exposure if one takes one of these herbs while using a loop diuretic.

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FURTHER READING

Brady, J. A., C. L. Rock, and M. R. Horneffer. "Thiamin Status, Diuretic Medications, and the Management of Congestive Heart Failure." *Journal of the American Dietetic Association* 95 (1995): 541-544.

Hardig, L., et al. "Reduced Thiamine Phosphate, but Not Thiamine Diphosphate, in Erythrocytes in Elderly Patients with Congestive Heart Failure Treated with Furosemide." *Journal of Internal Medicine* 247 (2000): 597-600.

Sole, M. J., and K. N. Jeejeebhoy. "Conditioned Nutritional Requirements: Therapeutic Relevance to Heart Failure." *Deutsches Herzzentrum München* 27 (2002): 174-178.

Yue, Q. Y., et al. "No Difference in Blood Thiamine Diphosphate Levels Between Swedish Caucasian Patients with Congestive Heart Failure Treated with Furosemide and Patients Without Heart Failure." *Journal of Internal Medicine* 242 (1997): 491-495.

See also: Dong quai; Food and Drug Administration; Licorice; Magnesium; Potassium; St. John's wort; Supplements: Introduction; Vitamin B_1.

Assorted carbohydrates. (Garo/Phanie/Photo Researchers, Inc.)

Low-carbohydrate diet

CATEGORY: Therapies and techniques

RELATED TERMS: Atkins diet, high-protein diet, low-carbohydrate diet, Zone diet

DEFINITION: Weight loss and maintenance through diets that are low in carbohydrates.

OVERVIEW

Mainstream groups such as the American Heart Association and the American Dietetic Association endorse a unified set of dietary guidelines for people who wish to lose weight: Eat a low-fat diet and cut calories. However, many popular weight-loss and diet books take a very different approach. The Atkins diet, the Zone diet, Protein Power, and numerous other dietary approaches reject the low-fat guideline. Instead, these methods recommend cutting down on carbohydrates. According to proponents of these theories, when a person reduces the carbohydrates in his or her diet (and, correspondingly, increases protein or fat, or both), that person will find it much easier to reduce calorie intake and may even lose weight without cutting calories.

The controversy over these contradictions has been heated. Proponents of the low-fat diet claim that low-carbohydrate (low-carb) diets are ineffective and even dangerous, while low-carb proponents say much the same about the low-fat approach. However, an article published in the *Journal of the American Medical Association* suggests that neither side has a strong case. Researchers concluded, essentially, that a calorie is a calorie, regardless of whether it comes from a low-carb or a low-fat diet. They did not find any consistent evidence that the low-carb diet makes it easier to lose weight than the low-fat diet, but neither did they find

any consistent evidence for the reverse. Furthermore, the authors of the review did not find any compelling reason to conclude that low-carb diets are unsafe, although they did point out that the long-term safety of such diets remains unknown.

Subsequent studies confirmed these findings for a variety of low-carb diets. In some studies, one particular diet method may do better than others, but in other studies a different diet will stand out. Researchers reviewing thirteen studies comparing low-carb with low-fat/low-calorie diets in overweight participants for a minimum of six months concluded that the low-carb diets tended to perform better at reducing weight and cardiovascular disease factors for up to one year. Nevertheless, a consensus has yet to emerge among nutrition scientists as to what diet performs better overall. Many of the foregoing studies suggest that if a diet causes weight loss, cholesterol will improve regardless of the diet used to achieve that weight loss. However, the manner of change in a person's cholesterol profile differs between the two approaches. Low-fat diets tend to improve total and LDL (low-density lipoprotein, or bad) cholesterol levels, but they tend to worsen HDL (high-density lipoprotein, or good) cholesterol and triglyceride levels; low-carb, high-fat diets have the opposite effect.

The Mediterranean diet, which is relatively high in fiber and monounsaturated fats (such as olive oil) has also attracted the attention of nutrition researchers. There is good evidence that it is as effective as low-carb diets for weight reduction and probably more effective than low-fat diets. It also seems to have the added advantage of benefiting persons with diabetes more than the other two diets.

However, if one undertakes a low-carb (or low-fat) diet that does not cause weight loss, that person's cholesterol profile will probably not improve significantly. In addition, there is little to no evidence that the low-carb approach improves blood sugar control except insofar as it leads to weight loss. However, there is some evidence that a low-carb diet that is high in mono-unsaturated fats reduces blood pressure to a slightly greater extent than does a high-carb, low-fat diet. Contrary to claims by some low-carb proponents, low-fat, high-carb diets do not seem to backfire metabolically and promote weight gain.

