Diet Reviews

From bookstores to social media to blogs, there's no shortage of information on diet. So how to differentiate what "works" from an overhyped fad?

It's important to remember that even if a particular diet may be successful for one person, it may not be effective for another due to individual differences in genes and lifestyle. And while research shows that calories matter, focusing on

food quality is an equally important part of preventing weight gain and promoting weight loss. Diets are also more likely to be successful when they are easier to follow, so tailoring a strategy to suit your own lifestyle is key.

Still, when faced with the seemingly endless promotion of weight-loss strategies and diet plans, it helps to see what evidence is supporting them. In this series, we take a look at some popular diets and approaches to eating—and review the research behind them.

Diet Review: Anti-Inflammatory Diet

Finding yourself confused by the seemingly endless promotion of weight-loss strategies and diet plans? In this series, we take a look at some popular diets—and review the research behind them.

What Is It?

An anti-inflammatory diet is promoted as a remedy to battle inflammation in the body. A common belief is that "inflammation" is always bad. Although it produces unpleasant side effects, inflammation is actually a healthy

response by our immune system. When a foreign invader enters the body such as bacteria, viruses, or allergens, or an injury occurs, our immune cells act quickly. We may sneeze or cough to rid the body of an offending agent. We may feel pain and swelling at the site of a cut or injury to signal us to be gentle with this delicate area. Blood flows in rapidly, which may produce warmth or redness. These are signs that our immune system is repairing damaged tissue or fighting invaders. As healing takes place, inflammation gradually subsides.

Inflammation becomes harmful when it is prolonged and begins to damage healthy cells, creating a pro-inflammatory state. Another problem is due to genetic deviants causing the body's immune system to constantly attack cells. This sometimes occurs with autoimmune disorders like lupus, fibromyalgia, multiple sclerosis, rheumatoid arthritis, type 1 diabetes, and Crohn's disease. Sometimes an unhealthy lifestyle from lack of exercise, high stress, and calorie-rich diets can trigger chronic low levels of inflammation throughout the entire body, termed metaflammation. [1,2] This type of low-grade inflammation does not usually produce noticeable symptoms, but over time metaflammation can pave

the pathway for chronic conditions like cardiovascular disease, non-alcoholic fatty liver disease, type 2 diabetes, Alzheimer's disease, and certain cancers (e.g., breast, colon).

Anti-inflammatory diets may be promoted for these inflammatory conditions. They include several foods that are believed to interfere with the inflammatory process, though research on its exact mechanism is not conclusive. There is no single anti-inflammatory diet plan. Generally it emphasizes eating a wide variety of fruits and vegetables, unsaturated fats, minimally refined whole grains, tea, coffee, herbs, spices, and oily fish. The Mediterranean diet and DASH diet are popular dietary plans that already showcase many anti-inflammatory foods.

An anti-inflammatory diet plan not only highlights specific foods and food groups but limits other foods that may contribute to metaflammation such as fatty cuts of red meat, refined sugary foods and beverages, and excess alcohol.

How It Works

An anti-inflammatory diet does not follow strict rules about calories or portion sizes. It suggests a variety of

anti-inflammatory foods to eat daily, rather than focusing on eating one or two specific foods or nutrients. This ensures a greater variety of protective food components, some of which may work synergistically to boost immunity. These foods provide plant chemicals (phytochemicals), antioxidants, and fiber that prevent cellular stresses, inhibit inflammatory signals caused by the immune system, promote healthy gut microbiota, and slow down digestion to prevent surges in blood glucose. [3] They may also favorably affect the composition of fat cells to further reduce inflammation.

Examples of anti-inflammatory foods:

- Fruits
- Vegetables
- High-fiber whole grains
- Legumes
- Monounsaturated fats (avocados, olive oil, nuts, nut butters, seeds)
- Polyunsaturated omega-3 fats (walnuts, flaxseeds, chia seeds, and aquatic foods including salmon, herring, sardines, mackerel)
- Tea
- Coffee
- Dark chocolate with at least 70% or higher cocoa solids
- Herbs, spices (turmeric, ginger)
- Moderate amounts of alcohol (wine, beer)

Examples of inflammatory foods to limit:

- Sweetened beverages like soda, juice drinks, iced tea
- An excess of refined carbohydrate foods like white bread, pasta, rice

- Fried foods
- Processed high-fat meats like bacon, sausage, hot dogs
- Saturated fats like full-fat dairy from cream and butter, partially hydrogenated oils, fatty cuts of meat and poultry
- Excess alcohol

Other factors aside from diet may help to control inflammation, such as exercising regularly, controlling stress, and getting enough sleep.

The Research So Far

Most available research focuses on foods and dietary patterns that are associated with metaflammation, which in turn helps to determine the components of an anti-inflammatory diet. Metaflammation is especially associated with Western-type dietary patterns high in processed meats, saturated fat, refined sugars, salt, and white flour while being low in fiber, nutrients, and phytochemicals. [1,4] These diets also tend to be calorie-dense with a high glycemic load, potentially leading to blood sugar surges, insulin resistance, and excess weight gain. Studies have shown that Western diets are associated with increased blood markers of inflammation, though the connection may be due to a string of events rather than one direct action. [1] For example, exposure to air pollution and chronic mental stress can lead to an excess of free radicals

produced in the body, which then oxidize and damage other molecules. Atherosclerosis is one condition in which these free radicals oxidize LDL cholesterol particles. The actions of both oxidized LDL cholesterol and several types of immune cells form lesions and plaque in the heart arteries that can lead to ischemic heart disease (a type of heart disease caused by narrowed or partially blocked arteries). [5] A long-term diet that is high in saturated fat and cholesterol may raise LDL levels, increasing the risk of free radical action that may promote this immune response, which partially contributes to a chronic low-level proinflammatory state.

A major cause of low-level inflammation is the build-up of fatty acids in fat tissue (and other tissues) promoted by a high-fat or high-sugar diet. This may cause fat tissue to send signals to immune cells that produce inflammation in various areas, including organs like the pancreas. An inflamed pancreas can then lead to insulin resistance and diabetes. Therefore, the combination of carrying extra body fat (obesity) and eating a diet high in saturated fat and refined sugars increases the risk of cell damage because of increased immune cell activity.

An anti-inflammatory diet contains foods rich in nutrients, fiber, and phytochemicals and limits foods found in a typical Western diet to help reduce oxidative stress and inflammation. There is also emerging research studying the effects of high-fiber plant-rich diets that support a greater diversity of beneficial gut microbes, which may prevent a condition called metabolic endotoxemia. This is a low-grade inflammation that occurs because of an increase in the number of endotoxins, which are believed to cause the inflammation associated with metabolic diseases like cardiovascular disease and type 2 diabetes. [6,7]

- A randomized trial of participants at risk for cardiovascular disease found that a Mediterranean diet with an emphasis on fresh fruits, vegetables, legumes, nuts, seafood, and olive oil significantly decreased several markers of inflammation compared with a low-fat diet. [8,9]
- There are currently no standardized dietary guidelines for rheumatoid arthritis, an autoimmune disease that causes inflammation of joints and breakdown of bone and cartilage. A vegan diet, Mediterranean diet, and

elimination diet (avoiding certain food allergens) have been shown in some studies to suppress pro-inflammatory cells and improve symptoms in patients with rheumatoid arthritis. [10] Patients tend to report worse symptoms when eating certain foods like red meat, alcohol, and soda, whereas fish and berries are reported to improve symptoms. [11] The Anti-inflammatory Diet In Rheumatoid Arthritis randomized controlled crossover trial examined patients with rheumatoid arthritis who were assigned to either a diet with anti-inflammatory foods or a control diet for 10 weeks. [11] After a 4-month washout period, the participants switched diets. The study found that the disease activity score significantly decreased during the anti-inflammatory diet intervention period.

- Vegetarian diets are based on large amounts of whole grains, fruits, vegetables, legumes, and nuts. A meta-analysis of 17 observational cross-sectional studies found that following a vegetarian diet (including vegan diets with no animal foods and lacto-ovo-vegetarian diets with eggs and dairy) for at least 2 years was associated with lower C-reactive protein levels, a pro-inflammatory marker, than in omnivores who had no dietary restrictions. [12]
- The MIND diet, a hybrid of the DASH and Mediterranean diets, is an anti-inflammatory eating plan that includes whole grains, vegetables especially green leafy types, berries, olive oil, beans, nuts, fish and poultry, and limits fried/fast food, butter, cheese, sweets, and red meat. The MIND diet was found to significantly reduce the incidence of Alzheimer's disease, a chronic pro-inflammatory condition, in a cohort of 923 older adults. Those who followed the diet the most closely showed a 53% reduced rate of the disease, but even those who followed the diet moderately had a 35% reduced rate. [13]
- Two different studies following three large cohorts (Nurses' Health Study I and II and the Health Professionals Follow-up Study) rated the participants' diets using a dietary inflammatory pattern score. [14,15] These scores were defined based on levels of several inflammatory markers in the body including C-reactive protein. Inflammatory foods included red, processed, and organ meats; refined carbohydrates; and sweetened beverages. Anti-inflammatory foods included green leafy and dark yellow vegetables, whole grains, fruit, tea, and coffee. The studies found that when comparing participants with the highest to lowest inflammatory diet scores, the highest scores were associated with an

increased risk of cardiovascular disease and twice the risk of type 2 diabetes.

- Large cohort studies following men and women in the Health Professionals Follow-up Study and Nurses Health Studies found an increased risk of Crohn's disease and colorectal cancer in persons who ate diets highest in inflammatory foods. [16,17] A validated score called the Empirical Dietary Inflammatory Pattern (EDIP) was created that measured markers of inflammation in the blood such as C-reactive protein and tumor necrosis factor in relation to eating certain foods. [18] A high EDIP score indicated a proinflammatory diet, which was associated with higher intakes of total calories, red meat, refined grains, and soda. Lower scores indicated an anti-inflammatory diet, which was associated with intakes of leafy green vegetables, dark yellow vegetables, coffee, and tea.

Inflammation and the leaky gut

The research is still young, but rapidly growing evidence suggests a connection between our microbiome and various diseases and disorders. Abnormal levels of bacteria found in areas of the body where they should not be, termed dysbiosis, and increased intestinal permeability (sometimes referred to as "leaky gut") that allows bacteria to travel or "leak" from the gut into the bloodstream have been observed in inflammatory conditions like rheumatoid arthritis, [19] Hashimoto thyroiditis, [20] celiac disease, [21,22] Crohn's disease, [22] multiple sclerosis, [23] obesity, [24,25] and non-alcoholic fatty liver disease, [26] as well as major depression. [27] The small and large intestines of the digestive tract are lined with a layer of epithelial cells that create a barrier of

tight junctions, which prevents bacterial translocation. Bacterial translocation occurs when not only bacteria but viruses, toxins, and allergens in the gut escape into the bloodstream and the rest of the body. [22] If translocation occurs, inflammation or disease may develop. This intestinal barrier also regulates various immune functions by sending signals to immune cells. Beneficial bacteria naturally live in the gut, and any abnormal changes in the amount or type of these microbes (for example due to chronic stress or the use of medications like antibiotics or non-steroidal anti-inflammatory drugs) can change the intestinal barrier, lowering its immune defense system and increasing the risk of disease. However, it is not yet clear of the initial trigger for dysbiosis: leaky gut causing the disease/inflammation, or vice versa.

The most common causes of leaky gut are drug abuse and food toxins (for example, gluten acting as a toxin in susceptible people with celiac disease). Certain nutrients, such as the amino acids glutamine and tryptophan, have been shown in clinical trials to decrease intestinal permeability by improving the tight junctions. [28] Fiber in the diet can improve the diversity of bacteria in the gut that increases production of short chain fatty acids and other beneficial metabolites, which in turn strengthens the intestinal barrier. Foods rich in prebiotics and probiotics, and probiotic supplements, are also being studied. Much more research is needed to confirm the relationship of dysbiosis and inflammatory conditions, and potential treatments.

Potential Pitfalls

- The anti-inflammatory diet is flexible in that it does not include rigid meal plans. However, this requires people to plan their own meals and find recipes incorporating foods on the plan. People who are not used to meal planning or cooking may need more specific guidance.

- Calorie levels and portion sizes are not highlighted on this plan, so it is possible to gain weight if excessive portions are consumed.

Bottom Line

An anti-inflammatory diet is a healthful eating plan that may help to reduce chronic low levels of inflammation that otherwise might increase the risk of various chronic diseases. Although research is limited, it may also help to lower inflammatory markers in individuals with autoimmune-type inflammation such as with rheumatoid arthritis. Popular dietary patterns that are anti-inflammatory include the Mediterranean diet, DASH diet, and vegetarian diets. People may seek the guidance of a registered dietitian familiar with any of these dietary patterns to assist with meal planning and appropriate portion sizes. Along with the diet, it is important to incorporate other healthy lifestyle factors that positively affect the body's immune response, such as practicing stress reduction, exercising regularly, and getting adequate sleep.

Clean Eating

Once just a buzzword, “clean eating” is now a popular eating style. What it means will depend on who you ask. The terms clean eating and clean diets are not federally regulated in the U.S., so interpretation by consumers and the marketing of “clean” products by the food industry can vary widely. Generally, clean eating is assumed to refer to foods that are as close to their natural state as possible, maybe organic, and most likely with minimal use of any chemical additives and preservatives. A clean diet may include whole fruits, vegetables, lean proteins, whole grains, and healthy fats while

limiting highly processed snacks and other packaged foods with added sugar and salt. It may also be associated with terms like plant-based, grass-fed, sugar-free, or gluten-free. In summary, clean eating seemingly promotes health and wellness.

The concept is popular among younger consumers active with social media, which is the prime platform for celebrities, bloggers, and other high-profile personalities who chronicle their clean eating meals and recipes. A survey of more than 1,200 participants ages 14-24 years found that 55% were familiar with the term clean eating from social media, other online sources, or their peers. [1]

A survey by the International Food Information Council (IFIC) helps to further define consumer beliefs about clean eating. It found that "clean eaters" eat foods that are not highly processed, such as fresh or organic fruits and vegetables, and food products with a short, simple ingredients list. [2]
Additional findings:

- Almost half of those surveyed considered themselves to be clean eaters, with "eating foods that aren't highly processed," "eating fresh produce," "eating organic foods," and "eating foods with a simple ingredients list" as the most cited definitions.

