FATS

Dietary fat plays several important roles in the body. First, fat is the most concentrated source of calories as it provides 9 calories per gram. Carbohydrate and protein provide less than half that amount at 4 calories per gram each. Second, is the preferred energy source to fuel the body. And third, fats are also used in the body as structural components in cell membranes and as the backbone for steroid hormones and prostaglandins.

Despite these important roles, fat is often given a bad rap as any extra dietary fat is converted to body fat and stored in fat cells. Since the human body has an almost unlimited capacity to store fat, eating a diet too high in fat can lead to obesity. Therefore the diet should supply less than 30% of calories as fat. However, just as important as the amount of fat is the *type* of fat you consume. The goal is not only to *limit* your total fat intake, *decrease* intake of saturated fats, trans-fatty acids (also called hydrogenated fats), and omega-6 fats, but *increase* your intake of omega-3 fatty acids and monounsaturated fatty acids.

FAT NOMENCLATURE

Fat molecules are made of atoms of carbon, hydrogen, and oxygen. Each of the separate atoms attaches to the others only in precise predetermined ways. The backbone of a fat is a chain of carbon atoms (C):

```
   |   |   |   |
 – C – C – C – C –
   |   |   |   |
```

Hydrogen (H) and oxygen (O) atoms can then attach to the carbon. A *saturated fat* is a fat molecule in which all of the available binding sites are occupied with another atom. In other words, the carbons are *saturated* with all of the atoms they can hold:

```
    H   H   H   H
    |   |   |   |
H – C – C – C – C – O
    |   |   |   |
    H   H   H   H
```

An *unsaturated fat* has one or more bonding sites left unoccupied. The two neighboring carbon atoms will take up the slack by forming a double bond:

```
    H           H
    |           |
H – C – C = C – C – O
    |   |   |   |
    H   H   H   H
```

A fat molecule with one double bond is called a monounsaturated fat. Molecules with more than one double bond are called polyunsaturated fats. *Mono-* means “one”; *poly-* means “many.” When an unsaturated fat contains the first double-bond at the third carbon, it is referred to as an omega-3 fatty acid. If the first double-bond is at the sixth carbon, it is an omega-6 fatty acid, and if it occurs at the ninth carbon it is an omega-9 fatty acid.

Table 6.1 - Fatty Acid Composition (% of Total Fat) of Selected Oils*

	SF	OA	LA	GLA	Alpha-LA
<u>Cooking oils</u>					
Canola	7	54	30	0	7
Coconut	86	6	2	0	0
Corn	17	24	59	0	0
Olive	16	76	8	0	0
Macadamia nut oil	16	81	3	0	0
Safflower	7	10	80	0	0
Soy	15	26	50	0	9
<u>Medicinal Oils</u>					
Evening Primrose	10	9	72	9	0
Blackcurrant	7	9	47	17	13
Borage	14	16	35	22	0
Flaxseed	9	19	14	0	58

*"Vegetable oil" is generally a combination of various vegetable derived oils such as corn, canola, safflower and soy.

SF = Saturated Fats
OA = Oleic Acid (an omega-9 fat)
LA = Linoleic Acid (an omega-6 fat)
GLA = Gamma-Linolenic Acid (an omega-6 fat)
Alpha-LA = Alpha-Linolenic Acid (an omega-3 fat)

ESSENTIAL FATTY ACIDS

The only two official essential fatty acids are linoleic acid (an omega-6 fat) and alpha-linolenic acid (an omega-3 fat), but other fats are clearly beneficial. Although not considered essential since they can be formed from alpha-linolenic acid, the longer chain omega-3 fatty acids, such as eicosapentaenoic acid (EPA) and docosahexanoic acid (DHA) found in fish, especially cold-water fish, such as salmon, mackerel, herring, and halibut, are gaining tremendous acceptance in the scientific community as vital components to good health. Similarly, the role of the omega-9 oil oleic acid is also gaining recognition.

