Nutrition file for Health Educators

Canada Publications Agreement #40065735

December 2005

Key Messages

- CLA research is in the early stages. Pioneering studies based largely on animal models have shown considerable CLA promise for human health benefits related to cancer, heart disease and kidney disease, obesity, diabetes and osteoporosis.
- Not all CLA is the same. There are many different isomers of CLA, each with varying degrees of activity. To date, the most promising isomers identified are CLA 9,11 and CLA 10,12. Synthetic forms of CLA have been developed but many products marketed are based on little science or questionable claims. Many leading scientists believe natural CLA will offer the best avenue for developing CLA health potential.
- Dairy and beef products are good sources. Studies have confirmed these products already contain natural CLA, and there is strong potential to enhance these levels through a variety of livestock production strategies, including simple livestock dietary changes.

This issue of *Nutrition File for Health Educators* was reviewed by Dr. Spencer Proctor, Director, Metabolic and Cardiovascular Diseases Laboratory, University of Alberta and Dr. Catherine Field, Professor, Human Nutrition, University of Alberta. Their contribution is greatly appreciated.

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Research round-up: The rising health potential of CLA

Written by the CLA Network

New research results are strengthening the case for conjugated linoleic acid (CLA) as one of the most promising food nutrients to aid in the battle against chronic disease.

This unique fat, found naturally in dairy and beef products, is showing considerable potential for human health benefits related to cancer, heart and kidney disease, obesity, diabetes and osteoporosis.

Though research is in the early stages and based largely on animal models, the potentially broad and clinically significant benefits of CLA have earned it increasing recognition as a wonder nutrient of the future.

"We are very excited and encouraged by the new research knowledge on CLA," says Dr. Spencer Proctor, a world leader in blood cholesterol research and Director of the Metabolic and Cardiovascular Diseases Laboratory at the University of Alberta. "We are learning that CLA is important for many human biological systems and has excellent potential to support human health."

Canadian scientists are part of a growing international base of CLA researchers who are working to understand and harvest the promise of CLA. Major advances are expected over the next five to 10 years.

"Cancer is one of the best examples of recent CLA research progress," says Dr. Catherine Field, a leading researcher on the effect of nutrition on the immune system and Professor of Human Nutrition at the University of Alberta. "For a food nutrient, the potential CLA is showing to aid in the treatment and prevention of cancer is remarkable."

The ABCs of CLAs

At a fundamental level, the strong potential of CLA stems from the unique health boosting properties of this fatty acid, its apparent broad distribution in the human body and growing evidence of its significant role in a variety of human biological systems.

First identified in the late 1970s, the term CLA describes a group of isomers of linoleic acid, which is a good fat and one of the omega six essential fatty acids.

Although CLA is technically classified as a trans fat, it is essentially a good trans fat different from industrially processed trans fat. CLA is different because it is formed naturally in dairy and beef and does not share the harmful properties made through the hydrogenation of vegetable oils. Rather, this natural trans fat may be health promoting with an important role to play in the human body.

In fact, in recognition of CLA's potential health benefits, Health Canada did not include CLA as part of the total trans fat value in the new nutrition label.

The mechanisms of CLA are not well understood. But there are indications that CLA, when digested, is taken up by *phospholipids*, the class of fats that serve as the principal structural component of cell membranes. This would explain the apparent pervasive distribution of CLA in the body and its significance for a number of biological systems.

Natural benefits

Natural CLA is formed in the gut of ruminant animals when micro-organism activity adds hydrogen to linoleic acid. The CLA that results from this process retains the essential health facilitating properties of linoleic acid. In addition, it features the ability to displace bad fat and the ability to act as an anti-carcinogen.

While synthetic forms of CLA have been developed for both commercial supplements and research purposes, many leading scientists believe the CLA found naturally in dairy and beef products may offer the best avenue for developing CLA health potential.

There are many different CLA isomers. However, CLA 9,11 and CLA 10,12 have been the two linked to health benefits and studied extensively for biological function. These two CLA isomers are known to be present in dairy and beef products.

Also known to be present in dairy and beef products is vaccenic acid, which recent research has revealed as a precursor to CLA 9,11. This precursor can be converted into CLA once inside the human body.

Nutrition file

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Nutrition File is a free quarterly research newsletter for health professionals, funded by the dairy producers in Alberta. If you are a new reader and would like to add your name to our mailing list, please contact Alberta Milk at:

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Early research findings

To date, most CLA research using mixtures of CLA isomers has concentrated on the impact of CLA in animal models for a variety of chronic diseases. This research has delivered encouraging results.

