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ON THE  
COVER**Safely Burn Away Body Fat**

Research shows how a new plant extract safely reduces body fat while lowering vascular and inflammatory disease risk factors

By Julius Goepp, MD



A novel carotenoid can do something scientists had long thought was impossible—trigger the burning (or thermogenesis) of white body fat—without producing stimulatory effects. In addition to inducing significant weight loss in human study subjects, this plant extract has been shown to improve blood markers associated with vascular and inflammatory disorders.

Why is burning white body fat so critical? Because new studies show there is a significant decrease in resting energy expenditure as humans age. If you've ever wondered why diet and exercise so often fails to produce meaningful weight loss, scientific research shows that with normal aging, metabolism slows significantly, while white body fat mass increases.

Up until now, people seeking to boost their resting metabolic rate had to rely on compounds that produced unpleasant stimulating effects. That has all changed with the discovery of a new carotenoid that safely increases resting energy expenditure at the cellular level—with none of the side effects associated with high-dose ephedra.

In this article, we look at the recent studies that document the impressive ability of this carotenoid to reduce body fat while simultaneously providing a range of life-saving health benefits.

### FUCOXANTHIN: THE NEW CAROTENOID

Human health is highly reliant on the ingestion of plant carotenoids. For example, inadequate intake of the carotenoids lutein and zeaxanthin can result in the development of macular degeneration—the leading cause of blindness in the elderly.

Fucoxanthin is a carotenoid derived from a special seaweed that has been extensively studied for its antioxidant powers.<sup>1-3</sup> Animal studies have demonstrated its beneficial effects in stroke prevention,<sup>4</sup> reduction of inflammation,<sup>5</sup> and slowing the growth of various cancer cell types.<sup>6-10</sup>

Based on this information alone, fucoxanthin would be an effective nutritional supplement to add to one's daily program. It is the favorable effect on cell energy expenditure, however, that gives fuco-xanthin its remarkable fat-reducing properties.

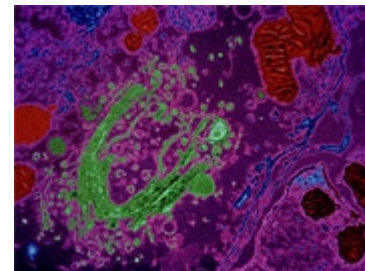
Fucoxanthin facilitates youthful energy metabolism by activating a special cellular protein called mitochondrial uncoupling protein 1 (or UCP1). As you will soon read, mitochondrial uncoupling protein 1 promotes the natural removal (metabolic burning) of white fat stored in the body.

### A SERENDIPITOUS FINDING

A group of Japanese marine biologists<sup>11</sup> discovered during their research that when study animals were supplemented with fucoxanthin, something unexpected occurred—mitochondrial uncoupling protein 1 (UCP1) was expressed in white adipose (fat) tissue. This unique protein (UCP1) is normally only active in brown fat, a type of fat that is capable of non-shivering thermogenesis, a process that ultimately results in an increase in metabolic rate by “uncoupling” energy transfer in the cells. White fat, on the other hand, often accumulates excessively in human bodies as we age, and white fat generally does not express UCP1 to any appreciable degree.

What this means is that fucoxanthin can help white adipose tissue mimic some of the thermogenic properties of brown fat, ultimately resulting in a safe increase in metabolic rate and enhanced fat-burning.

