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The Effect of Post-transport Electrolyte Supplementation on the Dressing-out Percentage of Cattle, Tested Under Commercial Conditions.

A thesis presented in partial fulfilment of the requirements
for the degree of Masters in Technology, at Massey University,
Palmerston North, New Zealand.

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ABSTRACT

The commercially used electrolyte supplement Multigro, was diluted with water and supplied to cattle as a dilute electrolyte solution. The cattle were being held in the lairage area of an export licensed meat works, and experienced normal commercial lairage conditions. The electrolyte solution was supplied to the cattle through the trough system in the lairage area. The aim of the experiment was to measure whether the cattle supplied the solution achieved a greater dressing out yield compared to cattle that were supplied water only in the lairage area.

A total of 83 animals, made up of a combination of steers and bulls, were split into two treatment groups; cattle supplied water (W), ($n = 41$), and cattle supplied electrolyte (E), ($n = 42$). The cattle came from different commercial farms all within a 40 minute transportation journey of the meat plant. Two other experiments were also conducted, the first attempted to determine the water requirements of cattle in lairage. The second aimed to identify whether cattle preferred the electrolyte solution offered to water by offering both solutions to a roup of cattle at the same time.

The use of this electrolyte solution failed to improve the dressing-out percentage, under commercial conditions. It is suggested that the reason for this result was due to the failure of the animals to gain adequate rest while in lairage. It is further suggested that this inability to rest adequately meant that the animals never fully recovered from the influence of stressors affecting their behaviour in lairage, the result being the homeostatic control mechanism would still have been operative, assisting the animal in adjusting to its new surroundings, but not allowing its muscles to rehydrate and achieve a normal, rested, homeostatic balance.

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CHAPTER ONE

INTRODUCTION

The treatment of cattle from the farm paddock to the knocking box subjects the animals to a variety of stressors. If the duration of exposure to the stressor(s) is prolonged or intense, detectable changes in the homeostatic, physiological and behavioral responses of animals can occur. The animal is then said to be in a state of stress (Stephens, 1980). Stress can be detrimental to both the welfare of cattle processed through a meat plant (Kilgour, 1988) and the economic returns of the processor (Tarrant, 1981).

Stress has been identified as a main cause of economic loss in the meat industry as it increases the occurrence of Dark, Firm and Dry (DFD) meat in beef carcasses. This has led to research which has identified some of the sources of stress in the movement of cattle from the farm to slaughter (Tarrant, 1988). The identification of these stressors has led to new lairage designs and handling practices. These focus upon decreasing the behavioral response of cattle as they interact with stressful environments (Grandin, 1979; 1980).

Recently, theories have been put forward that suggest the movement of cattle from the farm to slaughter may be incurring greater economic penalties than just the occurrence of DFD. It is known that stress can affect the homeostatic and physiological mechanisms of cattle, which become responsive during their reaction to stressors (Shaw and Tume, 1992; Gortel *et al.* 1992). These responses lead to an interaction in the body between the nervous and endocrine systems (Stephens, 1980), which when combined with time off feed and water during transport, followed by possible restricted access to lairage water supplies, may be having a profound effect upon an animal's homeostatic water balance.

The reaction of an animal to external and/or environmental stimuli was referred to, by Hans Seyles, as the General Adaptation Syndrome (GAS) (Seyles, 1946 *via* Grossman,

1987). This refers to the endocrine system, which caters to long-term homeostatic and physiological responses and the nervous system for sensory inputs and the short term responses (Blood *et al.* 1983). That an animal must adapt to any external demands that are abnormal, be they unfamiliar handling practices or freezing temperatures, is agreed upon. The exact interactions between the neuro-endocrine axis which acts in concert with other physiological systems to negate the effects of the stressors, is not yet fully understood (Grossman, 1987).

Recent theories put forward by Schaefer *et al.* (1990; 1992), are that a cattle beast, when dealing with emotional and physical stressors, experiences physiological changes, these include changes in the level of essential minerals, plasma metabolites and hormone concentrations present in the blood. Schaefer *et al.* suggests that cattle under stress have a lower body water content which at the time of slaughter decreases the dressing-out percentage. Gortel *et al.* (1992), stated that as the changes cattle experience are physiological in origin they are essentially treatable, and recommends treatment using an electrolyte solution.

Recent research by Schaefer *et al.* (1988; 1990; 1992), Gortel *et al.* (1992) and Jones *et al.* (1988; 1990; 1992) has indicated that there are real and tangible benefits to be gained, in the form of improved carcass weights, through the supply of an electrolyte solution to cattle prior to slaughter. Their research identifying significant dressing-out percentage improvements that were made possible via the supply of these electrolytes.

Electrolytes have already been proven to be beneficial for the rehydration of children (Hirschhorn and Greenough, 1991), and calves (Mitchell *et al.* 1992) suffering from diarrhoea and are used to aid in the recovery of horses after intensive training or racing (Cohen *et al.* 1993). In most cases the emphasis behind the use of electrolyte was to improve the rate of water uptake by the body, and increase the retention time of the water in the body. After the success of Schaefer *et al's.* (1992) study, they suggested that it was time to examine the value of supplying an electrolyte solution to cattle in a commercial situation.

Therefore, this research trial examines the feasibility behind supplying an electrolyte solution to cattle prior to slaughter in a commercial situation, based upon any changes in the carcass yield of the cattle trialed. In this study an electrolyte supplement which is currently supplied to animals orally in a concentrated form, was diluted and supplied to cattle through the lairage trough system of a commercial abattoir, using an electrolyte formula that is similar to that used by Gortel *et al.* (1992).

A point to note, the establishing of individual carcass weight losses to within 1% can be difficult due to variables in the relative live weights, marketing treatments, different states of gut fill and nutritional history of the cattle leaving the farm. Therefore experiments studying carcass yields do require large numbers to identify any significant effects (Shorthose *et al.* 1988; Wythes, 1984).