

# Posters

## Effect of a ration change from a total mixed ration to pasture on production, health and rumen physiology of dairy cows

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### Introduction

In temperate climate zones dairy cows need to be fed with conserved feed during winter, and are then often gradually transitioned to a pasture-based ration in spring. We hypothesized that the change from a confinement to a pasture-based system involves complex nutritional and metabolic adaptations with consequences on health and performance.

### Materials and Methods

A 10-week trial (wk 1-10) was performed including 60 German Holstein dairy cows ( $166 \pm 23$  DIM,  $51.7 \pm 8.14$  lb ( $23.5 \pm 3.7$  kg) milk/d; means  $\pm$  SD). The cows were divided into a pasture and a confinement group (PG and CG,  $n = 29$  and  $31$ , each group contained 5 fistulated animals). The CG had free access to a total mixed ration (TMR; 35% corn silage, 35% grass silage, 30% concentrate; DM basis) throughout the experiment, whereas the PG was gradually transitioned from free access to the TMR to a pasture-based ration (wk 1: TMR-only, wk 2: TMR and 3 h/d on pasture, wk 3-4: TMR and 12 h/d on pasture, wk 5-10: pasture-only and 3.85 lb (1.75 kg) concentrate DM/d). A continuous grazing system was implemented on a ryegrass-dominated pasture. Pasture DMI was estimated using the n-alkane method in wk 7 and wk 9. Urine, blood, and rumen liquid samples were collected weekly. Continuous ruminal pH measuring devices were used to monitor rumen pH (Dascor). Rumen total content, papillae surface area and histopathology, and VFA absorption were assessed in wk 1, 5, and 10. Using a DNA-fingerprinting method (SSCP) the change in similarity over time within the population of the liquid-, fiber-, and epithelium-associated rumen bacteria was investigated. Data were analyzed as repeated measures.

### Results

Intake of DM from TMR, milk production, body weight (BW), and BCS decreased with partial access to pasture. Milk production and BW decreased even further in the first week on a full grazing ration, but thereafter BW increased again

and milk production stabilized. DMI from pasture increased between wk 7 and wk 9. Serum beta-hydroxybutyrate (BHB) and BCS indicated an energy deficit in the PG during the whole course of the trial. These alterations in the PG were also reflected in various rumen variables (mean and variation of pH, VFA proportions, protozoal counts, total rumen contents, papillae surface area, VFA absorption potential). Although continuous rumen pH assessments and lipopolysaccharide (LPS) concentrations did not reveal an increased risk for subacute rumen acidosis (SARA) during the adaption period, histopathology of rumen papillae and VFA absorption potential suggest a temporarily adverse effect on rumen physiology. An increased risk for SARA (increase of time pH  $< 5.8$ ) was observed in wk 9 and wk 10 in the PG, but rumen LPS concentrations and histopathology were not adversely affected. At all 3 locations the average similarity of bacteria populations decreased in the PG between wk 1, wk 5, and wk 10, whereas in the CG only minor alterations were observed. Blood and milk urea concentrations, and the urine total N-to-creatinine ratio increased in the PG with access to pasture, indicating an increased N intake and excretion. No negative changes were observed for serum albumin, total protein, cholesterol, aspartate transaminase,  $\gamma$ -glutamyltransferase, and glutamate dehydrogenase concentrations, as well as white and red blood cell counts.

### Significance

Results suggest that during the transition from a TMR to pasture an initial decrease in DMI occurred, which was accompanied by possible negative effects on rumen function and integrity. After a behavioral and metabolic adaption, DMI and ruminal fermentation rate increased again with no adverse effects on rumen morphology and VFA absorption capacity, although rumen pH after adaptation to pasture indicated increased risk of SARA. Higher metabolic N loads did not have any negative transitional impact on liver cell vitality. The results indicate that the complete adaptation of microbiota, metabolism, and behavior to this new nutritional situation requires several weeks.