NOTES

PRESLAUGHTER MANAGEMENT AND DARK-CUTTING IN THE CARCASSES OF YOUNG BULLS

One hundred-and-twelve yearling bulls were penned together for at least 3 mo in groups of 7 or 21. They were then shipped 150 km to an abattoir in groups of either 7 or 21, and were either regrouped or not regrouped before shipment. They were held overnight at the abattoir before slaughter. A further seven yearling bulls were shipped and held individually before slaughter. After slaughter, muscle color was appraised by Federal graders. Load size had no significant effect on the incidence of dark-cutting, but regrouping had a dramatic effect (73 vs. 2% dark cutters, $P < 0.01$). There were no dark cutters among the bulls shipped individually. It is concluded that agonistic encounters among regrouped bulls was a far more important cause of dark-cutting than either load size or exposure to an alien environment.

Cent douze taurillons d'un an ont été parqués ensemble pendant au moins 3 mois en groupes de 7 ou de 21. Ils ont ensuite été expédiés à l'abattoir, à 150 km de là, en groupes de 7 ou de 21, de même composition que les premiers ou remainés. Ils ont été abattus le lendemain de leur arrivée à l'abattoir. Sept autres taurillons ont été expédiés et gardés individuellement avant l'abattage. Après l'abattage, les agents fédéraux du classement ont procédé à l'appréciation de la couleur du maigre. Le nombre d'animaux par lot n'a pas eu d'effet sur la fréquence de "viandes noires", mais en revanche le remaniement des groupes avant l'expédition a eu un effet spectaculaire (73% de cas de viande noire contre seulement 2%, $P < 0.01$). Les taurillons expédiés individuellement n'ont pas donné de viande noire. On en conclut que les contacts agonistiques entre les taurillons regroupés ont été une cause de loin plus importante d'apparition de viande noire que le nombre d'animaux réunis par lots ou l'exposition à un environnement étranger.

The Beef Carcass Grading Regulations of the Canada Agricultural Products Standards Act (Anonymous 1972) state that to qualify for the Canada A grade a carcass should have "Longissimus dorsi muscle that has a bright red color." A carcass showing medium dark red or dark red muscle color must be downgraded. The dark-cutting phenomenon (Hall et al. 1944) must, therefore, be considered important to Canadian beef producers.

It is widely accepted that the incidence of dark-cutting is higher among bulls than among steers and heifers (Martin et al. 1971; Buchter 1975); this serves as a continuing disincentive to potential bull-beef producers. The reason for the higher incidence of dark-cutting appears to be greater stress susceptibility among bulls (Field 1971; Martin et al. 1971) rather than any intrinsic quality of bulls' muscles, since under controlled conditions no difference is usually reported (Rhodes 1969; Field 1971).

An experiment to investigate the influence of social interactions among bulls before slaughter on the incidence of dark-cutting used bulls aged about 12 mo which had recently completed a 140-day feedlot performance test. The bulls were taken from their pens, some were removed for use in the breeding herd, and the remaining 112 were redistributed among the same pens in groups of 21 and 7 as shown in Fig. 1. The bulls were held in these groups for a period of 12–14 wk, during which time stable social structures developed within each pen (Tennessen and Price 1980). At the end of this period they were trucked in groups of 21 or 7 bulls in either mixed (regrouped) or

unmixed (not regrouped) lots (Fig. 1) 150 km to an Edmonton packing plant. At the plant, the groups were held together overnight. The bulls' behavior patterns were monitored during loading, transporting, unloading and holding overnight. They were marketed in a total of eight shipments over a 4-wk period (July and August 1979). A further seven bulls, drawn individually from pens of 5–10 bulls were trucked and held individually at weekly intervals in October and November 1979, but otherwise treated identically to the previous 112.

All bulls were slaughtered and dressed in the normal manner on the morning following arrival at the plant. After overnight chilling, the carcasses were knife-ribbed and appraised by Federal graders, who scored the muscle color as bright, medium or dark as required by the grading regulations (Anonymous 1972). Carcasses scored as medium or dark were all considered dark-cutters.