Cell Membrane Function

The primary answer to the question "What makes saturated fats and most margarines "bad" and monounsaturated and omega-3 fatty acids "good?" is related to the function of fats in cellular membranes. Every human cell has a protective, permeable membrane. Membranes contain two layers, each made mainly of proteins, cholesterol, and fats in the form of phospholipids. Phospholipids are almost the same as triglycerides, except that one of the three fatty acid units has been replaced with a molecule that contains phosphorus.

What determines the type of fatty acid present in the cell membrane is the type of fat you consume. A diet that is high in cholesterol and composed mostly of saturated fat, animal fatty acids, and trans fatty acids (from margarine, shortening, and other sources of hydrogenated vegetable oils) results in cell membranes that are much less fluid in nature than the cell membranes found in a person who consumes optimal levels of unsaturated fatty acids.

According to modern pathology, or the study of disease processes, an alteration in cell membrane function is the central factor in the development of virtually every disease. As it relates to diabetes, abnormal cell membrane structure due to eating the wrong types of fats leads to an impairment in the action of insulin.

Without a healthy membrane, cells lose their ability to hold water, vital nutrients, and electrolytes. Without the right type of fats in cell membranes, cells simply do not function properly. In particular, they also lose their ability to communicate with other cells and be controlled by regulating hormones. To highlight the impact of having the right type of fat in the cell membranes, let's look at the effect of different diets on insulin action. Insulin is a hormone produced by the pancreas that plays a critical role in blood sugar regulation. Loss of sensitivity to the effects of insulin is linked to obesity and Type II diabetes. While margarine and saturated fats dampen insulin sensitivity, clinical studies have shown that monounsaturated fats and omega-3 oils improve insulin action. Adding further support to these studies is the fact that population studies have also indicated that frequent consumption of monounsaturated fats, such as olive oil, nuts and nut oils, and omega-3 fatty acids from fish protect against the development of Type II diabetes. Similar associations are seen with over 50 health conditions including heart disease, cancer, and arthritis. See Talbe 6.3 for a complete list.

<u>Margarine and Other Foods Containing Trans Fatty Acids and Partially Hydrogenated Oils</u>

Margarine and shortening are manufactured from vegetable oils through "hydrogenation." This means that a hydrogen molecule is added to the natural unsaturated fatty acid molecules of the vegetable oil to make it more saturated. Hydrogenation, the adding of hydrogen molecules, results in changing the structure of the natural fatty acid to many "unnatural" fatty acid forms, as well as from the cis or U-shaped configuration to the trans, or z-shaped configuration. The resulting hydrogenated vegetable oil becomes solid or semi-solid.

Margarine, vegetable oil shortening, and other foods containing trans fatty acids and partially hydrogenated oils are particularly harmful to cell membrane function. These "unnatural" forms of fatty acids interfere with the body's ability to utilize important essential fatty acids. For example, one study estimated that substituting polyunsaturated vegetable oils for margarine containing hydrogenated vegetable oil would reduce the likelihood of developing Type II diabetes by a whopping 40%.

Table 6.2 – Health Conditions Linked to Insufficient Intake of Omega-3 Fatty Acids

- ACNE
- AIDS
- ALLERGIES
- ALZHEIMER'S
- ANGINA
- ANGIOPLASTY RECOVERY
- ATHEROSCLEROSIS
- ARTHRITIS
- AUTOIMMUNE DISEASES
- ATTENTION DEFICIT DISORDER
- HIGH BLOOD PRESSURE
- BREAST CANCER
- ACNE
- AIDS
- ALLERGIES
- ALZHEIMER'S
- ANGINA
- ANGIOPLASTY RECOVERY
- ARTHRITIS
- ASTHMA
- ATHEROSCLEROSIS
- ATTENTION DEFICIT DISORDER
- AUTOIMMUNE DISEASES
- BREAST CANCER
- BREAST CYSTS
- BREAST PAIN
- CANCER
- CARTILAGE DESTRUCTION
- CORONARY BYPASS RECOVERY
- CYSTIC FIBROSIS
- DEMENTIA
- DEPRESSION
- DERMATITIS
- DIABETES
- ECZEMA
- HEART DISEASE
- HIGH BLOOD PRESSURE
- HYPERACTIVITY
- HYPERTENSION
- HYPOXIA
- ICHTHYOSIS
- IMMUNE DISORDERS
- INFLAMMATORY BOWEL DISEASE
- INFLAMMATORY CONDITIONS
- KIDNEY DYSFUNCTION

