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Extended Abstract

Exploring Rumen Microbial Circadian Biology to Improve Food Safety and Security

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Abstract

HLs perspective article introduces an innovative roadmap for research and farm application based on optimizing rumen microbial circadian biology to help minimize metabolic disorders and foodproducing ruminant health and eٹcLenc\Suitable feedstuؤs must be fed at optimal times of the circadian phase in optimal relation to milking and housing management. Certain microbial populations may be negatively sensitive to given combinations of sugars, starches, proteins and fats. Discovering optimal harmonies amongst circadian rhythms of ruminant, rumen, and their environmental management is key towards improving food safety and security for humans in the new era. Keywords: Microbial ecology; Rumen; Physiology; Circadian rhythm Philosophy for Practice Ruminants have evolved to graze mostly during day, especially at the beginning and end of the light phase. As such, they have evolved to ruminate predominantly overnight when little grazing/easting occurs [1-5]. Rumination stimulates chewing and insalivation to eؤectLvel\ neutralize rumen acids and help maintain stable and healthy rumen conditions [2-4]. It thus seems that ruminants experience more stable or more tolerant rumen environment during evening and night times [2,3,5]. Should that be the case, rumen microbial populations must have circadian properties in fermenting ruminated ingesta. In so doing, rumen should possess dLؤerentLal capacities for bioprocessing of dLؤerent substrates. In modern ruminant farming with no grazing, however, such natural patterns of rumen ecology are in ways interrupted or altered [6-10]. For instance, feed delivery could well be exercised during evening and night hours. Milking does essentially occur overnight and early morning. Hus it is critical to discover optimal combinations of feeding, milking, housing and health management [11-16]. Recent findLngs suggest that nocturnal vs. morning feeding can improve feed intake and milk fat and energy production in dairy cows [5,6,7,10-12]. Data, also, suggest that rumen encounters more periprandial fluctuatLons in feed intake and rumen conditions rhythms when ruminants are fed at night vs. morning [10-12]. Hese discoveries would question the conventional belief that higher fluctuatLons in rumen conditions are rather harmful to healthy rumen physiology and ruminant production [13,14]. Instead, it appears that rumen can develop tolerance against those conditions that are considered risky under practical scenarios [15-18]. Rumen, thus, possesses specialized circadian rhythm in its microbial properties that must be matched optimally with nutritional characteristics of feeds and patterns of environmental cues. It is time to formulate strategies that optimize rumen microbiology based on circadian rhythms of rumen fermentation and microbial metabolism [19]. Advanced rumen microbiology must take initiatives to embrace circadian microbial properties towards more specialized feeding management and reduced risks of subacute rumen acidosis and related metabolic abnormalities [18-20]. 6pecLfic microbial populations and activities must be uncovered to enable optimal utilization of risky feed components at optimal circadian times under competitive feeding and housing environments. Implication He evolutionary trends of ruminant physiology and metabolism provide evidence to uncover specialized circadian rhythms in rumen microbial properties. HLs is to improve rumen health and microbial interactions towards greater fibre digestion and lower risks of subacute rumen acidosis and related metabolic and immune problem. Prospects are vast and vivid in harmonizing feeding and housing management with circadian rumen microbial characteristics. He goal is reducing waste and increasing microbial eٹcLenc\ and health. Acknowledgments Hanks to the Ministry of Science Research and Technology and National Elite Foundation for supporting the author's global programs of optimizing science edLficatLon in the third millennium.

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