- 64% surveyed said they try to choose foods made with clean ingredients, defined as “not artificial or synthetic,” “organic,” “fresh,” or “natural.”

A Darker Side to Clean Eating

Clean eating can take on a different meaning when it introduces unrealistic expectations. In a survey of teenagers and young adults, though 71% defined clean eating as a healthy positive approach, a small percentage felt it was unhealthy due to its restrictive nature. [1] Because of its strong association with health, clean eating was viewed favorably according to another survey of college students even though it produced emotional distress (experiencing negative emotions if not able to follow the diet) and functional impairment (having a rigid eating schedule, ignoring natural hunger cues to eat more or less than is scheduled, interference with school work). [3] Some clean diets advise eliminating groups of foods like dairy, wheat, or refined sugars. The term “clean” also suggests that not following this pattern is “dirty,” which encourages food restrictions and a preoccupation with healthy eating. [1]

Although clean eating is not always focused on weight loss, it can mask symptoms of an eating disorder. When food restrictions are taken to an extreme to be “healthy,” clean eating can have negative health consequences that mirror

those of eating disorders like anorexia nervosa, such as osteoporosis, amenorrhea, difficulty concentrating, and depression. [3]

Orthorexia or Just Trying to Be Healthy?

Orthorexia nervosa (ON) is a term coined in 1997 by physician Steven Bratman, though it is not yet a diagnosis in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). Currently there is no universally shared definition of ON and the diagnostic criteria is debatable. It is a condition that exhibits extreme preoccupation with healthy eating, with a goal of trying to achieve dietary "purity" but which leads to distress, anxiety, or obsessive-compulsiveness. Whereas a condition like anorexia nervosa is centered on weight loss, ON is centered on a healthy diet. Some researchers believe that ON is an extreme variant of clean eating. It is the pursuit of control with clean eating and restraint from eating (whether it be amounts or certain types of foods) that can crossover from healthy eating behaviors into ON.

Suggested criteria in defining ON include: [4]

- Obsessional or pathological preoccupation with healthy nutrition

- Emotional consequences (e.g., distress, anxiety) of non-adherence to self-imposed nutritional rules
- Psychosocial impairments in relevant areas of life as well as malnutrition and weight loss

The most common warning signs of ON include experiencing anxiety around food, and impaired functioning that disrupts daily life. This may mean avoiding social events involving food because one cannot eat what is offered. ON often restricts certain foods and nutrients, which may lead to an imbalanced diet. Because it wears a mask of health and wellness, it is not easily recognized as problematic and does not carry the stigma of other eating disorders like bulimia or anorexia nervosa.

It is important to emphasize that it is not harmful to enjoy and seek out healthful foods and recipes. Our society praises and promotes healthy behaviors because of high rates of obesity and other chronic diseases. Changing dietary habits to reduce the risk of these diseases can feel empowering, because other factors like family history and genetic predisposition cannot be changed. A healthy lifestyle can protect from developing chronic conditions that might otherwise mean hospital visits and bills, which causes anxiety and stress.

Therefore, it may be difficult to distinguish ON from normal health-promoting behaviors. People at higher risk for ON tend to have a history of an eating disorder or obsessive-compulsive disorder, have perfectionistic tendencies, or are working in a health/wellness-related field. The following are examples of statements that may help differentiate healthy eating from ON.

Healthy Eating	Orthorexia Nervosa*
I plan out meals once a week so I can create a food shopping list and do meal prep for the upcoming week to save time later.	I spend more than 3 hours a day thinking about what I will eat and planning meals.
I am learning what foods are beneficial to my health and adding them to my diet, but I don't follow special rules and allow "junk" foods occasionally because I enjoy them.	I find that in order to eat healthfully, I am eliminating more foods and creating more food rules.
I value nutrition but if the food does not taste good, I likely will not eat it, as I know there are many different delicious, healthful foods from which to choose.	The nutritional value of my food is more important to me than how good it tastes.

Eating healthful foods often makes me feel better with greater energy and better digestion.	I feel better about myself and have more self-confidence when I eat very healthy foods.
I know that restaurant meals can be indulgent, but I order what I enjoy and eat it mindfully.	I have a hard time eating out because I often can't find anything on the menu that fits my diet.
I understand that I cannot always follow my usual healthy meal plan (such as when traveling with limited food choices), but I do the best I can to nourish myself with what is available.	I feel guilty, unclean, or anxious when I cannot follow my healthy meal plan.
I feel good about eating healthfully but it is not my main source of peace.	I feel at peace with myself and in total control when I eat healthfully.
The quality of my diet has improved, and it has enhanced my relationships, work, and school, as I have more energy and focus to work and am happier around my family and friends.	The quality of my diet has improved, but it has interfered with other areas of my life, such as my relationships, work, and school as it consumes much of my time and focus and I am spending less time with family and friends.

**Adapted from a self-test for ON created by Steven Bratman [5]*

The Instagram effect

There are more than 1 billion users globally on the social media platform Instagram, which was introduced in 2010. Each Instagram post is an image, photo, or short video, offering a quick easy way to share a user’s ideas, inspiration, and creativity. People ages 18-34 years represent the largest age group using Instagram. Research has shown potential negative effects of frequent users of this platform, including anxiety, depression, and negative body image due to social comparison when viewing the often picture-perfect images. One study

surveyed a group of young men and women with a mean age of 25 years, using a validated questionnaire to screen for orthorexia nervosa. The results showed that the higher the use of Instagram reported, the greater the tendency toward orthorexia nervosa, with a prevalence of 49%. [6] No other social media platform (Twitter, Facebook) showed this effect. This may be because Instagram is the channel of choice for the healthy eating community, where users post photos and videos about their meals, recipes for various diets, and exercise workouts.

The authors observed a potential risk from the Instagram feature in which users select accounts they wish to follow; if they choose mostly health and food-related accounts, they are constantly exposed to these ideas, potentially leading to the belief that extremes of healthy behaviors are normal and feeling increased pressure to emulate them. Sometimes celebrities and other “influencers” are perceived as authorities on health due to their physical appearance, which typically conforms with dominant societal beauty ideals, further encouraging users to follow their lead in health behaviors. Studies have shown that popular social media influencers such as these have a strong impact on their followers’ decisions and increasingly change their behaviors related to food choices and diet. [7]

Future Directions

> There are proposals for the Food and Drug Administration to provide clear industry guidance and enforce labeling laws to police deceptive “clean” labeling claims on food products. [8]

This may in turn help to reduce the use of unsupported health claims and protect vulnerable individuals such as those with disordered eating patterns.

Bottom Line

Clean eating can be a concept that promotes health and wellness by encouraging the selection of minimally processed fruits, vegetables, whole grains, healthy proteins, and healthy fats. However, it is an unregulated term, so the interpretation of what defines clean eating can vary widely, both among individuals and within the food industry that markets "clean" food products. Clean eating taken to an extreme has been associated with an increased risk of disordered eating patterns, such as orthorexia nervosa. If you feel increased anxiety around food and eating, avoid situations involving food, or have a preoccupation with food that interferes with daily activities, seek help from your doctor, a counselor, or a registered dietitian.

Diet Review: DASH

Finding yourself confused by the seemingly endless promotion of weight-loss strategies and diet plans? In this series, we take a look at some popular diets—and review the research behind them.

What Is It?

The DASH (Dietary Approaches to Stop Hypertension) diet is sometimes prescribed by doctors to help treat high blood pressure. Blood pressure is the amount of pressure that blood places against the walls of arteries. It will normally vary throughout the day but if it remains too high, this is called high blood pressure or hypertension. Untreated high blood

pressure can lead to heart disease, stroke, congestive heart failure, kidney disease, and blindness. [1]

DASH was first introduced at a meeting of the American Heart Association in 1996 and later published in the *New England Journal of Medicine* in 1997. [2] The DASH trial randomly assigned 456 people to different diets to test the effects of dietary patterns on lowering blood pressure. The authors surmised that eating a diet with many different foods with blood pressure-lowering nutrients would show a greater effect on blood pressure than eating single nutrients, such as found in supplements or in a limited diet. Three diets were tested: 1) a control diet, or a standard American diet, 2) a fruits and vegetables diet, similar to the control diet but providing more fruits and vegetables and less snacks and sweets, and 3) a combination diet rich in fruits, vegetables, nuts, and low-fat dairy foods with reduced amounts of saturated fat, total fat, and cholesterol. The last two diets were richer in nutrients associated with lower blood pressure, such as potassium, magnesium, calcium, fiber, and protein. All three diets provided about 3000 mg sodium, which is more than the recommended amount from the *Dietary Guidelines for*

Americans but less than the average sodium intake for Americans. [3]

Despite no weight changes, the combination diet reduced blood pressure more than the other two diets. Those with hypertension showed greater decreases in blood pressure than those without hypertension. The reduction of blood pressure in the DASH combination diet was comparable to that of people on medication for stage 1 hypertension.

The results of this landmark study contributed much of the scientific basis for the *Dietary Guidelines for Americans 2010* and later editions.

Podcast: Reduce Blood Pressure with the DASH Diet

Hear from Drs. Frank Sacks and Larry Appel about the origins of the DASH Diet in this True Health Initiative Podcast.

How It Works

DASH is based on the following foods: fruits, vegetables, low fat milk, whole grains, fish, poultry, beans, and nuts. It recommends reducing sodium, foods and beverages with added sugars, and red meat. The diet is heart-friendly as it limits saturated and trans fat, while increasing the intake of

potassium, magnesium, calcium, protein, and fiber, nutrients believed to help control blood pressure. [1]

The diet suggests a specific number of servings of the recommended foods listed above. The sample plans provided by the National Heart Lung and Blood Institute (NHLBI) are based on 1600, 2000, or 2600 calories daily. For 2000 calories a day, this translates to about 6-8 servings of grains or grain products (whole grains recommended), 4-5 servings vegetables, 4-5 fruits, 2-3 low fat dairy foods, 2 or fewer 3-ounce servings of meat, poultry, or fish, 2-3 servings of fats and oils, and 4-5 servings of nuts, seeds, or dry beans per week. It advises limiting sweets and added sugars to 5 servings or less per week. The plan defines the serving sizes of each these food groups.

Eating less carbohydrate but more protein or unsaturated fats may also benefit the heart. The OmniHeart (Optimal Macronutrient Intake Trial to Prevent Heart Disease) clinical trial found that swapping out about 10% of calories from carbohydrates with protein (especially plant proteins like legumes, nuts, seeds) or monounsaturated fats (olive oil, canola oil, nuts, seeds) lowered blood pressure, LDL cholesterol, and

triglycerides among adults with early or stage 1 hypertension. [4] Swapping carbohydrates specifically with unsaturated fats also helped to increase "good" HDL cholesterol. The benefit did not come from simply eating more fats and protein, but swapping an equal amount of calories so that the total calorie level stayed about the same. For 2000 calories a day, this translates to eating daily about 4-5 servings of whole grains, 5 servings of vegetables, 2-3 fruits, 2 low fat dairy foods, one 3-ounce serving of fish, poultry, or meat, and 2-3 servings of unsaturated fats, and eating weekly 7-8 servings of beans, nuts, or seeds.

To follow the plan, one must decide their calorie level and then divide the suggested servings of each food group throughout the day. This requires meal planning ahead of time. The NHLBI guide provides many tips on how to incorporate DASH foods and to lower sodium intake; a one-day sample menu following a 2300 mg sodium restriction and a 1500 mg sodium restriction; and one week's worth of recipes. The NHLBI also publishes an online database of "heart healthy" recipes.

Sample meal plan

This sample meal plan is roughly 2000 calories, the recommended intake for an average person. If you have higher calorie needs, you may add an additional snack or two; if you have lower calorie needs, you may remove a snack. If you have more specific nutritional needs or would like assistance in creating additional meal plans, consult with a registered dietitian.

Breakfast:

- 1 cup plain Greek lowfat yogurt sprinkled with cinnamon
- ¾ cup sliced strawberries
- 1 whole grain English muffin with mashed avocado

Snack: ¼ cup lightly salted or unsalted nuts

Lunch:

- Orange Chicken Salad – combine the following into a bowl:
    - 2 cups mixed salad greens with lemon vinaigrette dressing (mix together 2 tbsp olive oil, 1 tbsp lemon juice or vinegar, ½ teaspoon Dijon mustard, ½ teaspoon garlic powder, ¼ tsp black pepper)
    - 3 ounces chopped chicken breast
    - ½ cup canned chickpeas, drained and rinsed
    - 1 orange, separated into wedges

    - ½ avocado, diced

Snack: String cheese, medium apple

Dinner:

- 4 ounces baked tilapia or other white fish brushed with mixture of olive oil, lemon juice, oregano, parsley (or any other herbs)
- 1 medium baked sweet potato with 1 tbsp soft margarine
- 2 cups steamed green beans

Snack: 3 ½ cups air-popped popcorn

The Research So Far

Numerous studies show wide-ranging health benefits of the DASH diet. A consistent body of research has found that DASH lowers blood pressure in people with high blood pressure but also normal blood pressure even without lowering sodium intake. [5] It can produce greater reductions in blood pressure if sodium is restricted to less than 2300 mg a day, and even

more so with a 1500 mg sodium restriction. [6, 7] When compared with a standard American diet (e.g., high intake of red and processed meats, beverages sweetened with sugar, sweets, refined grains) DASH has also been found to lower serum uric acid levels in people with hyperuricemia, which places them at risk for a painful inflammatory condition called gout. [8] Because people with gout often also have high blood pressure and other cardiovascular diseases, DASH is optimal in improving all of these conditions.

