

## Chronoregulation of Ruminants Feed Intake: A Cropping Science

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### Abstract

Chronophysiology is an evolutionary pragmatic interscience that helps ruminants cope with the fluctuating environment. In light of the most recent discoveries on feeding and eating timing-orchestration of postprandial intake and rumen fermentation patterns, an innovative perspective is born to analyze chronophysiology as a major organizer of voluntary feed intake (VFI). This article elaborates on this postmodern innovation.

**Keywords:** Chronophysiology; Ruminant; Nutrient intake; Circadian pattern

### Innovation of a Pragmatic Theory

Quantitative evaluation of the factors regulating VFI in high-producing ruminants is of high priority, as it enables proper modeling and adequately accurate predictions of feed intake especially during critical physiological conditions [1,2]. However, due the multitude of effectors under varying farm, diet and animal conditions, securing reasonable accuracy has been an enormous challenge [3-6].

Recent discoveries on timing of feeding-eating mediation of postprandial and circadian patterns of feed intake in lactating dairy cows, have opened new windows into VFI regulation [7,8]. The fact that night-fed cows consume feed more rapidly shortly post-feeding compared to morning-fed cows suggests that the mechanisms regulating VFI differ in nature and magnitude depending on time of the 24-h period.

The path of evolution has equipped ruminants with biological tools to effectively ferment and degrade plant cell walls and be able to survive in such a natural wild environment. As such, ruminants developed significant capacities to regurgitate the ingesta and re chew for sufficient microbial adherence and fermentation. This development has followed the circadian nature of life on earth, regulated to possess almost 24-h rhythms. The phenomenon made it possible for ruminants to graze often at sunrise and sunset and also voluntarily during day to be able to ruminate later in evening and overnight when they rest under relaxed and safe conditions far from any threats from predators. Modernity, however, has somehow interfered with such rhythmic behaviors, but indeed has not totally changed them. These effects need to be quantified for accurate determination of feeding and eating timing on daily and rhythmic feed intake regulation. Timing of feed provision and thus eating activity does noticeably modify postprandial rhythms of intake, rumen fermentation, splanchnoperipheral metabolites, and thus productivity and health [7-10]. This innovative science possesses significant health and life quality implications for human, notably to minimize risks from different cancers, obesity, diabetes, and cardiovascular abnormalities [11-15].

In a nutshell, a global theory is being specialized to relate feed intake regulation to circadian timing of feed preparation and presentation. Efforts will be made to incorporate timing of feeding/eating into voluntary feed intake prediction models. This is expected to improve prediction accuracy under varying animal and farm management conditions.

### Implication

A new innovative science is being developed to establish the impact

of chronophysiological management of ruminants on VFI regulation both accumulatively and rhythmically. Timing of feeding, milking, treating, grouping and other farm essentialities will be viewed within this chronophysiological framework. The goal is to more accurately predict nutrient intake under varying farm, diet and animal conditions.

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