

## FAQ #2 Alkaline Diet

### SCOPE:

This document aims to provide background information about alkaline diets and cancer, review evidence on the topic of diet and pH, and provide health care professionals with information that can be used when discussing this topic with patients or the public.

### Background and Rationale:

Proponents of the 'Acid-Ash diet' claim that cancer thrives in an acidic environment but cannot survive in an alkaline environment. Based on this claim some cancer patients will adjust their diet hoping to slow or stop cancer growth. Foods alleged to make the body more acidic will be avoided and foods promoting alkalinity are favored.

### EVIDENCE:

#### The pH Scale and pH Regulation in the Body

- The pH scale ranges from 0-14. The middle (pH 7) is neutral, numbers below 7 are considered acidic and numbers above 7 are considered alkaline or basic (Figure 1).

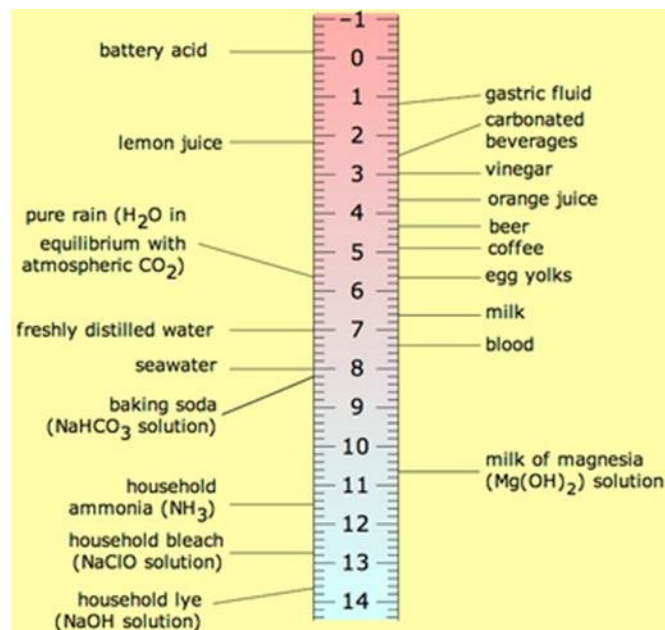
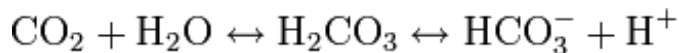


Figure 1. pH Scale

- When speaking of the pH of the body one is usually referring to the pH of the blood. The blood circulates throughout the body to provide nourishment and remove waste for all cells.
- The bicarbonate buffering system (described below) maintains the pH of the blood within the narrow range of 7.35 – 7.45. Changes to the blood pH outside of this range are life-threatening (Cunningham, 2009).
- For healthy individuals, the kidneys play an essential role in maintaining the body's pH within the range of 7.35-7.45 by regulating the excretion of hydrogen ions (H<sup>+</sup>) in the urine. If the pH of the blood decreases below the normal range, the kidneys will excrete more hydrogen ions (H<sup>+</sup>) in the urine to compensate, thus the urine becomes more acidic and the pH of the blood increases (Whitmire, 2004). When the pH of the blood increases above the normal range (becomes more alkaline), the kidneys will excrete less H<sup>+</sup> in the urine to compensate. This results in less acidic urine and a decrease in the pH of the blood to its normal range. Thus although blood pH stays relatively stable, the pH of the urine can fluctuate within the range of approximately 4.5 – 8.5. The ability of the body to regulate the pH of the blood becomes impaired with individuals with kidney disease and some respiratory conditions such as COPD and Asthma (Whitmire, 2004).