The DASH diet was found to lower cardiovascular risk in a controlled 8-week trial looking at participants randomized to consume either a DASH diet (low in total/saturated fat with whole grains, poultry, fish, nuts, fruits and vegetables), a fruit and vegetable-rich diet (more fruits/vegetables than control diet but same amount of fat), or control diet (standard American diet high in fat and cholesterol). [9] The researchers estimated a 10-year reduction in risk for cardiovascular disease based on the participants' blood pressure and cholesterol levels before and after the diet intervention. Participants who ate the DASH or fruit/vegetable diets showed a 10% reduced risk compared with those eating the control diet, but women and

Black adults showed the greatest benefits with a 13% and 14% risk reduction, respectively.

Adherence to the DASH-style pattern may also help prevent the development of diabetes, as analyzed in a recent meta-analysis, and kidney disease as found in the Atherosclerosis Risk in Communities (ARIC) cohort that followed more than 3700 people who developed kidney disease. [10, 11] Dietary components of DASH that were protective in the ARIC cohort included a high intake of nuts, legumes, and low-fat dairy products. A high intake of red meat and processed meats increased kidney disease risk.

Potential Pitfalls

- DASH requires each person to plan their own daily menus based on the allowed servings. People who are not used to meal planning or cooking may need more specific guidance.
- The types of foods listed are not comprehensive. For example, avocados are not included so it is not clear if they would be categorized as a fruit or a fat serving. Certain foods are placed into questionable categories: pretzels are placed in the grain group even though they have fairly low nutrient content and no fiber; frozen yogurt is placed in the dairy group even though most brands contain little calcium and vitamin D and are high in added sugar. The general term “cereals” are placed in the grain group but different types of cereals can be highly variable in nutrient and sugar content.

- Those with lactose intolerance or food allergies (e.g., nuts) may need to modify the diet to include lactose-free alternatives to dairy and seeds instead of nuts.
- Some people may experience gas and bloating when starting the diet due to the high fiber content of plant foods like fruits, vegetables, and whole grains. This can be minimized by adding one or two new high fiber foods a week instead of all at once.

Bottom Line

Research supports the use of the DASH diet as a healthy eating pattern that may help to lower blood pressure, and prevent or reduce the risk of cardiovascular diseases, diabetes, kidney disease, and gout.

Diet Review: Gluten-Free for Weight Loss

Finding yourself confused by the seemingly endless promotion of weight-loss strategies and diet plans? In this series, we take a look at some popular diets—and review the research behind them.

What Is It?

A gluten-free diet is not new. It is the sole treatment for 1-2% of Americans who have celiac disease, a serious condition where the body attacks a protein called gluten, naturally found in many whole grains, causing a spectrum of symptoms that range from bloating to intestinal damage. Up to 6% of people

have a related stomach-upsetting but less threatening condition called non-celiac gluten sensitivity. With such a small number truly needing this diet, why have sales of gluten-free products topped $12 billion according to market research?

What is new—and driving these sales upward—is the use of a gluten-free diet for weight loss, partly fueled by celebrity endorsements and personal testimonies of not only pounds quickly shed, but increased energy, improved digestion, and even clearer skin. Consumer surveys reveal that people perceive gluten-free products to be healthier than their gluten-containing counterparts, and almost a third of Americans are now avoiding or reducing their intake of gluten. [1]

How It Works

A gluten-free diet eliminates all foods containing or contaminated with gluten. Gluten is largely ubiquitous in foods, found as a main ingredient (in wheat, rye, barley, triticale, cross-contaminated oats), in sauces (soy sauce, malt vinegar, flour), and as additives or fillers (maltodextrin, wheat starch). See What Is a Gluten-Free Diet?

When first going gluten-free, perhaps the most noticeable change is having to relinquish favorite staples of bread, pasta, cereals, and processed snack foods. Because some of these products, which are typically highly processed, may be low in nutrients and high in calories, one may feel better and even lose some weight soon after removing them from the diet. Although there are now plenty of gluten-free counterparts to take their place, a gluten-free diet usually causes one to revisit naturally gluten-free whole foods like fruits, vegetables, and grains like brown rice, quinoa, and millet. Including these minimally processed, high-fiber foods may also help to promote weight loss and a feeling of well-being.

The Research So Far

Though research has explored the effects of a gluten-free diet on gastrointestinal disorders, autism, and fibromyalgia, there is none that examines the diet's effects on weight loss alone or for general health benefits. Because of the lack of experimental studies on weight loss, some researchers have instead examined the long-term effects of people with celiac disease on gluten-free diets, or who are generally healthy and consume a diet low in wheat and other gluten-containing grains. They have found that gluten-free diets: 1) may promote certain

nutrient deficiencies, 2) may increase the risk of some chronic diseases, and 3) may actually cause weight gain.

- Intakes of people with celiac disease on a strict gluten-free diet were found to have inadequate intakes of fiber, iron, and calcium. [2] Other research has found gluten-free cereal products to be low not only in those nutrients but also B vitamins including thiamin, riboflavin, niacin, and folate.
- A study of over 100,000 participants without celiac disease found that those who restricted gluten intake were likely to limit their intake of whole grains and experienced an increased risk of heart disease compared with those who had higher gluten intake. [3] Many studies have found that people with higher intakes of whole grains including whole wheat (2-3 servings daily) compared with groups eating low amounts (less than 2 servings daily) had significantly lower risk of heart disease and stroke, type 2 diabetes, and deaths from all causes. [4-7]
- Gluten may act as a prebiotic, feeding the "good" bacteria in our bodies. [8-10] It contains a prebiotic carbohydrate called arabinoxylan oligosaccharide that has been shown to stimulate the activity of bifidobacteria in the colon, bacteria normally found in a healthy human gut. A change in the amount or activity of these bacteria has been associated with gastrointestinal diseases including inflammatory bowel disease, colorectal cancer, and irritable bowel syndrome.
- Research is conflicting, but some studies have shown weight gain or increased BMI in people with celiac disease after starting a gluten-free diet. [10-13] This may be partly due to improved absorption of nutrients, a reduction in stomach discomfort, and increased appetite after starting the diet. However, another suspected reason is an increased intake of gluten-free processed food options containing high amounts of calories, fat and sugar.

Potential Pitfalls

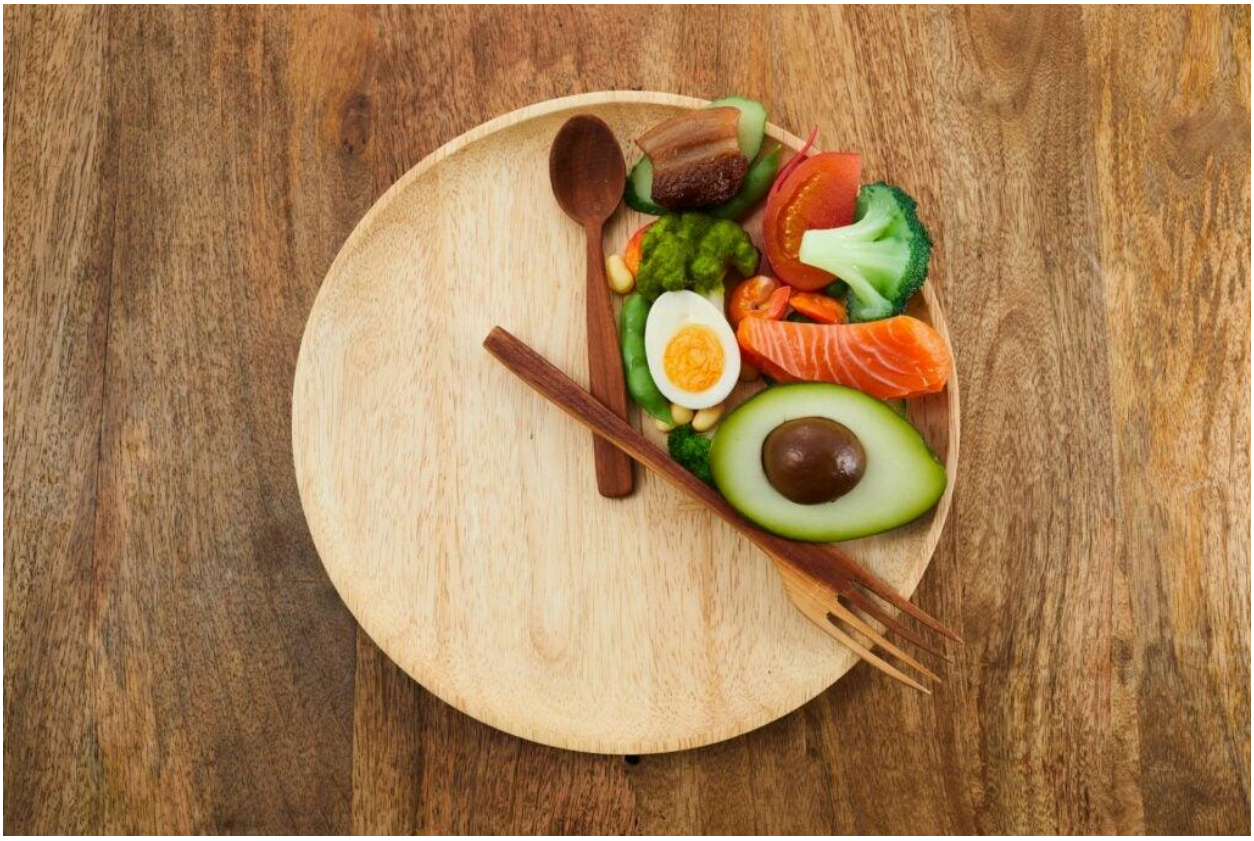
Gluten-free foods wear a health halo, a belief that a food product is healthful even when it may not offer special health

benefits for most people. Research has shown that if one aspect of a food is advertised as healthy or people believe it to be healthy (in this case, the term “gluten-free”), there is a tendency to eat more of it. [14] This may promote weight gain. Also, an overreliance on processed gluten-free products may lead to a decreased intake of certain nutrients like fiber and B vitamins that are protective against chronic diseases.

Bottom Line

Although a gluten-free diet is the primary treatment for celiac disease and may help to alleviate symptoms in various conditions related to gluten sensitivity, there is currently no evidence showing that a gluten-free diet is effective for weight loss or for general health benefits. For individuals who don’t have celiac disease or gluten sensitivity, there is no need to restrict gluten consumption. A healthy dietary pattern typically includes higher amounts of whole grains and lower amounts of refined grains and added sugar.

Diet Review: Intermittent Fasting for Weight Loss



Finding yourself confused by the seemingly endless promotion of weight-loss strategies and diet plans? In this series, we take a look at some popular diets—and review the research behind them.

What Is It?

Intermittent fasting is a diet regimen that cycles between brief periods of fasting, with either no food or significant calorie reduction, and periods of unrestricted eating. It is promoted to change body composition through loss of fat mass and weight, and to improve markers of health that are associated with

disease such as blood pressure and cholesterol levels. Its roots derive from traditional fasting, a universal ritual used for health or spiritual benefit as described in early texts by Socrates, Plato, and religious groups. [1] Fasting typically entails a steady abstinence of food and beverages, ranging from 12 hours to one month. It may require complete abstinence, or allow a reduced amount of food and beverages.

Prolonged very low calorie diets can cause physiological changes that may cause the body to adapt to the calorie restriction and therefore prevent further weight loss. [2] Intermittent fasting attempts to address this problem by cycling between a low calorie level for a brief time followed by normal eating, which may prevent these adaptations. However, research does not consistently show that intermittent fasting is superior to continuous low calorie diets for weight loss efficiency.

How It Works

The most common methods are fasting on alternate days, for whole days with a specific frequency per week, or during a set time frame. [3]

- *Alternate-day fasting*—Alternating between days of no food restriction with days that consist of one meal that provides about 25% of daily calorie needs. Example: Mon-Wed-Fri consists of fasting, while alternate days have no food restrictions.
- *Whole-day fasting*—1-2 days per week of complete fasting or up to 25% of daily calorie needs, with no food restriction on the other days. Example: The 5:2 diet approach advocates no food restriction five days of the week, cycled with a 400-500 calorie diet the other two days of the week.
- *Time-restricted feeding*—Following a meal plan each day with a designated time frame for fasting. Example: Meals are eaten from 8am-3pm, with fasting during the remaining hours of the day.

The Research So Far

Physiologically, calorie restriction has been shown in animals to increase lifespan and improve tolerance to various metabolic stresses in the body. [4] Although the evidence for caloric restriction in animal studies is strong, there is less convincing evidence in human studies. Proponents of the diet believe that the stress of intermittent fasting causes an immune response that repairs cells and produces positive metabolic changes (reduction in triglycerides, LDL cholesterol, blood pressure, weight, fat mass, blood glucose). [3,5] An understandable concern of this diet is that followers will overeat on

non-fasting days to compensate for calories lost during fasting. However, studies have not shown this to be true when compared with other weight loss methods. [5]

A systematic review of 40 studies found that intermittent fasting was effective for weight loss, with a typical loss of 7-11 pounds over 10 weeks. [2] There was much variability in the studies, ranging in size from 4 to 334 subjects, and followed from 2 to 104 weeks. It is important to note that different study designs and methods of intermittent fasting were used, and participant characteristics differed (lean vs. obese). Half of the studies were controlled trials comparing the fasting group to a comparison group and/or a control group (either continuous calorie restriction or usual lifestyle), with the other half examining an intermittent fasting group alone. A brief summary of their findings:

- Dropout rates ranged from 0-65%. When comparing dropout rates between the fasting groups and continuous calorie restriction groups, no significant differences were found. Overall, the review did not find that intermittent fasting had a low dropout rate, and therefore was not necessarily easier to follow than other weight loss approaches.

- When examining the 12 clinical trials that compared the fasting group with the continuous calorie restriction group, there was no significant difference in weight loss amounts or body composition changes.
- Ten trials that investigated changes in appetite did not show an overall increase in appetite in the intermittent fasting groups despite significant weight loss and decreases in leptin hormone levels (a hormone that suppresses appetite).

