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THE ALKALINE DIET EXAMINED

This article will examine how the alkaline diet emerged and gained popularity, as well as the current evidence base related to this.

The alkaline diet is also known as: the alkaline ash or the acid-alkaline diet. This diet promotes replacing so called 'acid forming foods' with 'alkaline forming foods' in order to promote better health by altering the pH of our blood. The proposed action of this diet is of course flawed, as the processes of homeostasis and digestion (including the acidic pH of our stomach) maintains the pH of our blood between about 7.35 and 7.45, regardless of the type of food eaten (see Figure 1). This mechanism keeps us healthy and avoids the harmful effects of alkalosis or acidosis.¹

DEVELOPMENT OF THE ALKALINE DIET

In the 1850s, the French physiologist Claude Bernard (who is also known for discovering glycogen and the role of pancreatic juice) conducted experiments

in which rabbits were fed boiled beef in place of their usual herbivorous diet. In response to this, the rabbits were observed to develop acidic urine in contrast to their usual alkaline urine.^{2,3} This phenomenon was later explained due to the metabolism of methionine and cysteine found in meat, which produces sulphuric acid and in turn causes more acidic urine.⁴

In the early 20th century, our understanding of acid-base disorders evolved further; for example, in 1908, the Henderson-Hasselbalch equation was developed, which is used to calculate the pH of a buffer solution.⁵ It also became possible to determine in a laboratory setting whether the 'ash' content of a food was acid, alkaline or neutral.^{6,7} This experiment is conducted by heating the

REFERENCES

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Figure 1: Infographic from the BDA about the alkaline diet

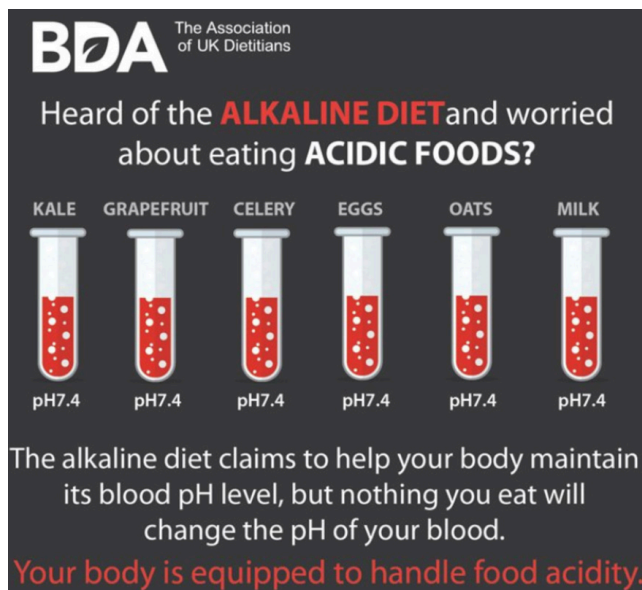




Table 1: List of acid and alkaline foods⁸

Acid-ash Foods		Neutral-ash Foods	Alkaline-ash Foods	
White bread	Brazil nuts	Arrowroot starch	Apples	Beans
Whole wheat bread	Peanuts	Butter	Bananas	Broccoli
Rye Bread	Walnuts	Coffee	Blackberries	Carrots
Cake	Bacon	Corn-starch	Cherries	Aubergine
Corn cereal	Beef	Lard	Dates	Kale
Macaroni	Cheddar & cottage	Margarine	Grapefruit	Lettuce
Oatmeal	cheese	Sugar	Lemon	Mushrooms
Rice	Chicken	Syrup	Lime	Almonds
Mayonnaise	Eggs	Tapioca	Mango	Coconuts
Cranberries	Fish	Tea	Oranges	Milk
Plums	Ham	Vegetable oil	Pear	Jam
Prunes	Pork		Peach	Ice cream
Corn	Lamb		Strawberries	Cream
Lentils			Asparagus	

food along with oxidising agents until the water and organic matter is removed and then analysing the mineral content of the remaining ash.⁸ Acid-forming minerals include chlorine, phosphorus and sulphur, whereas calcium, magnesium, potassium and sodium are alkaline-forming minerals (also referred to as base-forming minerals).⁸

In conjunction with these discoveries, theories about how acid and alkaline forming foods can affect health were emerging. The Report of the Committee on Nutritional Problems of the American Public Health Association for 1935-1936, *Food Fallacies and Nutritional Quackery*, highlighted that, ‘elaborate menus are offered for “alkali-forming” meals and systems of dieting which can be had by purchasing their books or enlisting their services and special courses’.⁷ Another article published in *The American Journal of Public Health* that year also reported that, ‘one widely publicised system of diet is based on the erroneous theory that proteins and starches and fruits and starches should not be mixed in any one meal. As a reason for this perverted idea, it is declared that protein digestion takes place in the acid contents of the stomach, while starch can be digested only in the alkaline intestine, and that carbohydrates encounter some sort of baleful interference when associated with protein in the stomach’.⁶

