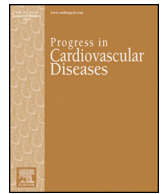


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Popular fad diets: An evidence-based perspective

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ABSTRACT

Despite the emergence of stronger nutritional science over the past two decades, fad diets remain highly popular. However, growing medical evidence has led to the endorsement of healthy eating patterns by medical societies. This thus allows fad diets to be compared to the emerging scientific evidence as to which diets promote or damage health. In this narrative review, the most popular current fad diets are critically analyzed, including low-fat diets, vegan and vegetarian diets, low-carbohydrate diets, ketogenic diets, Paleolithic diets, and intermittent fasting. Each of these diets has some scientific merit, but each has potential deficiencies relative to the findings of nutritional science. This article also presents the common themes that emerge among the dietary guidance of leading health organizations, such as the American Heart Association and the American College of Lifestyle Medicine. While there are important distinctions between dietary recommendations emanating from various medical societies, each recommends eating more unrefined, plant-based foods, while eating fewer highly processed foods and added sugars, and avoiding excessive calorie consumption as an important nutritional strategy for the prevention and management of chronic conditions and promotion of overall health.

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Contents

Dietary confusion	79
Low fat diets	79
Vegan and vegetarian-based diets	79
Low-carbohydrate diets	80
Ketogenic diets	81
Paleolithic diets	82
Intermittent fasting	83
Fad diets in perspective	84
References	84

The 20th century saw a marked change in the drivers of disease morbidity and mortality. At the turn of the 20th century, acute infectious diseases such as pneumonia, tuberculosis, and gastrointestinal diseases, were the leading cause of premature mortality. The advent of improved sanitation, vaccines, and antibiotics markedly reduced the threat of such illnesses and markedly improved longevity. By the 1930s, chronic diseases, and particularly, cardiovascular disease (CVD), emerged as the leading cause of mortality. In response, the U.S. Congress commissioned

the Framingham Study, to determine the principal drivers of CVD through the longitudinal study of the Framingham community. By 1961, The Framingham study had identified most of the major risk factors for CVD, including hypertension, diabetes, smoking, and high cholesterol. Concurrently, led by Ancel Keys, the Seven Countries Study was initiated to study the cross-cultural comparison of risk factors for CVD. Its findings also identified hypercholesterolemia as a major risk factor for CVD.

As the medical community focused on this newly recognized importance of hypercholesterolemia, an increasing preoccupation arose as to the relationship between hypercholesterolemia and diet. In response, various “fad” diets emerged, i.e., diets popularized in the mainstream even without the backing of clinical scientific investigations. Since

Abbreviations: CVD, cardiovascular disease; ACLM, American College of Lifestyle Medicine.

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Table 1

Common reasons for adopting a fad diet.

-
- Provides structure in adopting a diet.
 - The proposed diet seems achievable (consistent with one's sense of self-efficacy).
 - Believe the diet will lead to better health
 - Believe the diet will lead to weight loss
 - Highly recommended by a friend
 - Attracted by the popularity of the diet
 - Feel that need to try something new
 - Attracted by the novelty of the diet
-

then, fad diets have become a staple of the American health scene. While many fad diets have come and gone, others enjoy continued popularity. Indeed, the reasons why individuals may gravitate to fad diets are multifold, as listed in Table 1. Over time, some elements of fad diets have played an important role in helping to spur what is now a robust nutritional science which increasingly defines the essence of healthy versus unhealthy diets. However, the sheer plethora of fad diets and often false advertising surrounding these diets have created public confusion as to what constitutes optimal eating patterns.

Dietary confusion

Controversy abounds in medicine. For example, within Cardiology, there is frequent debate as to which medications to use for which cardiac conditions, which imaging tests are best used to assess cardiac risk, and which patients deserve myocardial revascularization procedures. While important, none of these debates strongly capture the public's interest. By contrast, there has always been a strong public interest regarding the controversies which have roiled the world of nutritional science and a willingness to often accept unsubstantiated nutritional advice, even if it did not come from normative scientific sources.

As a result, this has led to a “diet industry” that is very large and profitable, estimated to be worth billions of dollars.¹ The industry has been characterized by outsized public discussion and marketing, as reflected by its prominent presence on social media feeds and diet-related advertisements, promising quick fixes to many ailments.

Despite the diet industry's often assertive claims, there are strong reasons to be skeptical of fad diets in lieu of hard scientific nutritional facts. This very concern led to a Congressional hearing on Deception and Fraud in the Diet Industry in the 1990's. The hearings concluded that most commercial dietary programs actively suppress facts about what to expect regarding chances of success of their programs.² One team of researchers set out to prove this by analyzing the best-selling diet book at the time of their analysis. They reviewed the claims made in the book for scientific merit. They found that over 67% of the nutrition claims were not or may not have been supported by peer-reviewed literature, including the claim from the book that it had been “scientifically studied and proven effective”.³

Fortunately, the emergence of a true nutritional science, based on improving epidemiological science, food substitution studies, experimental studies, and a profound rise in meta-analytical studies have emerged which permit greater clarity as to the bounds of what constitutes healthy and unhealthy diets.

This review evaluates the prominent fad diets of the last 40 years, with specific focus on current popular fad diets. The validity of these diets is assessed in relationship to now well-accepted dietary principles, based on an accelerating evidence-base as to what constitutes healthy nutrition. The diets that are reviewed herein are listed in Table 2.

Low fat diets

One of the early fad diets to address health concerns over the last 50 years was the Pritikin diet, developed by Nathan Pritikin in the 1970s.

Table 2

Common diets.

-
- (1) Low Fat Diets
 - Pritikin Diet
 - Ornish Diet
 - (2) Vegetarian Diets
 - Vegan Diet
 - Vegetarian Diet
 - (3) Low Carbohydrate Diets
 - (4) Intermittent Fasting
 - (5) Diets recommended by medical societies
 - Whole-food plant-based diet
 - American Heart Association
 - Dash diets
 - Mediterranean diet
-

Pritikin's focus was to promote a diet which would help reduce serum cholesterol levels. Pritikin called for a diet that emphasized the ingestion of complex carbohydrates, including whole grains and dietary fiber, foods low in cholesterol (e.g., limited egg consumption), and very low fat consumption. He advocated that fewer than 10% of calories come from fats. Given that 40% of the typical American diet were coming from fat sources, this diet represented a radical suggestion. It was strongly opposed by the American Heart Association and other medical societies at that time. Nevertheless, the Pritikin diet became quite popular and his book on the subject became a best-seller.