A randomized controlled trial that followed 100 obese individuals for one year did not find intermittent fasting to be more effective than daily calorie restriction. [6] For the 6-month weight loss phase, subjects were either placed on an alternating day fast (alternating days of one meal of 25% of baseline calories versus 125% of baseline calories divided over three meals) or daily calorie restriction (75% of baseline calories divided over three meals) following the American Heart Association guidelines. After 6 months, calorie levels were increased by 25% in both groups with a goal of weight maintenance. Participant characteristics of the groups were similar; mostly women and generally healthy. The trial examined weight changes, compliance rates, and cardiovascular risk factors. Their findings when comparing the two groups:

- No significant differences in weight loss, weight regain, or body composition (e.g., fat mass, lean mass).
- No significant differences in blood pressure, heart rate, fasting glucose, and fasting insulin. At 12 months, although there were no differences in total cholesterol and triglycerides, the alternate-day fasting group showed significantly increased LDL cholesterol levels. The authors did not comment on a possible cause.
- The dropout rate was higher in the alternate-day fasting group (38%) than in the daily calorie restriction group (29%). Interestingly, those in the fasting group actually ate less food than prescribed on non-fasting days though they ate more food than prescribed on fasting days.

> A one-year randomized trial also did not find intermittent fasting (16:8 method) more beneficial than calorie reduction without a restricted eating time. [7] Patients with obesity were placed on the same moderate calorie restriction but randomized to one of two groups: time-restricted eating (allowed to eat from 8am-4pm), or allowed to eat any time. Weight, waist circumference, body mass index, body fat, and blood work were measured. At one year, the time-restricted group lost an average of 18 pounds and the time-unrestricted group lost 14 pounds; blood pressure, cholesterol, and blood glucose levels also decreased. However, the changes in weight

and other parameters were not significantly different among the groups.

Potential Pitfalls

This type of dietary pattern would be difficult for someone who eats every few hours (e.g., snacks between meals, grazes). It would also not be appropriate for those with conditions that require food at regular intervals due to metabolic changes caused by their medications, such as with diabetes. Prolonged periods of food deprivation or semi-starvation places one at risk for overeating when food is reintroduced, and may foster unhealthy behaviors such as an increased fixation on food. [8,9]

Individuals with the following conditions should abstain from intermittent fasting:

- Diabetes
- Eating disorders that involve unhealthy self-restriction (anorexia or bulimia nervosa)
- Use of medications that require food intake
- Active growth stage, such as in adolescents
- Pregnancy, breastfeeding

Unanswered Questions

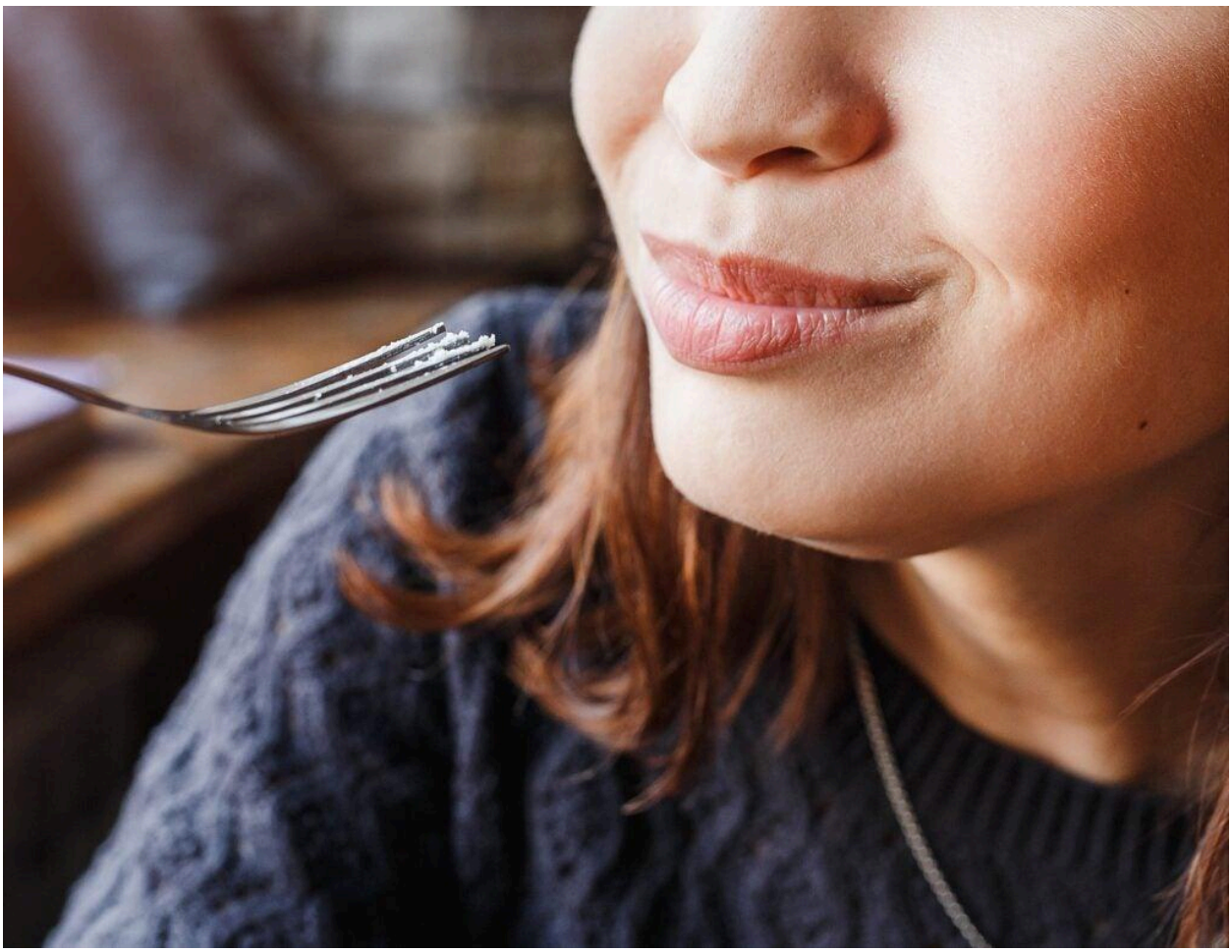
- How often and for how long should one fast to see a therapeutic benefit?
- Is this diet safe and beneficial for everyone (e.g., generally healthy population, higher risk individuals with chronic diseases, elderly)?
- What are the long-term effects of intermittent fasting?
- Is there a risk of negatively influencing the dietary behaviors of other family members, especially in children who see their parents abstaining from food and skipping meals?

Bottom Line

Although certain benefits of caloric restriction have been demonstrated in animal studies, similar benefits of intermittent fasting in humans have not been observed. It is unclear that intermittent fasting is superior to other weight loss methods in regards to amount of weight loss, biological changes, compliance rates, and decreased appetite. Certain people who typically eat one or two meals a day or do not eat for long stretches of time may show better compliance with this type of regimen. Additionally, people who tend to eat or snack excessively at night may benefit from a cut-off eating time, especially if the late eating leads to unpleasant side effects such as reflux or disrupted sleep.

More high-quality studies including randomized controlled trials with follow-up of greater than one year are needed to show a direct effect and the possible benefits of intermittent fasting. Strong recommendations on intermittent fasting for weight loss cannot be made at this time.

Intuitive Eating



What Is It?

Intuitive eating (IE) is not so much a diet plan as an approach to eating based on one's internal needs, whether physical, emotional, or other influencers. When these needs are recognized, they may determine one's food choices. Because the method is based on an individual's needs at one moment in time, it does not focus on specific foods, a calorie level to reach, or even eating at certain times. It has been used as an approach to lose weight as well as a treatment strategy for those with disordered eating patterns. The term "intuitive eating" was introduced in 1995 as the title of a book authored by registered dietitians Evelyn Tribole and Elyse Resch. However, the concept of eating from an emotional response was described by researchers prior to that date. [1]

How It Works

IE is the antithesis of restrained eating that demands rigid control. Many commercial diets follow a restrained eating model, with meal plans that include specific foods and/or measured portions. In contrast, IE focuses on body cues such as hunger and fullness, which may be physical hunger and fullness from an empty or filled stomach, or cues caused by emotional or external triggers. IE is flexible, with no

restrictions on types of foods to eat, amounts, or specific mealtimes.

IE is sometimes described as this basic concept: learning to eat when hungry and stopping when full. Yet, in our society physical hunger is not the only reason we eat. Our appetites and cravings are continuously stimulated by visual cues (cooking shows, food advertisements), emotional cues (feeling sad, lonely, stressed, bored), olfactory cues (smelling freshly baked bread), or social cues (Sunday family dinners, sharing a restaurant meal with friends). IE seeks to identify the specific cause of the "hunger," and to respond with awareness and intention. Eating in response to triggers other than from physiological cues may cause a feeling of lack of self-control, guilt, or self-condemnation. Practicing IE concepts may help to prevent these negative feelings. Intuitive eating encourages self-care and a positive body image.

Weight loss is not a focus of IE. However, eating excess calories can occur from emotional cues, so if one learns to respond appropriately to emotional eating cues, weight loss may follow naturally.

Signs of physical hunger:

- Fatigue, lightheadedness
- Irritability
- Headache
- Stomach is grumbling
- Hunger gradually intensifies
- No specific cravings; any type of food will satisfy

Signs of emotional hunger:

- Stomach is quiet
- Desire for food occurs suddenly (e.g., because of an emotion such as anger or stress, or from external cues such as viewing a television commercial or other food advertising)
- Cravings are for a specific food or flavor, whether salty, sweet, crunchy, creamy, etc.
- Guilt is associated with eating

Examples of intuitive eating strategies:

- Acknowledge hunger. Recognize physical hunger cues and respond to them. These cues will not always occur at consistent times, as true hunger can be influenced by changes in physical activity, lack of sleep, etc. Therefore, eating meals and snacks at the same time every day may not be appropriate according to IE principles, if you are not hungry.

- Recognize and respond to fullness. As you identify true hunger, you will also learn to identify a comfortable degree of fullness after eating, and respond by stopping eating. This may require periodic check-ins while eating, noting if you are enjoying the food and reaching a point of having enough.
- Don't fear negative feelings. Accept that negative emotions like stress, anger, and boredom will come and go. Learn to cope with these feelings without using food: talk to a friend, go for a walk, take a shower, pray, or meditate.
- Honor and respect your body regardless of size and ability. A negative self-image can lead to self-destructive behaviors, whereas nurturing a positive self-image may lead to healthful behaviors.

How is intuitive eating different from mindful eating?

Often used interchangeably, many intuitive eating and mindful eating concepts overlap but there are some key differences. Mindful eating stems from the broader practice of mindfulness, a centuries-old philosophy used in many religions. Mindful eating focuses on the present eating experience with heightened awareness beyond the self, and without judgment. [2] The following are some areas of focus:

- Considering the wider spectrum of the meal which informs what and how much one eats: where the food came from, what elements were needed from nature that enabled the food to grow and thrive, the individuals involved in getting the food from

the farm to grocery stores or restaurants, how the food was prepared, who prepared it.

- Noticing how the food looks, tastes, smells, and feels in our bodies as we eat.
- How the body feels after eating the meal.
- Expressing gratitude for the meal before and/or after eating
- May use deep breathing or meditation before the meal to transition your busy mind to focus on the meal in front of you.
- How our food choices affect our local and global environment.

Including these considerations when eating can help to increase appreciation, enjoyment, and understanding of the food.

Intuitive eating often integrates concepts of mindful eating but also considers eating specifically in response to hunger and satiety cues, nurturing a positive body image, addressing non-physiological reasons for hunger, and physical activity. It usually does not involve meditation nor gratitude.

The Research So Far

There is a growing body of research on IE. Small, short-term controlled trials or cross-sectional studies using IE concepts have consistently shown benefits for psychological wellbeing (e.g., reduced depression and anxiety; increased body satisfaction, self-acceptance, and quality of life). [3,4] IE interventions have also shown a decrease in certain behaviors

such as binge eating and restrained eating/dieting. A limited number of studies have shown improvements in blood pressure and cholesterol. [5] Randomized trials show conflicting results of IE interventions and weight loss or decreased body mass index; some show no weight changes while others show modest weight reductions.

Diet quality

- A cross-sectional study of 5,238 Swiss men and women were evaluated with self-administered questionnaires assessing intuitive eating behaviors and diet quality. [3] The study found that scoring higher with “unconditional permission to eat” was associated with poorer diet quality (increased sugar sweetened beverages, salty snacks, sweets, meat, and fried foods; lower intake of fruits, vegetables, and whole grains).
- Another cross-sectional study of 41,536 men and women found that scoring higher with “unconditional permission to eat” or no food rules/restrictions was associated with more unhealthful food choices and a higher total calorie intake. High scorers tended to eat less fruits, vegetables, and whole grains, while eating more fast food and sweetened and fatty foods. [6] Those who scored higher on “physical rather than emotional reasons to eat” had a lower calorie intake and ate less sweet and fatty foods.

