Are You Doing Your Best At Transporting Cull Dairy Cows to Market?

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Take Home Messages

- Cull cows have the greatest probability of becoming lame, non-ambulatory and dying at the end of a long haul (> 400 km) journey compared to other cattle.
- More welfare issues are observed when shipping times exceed 30 hours.
- Longer journey durations at higher air temperature increase shrink and poor welfare outcomes.
- Cull cows have increased chance of being under loaded in the doghouse and nose compartments thereby increasing injury.
- Cows shipped at loading densities lower than 0.015 or greater than 0.035 k-value (m^2 per animal / (body weight$^{0.67}$) are more likely to die, become non-ambulatory, or lame.
- Dairy producers can be proactive by only hiring trucking companies/drivers that are trained through certified programs like the Canadian Livestock Transport program.
- Even the best transport personnel and conditions cannot compensate for bad loading decisions.

Introduction

Although milk production is the main and obvious focus of the dairy industry, a secondary but equally important component of the dairy business is the production and marketing of beef cattle resulting from surplus bull calves and cull cows. A necessary part of marketing cattle in Canada today involves road transport. In the case of cull cows, transport directly to processing plants or through the auction market system often involves travelling a significant distance from their farm of origin. As cull cows are, by nature one of the most fragile types of animals transported, more attention to the conditions of transport is required, particularly during long distance (> 400 km) travel.

The transport of cull dairy cows continues to be the topic of many producer articles and press releases from organizations both within and outside the agriculture sector, and have been predominantly associated with enhancing awareness of animal welfare of this type of animal. These communiqués are particularly relevant given that public sensitivity to poor animal welfare is at an all time high. For example, over the last 5 years, the most frequent letter of concern to the Canadian Minister of Agriculture has been livestock welfare during transport. Among the most common concerns are excessive transport durations, limited access to feed and water, inappropriate loading densities, exposure to variable and or extreme climatic conditions and transport of compromised cattle.

One needs to look no further than the recent video made of abusive handling on a dairy farm, which dominated the national news and internet in the summer of 2014, to realize the gravity of improper animal care. Ultimately, these scenarios can have catastrophic effects on consumer confidence in both dairy and beef products domestically and internationally.

The objective of this paper is to define cull cow welfare and discuss its relationship to current transport practices based on recent research findings. The sections below will include a summary of our own research and others with regard to the effects of distance, weather and trailer environment loading density and driver factors and their effects on cull cows. It should be noted that cull cows were not identified by breed in the majority of the studies presented but rather indicate cows that are no longer economically viable.

■ Animal Welfare And The Cull Cow

Animal welfare is the state of an animal as it attempts to cope with its environment (Broom, 2005). Optimal welfare means that an animal’s needs are met with regard to nutrition, shelter, health, and ability to express natural behaviour, and to live free of undue pain and suffering.

It is well known that when animal health and condition are optimal, the animal’s ability to cope with environmental stressors is superior to that of an animal that is considered compromised (Broom, 2005). Accordingly, cull cows are one of the most vulnerable types of animal from an animal welfare perspective. They are often thin with marginal energy reserves and are culled because they are no longer economically viable due to advanced age, reduced health or poor reproductive performance. Reasons for culling most commonly include lameness, low body condition or cancer eye and udder problems. Consequently, these cows are less able to withstand transport stress than younger, healthier animals, and are at greater risk of poor welfare because of their low economic value, which in turn may result in reduced care. It is well documented that during transport, cull dairy cows can suffer compromised physical state including weakness, hypothermia, recumbence and death.

There are several excellent published documents that clearly define the conditions a cow must have to be considered unfit for loading on a transport vehicle, and what conditions constitute a compromised animal than can be transported with special provisions (CFIA, 1998; Western Dairy Science Inc., 2004). It is mandatory that dairy producers and haulers know these conditions and guidelines intimately. All parties must do everything in their power to implement these standards, which is the first and most important step to ensuring optimal cow care.