In the experiment, these scientists fed fuco-xanthin-rich extracts from edible seaweed to rats and mice and then measured the weight of white adipose tissue in the animals' abdomens. A diet containing the same calorie content was fed to a second set of animals that served as the control group. In the fat tissue of the animals who were given fucoxanthin, the scientists found noticeable increases in the expression of the fat-burning protein UCP1. In the control animals who did not receive fucoxanthin, little UCP1 expression occurred in their fat. The fucoxanthin-supplemented animals demonstrated significant loss of white adipose tissue weight, whereas there was no weight loss at all in animals fed the control diet.<sup>11</sup>



The same researchers then turned their attention to the effects of fucoxanthin and its derivatives on fat cell formation in cultured cells. Treatment of pre-adipocytes (cells that will eventually become fat cells) with fucoxanthin prevented lipid (fat) accumulation inside the developing cells. It was also converted by the cells into a compound, fucoxanthinol, which prevented the cells from “growing up” into mature fat cells.<sup>12</sup> In essence, fucoxanthin stopped fat in its tracks. Evidence that fucoxanthin reduces the growth of new blood vessels in adipose tissue suggests that this may be another mechanism by which the seaweed derivative blocks development of new fat stores.<sup>13</sup>

## REDUCED BLOOD SUGAR LEVELS

These prolific researchers then examined the combination of fucoxanthin and fish oil on white adipose (fat) tissue weight and blood glucose in obese mice with type 2 diabetes.<sup>14</sup> Mice were supplemented for four weeks with fucoxanthin alone, fucoxanthin plus fish oil, or a control diet with the same calorie content. Fucoxanthin alone markedly reduced gain in white fat tissue weight compared with controls, while the animals given fucoxanthin and fish oil had still further reductions in weight gain. Groups receiving either fucoxanthin alone or fucoxanthin plus fish oil experienced significant reductions in blood glucose and plasma insulin concentrations, as well as in inflammatory markers such as TNF-alpha—all highly beneficial effects in this animal model of the human metabolic syndrome (which is so often characterized outwardly as abdominal obesity)!



## ALTERING THE FAT-MAKING PROCESS

The exact mechanism by which fucoxanthin reduces body fat is still undergoing scientific evaluation, but we know that it has to do with the process by which the body normally transfers and stores energy, known as “coupling.”<sup>11</sup>

## WHAT YOU NEED TO KNOW: SAFELY BURN AWAY BODY FAT

- A major reason why maturing humans accumulate excess body fat is that the aging process itself is associated with a dramatic drop in metabolic energy expenditure (i.e., calorie burning). This helps explain why dieting alone so often fails to provide long-term weight control, and why it is so critical for aging humans to boost resting metabolic rate if they are to lose significant body fat stores.
- Fucoxanthin, an extract from a common edible seaweed, can “switch on” the fat-burning capacity of white fat.
- Studies in both animals and humans have demonstrated that supplementing with fucoxanthin increases resting energy expenditure, reduces body weight, and decreases abdominal and liver fat storage (both of which are known to be associated with increased risks of insulin resistance and metabolic disease).

Under normal circumstances, chemical energy from food is poured into molecules of adenosine triphosphate (ATP), which are then used by cells for energy.<sup>15</sup> Any unused energy from the ATP molecules is stored for future use through the formation of new fat molecules. This is why people who consume more calories than they expend end up gaining weight in the form of fat. Then, when the body's caloric needs increase (say, with increased exercise), fat molecules are broken down and their stored energy is put back into new ATP molecules which provide it to working cells. Scientists refer to this entire process as “coupling,” which efficiently transforms chemical energy to physical energy and back again.<sup>15-17</sup> Under normal circumstances, this process is highly efficient within the body.

It is during this “fat-making process” that fuco-xanthin can have a beneficial influence on the mechanism that causes so many people to gain unhealthy weight in the form of fat. Fucoxanthin induces the production of a protein that “uncouples” cellular energy transfer so the body is less efficient at converting food energy into fat.<sup>18</sup> In the human body, excess energy (calories) is stored in the form of white fat. An increase in metabolic rate can allow the burning of ingested calories and promote the removal

of stored body fat.

Interestingly, animals—especially those that hibernate—have a different kind of fat (brown fat) that enables them to keep warm without physical movement through the fat-burning process. This process was considered impossible for non-infant humans, because adult humans largely have white fat that was not previously believed to possess the same properties as brown fat. The remarkable “uncoupling” properties of fucoxanthin essentially allow white fat cells to mimic some of the properties of brown fat and increase resting energy expenditure, therefore relying on the burning of stored body fat for fuel.