Based on this information, it seems that the most sensible course to take to lose weight is to experiment with different diets and determine which one cuts the most calories (and keeps them cut). If the low-carb diet approach works, one should continue with it. However, if it does not help one lose weight, it should not be continued indefinitely.

Any form of extreme dieting can cause serious side effects or even death. All people who intend to adopt an unconventional diet should first seek medical advice. Furthermore, people with kidney failure should not use low-carb, high-protein diets, as high protein intake can easily overstress failing kidneys. (High-protein diets are probably not harmful for people with healthy kidneys.)

In addition, people who take the blood thinner warfarin (Coumadin) may need to have their blood coagulation tested after beginning a high-protein, low-carb diet. Two case reports suggest that such diets may decrease the effectiveness of warfarin, requiring a higher dose. Conversely, a person who is already on warfarin and a high-protein, low-carb diet and then goes off the diet, may need to reduce his or her warfarin dose.

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Further Reading

Berglund, L., et al. "Comparison of Monounsaturated Fat with Carbohydrates as a Replacement for Saturated Fat in Subjects with a High Metabolic Risk Profile: Studies in the Fasting and Postprandial States." *American Journal of Clinical Nutrition* 86 (2007): 1611-1620.

Dansinger, M. L., et al. "Comparison of the Atkins, Ornish, Weight Watchers, and Zone Diets for Weight Loss and Heart Disease Risk Reduction." *Journal of the American Medical Association* 293 (2005): 43-53.

Ebbeling, C. B., et al. "Effects of a Low-Glycemic Load vs Low-Fat Diet in Obese Young Adults." *Journal of the American Medical Association* 297 (2007): 2092-2102.

Gardner, C. D., et al. "Comparison of the Atkins, Zone, Ornish, and LEARN Diets for Change in Weight and Related Risk Factors Among Overweight Premenopausal Women: The A to Z Weight Loss Study." *Journal of the American Medical Association* 297 (2007): 969-977.

Hession, M., et al. "Systematic Review of Randomized Controlled Trials of Low-Carbohydrate vs. Low-Fat/Low-Calorie Diets in the Management of Obesity and Its Comorbidities." *Obesity Reviews* 10 (2009): 36-50.

Howard, B. V., J. E. Manson, et al. "Low-Fat Dietary Pattern and Weight Change over Seven Years: The Women's Health Initiative Dietary Modification Trial." *Journal of the American Medical Association* 295 (2006): 39-49.

Howard, B. V., L. Van Horn, et al. "Low-Fat Dietary Pattern and Risk of Cardiovascular Disease: The Women's Health Initiative Randomized Controlled Dietary Modification Trial." *Journal of the American Medical Association* 295 (2006): 655-666.

Luscombe-Marsh, N. D., et al. "Carbohydrate-Restricted Diets High in Either Monounsaturated Fat or Protein Are Equally Effective at Promoting Fat Loss and Improving Blood Lipids." *American Journal of Clinical Nutrition* 81 (2005): 762-772.

Nordmann, A. J., et al. "Effects of Low-Carbohydrate vs Low-Fat Diets on Weight Loss and Cardiovascular Risk Factors: A Meta-analysis of Randomized Controlled Trials." *Archives of Internal Medicine* 166 (2006): 285-293.

Shai, I., et al. "Weight Loss with a Low-Carbohydrate, Mediterranean, or Low-Fat Diet." *New England Journal of Medicine* 359 (2008): 229-241.

Tay, J., et al. "Metabolic Effects of Weight Loss on a Very-Low-Carbohydrate Diet Compared with an Isocaloric High-Carbohydrate Diet in Abdominally Obese Subjects." *Journal of the American College of Cardiology* 51 (2008): 59-67.

Wal, J. S., et al. "Moderate-Carbohydrate Low-Fat Versus Low-Carbohydrate High-Fat Meal Replacements for Weight Loss." *International Journal of Food Sciences and Nutrition* 58 (2007): 321-329.

See also: Anti-inflammatory diet; Diet-based therapies; Low-glycemic index diet; Macrobiotic diet; Obesity and excess weight; Raw foods diet; Vegan diet; Vegetarian diet.

Low-glycemic-index diet

CATEGORY: Therapies and techniques

RELATED TERMS: GI diet, GL diet, low-glycemic-load diet

DEFINITION: Nutritional approach based on the consumption of low-fat foods and foods that have particular kinds of carbohydrates.

OVERVIEW

Mainstream organizations, such as the American Heart Association and the American Dietetic Association, endorse a unified set of guidelines for the optimum diet. According to these organizations, the majority of calories in the daily diet should come from carbohydrates (55 to 60 percent), fat should provide no more than 30 percent of total calories, and protein should be kept to 10 to 15 percent.

