



## Colgan Institute News

### January 2010

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### **Lean for Life**

## **Caffeine and Green Tea Stimulate Thermogenesis & Fat loss**

Thermogenesis is the creation of heat in the body. It occurs mainly through the activity of a type of fat called Brown Adipose Tissue (BAT). In the 1980s, research showed that BAT creates body heat by using as fuel the white fat that makes up most of our body fat.<sup>1</sup> A hibernating bear for example, can lose 300 lbs of fat while it sleeps, as its body uses BAT to create the heat required to prevent it from freezing over the winter. The bear does not have to move a muscle.

We are not as efficient as bears at producing heat, and our meagre levels of BAT also decline with age, one reason we tend to gain body fat over the years. Nevertheless, the amount of BAT in the body of a 40-year-old man or woman is still sufficient to use 10% -15% of their total energy, and get it all from body fat, if only we can get the BAT moving.<sup>2</sup> Anything that steadily stimulates BAT, will reduce your body fat even while you sleep.

Recent molecular science shows that BAT works by DNA expression of specific proteins. These proteins are termed uncoupling proteins (UCPs), because they permit the production of energy to uncouple from the Krebs cycle and go directly to heat, without first becoming the energy molecule, adenosine triphosphate (ATP). This molecular mechanism of energy use is an important discovery in the fight against obesity.<sup>2</sup> Many pharmaceutical teams are now focussed on developing a non-toxic drug that will stimulate DNA expression of uncoupling proteins, in order to keep BAT activity high indefinitely. Of course, it will also have to be a very expensive, patentable drug in order to keep the pharmaceutical companies profitable. It remains undiscovered.

Popular approaches to weight loss do not activate BAT at all. Quite the opposite. Going on a sudden diet for example is the most common way to attempt to lose body fat. Anyone who has done it will tell you that there is little other than water loss for weeks. That is largely because your body automatically turns down its heat as a defence mechanism in order to conserve its fat. Just before the turn of this century, studies showed definitively that dieting, by reducing food intake to the level of hunger, reduces the activity of uncoupling proteins and turns down the BAT mechanism.<sup>3-5</sup>

The second most popular way to attempt to lose weight is long aerobic exercise. Despite all the sweating you may do, it tends to reduce the activity of uncoupling proteins, and reduce bodily heat production, during all the time you are not exercising.<sup>6,7</sup> And, if you fail in the exercise, and gain more weight, uncoupling protein activity dive bombs.<sup>8,9</sup> Incorrect dieting and exercise are two big reasons that we see so many people continually going on one or other diet, or bent on aerobics, yet remaining overweight, and also cold all the time. Yet, as we are showing in this series of articles, nutrition and exercise done properly, work like a charm to keep you lean.

## **Stimulating BAT**

Fortunately, there are several substances in natural foods that stimulate BAT activity very well when used correctly. Best known is caffeine. Studies indicate that a cup of ground arabica coffee on an empty stomach,(50-100mg caffeine) not only signals DNA to up-regulate the expression of uncoupling proteins,<sup>10</sup> but also increases oxygen consumption in BAT mitochondria, and increases resting metabolic rate.<sup>11</sup> Caffeine is a cert for thermogenesis.

Combined with green tea, caffeine is even better. Scientists do not yet understand why green tea (which does contain a little caffeine) synergistically increases the BAT effects of caffeine. But all we have to know is that it works. Green tea has a thermogenic effect itself, which was thought to be because of its caffeine content. But recent studies show that green tea extract stimulates BAT thermogenesis to a much greater degree than could be caused by its small amount of caffeine. The latest evidence suggests that the abundant catechins in green tea may be responsible.<sup>12</sup> Over the last five years, research has shown that the principle catechin, epigallocatechin gallate (EGCG) induces thermogenesis by itself.<sup>12,13</sup>

We are impressed by a recent study in the American Journal of Clinical Nutrition, a journal that is very conservative about publishing dramatic effects of foods on weight control. In a 12-week study, 38 healthy, middle-aged men used a moderately reduced calorie diet, including oolong tea. The tea was made to contain either high levels of catechins from green tea or low levels (placebo). Men in the control group lost 2.9 pounds over the course of the 12 weeks. The group consuming the tea with the green tea extract lost an average of 5.4 pounds. The researchers concluded that:

Body weight, BMI, waist circumference, body fat mass, and subcutaneous fat area were significantly lower in the green tea extract group than in the control group.<sup>14</sup>

In a larger study with a similar design, 240 obese individuals were given tea containing either high or low levels of catechins. Over 12 weeks, the high catechin group had significant declines in body weight, body mass index (BMI), body fat ratio, body fat mass, waist circumference, hip circumference, and area of visceral fat.<sup>15</sup> A dieter's dream come true.