During loading, transport, and holding at the plant the regrouped bulls were observed to be continually active. Fighting and mounting occurred frequently and the bulls appeared to expend a great deal of energy in these activities. The bulls which were not regrouped were calm but remained standing throughout the period of transport and holding. The individually shipped bulls also remained calm throughout but spent most of the time in the truck and the plant lying down. These results suggest strongly that the alien environments of the truck and the packing plant did not disturb the bulls excessively. In the case of the bulls which were regrouped, this could be attributed to the presence of familiar animals simulating a normal environment. However, the individually shipped bulls had no familiar animals from

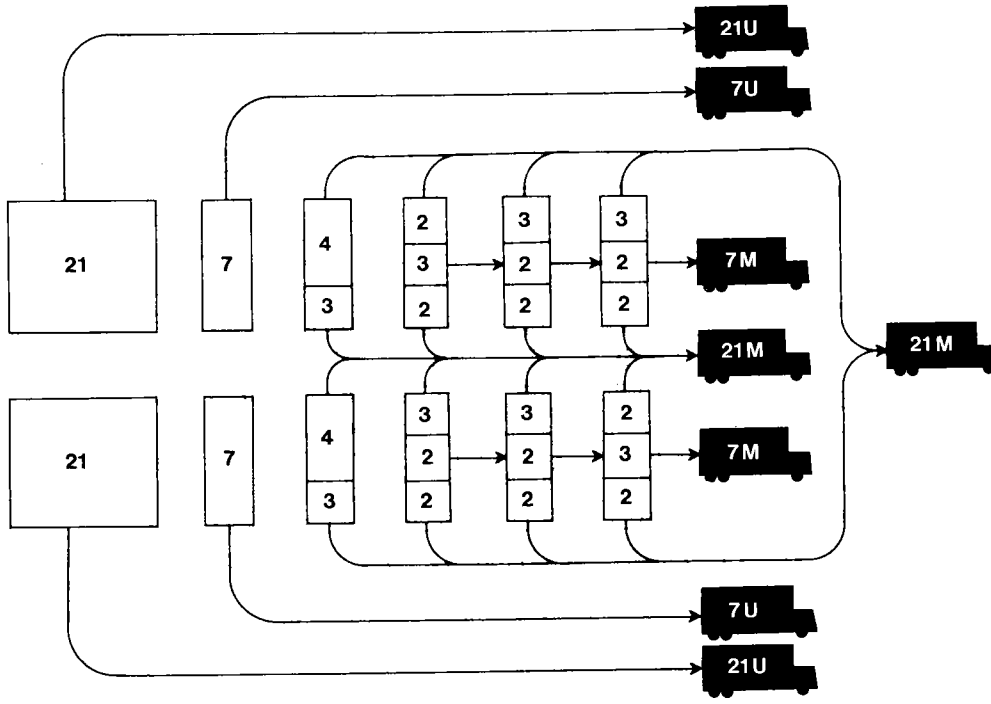

Fig. 1. Schematic representation of load composition. Loads consisted of either 7 or 21 bulls from a single pen (U) or regrouped from several pens (M) as illustrated.

Table 1. The incidence of dark-cutting among the carcasses of young bulls shipped to the packing plant in large (21) or small (7) groups drawn from several pens (mixed) or single pens (unmixed) in the feedlot

	Large loads (21 bulls)	Small loads (7 bulls)	Individually shipped bulls	Total
Mixed				
Number	42	14	–	5
Dark cutters†	29(69%)	12(86%)		41(73%) *a*
Unmixed				
Number	42	14	–	56
Dark cutters†	1(2%)	0(0%)		1(2%) *b*
Total				
Number	84	28	7	119
Dark cutters†	30(36%) *c*	12(48%) *c*	0(0%)	42(35%)

†As defined in the Canadian Beef Carcass Grading Regulations.
a,b Numbers in the same column having different letters are significantly different ($P < 0.01$).
c Numbers in the same row having the same letter are not significantly different ($P > 0.05$).

which to derive comfort, yet they too appeared undisturbed by the changed environment. It is therefore concluded that the most disturbing part of the marketing process for these bulls was not the unfamiliar surroundings or handling procedures but the presence of strange bulls. This probably applies to the marketing of cattle generally, suggesting that the greatest stressor in moving cattle is agonistic encounters among unfamiliar animals.

Of the 119 bulls in the experiment, 42 were judged to have dark-cutting carcasses (Table 1). Analysis of variance among the 112 comprising the loads of 7 and 21 bulls indicated no significant effect of load size on the incidence of dark-cutting, but a significant ($P < 0.01$) effect of regrouping before slaughter. The load size × regrouping interaction was not significant. The fact that regrouping exacerbated dark-cutting was predictable on the basis of the behavior of the regrouped bulls before slaughter. The agonistic encounters would lead to elevated catecholamine levels, and also to a greater rate of energy metabolism, both of which would be expected to decrease the available muscle carbohydrate for postmortem glycolysis, a known cause of dark-cutting (Forrest et al. 1975).

It thus appears that group size per se is unlikely to affect the incidence of dark-cutting provided all the bulls within the group are familiar with each other. It is likely, however, that a group size could be reached (probably far in excess of 21) where there would be too many bulls to form a stable social structure (Tennessen and Price 1980). Under these circumstances group size could affect the incidence of dark-cutting. It is concluded that encounters with strange animals is a primary cause of dark-cutting in bull carcasses.

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