## WHITE FAT VERSUS BROWN FAT

Exciting research reveals that body fat can actually be put to work to increase energy expenditure (that means using up calories). The key is to recognize that all fat isn't created equal. The vast bulk of fat in humans exists in the form of “white adipose tissue,” or white fat. It is the white fat that stores most of the body's fat energy, produces visible and often unsightly changes in body contours, and carries out detrimental endocrine functions.<sup>19</sup> And it's exclusively the white body fat that produces all the disease risk factors associated with elevated body fat content.

The other form of fatty tissue, known as “brown adipose tissue,” or brown fat, is rare in adult humans (in fact, until quite recently we thought that brown fat was essentially absent in the adult body).<sup>20,21</sup> Brown fat is found in significant quantities in human babies, small mammals, and large mammals that hibernate.<sup>22</sup> What do these creatures have in common? They need to generate heat efficiently in the process known to scientists as non-shivering thermogenesis,<sup>23</sup> whereby they increase metabolic rate and resting energy expenditure without having to move or exercise. Until just the past few years, it was thought that white fat could not mimic the thermogenesis capability of brown fat to any appreciable degree.

## IMPRESSIVE HUMAN STUDIES

But what about fucoxanthin in humans? While research is in its early stages, evidence suggests that when humans supplement with fucoxanthin, they may induce the expression of UCP1 in their stores of white fat, just as the animals did in the Japanese studies.<sup>24-28</sup> In the words of one researcher, this makes fucoxanthin an attractive new target for “pharmacological management of complex pathological syndromes such as obesity, type 2 diabetes or chronic inflammatory diseases.”<sup>27</sup>

Two groups of researchers are leading the way by studying how fucoxanthin supplements affect fat stores in human subjects. These studies are so recent that they haven't yet even appeared in print, but we were given the opportunity to review the completed data analyses and report some of the most exciting results here.

The first study was aimed at determining the effects of fucoxanthin supplements, in combination with pomegranate seed oil, on energy expenditure rate in obese, non-diabetic female volunteers.<sup>28</sup> Subjects ingested supplements before meals daily for 16 weeks, and all participants were placed on a controlled 1,800-calorie/day diet. Their energy expenditure rate (how much energy their bodies produced over time) was measured using a standard procedure known as indirect calorimetry.



The results were nothing short of astonishing—subjects who took fucoxanthin plus pomegranate seed oil generated greater absolute increases in energy expenditure. These researchers concluded that the combination of fucoxanthin and pomegranate seed oil can significantly increase metabolism and could well have profound anti-obesity properties.

That conclusion was put to the test by the second research group, who studied the impact of the fuco-xanthin-pomegranate seed oil combination on body weight, body and liver fat content, and a variety of plasma risk factor markers in a group of obese, non-diabetic women.<sup>18,28,29</sup> The 110 subjects in this placebo-controlled study were randomized into two groups who received the following:

- either 200 mg of a proprietary extract that included marine vegetable standardized for fucoxanthin, fucoxanthinol, omega-3 fatty acids, and pomegranate seed oil high in puniolic acid or
- 200 mg placebo. Treatment was given in both groups 15-30 minutes before meals three times per day for 16 weeks in conjunction with an 1,800-calorie/day diet.

## OUTSTANDING RESULTS

Sit down for these results—they are stunning. After six weeks on the supplements, there was a statistically significant reduction in body weight in the supplemented group who had normal liver fat content, and by eight weeks the fatty-liver group was also showing significant weight loss, compared with placebo. By the end of the 16-week study, women with fatty livers had lost an

average of more than 15 pounds, compared with just three pounds in their placebo-supplemented peers! The normal liver-fat group had similar results, losing an average of nearly 14 pounds, compared with just over three pounds in the placebo group.<sup>29</sup> In other words, both active groups lost just under a pound a week over the entire study period, which is a healthy, sustainable, and realistic rate of weight loss.