Green tea catechins have also been studied in combination with other possible thermogenic agents, including the capsaicin from hot peppers that we recommended in a previous article in this series. In a recent placebo-controlled, double-blind trial, 80 overweight subjects who initially underwent a four-week low calorie diet, were then randomized to receive a placebo or a supplement of capsaicin plus EGCG. After eight weeks, subjects taking the supplement had a significantly greater loss in body fat mass, plus increased levels of thermogenesis.<sup>16</sup>

We have covered only a few of the recent studies. From these and similar research, we recommend the use of both caffeine and especially green tea, either in foods or as supplements. From our summary of the amounts found effective in controlled studies, aim at a total intake of 1000mg per day of green tea catechins. Add these foods to your synergistic combination of natural, non-toxic chemicals that will assist you to remain Lean for Life.

You will find these substances in our new Weight Management Daily Pack, part of our new Weight Management Program.

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## **Lean For Life Series**

### **Cayenne for Weight Loss**

Are you fed up with temporary approaches to fat loss and fitness? Are you frustrated with the Internet, overflowing with speculative nonsense about expensive pre-packaged meals, and diets, and fat loss drugs, and weight control programs and exercise tortures that never work for long? Do you want to make the best use of 2010, to get your body into great shape, and start the permanent physiological changes that will enable you stay in great shape lifelong. Then this series, Lean for Life, is the only guide to fat salvation that you will never need.

In previous articles, I have listed foods that can help you control body fat. These foods, either in their natu-

ral form, or as extracts made into dietary supplements, can keep you lean by regulating the amount of food you eat, increasing the energy you feel, increasing the energy available for use, controlling the stomach and brain triggers of appetite, and eliminating the emotional triggers to eating. They work by one or other of five mechanisms to:

1. Release excitatory neurotransmitters in the brain (dopamine, acetylcholine, adrenalin) to increase energy output.
2. Stimulate thermogenesis (raise body temperature to increase energy use).
3. Bulk up in the stomach to 100-200 times their size to reduce appetite.
4. Suppress appetite signals to and from the brain.
5. Relieve stress and anxiety

What you have to do is make the right foods a permanent part of your lifestyle. We will tell you the science behind them, where to get the right stuff, and when, and how much to use. We stick strictly to the science.

First, you should know that any “wonder” food or diet that is not confirmed repeatedly by controlled evidence in the peer-reviewed scientific literature, is a definite scam, no matter how many celebrities or athletes endorse it, no matter how many pictures you see of Teletubbies transformed into Twiggies. It is naive to believe that the pirouetting models or the biggest losers depicted on TV are anything more than promotional deceptions.

I will give you just one example. Consider for a moment Oprah Winfrey, who has hosted a continuing succession of celebrity diet gurus for the last 30 years. And she has worked hard at their “miraculous” programs. Not one of them has helped her, except temporarily. She can afford whatever she wants, yet, after many years of following false prophets, she has been unsuccessful.

Becoming and remaining lean for life is not the simple task that diet companies and gurus claim. Permanently controlling body fat requires precise knowledge of molecular physiology, precise control over the sources of foods and chemicals that you use, and long-term physiological changes that you have to engineer in your own brain, organs, and hormone cascade.

It is important for you to know that we have been successful personally at the Colgan Institute in remaining lean continuously for more than 30 years, and we have taught thousands of folk to do the same. We do not have to diet strenuously, or avoid the chocolate or Holiday cakes, or follow weird practices, or fast, or eat toad slime, or exercise to death. And there is no angst involved either. The answer is always in the science, and it allows me and mine to remain lean, yet eat chocolate and drink wine, or whatever is your fancy, every day. Come see for yourself if it sounds unreal.

In coming months, we will examine the research behind each of the fat loss foods and methods we recommend, and how to use them. Being right in the middle of the biggest eating time of the year, I will start with cayenne, as it could save you from gaining a mountain of fat over the Holidays.