- The pH of the digestive tract varies to aid in chemical digestion. Saliva is slightly acidic with a pH ranging from 6-7. The stomach produces acid with a pH of approximately 2, the pancreas secretes bicarbonate with a pH ranging from 8.2-9.3 to neutralize the acidic contents of the stomach and protect the duodenum as well as provide an optimal pH for pancreatic digestive enzymes (Gropper, 2013).
- Many followers of an alkaline diet test their urine pH to assess the impact of dietary change on pH. Urine pH will vary depending on variations in the diet, but urine pH does not reflect blood pH (which needs to be measured by a blood test). Testing urine pH can incorrectly lead people to believe that they are either acidic or alkaline while serving as a motivator to continue following the diet pattern and testing (Bonjour, 2013).

### **Influence of Diet on Blood pH**

- Classification of foods as either acidic or alkaline comes from research conducted over 100 years ago where a bomb calorimeter was used to determine the calorie content of food (Sherman & Gettler, 1912). After the food was incinerated the leftover ash was then mixed with water and the pH was measured. Foods were classified as acid-ash foods and alkaline-ash foods. Acid-ash foods include white sugar, whole grains, dairy, egg yolk, processed meat, meat, poultry, canned and packaged snacks and convenience foods, alcohol, and caffeine. Alkaline-ash foods include vegetables, low-sugar fruit, soybeans, tofu, nuts, seeds, legumes. The term Potential Renal Acid Load (PRAL) is used to describe the extent that a particular food can impact the acidity of the urine (Remer & Manz, 1995). Foods with a positive PRAL are likely to make the urine more acidic. Table 1 describes the PRAL of common foods.
- The pH of whole (not incinerated) food does not reflect the pH of the ash it produces (Bonjour, 2013). For example, oranges have a low pH yet produce an alkaline ash.

- The acidic or alkaline ash classification system has been stated as evidence for the mechanism of how diet is proposed to influence the body's pH by proponents of the alkaline diet. Yet, more recent research and understanding of principles of chemistry doesn't fully support the classification system nor does it account for the buffering systems in the body (Dietitians of Canada, 2011).

Table 1: Average Potential Renal Acid Load (PRAL) of Common Foods

Food Group	PRAL (mEq)	Food Group	PRAL (mEq)
<i>Fats and Oils</i>		<i>Beverages</i>	
Butter	0.6	Beer	- 0.2
Margarine	- 0.5	Red wine	- 2.4
Olive oil	0.0	Cola	0.4
<i>Vegetables and Fruit</i>		<i>Meat &amp; Alternatives</i>	
Asparagus	- 0.4	Beef	7.8
Carrots	- 4.9	Chicken	8.7
Potatoes	- 4.0	Salami	11.6
Tomatoes	- 3.1	Fish	7.9
Spinach	- 14.0	Lentils	3.5
Apple	- 2.2	peanuts	8.3
Banana	5.5		
Orange	- 2.7		
Cherries	3.6		
Raisins	- 21.0		
<i>Grain Products<sup>a</sup></i>		<i>Milk &amp; Dairy products</i>	
Bread			0.7
Flour	3.5	Milk	19.2
Noodles, pasta	7.0	Hard cheese	8.7
	6.7	Cottage cheese	1.2
		Fruit yogurt	

<sup>a</sup>Includes white, whole wheat and whole grain flours.

## Cancer and Acidic Environments

- Solid tumors create an acidic environment in their surrounding extracellular space due to upregulation of glycolysis and decreased oxygen (Moellering et al., 2008; Wojtkowiak, Verduzco, Schramm & Gillies, 2011). Therefore, it is the cancer itself that creates a local acidic environment, as opposed to thriving because the body or blood is acidic due to food choices or inappropriate pH regulation by the body. This is in contrast to large scale changes in the pH of the body (blood) as proposed by the acid-ash hypothesis. While there is evidence that certain eating patterns can impact the pH of the urine (which is a natural physiological process), consuming a diet of predominantly acid-ash foods has not been shown to alter the pH of the blood outside of the range of 7.35-7.45 (Robey, 2012).