This novel diet was followed by the development of the Ornish diet, created by Dr. Dean Ornish in the early 1980s. Like the Pritikin diet, Ornish recommended a diet that was primarily low fat (<10% of calories), with an emphasis on whole plant-based foods, such as whole grains, fruits and vegetables, and legumes. The diet also incorporates egg whites, soy products, and limited intake of non-fat dairy products. Both the Pritikin and Ornish diet strongly discouraged the consumption of highly processed vegetable products, and both couched their diet in the context of a global change in lifestyle, including attention to exercise, weight control, smoking cessation, and stress reduction.

It is notable that the Pritikin and Ornish diets preceded the advent of nutritional findings which have strongly shown the benefits of healthy forms of fat, consisting of unsaturated fats, such as those listed in Table 3. Otherwise, the original Pritikin and Ornish diets do not differ in quality from the healthy diets that are now advocated by many medical societies.

Vegan and vegetarian-based diets

A popular form of eating, often adopted by those trying to lose weight or transition to a healthier diet pattern, is the consumption of

Table 3

Common sources of unsaturated fats.

-
- NUTS AND NUT BUTTERS
 - Walnuts
 - Cashews
 - Pecans
 - Almonds
 - Peanut butter
 - Almond butter
 - SEEDS AND SEED BUTTERS
 - Flaxseed
 - Chia seeds
 - Sunflower seeds
 - Hemp seeds
 - Sunflower seed butter
 - AVOCADO
 - OLIVES
 - PLANT-BASED OILS
 - Olive oil
 - Flaxseed oil
 - Avocado oil
-

Table 4
Common terms applied to vegetarian diets.

Vegan diet	plant-based diet that excludes all animal products and by-products (e.g., meat, fish, dairy, and eggs)
Vegetarian diets	
• Ovo vegetarian	Vegetarian diet that excludes meat but allows eggs (ovo)
• Lacto vegetarian	Vegetarian diet that excludes meat but allows dairy products (lacto)
• Ovo vegetarian	Vegetarian diet that excludes meat but allows both dairy products (lacto) and eggs (ovo).
Pescatarian	A plant-based diet that includes fish and seafood.
Flexitarian	Primarily plant-based, but small amounts of meat, eggs, fish, and dairy can be included if desired.
Whole-food plant-based diet	Diet that excludes all animal and animal products and excludes plant-based foods that are highly processed

a vegan or vegetarian-diet. Generally, plant-based diets are an excellent choice for optimizing health, but pitfalls exist. Much confusion abounds due to the various terms that are frequently used to describe various forms of vegetarian diets. A list of the most used terms to describe vegetarian diets and their meaning are listed in Table 4. A “vegan diet”, a term coined by Don Watson in 1944, is a diet that eliminates all animal-derived foods including meat, poultry, seafood, dairy, eggs, and honey. The purest form of a vegan diet has little to do with human health. It is the practice of making food and lifestyle decisions driven by the ethical goal of eliminating animal suffering and the industrialization of animals. Simply eliminating animal foods does not always equate to improved health. From that vantage point, it does not technically belong in a conversation about fad diets. However, the diet industry has turned it into a diet by attaching health claims and inflated promises to it.

The term “vegan” has come to be used interchangeably with the term “plant-based”. Many of the diet books out there that are labeled “vegan” may actually be referring to plant-based eating and may utilize many of the nutrition principles characteristic of a healthy diet, such as more fruits and vegetables. This is also seen in research studies which occasionally use the terms “vegan” and “plant-based” interchangeably. However, this practice causes confusion.

There are various forms of vegetarian diets which while being primarily plant-based do allow some animal by-products. One such type is an “ovo-vegetarian” diet, which includes eggs in an otherwise vegetarian diet. A second type is a “lacto-vegetarian diet”, which includes dairy products in an otherwise vegetarian diet, but excludes eggs and egg-containing food products. “Lacto-ovo-vegetarian” diets are vegetarian diets that incorporate both eggs and dairy products into one's meal plans.

An increasingly popular form of eating is the adoption of a whole food plant-based diet. The term “plant-based” was coined by T. Colin Campbell in 1980 when he was researching the therapeutic effects of a low-fat, high-fiber, vegetable-based diet on cancer. He later added “whole food” to the term to clarify that he was speaking of plant foods in whole form and not isolated nutrients in the form of supplements or heavily processed foods.⁴ The terms “whole food plant-based”, and “plant-based” currently have no official, regulated definitions. Vegan, on the other hand, does have a third-party certifier that food companies can pursue to get the vegan seal on their food packaging.

Since the vegan food industry is rapidly growing, consumers now have ample choices of meat, dairy, and even egg substitutes in the grocery store aisles. Because veganism has been coerced into a diet, it can be difficult to know which of the many vegan products support health, and which ones do not. As an example, the “Impossible Burger” is a vegan sandwich patty made to closely imitate a beef burger. Fig. 1 displays the nutrition information for a single Impossible Burger patty. The burger is free of cholesterol and contains some fiber, which can be considered an improvement over a beef burger. Its protein content is equivalent to a beef burger. However, the patty is 53% fat and contains 8 g of saturated fat.⁵ Many vegan foods, however, are healthy.

Nutrition Facts	
Serving size	4 oz (113g)
Amount per serving	
Calories	240
	% Daily Value*
Total Fat 14g	18%
Saturated Fat 8g	40%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 370mg	16%
Total Carbohydrate 9g	3%
Dietary Fiber 3g	11%
Total Sugars <1g	
Includes <1g Added Sugars	1%
Protein 19g	31%
Vitamin D 0mcg	0%
Calcium 170mg	15%
Iron 4.2mg	25%
Potassium 610mg	15%
Thiamin	2350%
Riboflavin	15%
Niacin	50%
Vitamin B ₆	20%
Folate	30%
Vitamin B ₁₂	130%
Phosphorus	15%
Zinc	50%

*The % Daily Value tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Fig. 1. Impossible Burger Nutrition Facts Panel.