## **Cayenne For Your Lean Lifestyle**

Cayenne, from the Greek “to bite”, comes from capsicums, the hot, red peppers used for flavoring foods. The most important substance in cayenne is a group of chemicals collectively called capsaicin. Pure capsaicin is extremely toxic and would burn a hole right through you. Even one drop in 100,000 dilution can raise blisters on the skin. These powerful natural chemicals are new darlings of the pharmaceutical companies because capsaicinoid drugs are now being developed for a whole range of health problems.

Capsaicin content of peppers is measured in parts per million which is then converted into what are called Scoville units, which is the number of dilutions you have to make until the liquid is no longer hot to taste.

The hotter the pepper the more capsaicin it contains. The hottest are habaneras with a score of 100,000–400,000 Scoville Units. Far too hot for most people! Then come Scotch bonnets and Jamaican peppers at 60,000–250,000 Scoville units. To understand how hot that is, powdered cayenne pepper scores only 30,000–50,000 Scoville Units. The usual bell peppers you see in the supermarket come from cultivars that are so in-bred they no longer contain capsaicin. Only hot peppers are of any use.

We became interested in capsaicin when studies in the 1980s began to show that it has complex and unique effects. To briefly summarize some highlights, recent research has discovered a new neural receptor in the human system now called the “capsaicin receptor.”<sup>1</sup> It allows capsaicin to act as a unique anti-inflammatory. From extensive studies, the US Food and Drug Administration has recently approved a capsaicin spray, which, when sprayed up the nose onto the nasal epithelium, relieves headaches that are resistant to other anti-inflammatories such as aspirin and ibuprofen. Because it is made from a food, and not a drug, you can now buy various versions of this spray over-the-counter at your local pharmacy.

Research also shows that capsaicin applied locally to the skin has anti-inflammatory effects at other sites in the body, remote from where it was applied. Further, capsaicin influences neuro-hormonal systems that regulate the hormone cascade.<sup>1</sup> a very important effect that helps maintain your body as you age.

The unique anti-inflammatory of capsaicin is of great interest to medical scientists because of its value in numerous diseases of obesity. Obesity-induced inflammation contributes to the development of the metabolic syndrome, which precipitates insulin resistance, type 2 diabetes, fatty liver disease, and cardiovascular disease as we age. In a just published study, overweight mice were fed a high-fat diet and supplemented with capsaicin for ten weeks, and were compared with a control group of normal mice. In other studies, overweight mice fed a high fat diet become more overweight and develop greater insulin resistance. In this case, dietary capsaicin lowered fasting glucose, lowered fasting insulin, and markedly reduced the impairment of glucose tolerance in the mice. It is likely that dietary capsaicin reduces obesity-induced glucose intolerance not only by suppressing inflammatory responses, but also by enhancing fatty acid oxidation in adipose tissue and liver, both of which are important peripheral tissues affecting insulin resistance.<sup>2</sup>

## **Capsaicin Promotes Fat Loss**

Capsaicin has numerous other effects on weight control. By the 1990s, controlled studies were showing that red pepper in meals dramatically increases thermogenesis, and energy use.<sup>3</sup> Specifically, in animal studies, red pepper increases the use of body fat as fuel to produce the extra heat.<sup>4</sup> In the brain, it causes stimulation of catecholamines, and increased activity of the sympathetic nervous system that regulates heart rate, blood pressure, and breathing. <sup>5</sup> That is, capsaicin energizes the body, but not in the same way as a stimulant, such as caffeine.

Red pepper also reduces appetite. Human studies show that people eating meals containing red pepper, eat less at subsequent meals. They also feel more satisfied with their meals, both in sensory gratification and in satiety.<sup>7,8</sup> A 2009 review of most of the controlled studies, concluded that capsaicinoids have been shown to reduce food intake, increase thermogenesis, and increase lipolysis (fat-use for fuel). The only adverse outcome is gastric discomfort, associated with taking too much too soon.<sup>9</sup>

Some recent studies of capsaicin also show human fat loss, consistent with the fat loss found in the animal research.<sup>3</sup> In one 2-week study, participants were fed capsaicin together with green tea and chicken stock. Compared with placebo, they showed a significant reduction in body fat. In a long-term follow-up, the capsaicin group sustained greater fat oxidation than the placebo group.<sup>7,8</sup>

Probably the most important effect of capsaicin is that it activates an enzyme with a complicated name, 5' adenosine-monophosphate-activated-protein-kinase, (AMPK for short). It is a critical enzyme in energy

homeostasis. AMPK is expressed mainly in your liver, muscles, and brain. Its function is to stimulate fatty acid oxidation, and ketogenesis ( production of ketone bodies to make energy available from fatty acids). In simple terms, it releases fat for use as muscle fuel, and then excretion from the body.

