Impact of Road Transport Practices on Physiological and Behavioural Responses in Cattle

A THESIS SUBMITTED FOR THE DEGREE OF MASTER OF RURAL SCIENCE

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DECLARATION

I certify that the substance of this thesis has not already been submitted and is not currently being submitted for any other degree. All assistance received in the preparation of this thesis, and all sources used, have been acknowledged.

Sharon G Pettiford
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<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACTH</td>
<td>Adrenocorticotrophic Hormone</td>
</tr>
<tr>
<td>ALB</td>
<td>Albumin</td>
</tr>
<tr>
<td>ANOVA</td>
<td>Analysis of Variance</td>
</tr>
<tr>
<td>ANS</td>
<td>Autonomic Nervous System</td>
</tr>
<tr>
<td>ATP</td>
<td>Adenosine Triphosphate</td>
</tr>
<tr>
<td>BAS</td>
<td>Basophils</td>
</tr>
<tr>
<td>BHB</td>
<td>Beta Hydroxybutyrate</td>
</tr>
<tr>
<td>BRD</td>
<td>Bovine Respiratory Disease</td>
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<tr>
<td>BUN</td>
<td>Blood Urea Nitrogen</td>
</tr>
<tr>
<td>CK</td>
<td>Creatine Kinase</td>
</tr>
<tr>
<td>CNS</td>
<td>Central Nervous System</td>
</tr>
<tr>
<td>CRH</td>
<td>Corticotrophin Releasing Hormone</td>
</tr>
<tr>
<td>CV</td>
<td>Coefficient of Variation</td>
</tr>
<tr>
<td>EDTA</td>
<td>Ethylenediaminetetraacetic</td>
</tr>
<tr>
<td>EOS</td>
<td>Eosinophils</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>FFA</td>
<td>Free Fatty Acids</td>
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<tr>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>HAPT</td>
<td>Haptoglobin</td>
</tr>
<tr>
<td>HCT</td>
<td>Haematocrit</td>
</tr>
<tr>
<td>HGB</td>
<td>Haemoglobin</td>
</tr>
<tr>
<td>HPA</td>
<td>Hypothalamic Pituitary Adrenal</td>
</tr>
<tr>
<td>LYM</td>
<td>Lymphocytes</td>
</tr>
<tr>
<td>MCH</td>
<td>Mean Corpuscular Haemoglobin</td>
</tr>
<tr>
<td>MCHC</td>
<td>Mean Corpuscular Haemoglobin Concentration</td>
</tr>
<tr>
<td>MCV</td>
<td>Mean Corpuscular Volume</td>
</tr>
<tr>
<td>MJ</td>
<td>Megajoules</td>
</tr>
<tr>
<td>MON</td>
<td>Monocytes</td>
</tr>
<tr>
<td>NEU</td>
<td>Neutrophils</td>
</tr>
<tr>
<td>N:L</td>
<td>Neutrophil to Lymphocyte Ratio</td>
</tr>
<tr>
<td>NSW</td>
<td>New South Wales</td>
</tr>
<tr>
<td>OSMOL</td>
<td>Osmolality</td>
</tr>
<tr>
<td>PCV</td>
<td>Packed Cell Volume</td>
</tr>
<tr>
<td>pH</td>
<td>Hydrogen-ion Concentration</td>
</tr>
<tr>
<td>PT</td>
<td>Pre-transport</td>
</tr>
<tr>
<td>QLD</td>
<td>Queensland</td>
</tr>
<tr>
<td>RBC</td>
<td>Red Blood Cell; Red Blood Count</td>
</tr>
<tr>
<td>RH</td>
<td>Relative Humidity</td>
</tr>
<tr>
<td>RIA</td>
<td>Radioimmunoassay</td>
</tr>
<tr>
<td>RPM</td>
<td>Revolutions Per Minute</td>
</tr>
<tr>
<td>SA</td>
<td>Sympatho-adrenal</td>
</tr>
<tr>
<td>SCARM</td>
<td>Standing Committee on Agriculture and Resource Management</td>
</tr>
<tr>
<td>SED</td>
<td>Standard Error of the Difference</td>
</tr>
<tr>
<td>THI</td>
<td>Temperature Humidity Index</td>
</tr>
<tr>
<td>TP</td>
<td>Total Protein</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
</tr>
<tr>
<td>WBC</td>
<td>White Blood Cell; White Blood Count</td>
</tr>
<tr>
<td>WBT</td>
<td>Wet Bulb Temperature</td>
</tr>
<tr>
<td>WSPA</td>
<td>World Society for the Protection of Animals</td>
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</table>
ABSTRACT