As a response to these ‘food fallacies’ related to acid and alkaline forming foods, the Committee on Nutritional Problems reported that ‘there is no evidence that a preponderantly acid diet is injurious. That the body reaction remains practically unaltered even when a wide range of amount of acid or base is ingested has been pointed

out by Henderson.’⁷ This report also highlighted that acidosis only occurs in response to certain medical conditions such as: diabetes, kidney disease and metabolic disorders.⁷ So, although foods can be classified according to the pH of its ash (see Table 1), it was known by academics and medical professionals at the time that this does not significantly impact the pH of our blood, as a healthy body maintains homeostasis via our buffer, respiratory and renal systems.⁶

More recently, the concept of promoting alkaline forming foods for health made a comeback in the 1990s in conjunction with the trend for low carb diets. In 1992, *One Sickness, One Disease, One Treatment* by Robert O Young was published, which warns about ‘over-acidification of the blood and then tissues due to an acidic lifestyle and diet’. Robert O Young, who has been referred to as ‘father of the alkaline diet’, has published numerous other books on similar topics, including *The pH Miracle*, which was first released in 2002 and has sold more than four million copies worldwide.⁹ *The pH Miracle* advises ‘striking the optimum 80/20 balance between an alkaline and acidic environment provided by eating certain foods’ including low carb options, a ‘liquid detox’, drinking water, taking specific supplements and, of course, eating mainly ‘alkaline foods’.¹⁰ Foods which are considered ‘highly alkaline’ include: ‘pH 9.5 water drinks’, ‘green drinks’, salt, avocado, broccoli, cabbage, celery, kale, spinach and tomato.¹¹ Foods which are considered ‘highly acidic’ include: alcohol, miso, dried fruit, honey, eggs, beef, pork, chicken, farmed fish, shellfish, white rice, cheese and artificial sweeteners.¹¹

The popularity of the alkaline diet has also been boosted by endorsement from celebrities such as Gwyneth Paltrow, Kirsten Dunst and Jennifer Aniston. There are also numerous products related to the alkaline diet including supplements, alkaline water, 'water ionisers', books and videos.¹²

Recently, there has been some controversy related to the alkaline diet, including the news story from January 2017 about Naima Houder-Mohammed, a British Army Officer with terminal cancer who 'paid thousands of dollars for [Robert O Young's] alkaline treatment, which consisted mainly of intravenous infusions of baking soda'.⁹ Sadly, Naima died three months into this treatment. In June 2017, Robert O Young was jailed for five months 'after admitting that he illegally treated patients at his luxury Valley Centre ranch without any medical or scientific training'.¹³ Robert O Young was also previously convicted for practicing medicine without a license.¹³

EXAMINING THE EVIDENCE-BASE

Numerous health claims have been associated with the alkaline diet,^{14,15} one of the most worrying claims being that the alkaline diet can be used as a cancer treatment. This idea is based on studies which have found that cancer cells thrive in an acidic environment in vitro.^{16,17} However, a recent systematic review concluded that, 'promotion of the alkaline diet and alkaline water to the public for cancer prevention or treatment is not justified' due to a lack of actual research.¹⁷

Arguments in relation to bone health are also common among alkaline diet supporters. The theory is that a high 'acidic load' causes minerals, such as calcium, to leach from our bones to counteract an acidic blood pH. However systematic review data has not found a causal relationship between dietary acid load and osteoporosis and there is 'no evidence that an alkaline diet is protective of bone health'.^{14,18} Conversely, in April 2017, the National Osteoporosis Society (NOS) released a statement which associated increased bone fracture rates in young people with diets which exclude dairy (such as clean eating and the alkaline diet).¹⁹

Some low quality studies have found an association between the modern Western diet (which has a high 'acid load') and an increase

risk of cardiovascular disease.^{14,20} However, this 'acid load' is based on the food that the modern Western diet contains, rather than the effect of those foods in our body. Therefore, it is too simplistic to assume that it is purely the 'acid load' which affects disease risk. There have also been some similar findings in relation to diabetes.¹⁴

As the alkaline diet is low in carbohydrates, this style of eating may be effective for some people with type two diabetes.²¹ However, there appears to be no evidence from systematic reviews or randomised controlled trials that following an alkaline diet or altering the dietary 'acid load' can prevent or cure Type 2 diabetes.¹⁴ In October 2017, the UK Advertising Standards Authority (ASA) actually banned an advertisement for 'ADrop' which claimed that, 'ionised alkaline water [is] a natural way to improve your circulation' in the context of treating Diabetes.²² Similarly, certain characteristics of the alkaline diet may be effective for some people in terms of weight management, as it is low carbohydrate and mainly plant-based. But there doesn't appear to be any experimental evidence to test whether an 'acidic dietary load' directly affects weight management.¹⁴

There is also 'no evidence to support the assertion that an alkaline diet may prevent or cure depression, or yeast overgrowth, or cellulite'.¹⁴

Certain human studies have identified specific risks associated with 'alkaline water', including reduced gallbladder emptying, inhibited gastric secretion and even toxic reactions.¹⁷ As with all diets which exclude food groups, there is also a risk of nutritional deficiency, as the alkaline diet can be low in protein, calcium, iron and calories.

CONCLUSION

Theories about the alkaline diet have been in circulation for more than 100 years. However, there is still no good evidence that reducing the 'acidic load' of our diet has any real health benefits. There may be some positive side-effects to this diet in certain contexts as it promotes a plant-based diet which is low in refined sugar. But there are also significant risks to consider, such as nutritional deficiency and spreading harmful messages about using the alkaline diet to treat serious medical conditions.