At the same time, AMPK inhibits lipogenesis (formation of new body fat) and inhibits formation of new adipocytes (fat cells). As a bonus, it also inhibits formation of cholesterol and triglycerides. And, it regulates insulin secretion from the pancreas. First explained in 1999, AMPK is now considered the metabolic master-switch of the human body.<sup>9,10</sup> Any simple way to activate it is a boon for fat loss and general health.

As we age, AMPK activity starts to decline, thereby increasing the risk of insulin resistance, rising blood sugar, body fat accumulation, and the whole metabolic syndrome of diabetes and cardiovascular disease that is now overtaking America. Capsaicin offers a natural, readily available, non-toxic, means of combating all of these problems, while also enjoying deliciously flavored foods lifelong.

## Use Capsaicin for Life

Using capsaicin is simple. Eat hot peppers in cooking and in meals out whenever you can. Change your diet to include hot salsas, curries and hot sauces. Make them a regular part of your food. In addition, use cayenne pepper, 6-10 grams, in appropriate recipes. You can also take cayenne supplements of 500mg-1000mg with meals.

Start easy both in eating capsaicin and cayenne and in handling them. Remember, capsaisin is the main ingredient in pepper spray. If you are not used to hot peppers, be sure to use gloves when preparing them for cooking, and do not touch your face. Start with the milder types such as serranos: (*Capsicum annuum*). They have a heat factor of 5,000 to 15,000 Scoville Units. With its clean, biting flavor and high acidity, the serrano is a popular addition to salsas and sauces. Don't consider your self a pepper expert just because you have had a few curries at home or the local family restaurant. My wife Lesley made that mistake when she took her grandmother to a good Indian restaurant and they both eagerly ordered the "hot" curry. That it left them both sweating for the next three days has been a source of great amusement since.

Take your time before moving up to hotter peppers such as Scotch bonnets or habaneras. With Scoville scores of 60,000 -250,000 and 100.000-400,000 respectively, their very hot, fruity flavors make perfect curries and Caribbean sauces, but you have to be used to the fire. In a very few years, when you look at friends who have not incorporated capsaicin into their nutrition, you will be ecstatic that you use this Lean for Life adjustment.

You will find these substances in our new Weight Management Daily Pack, part of new Weight Management Program.

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## **Insulin, Diabetes and Degeneration**

The 1995 National Academy of Sciences Report and further reports in 2001 show that adult-onset diabetes affects more than ten million Americans. Those are the diagnosed cases. The report concludes that probably another 10 million cases are undiagnosed, and many millions more are pre-diabetic.<sup>1</sup> The bodies of these pre-diabetic folk have become so deficient at dealing with carbohydrates (starches and sugars) that they get recurrent incidents of hyperglycemia (high blood sugar) or hypoglycemia (low blood sugar). They suffer fatigue, even after a long sleep, unexplainable hunger and thirst, weakness, tremor, nausea, headaches, giddiness, irritability or anxiety. They risk overt diabetes every day.

By careless nutrition and lifestyle habits, or simply lack of knowledge they are “training” themselves to become diabetic. The mechanisms that maintain their blood sugar at a stable level are being abused to the brink of disorder. They cannot go more than a few hours or so without feeling the need for a pick-me-up snack only about 5% diabetes results from genetic defects, and viral infections. Over 90% of cases do it all to themselves!

The seed of adult-onset diabetes is planted early in adult life in everyone who eat western diet. We know now that in many cases of mild disturbance of sugar metabolism, the degeneration of eyes, kidneys and blood vessels that typically shows in diabetes is already taking place.<sup>2</sup> We know also that this degeneration can be reversed if caught early.<sup>3</sup> But if you do not even suspect it is happening, then it will progress silently until it is irreversible.

These findings help explain why, for the last forty years, America and Canada have had one of the highest rates of diabetic complications and death by diabetes in the world. We have five times the rate of Japan, twice the rate of Britain and a higher rate than fifteen other developed countries. Despite a massive medical effort against diabetes, the incidence of this fearsome disease is steadily increasing.<sup>4</sup> Preventable adult-onset diabetes is now the largest cause of blindness and the largest cause of amputations in America.

