

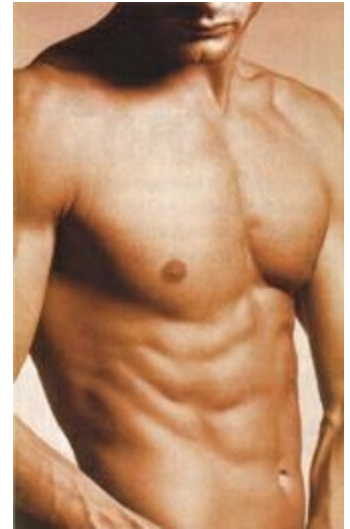
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## REPORT

CLA: Newly Discovered Benefits

LOSE THE  
FAT  
KEEP THE  
MUSCLE

by Ivy Greenwell



Compelling evidence indicates that CLA can promote youthful metabolic function and reduce body fat. The unique mechanisms by which this fatty acid protects against disease makes it an important addition to a life extension program.

Several years ago, the discovery of conjugated linoleic acid (CLA) caused a scientific sensation. Here was a fatty acid found in red meat and cheese that showed strong anti-cancer properties, being particularly effective in inhibiting breast and prostate tumors, as well as colorectal, stomach, and skin cancer, including melanoma. On the whole, scientists found CLA to be more strongly anti-carcinogenic than other fatty acids. What made CLA especially unique is that even low concentrations significantly inhibited cancer cell growth.

CLA supplementation was also shown to improve the lean mass to body fat ratio, decreasing fat deposition, especially on the abdomen, and enhancing muscle growth. One mechanism whereby CLA reduces body fat is by enhancing insulin sensitivity so that fatty acids and glucose can pass through muscle cell membranes and away from fat tissue. This results in an improved muscle to fat ratio.

After some head-scratching about cheeseburgers as the newest health food, it was discovered that, sadly, the natural sources of CLA such as beef, butter and cheese no longer provide as much of this valuable fat as they used to. Compared to the previous generations, Americans are deficient in CLA, and not only because of lower consumption of red meat and butter fat. It turns out that changes in cattle-feeding practices have decreased CLA content in meat and milk. For optimal CLA production, cows need to graze on grass rather than be artificially fattened in feed lots. The meat of grass-fed cows contains up to four times as much CLA. Today's dairy products have only about one third of the CLA content they used to have before 1960.

One big reason for the current obesity epidemic in America could be CLA deficiency. Several animal studies showed that adding CLA to the diet resulted in leaner, more muscular bodies. One 1996 study, for instance, showed as much as 58% lower body fat in CLA-supplemented mice. A pioneering Norwegian human study found that CLA-supplemented subjects lost up to 20% of their body fat in three months without changing their diet, while the control subjects on the average gained a slight amount of body fat during the same period.

CLA was also shown to have antioxidant properties, and to prevent muscle wasting (an anti-catabolic effect). It became popular with muscle builders because of its ability to improve the transport of glucose, fatty acids and protein to the muscle tissue.

It is interesting that while it is chemically related to linoleic acid, conjugated linoleic acid (CLA) appears to have opposite effects in certain important areas. For instance, linoleic acid stimulates fat formation (lipogenesis) in adipose tissue, while CLA inhibits fat formation; linoleic acid tends to promote tumor growth, while CLA is an excellent inhibitor of tumor growth; linoleic acid makes cholesterol more susceptible to oxidation, while CLA makes cholesterol more stable.

One of the greatest problems with the Western diet during the last fifty years has been excessive consumption of linoleic acid, due

to the introduction of margarine, seed oils such as corn oil and safflower oil, and the modern artificial feeding methods that have raised the linoleic acid content of meat. At the same time, the consumption of beneficial fatty acids such as omega-3 fats (fish, flax, perilla) and CLA has gone down. Because of the enormous impact that fatty acids have on our physiology, an excess of linoleic acid combined with a deficiency of CLA could have far-reaching effects on health and longevity.

Let us now take a closer look at the current research findings about CLA.

### CLA reduces body fat in mice by up to 88%

A recent study at the Louisiana State University confirmed that feeding male mice a CLA-enriched diet (at 1% of the diet by weight, or 10g/kg) for six weeks resulted in 43% to 88% lower body fat, especially in regard to abdominal fat. This occurred even if the mice were fed a high-fat diet. The effect was partly due to reduced calorie intake by CLA-supplemented mice, and partly to a shift in their metabolism, including a higher metabolic rate.