The movement of cattle by road transport in Australia is necessary and is common practice for many rural operations. Whilst acknowledging the importance of livestock transport by road, the impact that transport has on the animal’s well-being is not well understood, particularly under Australian transport conditions. The purpose of this thesis was to investigate the impact of two different loading practices combined with 6 h of road transport and secondly to examine the impact of transport duration on the physiological and behavioural responses in cattle.

The first experiment investigated the impact of an electric prodder at loading versus normal quiet loading without a prodder (control), followed by a 6 h road transport journey and a 17 h recovery period. Use of an electric prodder during loading compared with those animals that were loaded without the prodder did not modify the physiological responses to loading, transport or the rate of recovery. The physiological responses in yearling cattle indicated that most stress occurred during loading and the initial stages of transport, but after this the cattle habituated and coped well with the 6 hours of transport. Following 17 h of recovery, nearly all the variables measured had returned to their pre-transport levels. However, this does not mean that such practices are advocated during loading. The post-transport values and rates of recovery of the physiological measurements suggest that 6 h of road transport did not create a substantial imposition on the welfare of healthy yearling cattle.

The second study examined the transport of cattle for journey durations of 6, 12, 30 and 48 h. The aim of the experiment was to quantify the impact of transport duration from farm to
abstract

feedlot on behavioural and physiological indicators of cattle welfare. Significant interactions between transport duration and time were observed for the majority of the blood measurements and liveweight. The physiological measurements recorded in this study indicated that duration did impact on the level of biological cost to the animals, with the largest treatment effect observed immediately on arrival for all treatment groups. These effects were generally not large and the majority were often still within normal physiological values. The group that underwent the 48 h treatment lost the greatest amount of liveweight. Hence there was a positive relationship between transport duration and the loss in liveweight, however, the differences between treatments were not always significant. The cattle recovered the majority (95 - 98%) of the weight lost through trucking after 72 h of recovery with ad libitum food and water.

This final study also indicated that cattle that were transported 48 h spent significantly more time lying down in the recovery yards, than cattle transported for 12 h, during the initial 3 h post-transport recovery period. However, during the second 3 h period, the results differed between replicates and less time was spent lying by the cattle transported for 48 h and more drinking and eating activity was observed. Transport duration had no effect on feedlot average daily gain over the 42 day feedlot finishing period that occurred post recovery. The results of this study generally indicate that healthy cattle that have not had restricted access to food or water prior to transport can tolerate best practice transport of these durations without major compromise to their welfare or productive capacity.
Abstract

The results obtained from these studies address research that is pertinent to loading and long distance transport of cattle by road in Australia. Notably, this research gives a better understanding of the impact of livestock transport on cattle welfare. The two investigations of loading practices and transport duration show that loading and the initial stages of transport can be somewhat stressful, however as the journey progresses cattle habituate to the transport process, whether it be of short or long duration. Moreover, the results indicate that if the cattle to be transported are healthy, and have not been deprived of feed or water prior to commencement of transport a substantial recovery can be achieved within 3 days of *ad libitum* good quality feed and clean water. Most importantly these two studies have scientifically validated and more clearly defined how healthy cattle respond to different loading treatments and journey durations during both transit and recovery under Australian conditions.

*Keywords:* Cattle, Loading, Duration, Stress, Transport, Recovery
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