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## Differences in Rumination and Animal Activity Can Be Quantified by Utilizing New Technologies

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### Abstract

The objective of this research was to evaluate the Allflex eSense Flex ear tag (Allflex Livestock Intelligence, Madison, WI), which measures rumination and activity between two different diets fed to growing calves. One diet was high-energy, limit-fed, while the other was high roughage, fed ad libitum. For this study, 418 crossbred heifers of Texas and New Mexico origin were utilized in an 84-day backgrounding study at the Kansas State University Beef Stocker Unit. Coupled with the software data system called Heat-Time Pro+, it was determined that high-energy, limit-fed cattle ruminated less than the high roughage, ad libitum cattle ( $P < 0.01$ ). Using GoPro cameras, footage was also collected to determine activity and enthusiasm differences between diets during feeding time, but the data were inconclusive.

### Introduction

Industry-advancing technologies have given cattle producers new opportunities and ways to monitor the performance and health of their animals. The dairy industry, for example, has seen rapid innovation in cow-health monitoring and heat detection for reproduction in recent years. Beef cattle researchers are developing and evaluating similar applications for health or production in the cow-calf sector, stocker-backgrounder phase, and feedlot stage. The Allflex eSense ear tag (Allflex Livestock Intelligence, Madison, WI) provides perspective into the animal that otherwise would largely be unnoticed. Moreover, it measures rumination and general activity through motions of the ear and the animal's body that have been correlated back to a specific behavior (rumination or activity). As it relates to backgrounders and feedlot operators, health monitoring to proactively avoid nutritional or other disruptions to growth is critical. The aim of this study was to observe ruminal and activity differences in high-energy, limit-fed cattle compared to high roughage, ad libitum cattle.

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## Experimental Procedures

A total of 418 weaned, crossbred heifers (body weight =  $615 \pm 53$  lb) were purchased at auction markets in Texas and New Mexico, assembled at two different farms approximately 90 miles southwest of Amarillo, TX, then shipped 570 miles to the Kansas State University Beef Stocker Unit, Manhattan, KS, on May 28, 2019. The heifers were used in a completely randomized block design, 84-day receiving and growing study. The study evaluated the impact of high-energy, limit-fed diets containing dry-rolled corn and Sweet Bran (Cargill Animal Nutrition, Blair, NE) compared to high roughage diets fed ad libitum on both animal rumination and activity, as well as enthusiasm to approach the bunk upon arrival of the feed wagon. Cattle were randomized by arrival weight and assigned to pens, each containing 13 or 14 heifers. Additionally, each pen was randomly assigned to one of two treatments in a “treatment pair.” Each treatment pair consisted of one high-energy, limit-fed pen, and one high roughage, ad libitum pen. There was a total of 32 pens. The high roughage, ad libitum diet and the high-energy, limit-fed diet each were formulated to provide 45 or 60 Mcal of net energy for gain/100 lb of dry matter, respectively. Each heifer was tagged with an Allflex eSense Flex Ear Tag to monitor and measure rumination and general activity. In addition, during the first ten days of the study, GoPro cameras were mounted on the feed wagon and tractor to capture footage of the cattle during the feeding process.

## Results and Discussion

The high-energy, limit-fed heifers ruminated 45 minutes less per day, compared to the high roughage, ad libitum heifers ( $P < 0.01$ ), as shown in Figure 1. This may be due to less dry matter consumption and lower roughage content of the high-energy, limit-fed diet. However, activity was not affected by diet ( $P = 0.70$ ), which is shown in Figure 2. Based on observation of the GoPro videos collected, it could not be determined if the high-energy, limit-fed cattle were more enthusiastic at feeding time compared to the high roughage, ad libitum cattle.

## Implications

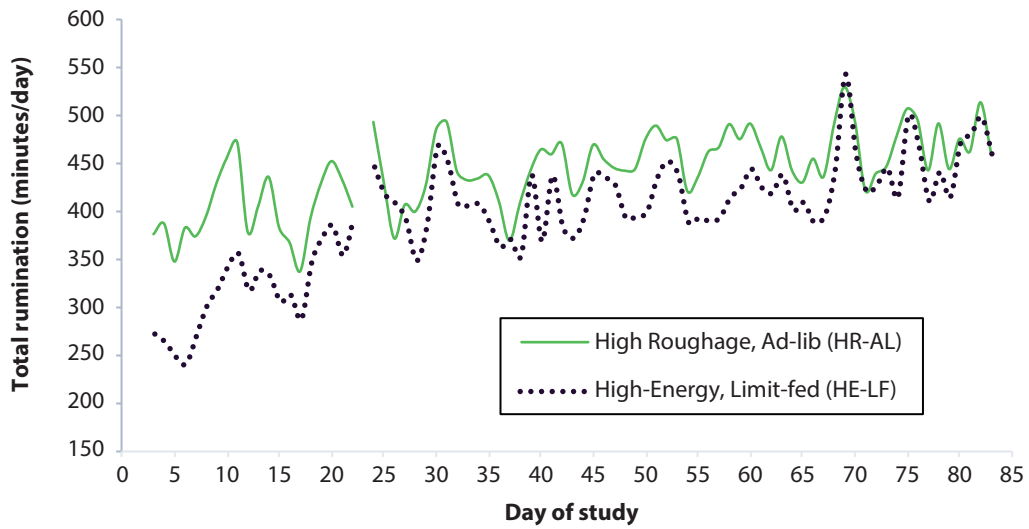
Limit feeding practices decreased total time spent ruminating per day by 45 minutes compared to cattle fed a high roughage diet ad libitum. However, it was not conclusive from our data whether one group was generally more active than the other.

## Acknowledgments

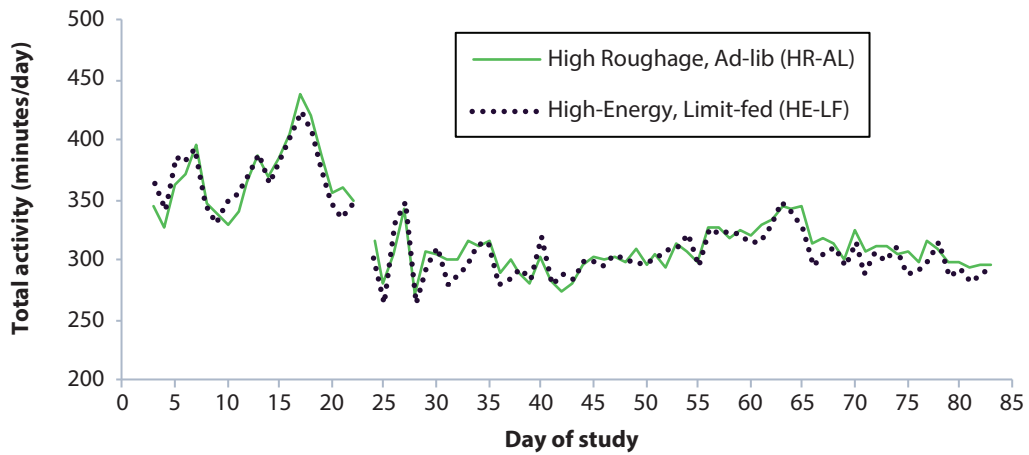
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**Figure 1. Total daily rumination, measured in minutes per day, for both high-energy, limit-fed and high roughage, ad libitum heifers.**



**Figure 2. Total daily activity, measured in minutes per day, for both high-energy, limit-fed and high roughage, ad libitum heifers.**