Vegetables, fruits, beans, and whole grains are all vegan. However, many others like the Impossible Burger fall into the category of processed foods.

When it comes to vegan diets and human health, this distinction is critical. In one study that compared high-quality and low-quality plant-based diets, healthy plant-based diets, defined as those that contain whole grains, fruits, vegetables, nuts, and legumes, were inversely associated with both systolic and diastolic blood pressure. On the other hand, unhealthy plant-based diets were directly associated with higher systolic blood pressure. Similarly, a recent randomized controlled study has demonstrated that vegetarian sources of protein have a favorable effect on lipid profiles compared to both red and white meat.⁶ Similarly, a 2019 meta-analysis of 36 studies found that substituting red meats with high quality plant protein sources led to favorable changes in blood lipids and lipoproteins.⁷ Finally, in a study that examined follow-up in a general community cohort, participants from the Atherosclerosis Risk in Communities study, individuals who followed a plant-based diet had a lower risk of cardiovascular morbidity and mortality during follow-up compared to those whose diets had higher animal content.⁸ Together, these studies demonstrate the benefit of plant-based diets, but only when highly processed vegetarian foods are minimized. In other words, simply eliminating animal products is not sufficient on its own when health improvement is the goal.⁹

Low-carbohydrate diets

Low-carbohydrate diets have been part of the mainstream for many years. Initial diet books advocating low carb diets, such as *Eat Fat and*

Table 5
Comparison of weight loss among participants adherent to three diets.

	Low fat restricted calorie diet	Mediterranean restricted calorie diet	Low carb non-restricted calorie diet	P values
% Adherence to diet	90.4%	85.3%	78.0%	P = 0.004 among groups
Loss of weight (kg)	3.3 + 4.1	4.6 + 6.0	5.5 + 7.0	P = 0.03 low fat vs low carb
Reduction in BMI (kg/m ²)	1.0 + 1.4	1.5 + 2.2	1.5 + 2.1	P = 0.05 among groups
Reduced waist circumference (cm)	2.8 + 4.3	3.5 + 5.1	3.8 + 5.2	P = 0.33 among groups

Date from Reference 12.

Grow Slim and *Calories Don't Count* were appearing by the early 1960s. But it was the publication of Dr. Robert Atkins's book (*Dr. Atkins's Diet Revolution*) in 1972 that led to a strong popularization of low carb diets. The Atkins diet is best described as a low carb, high fat, high protein diet. Running counter to medical evidence or opinion, Atkins promulgated high consumption of high-saturated fat foods, including meat, cheese, eggs, butter, and mayonnaise. Dr. Atkins's book was followed by the promulgation of other popular carb diet books, including *The Zone Diet* in 1995, *Sugar Busters!* in 1998, and *The South Beach Diet* in 2003. Unlike Atkins's approach, these latter books did not promulgate the unlimited consumption of saturated fats. More recent versions of low carb diets include the Paleolithic and Ketogenic diets.

The general premise of low carb diets is that restricting carbohydrates causes lower insulin levels, which forces the body to burn stored fat for energy and results in weight loss and improved health. The term "low-carb" is not standardized, but the typical low-carb diet is usually <40% of total calories, with some versions dipping as low as 5–10% of total calories.^{10,11} Low-carbohydrate diets generally rely heavily on high-protein and high-fat animal foods, non-starchy vegetables, and certain fruits. Due to their low carb influence, these diets limit foods containing added sugars, but also tend to limit the ingestion of grains, legumes, and starchy vegetables, such as corn, green peas, and white and sweet potatoes.

Two reasons why individuals adopt low carb diets is a perception that such diets will result in greater weight loss than low fat diets and a belief that low carb diets are intrinsically healthier. With respect to weight loss, medical evidence suggests that low carb diets are an effective diet for weight loss. For instance, in one trial, 322 moderately obese individuals were assigned one of three diets: a low-fat, restricted-calorie diet, a Mediterranean restricted calorie diet, or a low

carbohydrate non-restricted calorie diet. At two-year follow-up, all three groups lost weight, but the degree of weight loss was greater among the subjects on a Mediterranean or low CHO diet, even though the latter diet did not involve calorie restriction¹² (Table 5). These data represent a seminal demonstration that a variety of diets can be used to support weight loss. Similarly, a large meta-analysis compared 48 randomized trials, including 7286 individuals, in which popular diets were compared to no diet for weight loss.¹³ The net weight loss associated with low-carbohydrate diets at 12 months, averaging 7.25 kg, was nearly equal to that associated with low fat diets (7.25 versus 7.27 kg). These results confirm a general evidence base which indicates that nearly all popular diets are effective for short-term weight loss. Thus, over the short-term, the initial choice of a "weight-loss" diet may rely on patients' dietary preference and their own personal experience as to which type of diet helps them to lose weight.

However, the long-term health benefits of low carbohydrate diets are uncertain, given that strict adherence to such diets may increase the tendency to ingest the intake of protein from animal sources and/or limit the ingestion of some health-protective carbohydrates, such as fruits and fiber. Among a nationally representative sample from the National Health and Nutritional Examination Survey (NHANES), adherence to a lower-carbohydrate diet was associated with an increased risk for all cause-mortality, cancer, and cardiac events.¹⁴ Two meta-analytical studies have also observed an association between low carbohydrate diets and adverse clinical outcomes.^{14,15} However, since most of such outcome studies have not captured the influence of overall carbohydrate, protein, and fat quality, more prospective study is indicated to assess the potential health benefits of low -carb diets over the long-term.