Recent statistics from the Canadian Food Inspection Agency (CFIA) indicate that there have been some improvements in the condition of cull cows being transported within Canada. Body condition scores of cull cows were documented to be up to 27% in 2013-2014 compared to previous years. In addition, fewer animals were being shipped with cancer eye, with values being at their lowest point since 1999. Although these statistics show that producers are hearing the message regarding proper marketing of cows it is still clear that much more needs to be done.

▪ Transport Management Factors Affecting Cull Cow Welfare

By its very nature, transport has the potential to result in injury or death related to both physical and psychological stress that cattle may encounter. As previously noted, the state of a cow defines how fit it is for transport and ultimately its ability to cope with stress. In support of this point, our research has shown that cull cows are at greatest risk of poor welfare during long-haul transport (> 400 km) because they have the greatest probability of becoming lame and non-ambulatory and dying at the end of the journey compared to other types of cattle (González et al., 2012d). The same study found that cull cows were most affected by long-haul transport because they had greater shrink than fat cattle transported the same distance.

The transport process consists of all events associated with loading/unloading as well as time on the truck (driving and stationary periods). Several factors, alone or in combination, can contribute to either positive or negative welfare outcomes during this process, including driving and handling quality, time on the truck, trailer design and ventilation, and loading density and fitness of the animals. Transport regulations and industry codes of practice can further affect the factors listed above. Each of these contributing factors will be discussed separately below.

Transport Regulations

Currently, our transport regulations (CFIA, 1998) are in the process of being updated and revised by the CFIA as they more than 37 years old. This is to ensure they reflect current welfare concerns, research findings and global standards set by the World Organization for Animal Health. Until the new regulations are passed the standards outlined below would currently apply to transported cull cows.

Cows can be on a transport vehicle for a maximum of 52 hours before reaching their final destination (CARC, 2001). As a point of interest, this time is approximately twice as long as identified in the U.S. (USDA, 1997) and 6.5 times as long as the European Union (European Commission, 2005) regulations. The regulations also specify that cow stress and pain be reduced during transport. For example, incompatible cattle must be segregated on the trailer, and rules are clearly outlined for what type of animal is considered unfit for transport (e.g. downer animals, cancer eye and bone fracture, etc.) and what type of animal can be transported with special provisions (CFIA, 1998). The use of bedding is also required on journeys over 12 hours (CFIA, 1988). It is mandatory to off-load cows for a minimum of 5 hours rest after 48 hours of transport (unless they can reach their final destination in 52 hours). Rest stops consist of bedded pens where the cattle can lie down and have access to feed and water for at least 5 hours and as long as 24 hours. At this time, we know very little about the effectiveness of rest stops or optimal rest durations for cattle. The additional handling associated with loading and unloading of frail cows may be more detrimental than leaving them on the truck (with access to food and water). New research is needed to assess the welfare affects of varying feed water and rest intervals and if they actually improve animal welfare.

Animal Handling and Truck Driver Experience

Individuals tasked with handling (during loading and unloading) and hauling cattle have a considerable role to play in ensuring their wellbeing. Studies have shown that loading and unloading cattle can be more stressful for them (elevated heart rate and stress related hormones such as cortisol) than leaving them on a truck (Camp *et al.*, 1981). Therefore, handling during these events should be conducted slowly, and as gently and quietly as possible (Grandin, 2007). Strategies to facilitate calm handling include moving cows in groups to reduce separation related agitation and using appropriate handling tools such as flags or paddles or providing light so that the cattle can see where they have to go (Grandin, 2007). This is particularly important because cull dairy cows are extremely susceptible to bruising because of their reduced fat cover. Consequently, cows should be handled as few times as possible immediately prior to slaughter and especially during long distances (> 300 km) as shrink can magnify this effect (Hoffman et al., 1988). In addition, caution should be taken when loading cows into the doghouse compartment of the trailer because most cows are tall (~140 to 147 cm) and are not able to stand normally without touching their backs on the ceiling beams of the trailer. A diagram of a transport trailer with the internal compartments is shown in Figure 1.

