Hannah Dairy Research Foundation

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# Research Paper Summary

# Relative merits of offering a milk replacer, glucose-electrolyte or whey-based diet on the blood composition and health of unweaned calves after transport.

**Short title:** **Liquid feeds for your calves after transport**

**Key words:** **calves, dehydration, fasting, feeding, transport**

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## Practical point

When unweaned calves are moved from farms to rearing units they can be exposed to hunger and thirst, resulting in dehydration and energy loss. Feeding a milk replacer diet after transportation better provides calves with the nutrients and water needed to replace energy and water lost during transport than a whey-based diet, and both milk and whey-based diets perform better than a glucose-electrolyte solution.

## Background

When unweaned calves are moved to a rearing facility, particularly if this journey involves a mart or collection centre, calves can be exposed to welfare issues. These include stress, temperature extremes, injury, fatigue, motion sickness, disease, hunger and thirst. This study focused on the type of liquid feed needed to combat effects of dehydration and energy loss following transport.

Although giving liquid feed to calves is recommended, or required, before and during a long journey, different feed types are recommended. It is difficult to offer very young calves liquid feed while they are in transport and during stops. However, the longer animals are without feed and water, the higher the risk of severe hunger, thirst, negative energy balance and dehydration. This is a combination of the duration between their last feed on farm and the start of their journey, time taken for transportation, any

intermediate periods without feed, e.g., an auction mart or collection centre, and the time between arrival at their destination or a stop and when they are first offered a liquid feed. Standard recommendations and common industry practice is to offer calves electrolytes/glucose-electrolyte solution or milk replacer during/after a journey.

Although milk replacer can provide energy and water, the potential benefit of offering a whey-based diet to calves after a journey or during transit, is that it is easier to prepare and avoids the potential increased risk of diarrhoea associated with milk replacer. Due to concerns around the increased risk of diarrhoea, there is industry interest in evaluating whether a whey-based diet with added electrolytes would provide the best solution for calves. The aim of this study was to examine the effects on health and welfare of feeding different types of liquid feed to unweaned calves after transport, to replace energy and water before a subsequent journey.

## Work undertaken

The study was undertaken in Canada and tested the effects of three diets (n=58 per dietary treatment), considering calf source and weight as factors. Calves were transported to a sorting centre in 29 loads from nine different sources (markets/collection centres). Calf ages were unknown but expected to be >8 days. Calves were transported on commercial multi-deck trailers bedded with wood shavings and with boarded air inlets. Distance travelled to the sorting centre ranged from <1 hour to >3h.

Calves were randomly allocated to the dietary treatments: milk replacer (M), glucose-electrolytes (G) and whey-based feed (W), balanced using body weights. Calves were examined and blood samples taken a) before dietary treatment, b) 2h and c) 4h following feeding. After feeding, calves were moved to a straw-bedded group pen before the next sampling. Vigour, presence of diarrhoea, dehydration and umbilical condition were scored for each calf, as well as noting positioning of calf, e.g., lying down, and response of calves to assessors, e.g., moving away. Blood was tested for markers such as glucose, protein, free fatty acids and BHB as measures of energy balance and dehydration.

Diets were made up in 2L water at 43 °C, and fed via bucket with teat in individual pens:

Milk replacer diet (M): 250g powder, 16.5% dairy protein sources (min 19.5% CP, 18.8% fat).

Glucose-electrolyte diet (G): 1g electrolyte powder (69.4% sodium chloride, 8.9% sodium acetate, 1.8% sodium diacetate, 3.6% potassium chloride, 1.8% magnesium chloride, 1.8% calcium acetate), vitamins A, D3, B12, B9, B5, B3, B2, and K3, 1.4% choline bitartrate, 20g dextrose powder.

Whey-based diet with added electrolytes (W): 100g powder (53% CP, 2% fat) composed of 65% whey, 21% whey permeate, 12% maltodextrin, 0.04% glycine with added electrolytes (0.03% sodium chloride, 0.03% potassium chloride, 0.02% magnesium sulfate, 0.006% sodium diacetate, 0.05% sodium citrate, 2% zeolite type clinoptilolite).

**Blood Effects**

There was an effect of calf source on blood parameters, with calves from the collection centre >3h away having lower blood glucose concentrations than others and higher serum protein levels (indicating dehydration). Both the milk replacer (M) and the whey-based diets (W) provided enough nutrient energy for calves to show increased blood glucose concentration and lower serum free fatty acid concentration after feeding, observed 2 and 4h after feeding.

The glucose-electrolyte diet (G) was less able than M and W diets to supply enough nutrient energy to allow calves to recover from the fasting during transport. The M and W diet were able to provide a sustained source of energy over several hours. However, in comparison, most of the G solution would have left the calves stomach within 1h, and by 4h after feeding, all the solution would have passed.

**Dehydration**

The G diet was better than the M and W diets in alleviating the effects of dehydration. However, the M diet was also effective in reducing dehydration. An electrolyte solution without a significant source of energy can help reduce the impacts of dehydration from transport but is not enough alone as a source of nutrient energy.

**Diarrhoea Risk**

The M diet did not induce diarrhoea during the 4h after feeding. However, a greater number of calves offered the M diet had an increased faecal score (looser faeces) between before feeding and 4h after feeding than those offered the W or G diet. A longer assessment period would have

allowed authors to understand the clinical significance of this and determine whether the M diet increased the risk of diarrhoea.

### Health and vigour

Calves that aren't healthy before and during transport have reduced resilience, and those that do not receive the right feed and energy levels struggle to cope with the effects of fasting. This study found no effect of diet on health during the 4h after feeding. However, again, authors note a more intensive and longer post-treatment assessment period would allow greater assessment of longer-term effects of the diets on health.

## Conclusions

A milk replacer diet provided calves with the nutrients and water needed to replace lost energy and water on arrival at the sorting centre, and these dietary benefits were still observed 4h after feeding. The whey-based diet produced similar results to the milk replacer diet, but the milk replacer was better able to allow calves to maintain their blood glucose concentration 4h after feeding than the whey. The glucose-electrolyte solution had short-term benefits, providing energy and helping calves to recover from dehydration. However, the glucose-electrolyte diet was poorer than the milk replacer and whey-based diets at helping calves to recover from the ill effects of transport and fasting.

## Reference

Cockram, M.S., Stryhn, H., Abdallah, A., Buczinski, S. 2024. Relative merits of offering a milk replacer, glucose-electrolyte or whey-based diet on the blood composition and health of unweaned calves after transport. Journal of Dairy Science, in press. https://doi.org/10.3168/jds.2024-24769