CLA - the milk fat wonder

In what could be a boon to the dairy industry, milk has been shown to contain anti-cancer and anti-obesity components

By Dale E. Bauman and James W. Perfield II

Over the last decade scientists have discovered that some nutrients in foods have an effect greater than their nutritional value. Conjugated linoleic acids (CLA) are an example. In animal studies, these unique fatty acids have been shown to have a range of health benefits, including anti-cancer and anti-obesity.

Fortunately for the dairy industry, its products are the major source of CLA in people's diets. If the dairy industry can capitalize on CLA's presence in its products, consumers will have more reason than ever to include nature's "health kick" in their diets.

What are CLA?

They are 18-carbon fatty acids that have two double bonds located between adjacent carbon pairs. Several isomers (forms) are possible depending on the location and orientation of the double bonds. Research has focused on two isomers: 9,11 CLA, or *cis*-9, *trans*-11 CLA, and 10,12 CLA, or *trans*-10, *cis*-12 CLA.

The 9,11 CLA isomer, which represents 75% to 90% of total milk fat CLA, is anti-carcinogenic. Our research group demonstrated this in collaboration with Dr. Clement Ip of Roswell Park Cancer Institute in Buffalo, N.Y., and Dr. David Barbano of Cornell University's Food Science Department. We used CLA-enhanced butter in a rat model for breast cancer. The research results were the first to show the benefits of a naturally occurring anti-carcinogen in a natural food.

Using chemically synthesized CLA, anti-cancer effects have been verified in other cancer models such as stomach, colon and skin.

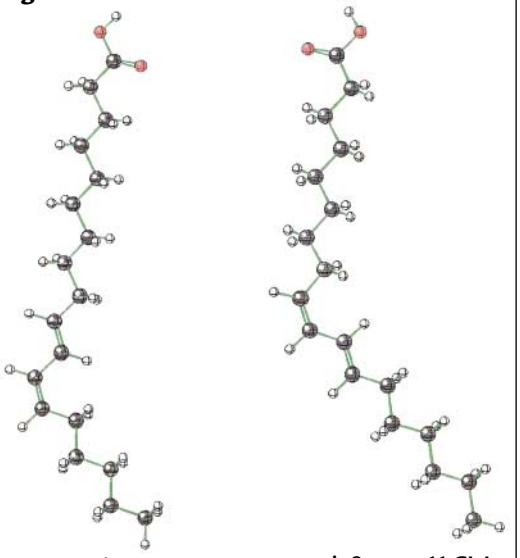
Much remains to be learned about CLA's anti-cancer effects, but these exciting discoveries are part of a worldwide scientific effort.

At the cow level

Our research group discovered that 9,11 CLA in milk fat is made by the cow, not by rumen bacteria as had been assumed. Synthesis involves a mammary enzyme, delta-9 desaturase, which acts on a specific trans fatty acid (vaccenic acid) produced by rumen bacteria. We have identified several factors that regulate the expression of the delta-9 desaturase gene and found as much as a 300% variation in enzyme activity among individual cows.

Research has also identified dietary factors that can affect the rumen's production of vaccenic acid. This may provide opportunities to enhance CLA content of dairy products.

Figure 1 Two CLA isomers



trans-10, *cis*-12 CLA

cis-9, *trans*-11 CLA

Our group demonstrated the 10,12 CLA isomer is a very potent inhibitor of milk fat synthesis. Feeding 10,12 CLA supplements also reduces body fat gain in several species. But the amount required to reduce body fat in growing animals is many times greater than what's needed to affect milk fat synthesis in dairy cows.

Milk fat always has only trace levels of 10,12 CLA. But we discovered we could increase synthesis of this CLA isomer by rumen bacteria under certain feeding conditions, such as high concentrate, low forage diets or ones low in effective fiber, that cause a depression in milk fat test.

Diet-induced milk fat depression was first observed more than 100 years ago. But it was our research that showed a specific CLA isomer is involved.

We're currently exploring the use of CLA supplements as a management tool to reduce milk fat. One example is to reduce nutritional stress in transition cows, a research project we initiated with Dr. Tom Overton in Cornell's Department of Animal Science. (See Research explores CLA's role in transition cow nutrition, page 22.)

FYI

- Dale Bauman is a professor in the Department of Animal Science at Cornell University. James Perfield is a graduate student in the department.
- For more information on CLA, see this website: www.asas.org/jas/symposia/proceedings/0937.pdf
- CLA information is also in the proceedings of the 2001 Cornell Nutrition Conference. For printed or CD copies, contact Diane Ten Kate at (607) 255-2060. E-mail: dkt2@cornell.edu
- Proceedings can be ordered on-line at www.ansci.cornell.edu/prodairy Cost is $10 for domestic orders and $20 for orders outside the United States.