

Assessing the impact of changing diets on the gut microbial community of developing dairy calves

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Development of the rumen and its microbiota are essential for animal survival as this community is responsible for the conversion of indigestible forage into host-accessible nutrients.

Traditionally, dairy farms worldwide raise calves on starter grains; however, recent trends favor cheaper, corn-based alternatives. Here, we determined the consequences of calf diet on short- and long-term growth, health, and gut-associated microbial communities in dairy cows. Three cohorts of 15 calves were raised until 8 weeks on milk plus starter grain and/or corn silage. Fecal samples and growth metrics were obtained at 2, 4 and 8 weeks as well as 1 and 2 years. Ruminal samples were obtained from 3 males per cohort sacrificed at 8 weeks, and a subset of cannulated females at 1 and 2 years. Internal development was also assessed in sacrificed animals. Microbial communities were determined for bacteria, archaea, and fungi. All fecal and ruminal communities showed significant age-related changes, but no diet trends were apparent in fecal, rumen archaeal, or rumen fungal communities. In contrast, rumen bacteria showed distinct diet-dependent differences at weaning with the mixed diet animals having the most adult-like microbial communities. Moreover, animals on the mixed diet were correlated with intermediate ruminal and increased intestinal development at weaning. Diet trends were not apparent in the microbiota of adult animals and did not correlate to animal growth. Thus, our data suggest that calf diet affects development of the rumen and its associated microbiota but does not have long-term consequences for the adult cow. Future work will assess different forages and their impact on calf development.