Body mass index

- In a randomized-controlled trial, 40 women each (ages 30-45 years) were randomized to a weight loss program or to a weight neutral program. [7] Both programs emphasized healthy gradual lifestyle changes, but the weight loss program focused on a prescribed calorie restriction, while the weight neutral program focused on an intuitive eating approach with internal physical cues of hunger and satiety. Size acceptance was emphasized in the weight neutral group, as opposed to meeting weight loss goals in the other group.
    - Reductions in weight and BMI occurred in the weight loss group but not the weight neutral group. However, the weight neutral group showed greater reductions in LDL cholesterol. Both groups showed an increase in healthy lifestyle behaviors (increased physical activity and fruit/vegetable intake), improved quality of life and self-esteem, and decreased total and LDL cholesterol, all of which were maintained at the 2-year follow-up.
- A meta-analysis of 10 randomized controlled trials looked at conventional weight loss programs (via calorie restriction) versus mindful/intuitive eating strategies for weight loss. It found that mindful/intuitive eating strategies were effective for weight loss compared with no intervention, but there was no difference in weight reduction compared with conventional weight loss programs. [8]

Eating behaviors

- A literature review of 68 publications looked at the role of mindful eating and intuitive eating in changing eating behaviors. The number of studies specific to intuitive eating was limited but found that it had positive associations with identifying hunger cues, increased freedom to eat, greater pleasure associated with food, and greater awareness of how their bodies were feeling. [9]

Potential Pitfalls

- *May not cause weight loss.* The IE model is not intended to cause weight loss, but to promote a positive self-image and healthy lifestyle changes. People who are seeking a plan that causes weight loss may not prefer this approach, because there are no specific amounts or types of foods recommended and body weight is not measured. However, a decrease in behaviors like restrained eating and emotional eating may naturally lead to weight loss for some. If a person has been advised to lose weight by their physician to improve medical conditions (e.g., prediabetes, high blood pressure, fatty liver), an IE approach may be used in conjunction with a weight-reducing eating plan. Guidance on this type of plan from a registered dietitian or licensed health coach can help to encourage a healthy body image and realistic lifestyle goals.
- *Fear of weight gain.* A concern with individuals is letting go of diet rules and "forbidden" foods. They may fear a lack of control around these foods that are now permitted without restrictions. In certain cases, less boundaries may lead some people to overeat or choose low-nutrient-dense foods (e.g., processed high-sugar beverages or foods). Consulting with a registered dietitian who is experienced with IE concepts can help one to identify the body's signals on what and how much to eat, ideally choosing foods and amounts that support their wellbeing and health.
- *May not improve health outcomes related to weight gain or chronic disease.* IE concepts encourage self-care and a positive response to food, which may or

may not cause a change towards healthful eating patterns (consuming more fruits and vegetables, less sweetened beverages and foods, less fried foods, not skipping meals, etc.). An individual has the freedom to choose fast food and soda if desired, so IE will not necessarily lead to a disease-preventive eating pattern or to a reversal of weight gain.

- *Does not address the concept of food addiction from "hyper-palatable" foods, which can lead to food cravings.* Cravings for food may stem from a neurobiological source that is neither caused by physical or emotional hunger. The notion of a food addiction is controversial, but research shows that the brain can activate reward regions of the brain in response to flavors like fat, salt, and sugar when they are eaten in excess and on a regular basis. [10-14] Researchers have compared this effect to that of addictive drugs like cocaine and alcohol. These foods tend to be highly processed, calorie-dense, and low in nutrients. People may develop strong cravings for these foods because of the reward-related neural changes that occur after consumption (a calming or pleasurable feeling with the release of dopamine). In this case, relying on intuition about what to eat may backfire if one has developed an "addiction" to these types of foods.

Unanswered Questions

- Can IE concepts prevent the onset or progression of chronic diseases including obesity by promoting healthier lifestyle behaviors?

- Are there certain types of people in which the IE approach would work best (e.g., chronic dieters, those experiencing disordered eating)?

Bottom Line

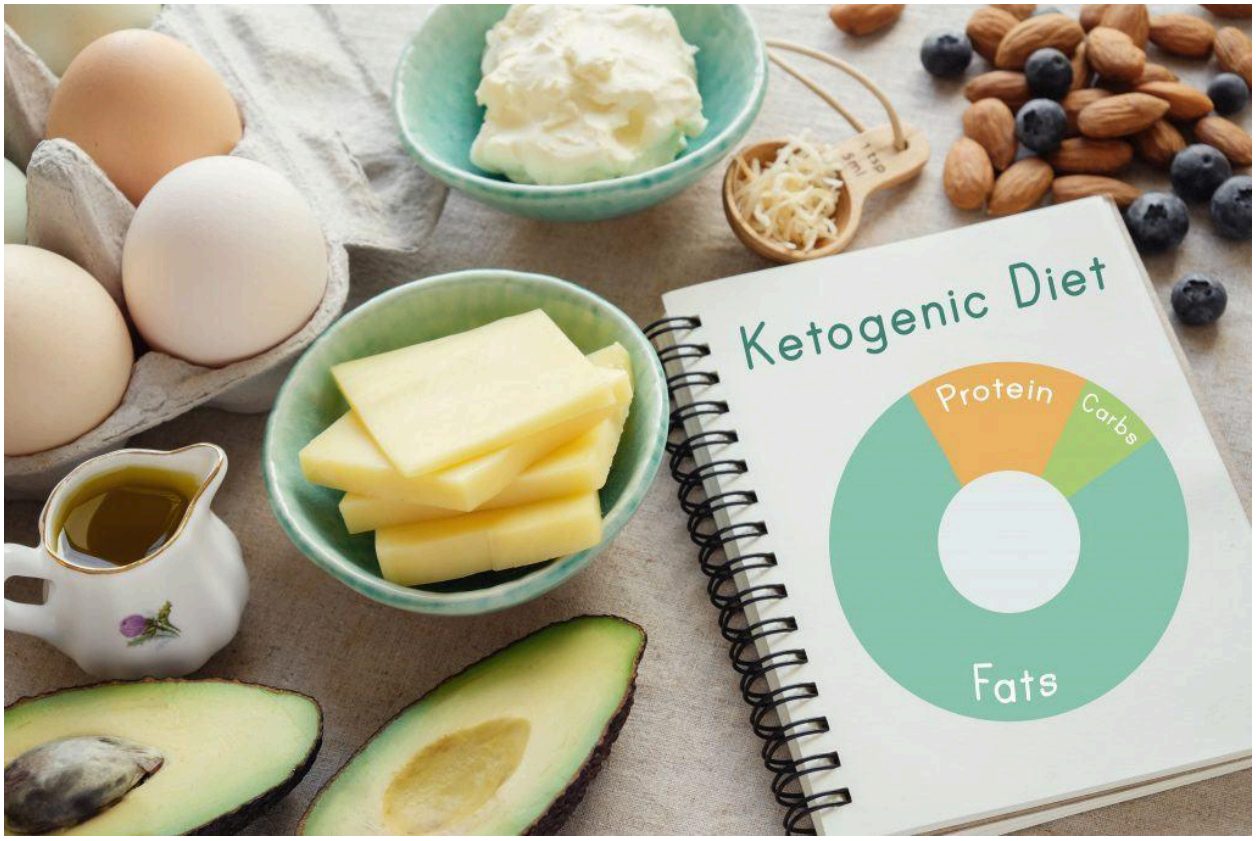
Intuitive eating is an alternative approach that was developed in response to the negative mental and physical health effects caused by traditional diets for weight loss, which involve the deliberate long-term restriction of food. IE allows internal cues to guide one's eating choices and patterns rather than a meal plan or designated rules.

Research has shown that IE can lead to greater psychological wellbeing, increased pleasure when eating, and body satisfaction. However research also shows that permission to eat all foods with no "food rules" can sometimes lead to unhealthful food choices with more high-calorie palatable foods. Therefore a certain level of restraint and nutrition knowledge may be beneficial when starting an IE plan (if the desired result is to improve overall health and wellness). Still, in the long run, continued dietary restraint increases the risk of ignoring natural physiological signals to eat. Therefore a combination of IE practices with basic nutrition knowledge

may lead to more positive outcomes than either approach alone.

It may also be beneficial to use IE strategies to heighten one's awareness of internal cues of not just feeling "full" versus "hungry" but to also note how the body feels after eating healthful foods of fruits and vegetables versus highly processed high-calorie snack foods, which may lead to eating patterns that promote wellbeing. [3]

Diet Review: Ketogenic Diet for Weight Loss



Finding yourself confused by the seemingly endless promotion of weight-loss strategies and diet plans? In this series, we take a look at some popular diets—and review the research behind them.

What Is It?

The ketogenic or "keto" diet is a low-carbohydrate, fat-rich eating plan that has been used for centuries to treat specific medical conditions. In the 19th century, the ketogenic diet was commonly used to help control diabetes. In 1920 it was introduced as an effective treatment for epilepsy in children in

whom medication was ineffective. The ketogenic diet has also been tested and used in closely monitored settings for cancer, diabetes, polycystic ovary syndrome, and Alzheimer's disease.

However, this diet is gaining considerable attention as a potential weight-loss strategy due to the low-carb diet craze, which started in the 1970s with the Atkins diet (a very low-carbohydrate, high-protein diet, which was a commercial success and popularized low-carb diets to a new level). Today, other low-carb diets including the Paleo, South Beach, and Dukan diets are all high in protein but moderate in fat. In contrast, the ketogenic diet is distinctive for its exceptionally high-fat content, typically 70% to 80%, though with only a moderate intake of protein.

How It Works

The premise of the ketogenic diet for weight loss is that if you deprive the body of glucose—the main source of energy for all cells in the body, which is obtained by eating carbohydrate foods—an alternative fuel called ketones is produced from stored fat (thus, the term "keto"-genic). The brain demands the most glucose in a steady supply, about 120 grams daily, because it cannot store glucose. During fasting, or when very little

carbohydrate is eaten, the body first pulls stored glucose from the liver and temporarily breaks down muscle to release glucose. If this continues for 3-4 days and stored glucose is fully depleted, blood levels of a hormone called insulin decrease, and the body begins to use fat as its primary fuel. The liver produces ketone bodies from fat, which can be used in the absence of glucose. [1]

When ketone bodies accumulate in the blood, this is called ketosis. Healthy individuals naturally experience mild ketosis during periods of fasting (e.g., sleeping overnight) and very strenuous exercise. Proponents of the ketogenic diet state that if the diet is carefully followed, blood levels of ketones should not reach a harmful level (known as “ketoacidosis”) as the brain will use ketones for fuel, and healthy individuals will typically produce enough insulin to prevent excessive ketones from forming. [2] How soon ketosis happens and the number of ketone bodies that accumulate in the blood is variable from person to person and depends on factors such as body fat percentage and resting metabolic rate. [3]

What is ketoacidosis?

Excessive ketone bodies can produce a dangerously toxic level of acid in the blood, called ketoacidosis. During ketoacidosis, the kidneys begin to excrete ketone bodies along with body water in the urine, causing some fluid-related weight loss. Ketoacidosis most often occurs in individuals with type 1 diabetes because they do not produce insulin, a hormone that prevents the overproduction of ketones. However in a few rare cases, ketoacidosis has been reported to occur in nondiabetic individuals following a prolonged very low carbohydrate diet. [4,5]

The Diet

There is not one “standard” ketogenic diet with a specific ratio of macronutrients (carbohydrates, protein, fat). The ketogenic diet typically reduces total carbohydrate intake to less than 50 grams a day—less than the amount found in a medium plain bagel—and can be as low as 20 grams a day. Generally, popular ketogenic resources suggest an average of 70-80% fat from total daily calories, 5-10% carbohydrate, and 10-20% protein. For a 2000-calorie diet, this translates to about 165 grams fat, 40 grams carbohydrate, and 75 grams protein. The protein amount on the ketogenic diet is kept moderate in comparison with other low-carb high-protein diets, because eating too much protein can prevent ketosis. The amino acids in protein can be converted to glucose, so a ketogenic diet specifies enough protein to preserve lean body mass including muscle, but that will still cause ketosis.

> Many versions of ketogenic diets exist, but all ban carb-rich foods. Some of these foods may be obvious: starches from both refined and whole grains like breads, cereals, pasta, rice, and cookies; potatoes, corn, and other starchy vegetables; and fruit juices. Some that may not be so obvious are beans, legumes, and most fruits. Most ketogenic plans allow foods high in saturated fat, such as fatty cuts of meat, processed meats, lard, and butter, as well as sources of unsaturated fats, such as nuts, seeds, avocados, plant oils, and oily fish. Depending on your source of information, ketogenic food lists may vary and even conflict.

The following is a summary of foods generally permitted on the diet:

Allowed

- Strong emphasis on fats at each meal and snack to meet the high-fat requirement. Cocoa butter, lard, poultry fat, and most plant fats (olive, palm, coconut oil) are allowed, as well as foods high in fat, such as avocado, coconut meat, certain nuts (macadamia, walnuts, almonds, pecans), and seeds (sunflower, pumpkin, sesame, hemp, flax).
- Some dairy foods may be allowed. Although dairy can be a significant source of fat, some are high in natural lactose sugar such as cream, ice cream, and full-fat

milk so they are restricted. However, butter and hard cheeses may be allowed because of the lower lactose content.

- Protein stays moderate. Programs often suggest grass-fed beef (not grain-fed) and free-range poultry that offer slightly higher amounts of omega-3 fats, pork, bacon, wild-caught fish, organ meats, eggs, tofu, certain nuts and seeds.
- Most non-starchy vegetables are included: Leafy greens (kale, Swiss chard, collards, spinach, bok choy, lettuces), cauliflower, broccoli, Brussels sprouts, asparagus, bell peppers, onions, garlic, mushrooms, cucumber, celery, summer squashes.
- Certain fruits in small portions like berries. Despite containing carbohydrate, they are lower in “net carbs”* than other fruits.
- Other: Dark chocolate (90% or higher cocoa solids), cocoa powder, unsweetened coffee and tea, unsweetened vinegars and mustards, herbs, and spices.

Not Allowed

- All whole and refined grains and flour products, added and natural sugars in food and beverages, starchy vegetables like potatoes, corn, and winter squash.
- Fruits other than from the allowed list, unless factored into designated carbohydrate restriction. All fruit juices.
- Legumes including beans, lentils, and peanuts.
- Although some programs allow small amounts of hard liquor or low carbohydrate wines and beers, most restrict full carbohydrate wines and beer, and drinks with added sweeteners (cocktails, mixers with syrups and juice, flavored alcohols).

*What Are Net Carbs?

“Net carbs” and “impact carbs” are familiar phrases in ketogenic diets as well as diabetic diets. They are unregulated interchangeable terms invented by food manufacturers as a marketing strategy, appearing on some food labels to claim that the product contains less “usable” carbohydrate than is listed. [6] Net carbs or impact carbs are the amount of carbohydrate that are directly absorbed by the body and contribute calories. They are calculated by subtracting the amount of indigestible carbohydrates from the total carbohydrate amount. Indigestible (unabsorbed) carbohydrates include insoluble fibers from whole grains, fruits, and vegetables; and sugar alcohols, such as mannitol, sorbitol, and xylitol commonly used in sugar-free diabetic food products. However, these calculations are not an exact or reliable science because the effect of sugar alcohols on absorption and blood sugar can vary. Some sugar alcohols may still contribute calories and raise blood sugar. The total calorie level also does not change despite the amount of net carbs, which is an important factor with weight loss. There is debate even within the ketogenic diet community about the value of using net carbs.