- LEARNING DIFFICULTIES
- MENOPAUSAL SYMPTOMS
- MULTIPLE SCLEROSIS
- OSTEOARTHRITIS
- POST VIRAL FATIGUE
- PREGNANCY COMPLICATIONS
- PREMENSTRUAL SYNDROME
- PSORIASIS
- REFSUMS SYNDROME
- REYES SYNDROME
- RHEUMATOID ARTHRITIS
- SCHIZOPHRENIA
- SEPSIS
- SJOGREN-LARSON SYNDROME
- STROKE
- VASCULAR DISEASE
- VISION DEVELOPMENT IMPAIRMENT

Symptoms Associated with Essential Fatty Acids Deficiency*
Arthritis
Constipation
Cracked nails
Depression
Dry, lifeless hair
Dry mucous membranes (tear ducts, mouth, vagina, etc.)
Dry skin
Fatigue, malaise, low energy
Forgetfulness
Frequent colds and sickness
High blood pressure
History of cardiovascular disease
Immune weakness
Indigestion, gas, bloating
Lack of endurance
Lack of motivation
These symptoms are not specific to a deficiency of essential fatty acids. They can also be caused by other diseases or dietary insufficiencies.

Prostaglandins
Essential fatty acids are transformed into regulatory compounds known as prostaglandins. These compounds carry out many important tasks in the body including playing a role in the regulation of:

Allergic response
Blood clotting and platelet aggregation
Blood pressure
Gastrointestinal function and secretions
Heart function
Inflammation
Inflammation, pain, and swelling
Kidney function and fluid balance
Nerve transmission
Steroid production and hormone synthesis

Prostaglandins are assigned to either the 1, 2, or 3 series based upon the number of double bonds in the fatty acid. Series 1 and 2 prostaglandins come from the omega-6 fatty acids, with linoleic acid serving as the starting point. Linoleic acid is changed to gamma-linolenic acid and then to dihomo-gamma-linolenic acid, which contains three double bonds and is the precursor to prostaglandin of the anti-inflammatory 1 series.

Dihomo-gamma-linolenic acid (DHGLA) can also be converted to arachidonic acid, which contains four double bonds and is precursor to the pro-inflammatory 2 series prostaglandins. However, because the delta-5 desaturase enzyme responsible for the conversion of DHGLA to arachidonic acid prefers the omega-3 oils, in humans the greatest source of arachidonic acid is from the diet. Arachidonic acid is found almost entirely in animal foods, along with saturated fats.

The omega-3 prostaglandin pathway can begin with alpha-linolenic acid, which can be eventually converted to eicosapentaenoic acid (EPA) and docosahexanoic acid (DHA), the precursors to the anti-inflammatory 3 series prostaglandins, but the process is much more efficient when the EPA and DHA are already preformed as they are, for example, in fish oils.

Prostaglandins of the 1 and 3 series are generally viewed as "good" prostaglandins while prostaglandins of the 2 series are viewed as “bad”. This labeling is most evident by looking at their effects on platelets. Prostaglandins of the 2 series promote platelet stickiness, a factor which leads to hardening of the arteries, heart disease, and strokes. In contrast, the 1 and 3 series prostaglandins prevent platelets from sticking together, improve blood flow, and reduce inflammation.

By altering the type of dietary oils consumed and stored in cell membranes, prostaglandin metabolism can be manipulated. Prostaglandin manipulation can be extremely powerful in the treatment of inflammation, allergies, high blood pressure, and many other health conditions. The basic goal in most situations is two-fold: (1) reduce the level of arachidonic acid and (2) increase the level of DHGLA and EPA/DHA. This goal can best be achieved in most circumstances by reducing the intake of sources of omega-6 fatty acids and animal foods, while increasing the intake of omega-3 fatty acids, particularly fish oils. Although flaxseed oil provides alpha-linolenic acid, which can be converted by the enzyme delta-6-desaturase into stearidonic acid and then elongated into EPA and DHA, this cumbersome conversion process is obviously not as effective in increasing tissue concentrations of EPA and DHA as fish oil supplements.

