

Continuously Changing Light-Dark Phase Decreases Milk Yield, Fat, Protein and Lactose in Dairy Cows

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Abstract

Photoperiod impacts feeding behavior, health, growth and milk production of dairy cattle. In humans behaviors that are asynchronous with the natural light-dark cycle, such as shift work or jet lag, are strongly associated with metabolic disorders as well as impaired reproductive performance. The objective of this study was to determine the effects of exposing mid-lactation dairy cows to chronically shifting 8h light (L)-8h dark (D) cycles on feed intake, milk yield, milk composition and mammary gene expression. Six first lactation Holsteins ~90d in milk were maintained on a 16 h L: 8 h D cycle and milked at 5AM and 4PM for 7d (control, Period 1). During Period 2, 7 d immediately following Period 1, cows were exposed to continuous cycles of 8 h L: 8 h D, but maintained on the same milking and feeding schedule. Exposure to chronic 8 h LD cycles significantly depressed milk yield ($P < 0.05$) after 7 d of chronic 8 h LD cycles. The results from this study show for the first time that exposing lactating cows to chronic light shifts decreases milk production and may alter metabolism. Further, experimental design may provide a paradigm to study the effects of changing lighting schedules on milk production and a potential model to study effects of disrupting circadian system on production efficiency

Environmental factors, including thermal stress and photoperiod, impact the feeding behavior [1-3], health [4], growth [5] and milk production of dairy cattle [6, 7]. To more effectively control environmental factors and improve production efficiency, housing domestic food-producing

animals in close confinement has become the norm. Extension bulletins promote housing lactating cattle under long day photoperiod (16h light 8h of dark) conditions, as multiple studies have shown it enhances milk production [8]. However, many intensive dairy operations do not follow lighting recommendations, often providing varying light levels with exposure to light throughout the night.

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