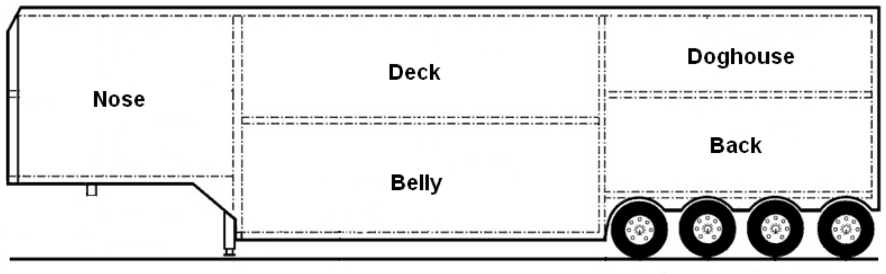

Figure 1. Compartment layout in a typical pot belly livestock transport trailer. Image adapted from Merritt Equipment Co. (http://www.merrittequipment.com/quad-axle/canadian-quad-axle.html).

Driver training, experience and compassion are critical components of optimal cow care. Drivers must be aware of and trained to recognize and manage risk prior to and during transport. For example, any individual loading cows for transport must be vigilant about the condition (fitness) of that cow to reduce downer animals or mortality. Driver preparation for transport should include scheduling border arrivals and gathering information about road conditions, construction and detour routes, and potential weather related road closures (Schwartzkopf-Genswein et al., 2008). Our studies have shown that cattle transported across the Canada/U.S. border experienced average delays (related to border wait times, weather, etc.) of 3 hours with maximum recorded delay lengths of 15 hours (González et al., 2012a). Although maximum delays of 15 hours were not recorded frequently, such delays would have a significant impact on the welfare of cows, especially those identified as compromised or those being transported in hot weather.

Delays associated with such events as loading/unloading, mechanical breakdown, driver rest, etc., inherently increase the length of the time cows are in transport and the potential for reduced welfare. González et al. (2012a) reported loading and unloading times for commercially transported cattle to be on average 20 and 30 minutes with maximums of 5 and 3 hours, respectively. Another study noted that there were several occasions where truck drivers waited for more than one hour to unload at a slaughter facility (Warren et al., 2010). Some of our recent unpublished work found that the risk of bruising was higher in loads of cows that waited at the plant for more than 30 minutes before unloading. Ultimately, the goal of the producer and hauler should be to reduce the total amount of time cows are on a truck.

Poor driving practice is a major factor contributing to poor cow welfare, which would include falling, injury, stress, and bruising (Eldridge, 1988; Tarrant et al., 1988). Two factors that can impact driving quality are conscious effort and experience. González et al. (2012a) recorded the number of years of cattle hauling experience divers had (< 2 yr, 3 to 5 yr, 6 to 10 yr and > 10 yr) and found that shrink at unloading was lower in cattle transported by drivers having ≥ 6 years of experience compared to those with ≤ 5 years. This study suggests that experienced drivers may be more conscientious at stopping, starting, and cornering, have better cattle handling skills or are better at managing transport risk factors.

Most large livestock transport companies and processing plants in Canada require that drivers be trained through a recognized program such as the Canadian Livestock Transporter (CLT) program before or as a condition of hiring. The goals of these programs include educating drivers about animal behaviour, comfort, monitoring and handling; driving practice; maintaining vehicles, and knowing the regulations and risk factors. The degree to which these driver-training programs are effective is unknown but handler-training programs in slaughter plants are reported to improve animal welfare during lairage and slaughter (Grandin, 2006). Dairy producers can be proactive by only hiring trucking companies/drivers that are trained through these programs. However, it should be noted that even the best transport personnel and conditions cannot compensate for bad loading decisions.

