



On Chronophysiomics: Prospects to Optimize Appetite and Health

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This editorial describes evolving chronophysiological mediations of appetite and food intake (AFI). Chronophysiomics is a multisience involving integrated chronophysiology and functional omics biotechnologies. Chronophysiology as an evolutionary interscience has enabled humans and animals to better cope with the changing environment from the mother nature towards modernity. This trend continues to evolve into postmodernity. With the recent discoveries on timing of eating and feeding orchestrating circadian and postprandial nutrient intake and metabolic rhythms in animal models [1-7], time has already come to contemplate chronophysiology as a key regulator of AFI. Omics biotechnologies (e.g., genomics, proteomics, lipidomics, transcriptomics, and metabolomics) provide new tools to further our perceptions of possible mechanisms underlying such regulations. This is important since AFI affects directly or circuitously risks of health issues such as obesity, diabetes mellitus, blood pressure and cardiovascular diseases.

Chronophysiomics has been a key missing postmodern biotechnology in realistic modeling of AFI regulation. The shortcoming gains increasing thoughts given that accurate and reliable appetite and nutrient intake predictions are essential to consistent meeting of nutrient requirements and, thus, to healthy human life. In farm animal ruminant models, altered evolutionary circadian and postprandial rhythms in grazing, chewing, rumen fermentation, and peripheral substrate assimilation in response to shifting timing of eating have been discovered. These may help develop innovative strategies to improve appetite prediction accuracy and, thus, to help control appetite for durable health.

Inspired by the nature, ruminants have evolved to ruminate habitually overnight and graze during day. Accordingly, rumen fermentation and peripheral metabolism have developed specialized circadian rhythms [2,3]. These evolutionary rhythms in eating 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 rhythms. Therefore, it has become vital to preserve synchronies between external cues and ruminant internal state [2,4].

Most recent findings suggest altered postfeeding AFI rhythms of nongrazing cows by shifting feeding timing [1,5]. Eating rate and AFI, 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 AFI and splanchnoperipheral metabolism. This animal model data imply that timing of eating may be used as a feasible strategy to manipulate and optimize appetite and cell health. However, conclusive data on omics will need to be generated to enable drawing pathways through which timing of eating (or chronophysiomics) orchestrates appetite and intermediary metabolism and health.

The impacts of chronophysiological management strategies (e.g., eating timing) must be quantified for inclusion in appetite and nutrient intake prediction under varying physiological states and life styles. This innovative biotechnological revelation will help enhance health-promoting functions of foods for improved global health and life quality.

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