

# **Bioproduct Development: Combining the Wisdom of Nature with the Power of Biotechnology to Enhance the Healthfulness of Milk**

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Milk contains many different types of fats and there is considerable natural variation from cow to cow in the amount of each fat. The natural variation in milk fat composition between cows is due to genetic differences between cows. Modern molecular technology offers for the first time an effective approach to identify and characterize the genetic differences responsible for the natural variation between cows in milk composition. The main objective of this study was to identify genetic differences between cows that underlie the natural variability in milk composition, including total fat content and fatty acid profile. Our research strategy involved the application of molecular technology in a comprehensive search for natural differences in genes in cows with significant differences in the composition of their milk.

One of the genes under investigation in the project is the stearoyl coenzyme A desaturase (SCD) gene, which codes for the enzyme (i.e., SCD protein) involved in conversion of precursors of CLA (conjugated linoleic acid) into CLA. Like most mammalian genes, the SCD gene is complex in both its structure and regulation. We are the first research group to clone the bovine stearoyl coenzyme A desaturase (SCD) gene. Our search for natural genetic variation in the bovine SCD gene required the development of a collection of molecular tools and methods for high-throughput evaluation of specific regions of the SCD gene.

Another important outcome of the project was the development of two different methods for analysis of the bovine SCD gene. The first method is based on the use of milk, and the second method is based on the use of a single hair, which is simply plucked from the ear or tail of the cow. The methods are also applicable to the study of other genes of potential economic importance to the dairy industry.

**Implications of the Research for the Dairy Industry:** New genetic information about milk composition will allow production of milk and milk products with enhanced nutritional and health properties. The ability to identify cows that produce milk with more healthful characteristics will create opportunity for development of new products that enhance the health status of consumers. Similarly, production of milk with enhanced healthfulness also creates opportunity for development of new products to meet consumer preferences.