However, many popular diet books turn the standard diet upside down. The Atkins diet, the Zone diet, Protein Power, and other alternative dietary approaches reject carbohydrates and advocate increased consumption of fat or protein, or both. According to theory, the low-carbohydrate (carb) approach aids in weight loss (and provides a variety of other health benefits) by reducing the body's production of insulin.

The low-glycemic-index (low-GI) diet splits the difference between the low-carb and low-fat approaches. It maintains the low-carb diet's focus on insulin, but it suggests choosing certain carbohydrates over others rather than restricting carbohydrate intake.

Evidence suggests that carbohydrates are not created equal. Some carbohydrates, such as pure glucose, are absorbed quickly and create a rapid, strong rise in both blood sugar and insulin. However, other carbohydrates (such as brown rice) are absorbed much more slowly and produce only a modest blood sugar and insulin response. According to proponents of the low-GI diet, eating foods in the latter category will enhance weight loss and improve health. However, despite some promising theory, there is no solid evidence that low-GI diets enhance weight loss.

Besides weight loss, preliminary evidence suggests that the low-GI approach (or, even better, a related method called low-glycemic load, which is discussed later in this article) may help prevent heart disease. The low-GI approach has also shown promise for treating and possibly preventing diabetes.

WHAT IS THE GLYCEMIC INDEX?

The precise measurement of the glucose-stimulating effect of a food is called its glycemic index. The lower a food's GI, the less potent its effects on blood sugar (and, therefore, on insulin).

The GI of glucose is arbitrarily set at 100. The ratings of other foods are determined as follows. First,

researchers calculate a portion size for the food to supply 50 grams (g) of carbohydrates. Next, they give that amount of the food to a minimum of eight to ten people and measure the blood sugar response. (By using a group of people rather than one person, researchers can ensure that the idiosyncrasies of one person do not skew the results.) On another occasion, researchers also give each participant an equivalent amount of glucose and perform the same measurements. The GI of a food is then determined by comparing the two outcomes. For example, if a food causes one-half of the blood sugar rise of glucose, it is assigned a GI of 50; if it causes one-quarter of the rise, it is assigned a GI of 25. The lower the GI, the better.

When scientists first began to determine the GI of foods, some of the results drew skepticism. It did not surprise anyone when jellybeans turned out to have a high GI of 80 (after all, jellybeans are mostly sugar). Also, it was not unexpected that kidney beans have a low GI of 27 because they are notoriously difficult to digest. However, when baked potatoes showed an index of 93, researchers were stunned. This rating is higher than that of almost all other foods, including ice cream (61), sweet potatoes (54), and white bread (70). Based on this finding, low-GI diets recommend that people avoid potatoes.

There are other surprises hidden in the GI tables. For example, fructose (the sweetener in honey) has an extraordinarily low GI of 23, lower than brown rice and almost three times lower than white sugar. Candy bars also tend to have a relatively good (low) GI, presumably because their fat content makes them digest slowly.

Dietary Changes and Type 2 Diabetes

More than any other disease, type 2 diabetes is related to lifestyle. It is often the case that people prefer having an injection or taking a pill to improve their quality of life rather than changing their diet and level of physical activity. Attention to diet and exercise results in a dramatic decrease in the need for drug therapy in nine of ten persons with diabetes. In some cases, the loss of only a small percentage of body weight results in an increased sensitivity to insulin. Permanent weight reduction and exercise also help to prevent long-term complications and permit a healthier and more active lifestyle.

It is difficult to predict the GI of a food without specifically testing it, but there are some general factors that can be recognized. Fiber content tends to reduce the GI of a food, presumably by slowing down digestion. For this reason, whole grains usually have a lower GI score than refined, processed grains. Fat content also reduces GI score. Simple carbohydrates (such as sugar) often have a higher GI score than complex carbohydrates (such as brown rice).

However, there are numerous exceptions to these rules. Factors such as the acid content of food, the size of the food particles, and the precise mixture of fats, proteins, and carbohydrates can substantially change the GI measurement. For a measurement like the GI to be meaningful, it has to be generally reproducible among people. In other words, if a potato has a GI of 93 in one person, it should have nearly the same GI when given to another person. Science suggests that the GI passes this test. The GI of individual foods is fairly constant among people, and even mixed meals have a fairly predictable effect according to most studies.

Thus, the GI of a food really does indicate its propensity to raise insulin levels. Whether a diet based on the index will aid in weight loss, however, is a different issue.

Following a Low-Glycemic-Index Diet

Following a low-GI diet is fairly easy. Basically, one should follow the typical diet endorsed by authorities such as the American Dietetic Association, but in doing so, one should choose carbohydrates that fall toward the lower end of the GI scale. Popular books such as *The Glucose Revolution* (1999) give a great deal of information on how to make these choices.