### **The Insulin Myth**

It’s a popular myth that diabetes develops because the body gradually loses its ability to produce insulin, the hormone made by the pancreas gland that regulates the body’s use of sugar. Some unfortunate people do have this problem, but many diabetics produce just as much insulin, just as rapidly, as non-diabetics.<sup>5</sup> The prediabetic condition, which we are concerned to prevent from progressing into diabetes often shows high blood insulin.<sup>6</sup> The ability to produce insulin may be perfectly normal. But for a variety of reasons it fails to control blood sugar, a condition called “insulin resistance”. The most common fault is a loss of sensitivity

in the cells that recognize the level of sugar in the blood and enable insulin to react with it.<sup>7</sup> So sugar and insulin continue to circulate in the bloodstream, ignoring each other. The sugar level rises until the blood can no longer contain the excess, resulting in the typical spillover into the urine that used to be the hallmark of diabetes mellitus (the sweet urine disease).

Initially, prediabetics may notice only that they always seem to be hungry and thirsty. Because of this hunger and the consequent overeating, many prediabetics become overweight, which only hastens the onset of diabetes. Then unaccountable fatigue and weakness starts to appear. The disorder slowly progresses insidiously to destruction of the eyes, the kidneys and the small blood vessels, resulting in blindness, gangrene, progressive amputations, and lingering illness that often concludes with a fatal heart attack.

Even if injected insulin is used to “control” the disease, it continues to progress.<sup>8</sup> The lifespan and health of a “controlled” diabetic is way below average. In a typical study, Drs. Torsten Deckert and Morgens Larsen at the Steno Memorial Hospital in Copenhagen charted the lives of 800 diabetic men and 650 diabetic women. All had previously developed diabetes before age thirty-one. All but thirteen were “controlled” with insulin. Deckert and Larsen matched the diabetic patients with same-age healthy men and women in the normal population of Denmark. As the disease progressed, nearly all the patients developed serious degenerative complications. After 15 years only 40 percent of them were still alive, compared with 90% of the control population.<sup>9</sup> Fortunately, nutrition and exercise can do a lot to stop your becoming a similar statistic of this sickness.

## **Saturated and Trans Fats Cause Diabetes**

The usual prediabetic, a person whose body is losing its ability to deal with sugar (and other carbohydrates), shows high blood sugar, high blood insulin and high blood fats (triglycerides)<sup>10</sup> a condition called Syndrome X in medicine. And studies of confirmed diabetics show that high levels of blood fats interfere with the ability of the body to use insulin.<sup>11</sup> We know blood fats are major culprits, because if we lower them in prediabetics the body’s use of insulin returns to normal.<sup>12</sup>

Lowering blood fats (triglycerides) is not so easy, because the very loss of interaction between insulin and sugar that high triglycerides cause, also serves to keep fat levels up. This is because the high level of insulin, which is inhibited from dealing with the sugar, goes to the liver, where it is used up by the body to make excess triglycerides.<sup>13</sup> So, it’s a vicious cycle. The more triglycerides the body makes, the greater the interference with the insulin/sugar reaction. The body then makes even more insulin to compensate, which is then used to make even more triglycerides. Each day, the person runs a progressively greater risk of diabetes.

Happily, there are several ways to break the cycle. High blood fats are correlated with diets high in fat. Populations in undeveloped countries that live on low-saturated and low trans-fats diets typically have low blood sugar, low triglycerides and virtually no diabetes. Diabetes is rare in the Bantu tribe, for example. Yet those Bantu who adopt city life, and with it the Western high-fat diet, quickly change to show rising blood fats and disturbances of carbohydrate metabolism at the same rate as Europeans.<sup>14</sup>

Probably the best evidence comes from confirmed diabetics. There is no longer any doubt that low-fat diets improve the insulin mechanism and reduce the need for insulin medication.<sup>15</sup> So, avoiding dietary saturated and trans fats is a first step to prevent diabetes.

## **Obesity Causes Diabetes**

Dietary fat is not the only kind of fat you should worry about. The fat of overweight is a worse danger. Bodily abuse over many years, which has led to the overweight endemic in America today which now afflicts two-thirds of the population over age 40, produces not only atherosclerosis, and cancer but diabetes too.

Overweight raises both cholesterol levels,<sup>16</sup> and triglycerides levels. This disorder of blood fats develops because fat cells themselves are resistant to the normal action of insulin, as it tries to control the body's use of sugar. For every extra fat cell you develop, or latent fat cell you fill up, the body has to produce more and more excess insulin in an attempt to keep them nourished. It is not very successful, so a lot of the insulin goes to the liver, which then turns it into excess triglycerides. These blood fats add further to the insulin resistance, and the vicious cycle is off and running.<sup>17</sup> Eventually, the pancreas can no longer keep pace with the demand for insulin. Blood sugar rises to dangerous levels, and diabetes is born.

