

# A review: Transportation of commercial finished cattle and animal welfare considerations

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## Introduction

The purpose of this review is to evaluate and report current finished cattle road transportation on animal health and welfare and carcass quality within the United States and Canada. Reviewed literature was divided into the 5 distinct categories of: 1) microclimate; 2) loading density; 3) duration of transport; 4) quality of transport; and 5) animal behavior. These 5 factors influence animal health, welfare, and carcass quality considerations, resulting in differing levels of manipulation and understanding within the reported literature. Duration, loading density, and animal behavior effects are more easily defined than those of microclimate and transport quality. Altering 1 of the factors can have an unintended impact on another, thus causing less defined results. These factors and their interactions must be further evaluated to fully understand the impact these stressors have on animal welfare and economic return. The objectives of this review were to compile previous literature and identify research areas that will further improve cattle transportation.

## Materials and Methods

A thorough literature search was conducted to evaluate published research in finished cattle transportation and factors affecting animal health, welfare, and carcass quality concerns. Literature in the areas of microclimate, loading density, duration of transport, quality of transport, and animal behavior of finished cattle were evaluated. Details from the literature in regards to publication date and subsequent research was evaluated to determine future research area opportunities.

## Results

The United States follows the 28-hour law that dictates the duration animals may be transported before being offloaded and allowed to rest with access to food and water. Minimal amendments have been made to the 28-hour law since it was enacted in 1918, indicating there may be opportunities to further evaluate and define specific areas for animal welfare improvements during transportation.

Microclimate is a term used to describe the internal climate of the trailer that the animals are subjected to. Due to the aerodynamics of a moving trailer, air enters at the back, moves up the length of the trailer, and exits through the nose compartment. Air exiting the trailer can be 61°F to 68°F (16°C to 20°C) higher than inlet due to cattle heat production. Modifications to the ventilation and airflow properties of the trailers could improve the microclimate and animal welfare during transport. Stationary trailers must rely on wind to create any air flow within the trailer, resulting in undesirable conditions for the animals. Data reported approximately 1.8°F (1°C) increase for every minute the trailer sat motionless, and trailers can reach up to 60°F (10.5°C) higher than ambient.

Loading density is a topic that has been repeatedly evaluated to the point of creating an equation to determine appropriate space allotment. The equation is:  $A = kBW^{0.67}$  where A is area (square meters), k is the allometric coefficient, BW is the average body weight of the animal being transported (kg). Recommended allometric coefficients vary some in research but many lie between 0.015 to 0.035.

Time spent in transport is highly depended upon the age of the animal, but all are limited to 28 hours within the United States. One researcher found that the mortality rate doubles when transport increases from 20 to 30 hours, and then increases by a factor of 7 after that. Human factors and the quality of transport also can affect shrink and animal welfare. For instance, data has shown that as driver experience increases, the amount of shrink decreases. Animal behavior is a difficult subject in that there are common markers like creatine kinase, blood pH, lactate, etc. that can be monitored, but the actions and predispositions of the animals can be difficult to predict and can affect other animal's welfare.

## Significance

Previous research has focused on evaluating each of these factors, but there are limitations as to what has been done to evaluate the interactions of multiple factors. Reviewing current literature provides a better understanding to determine and define areas where modification and manipulations of the current transportation system could improve animal health, welfare, and carcass quality.