Do Low-Glycemic-Index Diets Aid in Weight Loss?

There are two primary theoretical reasons given why low-GI diets should help reduce weight. The most prominent reason given in books on the low-GI approach involves insulin levels. Basically, these books show that low-GI diets reduce insulin release, and then take almost for granted the idea that reduced insulin levels should aid in weight loss. However, there is little justification for the second part of this argument. Excess weight is known to lead to elevated insulin levels, but there is little meaningful evidence for the reverse: that reducing insulin levels will help remove excess weight.

Books on the low-GI diet give another reason for using their approach. They state that low-GI foods fill a person up more quickly than do high-GI foods and that they also keep one feeling full for longer. However, there is more evidence against this belief than for it.

The satiety index. A measurement called the satiety index assigns a numerical quantity to the filling quality of a food. These numbers are determined by feeding people fixed caloric amounts of those foods and then determining how soon they get hungry again and how much they eat at subsequent meals. The process is similar to the methods used to establish the GI index.

The results of these measurements do not corroborate the expectations of low-GI diet proponents. As it happens, foods with the worst (highest) GI index are often the most satiating, exactly the reverse of what low-GI-theory proponents would say. For example, the satiety index claims that potatoes are among the most satiating of foods. However, the GI analysis gave potatoes a bad rating. According to the low-GI theory, one should feel hunger pangs shortly after eating a big baked potato. In real life, this does not happen.

There are numerous other contradictions between research findings and the low-GI/high-satiety theory. For example, one study found no difference in satiety between fructose (fruit sugar) and glucose when taken as part of a mixed meal, even though fructose has a GI more than four times lower than glucose.

Some studies do seem to suggest that certain low-GI foods are more filling than high-GI foods. However, in these studies the bulkiness and lack of palatability of the low-GI foods chosen may have played a more important role than the foods' GI. Thus, the satiety argument for low-GI diets does not appear to hold up to scrutiny.

Is the Glycemic Index the Right Measurement?

There is another problem with the low-GI approach: It is probably the wrong way to assess the insulin-related effects of food. The GI measures blood sugar response per gram of carbohydrate contained in a food, not per gram of the food. This leads to some odd numbers. For example, a parsnip has a GI of 98, almost as high as pure sugar. If taken at face value, this figure suggests that dieters should avoid parsnips. However, parsnips are mostly indigestible fiber, and a person would have to eat a few bushels to trigger a major glucose and insulin response.

The reason for the high number is that the GI rates the effects per gram of carbohydrate rather than per gram of total parsnip, and the sugar present in minute amounts in a parsnip itself is highly absorbable. The high GI rating of parsnips is thus extremely misleading. Books such as *The Glucose Revolution* address issues like this on a case-by-case basis by arguing, for example, that one can consider most vegetables "free foods" regardless of their GI. In fact, the same considerations apply to all foods and distort the meaningfulness of the scale as a whole.

A different measurement, the glycemic load (GL), takes this into account. The GL is derived by multiplying the GI by the percent carbohydrate content of a food. In other words, it measures the glucose/insulin response per gram of food rather than per gram of carbohydrate in that food. Using this system, the GL of a parsnip is 10, while glucose has a relative load of 100. Also, the GL of a typical serving of potato is only 27.

Scientific Evidence

Theory is one thing and practice is another. It is certainly possible that making sure to focus on low-GI or low-GL foods will help a person lose weight, even if the theoretical justification for the idea is weak. However, there is only preliminary positive evidence to support this possibility, and the largest and longest-term trial failed to find benefit.

In one of the positive studies, 107 overweight adolescents were divided into two groups: a low-GI group and a low-fat group. The low-GI group was counseled to follow a diet consisting of 45 to 50 percent carbohydrates (preferably low-GI carbohydrates), 20 to 25 percent protein, and 30 to 35 percent fat. Calorie restriction was not emphasized. The low-fat group received instructions for a standard low-fat, low-calorie diet divided into 55 to 60 percent carbohydrates, 15 to 20 percent protein, and 25 to 30 percent fat. In about four months, participants on the low-GI diet lost about 4.5 pounds, while those on the standard diet lost just under 3 pounds.

This study does not say as much about the low-GI approach as it might seem. Perhaps the most obvious problem is that the low-GI diet used here was also a high-protein diet. It is possible that high-protein diets might help weight loss regardless of the GI of the foods consumed. (In fact, this is precisely what proponents of high-protein diets claim.)