In another study, performed at the University of Wisconsin-Madison, mice supplemented with only .5% of CLA showed up to 60% lower body fat and up to 14% increased lean body mass compared to controls. The researchers discovered that CLA-fed animals showed greater activity of enzymes involved in the delivery of fatty acids to the muscle cells and the utilization of fat for energy, while the enzymes facilitating fat deposition were inhibited.

### CLA improves insulin sensitivity

A study using diabetic Zucker rats indicates that part of CLA's effectiveness in preventing obesity may lie in its ability to act as a potent insulin sensitizer, thus lowering insulin resistance and consequently insulin levels. Since elevated insulin is the chief pro-obesity agent, it is enormously important to keep insulin within the normal range. By activating certain enzymes and enhancing glucose transport into the cells, CLA acts to lower blood sugar levels and normalize insulin levels. Thus, besides being anti-atherogenic and anti-carcinogenic, CLA is also anti-diabetogenic: it helps prevent adult-onset diabetes, characterized by insulin resistance. If the current animal results are corroborated, CLA may prove to be important not only in the prevention of diabetes, but also as a new therapy for adult-onset diabetics, aimed at lowering insulin resistance.

### CLA inhibits the growth of prostate cancer while linoleic acid promotes it

Immuno-deficient mice inoculated with human prostate cancer cells were fed either a standard diet, a diet supplemented with 1% linoleic acid, or a diet supplemented with 1% CLA. Mice receiving linoleic acid showed significantly higher body weight and increased tumor load compared with the two other groups. CLA-supplemented mice, on the other hand, showed the lowest tumor load and a dramatic reduction in lung metastasis.

### CLA supplementation helps prevent the initiation, promotion and metastasis of breast cancer

In a study performed at Roswell Park Cancer Institute in Buffalo, 50 day-old rats were treated with a potent carcinogen and then supplemented with 1% CLA for 4, 8 or 20 weeks. Only rats receiving CLA for the full 20 weeks showed tumor inhibition. CLA lowered the total number of carcinomas by 70%. Interestingly, there was a much higher incorporation of CLA into the neutral lipids of the mammary tissue rather than into the phospholipids (cell membranes). While the physiological significance of this phenomenon is not understood, it seems that the presence of CLA in mammary tissue plays a highly protective role against the initiation of breast cancer.

In another study, immuno-deficient mice were fed a 1% CLA- enriched diet for two weeks prior to inoculation with human breast adenocarcinoma cells. Besides inhibiting tumor growth, CLA totally prevented the metastasis of breast cancer to the lungs and bone marrow.

The preventive effect of CLA against breast cancer is independent of the amount of fat in the diet. Even when the tumor-promoting excess levels of linoleic acid reach 12% in the diet, CLA was still incorporated into the lipids of the mammary tissue, and still provided protection against carcinogenesis. Anticarcinogenic effects of CLA did not increase with a dose beyond 1% of CLA in the diet.

A recent in-vitro study of breast cancer cells showed that CLA worked synergistically with nordihydroguaiaretic acid (NDGA), a potent antioxidant and lipoxygenase inhibitor found in the desert herb chaparral. This suggests that one mechanism of CLA's suppression of tumor growth is its ability to inhibit the production of leukotrienes, inflammatory compounds that may be even more harmful and difficult to control than series II prostaglandins. (Both series II prostaglandins and leukotrienes fuel tumor growth; both are metabolites of arachidonic fatty acid, itself a metabolite of linoleic acid.)

Yet another mechanism of CLA's anti-cancer action may lie in its interference with tumor growth factors such as thymidine.

CLA is especially effective at inhibiting the proliferation of estrogen receptor positive breast cancer cells, arresting estrogen-dependent cell division. Besides the oncostatic properties of CLA, it is also likely that CLA inhibits the enzymes that activate various carcinogens. Thus CLA appears to protect against all three stages of cancer: initiation, promotion, and metastasis.

Early CLA supplementation lowers the glandular density in mammary tissue

Previous research showed that supplementation with CLA during the formative period in mammary-gland development confers a lasting protection against carcinogen-induced breast cancer. A new and more detailed study showed that female rats fed a 1% CLA diet after weaning showed a 20% reduction in the density of the ductal-lobular tree, meaning that the glandular density of the mammary glands was lower. High glandular density is a very significant breast cancer risk factor. This study implies that supplementing the diet of young girls with CLA might reduce the glandular density of their breast tissue, conferring a significant degree of life-long protection against breast cancer.