These following steps will help you gain the optimal ratio of essential fatty acids for healthy cell membranes, and balanced and efficient production of prostaglandins:

1. Be aware of the fat content of foods. Limit total dietary fat intake to no more than 30% of calories consumed. That’s 400–600 calories a day from fat, based on a standard 2000-calorie-a-day diet (See Table 6.4). Reduce the amount of saturated fats and total fat in the diet. In general, animal products are high in fat, while most plant foods are very low in fat. However, while most nuts and seeds are relatively high in fat, the calories they supply come mostly from monounsaturated fats.
2. Reduce the intake of meat and dairy products, while increasing the intake of fish. Particularly beneficial are the cold-water fish, such as wild salmon, mackerel, herring, and halibut, because of their high levels of omega-3 fats.
3. Cook with canola, coconut, macadamia nut, or olive oil.
4. Eliminate margarine and other foods containing trans fatty acids and partially hydrogenated oils. These “unnatural” forms of fatty acids interfere with the body’s ability to utilize important essential fatty acids.
5. Take a high quality fish oil supplement providing 600 to 1,200 mg of omega-3 fatty acids. For vegetarians, take 1 tablespoon of flaxseed oil daily.

Fat Content of Selected Foods

Meats		*Vegetables*	
Sirloin steak, hipbone, lean	83%	Mustard greens	13%
Pork sausage	83%	Kale	13%
T-bone steak, lean	82%	Beet greens	12%
Porterhouse steak, lean	82%	Lettuce	12%
Bacon, lean	82%	Turnip greens	11%
Rib roast, lean	81%	Mushrooms	8%
Bologna	81%	Cabbage	7%
Country style sausage	81%	Cauliflower	7%
Spareribs	80%	Eggplant	7%
Frankfurters	80%	Asparagus	6%
Lamb rib chops, lean	79%	Guam been,	6%
Duck meat, w/skin	76%	Celery	6%

Salami	76%
Liverwurst	75%
Rump roast, lean	71%
Ham, lean	69%
Stewing beef, lean	66%
Goose meat, w/skin	65%
Ground beef, lean	64%
Veal breast, lean	64%
Leg of lamb, lean	61%
Chicken, dark meat w/skin, roasted	56%
Round steak, lean	53%
Chuck rib roast, lean only	50%
Chuck steak, lean only	50%
Sirloin steak, hipbone, lean only	47%
Turkey, dark meat w/skin	47%
Lamb rib chop, lean	45%
Chicken, light meat w/skin roasted	44%

Fish	
Tuna, chunk, oil-packed	63%
Herring	58%
Anchovies	54%
Bass, black sea	53%
Perch, ocean	53%
Caviar, sturgeon	52%
Mackerel, Pacific	50%
Sardines, Atlantic, in oil, drained	49%
Salmon, sockeye (red)	49%

Cucumber	6%
Turnip	6%
Zucchini	6%
Carrots	4%
Green pass	4%
Artichokes	3%
Onions	3%
Beets	2%
Chives	1%
Potatoes	1%

Legumes	
Tofu	49%
Soybean	37%
Soybean sprouts	28%
Garbanzo beans	11%
Kidney bean	4%
Lima bean	4%
Mung bean sprouts	4%
Lentils	3%
Broad bean	3%
Mung bean	3%

Table 6.4 –Fat Content of Selected Foods (continued)

Dairy Products	
Butter	100%
Cream, light whipping	92%
Cream cheese	90%
Cream, light	85%
Egg yolks	80%
Half and half	79%
Blue cheese	73%
Brick cheese	72%
Cheddar cheese	71%
Swiss cheese	71%
Ricotta cheese, whole milk type	66%
Eggs, whole	65%
Ice Cream	64%
Mozzarella cheese, part skim type	55%
Goat's milk	54%
Cow's milk	49%
Yogurt, plain	49%
Ice cream, lowfat	48%
Cottage cheese	35%
Low-fat milk (2%)	31%
Low-fat yogurt (2%)	31%
Ice milk	29%
Nonfat cottage cheese (1%)	22%