Recent research shows that overweight and adult onset diabetes go together like the peanut butter and jelly that are part of them causes. Worse, most of these people also develop high cholesterol and triglycerides. The increase in bodyfat also causes the body to make more of an enzyme called aromatase which converts testosterone into estrogen, which increases the deposit of bodyfat even further, especially in men. Another hormone, called leptin loses its ability to control bodyfat, and insulin loses its ability to control sugar, hugely increasing the risk of diabetes, hypertension and heart disease.<sup>18</sup>

Today in medicine these linked conditions are called the CHAOS Complex, which stands for coronary heart disease, hypertension, adult-onset diabetes, obesity and stroke.<sup>19,20</sup> The CHAOS complex has not hit the public press yet but it will soon. Remember you heard it first here. A further condition now being added to CHAOS as the evidence pours in, is Alzheimer's disease. There is no longer any doubt insulin resistance and adult-onset diabetes increase risk of Alzheimer's in both men and women.<sup>21</sup> CHAOS now afflicts 40 million Americans, and most of them did it all to themselves, by allowing their insulin mechanism to decline.

The good news is that prediabetes and the start of the CHAOS complex caused by overweight can be overcome, as long as it is caught before irreversible kidney damage, blood-vessel damage and damage to the brain occurs. If people of normal weight are force fed, they become obese and show the typical beginnings of CHAOS. But as soon as they return to a good diet and lose the weight, sugar metabolism returns to normal and the other symptoms of CHAOS disappear.<sup>19</sup>

It is the same for obese patients put on a reducing diet. Sugar metabolism improves in direct proportion to every pound of fat lost.<sup>20</sup> Even in confirmed obese diabetics, weight reduction substantially improves their sugar metabolism, lowers their blood insulin and lowers their blood triglycerides.<sup>21,22</sup> If you can find no other reason to stay slim, then perhaps saving your sight may give you an incentive. At this seminar we hope to show you how to stay leaner for life.

## **Carbohydrates and the Glycemic Index**

Almost all obesity results from eating excess calories. Because Americans are sensibly eating less fat, most of the excess is now in the form of processed carbohydrates (starches and sugars), the part to which most our food is reduced today. Excess sugar is the biggest problem. Forty years ago, Dr. William Ishmael of the University of Oklahoma Medical Center showed how dietary sugar causes prediabetic reactions by raising the level of triglycerides in the blood.<sup>23</sup> Populations that live on low-sugar diets, such as the Zulus, have very few diabetics. But Zulus who migrate to city life, adopt the Western diet. Their sugar consumption goes up tenfold, and the rates of hyperglycemia, hypoglycemia and diabetes rise to the same level as that of Caucasian South Africans.<sup>24</sup>

Some uninformed health writers have advised folk to reduce the sugar risk by using unsweetened bread and cereal products. They fail to realize that processed starches are absorbed by the body just as fast as sugar, and are immediately converted to sugar by bodily processes. People who martyr themselves with dry crackers in the mistaken belief that they are helping their sugar metabolism, are not gaining a whit of value over the equivalent number of calories' worth of lip-smacking pecan pie. The answer to all this confusion lies in

the Glycemic Index.

## The Glycemic Index

First developed by Dr. David Jenkins in 1971, to assist diabetics to stabilize their blood sugar, the Glycemic Index measures the magnitude of the blood sugar response to different foods. Pure glucose, one of the worst foods, is taken as the standard, representing a 100% blood sugar spike.

I should mention however, that some Glycemic Index lists use white bread as the 100% mark, which makes glucose 138-142 depending on whose standard you take. These variations confuse a lot of people. The pure glucose standard is more accurate, because the blood sugar spike to white bread varies considerably depending on the flour used to make it, baking methods, the age of the bread and numerous other factors. So we stick to the glucose standard used with diabetics. We have a Glycemic Index Table at the end of the article.