Immune-enhancing effects of CLA

CLA has been found to stimulate the production of lymphocytes and of interleukin-2, and to increase the levels of certain immunoglobulins, while lowering the release of immunoglobulin E, associated with allergies.

Improved immune function resulting from CLA supplementation can also be postulated on the basis of its ability to lower the production of immunosuppressive compounds such as leukotrienes and series II prostaglandins, and to improve insulin sensitivity (elevated insulin leads to immunosuppression).

Anti-Atherogenic effects of CLA

We have already mentioned that CLA improves insulin sensitivity. Since elevated insulin promotes atherosclerosis, any agent that lowers insulin levels by improving insulin sensitivity can be classified as anti-atherogenic. However, CLA has also been shown to have further anti-atherogenic benefits thanks to its ability to improve serum lipids and to its tocopherol (Vitamin E)-sparing effect.

CLA lowers cholesterol and triglycerides, helps keep arteries clean

A study at the University of Wisconsin-Madison found that rabbits supplemented with .5g CLA/day showed markedly lower total and LDL cholesterol, lower LDL to HDL ratio, lower total cholesterol to HDL ratio, and lower serum triglycerides. On autopsy, the aortas of CLA-supplemented rabbits showed less atherosclerotic plaque.

A more recent study done at the University of Massachusetts confirmed that hamsters whose diets were supplemented with CLA showed significantly lower total cholesterol, LDL cholesterol and triglycerides compared to controls. The serum of CLA-fed hamsters also showed higher tocopherol/cholesterol ratios, indicating that CLA has a tocopherol-sparing effect (that is, being less oxidizable than linoleic acid, it does not require as much Vitamin E for antioxidant protection).

It is not cholesterol per se, but oxidized cholesterol that is harmful to the blood vessels. The oxidizability of cholesterol varies mainly in proportion to the percentage of linoleic acid that it contains; thus the more stable fatty acids, such as CLA, that can be incorporated into cholesterol serve to make it less vulnerable. CLA's antioxidant properties may also play a role in its ability to help keep the blood vessels clean.

As a side note, CLA tends to be incorporated more abundantly into the cell and mitochondrial membranes of the heart muscle. Since the heart relies on fatty acids rather than glucose as its energy source, greater abundance of CLA in the heart muscle may improve the efficiency of fat transport and fat metabolism in the cardiac mitochondria.

Possible anti-osteoporosis effects of CLA

An in-vitro study done at Purdue University showed that in various rat tissue cultures, including bone tissue, supplemental CLA (at 1% of diet) decreased the levels of omega-6 fatty acids and total monosaturated fatty acids, while increasing the concentrations of omega-3 fatty acids and saturated acids. The levels of inflammatory series II prostaglandins were also decreased by CLA feeding. Since inflammatory compounds lead to bone loss, CLA might potentially be of use in preventing osteoporosis. We are gaining more and more understanding of the importance of beneficial fatty acids for bone health. Unfortunately, women aren't being told about the need to consume adequate amounts of healthy fats in order to prevent bone loss.

The Safety of CLA

In a study conducted by the Nutrition Department of Kraft Foods, male rats were fed a diet of 1.5% CLA, which is 50 times higher

than the estimated upper-range human intake. The animals were examined weekly for any signs of toxicity; no toxicity was found. After the end of the 36-week study, the animals were sacrificed and autopsied. Again, no pathology was found. The study confirmed that CLA supplementation is safe even at high doses. Nevertheless, high doses are not necessary for obtaining the benefits of CLA.

Most people obtain their essential omega-3 fatty acids from flax, fish or perilla oils. CLA appears to be in a class by itself as far as its unique mechanism of disease prevention and body fat reduction. A deficiency of CLA in the diet may be a major factor in causing Americans to gain so many fat pounds. CLA is a potent antioxidant, but appears to prevent cancer via other mechanisms of action. A particularly rich source of CLA is melted cheddar cheese, yet most consumers prefer to obtain this fatty acid from low-cost CLA supplements that provide the exact isomers that have shown the greatest levels of protection against disease and obesity.

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