2]	Difference	Chi-square[1] Value	P
1	28.8	58.6	29.8	28.84	0.001
2	14.3	40.6	26.3	5.902	0.015
3	38.3	56.6	18.3	17.59	0.001
4	20.2	48.3	28.1	15.41	0.001
5	32.7	58.7	26.0	14.90	0.001
6	22.0	53.5	31.5	21.16	0.001
Overall	30.1	55.2	25.1	97.36	0.001
Std. Dev.	8.83	7.10			
7[3]	70.3	60.4	9.9	2.972	0.085

[1] Chi-square for Y/N distribution in each plant (Y = AAA+/Choice+)
[2] Percentage of total grade, excluding off-grades or ungraded carcasses.
[3] Heifers, validation trial.
P = probability. Observed difference is statistically significant when P<0.

Table 3. Effects of high voltage stimulation on marbling assessment

Year	n	Treatment	Small or greater, %
1986	79	Stimulated	77.2
		Control	63.3
		Difference	13.9
1987	68	Stimulated	72.1
		Control	55.9
		Difference	16.2