

Responses in foraging behavior, concentrate and hay intake, rumen metabolism and growth of Holstein dairy calves with no prior exposure to grazing



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INTRODUCTION: - Forages high in protein and low in fiber, and concentrate feeds, are critical in development of the fore-stomachs in calves. Natural grazing stimulates higher saliva secretion, increasing rumen water content, and enhancing rumen metabolomics (Kertza et al., 2010). The fiber mat traps grain and reduces rate of feed passage, but tends to limit intake through gut fill reducing genetic disposition for growth (Mertens, 2009; Grant 2004). Dairy calves are usually not exposed to foraging before the fore-stomachs are fully developed and energetic nutrient loss as methane may be high. However without the stimuli from forage fiber rumen development is limited and potential margins in nutrient intake capacity, and growth rates during early life are diminished. The inherent conundrum of fiber gut fill versus depressing concentrates depressing fiber digestion requires further analyses in early calf growth more so with calf heifers being adapted for future production in extensive dairy production systems.

AIM OF STUDY: To determine foraging behavior, nutrient intake and metabolism and growth of weaned Holstein dairy calves that had no prior exposure to forage intake and grazing pasture

OBJECTIVES:

1. To assess foraging behavior of Holstein heifers raised under early weaning system when exposed to a capped grazing time on irrigated pasture
2. To determine proportionate shifts in nutrient chemistry and the intake of pasture nutrients, and processed feeds
3. To estimate rumen development & metabolism of fiber and protein and post-ruminal digestion of components
4. To determine the effects of foraging on body growth, protein and fat gain and feed efficiency

MATERIALS AND METHODS

- This study will be done at the Agriculture Research council in Irene, Pretoria. Twenty four Holstein calves weaned at 42 days of age and reared in individual pens, with no previous exposure to grazing and fed concentrate pellets and will be randomly selected and allocated to two treatment groups. Camp A will host heifers that will continue on zero grazing system where calves receive pellets. Camp B will host calves that would be exposed for the first time to irrigated lucerne pasture grazing for 1 hour daily before returning to camp at 10 am and supplied with pellets. Water and good quality hay will be available in pens ad libitum.
- Daily observation of grazing behaviors will be enhanced by video footage in addition to direct observation of time spent grazing, resting, playing and selectivity of leaf and stem parts over a period of 4-8 weeks. Pasture intake will be estimated weekly by determining loss in pasture biomass. Rumen metabolism and microbial content will be determined using in Sacco and in vitro procedures with incubation media (rumen fluid) sucked from two calves randomly selected from each group. Feed and forage nutrients and secondary metabolites will be assessed using chemical methods, Near Infrared spectroscopy and chromatographic techniques used for determining protein chemistry. Metabolizable energy and protein, changes in body growth, protein and fat gain and feed conversion efficiency will be estimated using NRC (2001) equations.
- Behavioral data, chemical parameters and growth measures will be analyzed using ANCOVA (initial body weight as covariate), and regression procedures in SAS (9.3; 2012) and pairwise comparisons done using Tukey's method. Recommendations of periods in early life when exposure to fresh pasture will yield optimal benefits be made to optimize early gut and growth development.

EXPECTED RESULTS

- Preliminary results showed that calves do not graze upon first exposure to grazing and slowly adapt to foraging.
- We expect that limited grazing of good quality pasture would stimulate rapid rumen development and enhance energy and protein efficiency and calves would rapidly adapt to increased foraging.
- Exposure to foraging may reduce the drop in body growth that is usually occurs during transition from milk and pellets to forage based rations post weaning
- Foraging formulations would constitute important sources of digestible fiber and proteins substituting a significant proportions of cereal based calf rations.

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