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THE EFFECTS OF FASTING AND TRANSPORT ON CALVES.

A Thesis presented in partial fulfilment of the requirements for the degree
of
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ABSTRACT

The welfare of domestic animals is becoming increasingly important in New Zealand. Consequently, Codes of Recommendations and Minimum Standards are produced by the Animal Welfare Advisory Committee to maintain adequate standards of welfare for animals in our care. These Codes are updated to incorporate new knowledge which may improve welfare standards further. There is one such Code for the welfare of bobby calves. In New Zealand, calves born to dairy cows that are not required for replacements in the herd are slaughtered for human consumption. These 'bobby calves' are exposed to a number of factors which have the potential to compromise welfare. Work in this thesis is based on the recommendations and minimum standards given in the bobby calf code. The general aim of this work was to investigate the combined effects of transport and nutrition on bobby calves, and to assess the ability of the calves to operate within their physiological capacity without significant welfare compromise during the bobby process.

In this study the metabolic effects of feeding and fasting hand-reared dairy calves aged 1-2 weeks were examined over a period of 30 hours. Parameters used to assess the response to feeding and fasting included PCV and plasma concentrations of total proteins, glucose, triglycerides, beta-hydroxybutyrate and urea. In mild climatic conditions and with access to water at all times, it was found that feeding calves the recommended volume of colostrum or milk at 12 hourly intervals was sufficient to maintain high glucose concentrations between feeds. A period of 30 hours without food had minimal adverse effects on calves as they were able to maintain energy levels during this time without excessive use of endogenous energy reserves. There was no evidence to suggest that significant dehydration had occurred.

Work in this study included examination of the metabolic effects of transport duration and stocking density in calves that were deprived of food for 30 hours. PCV and plasma concentrations of total proteins, glucose, triglycerides, beta-hydroxybutyrate, urea, creatine phosphokinase and lactate were measured. Three hours of transport at the recommended stocking density ($0.2\text{m}^2/\text{calf}$) caused minimal adverse effects in food-

deprived calves. Food-deprived calves transported for 12 hours at the recommended density maintained normoglycemia for 6 hours longer than non-transported food-deprived calves. This was thought to be caused by a mild increase in physical activity resulting from the need to maintain balance during transport. Thus the physical activity probably produced a glucose-sparing effect by mobilising muscle glycogen. The response of food-deprived calves transported for 12 hours at half the recommended density ($0.4\text{m}^2/\text{calf}$) was similar to that of non-transported, food-deprived calves. This suggests minimal physical activity occurred at the lower stocking density and this was attributed to the fact that most of these calves lay down during transport.

In this study the initial metabolic responses of calves to feeding were evaluated after 30 hours of food-deprivation in transported and non-transported calves, and immediately after transport of 3 or 12 hours duration. Parameters measured included PCV and plasma concentrations of total proteins, glucose, triglycerides, urea and lactate. Feeding after 30 hours without food apparently caused a decrease in glucose clearance. It is thought that this may have resulted from a metabolic overcompensation due to delayed adjustment of hormones and metabolites from the starved state to the fed state. Feeding immediately after transport restored plasma glucose levels to be within the normal range within 3 hours.

As indicated by the parameters measured in this study, hand-reared dairy calves appear to tolerate the combined effects of transport and food-deprivation quite well. However the present experiments were conducted in mild climatic conditions. Air temperatures ranged from 7-13 °C and there was little wind or no rain. In situations of climatic extremes, the physiological capacity of calves to withstand the bobby process may not be as great. At higher temperatures there is a risk of dehydration. At lower temperatures, especially combined with wind and rain, an increased metabolic rate may be required to fuel heat production so that endogenous body reserves may not last as long during times of food-deprivation.

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