Ketogenic diets

Ketogenic Diets are an extreme form of low-carbohydrate diets. The origins of the ketogenic diet were to reduce epileptic seizures which it does successfully, but with many long-term health risks.¹⁶ The potential value of a keto diet is based on an understanding of ketosis. Ketosis is defined as elevated ketones in the blood and urine, and, in the case of the keto diet, it is triggered by macronutrient composition that forces

Table 6
One-Day Nutritional Comparison Dietary Reference Intakes, a Modern Paleo Diet, a Historical Paleo Diet, and a Healthy Plant-based Diet.

	DRI	Modern Paleo	Historical Paleo	Healthy Plant-based
Energy (cal)	2200–2900	3000	3000	3000
<i>Controlled for calories for comparison</i>				
Protein (%)	10–35	32	25–30	15
Carbohydrate (%)	45–65	15	35–65	60
Fat (%)	15–30	53	20–35	25
Sat Fat (%)	<10	19	7.5–12	5
Cholesterol (mg)	–	1308	500+	0
n-6:n-3	–	11:1	2:1	3:1
Fiber (g)	25–38	31	70–150+	81
Riboflavin (mg)	1.3–1.7	2.6	6.5	4
Thiamin (mg)	1.1–1.2	2.7	3.9	3.9
Vitamin C (mg)	75–90	226	500	491
Vitamin A (mcg RAE)	700–900	2436	3797	1966
Vitamin E (mg)	15	24	32.8	27
Iron (mg)	8–18	25	87.4	37
Zinc (mg)	8–11	33	43.4	25
Calcium (mg)	1000–1200	643	1000–1500	2633
Sodium (mg)	<2300	4193	<1000	1958
Potassium (mg)	4700	4762	7000	8153

Table 7
Intermittent fasting protocols.

Type	Descriptors
Time-restricted fasting	Following a meal plan each day with a designated time frame for fasting. For example, a sixteen hour fast may restrict eating to between 9 am and 5 pm.
Alternate day fasting	Rotating days of eating with days of fasting.
Modified fasting (5:2 diet)	1–2 days per week of limiting calories to 20–25% of daily needs, with no food restriction on the other days.
Fasting mimicking diet	Eating packaged foods provided by a company called Prolon for a 5-day cycle. The company claims that because of the nutrient composition of the food, it is not recognized by the cellular pathways. Although this protocol is often represented as "fasting with food", the fasting days are still very low-calorie, ranging from about 700–1100 cal a day.

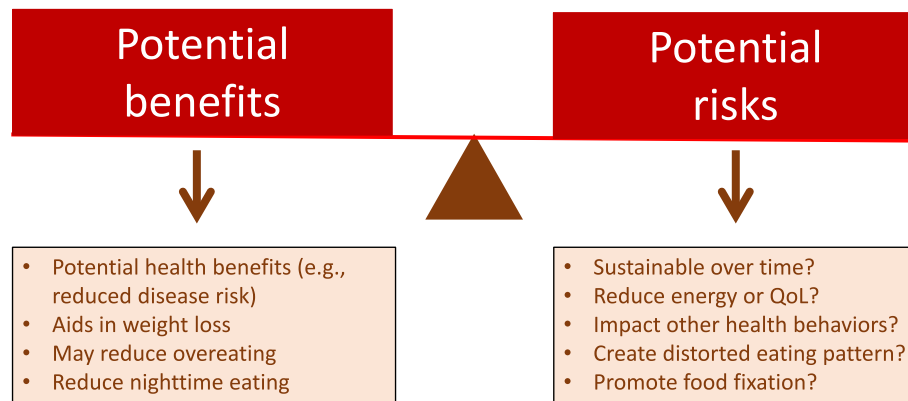


Fig. 2. Considerations regarding the practice of intermittent fasting.

the body to shift from using its preferred fuel source (glucose) to its emergency fuel source (ketones). Ketones are acids produced by the liver from fatty acids and are used as an alternative or emergency energy source by the body. It is important to note that not all the body's cells are able to utilize ketones. Only 50% of basal energy needs and only 70% of brain energy needs can be satisfied by ketones. The rest must have glucose.¹⁸

Adoption of a keto diet generally requires cutting carbohydrate intake to <40 g per day. The nutrition composition of this original ketogenic diet is roughly 5% carbohydrate, 25% protein, and 70% fat. The popular culture versions of the diet tend to be a little more liberal with their carbohydrate recommendation but are still extremely low in carbohydrate.¹⁷ The keto diet is based heavily on high-fat foods like fatty meats, oils, eggs, high-fat dairy, nuts, seeds, avocado, and coconut. Leafy greens and low-carbohydrate vegetables and berries are also allowed. It eliminates breads, pasta, and other grains, added sugars, milk, starchy vegetables, and most fruits.

Like other low-carb diets, keto diets also promote short-term weight loss. However, the initial bump of weight loss is mostly lost water. For instance, in a small weight loss trial, six people with obesity were put on two different diets, a keto diet or a “normal” diet, matched for calories.¹⁹ Although the keto group lost more overall weight in the first 10 days, the groups lost the same amount of fat, indicating that the initial loss in the keto diet was water. This is due to the emptying of glycogen from the cells that occurs when carbohydrates are restricted.

In another study of 20 men and women classified as overweight, a keto diet (10% carbohydrate, 75% fat) was compared to a low-fat plant-based diet (75% carbohydrate, 10% fat).²⁰ All participants followed both diets for two weeks each with unrestricted food intake. Although the keto diet lowered blood glucose, insulin, and triglycerides, it impaired glucose tolerance and increased muscle mass loss. On the other hand, the plant-based diet lowered blood pressure and cholesterol, resulted in lower overall calorie intake, and increased fat loss.

While a ketogenic diet has been proven to be helpful for epileptic seizure reduction, it comes with many detrimental side effects.²¹ Possible short-term benefits may include weight loss, improved blood glucose, lower triglycerides, and increased HDL. The long list of possible negative effects includes a host of symptoms deemed the “keto flu”:

Table 8
Conditions in which intermittent fasting should be avoided.

