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Editorial Open Access

Dairy Ruminant Nutrient Intake Orchestration: A Novel Chronophysiological Discipline

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Editorial

Chronophysiology as an evolutionary multiscience has enabled ruminants to better cope with the changing environment from the mother nature towards modernity. With the recent discoveries on timing of feeding orchestrating circadian and postprandial nutrient intake and metabolic rhythms, time has already come to contemplate chronophysiology as a foundation of voluntary feed intake (VFI) regulation in dairy ruminants as workable models for humans.

This editorial describes evolving chronophysiogenomical mediations of VFI in ruminants of especially dairy cows. Chronophysiology has been a key missing interscience in realistic modeling and understanding of VFI regulation in high-producing ruminants. The shortcoming gains increasing thoughts given that accurate and reliable nutrient intake predictions are essential to consistent meeting of nutrient requirements and, thus, to profitable human food production. With the recent chronophysiological discoveries on dairy farm management strategies, time has already come to realize that evolutionary circadian rhythms in grazing, chewing, rumen kinetics, and peripheral substrate assimilation can help develop innovative strategies to improve VFI prediction accuracy and dairy ruminant efficiency and health [1].

Inspired by the nature, ruminants have evolved to ruminate habitually overnight and graze during day, particularly just about sunrise and sunset. Accordingly, rumen fermentation, postrumen assimilation and peripheral metabolism have developed specialized circadian rhythms [2,3]. These evolutionary rhythms in feeding behavior and metabolism have generated circannual, seasonal, and circadian rhythms in endocrinology. The drastic changes in production systems due to modernization have altered such natural eating, ruminating and rumen fermentation rhythms. Therefore, it has become vital to preserve synchronies between external cues and dairy ruminant internal state [2,4].

Most recent findings suggest altered postfeeding VFI rhythms of nongrazing dairy cows by shifting feeding timing [1,5]. Eating rate and VFI, especially shortly postfeeding, have increased by night instead of day feeding. As a result, rhythms of circadian and postprandial rumen fermentation and intermediary metabolism have changed [6,7]. Timing of feeding/eating as a key external manager, thus, determines the rate and extent of VFI, rumination, fermentation and splnachnoperipheral metabolism in dairy cows.

The impacts of chronophysiological management strategies (e.g., eating timing) should be quantified for inclusion in dairy cow nutrient intake prediction and production estimation models to improve accuracy and practicality under varying physiological and management states. This will help optimize ruminant efficiency, food safety and security, and environmental quality interconnectedly. Such practical ruminant models greatly serve human health initiatives, particularly on overcoming challenges of obesity, diabetes, and cardiovascular diseases.

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