Another problem is that participants were not assigned to the two groups randomly. Rather, researchers consciously picked what group each participant should join. This is a major flaw because it introduces the possibility of intentional or unintentional bias. It is quite possible, for example, that researchers placed adolescents with greater self-motivation into the low-GI group, based on an unconscious desire to see results from the study. This is not an academic problem, and modern medical studies always use randomization to circumvent it.

Finally, researchers made no effort to determine how well participants followed their diets. It might be that those in the low-fat diet group simply did not follow the rules as well as those in the low-GI diet group because the rules were more challenging. Despite these many flaws, the study results are still promising. Losing weight without deliberately cutting calories is potentially a great thing.

In another study, thirty overweight women with excessively high insulin levels were put on either a normal low-calorie diet or one that supplied the same amount of calories but used low-GI foods. The results during twelve weeks showed that women following the low-GI diet lost several pounds more than those following the normal diet.

In yet another small study, this one involving overweight adolescents, a conventional reduced-calorie diet was compared with a low-GL diet that did not have any calorie restrictions. The results showed that simply by consuming low-GI foods, without regard for calories, the participants on the low-GI diet were able to lose as much or more weight as those on the low-calorie diet.

However, in a large and long-term study, an eighteen-month trial of 203 Brazilian women, the use of a low-GI diet failed to prove more effective than a high-GI diet. Additionally, a smaller study failed to find a low-GI diet more effective for weight loss than a low-fat diet except in people with high levels of circulating insulin.

Possible Health Benefits

There is some evidence that a low-GI diet (or, even better, a low-GL diet) might help prevent cancer and heart disease. The low-GI approach has also shown promise for preventing or treating diabetes.

Heart disease prevention. One large observational study evaluated the diets of more than 75,000 women and found that those women whose diets provided a lower GL had a lower incidence of heart disease. In this study, 75,521 women age thirty-eight to sixty-three years were followed for ten years. Each filled out detailed questionnaires regarding her diet. Using this data, researchers calculated the average GL of each participant. The results showed that women who consumed a diet with a high GL were more likely to experience heart disease than those who consumed a diet of low GL.

Other observational studies suggest that the consumption of foods with lower GL may improve cholesterol profile: specifically, reduced triglyceride levels and higher HDL (good cholesterol) levels. These effects, in turn, might lead to decreased risk of heart disease. However, other observational studies have found little or no relationship between heart disease and GI or GL.

These contradictory results are not surprising, but even if the observational study results were entirely consistent, it would not prove the case for a low-GI approach. Conclusions based on observational studies are notoriously unreliable because of the possible presence of unidentified confounding factors. For example, because there is an approximate correlation between fiber in the diet and GL, it is possible that benefits, when seen, are from fiber intake instead. Factors such as this one may easily obscure the effects of the factor under study, leading to contradictory or misleading results.

Intervention trials (studies in which researchers actually intervene in participants' lives) are more reliable, and some have been conducted to evaluate the low-GI diet. For example, in the foregoing large weight-loss trial, the low-GI diet failed to prove more effective than a high-GI diet in terms of weight loss. The results did suggest, though, that a low-GI diet can improve cholesterol profile. However, this study was not primarily designed to look at effects on cholesterol.

A study that primarily focused on this outcome followed thirty people with high lipid levels for three months. During the second month, low-GI foods were substituted for high-GI foods, while other nutrients were kept similar. Improvements were seen in total cholesterol, LDL (bad) cholesterol, and triglycerides, but not in HDL. A close analysis of the results showed that only participants who had high triglycerides at the beginning of the study showed benefit. Another

controlled trial found that a high carb, low-GL diet optimized lipid profile compared with several other diets. However, another study found that low-fat and low-GI diets were about equally effective in terms of profile.

Another approach to the issue involves analysis of effects on insulin resistance. Evidence suggests that increased resistance of the body to its own insulin raises the risk of heart disease. One study found that the use of a low-GI diet versus a high-GI diet improved the body's sensitivity to insulin in women at risk for heart disease. Similar results were seen in a group of people with severe heart disease and in healthy people. While these results are preliminary, taken together they do suggest that consumption of low-GI foods might have a beneficial effect on heart disease risk.

Low-GL diet and diabetes. Two large observational studies, one involving men and the other involving women, found that diets with lower GLs were associated with a lower rate of diabetes. For example, one trial followed 65,173 women for six years. Women whose diets had a high GL had a 47 percent increased risk of developing diabetes compared with those whose diets had the lowest GL. Fiber content of diet also makes a difference. People who consumed a diet that was both low in fiber and high in GL had a 250 percent increased incidence of diabetes.