Weight loss alone is not the only or even the best marker of improvement in the risks posed by fat. Supplemented patients in this study also demonstrated a significant reduction in visceral fat. Visceral fat is the type of fat that covers the organs of the abdominal cavity like the liver.

No patient in this study reported any side effects. Please note that pomegranate seed oil contains different constituents and functions differently in the body than pomegranate juice extracts.

## WHY BOOSTING METABOLIC RATE IS SO CRITICAL

Humans have a unique ability to store ingested calories in the form of white body fat. This fat-storage propensity saved countless lives during past famines, but has become a curse in today's world of food abundance.

Three years ago, I resigned my leadership position in global drug development at one of the world's largest pharmaceutical companies to come to work for the Life Extension Foundation.

Although I enjoyed the privilege of working with highly dedicated physicians and scientists, I craved an opportunity to break free from the burdensome bureaucracy that so often impeded rapid advancements in new medical technologies. Regrettably, the pharmaceutical industry is plagued by a bureaucratic, FDA-imposed, inefficient development process that significantly delays life-saving drug approval for patients in need. In contrast, the Life Extension Foundation is dedicated to rapid and efficient innovation. The Foundation's goal is to search out the most advanced information and products to help members make significant improvements in their health.

In my previous position, I was responsible for analyzing data on a variety of drug development projects related to diabetes, obesity, and cardiovascular disease. A major problem is that many unethical dietary supplement companies have promoted and marketed weight-loss products that make egregious fraudulent claims. The many false advertisements and unrealistic claims that have been made, such as "Lose 30 pounds in 30 days," have caused many consumers to believe that they can lose substantial amounts of body fat merely by taking a single supplement or pill. This is highly misleading.

While there are a variety of partially effective products that have mild weight-control benefits, the core truth is that calorie control and exercise remain key elements for a weight-management program to work over the course of one's lifetime.

Based upon the countless weight-loss products I have reviewed over the past 10 years, the clinical trial data on fat loss with a combination of fucoxanthin and pomegranate seed oil is the most impressive of any other natural compound I have evaluated in the past 10 years.

This innovative nutritional product provides an important complement to a rational, long-term weight-control program, in combination with calorie control and exercise

— Steven V. Joyal, MD

Virtually everyone with excess body fat has tried various diet and exercise programs. The failure rate of relying on these approaches alone is documented by the large numbers of overweight and obese individuals today.

A major reason why maturing humans accumulate excess body fat is that the aging process itself is associated with a dramatic drop in metabolic energy expenditure (i.e., calorie burning). Findings from a recent published study show that aging humans suffer a greater than predicted decrease in resting energy expenditure.<sup>30</sup> This helps explain why dieting alone so often fails to provide long-term weight control, and why it is so critical for aging humans to boost resting metabolic rate if they are to lose significant body fat stores.

## SUMMARY

Up until now, those seeking to shed excess body fat had to endure miserable diets that usually produced only mediocre results. While compounds have been available that increased resting energy expenditure rates, their stimulating side effects were so unpleasant that people could not take optimal doses, or even tolerate them on a consistent basis.

With the discovery of the non-stimulating metabolic-enhancing effects of fucoxanthin, those seeking to achieve optimal long-term weight control have a potent new weapon that functions to program the mitochondria contained in white adipose cells (fat cells) to “uncouple” cellular energy transfer, with the result being an increase in resting energy expenditure and metabolic rate.

Unlike products that produce undesirable side effects, fucoxanthin has demonstrated remarkable health benefits that may lower one’s risk of heart disease, diabetes, and even cancer.

Fucoxanthin thus functions as a critical adjunct to enable controlled calorie intake and increased physical activity to produce meaningful fat-loss effects in aging humans.

If you have any questions on the scientific content of this article, please call a Life Extension Health Advisor at 1-800-226-2370.

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