- Premenopausal females
- Pregnancy and lactation
- Engagement in very high physical activity levels,
- History of eating disorders
- Food insecurity
- Taking medications dependent on food intake

constipation, diarrhea, muscle cramps, weakness, rashes, bad breath, headaches, and impaired ability to exercise. In the long-term, ketogenic diets are associated with increased all-cause mortality, insulin resistance, impaired artery function, risk of cardiovascular disease, increased LDL cholesterol, impaired glucose tolerance, worsened kidney function, nutrient deficiencies, colon cancer, and bone loss.^{22–32} The bottom line: the ketogenic diet is a high-risk diet with little long-term reward.

Paleolithic diets

The Paleolithic diet is another rendition of the low-carbohydrate diet, but like the keto diet, its popularity makes it worthy of its own discussion. The Paleolithic diet, also called the caveman diet, the primal diet, or the hunter-gatherer diet, is based on the theory that when our ancestors shifted away from a diet built on hunting and gathering and toward a diet built on agricultural practices, they set in motion the chronic diseases that plague humans today. Therefore, the Paleo diet is a so-called return to the ancestral way of eating.^{33,34}

The Paleo diet, as it is practiced in the modern world, tends to include generous amounts of saturated fat in the forms of coconut oil, butter, and clarified butter, animal protein (preferably grass-fed), certain vegetables, and low to moderate amounts of fruit. Although the recommended avoidances vary slightly among Paleo diet gurus, this diet tends to eliminate all grains and legumes, added sugars, corn, and dairy.³⁵

The Paleo diet begs the question, what did our ancestors actually eat? Based on anthropological data, they ate a diet of wild plants, wild animals, fish, and insects, all of which have a much different nutritional composition compared to the industrially farmed foods eaten today.^{36,37} They did not eat ultra-processed foods, fast food or fried foods, refined foods like added sugars, oils, and refined grains, processed meats, or dairy products.

The modern Paleo diet is correct that our ancestors' diet was quite different from what most Americans eat today, but there's one important piece of information that is often omitted from the modern Paleo diet - our ancestors ate mostly plants. According to anthropologists, the real Paleo diet was overwhelmingly plant-based with small amounts of animals and insects. Table 6 compares the modern Paleo diet, the historical Paleolithic diet as defined by anthropologists, and a healthy plant-based diet, all controlled for calories. As the table shows, the historical Paleo diet has much more in common with the plant-based diet, the most notable being the fiber content. It's estimated that our ancestors ate as much as 150 g of fiber every day, which is nearly five times more fiber than the modern Paleo diet. Since fiber is only found in plant foods, our Paleolithic ancestors were clearly eating a lot of plants. Other clues that point to a plant-based diet include their high vitamin C and potassium intake.^{38–41}

The Paleo diet does contain granules of benefit. The benefits include the emphasis on many foods linked to positive health outcomes,

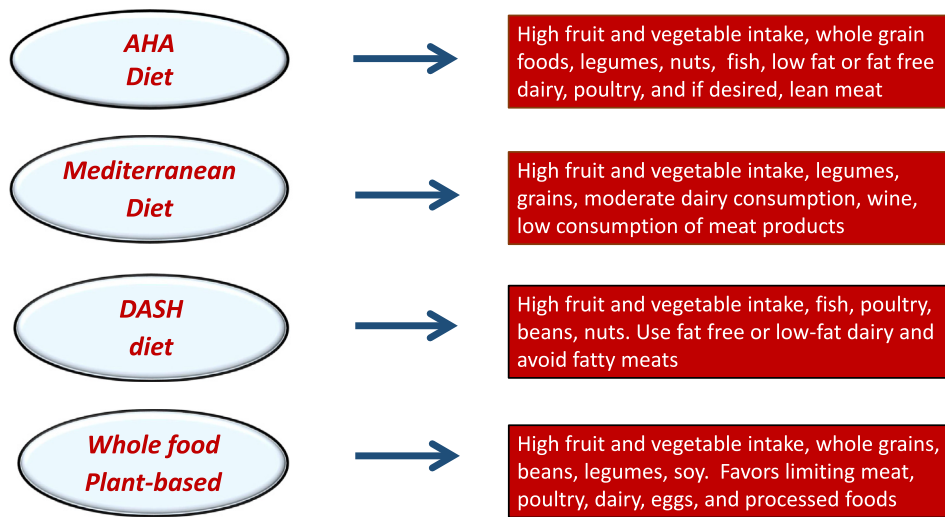


Fig. 3. Chief characteristics of four dietary patterns recommended by medical societies.

including whole, unprocessed foods. Simply making this shift in one's diet has the potential to improve health. However, modern Paleo diets often promote consuming significant quantities of animal product above what is recommended and eliminating certain foods and food groups that are rich sources of fiber, a nutrient that should be emphasized, not discouraged. The most important takeaway is that the modern Paleo diet is a poor reflection of the actual eating patterns of Paleolithic humans, and to truly eat like our ancestors means adding more plant-based foods to our plates.

Intermittent fasting

Intermittent fasting is the practice of abstaining from or significantly reducing food intake for a set period of time. The most common forms of

intermittent fasting are shown in Table 7.⁴² Intermittent fasting is promoted for everything from longevity, weight loss, diabetes reversal, and improved cardiovascular health. At a high level, intermittent fasting is based on the idea that fasting induces metabolic switching from liver-derived glucose to adipose cell-derived ketones. During fasting, cells activate pathways that enhance intrinsic defenses against oxidative and metabolic stress and pathways that remove or repair damaged cells.^{43,44}

Currently, most of the research on intermittent fasting has been done in animals, while human research is mostly observational. The experimental studies that do exist are mostly short-term with small sample sizes. Physiologically, calorie restriction has been shown in animals to increase lifespan and improve tolerance to various metabolic stresses in the body. Although the evidence for caloric restriction in animal studies is strong, there is less convincing evidence in human