Meat and Fish Products	
Hormel Spam luncheon meat	7%
Mrs. Paul's Buttered Fish Filets	75%
Del Monte Burrito	67%
Morton Beef Tenderloin	64%
Mrs. Paul's Fried Shrimp	58%
Mrs. Paul's Clam Crepes	55%
Hormel Dinty Moore Corned Beef	53%
Swanson Salisbury Steak	52%
Nabisco Chicken in a Biscuit	51%
Morton Beef Pot Pie	49%
Mrs. Paul's Fish Au Gratin	48%
Swanson Veal Parmigiana	48%
Swanson Fried Chicken	46%
Hormel Dinty Moore Beef Stew	45%
Modern Chicken Croquettes,	40%

Fruits	
Olive	91%
Avocado	82%
Grapes	11%
Strawberry	11%
Apple	8%
Blueberry	7%
Lemon	7%
Watermelon	5%
Apricot	4%
Orange	4%
Cherry	4%
Ban	4%
Cantaloupe	3%
Pineapple	3%
Grapefruit	2%
Papaya	2%
Peach	2%
Prune	1%

Grains	
Oatmeal	16%
Buckwheat, dark	7%
Rye, dark	7%
Whole wheat	5%
Brown rice	5%
Corn, flour	5%
Bulgur wheat	4%
Barley	3%
Buckwheat, light	3%
Rye, light	2%
Wild rice	2%

Nuts and Seeds	
Coconut	85%
Walnut	79%
Sesame	76%
Almond	76%
Sunflower	71%
Pumpkin seeds	71%
Cashew	70%
Peanut	69%
Chestnut	7%

OTHER FATTY SUBSTANCES

Phospholipids

Phospholipids are the predominate form of fats in our cell membranes. The major phospholipid of the human body is phosphatidylcholine. Commercially available phosphatidylcholine supplements are derived from soy lecithin, an excellent source of phosphatidylcholine. These preparations are used in the treatment of Alzheimer's disease, bipolar disorder, elevated cholesterol levels, and liver disorders. The beneficial effects are likely due primarily to the essential fatty acid components of phosphatidylcholine and the soy lecithin preparations, because the body primarily breaks down phospholipids into free fatty acids, which benefit the body. These free fatty acids are used directly as fuel by the cells of the body. As previously discussed, free fatty acids can be long, short, saturated or unsaturated. The free fatty acids from soy lecithin are beneficial medium and short chain, unsaturated fatty acids.

Phosphatidylcholine has many important functions in the body, including increasing the solubility of cholesterol, thereby decreasing its ability to induce atherosclerosis. Phosphatidylcholine also aids in lowering cholesterol levels and removal of cholesterol from tissue deposits. In a total of 15 clinical trials with a duration of treatment with phosphatidylcholine ranging from 1 and 12 months, total serum cholesterol was lowered by 8.8%-to-28.2%, triglyceride levels decreased by 25%, and HDL cholesterol levels increased by 13.4%-to-20%. The typical dosage was 1.5 to 2.7 g daily.

Phosphatidylcholine supplements are available as soy lecithin and phosphatidylcholine isolated and purified from soy lecithin ranging in content from 10% to 55% phosphatidylcholine.

Cholesterol

Cholesterol is often portrayed as an evil compound, but it serves many important roles as it is the starting point for the manufacture of many hormones and bile acids, and serves as an important component of cell membranes as well. While the liver is the major source of blood cholesterol, dietary cholesterol can be an important contributor. Diets high in cholesterol are associated with an increased risk for heart disease, cancer, and strokes. However, it may turn out to be that the level of saturated fats in these diet foods is more relevant than the cholesterol content. This opinion is supported by a statistical analysis of 224 dietary studies carried out over the past 25 years that investigated the relationship between diet and blood cholesterol levels in over 8,000 subjects. What investigators found was that saturated fat in the diet, not dietary cholesterol, is what influences blood cholesterol levels the most.