> Programs suggest following a ketogenic diet until the desired amount of weight is lost. When this is achieved, to prevent weight regain one may follow the diet for a few days a week or a few weeks each month, interchanged with other days allowing a higher carbohydrate intake.

The Research So Far

The ketogenic diet has been shown to produce beneficial metabolic changes in the short-term. Along with weight loss, health parameters associated with carrying excess weight have improved, such as insulin resistance, high blood pressure, and elevated cholesterol and triglycerides. [2,7] There is also growing interest in the use of low-carbohydrate diets, including the ketogenic diet, for type 2 diabetes. Several theories exist as to why the ketogenic diet promotes weight loss, though they have not been consistently shown in research: [2,8,9]

- A satiating effect with decreased food cravings due to the high-fat content of the diet.
- A decrease in appetite-stimulating hormones, such as insulin and ghrelin, when eating restricted amounts of carbohydrate.
- A direct hunger-reducing role of ketone bodies—the body's main fuel source on the diet.
- Increased calorie expenditure due to the metabolic effects of converting fat and protein to glucose.
- Promotion of fat loss versus lean body mass, partly due to decreased insulin levels.

The following is a summary of research findings:

The findings below have been limited to research specific to the ketogenic diet: the studies listed contain about 70-80% fat, 10-20% protein, and 5-10% carbohydrate. Diets otherwise termed “low carbohydrate” may not include these specific ratios, allowing higher amounts of protein or carbohydrate. Therefore only diets that specified the terms “ketogenic” or “keto,” or followed the macronutrient ratios listed above were included in this list below. In addition, though extensive research exists on the use of the ketogenic diet for other medical conditions, only studies that examined ketogenic diets specific to obesity or overweight were included in this list. (*This paragraph was added to provide additional clarity on 5.7.18.*)

- A meta-analysis of 13 randomized controlled trials following overweight and obese participants for 1-2 years on either low-fat diets or very-low-carbohydrate ketogenic diets found that the ketogenic diet produced a small but significantly greater reduction in weight, triglycerides, and blood pressure, and a greater increase in HDL and LDL cholesterol compared with the low-fat diet at one year. [10] The authors acknowledged the small weight loss difference between the two diets of about 2 pounds, and that compliance to the ketogenic diet declined over time, which may have explained the more significant difference at one year but not at two years (the authors did not provide additional data on this).
- A systematic review of 26 short-term intervention trials (varying from 4-12 weeks) evaluated the appetites of overweight and obese individuals on either a very low calorie (~800 calories daily) or ketogenic diet (no calorie restriction but ≤50 gm carbohydrate daily) using a standardized and validated appetite scale. None of the studies compared the two diets with each other; rather, the participants’

appetites were compared at baseline before starting the diet and at the end. Despite losing a significant amount of weight on both diets, participants reported less hunger and a reduced desire to eat compared with baseline measures. The authors noted the lack of increased hunger despite extreme restrictions of both diets, which they theorized were due to changes in appetite hormones such as ghrelin and leptin, ketone bodies, and increased fat and protein intakes. The authors suggested further studies exploring a threshold of ketone levels needed to suppress appetite; in other words, can a higher amount of carbohydrate be eaten with a milder level of ketosis that might still produce a satiating effect? This could allow inclusion of healthful higher carbohydrate foods like whole grains, legumes, and fruit. [9]

- A study of 39 obese adults placed on a ketogenic very low-calorie diet for 8 weeks found a mean loss of 13% of their starting weight and significant reductions in fat mass, insulin levels, blood pressure, and waist and hip circumferences. Their levels of ghrelin did not increase while they were in ketosis, which contributed to a decreased appetite. However during the 2-week period when they came off the diet, ghrelin levels and urges to eat significantly increased. [11]
- A study of 89 obese adults who were placed on a two-phase diet regimen (6 months of a very-low-carbohydrate ketogenic diet and 6 months of a reintroduction phase on a normal calorie Mediterranean diet) showed a significant mean 10% weight loss with no weight regain at one year. The ketogenic diet provided about 980 calories with 12% carbohydrate, 36% protein, and 52% fat, while the Mediterranean diet provided about 1800 calories with 58% carbohydrate, 15% protein, and 27% fat. Eighty-eight percent of the participants

were compliant with the entire regimen. [12] It is noted that the ketogenic diet used in this study was lower in fat and slightly higher in carbohydrate and protein than the average ketogenic diet that provides 70% or greater calories from fat and less than 20% protein.

Potential Pitfalls

Following a very high-fat diet may be challenging to maintain. Possible symptoms of extreme carbohydrate restriction that may last days to weeks include hunger, fatigue, low mood, irritability, constipation, headaches, and brain “fog.” Though these uncomfortable feelings may subside, staying satisfied with the limited variety of foods available and being restricted from otherwise enjoyable foods like a crunchy apple or creamy sweet potato may present new challenges.

Some negative side effects of a long-term ketogenic diet have been suggested, including increased risk of kidney stones and osteoporosis, and increased blood levels of uric acid (a risk factor for gout). Possible nutrient deficiencies may arise if a variety of recommended foods on the ketogenic diet are not included. It is important to not solely focus on eating high-fat foods, but to include a daily variety of the allowed meats, fish, vegetables, fruits, nuts, and seeds to ensure adequate intakes of

fiber, B vitamins, and minerals (iron, magnesium, zinc)—nutrients typically found in foods like whole grains that are restricted from the diet. Because whole food groups are excluded, assistance from a registered dietitian may be beneficial in creating a ketogenic diet that minimizes nutrient deficiencies.

Unanswered Questions

- What are the long-term (one year or longer) effects of, and are there any safety issues related to, the ketogenic diet?
- Do the diet's health benefits extend to higher risk individuals with multiple health conditions and the elderly? For which disease conditions do the benefits of the diet outweigh the risks?
- As fat is the primary energy source, is there a long-term impact on health from consuming different types of fats (saturated vs. unsaturated) included in a ketogenic diet?
- Is the high fat, moderate protein intake on a ketogenic diet safe for disease conditions that interfere with normal protein and fat metabolism, such as kidney and liver diseases?
- Is a ketogenic diet too restrictive for periods of rapid growth or requiring increased nutrients, such as during pregnancy, while breastfeeding, or during childhood/adolescent years?

Bottom Line

Available research on the ketogenic diet for weight loss is still limited. Most of the studies so far have had a small number of participants, were short-term (12 weeks or less), and did not include control groups. A ketogenic diet has been shown to provide short-term benefits in some people including weight loss and improvements in total cholesterol, blood sugar, and blood pressure. However, these effects after one year when compared with the effects of conventional weight loss diets are not significantly different. [10]

Eliminating several food groups and the potential for unpleasant symptoms may make compliance difficult. An emphasis on foods high in saturated fat also counters recommendations from the Dietary Guidelines for Americans and the American Heart Association and may have adverse effects on blood LDL cholesterol. However, it is possible to modify the diet to emphasize foods low in saturated fat such as olive oil, avocado, nuts, seeds, and fatty fish.

A ketogenic diet may be an option for some people who have had difficulty losing weight with other methods. The exact ratio of fat, carbohydrate, and protein that is needed to achieve

health benefits will vary among individuals due to their genetic makeup and body composition. Therefore, if one chooses to start a ketogenic diet, it is recommended to consult with one's physician and a dietitian to closely monitor any biochemical changes after starting the regimen, and to create a meal plan that is tailored to one's existing health conditions and to prevent nutritional deficiencies or other health complications. A dietitian may also provide guidance on reintroducing carbohydrates once weight loss is achieved.

A modified carbohydrate diet following the Healthy Eating Plate model may produce adequate health benefits and weight reduction in the general population. [13]

Diet Review: Mediterranean Diet

Finding yourself confused by the seemingly endless promotion of weight-loss strategies and diet plans? In this series, we take a look at some popular diets—and review the research behind them.

What Is It?

Chances are you have heard of the Mediterranean diet. If you have a chronic condition like heart disease or high blood pressure, your doctor may even have prescribed it to you. It is often promoted to decrease the risk of heart disease, depression, and dementia.

The traditional diets of countries bordering the Mediterranean Sea differ slightly so there are different versions of the Mediterranean diet. However, in 1993 the Harvard School of Public Health, Oldways Preservation and Exchange Trust, and the European Office of the World Health Organization introduced the Mediterranean Diet Pyramid as a guide to help familiarize people with the most common foods of the region. More of an eating pattern than a strictly regimented diet plan, the pyramid emphasized certain foods based on the dietary traditions of Crete, Greece, and southern Italy during the mid-20th century. [1,2] At that time, these countries displayed low rates of chronic disease and higher than average adult life expectancy despite having limited access to healthcare. It was believed that the diet—mainly fruits and vegetables, beans, nuts, whole grains, fish, olive oil, small amounts of dairy, and red wine—contributed to their health benefits. The pyramid also highlighted daily exercise and the beneficial social aspects of eating meals together.

How It Works

The Mediterranean diet is a primarily plant-based eating plan that includes daily intake of whole grains, olive oil, fruits, vegetables, beans and other legumes, nuts, herbs, and spices.

Other foods like animal proteins are eaten in smaller quantities, with the preferred animal protein being fish and seafood. Although the pyramid shape suggests the proportion of foods to eat (e.g., eat more fruits and vegetables and less dairy foods), it does not specify portion sizes or specific amounts. It is up to the individual to decide exactly how much food to eat at each meal, as this will vary by physical activity and body size. There are additional points that make this eating plan unique:

- An emphasis on healthy fats. Olive oil is recommended as the primary added fat, replacing other oils and fats (butter, margarine). Other foods naturally containing healthful fats are highlighted, such as avocados, nuts, and oily fish like salmon and sardines; among these, walnuts and fish are high in omega-3 fatty acids.
- Choosing fish as the preferred animal protein at least twice weekly and other animal proteins of poultry, eggs, and dairy (cheese or yogurt) in smaller portions either daily or a few times a week. Red meat is limited to a few times per month.
- Choosing water as the main daily beverage, but allowing a moderate intake of wine with meals, about one to two glasses a day for men and one glass a day for women.
- Stressing daily physical activity through enjoyable activities.

Sample meal plan

This sample meal plan is roughly 2000 calories, the recommended intake for an average person. If you have higher calorie needs, you may add an additional snack or two; if you have lower calorie needs, you may remove a snack. If you have more specific nutritional needs or would like assistance in creating additional meal plans, consult with a registered dietitian.

Breakfast: 1 cup cooked steel-cut oats mixed with 2 tablespoons chopped walnuts, ¾ cup fresh or frozen blueberries, sprinkle of cinnamon

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Snack: ¼ cup nuts, any type

Lunch:

- Beans and rice – In medium pot, heat 1 tbsp olive oil. Add and sauté ½ chopped onion, 1 tsp cumin, and 1 tsp garlic powder until onion is softened. Mix in 1 cup canned beans, drained and rinsed. Serve bean mixture over 1 cup cooked brown rice.

- 2 cups salad (e.g., mixed greens, cucumbers, bell peppers) with dressing (mix together 2 tbsp olive oil, 1 tbsp lemon juice or vinegar, ½ teaspoon Dijon mustard, ½ teaspoon garlic powder, ¼ tsp black pepper)

Snack: 1 medium orange

Dinner:

- 3 ounces baked salmon brushed with same salad dressing used at lunch
- 1 medium baked sweet potato with 1 tbsp soft margarine
- 1 cup chopped steamed cauliflower

Snack: 1 ounce 75% dark chocolate

The Research So Far

> Research has consistently shown that the Mediterranean diet is effective in reducing the risk of cardiovascular diseases and overall mortality. [3, 4] A study of nearly 26,000 women found

that those who followed this type of diet had 25% less risk of developing cardiovascular disease over the course of 12 years. [5] The study examined a range of underlying mechanisms that might account for this reduction, and found that changes in inflammation, blood sugar, and body mass index were the biggest drivers. Similar benefits were found in a meta-analysis of 16 prospective cohort studies following more than 22,000 women for a median of 12.5 years. [6] Those who had the highest adherence to a Mediterranean diet showed a 24% lower risk of cardiovascular disease and 23% lower risk of premature death compared with those who had the lowest adherence.

One interesting finding of this eating plan is that it dispels the myth that people with or at risk for heart disease must eat a low fat diet. Although it does matter which types of fats are chosen, the percentage of calories from fat is less of an issue. The PREDIMED study, a primary prevention trial including thousands of people with diabetes or other risk factors for heart disease found that a Mediterranean diet supplemented with extra virgin olive oil or nuts and without any fat and calorie restrictions reduced the rates of death from stroke by roughly 30%. [7] Most dietary fats were healthy fats, such as those from fatty fish, olive oil, and nuts, but total fat intake was

generous at 39-42% of total daily calories, much higher than the 20-35% fat guideline as stated by the Institute of Medicine. [8] Risk of type 2 diabetes was also reduced in the PREDIMED trial. [9]

There has also been increased interest in the diet's effects on aging and cognitive function. [10-12] Cell damage through stress and inflammation that can lead to age-related diseases has been linked to a specific part of DNA called telomeres. These structures naturally shorten with age, and their length size can predict life expectancy and the risk of developing age-related diseases. Telomeres with long lengths are considered protective against chronic diseases and earlier death, whereas short lengths increase risk. Antioxidants can help combat cell stress and preserve telomere length, such as by eating foods that contain antioxidants nutrients like fruits, vegetables, nuts, and whole grains. These foods are found in healthy eating patterns like the Mediterranean diet. [13] This was demonstrated in a large cohort of 4676 healthy middle-aged women from the Nurses' Health Study where participants who more closely followed the Mediterranean diet were found to have longer telomere length. [13]

Another Nurses' Health Study following 10,670 women ages 57-61 observed the effect of dietary patterns on aging. [14] Healthy aging was defined as living to 70 years or more, and having no chronic diseases (e.g., type 2 diabetes, kidney disease, lung disease, Parkinson's disease, cancer) or major declines in mental health, cognition, and physical function. The study found that the women who followed a Mediterranean-type eating pattern were 46% more likely to age healthfully. Increased intake of plant foods, whole grains, and fish; moderate alcohol intake; and low intake of red and processed meats were believed to contribute to this finding.

