ECRONICON OPEN ACCESS

EC VETERINARY SCIENCE
Guest Editorial

Prediction of Feed Intake in Ruminants: A Volatile Essentiality

A Nikkhah* and MH Khabbazan

Ferdows Pars Agricultural and Livestock Holding Co., Tehran, Iran

***Corresponding Author:** Akbar Nikkhah, Chief Highly Distinguished Professor and Scientist, Ferdows Pars Holding Co., and Faculty of Veterinary Sciences, University of Tehran, Iran.

Received: August 15, 2020; **Published:** September 20, 2020

Abstract

Feed intake regulation is complex in ruminants. This is mainly because the factors that affect feed intake are numerous in ruminants. These dietary and animal factors interact with each other and make it challenging to reliably predict feed intake. Such a volatile nature of feed intake regulation must be taken into account in diet formulation and farm management. However, such interactions should not be overestimated when utilizing feed intake predictions in diet formulation and farm management.

Keywords: *Feed Intake; Regulation; Ruminant; Diet; Farm*

This objective of this editorial article was to emphasize the volatile nature of feed intake prediction in ruminants. This was to help realistically utilize feed intake predictions in ruminant diet formulation and farm management. Feed costs account for about half the total management costs in a modern dairy farm [1,2]. However, this estimate of feed cost may be underestimated. When poor choices of feedstuffs or feeding strategies are not used, costs would rise because health and longevity of cows are compromised. To meet nutrient demands of a lactating cow at a certain milk yield and body growth, we need to accurately predict its feed intake. Accurate prediction of feed intake requires a deep knowledge of both animal and non-animal factors affecting feed intake [3-5].

Next, the contribution of the above factors to feed intake control in certain productive and environmental situations must be quantified. Many factors affecting feed intake are still largely unknown [6]. Even the magnitude of the factors which are known requires further quantification and modification for different production scenarios. For these reasons, the prediction of feed intake remains a challenging task in livestock. Predicting feed intake is possibly more challenging in ruminants than in non-ruminants. A multitude of variables such as rumen pH, osmolarity, and outflow rate affect the extent and rate of nutrient use by rumen microbes. More importantly, these variables interact with each other. The nature of these interactions could be positive, negative, or additive and their extent would be difficult to measure *in vivo*.

The accurate prediction of feed intake would necessitate accurate prediction of the rumen fermentation including pH, VFA and ammonia production, and microbial protein synthesis. Therefore, it is not surprising that what nutritionists and microbiologists project to obtain in terms of microbial yield as well as VFA production from computerized feeding programs may not be achievable in many on-farm scenarios. In addition, the post-rumen digestion differs in both capacity and efficiency between ruminants and non-ruminants. Diets for ruminants are much more fibrous and contain less starch than diets for non-ruminants. As such, ruminants may not have developed as a high amylolytic capacity in the small intestine as non-ruminants. When starchy diets containing corn and sorghum grains are fed particularly to high-producing cows with high intake levels, the small intestine may receive a considerable amount of partially-hydrolyzed or intact starch. The small intestine in ruminants, however, may debatably not be able to efficiently assimilate the starch escaping the rumen. Furthermore, the small intestinal nutrient assimilation in ruminants depends on several factors such as energy and protein intake. Thus, numerous rumen and post rumen variables need to be quantified accurately before feed intake in ruminants can be reliably predicted.

A major factor that complicates feed intake regulation in ruminants is milk yield in dairy cows and daily weight gain in beef cattle. The degree to which milk yield and weight gain stimulate feed intake varies across lactation and growing phase, respectively. At higher production levels, feed intake response should be more pronounced. The hypothetical positive impact of a given feeding strategy (such as timing or frequency of feeding) on feed intake is expected to be of greater magnitude in higher-producing ruminants. For example, there is a speculation that high-yielding cows can produce more than low-yielding cows because they can ruminate longer. The longer rumination enables the high-yielding cows to digest the feed more effectively.

It has been a question whether, and to what extent, feed intake pushes milk production or milk secretion drives feed intake. The latest NRC [1] suggested that milk production drives feed intake. The NRC based its suggestion on the increased feed intake due to increased milk yield by bovine somatotropin. The application of bovine somatotropin in early lactation stimulates the mammary nutrient uptake and milk production in advance of increasing feed intake [7]. Across parities, the peak in milk yield usually occurs at about 4-6 weeks postpartum, but the peak in feed intake lags to occur at 10 - 14 weeks postpartum [2]. During the negative nutrient balance, the high-producing cows draw from their body reserves (fat, protein, calcium) to meet nutrient requirements [8]. This suggests that the elevated demand for nutrients at production peak drives the cow to increase feed intake. However, such a driving force does not become apparent until after several weeks of increased milk yield.

Conclusion

The volatile nature of feed intake regulation should be taken into consideration in formulating dairy and beef diets and farm management. The interactions of so many factors affecting feed intake should not be overestimated when utilizing feed intake predictions in diet formulation and farm management.

Acknowledgments

Thanks to Ferdows Pars Holding Co., for all-aspect supports.

Bibliography

1. National Research Council. Nutrient Requirements of Dairy Cattle: Seventh Revised Edition. Washington, DC: The National Academies Press (2001).
2. Schingoethe DJ. “Feeding dairy cows”. In Livestock Feeds and Feeding. Eds., R. O. Kellems and D. C. Church. 5th edition. Pearson Edition., Inc., NJ (2002): 313-328.
3. Nikkhah A. “The Art of Manipulating Nutrient Bioprocessing In Ruminants: Behind the Rumen Wheel”. *Biotechnology and Bioprocess Engineering* 5 (2015): e134.
4. Poppi DP., *et al*. “Integration of theories of intake regulation in growing ruminants”. *Journal of Theoretical Biology* 167 (1994): 129-145.
5. Forbes JM. “Voluntary feed intake and diet selection”. In Quantitative Aspects of Ruminant Digestion and Metabolism. Eds: J. Dijkstra, J. M. Forbes and J. France. CABI Pub. Wallingford, UK (2005): 60-626.

6. Nikkhah A. "Chronophysiology of ruminant feeding behavior and metabolism: an evolutionary review". *Biological Rhythm Research* 44.2 (2013): 197-218.

7. Etherton TD and DE Bauman. "Review: Biology of somatotropin in growth and lactation of domestic animals". *Physiological Reviews* 78.3 (1998): 745-761.

8. Bauman DE and WB Currie. "Partitioning of nutrients during pregnancy and lactation: A review of mechanisms involving homeostasis and homeorhesis". *Journal of Dairy Science* 63 (1980): 1514-1546.

Volume 5 Issue 10 October 2020