

# Impact of a 40-d Dry Period with Only a Close-up Diet

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Effects of dry-period management on milk production, feed intake, blood and rumen parameters, liver gene expression and rumen microbiota profile were determined in 11 second-parity and 15 third-parity and older cows. Animals were paired based on expected calving date, and randomly assigned to one of two treatments including 1) a 60 d dry period during which a far-off diet and a close-up diet were fed for 39 and 21 d, respectively (60-d treatment); 2) a 40-d dry period during which only a close-up diet was fed (40-d treatment). Milk production was recorded daily during the first 16 wk of lactation. Differential liver gene expression was assessed by affymetrix microarray analysis and DNA extracted from rumen samples was subjected to Illumina sequencing. Our study showed that parity affects the response to dry period management. The 40-d treatment reduced DMI after calving, milk yield for third parity and older cows, but not for second parity cows when compared to the 60-d. Cows on the 40-d treatment had higher concentrations of NEFA and tended to have higher liver TAG immediately after calving. These effects tended to be greater in third parity and older cows compared to second parity cows. Expression of key genes involved in  $\beta$ -oxidation such as ACSL1, CPT1B, CPT2, and ACADVL increased at wk 1 after calving compared to wk 3 before calving in both treatments. Other genes involved in  $\beta$ -oxidation such as CD36, CYC and ACOX2 were upregulated during this period only in the 60-d treatment. This probably resulted in lower hepatic  $\beta$ -oxidation capacity in the 40-d treatment compared to the 60-d treatment. In addition, during this period, the expression of DGAT, a key gene in the triglyceride synthesis, increased in the 40-d treatment while remained unchanged in the 60-d treatment. The expression patterns of genes involved in gluconeogenesis showed a higher capacity in the 40-d treatment cows compared to 60-d treatment cows. However, probably due to no change in the expression of PCK, the synthesized oxaloacetate was used to increase the capacity of tricarboxylic acid cycle. Our study also showed differences between the 40-d and the 60-d treatment on rumen microbiota during the dry period, as the 40-d treatment increased the relative abundance of Firmicutes and reduced the relative abundance of Bacteroidetes compared to the 60-d treatment. Results also demonstrated that the 40-d treatment reduced the shifts of rumen microbiota during the transition period and consequently, reduced the stress of diets adaptations. This was more evident in second parity than in older cows. Based on these results, a 40 d dry period management with only close-up diet can be beneficial for second parity cows. However, this treatment may be detrimental for older cows, as feeding the close up diet for 19 more days resulted in problems related to excessive energy intake and fat deposition.