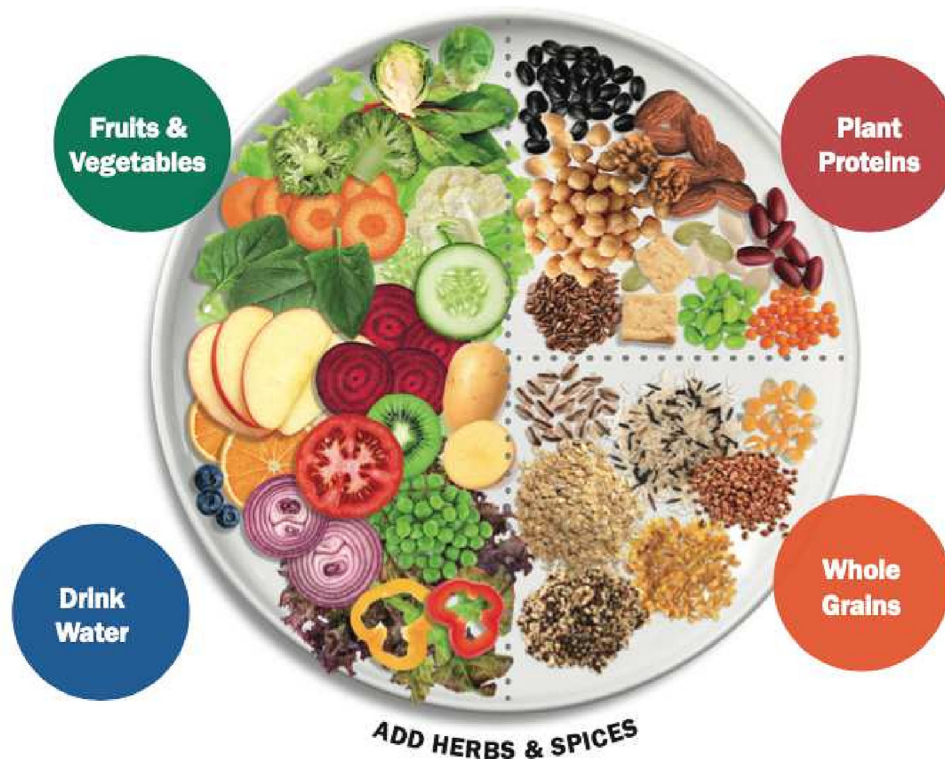


Fig. 4. The American College of Lifestyle Medicine WFPB Plate. From Reference 56. (Permission to reproduce figure granted from the American College of Lifestyle Medicine).

studies thus far. A meta-analysis looking at nine human trials of modified fasting concluded that although there is some promise in animal studies, the evidence in human studies is still inconclusive.⁴⁵

In another review by authors who are much more hopeful of the potential benefits of intermittent fasting, the authors cautioned that it remains to be determined how well individuals can maintain intermittent fasting over the long-term.⁴⁴ In addition, they note that clinical studies have primarily focused on the effects of intermittent fasting in overweight young and middle-aged adults. Thus, these results cannot be generalized to other age groups in whom the benefits and safety of intermittent fasting have not yet been adequately evaluated.

Some of the consideration in adopting intermittent fasting are shown in Fig. 2. Based on the current evidence, there are some indications in animal studies and small human studies that there could be benefits in the areas of longevity, cancer, diabetes, and cardiovascular disease. At this point, those results are mixed and have not been demonstrated on a larger scale in humans. Another area of interest regarding intermittent fasting is the possibility that it may lead to enhanced weight loss among some individuals. To the extent that intermittent fasting is adopted as part of an overall commitment to healthy eating, it might also serve as an aid to reducing overeating or nighttime eating. However, these considerations need to be counterbalanced by some potential risks. First, individuals must evaluate whether adoption of intermittent fasting is personally sustainable over the long-term (i.e., as a practical lifestyle)? Is it impacting one's energy level or quality of life? And is it negatively impacting other health behaviors, such as engagement in exercise? In addition, among some individuals, pre-occupation with intermittent fasting has the potential to lead to distorted eating patterns or undue food fixation. Regardless of potential benefits, intermittent fasting may be contraindicated for certain populations, as indicated in Table 8.^{46–49}

Fad diets in perspective

With an estimated one in five deaths globally associated with poor diet, the growing number of popular diets deserve increasing scrutiny as to their potential health effects.⁵⁰ Each year, the US News and World Report enlists a panel of experts to rank popular diets based on various criteria including how easy it is to follow, nutritional completeness, safety, and their potential for preventing and managing diabetes and heart disease. In 2022, the top five highest ranking diets were all predominantly plant-based diets. Meanwhile, Paleo, Atkins, and Keto diets were all ranked in the bottom ten.⁵¹

Fortunately, an emerging consensus from a now large body of research serves to inform the public as to what healthy eating looks like. Many major medical associations, health organizations, and governments have now developed guidance for health-promoting diets based on sound scientific science. Some major diets in this regard is the dietary pattern recommended by the American Heart Association,⁵² the Mediterranean Diet,⁵³ the Dietary Approaches to Stop Hypertension (DASH) diet,⁵⁴ and the whole food plant-predominant diet recommended by the American College of Lifestyle Medicine (ACLM).⁵⁵ Salient features of these four diets are shown in Fig. 3. Some of these societies have encapsulated their dietary recommendations in a recommended dietary plate or similar format, as shown for the ACLM's recommended diet in Fig. 4.⁵⁶

While there are differences in the recommendations that emerge from various medical organizations, common themes emerge among all their recommendations. First, among each, eating more unrefined, plant-based foods is an important strategy in prevention and management of chronic conditions and promotion of overall health.⁵² Second, each of these scientifically based diets recommend either strictly limiting or avoiding highly processed meats and carbohydrates and avoiding sugar sweetened drinks and foods with substantial amounts of added sugars. Third, these diets are generally couched with recommendations to avoid overeating and adopting an overall healthy lifestyle, including

managing weight, exercising, and getting adequate sleep and relaxation.

While fad diets are likely to remain popular for the reasons cited in Table 1, today the advent of scientifically recommended diets by medical organizations have moved the yardsticks.

In prior generations, fad diets could hide behind a lack of credible scientific evidence as a measuring stick. Today, all fad diets can and should be measured against the weight of accelerating scientific studies which form a strong consensus as to the pillars of the best dietary pattern for health and well-being.

Conflict of interest

None.