Transport Duration and Distance

From an animal welfare perspective, the actual time or duration an animal is transported is more important than the total distance it has travelled. The total duration includes waiting to depart after loading, driving and stationary periods, waiting to off-load and any experienced delays (as previously discussed).

Our transport survey (6152 long-haul loads, > 400 km) found that cattle shipped within and outside of Alberta were on the road an average of 15.9 hours and up to a maximum of 45 hours (Gonzàlez et al. 2012a). A similar study conducted in Ontario, documenting conditions of cattle transported to slaughter, reported average shipping times of 4.6 hours with a maximum of 68.3 hours (Warren et al., 2010). Both studies confirmed that few loads exceeded the maximum transport times specified in the regulations. However, it is important to note that neither study assessed transport duration experienced by cows (usually of poor condition or quality) that were sold and resold through the auction markets. In addition only 1% of all cattle tracked in the Gonzàlez study were classified as cull, which included dairy and beef cows and a small portion of bulls.

Several negative welfare outcomes have been associated with increased transport duration. For example, our research group found that shrink increased faster in cattle transported for longer periods at higher temperatures (González et al., 2012b; Figure 2).

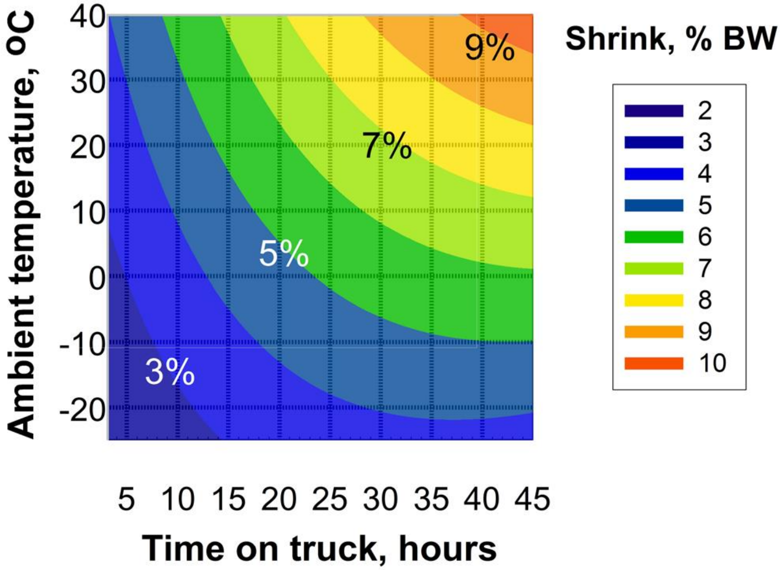

Figure 2. Effect of time spent on truck and average ambient temperature during the journey on shrink of fat cattle during commercial long haul transport in North America (> 400 km). Add 1.56% of BW for feeder cattle, 2.60 for calves, and 3.56 for cull cattle to the value from the any point in the figure. Ambient temperature was the midpoint between the minimum and maximum values reported within each journey.

We also found an increased incidence of mortality, non-ambulatory cattle and lameness when shipping times exceeded 30 hours (Figure 3A). The same study found that only 5% of the loads tracked exceeded 30 hours. This suggests that recommendations to reduce maximum transport durations to 30 hours would not limit marketing for the majority of producers and would improve welfare of the cows.