However, as always, the results of these observational studies have to be taken with caution. It is quite possible that unrecognized factors are responsible for the results seen. For example, magnesium deficiency is widespread and may contribute to the development of diabetes; whole grains contain magnesium and are also low-GI foods. Therefore, it could be that the benefits seen in these studies are actually caused by increased magnesium intake in the low-GI group, rather than by effects on blood sugar and insulin.

Furthermore, one observational study found no connection between the glycemic values of foods and the incidence of diabetes. Another observational study did find a correlation between carbohydrate intake (especially pastries) and the onset of diabetes, but no consistent relationship with GI. Other studies have found no relationship between sugar consumption (a high-GI food) and diabetes onset.

Thus, reducing dietary GL may help prevent diabetes, but this is not known for sure. Whether or not low-GI diets can prevent diabetes, going on a low-GI diet might improve blood sugar control for people who already have diabetes. However, the benefits seem to be small at most.

Other Uses and Applications

Weak evidence hints that a low-GI diet might help prevent macular degeneration. Although there are theoretical reasons to believe that the use of white sugar and other high-GI foods might promote colon cancer, a large observational study failed to find any association between colon cancer rates and diets high in sugar, carbohydrates, or GL.

It has been proposed that low-GI foods may enhance sports performance. One study involving a simulated sixty-four-kilometer bicycle race found no performance differences between the use of honey (low GI) and the use of dextrose (high GI) as a carbohydrate source. However, another study did find benefit with the consumption of a low-GI snack before endurance exercise. Finally, one study compared a low-GL diet with a high-carb diet in people with acne and found evidence that the low-GL diet reduced acne symptoms.

Conclusion

The evidence that a low-GI diet will help one lose weight is not impressive. Its theoretical foundation is weak, and it appears to be using the wrong method of ranking foods regarding their effects on insulin. Conversely, however, there is no reason to believe a low-GI diet causes harm.

While the most popular low-GI-diet books, such as *The Glucose Revolution* and *Sugar Busters* (1995), recommend a diet that is generally reasonable and should be safe, it is easy to design some fairly extreme low-GI diets. For example, a diet consisting of nothing but lard would be a very, very low-GI diet, because the GI of lard is 0. Although it no longer seems that saturated fat is as harmful as it was once thought to be, a pure lard diet is probably not a good idea. Any diet book or other source that recommends achieving a low GI by consuming an extreme diet should be approached with caution.

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Further Reading

Chiu, C. J., et al. "Dietary Glycemic Index and Carbohydrate in Relation to Early Age-Related Macular Degeneration." *American Journal of Clinical Nutrition* 83 (2006): 880-886.

Clapp, J. F., and B. Lopez. "Low- Versus High-Glycemic Index Diets in Women: Effects on Caloric Requirement, Substrate Utilization, and Insulin Sensitivity." *Metabolic Syndrome and Related Disorders* 5 (2007): 231-242.

Ebbeling, C. B., et al. "Effects of a Low-Glycemic Load vs Low-Fat Diet in Obese Young Adults." *Journal of the American Medical Association* 297 (2007): 2092-2102.

Noakes, M., et al. "The Effect of a Low Glycaemic Index (GI) Ingredient Substituted for a High GI Ingredient in Two Complete Meals on Blood Glucose and Insulin Levels, Satiety, and Energy Intake in Healthy Lean Women." *Asia Pacific Journal of Clinical Nutrition* 14, suppl. (2005): S45.

Pittas, A. G., et al. "The Effects of the Dietary Glycemic Load on Type 2 Diabetes Risk Factors During Weight Loss." *Obesity* 14 (2006): 2200-2209.

Smith, R. N., et al. "A Low-Glycemic-Load Diet Improves Symptoms in Acne Vulgaris Patients." *American Journal of Clinical Nutrition* 86 (2007): 107-115.

Tavani, A., et al. "Carbohydrates, Dietary Glycaemic Load, and Glycaemic Index, and Risk of Acute Myocardial Infarction." *Heart* 89 (2003): 722-726.

Wu, C. L., and C. Williams. "A Low Glycemic Index Meal Before Exercise Improves Endurance Running Capacity in Men." *International Journal of Sport Nutrition and Exercise Metabolism* 16 (2006): 510-527.

See also: Diet-based therapies; Low-carbohydrate diet.

Lupus

Related terms: SLE, systemic lupus erythematosus

Category: Condition

Definition: Treatment of an autoimmune disease in which antibodies develop to fight foreign substances in the body.

