

Circadian rumination: nutritional insights

Abstract

This editorial addresses some important circadian patterns of rumination in ruminants of food-producing nature. Rumination is a crucial bioprocess during which the rumen environment maintains its buffering capacity towards functioning and optimal health. As a result, the health of the host ruminant and optimal production of microbial mass depend largely on successful and durable rumination. Research is required to discover circadian patterns of rumination in high-producing dairy and beef cattle under varying managerial conditions.

Keywords: rumination, circadian pattern, nutrition, health

Special Issue - 2015

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Received: November 10, 2015 | **Published:** November 13, 2015

Introduction

Rumination is regurgitating the food already ingested and rechewing for optimal rumen microbial adherence and fermentation under well-neutralized conditions. Rumination is greatly determining in successful ruminant production and is related to resting that occurs when the ruminant is relaxed and not environmentally disturbed. Cows usually ruminate between 6-8h daily. Rumination takes place mostly overnight, between 2000h and 0800h when little eating and grazing occur. The most intensive rumination occurs between 2200h and 0600h in day-fed animals. Sheep fed twice daily at 12h intervals, exposed to 12h light and 12h dark period, possess diurnal rhythmicity in rumination. Thus, light does not seem to be a major cue affecting diurnal variation in rumination. The key factors regulating the initiation and cessation of rumination under different production systems will yet to be fully described. Rumination in sheep possesses diurnal patterns without a clear dependence on timing of feeding. In sheep fed at 1200, 2000, 0000, and 0800h, the maximal rumination occurs in the early morning (0400-0800h) and the minimum during the afternoon. The sheep fed at 0400h and 1600h peaks in rumination between 0000h to 0400h. When time of feeding coincides with the time of greatest ruminating activity (0400-0800h), feeding inhibits the rumination.¹⁻⁵

The rumen contents and rumination duration are positively correlated in dairy cows. The greater rumen contents or greater rumen fiber load may stimulate bolus formation required for rumination. This stimulatory impact would be more pronounced when the meal is more fibrous because it can increase the intake of physically effective fiber and stimulate chewing activity. Increasing the hay intake increases the rumination time in ruminants. However, the positive response in rumination time to the hay intake is linear in single meal-fed rams but curvilinear in sheep with continuous access to feed. Despite changing diurnal rumination patterns, shifting herbage allocation time from 0700h to 1500h does not affect total daily rumination time.^{1,2,6} However, the rumination and idling (no eating or ruminating activity) occurs mostly in the morning and afternoon after shifting grazing time from morning to the evening. Feeding in morning vs. evening entirely changes diurnal rumination patterns without affecting total daily rumination time. Such information is lacking for many types of

ruminants of especially dairy cows fed once or multiple times daily under intensive production systems, requiring future research.^{7,8}

Research is also highly required on discovering circadian rumination patterns and duration under varying managerial scenarios in high-producing dairy and beef cattle. Such knowledge is of crucial significance towards optimal nutritional management of food-producing ruminants.

Acknowledgments

Thanks to the Ministry of Science Research and Technology, and National Elite Foundation for supporting the author's global initiatives and programs of optimizing science edification in the third millennium.

Conflict of interest

Author declares that there is no conflict of interest.

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