Potential Pitfalls

- There is a risk of excess calorie intake because specific amounts of foods and portion sizes are not emphasized, which could lead to weight gain. It might be helpful to use the Mediterranean Diet Pyramid, which provides guidance on specific types of foods to choose, along with a balanced plate guide such as the Harvard Healthy Eating Plate, which gives a better indication of proportions of food to eat per meal. However, it is important to note that—probably in part due to the higher intake of olive oil and less processed foods—the Mediterranean dietary pattern provides satiety and enables long term adherence. In one of the most successful weight loss

trials to date, those assigned to the Mediterranean diet maintained weight loss over a period of six years. [15]

- Research supports the health benefits of a Mediterranean-style eating pattern that includes several different foods. It is the combination of these foods that appear protective against disease, as the benefit is not as strong when looking at single foods or nutrients included in the Mediterranean diet. [13] Therefore it is important to not simply add olive oil or nuts to one's current diet but to adopt the plan in its entirety.

Bottom Line

Research supports the use of the Mediterranean diet as a healthy eating pattern for the prevention of cardiovascular diseases, increasing lifespan, and healthy aging. When used in conjunction with caloric restriction, the diet may also support healthy weight loss.

Diet Review: MIND Diet

Finding yourself confused by the seemingly endless promotion of weight-loss strategies and diet plans? In this series, we take a look at some popular diets—and review the research behind them.

What Is It?

The Mediterranean-DASH Diet Intervention for Neurodegenerative Delay, or MIND diet, targets the health of the aging brain. Dementia is the sixth leading cause of death in the United States, driving many people to search for ways to

prevent cognitive decline. In 2015, Dr. Martha Clare Morris and colleagues at Rush University Medical Center and the Harvard Chan School of Public Health published two papers introducing the MIND diet. [1,2] Both the Mediterranean and DASH diets had already been associated with preservation of cognitive function, presumably through their protective effects against cardiovascular disease, which in turn preserved brain health.

The research team followed a group of older adults for up to 10 years from the Rush Memory and Aging Project (MAP), a study of residents free of dementia at the time of enrollment. They were recruited from more than 40 retirement communities and senior public housing units in the Chicago area. More than 1,000 participants filled out annual dietary questionnaires for nine years and had two cognitive assessments. A MIND diet score was developed to identify foods and nutrients, along with daily serving sizes, related to protection against dementia and cognitive decline. The results of the study produced fifteen dietary components that were classified as either “brain healthy” or as unhealthy. Participants with the highest MIND diet scores had a significantly slower rate of cognitive decline compared with those with the lowest scores. [1] The effects of

the MIND diet on cognition showed greater effects than either the Mediterranean or the DASH diet alone.

How It Works

The purpose of the research was to see if the MIND diet, partially based on the Mediterranean and DASH diets, could directly prevent the onset or slow the progression of dementia. All three diets highlight plant-based foods and limit the intake of animal and high saturated fat foods. The MIND diet recommends specific "brain healthy" foods to include, and five unhealthy food items to limit. [1]

The healthy items the MIND diet guidelines* suggest include:

- 3+ servings a day of whole grains
- 1+ servings a day of vegetables (other than green leafy)
- 6+ servings a week of green leafy vegetables
- 5+ servings a week of nuts
- 4+ meals a week of beans
- 2+ servings a week of berries
- 2+ meals a week of poultry
- 1+ meals a week of fish
- Mainly olive oil if added fat is used

The unhealthy items, which are higher in saturated and trans fat, include:

- Less than 5 servings a week of pastries and sweets
- Less than 4 servings a week of red meat (including beef, pork, lamb, and products made from these meats)
- Less than one serving a week of cheese and fried foods
- Less than 1 tablespoon a day of butter/stick margarine

**Note: modest variations in amounts of these foods have been used in subsequent studies. [9,10]*

Sample meal plan

This sample meal plan is roughly 2000 calories, the recommended intake for an average person. If you have higher calorie needs, you may add an additional snack or two; if you have lower calorie needs, you may remove a snack. If you have more specific nutritional needs or would like assistance in creating additional meal plans, consult with a registered dietitian.

Breakfast: 1 cup cooked steel-cut oats mixed with 2 tablespoons slivered almonds, ¾ cup fresh or frozen blueberries, sprinkle of cinnamon

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Snack: 1 medium orange

Lunch:

- Beans and rice – In medium pot, heat 1 tbsp olive oil. Add and sauté ½ chopped onion, 1 tsp cumin, and 1 tsp garlic powder until onion is softened. Mix in 1 cup canned beans, drained and rinsed. Serve bean mixture over 1 cup cooked brown rice.
- 2 cups salad (e.g., mixed greens, cucumbers, bell peppers) with dressing (mix together 2 tbsp olive oil, 1 tbsp lemon juice or vinegar, ½ teaspoon Dijon mustard, ½ teaspoon garlic powder, ¼ tsp black pepper)

Snack: ¼ cup unsalted mixed nuts

Dinner:

- 3 ounces baked salmon brushed with same salad dressing used at lunch
- 1 cup chopped steamed cauliflower

- 1 whole grain roll dipped in 1 tbsp olive oil

Is alcohol part of the MIND diet?

Wine was included as one of the 15 original dietary components in the MIND diet score, in which a moderate amount was found to be associated with cognitive health. [1] However, in subsequent MIND trials it was omitted for “safety” reasons. The effect of alcohol on an individual is complex, so that blanket recommendations about alcohol are not possible. Based on one’s unique personal and family history, alcohol offers each person a different spectrum of benefits and risks. Whether or not to include alcohol is a personal decision that should be discussed with your healthcare provider. For more information, read Alcohol: Balancing Risks and Benefits.

The Research So Far

The MIND diet contains foods rich in certain vitamins, carotenoids, and flavonoids that are believed to protect the brain by reducing oxidative stress and inflammation. Although the aim of the MIND diet is on brain health, it may also benefit heart health, diabetes, and certain cancers because it includes components of the Mediterranean and DASH diets, which have been shown to lower the risk of these diseases.

Cohort studies

Researchers found a 53% lower rate of Alzheimer's disease for those with the highest MIND diet scores (indicating a higher intake of foods on the MIND diet). Even those participants who had moderate MIND diet scores showed a 35% lower rate compared with those with the lowest MIND scores. [2] The results didn't change after adjusting for factors associated with dementia including healthy lifestyle behaviors, cardiovascular-related conditions (e.g., high blood pressure, stroke, diabetes), depression, and obesity, supporting the conclusion that the MIND diet was associated with the preservation of cognitive function.

Several other large cohort studies have shown that participants with higher MIND diet scores, compared with those with the lowest scores, had better cognitive functioning, larger total brain volume, higher memory scores, lower risk of dementia, and slower cognitive decline, even when including participants with Alzheimer's disease and history of stroke. [3-8]

Clinical trials

A 2023 randomized controlled trial followed 604 adults aged 65 and older who at baseline were overweight (BMI greater than 25), ate a suboptimal diet, and did not have cognitive impairment but had a first-degree relative with dementia. [9] The intervention group was taught to follow a MIND diet, and the control group continued to consume their usual diet. Both groups were guided throughout the study by registered dietitians to follow their assigned diet and reduce their intake by 250 calories a day. The authors found that participants in both the MIND and control groups showed improved cognitive performance. Both groups also lost about 11 pounds, but the MIND diet group showed greater improvements in diet quality score. The authors examined changes in the brain using magnetic resonance imaging, but findings did not differ between groups. [10] Nutrition experts commenting on this study noted that both groups lost a similar amount of weight, as intended, but the control group likely improved their diet quality as well (they had been coached to eat their usual foods but were taught goal setting, calorie tracking, and mindful eating techniques), which could have prevented significant changes from being seen between groups. Furthermore, the

duration of the study–3 years–may have been too short to show significant improvement in cognitive function.

The results of this study showed that the MIND diet does not slow cognitive aging over a 3-year treatment period. Whether the MIND diet or other diets can slow cognitive aging over longer time periods remains a topic of intense interest.

Other factors

Research has found that greater poverty and less education are strongly associated with lower MIND diet scores and lower cognitive function. [11]

Potential Pitfalls

- The MIND diet is flexible in that it does not include rigid meal plans. However, this also means that people will need to create their own meal plans and recipes based on the foods recommended on the MIND diet. This may be challenging for those who do not cook. Those who eat out frequently may need to spend time reviewing restaurant menus.
- Although the diet plan specifies daily and weekly amounts of foods to include and not include, it does not restrict the diet to eating *only* these foods. It also does not provide meal plans or emphasize portion sizes or exercise.

Bottom Line

The MIND diet can be a healthful eating plan that incorporates dietary patterns from the Mediterranean and DASH, both of which have suggested benefits in preventing and improving cardiovascular disease and diabetes, and supporting healthy aging. When used in conjunction with a balanced plate guide, the diet may also promote healthy weight loss if desired. Whether or not following the MIND diet can slow cognitive aging over longer time periods remains an area of interest, and more research needs to be done to extend the MIND studies in other populations.

Mindful Eating

What Is It?

Mindful eating stems from the broader philosophy of mindfulness, a widespread, centuries-old practice used in many religions. Mindfulness is an intentional focus on one's thoughts, emotions, and physical sensations in the present moment. Mindfulness targets becoming more aware of, rather than reacting to, one's situation and choices. Eating mindfully means that you are using all of your physical and emotional senses to experience and enjoy the food choices you make. This helps to increase gratitude for food, which can improve

the overall eating experience. Mindful eating encourages one to make choices that will be satisfying and nourishing to the body. However, it discourages "judging" one's eating behaviors as there are different types of eating experiences. As we become more aware of our eating habits, we may take steps towards behavior changes that will benefit ourselves and our environment.

How It Works

Mindful eating focuses on your eating experiences, body-related sensations, and thoughts and feelings about food, with heightened awareness and without judgment. Attention is paid to the foods being chosen, internal and external physical cues, and your responses to those cues. [1] The goal is to promote a more enjoyable meal experience and understanding of the eating environment. Fung and colleagues described a mindful eating model that is guided by four aspects: *what to eat*, *why we eat what we eat*, *how much to eat*, and *how to eat*. [1]

Mindful eating:

- considers the wider spectrum of the meal: where the food came from, how it was prepared, and who prepared it
- notices internal and external cues that affect how much we eat
- notices how the food looks, tastes, smells, and feels in our bodies as we eat
- acknowledges how the body feels after eating the meal
- expresses gratitude for the meal
- may use deep breathing or meditation before or after the meal
- reflects on how our food choices affect our local and global environment

Seven practices of mindful eating

From *SAVOR: Mindful Eating, Mindful Life* [2]

1. Honor the food. Acknowledge where the food was grown and who prepared the meal. Eat without distractions to help deepen the eating experience.
2. Engage all senses. Notice the sounds, colors, smells, tastes, and textures of the food and how you feel when eating. Pause periodically to engage these senses.
3. Serve in modest portions. This can help avoid overeating and food waste. Use a dinner plate no larger than 9 inches across and fill it only once.
4. Savor small bites, and chew thoroughly. These practices can help slow down the meal and fully experience the food's flavors.
5. Eat slowly to avoid overeating. If you eat slowly, you are more likely to recognize when you are feeling satisfied, or when you are about 80% full, and can stop eating.
6. Don't skip meals. Going too long without eating increases the risk of strong hunger, which may lead to the quickest and easiest food choice, not always a healthful one.

Setting meals at around the same time each day, as well as planning for enough time to enjoy a meal or snack reduces these risks.

7. Eat a plant-based diet, for your health and for the planet. Consider the long-term effects of eating certain foods. Processed meat and saturated fat are associated with an increased risk of colon cancer and heart disease. Production of animal-based foods like meat and dairy takes a heavier toll on our environment than plant-based foods.

Watch: Practicing mindful eating

Mindful eating starts with being conscious of every bite you take. Learn more about this practice and other mindful living approaches from the Thich Nhat Hanh Center for Mindfulness in Public Health.

The Research So Far

The opposite of mindful eating, sometimes referred to as mindless or distracted eating, is associated with anxiety, overeating, and weight gain. [3] Examples of mindless eating are eating while driving, while working, or viewing a television or other screen (phone, tablet). [4] Although socializing with friends and family during a meal can enhance an eating experience, talking on the phone or taking a work call while eating can detract from it. In these scenarios, one is not fully focused on and enjoying the meal experience. Interest in

mindful eating has grown as a strategy to eat with less distractions and to improve eating behaviors.