Principal proposed natural treatment: Dehydroepiandrosterone

Other proposed natural treatments: Beta-carotene, *Cordyceps*, fish oil, flaxseed, food allergen identification and avoidance, magnesium, pantothenic acid, selenium, vitamin B_3, vitamin B_{12}, vitamin E

Natural Product to Avoid: Alfalfa

Introduction

Systemic lupus erythematosus (also known as lupus or SLE) is an autoimmune disease that primarily affects young and middle-aged women. Its cause is unknown but is believed to involve both genetic inheritance and factors in the environment. Whatever the cause, people with lupus develop antibodies against substances in their own bodies, including deoxyribonucleic acid (DNA). These antibodies cause widespread damage and are believed to be primarily responsible for the many symptoms of this disease.

Lupus may begin with such symptoms as fatigue, weight loss, fever, malaise, and loss of appetite. Other common early symptoms include muscle pain, joint pain, and a facial rash. As lupus progresses, symptoms may develop in virtually every part of the body. Kidney damage is one of the most devastating effects of lupus, but many other serious problems may develop, including seizures, mental impairment, anemia, and inflammation of the heart, blood vessels, eyes, and digestive tract.

Conventional treatment for lupus centers on a variety of anti-inflammatory drugs. In mild cases, taking nonsteroidal anti-inflammatory drugs (NSAIDs) may help; more severe forms of lupus require long-term use of corticosteroid anti-inflammatory drugs such as prednisone. The side effects of these medications can be quite serious themselves. Cytotoxic agents (azathioprine, cyclophosphamide, and chlorambucil) might also be helpful, but they too have many side effects. Close physician supervision is always required with lupus because of the risk of complications in so many organs.

Principal Proposed Natural Treatments

A meaningful body of evidence indicates that the hormone dehydroepiandrosterone (DHEA) may be helpful for the treatment of lupus when used as part of a comprehensive, physician-directed treatment approach. DHEA is the most abundant steroid hormone found in the bloodstream. The body uses DHEA as the starting material for making the sex hormones testosterone and estrogen. DHEA has been tried as a treatment for a variety of medical conditions, including osteoporosis, but it is showing its greatest promise in the treatment of lupus.

A twelve-month, double-blind, placebo-controlled trial of 381 women with mild or moderate lupus

Treating Lupus

Because of the nature and cost of the medications used to treat lupus and because of the potential for serious side effects, many persons seek other ways of treating the disease. Some alternative approaches include special diets, nutritional supplements, fish oils, ointments and creams, chiropractic treatment, and homeopathy. Although these methods may not be harmful in and of themselves and may be associated with symptomatic or psychosocial benefit, no research to date shows that they affect the disease process or prevent organ damage.

Some alternative or complementary approaches may help the patient cope or reduce some of the stress associated with living with a chronic illness. If the doctor feels the approach has value and will not be harmful, it can be incorporated into the patient's treatment plan. However, it is important not to neglect regular health care or treatment of serious symptoms. An open dialogue between patient and doctor about the relative values of complementary and alternative therapies enables the patient to make an informed choice about treatment options.

evaluated the effects of DHEA at a dose of 200 milligrams (mg) daily. Although many participants in both groups improved (the power of placebo is often amazing), DHEA was more effective than placebo, reducing many symptoms of the disease.

Similarly, in a double-blind, placebo-controlled study of 120 women with lupus, the use of DHEA at a dose of 200 mg daily significantly decreased symptoms and reduced the frequency of disease flare-ups. A smaller study found equivocal evidence that a lower dose of DHEA (30 mg daily for women older than age forty-five years and 20 mg daily for women aged forty-five years) might also work.

A 2007 review of all published studies concluded that the use of DHEA may meaningfully improve quality of life in the short term for people with lupus, but that it probably does not alter the long-term course of the disease.

Other Proposed Natural Treatments

Flaxseed contains lignans and alpha-linolenic acid, substances with a wide variety of effects in the body. In particular, flaxseed may antagonize the activity of a substance called platelet-activating factor (PAF) that plays a role in lupus kidney disease (lupus nephritis). Preliminary evidence suggests that flaxseed might help prevent or treat lupus nephritis.

Fish oil contains omega-3 fatty acids, which have some anti-inflammatory effects. Fish oil has been found useful in rheumatoid arthritis, a disease related to lupus. The results of two small double-blind studies suggest that fish oil might also be useful for lupus. However, evidence suggests that fish oil is not effective for lupus nephritis.

Other treatments sometimes recommended for lupus include beta-carotene, *Cordyceps*, magnesium, selenium, vitamin B_3, vitamin B_{12}, vitamin E, pantothenic acid, and food allergen identification and avoidance. However, there is no meaningful evidence that these treatments work for lupus. Another study failed to find copper supplements helpful for lupus symptoms.

Herbs and Supplements to Avoid

The herb alfalfa contains a substance called L-canavanine, which can worsen lupus or bring it out of remission. People with lupus should avoid alfalfa entirely. Also, various herbs and supplements may interact adversely with drugs used to treat lupus.