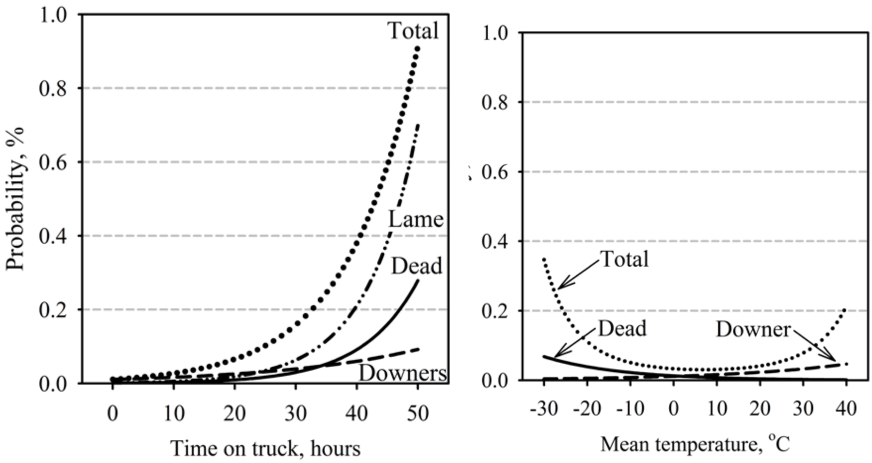

Figure 3. Effect of time cattle spent on truck (A), midpoint (mean) temperature (B), on the likelihood of becoming lame, non-ambulatory (downer) and dead during long haul transport (> 400 km). Total was the sum of lame, non-ambulatory (downer) and dead animals during the journeys.

Loading Density

Because of the high cost of hauling cattle, there is substantial economic incentive to load animals densely. However, there is potential for high loading densities (relative recommended) to cause welfare issues; consequently, the Transport Codes (CARC, 2001) propose hauling cull cows with 5 to 10% more space than recommended. In this section, the term k-value will be used when reporting loading density values. The k-value is calculated as m^2 per animal/(body weight$^{0.6667}$) and is very useful as it allows for a standardized comparison of loading densities across cattle of different weight ranges.

Our findings indicate that cull cows (> 500 kg; 0.019 to 0.047 *k*-value) are generally loaded less densely than calves (< 275 kg; 0.015 and 0.026 *k*-value) and feeder cattle (275 to 500 kg; 0.016 and 0.028 *k*-value) (González et al., 2012d). Regardless of the type of animal transported, loading density was quite variable between trailer compartments, with the belly and the deck loaded more densely than the nose, doghouse, or back. The number of truck axles (e.g. quad-axle vs. tri-axle trailers) used for hauling can also affect loading density. For example, the greater the number of axles, the more weight can be loaded. This increases the chance that light weight calves can be over loaded while cull cows that are heavier could be under loaded, especially in the doghouse and nose compartments (González et al., 2012d). Of great interest was the fact that cattle shipped at loading densities lower than 0.015 or greater than 0.035 k-value were more likely to die, become non-ambulatory, or lame, especially in the deck and belly (Figure 4). In addition, some of our recent unpublished work found that the risk of bruising was higher in cows transported in the doghouse compared to other compartments. We speculate that this may be a result of too much rather than too little space, reminding us that either situation has the potential to reduce cow welfare.

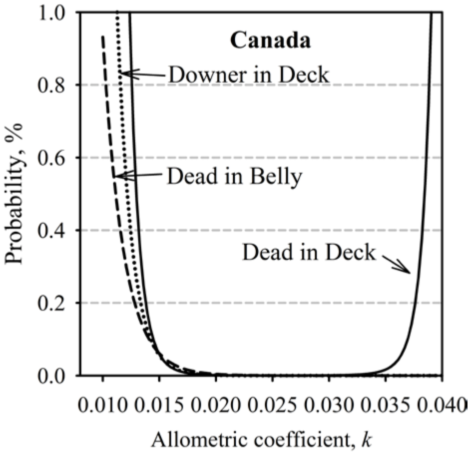

Figure 4. Relationship between space allowance within Canada with the likelihood of becoming lame, non-ambulatory (Downer) and dead during long haul transport of cattle (> 400 km). Space allowance was measured through the allometric coefficient (*k*) calculated for each compartment from the formulae *k* = space allowance (m2 /animal) / BW 0.667.

