

## Optimizing Dairy Herd Starch Efficiency via Strategic Heifer Management

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Policy Article

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### Abstract

This article demonstrates how effective heifer management via programmed prolonged starch nutrition can prepare the upcoming productive herd to efficiently and healthfully utilize starch towards milk production. Gradual but quite minor increases in dietary starch inclusion for heifers (from weaning through first-calf pregnancy and lactation) in a controlled intake program ensures that heifers receive just enough moderately fermentable starch to timely capacitate rumen ecology while not being overfed with energy to avoid consequent complications.

**Keywords:** Heifer; Management; Starch Efficiency; Programmed Feeding; Dairy Herd.

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### Strategic On-Farm Innovations

The modern dairy industry continues to suffer economically from illogical starch management in feeding dairy herds. This mounts up to billions of dollars annually that keeps dairy farms in many parts of the world from realizing deserving profits in response to the time, finance, and energy invested. This phenomenon of so called 'starch explosion' undoubtedly jeopardizes the economical and environmental integrity of the modern dairy industry. A major consequence of such a mismanagement is the overly challenged food safety and security programs [1, 2].

This article innovatively discusses a farsighted on-farm strategic program to effectively develop healthful and adequate rumen and post-rumen capacity for starch assimilation. This capacity has to be developed and expanded very gradually and safely, such that the upcoming adult dairy cow is capable to cope with the sig-

nificantly increased dietary starch density during early and peak milk production. This extended adjustment program can minimize risks from starch over-fermentation and sudden alterations in rumen and immune conditions. The solution provides grounds to reduce rumen sensitivity to acidic conditions as well. Moreover, this prolonged strategy conducted over months and years is expected to highly reduce inter-cow differences in sensitivity to low and fluctuated rumen pH and organic acid concentrations [3-5]. The success of this adaptation programs lies in its prolonged time frame. As such, the internal heifer-cow physiology has sufficient time to develop assimilative and absorptive capacities especially at cell and gene levels and as far as genomics, proteomics and metabolomics are concerned.

Basically, since ruminants have evolved in nature on pasture, they have not required developing very significant digestive systems for starch utilization [4-6]. The major portion of pasture diets is non-starch carbohydrates including cellulose, hemicelluloses, fructans, and other integrated polysaccharides. Thus, any major plan involving high starch feeding must initiate and augment evolution of its assimilative necessities and mechanisms to avoid unhealthy and toxic effects for both rumen microbes and the host ruminant [7, 8].

Due to relatively lower nutrient requirement of heifers and the concern on their overfeeding, overconditioning and compromised reproduction performance, care must be exercised to not over-nourish heifers with energy. This implies that should starch be included in heifer diets even at minimal portions, due to increased dietary energy density, especial programs such as limit-feeding or step-feeding may be practiced. In other words, the same diet with starch can be fed a little less than ad libitum to ensure no or minimal overintake while ensuring to deliver adequate starch to help gradually establish the assimilative and metabolic systems involving efficient starch utilization. Efforts must be made to very steadily include and increase dietary starch for heifers particularly after 10 months of age, such that dietary starch would shocklessly

reach its usual high portions around the first periparturient phase. That will minimize early lactation risks of constantly depressed dry matter intake, metabolic disorders (e.g., subacute rumen acidosis, advanced fatty liver, ketosis, laminitis, metritis, mastitis & immune deficiency). Furthermore, effective ruminal and small intestinal adaptation to starch digestion and glucose dynamics may be facilitated by optimizing starch processing techniques [9, 10]. However, this requires more research.

## Implication

A prolonged management program for heifers of steady starch feeding from weaning through the first lactation and on is required for healthy and capable starch assimilation and glucose metabolism in dairy cows. Ruminant evolution necessitates such an extended adaptation of rumen fermentation, post-rumen assimilation, and splanchnic metabolism to major starch feeding during lactations. As a rule of thumb, the high levels of dietary starch fed during lactation must be realized quite gradually to not shock the first and second calf heifers and adult cows with sudden overloads of starch, when compared to commercial growing heifer rations with usually quite modest grain starch.

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