It is not only diabetics who should strive to maintain blood sugar stability. This strategy applies to all of us if we want optimal health and also to athletes if they want optimal performance. The evidence shows that eating a low-glycemic diet:

1. Enables your body to gradually learn to produce energy more easily from its structure, and to be much less dependent on the food in your gut.
2. Minimizes the hypoglycemic effect of sudden intense exercise.
3. Increases the free fatty acids in the bloodstream, thereby enabling you to spare muscle glycogen during exercise and reduce bodyfat.
4. Reduces your appetite for quick sugars and carbohydrates that spike blood sugar, and start the prediabetic process.
5. Maintains insulin sensitivity and efficiency, thereby preventing diabetes.
6. Keeps blood sugar stable, including during exercise. Blood sugar stability is essential for growth of muscle and strength for the even flow of energy and the prevention of diabetes and CHAOS.<sup>25-31</sup>

## Vitamins Combat Diabetes

None of the dietary manipulations will work for long if your body lacks essential nutrients. While keeping in mind that no vitamin works alone and that you should take a complete daily mix I will look at a few examples of nutrients that help prevent the degenerative changes that precede and accompany diabetes.

Vitamin B<sub>2</sub>, riboflavin is intimately involved in sugar metabolism. Riboflavin deficiency in animals causes disorders of glucose tolerance similar to those seen in diabetics.<sup>31</sup> Mice made even moderately deficient in riboflavin, show large disturbances of blood sugar and blood insulin following a feeding of glucose. Sixty minutes after the feeding they show the typical prediabetic pattern of high blood glucose and high blood insulin, indicating a severe disorder of the mechanism whereby insulin deals with sugar in the blood. Riboflavin supplements quickly restore these responses to normal.<sup>32</sup>

Vitamin E is also an important preventive measure for anyone with evidence of insulin resistance. The inevitable accompaniment of insulin resistance is the gradual death of peripheral blood vessels. The first to go are the tiny capillaries that nourish the hands and feet, fingers and toes. There is firm evidence that supplemental Vitamin E is beneficial in maintaining peripheral circulation in a variety of vascular diseases.<sup>33</sup>

Vitamin E also helps to maintain normal levels of blood fats,<sup>34</sup> and thereby reduces cardiovascular risk and all the tendency to gain bodyfat with age.. So it is important to anyone whose signs of pre-diabetes show that cardiovascular risk is increased.

One of the latest discoveries is the power of the antioxidant, alpha lipoic acid, to reverse pre-diabetic symptoms and even to reduce the progression of overt diabetes.<sup>3</sup> Make vitamin E and alpha lipoic acid a daily part of your supplement mix.

## **Minerals Combat Diabetes**

The essential minerals work only in interaction with vitamins and with each other. Medical science is only just realizing how all these nutrients together are involved directly or indirectly in maintaining normal sugar metabolism. Manganese, for example is often deficient in people with poor glucose tolerance.<sup>35</sup> Without ample manganese the body cannot use the enzymes (biological catalysts which accelerate essential chemical reactions) necessary for the activity of the essential nutrients choline, biotin, thiamin and Vitamin C. The result is multiple disorders, including the low production of the neurotransmitter, acetylcholine, leading to the impairment of nerve conduction and brain damage that inevitably accompanies diabetes.

Chromium is a telling example. Way back in 1974, Dr. Walter Mertz of the US Department of Agriculture was able to persuade his colleagues (and the scientific world in general) that chromium permits insulin to act properly in the human body.<sup>36</sup> Now, we know that chromium is essential for insulin to maintain the delicate balance between hypoglycemia and hyperglycemia. Without it there is no way the body can handle sugar.

Because of the high level of processed carbohydrate in the American diet, a lot of body chromium is used and lost in the urine. Generally, it is not replaced, and the body gradually becomes depleted. Eggs, a usual American food, are often cited as being high in chromium. So they are, but unfortunately the chromium is in a form that is not available to the human body. Raw fruits and vegetables contain some bioavailable chromium, but not enough. One sure answer is inclusion of the effective supplement, chromium picolinate, in your daily supplement mix.

The last preventative of diabetes and the accompanying CHAOS complex I want to cover is the omega-3 fat docosahexaenoic acid (DHA). This is a component of fish oils and oils extracted from some seaweeds. We know now, that DHA is essential for normal insulin metabolism. Make DHA a regular component of your daily supplement mix.<sup>37,38,39</sup>