Dramatic cancer progress.
The most advanced area of CLA research is cancer treatment and prevention. Early studies show feeding CLA to animals can reduce the growth and formation of cancer – a remarkable finding for a food nutrient. As a next step, scientists are investigating CLA in human tissue studies, and human clinical trials could soon follow.

For cancer researchers, one of the most exciting things about CLA is its wide potential for guarding against many types of cancer and its apparent relatively strong potency. For example, those investigating the potential of fatty acids have long concentrated on omega 3 fatty acids, derived from fish oil, which have shown significant promise. At first, indications were that CLA would act in the same way as omega 3, but study results point toward CLA as having quite different mechanisms and producing an anti-cancer effect at a much lower concentration.

If proven true in humans, the identification of a fatty acid that could be fed at a lower level than omega 3 and deliver clinical outcomes would represent a major breakthrough in cancer treatment.

CLA's cancer fighting effect has held up in all the major animal models of cancer that are used for testing drug efficacy. These include primarily models for breast cancer and the colo-rectal cancers, along with models for some forms of leukemia and liver cancer, including hepatoma.

Among other key findings, early research indicates the major isomers CLA 9,11 and CLA 10,12 appear to act differently in relation to various forms of cancer. This opens the door to fighting cancer with CLA through more than one pathway. Overall, there is more work to be done in terms of cancer research in order to sort out how the different CLA isomers impact the many different types of cancer. Most studies to date have used cocktails of many different CLA isomers, but newer studies are using more purified mixtures and that trend will continue as the research progresses.

Another landmark finding is CLA appears to affect both the growth and death of cancer. This is of great significance to cancers such as breast cancer, which are characterized by mutated genes that stop cell death. This opens the potential for CLA to act in the manner as some chemotherapy drugs by "turning on" the death process of cancer cells. A benign food ingredient with this activity would be a remarkable tool for cancer treatment.

Heart healthy benefits.
Cardiovascular disease is another key research front. Early animal studies have indicated feeding animals CLA improves the profile of fats in the blood, particularly reducing high levels of low-density lipoproteins (LDL), which are associated with the disease.

Results have also indicated CLA may influence an inflammatory-related mechanism that reduces the disease pathology. Further animal studies are underway to examine CLA links to guarding against heart disease, and the research effort is shifting to focus more on human studies.

Strong obesity evidence.
In the area of obesity, results are also very encouraging. Various animal studies are linking CLA to increased energy expenditure, increased body muscle and reduced body fat.

Further studies are being done to confirm these results and determine how much weight can be lost and where it can be lost in humans, based on specific strategies.

Ties to diabetes.
Also related to the obesity benefits is the positive potential for type II diabetes. Though research knowledge is very limited, there is some indication that CLA may play a role in normalizing glucose metabolism.

Kidney disease potential.
Among the most recent CLA research findings is its progress related to kidney disease. One of the first animal studies set to be published indicates a combination of CLA isomers can significantly reduce the rate of the disease pathology, and researchers are eager to follow up on that result.

Osteoporosis significance.
Bone density is another groundbreaking area, with indications that CLA plays a role in supporting healthy bones and guarding against osteoporosis. Research is at a very early stage, with results of the first major studies yet to be published.

Driving new progress.
Overall, the CLA research effort is progressing steadily and is expected to gain strong momentum over the next decade.

While research related to cancer has advanced to include new studies using human tissue, CLA research in general is progressing to a more specific focus on particular CLA isomers and the differences between natural and synthetic. There is also a major new push to understand CLA mechanisms, which will open the door to further potential for human trials and health claims.

Boosting CLA in dairy and beef

With all the health promise of CLA, considerable research has also been done in livestock production, to investigate the opportunity for increasing CLA levels in dairy and beef products.

Studies have confirmed ruminant meats and dairy products already contain natural CLA, and there is strong potential to enhance these levels through a variety of livestock production strategies, including simple livestock dietary changes.

In fact, studies have shown that natural CLA levels can be increased significantly in milk and beef by adjusting animal-feeding regimes.

These increases would potentially allow consumers to take in a substantial portion of CLA by simply substituting beef and dairy products from conventionally raised animals with products that have enhanced CLA levels.

