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MEAT & LIVESTOCK AUSTRALIA

tips&tools

ANIMAL HEALTH AND WELFARE

# Minimising land transport stress in live export Brahman steers

## Background

**Cattle in northern Australia are often required to be transported over relatively long distances to reach markets, abattoirs and ports. While the welfare of these animals has improved with the implementation of codes of conduct for road, rail and sea transportation, little physiological data is available for *Bos indicus* cattle to support or refute current recommendations made by these codes and other legislation. The studies undertaken as part of a livestock export research and development project have identified some of the physiological mechanisms involved when sheep and cattle are placed under long-haul transportation and handling stress.**

There is increasing recognition of the need to minimise stress in livestock, both as a result of public concern for the welfare of animals and from the ongoing need to increase the efficiency of animal production. The timely fashion in which the transportation of live export cattle occurs from the property of origin to on-board ship, and the subsequent shipboard transportation to their final destination, results in a variable degree of stress on the animals concerned.

## Definitions

**Metabolism:** The chemical process in animals resulting in growth and the production of energy and waste by-products.

**Hydration:** The addition of water; the replacement of body fluids by mouth or infusion.

**Hyper-hydration:** The practice of increasing the body-water stores by fluid consumption and/or retention; a state of increased water content in the body.

**Cortisol:** A hormone released by the adrenal gland; important for responding to stress and normal carbohydrate metabolism. The primary responsibility of cortisol is to activate the immune system; it is also involved with the metabolism of glucose, and can cause elevation of the blood sugar level.

## Key points

- Limiting exposure to pre-delivery stress will minimise the overall stress load on animals for live export.
- Most of the weight loss during road transport is water and the longer the travel time, the more weight loss occurs.
- Preventative treatment with a novel non-electrolyte oral supplement has positive effects on *Bos indicus* steers during long duration road transportation.
- Electrolyte solutions fed post-transportation provide little benefit in correcting an animal's acid-base balance, compared to water alone.

**Electrolytes:** A substance that, when dissolved in water, breaks into basic components (ions) that conduct electricity. Electrolytes include sodium, potassium, magnesium, calcium, chloride and bicarbonate.

**Acid/base balance:** The acid/base balance refers to whether the body is acidic or alkaline (pH). One of the main functions of electrolytes is to maintain the acid/base balance (neutrality) of the body.

## Stress factors

Stress occurs when response mechanisms to changes in the environment exceed normal limits. The effects of stressors are cumulative when they operate in combination. An animal already burdened with one stressor is less able to adapt to another. Limiting exposure to stressors during the pre-delivery phase of the live export process will minimise the overall stress load present in the animals at assembly for live export. This enables the animals to better cope with stressors later in the export process.

Table 1 over the page indicates some of the main stressors likely to arise during the pre-delivery phase of live export, and their effects.

*Table 1: Stressors in livestock transport*

| Stress | Stressor | Effect |
|---|---|---|
| Behavioural | Novelty, restraint, noise | Fear |
| | Mixing, overcrowding | Aggressive interaction |
| Nutritional | Fasting | Dehydration and hunger |
| Physical | Mixing, overcrowding, road conditions, driving technique, horns | Bruising and injury |
| | Weather extremes | Hyper/hypothermia |
| Infectious | Dust | Respiratory disease |
| | Exposure | Respiratory disease |

## Physiological indicators of transport stress

Physiological changes occur when an animal adapts to its environment. Research has shown the most appropriate physiological measurement of stress is the blood level of cortisol.

A variety of physiological changes occur in response to the release of cortisol. These include increased heart rate and body temperature, a change in sugar and acid blood levels of glucose and a decrease in white blood cells.

## Behavioural indicators of transport stress

An animal will exhibit behavioural changes when adapting to changes in its environment. Agitated cattle have higher cortisol levels, suggesting behavioural changes are indicative of stress. Measurements of behaviour, together with physiological variables, will provide the best overall measure of animal discomfort.

## Clinical indicators of transport stress

Transport related stress can be measured by the occurrence of a range of clinical syndromes. These include loss of liveweight, dehydration, decreased feed intake, and traumatic lesions such as bruising and decreased disease resistance. The extent to which these occur depends on a number of other interrelated factors, including the environment, transport conditions, animal factors such as nutritional status and presence of infectious agents.

Loss of body weight is commonly found in transported ruminants. Most of the loss occurs in the first few days of the transportation process due to periods of food and water deprivation. The combination of feed and water deprivation with road transport compounds the weight loss, which is due mostly to loss of body fluids and gut contents rather than body tissue.

Dehydration is the principal nutritional stress encountered by animals during transport, and the main cause of liveweight loss during land transport. Water accounts for most of the weight loss during transport and the longer the travel time, the more weight loss occurs.

