Improving Meat Quality with CLA

Fatty acid benefits animal and human health

By Susan McGinley

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Glenn Duff, associate professor, with Holstein steer "Irwin" at the UA Campus Agricultural Center feedlot.

Conjugated linoleic acid (CLA) isn't yet a household term, but it likely will be. A naturally occurring polyunsaturated fatty acid found almost exclusively in the milk and meat fat of ruminants such as cattle, sheep and goats, CLA offers benefits for both animal and human health. Studies in experimental models have shown that CLA protects animals against cancer, diabetes and heart disease, decreases the animal's body fat, stimulates the immune system and bone development, alleviates wasting disease and eases symptoms of lupus. The substance has not yet been extensively evaluated in human trials.

"As a consequence of its biological effects and origin, CLA has received considerable attention from not only the medical community and human nutritionists, but also animal scientists,"says Lance Baumgard, assistant professor of animal sciences in the University of Arizona College of Agriculture and Life Sciences.

Baumgard and colleagues Glenn Duff, Darrell Goll, Ron Allen and graduate student Octavio Mendivil are investigating ways of increasing the CLA content of adipose tissue in cattle to improve meat quality in natural and conventionally raised beef. What they find may not only help Arizona's beef industry, but also provide a greater understanding of how CLA operates to protect and improve animal health.

In a feeding study focused on body composition, the research team aims to increase lean tissue in beef cattle while decreasing the fat content in the right places.

"Fat is deposited in three places in beef cattle," Duff says. "There's backfat, internal fat, and marbling. We want to decrease the first two while leaving the third alone, to increase the quality of the meat." CLA content in meat and milk can be improved by altering feed rations, including changes in the ratio of forage to grain concentrates, and by adding different types and levels of polyunsaturated oils.

In two trials with 30 cattle in 2001 and 20 in 2002, the researchers put half the animals on a diet with CLA in the feed, and half on a control diet. (The animals were from the UA's V Bar V Ranch). The CLA they fed the animals was chemically synthesized in a laboratory, although it can also be obtained from animal fat. Each animal received infusions of insulin, epinephrine (adrenalin) and glucose and was monitored for the way it handled these substances metabolically and hormonally.

Mendivil has collected blood from the cattle at selected times and analyzed it for different concentrations of non-essential fatty acids and glucose. He uses a gas chromatograph to analyze fat samples for fatty acid content. So far the team has demonstrated that supplementing dietary CLA in beef cattle can increase the CLA content of adipose tissue by more than four-fold, but questions regarding the implications of that change still need to be studied.

"We believe the animals on CLA will react in a way that increases muscle synthesis and decreases fat synthesis," Baumgard says. He hopes this will ultimately increase the healthiness of meat and milk products and improve carcass value, feed efficiency and the health and well-being of the animal.

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The next trial will target muscle and fat composition in a production situation, using Holstein steers from a cooperator in Arizona and the same CLA feeding regime. Holsteins comprise the majority of the state's approximately 300,000 head of feedlot cattle.

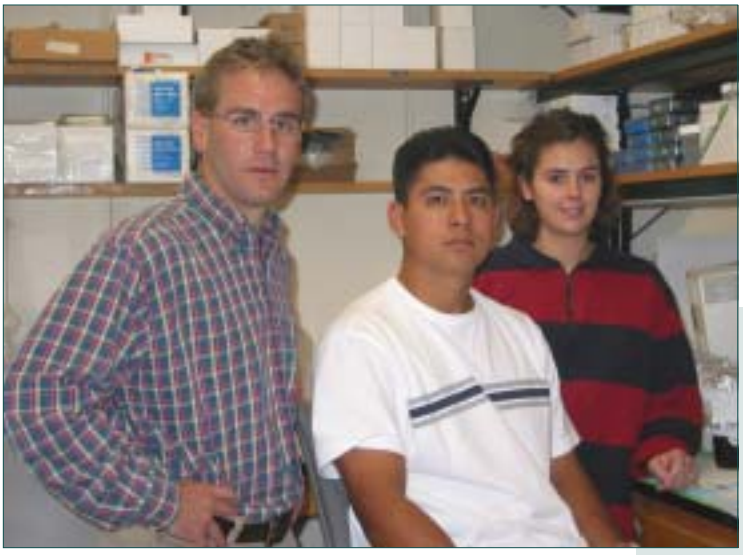
"They will be fed diets typical of those administered in feedlots across the state, with CLA given to half the group," Duff says. "During feeding we'll be looking at the performance of the cattle, including average daily gain, feed intake and feed efficiency. We'll also look at the carcasses for total meat yield, the size of the rib-eye area including the amount of muscle versus fat, fat thickness, the amount of internal or gut fat (waste), and quality grades—select, choice and prime—reflected in marbling." Approximately 60 to 80 percent of Arizona beef is designated choice grade, depending on management programs.

"We want to improve the percentage of calves that grade choice without sacrificing performance," Duff says. "This could potentially change the diet at the feedlots." Once CLA has been proven to be effective in improving meat quality—and the researchers believe it will—they will make sure it's cost-effective to the producer. CLA is so new that it is not commercially available as an animal feed component; the researchers have been using a preliminary study formulation and will have to develop a realistic cost analysis for producers.

"If it works the way we think it does there are probably at least two or three more years of testing to make sure CLA supplements are beneficial, effective and cost-efficient," Baumgard says. Feeding regimens need to be developed, including dosages and timing for growth stages. Meat quality resulting from increased dietary CLA must be determined, including effects on marbling, taste, tenderness, color and other factors.

In a related study Baumgard and Duff are analyzing the effects of dietary CLA on growth performance in castrated beef cattle. They hypothesize that "feeding this supplement will prevent the reduced rates of gain that immediately follow castration and thus improve economic return for the Arizona beef industry."

"There is substantial interest in the medical community to utilize CLA as a therapeutic nutrient or at least as a preventative dietary agent for many common human diseases,"Baumgard says. "At the very least, we believe CLA will have a strong positive effect on public perception of animal foodstuffs."



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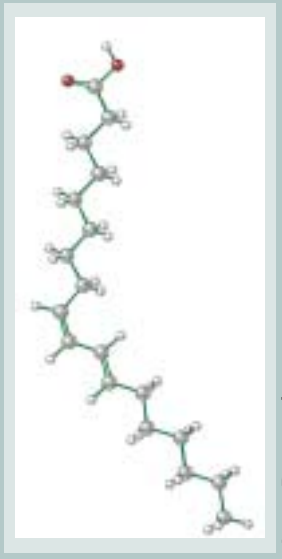
Lance Baumgard, assistant professor, with graduate student Octavio Mendivil and research specialist Sara Sanders in Department of Animal Sciences laboratory.



Lance Baumgard

CONJUGATED LINOLEIC ACID (CLA)

Beyond obvious vitamin and mineral properties, recent evidence shows that foods that have been around for millenia have other factors that improve health. Tomatoes contain lycopene, grapes have anthocyanins, and broccoli features cancer-fighting sulfides. For at least a decade scientists have known that conjugated linoleic acid found in ruminant animals contains one of the most potent anti-carcinogens ever discovered, according to Lance Baumgard, UA animal scientist.

"It decreases tumor formation, and is toxic to existing tumors," he says. It's preventative and therapeutic, and is not destroyed by cooking. CLA affects Type II diabetes, fat synthesis, lupus, atherosclerosis and immune system function. It's a remarkable molecule."

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