References

1. MarketData LLC. The U.S. Weight Loss & Diet Control Market. Research and Markets. Published February 2019. https://www.researchandmarkets.com/research/6sb283/united_states?w=5 2019, February.
2. United States. Congress. House. *Committee on Small Business. Subcommittee on Regulation, Business Opportunities, and Energy. Deception and Fraud in the Diet Industry*. Washington, D.C.: U.S. Government Printing Office. 1990
3. Goff SL, Foody JM, Inzucchi S, Katz D, Mayne ST, Krumholz HM. Brief report: nutrition and weight loss information in a popular diet book: is it fact, fiction, or something in between? *J Gen Intern Med* 2006;21(7):769–774.
4. Campbell TC, Campbell II TM. *The China Study, Startling Implications for Diet, Weight Loss, and Long-Term Health*. Dallas: TX, BenBella Books, Inc. 2005.
5. Impossible Foods. What Are the Nutrition Facts? Impossible Foods. <https://faq.impossiblefoods.com/hc/en-us/articles/360018939274-What-are-the-nutrition-facts->
6. Bergeron N, Chiu S, Williams PT, King M, S, Krauss RM. Effects of red meat, white meat, and nonmeat protein sources on atherogenic lipoprotein measures in the context of low compared with high saturated fat intake: a randomized controlled trial. *Am J Clin Nutr* 2019;110(1):24–33. <https://doi.org/10.1093/ajcn/nqz035>.
7. Guasch-Ferré M, Satija A, Blondin SA, et al. Meta-analysis of randomized controlled trials of red meat consumption in comparison with various comparison diets on cardiovascular risk factors. *Circulation* 2019;139(15):1828–1845. <https://doi.org/10.1161/circulationaha.118.035225>.
8. Kim H, Caulfield LE, Garcia-Larsen V, Steffen LM, Coresh J, Rebholz CM. Plant-based diets are associated with a lower risk of incident cardiovascular disease, cardiovascular disease mortality, and all-cause mortality in a general population of middle-aged adults. *J Am Heart Assoc* 2019;8(16). <https://doi.org/10.1161/jaha.119.012865>.
9. Aljuraiban G, Chan Q, Gibson R for the INTERMAP Research Group, et al. Association between plant-based diets and blood pressure in the INTERMAP study. *BMJ Nutr Prevent Health* 2020.
10. Oh R, Gilani B, Uppaluri KR. *Low Carbohydrate Diet*. Treasure Island (FL): StatPearls Publishing. 2020.
11. Wheeler ML, Dunbar SA, Jaacks LM, et al. Macronutrients, food groups, and eating patterns in the management of diabetes: a systematic review of the literature, 2010. *Diabetes Care* 2012;35(2):434–445.
12. Weight loss with a low-carbohydrate, Mediterranean, or low-fat diet. *N Engl J Med* 2009;361(27):2681. <https://doi.org/10.1056/nejmx090065>.
13. Johnston BC, Kanters S, Bandayrel K, et al. Comparison of weight loss among named diet programs in overweight and obese adults: a meta-analysis. *JAMA* 2014;312(9):923–933.
14. Mazidi M, Katsiki N, Mikhailidis DP, Sattar N, Banach M. Lower carbohydrate diets and all-cause and cause-specific mortality: a population-based cohort study and pooling of prospective studies. *Eur Heart J* 2019;40(34):2870–2879. <https://doi.org/10.1093/eurheartj/ehz174>.
15. Noto H, Goto A, Tsujimoto T, Noda M. Low-carbohydrate diets and all-cause mortality: a systematic review and meta-analysis of observational studies. *PLoS One* 2013;8(1). <https://doi.org/10.1371/journal.pone.0055030>.
16. Levy RG, Cooper PN, Giri P. Ketogenic diet and other dietary treatments for epilepsy. *Cochrane Database Syst Rev* 2012;3.CD001903. Published 2012 Mar 14.
17. Yancy Jr WS, Olsen MK, Guyton JR, Bakst RP, Westman EC. A low-carbohydrate, ketogenic diet versus a low-fat diet to treat obesity and hyperlipidemia: a randomized, controlled trial. *Ann Intern Med* 2004 May 18;140(10):769–777.
18. White H, Venkatesh B. Clinical review: ketones and brain injury. *Crit Care* 2011;15(2):219. Published 2011 Apr 6.
19. Yang MU, Van Itallie TB. Composition of weight lost during short-term weight reduction. Metabolic responses of obese subjects to starvation and low-calorie ketogenic and nonketogenic diets. *J Clin Invest* 1976;58(3):722–730.
20. Hall KD, Guo J, Courville AB, et al. A plant-based, low-fat diet decreases ad libitum energy intake compared to an animal-based, ketogenic diet: An inpatient randomized controlled trial. 2020.
21. Roehl K, Sewak SL. Practice paper of the academy of nutrition and dietetics: classic and modified ketogenic diets for treatment of epilepsy. *J Acad Nutr Diet* 2017 Aug;117(8):1279–1292.
22. Paoli A. Ketogenic diet for obesity: friend or foe? *Int J Environ Res Public Health* 2014;11(2):2092–2107. Published 2014 Feb 19.