Weather and the Trailer Environment

Cattle transport vehicles are not climate controlled and ventilation is accomplished passively through perforated metal sides and hatches in the roof. Consequently, the potential to have negative impact on cow welfare is great, particularly under extreme environmental conditions. We found that weather conditions within a single journey can vary greatly and temperatures we tracked over 18 months ranged between -42°C and 45°C (González et al., 2012a). Fortunately, cattle have the ability to adapt to their environment (homeothermic) which helps to reduce negative effects on their welfare (Curtis, 1993). However, it is important to note that abrupt changes in the outside temperature during transport can be more detrimental than consistent exposure to either high or low temperature or humidity. This is also relevant for cull cows that are housed in environments that are more moderate; therefore, they would not be acclimated to abrupt temperature changes that could be encountered during transport.

The environment within a cattle liner has been identified as one of the largest threats to animal welfare during transport (Mitchell and Kettlewell, 2008). It can be affected by a variety of factors such as air temperature and humidity, loading density, use of bedding and airflow. The animals themselves can add heat and moisture to the trailer through sweat, respiration, urine and feces (Curtis, 1993). Environmental conditions within the trailer are known to vary considerably by compartment, location within the compartment, and whether the truck is moving or standing still. Although not assessed for cull cows, our study looking at the effects of loading densities on trailer environment during the summer transport of feeder cattle found that the outside temperature had more effect on the trailer environment than loading density (Goldhawk et al., 2014). We also found that death in commercial cattle transported long distances (> 400 km) increases sharply when air temperatures fall below -15 ºC and the likelihood of becoming non-ambulatory increases when temperatures rise above 30ºC (Figure 3B) (González et al., 2012d). This suggests that producers and haulers should be extra vigilant and prepared when shipping cull cows under these conditions by using aids such as bedding, boarding and other management factors that will be discussed below.

Bedding is recommended for comfort and insulation during cold weather, especially for more fragile animals such as culls. However, we found bedding use to be less frequent with cull (41.9%) cattle than feeders (56.3%), calves (67.4%) and breeding cattle (75.0%; González et al., 2012a). These data suggest that decisions to bed cattle are based on their economic value instead of their need.

Moisture and heat can accumulate quickly in a trailer that is stationary so it is recommended that transport vehicles keep moving, especially in the summer months. Even during cool weather, temperatures inside a trailer can rise when the vehicle is stationary (Stevens et al., 1979). During cold weather, ventilation can be controlled with boards made of plastic, fiberglass or plywood that cover the trailer perforations and reduce air exchange between the inside and outside of the trailer. Boards can be used on the entire surface of the trailer or only on a portion to allow air flow and is recommended by CARC (2001). Some of our recent unpublished research assessing cull cow transport in western Canada found that > 50% of the trailer perforations were boarded at -4.5^{o}C, while 80% of perforations were boarded at -11^{o}C. The inside of the trailer was always warmer than the outside regardless of the boarding pattern. Trailer compartments were warmer and more humid when boarded and parked. There were no differences in environmental conditions between the inside and outside of an unboarded trailer regardless of whether it was in motion or parked. Boarding during winter transport had a positive effect on welfare by reducing the incidence of dark cutters.. It is recommended that the front and rear of the trailer be covered first because the middle of the trailer stays warmer. At this time, little is known about the effects of boarding on the incidence of frostbite in cull cows and should be studied.

■ Conclusions

Dairy producers have the obligation of ensuring humane management of their cull cows, including timely culling prior to transport for marketing or vigilance regarding animal friendly transport practices. The discussion and studies above indicate that unacceptable animal welfare outcomes for cull cows during transport can be minimized by respecting transport regulations, taking careful consideration of journey duration, space allowance, weather and trailer environment, and quality of driving. These research findings have important implications for helping dairy producers and cattle haulers making informed decisions about how to manage cull cows during transport while ensuring consumer confidence. Continued industry support for studies assessing particular transport management practices on cow welfare will be necessary for enduring ever changing animal, industry and societal demands.

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