## **Exercise Combats Diabetes**

A good diet and a complete vitamin and mineral supplement are two-thirds of the diabetes prevention equation. The other third is regular exercise. But it has to be the right exercise. Such exercise benefits pre-diabetics and even confirmed, insulin-dependent diabetics in several ways. First, exercise uses up excess blood sugar. It does this better in nondiabetics, because their insulin mechanism works to convert the sugar to energy. Prediabetics, however, tend to burn more fat when they exercise, because the body can't use its sugar properly. Nevertheless, this is of great benefit because, as we have seen, fat is one factor interfering with sugar metabolism. When prediabetics and diabetics exercise consistently, body fat and blood fats go down and the insulin mechanism recovers.<sup>40</sup> Even if no body fat is lost, twenty to thirty minutes of aerobic exercise a day causes blood fats and cholesterol to decline and insulin sensitivity to improve.<sup>41</sup> Studies have shown a beneficial reduction in blood insulin even with only three months of regular moderate exercise.<sup>42</sup>

## **Conclusion**

We have looked at the causes, and the ways to prevent adult-onset diabetes, a disorder caused in most cases by faulty nutrition and sedentary lifestyle. To prevent this insidious condition and the CHAOS complex of diseases that accompany it you should:

1. Eat a diet low in saturated and trans fats.
2. Stay lean or become lean for life.
3. Eat a low-glycemic diet.
4. Take a complete vitamin and mineral supplement every day that is especially rich in riboflavin, vitamin E, alpha-lipoic acid, chromium picolinate and manganese.
5. Include the omega-3 fat DHA in your daily supplement mix.
6. Adopt a regular moderate exercise program using the Power Program that you can stick to and enjoy for life.

<b>Colgan Institute Glycemic Index</b>			
<b>Low Glycemic Foods: Eat These</b>		<b>High Glycemic Foods: Avoid These</b>	
<b>Bakery Items</b>	<b>GI</b>	<b>Bakery Items</b>	<b>GI</b>
Apple Muffin	50	Croissant	67
Banana Cake	55	Doughnut	76
Vit-wheat Crispbread	55	Rice cakes	61-92
Betty Crocker Chocolate Cake	41	Buckwheat pancakes	102
<b>Breads</b>	<b>GI</b>	<b>Breads</b>	<b>GI</b>
Barley	40	Baguette (white)	102
Fruit loaf (white)	55	Hamburger bun (white)	62
Oat Bran	50	Kaiser roll	72
Pumpernickel	46	Rice bread	70
Wholewheat Sourdough	54	White bread	71
Nine grain bread	50	Enriched bread	72
<b>Cereals-Grains-Pasta</b>	<b>GI</b>	<b>Cereals-Grains-Pasta</b>	<b>GI</b>
Bran buds	47	Bran flakes	74
Museli	54	Cheerios	74
Old Fashioned Oats	53	Coco Pops	77
All Bran	42	Cornflakes	77
Quaker Oat Bran	50	Puffed wheat	67
Rice (long grain)	50	Instant white rice	78
Regular pasta (eg, fettuccine, macaroni)	40	Rice pasta	72
<b>Raw Fruit</b>	<b>GI</b>	<b>Raw Fruit</b>	<b>GI</b>
Apples	33	Apricots	57
Oranges	40-48	Mango	57
Pears	38	Pineapple	63
Grapes	46	Watermelon	78
Kiwis	49		
<b>Vegetables</b>	<b>GI</b>	<b>Vegetables</b>	<b>GI</b>
Peas	48-53	Roast Potato	85

# Colgan Institute Glycemic Index

Low Glycemic Foods: Eat These		High Glycemic Foods: Avoid These	
Asparagus	20	Boiled Potato	87
Lettuce	15	Pumpkin	75
Yam	42	French fries	75-93
Tomato	15	Broad beans	70
Soy beans	16	Parsnips	97
Nuts & Snacks	GI	Nuts & Snacks	GI
Peanuts	20	Plain popcorn	89
Cashews	27	Pretzels	83
Peanut M & M's	34	Cheese Twists	76
Low fat Yogurt	27	Potato chips	67
Dark chocolate	40	Snickers bar, Mars bar	66
Sugars	GI	Sugars	GI
Lactose	48	Table sugar (sucrose)	65
Fructose (fruit sugar)	40	Honey	55-60
		Glucose	100
Beverages	GI	Beverages	GI
Apple juice (from concentrate)	44	Gatorade	91
Fresh carrot juice	46	Milk	56
Grapefruit juice	48	Nestle Quik	72
Tomato juice (canned)	42	Coca Cola (regular)	63
Soy Banana smoothie	33	Orange juice (reconstituted)	59
Soy milk (3% fat)	49	Orange soda	74
Tea (with lemon)	0-4	Lemon Squash	60
Coffee (black)	0	Lucozade	100

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