23. Grandl G, Straub L, Rudigier C, et al. Short-term feeding of a ketogenic diet induces more severe hepatic insulin resistance than a obesogenic high-fat diet. *J Physiol* 2018 Oct;595(19):4597–4609.
24. Juraschek SP, Chang AR, Appel LJ, et al. Effect of glycemic index and carbohydrate intake on kidney function in healthy adults. *BMC Nephrol* 2016;17(1):70. Published 2016 Jul 8.
25. Czyżewska-Majchrzak Ł, Grzelak T, Kramkowska M, Czyżewska K, Witmanowski H. The use of low-carbohydrate diet in type 2 diabetes – benefits and risks. *Ann Agric Environ Med* 2014;21(2):320–326.
26. Numao S, Kawano H, Endo N, et al. Short-term low carbohydrate/high-fat diet intake increases postprandial plasma glucose and glucagon-like peptide-1 levels during an oral glucose tolerance test in healthy men. *Eur J Clin Nutr* 2012 Aug;66(8):926–931.
27. Jornayvay FR, Jurczak MJ, Lee HY, et al. A high-fat, ketogenic diet causes hepatic insulin resistance in mice, despite increasing energy expenditure and preventing weight gain. *Am J Physiol Endocrinol Metab* 2010 Nov;299(5):E808–E815.
28. Zhao SP, Liu L, Gao M, Zhou QC, Li YL, Xia B. Impairment of endothelial function after a high-fat meal in patients with coronary artery disease. *Coron Artery Dis* 2001 Nov;12(7):561–565.
29. Demeyer D, Mertens B, De Smet S, Ulens M. Mechanisms linking colorectal cancer to the consumption of (processed) red meat: a review. *Crit Rev Food Sci Nutr* 2016 Dec 9;56(16):2747–2766.
30. Li S, Flint A, Pai JK, et al. Low carbohydrate diet from plant or animal sources and mortality among myocardial infarction survivors. *J Am Heart Assoc* 2014;3(5):e001169. Published 2014 Sep 22.
31. Schwingshackl L, Hoffmann G. Low-carbohydrate diets impair flow-mediated dilatation: evidence from a systematic review and meta-analysis. *Br J Nutr* 2013;110(5):969–970.
32. Fleming RM. The effect of high-protein diets on coronary blood flow. *Angiology* 2000;51(10):817–826.
33. Konner M, Eaton SB. Paleolithic nutrition: twenty-five years later. *Nutr Clin Pract* 2010 Dec;25(6):594–602.
34. Turner BL, Thompson AL. Beyond the Paleolithic prescription: incorporating diversity and flexibility in the study of human diet evolution. *Nutr Rev* 2013;71(8):501–510.
35. Paleo Leap. Paleo Diet 101: Paleo Leap. Paleo Leap | Paleo diet Recipes & Tips. Published January 1, 2020. <https://paleoleap.com/paleo-101/>.
36. Sayers K, Lovejoy CO. Blood, bulbs, and bunodonts: on evolutionary ecology and the diets of *Ardipithecus*, *Australopithecus*, and early *Homo*. *Q Rev Biol* 2014;89(4):319–357.
37. Warinner C. Debunking the Paleo Diet. Youtube.TedX Talks. Published February 12, 2013. <https://www.youtube.com/watch?v=BMOjVYgYaG8>.
38. Akasha. Sampler Menu & Meal Plan. Paleo Plan. <https://www.paleoplan.com/resources/sampler-menu-meal-plan/>.
39. Eaton SB, Eaton 3rd SB, Konner MJ. Paleolithic nutrition revisited: a twelve-year retrospective on its nature and implications. *Eur J Clin Nutr* 1997;51(4):207–216.
40. Davis B. *The "Paleo" Phenomena: Facing Facts*. Brenda Davis R.D. Published 2015. <https://www.brendadavisrd.com/the-paleo-phenomena-facing-facts/>.
41. Karlsen MC, Rogers G, Miki A, et al. Theoretical food and nutrient composition of whole-food plant-based and vegan diets compared to current dietary recommendations. *Nutrients* 2019;11(3):625. Published 2019 Mar 14.
42. Patterson RE, Sears DD. Metabolic effects of intermittent fasting. *Annu Rev Nutr* 2017;37:371–393.
43. Tinsley GM, La Bounty PM. Effects of intermittent fasting on body composition and clinical health markers in humans. *Nutr Rev* 2015;73(10):661–674.
44. de Cabo R, Mattson MP. Effects of intermittent fasting on health, aging, and disease [published correction appears in *N Engl J Med*. 2020 Jan 16;382(3):298] [published correction appears in *N Engl J Med*. 2020 Mar 5;382(10):978]. *N Engl J Med* 2019;381(26):2541–2551.
45. Horne BD, Muhlestein JB, Anderson JL. Health effects of intermittent fasting: hormesis or harm? A systematic review. *Am J Clin Nutr* 2015 Aug 1;102(2):464–470.
46. Seimon RV, Roekenes JA, Zibellini J, et al. Do intermittent diets provide physiological benefits over continuous diets for weight loss? A systematic review of clinical trials. *Mol Cell Endocrinol* 2015;418(Pt 2):153–172.
47. Johnstone AM. Fasting – the ultimate diet? *Obes Rev* 2007;8(3):211–222.
48. Harvie M, Howell A. Potential benefits and harms of intermittent energy restriction and intermittent fasting amongst obese, overweight and normal weight subjects—a narrative review of human and animal evidence. *Behav Sci (Basel)* 2017;7(1):4. Published 2017 Jan 19.
49. Kumar S, Kaur G. Intermittent fasting dietary restriction regimen negatively influences reproduction in young rats: a study of hypothalamo-hypophysial-gonadal axis. *PLoS One* 2013;8(1), e52416.
50. Afshin Ashkan, et al. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the global burden of disease study 2017. *The Lancet* 2019;393(10184):1958–1972.
51. Health US News. *Best Diets*. US News. 2022. <https://health.usnews.com/best-diet/best-diets-overall>.
52. Lichtenstein AH, Appel LJ, Vadiveloo M, et al. Dietary guidance to improve cardiovascular health: a scientific statement from the American Heart Association. *Circulation* 2021;144(23). <https://doi.org/10.1161/cir.0000000000001031>.
53. Estruch R, Ros E, Salas-Salvadó J, et al. Primary prevention of cardiovascular disease with a mediterranean diet supplemented with extra-virgin olive oil or nuts. *N Engl J Med* 2018;378(25), e34.
54. National Heart, Lung and Blood Institute. DASH Eating Plan. <https://www.nhlbi.nih.gov/health-topics/dash-eating-plan> 2023.
55. American College of Lifestyle Medicine Announces Dietary Lifestyle Position Statement. PRWeb. 25 Sept. 2018. https://www.prweb.com/releases/american_college_of_lifestyle_medicine_announces_dietary_lifestyle_position_statement_for_treatment_and_potential_reversal_of_disease/prweb15786205.htm.
56. ACLM's WFPB Plate. American College of Lifestyle Medicine. 2021.