Intervention studies have shown that mindfulness approaches can be an effective tool in the treatment of unfavorable behaviors such as emotional eating and binge eating that can lead to weight gain and obesity, although weight loss as an outcome measure is not always seen. [5-7] This may be due to differences in study design in which information on diet quality or weight loss may or may not be provided. Mindfulness addresses the shame and guilt associated with these behaviors by promoting a non-judgmental attitude. Mindfulness training develops the skills needed to be aware of and accept thoughts and emotions without judgment; it also distinguishes between emotional versus physical hunger cues. These skills can improve one's ability to cope with the psychological distress that sometimes leads to binge eating. [6]

Mindful eating is sometimes associated with a higher diet quality, such as choosing fruit instead of sweets as a snack, or opting for smaller serving sizes of calorie-dense foods. [1]

- A literature review of 68 intervention and observational studies on mindfulness and mindful eating found that these strategies improved eating behaviors such as slowing down the pace of a meal and recognizing feelings of fullness and greater control over eating. [8] Slower eating was associated with eating less food, as participants felt fuller sooner. Mindfulness and mindful eating interventions appeared most successful in reducing binge eating and emotional eating. However, the review did not show that these interventions consistently reduced body weight. Limitation of the studies included small sample sizes, limited durations of about 6 months or less, lack of focus on diet quality, and lack of follow-up so that longer-term success was not determined.
- A randomized controlled trial following 194 adults with obesity (78% were women) for 5.5 months looked at the effects of a mindfulness intervention on mindful eating, sweets consumption, and fasting glucose levels. The participants were randomly assigned to one of two groups: a diet and exercise program with mindfulness concepts (stress reduction, chair yoga, meditation, affirmations) or the same program but without mindfulness concepts. After 12 months, the mindfulness group showed a decreased intake of sweets and maintenance of fasting blood glucose, as opposed to the control group showing increased fasting blood glucose. [9] The research authors also evaluated weight loss with these participants, but did not find a significant difference in weight changes between the mindfulness group and control group. [10]

- A small controlled trial of 50 adults with type 2 diabetes were randomized to either a 3-month mindful eating intervention that was focused on reducing overeating and improving eating regulation or to a diabetes self-management education (DSME) intervention that was focused on improving food choices. Both groups showed significant improvements in measures of depression, nutrition self-efficacy, and controlling overeating behaviors. Both groups lost weight during the intervention but there was no difference in amount of weight loss between groups. [11]

  It is important to note that currently there is no standard for what defines mindful eating behavior, and there is no one widely recognized standardized protocol for mindful eating. Research uses a variety of mindfulness scales and questionnaires. Study designs often vary as well, with some protocols including a weight reduction component or basic education on diet quality, while others do not. Additional research is needed to determine what behaviors constitute a mindful eating practice so that a more standardized approach can be used in future studies. [1] Standardized tools can help to determine the longer-term impact of mindful eating on health behaviors and disease risk and prevention, and determine which groups of people may most benefit from mindfulness strategies. [1]

Are mindful eating strategies applicable in youth?

Mindfulness is a strategy used to address unfavorable eating behaviors in adults, and there is emerging interest in applying this method in adolescents and children due to the high prevalence of unhealthy food behaviors and obesity in younger ages. More than one-third of adolescents in the U.S. have overweight or obesity. Youth who have overweight/obesity are likely to experience weight-related stigma and bullying by their peers, which in turn can negatively affect eating behaviors and lead to eating disorders. [12] Studies have found that eating disorders are developing at younger ages, with an increased number of children younger than 12 years of age presenting for treatment. [12]

- A review of 15 studies of mindfulness-based interventions in adolescents found that mindfulness techniques were associated with reduced concerns about body shape, less dietary restraint, decreased weight, and less binge eating. [12] However, interestingly, the overall acceptability of the mindfulness-related interventions was rated low by the participants, compared with general health education. It is likely that the way mindful strategies are presented to younger ages needs better understanding as it may be different than in adults. An example could be using new online technologies that are specific to their developmental age and learning ability. The review also found that mindfulness in the form of meditation and mindful breathing can have significant effects on disordered eating through better stress management and reduced overeating caused by depression and anxiety.

- Studies are still scarce in children, but novel programs are emerging. A pilot mindful eating intervention was tested in a low-income school in California involving third-through-fifth grade children including Hispanic and non-Hispanic children. [13] The goal was to foster healthy eating behaviors in the children and their parents. The program included topics such as “Master Mindless Munching,” “Getting to Know Hunger and Fullness,” and “Sensational Senses,” and provided take-home activities to do with their parents. Surveys at the end of the program showed that the children and parents liked the activities, and there was an increase in parents serving nutritious meals and practicing mindfulness during meals (e.g., recognizing when hungry vs. full).

Potential Pitfalls

- *Mindful eating is not intended to replace traditional treatments for severe clinical conditions such as eating disorders.* Neurochemical imbalances are a risk factor for developing eating disorders such as bulimia and anorexia nervosa, and although mindfulness may be an effective component of a treatment plan, it should not be used as a sole treatment.
- *May not be effective as a weight loss strategy on its own, but rather a complement to a weight loss program.* Mindful eating embraces making food choices that promote well-being and increasing enjoyment of the eating experience. Traditional weight loss regimens focus on following a structured meal plan that may not necessarily be satisfying or enjoyable. Combining mindfulness with a meal plan under the guidance of a registered dietitian may reduce the risk of emotional overeating or binge

eating. [14] Research has not consistently shown that mindfulness strategies lead to weight loss, but this may be due to the study design not including education on healthy eating choices as part of the mindfulness intervention.

Bottom Line

Mindful eating is an approach to eating that can complement any eating pattern. Research has shown that mindful eating can lead to greater psychological wellbeing, increased pleasure when eating, and body satisfaction. Combining behavioral strategies such as mindfulness training with nutrition knowledge can lead to healthful food choices that reduce the risk of chronic diseases, promote more enjoyable meal experiences, and support a healthy body image. More research is needed to examine whether mindful eating is an effective strategy for weight management.

Mindful eating in context of COVID-19

As COVID-19 lockdowns began, reports of food stockpiling by consumers (with trends toward shelf-stable, energy-dense comfort foods) fueled concern that adults may increase their overall food intake during extended isolation, thus leading to weight gain. [15] Along with the potential for increased emotional eating due to the numerous stressors brought on by the pandemic, researchers noted that home confinement provides an altered exposure to food cues, which may enhance impulsive eating behaviors. [16] The simultaneous loss of social eating opportunities was also flagged for its potential to reduce mindful eating practices, which could negatively influence food choice and promote overeating. [16] All said, the full impacts at a population-level remain to be seen amidst varying degrees of lockdown mandates and compliance with social-distancing measures worldwide.

In the meantime, individuals may consider incorporating any number of mindful eating strategies in their daily lives alongside other important measures to help stay healthy during COVID-19. For example:

- If you're working from home and find that "office" time blends into all hours of the day, schedule times in your calendar to *only eat*: a lunch break away from your computer, a reserved time for dinner with your family, etc.
- If you find yourself standing in your pantry or staring in your refrigerator, pause and ask yourself: "am I truly hungry, or am I just bored or stressed?" If hungry, eat. If boredom or stress is the source, reroute your attention to an activity you enjoy, call a friend, or simply spend some time breathing.
- If you have a craving for comfort foods, pause and take a few in-breaths and out-breaths to be fully present with your craving. Take a portion of the food from the

container (a handful of chips, a scoop of ice cream) and put it on a plate. Eat mindfully, savoring each bite.

A note about eating disorders: The COVID-19 pandemic may raise unique challenges for individuals with experience of eating disorders. [17] In the U.S., the National Eating Disorders Association has reported a significant increase in calls and messages for help as compared to a year ago. As noted, mindful eating is not intended to replace traditional treatments for severe clinical conditions such as eating disorders. If you or someone you know is struggling with an eating disorder, you can call the National Eating Disorders Association Helpline at 1-800-931-2237, or text "NEDA" to 741-741.

A note about food insecurity: Many individuals may be facing food shortages because of unemployment or other issues related to the pandemic. If you (or someone you know) are struggling to access enough food to keep yourself or your family healthy, there are several options to help. Learn more about navigating supplemental food resources.

Diet Review: Paleo Diet for Weight Loss

Finding yourself confused by the seemingly endless promotion of weight-loss strategies and diet plans? In this series, we take a look at some popular diets—and review the research behind them.

What Is It?

The Paleolithic or "Paleo" diet seeks to address 21st century ills by revisiting the way humans ate during the Paleolithic era more than 2 million years ago. Paleo proponents state that because our genetics and anatomy have changed very little since the Stone Age, we should eat foods available during that

time to promote good health. Our predecessors used simple stone tools that were not advanced enough to grow and cultivate plants, so they hunted, fished, and gathered wild plants for food. If they lived long enough, they were believed to experience less modern-day diseases like diabetes, cancer, and heart disease because of a consistent diet of lean meats and plant foods along with a high level of physical activity from intensive hunting. However, the life expectancy of our predecessors was only a fraction of that of people today.

The popularity of the Paleo diet, which hit a peak in 2014, appealed to consumers' increasing desire to eat more healthfully and to know where their food was coming from. [1]

How It Works

The Paleo diet, also referred to as the caveman or Stone-Age diet, includes lean meats, fish, fruits, vegetables, nuts, and seeds. Proponents of the diet emphasize choosing low-glycemic fruits and vegetables. There is debate about several aspects of the Paleo diet: what foods actually existed at the time, the variation in diets depending on region (e.g., tropical vs. Arctic), how modern-day fruits and vegetables bear little resemblance to prehistoric wild versions, and

disagreement among Paleo diet enthusiasts on what is included/excluded from the diet. Because of these differences, there is not one “true” Paleo diet.

For example, although white potatoes were recorded as being available during the Paleolithic era, they are usually avoided on the Paleo diet because of their high glycemic index. Processed foods are also technically off limits due to an emphasis on fresh foods, but some Paleo diets allow frozen fruits and vegetables because the freezing process preserves most nutrients.

Overall, the diet is high in protein, moderate in fat (mainly from unsaturated fats), low-moderate in carbohydrate (specifically restricting high glycemic index carbohydrates), high in fiber, and low in sodium and refined sugars. [2] The monounsaturated and polyunsaturated fats (including the omega-3 fats EPA and DHA) come from marine fish, avocado, olive oil, and nuts and seeds.

Grass-fed beef is often highlighted on the diet, which is promoted to contain more omega-3 fats than conventional beef (due to being fed grass instead of grain). It does contain

> small amounts of alpha-linolenic acid (ALA), a precursor to EPA and DHA. However, only a small proportion of ALA can be converted in the body to long-chain omega-3 fatty acids (EPA and DHA). The amount of omega-3 is also highly variable depending on the exact feeding regimen and differences in fat metabolism among cattle breeds. [3] In general, the amount of omega-3 in grass-fed beef is much lower than that in oily marine fish. [3] Cooked salmon contains 1000-2000 mg of EPA/DHA per 3-ounce portion, whereas 3 ounces of grass-fed beef contains about 20-200 mg of ALA.

The following is a summary of foods generally permitted on the diet:

- *Allowed:* Fresh lean meats, fish, shellfish, eggs, nuts, seeds, fruits, vegetables, olive oil, coconut oil, and small amounts of honey. Certain root vegetables like sweet potatoes and cassava may be allowed in moderation because of their high nutrient content.
- *Not Allowed:* Whole grains, cereals, refined grains and sugars, dairy products, white potatoes, legumes (peanuts, beans, lentils), alcohol, coffee, salt, refined vegetable oils such as canola, and most processed foods in general.
- Calorie counting and portion sizes are not emphasized. Some plans allow a few "cheat" non-Paleo meals a week, especially when first starting the diet, to improve overall compliance.

The Research So Far

Some randomized controlled trials have shown the Paleo diet to produce greater short-term benefits than diets based on national nutrition guidelines, including greater weight loss, reduced waist circumference, decreased blood pressure, increased insulin sensitivity, and improved cholesterol. However these studies were of short duration (6 months or less) with a small number of participants (less than 40). [4-6]

One larger randomized controlled trial followed 70 post-menopausal Swedish women with obesity for two years, who were placed on either a Paleo diet or a Nordic Nutrition Recommendations (NNR) diet. [7] The Paleo diet provided 30% of total calories from protein, 40% fat (from mostly monounsaturated and polyunsaturated fats) and 30% carbohydrates. It included lean meats, fish, eggs, vegetables, fruits, berries, nuts, avocado, and olive oil. The NNR diet provided less protein and fat but more carbohydrate with 15% protein, 25-30% fat, and 55-60% carbohydrates, including foods similar to the Paleo diet but also low-fat dairy products and high-fiber grains. Both groups significantly decreased fat mass and weight circumference at 6 and 24 months, with the Paleo diet producing greater fat loss at 6 months but not at 24

months. Triglyceride levels decreased more significantly with the Paleo diet at 6 and 24 months than the NNR diet.

Potential Pitfalls

- *Meal planning.* Because the diet relies heavily on fresh foods, expect a time commitment to plan, purchase, prepare, and cook meals. This may be challenging for busy lifestyles or for those less experienced with cooking.
- *Higher cost.* Fresh meats, fish, and produce tend to be pricier than processed versions such as frozen or canned.
- *Excluding foods.* The exclusion of entire categories of commonly eaten foods like whole grains and dairy requires frequent label reading in the supermarket and in restaurants. It may also increase the risk of deficiencies such as calcium, vitamin D, and B vitamins, if these nutrients are not consistently eaten from the allowed foods or a vitamin supplement. For example, there are some nondairy calcium-rich foods that are absorbed well by the body such as collard and turnip greens or canned bone-in sardines and salmon, but you would have to eat five or more servings of these greens and fish bones daily to meet recommended calcium needs. (Note that some greens like spinach that are touted to be calcium-rich also contain oxalates and phytates that bind to calcium so very little is actually absorbed.) One small, short-term intervention study of healthy participants showed a 53% decrease from baseline in calcium intake after following a Paleo diet for three weeks. [8] Furthermore, the exclusion of

whole grains can result in reduced consumption of beneficial nutrients such as fiber and thus may increase one's risk for diabetes and heart disease.

- *Health concerns of a high meat intake.* Several studies have shown that a high intake of red meat is linked to a higher risk of death, cardiovascular disease, and diabetes.

Unanswered Questions

- Is there potential for nutrient deficiencies, such as calcium and vitamin D, when following this diet for longer than one year that may make it inappropriate for certain at-risk groups (e.g., those with existing or at high risk of osteopenia or osteoporosis)?
- Are there long-term negative side effects of omitting entire food groups, especially if the diet is not carefully constructed to include the nutrients from the omitted foods?
- Is this diet safe and beneficial for everyone (e.g., generally healthy population, higher risk individuals with chronic diseases, elderly)?

Bottom Line

The Paleo diet includes nutrient-dense whole fresh foods and encourages participants to steer away from highly processed foods containing added salt, sugar, and unhealthy fats. However, the omission of whole grains, dairy, and legumes

could lead to suboptimal intake of important nutrients. The restrictive nature of the diet may also make it difficult for people to adhere to such a diet in the long run. More high-quality studies including randomized controlled trials with follow-up of greater than one year that compare the Paleo diet with other weight-reducing diets are needed to show a direct health benefit of the Paleo diet. Strong recommendations for the Paleo diet for weight loss cannot be made at this time.