Managing public expectations

For health professionals, at this stage the most likely questions on CLA to expect from the general public are those regarding weight loss. Particularly in the United States, CLA supplements are widely available and typically marketed as a weight loss wonder drug. While other potential health benefits are less well known, these too are gaining recognition and marketers are taking further advantage by advertising links to these benefits.

Despite the growing promise of CLA, it's important to remember that at this stage there is insufficient evidence to conclusively support major health claims.

The good news is studies to date have found no major negative implications for consumption of the natural CLA already found in dairy and beef products. Also, these products are known to contain the specific CLA isomers, CLA 9,11 and CLA 10,12, which have been linked to health benefits.

The message is more cautionary for the area of synthetic CLA, which includes nearly all CLA health supplements marketed today. First, many of these products do not contain the isomers linked to health benefits and are therefore of questionable value. Also, there is some preliminary evidence the synthetic form may be detrimental among subgroups of people at risk of diabetes or heart disease.

Learn more

In Canada, a major effort to understand and harvest the promise of CLA is the CLA Network. The CLA Network is a collaborative team from academia, industry and government, including representatives from many areas of expertise such as research, food industry, health and communications. For more information on the CLA Network, contact network manager Vince Ohama: CLAnetwork@gov.ab.ca or (403) 340-5545.

Frequently Asked Questions on CLA

What do we know about CLA health benefits?

A. CLA research is in its early stages, but there is growing evidence this natural fat is a significant health promoter. Research is showing considerable potential for human health benefits related to cancer, heart and kidney disease, obesity, diabetes and osteporosis.

What has been the major progress to date?

A. The most advanced and most dramatic findings are in cancer. Studies with all major animal models of cancer have confirmed dietary CLA inhibits the growth and formation of cancer, and research is advancing to studies with human tissue.

How was CLA discovered?

A. The biological activity of CLA was first discovered in the late 1970s by researchers investigating the carcinogenic properties of grilled hamburger. They found that there were anti-carcinogenic properties as well. They isolated the component responsible for this effect and identified it as CLA.

What is Canada's role?

A. Canadian researchers have been very active in studying the health benefits, the impact on animals and the methods of increasing CLA in both dairy and beef products. They are part of a now rapidly growing international base of CLA research and development.

Part of Canada's effort is the CLA Network. The CLA Network is a collaborative team from academia, industry and government, including representatives from many areas of expertise such as research, food industry, health and communications.

What's the difference between natural and synthetic CLA?

A. Synthetic forms of CLA have been developed for both commercial supplements and research purposes, but many leading scientists believe the CLA found naturally in beef and dairy products may offer the best avenue for developing CLA health potential.

Many synthetic CLA products do not contain the specific isomers linked to health benefits and are therefore of questionable value. Also, there is some preliminary evidence that the synthetic form may be detrimental among subgroups of people at risk of diabetes or heart disease.

Studies to date have found no major negative implications for consumption of the natural CLA already found in dairy and beef products. Also, these products are known to contain the specific CLA isomers, CLA 9, 11 and CLA 10,12, which have been linked to health benefits.

How much CLA is enough?

A. No one knows for certain. If we consider only CLA from natural sources, short-term animal studies suggest an equivalent daily intake of CLA 9,11 of about 1.5g. However, we know that CLA 9,11 is metabolized in the body and can be stored.

Future studies will determine how much individuals who regularly consume CLA-rich dairy and meat really need to ensure protection against cancer.

Is CLA a trans fat?

A. Although CLA is technically classified as a trans fat, it is essentially a good trans fat different from industrially processed trans fat. CLA is different because it is formed naturally in dairy and beef and does not share the harmful properties made through the hydrogenation of vegetable oils. Rather, this natural trans fat may be health promoting with an important role to play in the human body.

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CLA Content of Selected Foods from Ruminants*

Food (serving)	mg CLA/g fat	g fat/ serving	mg CLA/ serving
Whole milk* (250 ml)	3.4	8.6	29.2
Butter (10 g)	4.7	8.0	37.6
Plain yogurt (>4% MF; 175 g)	4.4	10.0	44.0
Cheddar cheese (50g)	4.2	17.0	71.4
Mozzarella cheese (50g)	4.6	13.0	59.8
Lean ground beef (75 g, broiled)	1.8	10.3	18.5
Rib roast (100 g, cooked)	2.9	26.75	77.6

**CLA content varies with the season and the diet of the animal*

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