Understanding Variation in Milk CLA Content: Development of Techniques to Characterize Diet-Induced Changes in Rumen Microbial Profiles

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There is an accumulating body of evidence to support a broad range of health benefits of dietary conjugated linoleic acid (CLA) for humans. The primary sources of dietary CLA are ruminant meats, milk, and milk products. Our research group has developed feeding strategies for lactating dairy cattle that result in up to a 10-fold increase in CLA content in milk. However, there is variability in the content of CLA in milk between cows on the same diet. We are conducting research to address critical questions about the interactions between diet and the rumen microbial community that may contribute to the observed variability in CLA isomer profiles and content of milk. We have completed a series of experiments for evaluating the feasibility and usefulness of recently developed molecular methods for comprehensive analysis of microflora profiles in rumen samples. The techniques required to perform this work were based on a collection of methods from the laboratories of four collaborating research groups. Established techniques were successfully modified for rumen sample collection, preparation, and evaluation of microflora in rumen samples. The overall objective of these efforts is to contribute new knowledge that advances our understanding of the rumen ecosystem as it relates to CLA synthesis in the lactating cow. Understanding the biological basis for the observed variation in milk CLA content is an essential step toward commercial production of standardized CLA-enhanced milk.

Implications of the Research for the Dairy Industry. The development of these leading-edge techniques in genetics and rumen microbiology was accomplished through efforts to continue advancing the molecular component of our dairy CLA research program. In addition to providing new knowledge about diet-induced changes in microbial populations in the rumen, another important outcome of this advance is the creation of new opportunity to address and provide solutions to other issues facing the industry. There is a broad range of problems that have either documented or suspected relationships to rumen function, including fertility, lameness, and various metabolic diseases like fatty liver, ketosis, milk fever, displaced abomasum, and retained placenta.