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Further Reading

Chang, D. M., et al. "Dehydroepiandrosterone Treatment of Women with Mild-to-Moderate Systemic Lupus Erythematosus." *Arthritis and Rheumatism* 46 (2002): 2924-2927.

Crosbie, D., et al. "Dehydroepiandrosterone for Systemic Lupus Erythematosus." *Cochrane Database of Systematic Reviews* (2007): CD005114. Available through *EBSCO DynaMed Systematic Literature Surveillance* at http://www.ebscohost.com/dynamed.

Duffy, E. M., et al. "The Clinical Effect of Dietary Supplementation with Omega-3 Fish Oils and/or Copper in Systemic Lupus Erythematosus." *Journal of Rheumatology* 31 (2004): 1551.

Nordmark, G., et al. "Effects of Dehydroepiandrosterone Supplement on Health-Related Quality of Life in Glucocorticoid Treated Female Patients with Systemic Lupus Erythematosus." *Autoimmunity* 38 (2005): 531-540.

See also: Corticosteroids; Dehydroepiandrosterone (DHEA); Fatigue; Fibromyalgia: Homeopathic remedies;

Nonsteroidal anti-inflammatory drugs (NSAIDs); Weight loss, undesired; Women's health.

Lust, Benedict

Category: Biography
Identification: German cofounder of naturopathic medicine
Born: February 3, 1872; Michelbach, Germany
Died: September 5, 1945; Butler, New Jersey

Overview

German natural medicine proponent Benedict Lust cofounded naturopathic medicine, which focuses on using natural remedies and the body's natural ability to heal and maintain itself. Lust has been referred to as the founder of naturopathy in the United States.

Lust worked as a professional waiter for many years in several countries (including Germany, Switzerland, and the United States) until he became sick with what he self-diagnosed as tuberculosis. Upon being struck ill, he decided to return to Germany to be treated by a religious leader—Father Sebastian Kneipp—who also was one of the founders of the naturopathic medicine movement. After being treated for some time, Lust claimed that his health had improved dramatically. The recovery turned him into a strong believer and proponent of natural medicine.

Kneipp advised Lust to return to the United States to spread the ideas of the homeopathic movement. Upon returning to the United States, Lust opened a health food store and eventually began publishing multiple magazines that advocated practices associated with natural medicine. Later, he formally studied the principles of homeopathy, and in 1901, he obtained a degree from the New York Homeopathic Medical College. The following year, he obtained a degree in osteopathy from the Universal College of Osteopathy in New York.

Upon completing his formal education, Lust decided to purchase the rights to the term "naturopathy" from John Scheel, a German physician and homeopath who first coined the term around 1895. Lust subsequently opened the first medical school in the world devoted to naturopathy, which he named the American School of Naturopathy. Some years later he also established the American Naturopathic Association, which reportedly was the first professional organization for naturopathic practitioners in the United States. Lust continued to publish several works on naturopathy, including a magazine called *Nature's Path* and the collection *Universal Naturopathic Encyclopedia* (1918), which outlined drugless forms of therapy.

Lust was scrutinized for his beliefs by many of his colleagues during his formal education, and well into his career. He was arrested more than one dozen times for his approach to natural healing, which often involved spa treatments (such as massage and sunbathing) in the nude at his established health spas.

Brandy Weidow, M.S.

Further Reading

Kirchfeld, Friedhelm, and Wade Boyle. *Nature Doctors: Pioneers in Naturopathic Medicine.* 2d ed. Portland, Ore.: NCNM Press, 2005.

Lust, Benedict. *Collected Works of Dr. Benedict Lust: Containing the Works "Yungborn," "The Life and Times of Dr. Benedict Lust," and "Pilgrimages to the Great Masters."* East Wenatchee, Wash.: Healing Mountain, 2006.

Lust, Benedict, and Jared Zeff. *Collected Works of Benedict Lust ND, Founder of Naturopathic Medicine.* Edited by Anita Boyd and Eric Yarnell. East Wenatchee, Wash.: Healing Mountain, 2006.

See also: Biologically based therapies; Naturopathy; Osteopathic manipulation; Thomson, Samuel.

Lutein

Category: Functional foods
Definition: Natural substance promoted as a dietary supplement for specific health benefits.
Principal proposed uses: None
Other proposed uses: Atherosclerosis, cataracts, macular degeneration, retinitis pigmentosa

Overview

Lutein, a chemical found in green vegetables, is a member of a family of substances known as carotenoids. Beta-carotene is the best-known nutrient in this class. Like beta-carotene, lutein is an antioxidant that protects cells against damage caused by dangerous, naturally occurring chemicals known as free radicals.