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Editorial Open Access

Gut Adaptation to Healthy Starch Assimilation in Dairy Ruminants: A Lifetime Development

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Editorial

This perspective policy article describes a lifetime program to effectively adapt rumen and post-rumen ecology to starch fermentation and assimilation. Such a program necessitates prolonged nutritional management of dairy animals from just after birth when concentrate feeding begins through heifer and dairy production cycles.

By an evolutionary definition, due to high dependence on natural resources especially on pastures, ruminants have long developed extensive rumen fermentation. This exceptionality enables utilization of resistant plant cell wall fibres using microbial enzymes symbiotically [1,2]. Accordingly, only so much starch could have been supplied to the rumen and post-rumen. Owing to such a limited starch nutrition in nature, ruminants have not required extensive amylolytic capacity particularly post-ruminally [3]. However, due to modernization of the dairy industry especially over the last few decades, nutritional and health demands for effective starch fermentation in rumen and capacious starch assimilation and glucose absorption in small intestine have increased. Collecting all of these optimums together has, thus, become a serious challenge on-farm [3,4]. Consequently, unhealthy and inefficient rumen fermentation, ineffective post-rumen starch assimilation, and metabolic disorders (e.g., subacute rumen acidosis, rumenitis, liver steatosis, laminitis, and immune malfunction) frequently occur in today's dairy farming [4,5]. The drama requires feasible and pragmatic actions to overcome the challenges and improve economics and food safety globally [6,7].

Pragmatically, timely adaptation of the ruminant gut to extensive starch fermentation and assimilation requires a step-wise planning. Reliance on prolonged milk supply and easily available pasture has kept natural ruminants from early development of starch assimilative capacity in both rumen and post-rumen. In modern farming, however, such natural properties must be modulated to cope with the increasing demand for higher production efficiency. The latter obliges improved production per unit of nutrient intake. Increased production can be achieved merely through effective nutrition of starch as a most concentrated form of available energy for both microbes and the host ruminant. In fact, improved milk and beef production efficiency stems from increased microbial mass yield as a result of stabilized rumen conditions. Notably then, any health-sustaining pathway must go through successful starch nutrition.

The industrial implication of this article involves allowing the living gut to receive and assimilate adequate starch right from few weeks post-birth in calves through heifer and adult cow production cycle. However, this plan must not contradict with the conventional practice to not overfeed heifers with high-energy diets that cause excessive abdominal and peripheral adiposity and reduced fertility. In other words, diets could have adequate starch and not be overly energy-dense. Additionally, to avoid over intake of energy, starch diets may be fed at limited intake levels under constrained feeding programs.

In a nutshell, a sustainable strategy to improve starch dynamics in the high-producing ruminant gut is to conduct the adaptation for the entire commercial life from just after birth through multiple production cycles. This requires systematic and well-managed starch nutrition of calves, heifers and mature dairy cows. Such an adaptation is not limited to short-term alterations in rumen microbial populations and hepatic biochemistry. Harmonically, but the program works at tissue, cell, and gene levels and helps build foundations for starch-based modern farm management. Research is a must to enlighten the various aspects of the theory.

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