Stress suppresses the immune system and therefore increases the likelihood of disease. Diseases that can be triggered by transport and environment changes from extensive to intensive husbandry conditions include bovine respiratory disease (BRD) – the most common disease in cattle upon introduction to feedlots.

### Stress: cause and effect

- Stressors during cattle transport may have behavioural, nutritional, physical and infectious stress impacts.
- The most common clinical manifestations of transport stress in cattle are:
  - liveweight loss
  - dehydration
  - reduced feed intake
  - physical injuries
  - respiratory disease
- Key land transport factors associated with decreased performance in livestock are:
  - total transit time
  - overloading
  - driving care
  - road conditions

## Management of transport stress

Management strategies for dealing with the problems caused by transport stress up until now have included pre-conditioning, rest periods during and after transport, and the use of electrolyte solutions.

The use of electrolyte solutions for minimising the effects of stressors on animals has been advocated in the sheep and beef industries without a full understanding of the effects of transport stress on the acid-base physiology of ruminants.

A recent study was undertaken to assess the mechanisms involved in the maintenance of acid-base balance in *Bos indicus* steers subjected to land transportation of long duration. The results indicated that *Bos indicus* steers continuously transported for 48 hours are able to maintain their acid-base balance within normal values. The primary challenge to these animals is the rise of total weak acids due to dehydration, which is compensated for by the animals' respiratory and renal systems. Some electrolytes are altered, but the difference is not significant between water and feed deprived and transported groups.

**Offering electrolyte solutions to dehydrated, transported, nutrient deprived and stressed *Bos indicus* cattle is unlikely to resolve the physiological stressors any more efficiently than water alone.**

## Hyper-hydration

Hydration strategies involved with the transportation process up until now have relied on the replacement of lost total body water and electrolytes at the completion of the journey, ie *after* the welfare of the animals has been compromised. Maintaining or boosting an animal's total body water to a normal range before exposure to a dehydrating environment such as the transport process is problematic for most livestock. Hyper-hydration with water alone is temporary, as the kidney rapidly excretes any excess fluid.

A recent study found that preventative treatment with a novel non-electrolyte oral supplement had positive effects on *Bos indicus* steers during long duration transportation. Use of the supplement in livestock prior to transport minimised the loss of body water during transportation for 24 hours and improved the energy balance for 48 hours, minimising spare muscle protein degradation through its effect on electrolytes, glucose and the acid-base balance.

The research has shown that the novel treatment achieves hyper-hydration, decreases the energy deficit and confers a positive effect on the animal's immune system. These findings have implications for the preservation of carcase protein and the reduction of dark cutting beef.

Bos indicus *steers used in this experiment*

*Sentinel steers in individual pens – note the black piping that carried the catheter lines into the cabin of the truck to facilitate blood sampling while mobile*

**This finding challenges the current 'best practice' management protocols for transported ruminants, in particular the efficacy of electrolyte solutions administered pre- or post-transportation to minimise transport stress.**

Research with this supplement indicates a potential application for this treatment in limiting the adverse effects of land transport stress in cattle. Further research is warranted and is being investigated to better understand the effects of the supplement.

## New findings: industry impact

The outcomes of this research could have a significant impact on the meat and livestock industry.

Firstly, the new findings challenge current 'best practice' by putting into question the efficacy of electrolyte solutions administered pre- and/or post-transportation to minimise the effect of transport stress on ruminants. Electrolyte solutions fed post-transportation provide little benefit in correcting an animal's acid-base balance, compared to water alone.

Secondly, the research suggests preventative pre-transport treatment of cattle with the novel oral supplement could have a number of significant welfare and production benefits for cattle, including:

i. Reducing the relative loss of body water during transportation;

ii. Assisting to delay the adverse, metabolic effects of dehydration;

iii. Promoting a positive energy balance and glycogen formation, aiding in the preservation of carcase protein and decreasing the incidence of dark cutting meat; and

iv. Providing a boost to the immune system during the post-transport period.

These outcomes have the potential to benefit not just the livestock export and feedlot industries, but also the entire meat and livestock industry, whenever ruminants are transported.

## Further information

This *Tips & Tools* is based on research results from the joint MLA/LiveCorp project, LIVE.301 "Management of pre-delivery stress in live export steers", November 2004, as well as extracts from a report written by Dr David Adams for MLA and LiveCorp, LIVE.102/SBMR.003 "Best practice standards for the preparation and husbandry of cattle for transport from Australia" and extracts from a report completed by Alliance Consulting and Management, LIVE.104A "Influence of pre-delivery management on livestock performance: Desk Top Study

A copy of these reports can be obtained by contacting LiveCorp or MLA.

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