Cholesterol is transported in the blood on carrier molecules known as *lipoproteins*. The major categories of lipoproteins are very low-density lipoprotein (VLDL), low-density lipoprotein (LDL), and high-density lipoprotein (HDL). Since VLDL and LDL are responsible for transporting fats (primarily triglycerides and cholesterol) from the liver to body cells while HDL is responsible for returning fats to the liver for use as energy and for excretion, elevations of either VLDL or LDL are associated with an increased risk for developing atherosclerosis, the primary cause of a heart attack or stroke. In contrast, elevations of HDL are associated with a low risk of heart attacks.

It is currently recommended that the total blood cholesterol level be less than 200 mg/dl. In addition, it is recommended that the LDL cholesterol be less than 130 mg/dl, the HDL cholesterol be greater than 35 mg/dl, and triglyceride levels be less than 150 mg/dl.

The ratio of total cholesterol to HDL cholesterol, as well as the ratio of LDL to HDL, are also important and are referred to as the cardiac risk factor ratios because they reflect whether cholesterol is being deposited into tissues or broken down and excreted. The total cholesterol to HDL ratio should be no higher than 4, and the LDL to HDL ratio should be no higher than 2.5. The risk for heart disease can be reduced dramatically by lowering LDL cholesterol while simultaneously raising HDL cholesterol levels. It has been concluded that for every 1% drop in the LDL cholesterol level, the risk for a heart attack drops by 2%. Conversely, for every 1% increase in HDL levels, the risk for a heart attack drops 3-to-4%.

Cholesterol levels and ratios can be improved by dietary changes undertaken to reduce your overall cholesterol and dietary fat intake (See table 6.5).

Cholesterol and Fat Content of Selected Foods

Food	*Serving Size*	*Total fat (g)*	*Saturated fat (g)*	*Mono-unsaturated fat (g)*	*Poly-unsaturated fat (g)*	*Cholesterol (mg)*
Beef, lean	3 oz.	7.9	3.0	3.3	0.3	73
Beef Liver, braised	3 oz.	4.2	1.6	0.6	0.9	331
Chicken, breast, roasted	3 oz.	3.0	0.9	1.1	0.6	72
Chicken, leg, roasted	3 oz.	7.2	2.0	2.6	1.7	79
Egg Yolk	1 large	5.1	1.6	1.9	0.7	213
Fish, cod	3 oz.	0.7	0.1	0.1	0.3	40
Lobster, boiled	3 oz.	0.5	0.1	0.1	0.1	61
Pork, lean	3 oz.	11.1	3.8	5.0	1.3	79
Shrimp, boiled	3 oz.	0.9	0.2	0.2	0.4	166
Turkey, dark, roasted	3 oz.	6.1	2.1	1.4	1.8	73
Turkey, light, roasted	3 oz.	2.7	0.9	0.5	0.7	59
Butter	1 Tbsp	11.5	7.2	3.3	0.4	31
Cheese, cheddar	1 oz.	9.4	6.0	2.7	0.3	30
Ice cream, regular	1/2 cup	7.2	4.5	2.1	0.3	30
Milk, lowfat 2%	1 cup	4.7	2.9	1.4	0.2	18
Milk, skim	1 cup	0.4	0.3	0.1	neg	4
Milk, whole	1 cup	8.2	5.1	2.4	0.3	33

Conjugated Linoleic Acid

Conjugated linoleic acid (CLA) is a slightly altered form of the essential fatty acid linoleic acid. It is found naturally occurring in meat and dairy products from grass fed cows. It was discovered in 1978 when researchers and the University of Wisconsin were seeking to find possible cancer-causing compounds in meat that are produced with cooking. Instead, they found what appears to be the anticancer compound CLA. In preliminary animal and test tube studies, CLA has shown evidence that it might reduce the risk of cancers at several sites, including breast, prostate, colon, lung, skin, and stomach. Whether CLA will produce a similar protective effect in humans has yet to be determined. Human studies have focused on its ability to help promote lean body mass during weight loss programs, which have been somewhat promising.

Ferulic acid derivatives

Ferulic acid derivatives include gamma-oryzanol, a growth promoting substance found in grains and isolated from rice bran oil. Gamma-oryzanol has been used in Japan as a medicine since 1962. Initially it was used in the treatment of minor anxiety and later became approved for the treatment of menopause (1970) and elevated cholesterol and triglyceride levels (1986).

