

Genotype of Stearoyl CoA Desaturase Affects Conjugated Linoleic Acid Production

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The fatty acid composition of ruminant milk is a growing area of interest due to the health promoting properties of specific fatty acids such as conjugated linoleic acid (CLA) which has been shown to have anticarcinogenic activity. When cows are fed diets containing sunflower seed oil (SFO), which is rich in linoleic acid, the rumen microbes produce vaccenic acid, which is then converted to CLA in the mammary gland. Stearoyl coA desaturase (SCD) is the enzyme involved in the conversion of vaccenic acid (precursor of CLA) to CLA in the mammary gland. Mutations in the SCD gene have been identified and it is hypothesized that they could be associated with the genetic potential of the cow's ability to produce milk enriched with higher levels of CLA.

The objective of the study was to determine the effect of mutations in the SCD gene on the cow's ability to produce CLA. The mutations in SCD lead to three genotypes: AA, AV, and VV. Four animals of each genotype were selected (n=12). The experimental design was a cross-over with 21 day periods. The treatment diets contained SFO at either 5% (High fat) or 0% (Low fat) on a dry-matter basis. The high fat diet contained 8% fat, and the low fat diet contained 3% fat.

CLA production increased from 0.61% on the low fat diet to 4.4% on the high fat diet ($P < 0.0001$). The ratio of CLA:vaccenic acid was 0.62 when AV and VV cows were fed the low fat diet, but was 0.50 when they were fed the high fat diet. However, for AA cows, the ratio of CLA:vaccenic acid was not affected by dietary fat content, averaging 0.57. Thus, it was evident that the AA cows maintained high activity of SCD regardless of diet while AV and VV cows had less relative activity of SCD when they were fed the high fat diet.

Implications: Genetic selection could be a useful tool in selecting cows with an increased ability to produce CLA-rich milk.