Gamma-oryzanol was first shown to be effective for menopausal symptoms, including hot flashes, in the early 1960s. Clinical studies demonstrated that 67%-to-85% of the women who took gamma-oryzanol had a 50% or greater reduction in their menopausal symptoms.

Gamma-oryzanol has been shown to be quite effective in lowering blood cholesterol and triglyceride levels in several double-blind studies, lowering total cholesterol levels 8-to-12% and triglycerides 15% within the first 4 weeks. Gamma-oryzanol's cholesterol-lowering action appears to involve a combination of effects in that it increases the conversion of cholesterol to bile acids and inhibits the absorption of cholesterol.

Double-blind studies have also shown supplemental gamma-oryzanol to increase lean body mass, increase strength, improve recovery from workouts, and reduce body fat and post-exercise soreness.

Octacosanol

Octacosanol is a waxy substance naturally present in wheat germ oil, rice bran, and the wax layer of many plants. Animal research indicates that it shares many common features with vitamin E and plays a role in enhancing energy production within cells. Early research suggested that octacosanol may help in improving amyotrophic lateral sclerosis (Lou Gehrig's disease), but this possible treatment was subsequently disproved. More recent research has focused on octacosanol as an ergogenic (exercise performance-promoting) agent. Preliminary studies have found that octacosanol has promising effects on endurance, reaction time, and other measures of exercise capacity. In one study, a dosage of only 1mg per day of octacosanol for eight weeks was found to improve grip strength and visual reaction time, but had no effect on chest strength, auditory reaction time, or endurance.

Octacosanol is also one of the key components of policosanol, a mixture of fatty substances isolated and purified from the wax of sugar cane (*Saccharum officinarum, L.*). Policosanol has exceptional clinical documentation demonstrating efficacy, safety, and tolerability in lowering cholesterol and triglyceride levels. The clinical studies have included comparative studies versus statins, conventional cholesterol-lowering drugs. In these studies, policosanol in dosages ranging from 5-to-20 mg/day, has demonstrated significant improvements in lowering cholesterol and triglyceride levels, typically 20%-to-30%).

In addition to its effects on cholesterol levels, policosanol also exerts additional positive effects in the battle against atherosclerosis. It prevents excessive platelet aggregation without effecting coagulation and exerts good antioxidant effects in preventing against LDL oxidation. Better news still is that these benefits of policosanol may transcend to other waxy substances that coat most fruits and vegetables.

Dietary fats are not all bad as was once promoted. Dietary fats and fatty substances are important dietary components that have many roles including fuel, structural support, hormone precursors and regulators of cholesterol metabolism. The types of fats and how they are prepared have a signifanct influence on health and well-being.

Cooking Oils

The best oils to cook with in baking recipes, stir fries, and sautés, are the monounsaturated oils and coconut oil. While olive oil and canola oil are by far the most popular monounsaturated oils in use, macadamia nut and coconut oils are superior to cook with because of their lower level of polyunsaturated oil: 1% for coconut, and 3% for macadamia nut oil vs. 8% for olive and 23% for canola. Because of their higher mono- and polyunsaturated contents, olive oil and canola oil can form lipid peroxides (rancid byproducts created through oxidation) at relatively low cooking temperatures, while coconut and macadamia nut oils are stable at much higher temperatures, in fact, over twice as stable as olive oil and four times more stable than canola. In addition, macadamia nut oil, like olive oil, is very high in natural antioxidants. In fact it contains over 4.5 times the amount of vitamin E as olive oil.

Even more stable for cooking than monounsaturated fats are the saturated fats from coconut oil. The saturated fats from coconut oil are different than the ones found in animal products becasue they are shorter in length. Coconut oil contains what are referred to as short- and medium-chain triglycerides, while the saturated fats in animal products are long-chain triglycerides. Being shorter in length, short- and medium-chain triglycerides are processed by the body differently and are preferentially sent to the liver to be burned as energy In fact, these fats actually have been shown to promote weight loss by increasing the burning of calories (thermogenesis), plus some research suggests that they lower cholesterol as well.

[END BOX]