## **CONCLUSION:**

Fluctuations in the pH of the urine are a byproduct of pH homeostasis in the body. While the pH of the urine can fluctuate based on eating patterns, it is not possible to drastically alter the pH of the body or blood outside of the normal range with diet. The alkaline diet excludes many high protein choices including meat and dairy foods, and may lead to inadequate protein intake if these choices are not replaced with other protein-rich options. It is well established that individuals with cancer have increased protein needs and could therefore run the risk of not meeting protein requirements. This might cause the body to use lean tissue (muscle mass) and fat mass to meet its needs and the tumor's needs, which is not ideal.

A positive aspect of the alkaline diet is that it does encourage liberal consumption of fruits and vegetables, which is consistent with public health recommendations for general health and for individuals with cancer as tolerated.

## **SPEAKING WITH PATIENTS**

### **Considerations When Speaking with Patients**

Patients asking about alkaline diets are likely interested in the relationship between food and health; they are trying to do what they can to help themselves and likely do not want to do anything that may cause harm. Each patient may have a different level of understanding of nutrition and a different interpretation of what it means to eat well.

#### **Patient's Nutritional Status**

**Patients at low risk of malnutrition:** When a patient is well nourished and able to eat well and she/he feels strongly about following an alkaline diet despite the lack of evidence to support this eating pattern, it may be helpful to provide information on protein requirements and how to meet them. Promoting a plant-based diet is supported by general health, and cancer prevention and survivorship recommendations. Reducing feelings of anxiety that anything but complete adherence to a particular eating pattern will lead to poor outcomes is important and valuable for minimizing food related anxiety and guilt.

**Patients who are malnourished or at risk for malnutrition:** When patients believe it is important to follow an alkaline diet yet are experiencing eating challenges and/or are struggling to maintain their weight they may resist recommendations to consume foods and fluids considered to be acidic including high calorie dairy products, canned and packaged snacks or convenience foods. They may be more receptive to higher calorie choices more aligned with an alkaline diet such as smoothies made with fruit, nut butters or smooth tofu, and coconut milk or olive oil.

### **Responses to Common questions or Statements from Patients:**

**Patient Question: "I've heard that cancer thrives in an acidic environment. Why wouldn't following an alkaline diet help to counter this?"**

**RD Response:** Cancer cells produce some acid in their nearby space but this does not affect the pH of the body as a whole, the blood, or the urine. The premise behind the alkaline diet is that the pH of the foods we eat can make the pH of the body or blood more alkaline (less acidic), making it hard for cancer cells to live. However, good quality evidence shows that pH of the blood is maintained within a very narrow range around neutral (pH of 7), regardless of the diet. Urine pH can change due to dietary patterns, which is a normal bodily function.

There are pros and cons to following an alkaline diet:

Following an alkaline diet may not be safe for individuals with cancer. The alkaline diet limits many high protein foods such as meat and dairy. If these foods are not replaced with other high protein foods, individuals with cancer may not meet their protein needs, which can lead to muscle loss.

An alkaline diet does encourage people to eat many vegetables and fruits, which are healthy choices that many people do not get enough of.

**Patient Question: “Why would urine test strips show pH changes based on diet?”**

**RD Response:** Followers of an alkaline diet are often encouraged to test the pH of their urine as a marker of the pH of their body or blood. Changes in the pH of the urine are normal and expected and do not reflect the pH of the whole body or blood. This process is what ensures that the pH of the body (blood) remains very tightly controlled.

**Patient Question: “What about alkaline water?”**

**RD Response:** Followers of an alkaline diet are often encouraged to purchase and use specialized *water alkalizers* that use a process called electrolysis to alter the pH of tap water. Alkaline water can contribute to pH changes in the urine in the same way that alkaline-ash foods may change the pH of the urine. However, drinking alkaline water cannot change the pH of the whole body or the blood.

**Additional Patient-Friendly Resources:**

Suzanne Dixon’s blog post titled “Does an ‘Acidic body’ cause or worsen cancer?”  
<http://nonutritionfear.com/?blogsub=confirming#subscribe-blog> (note: readers must scroll down to find the post)

Canadian Cancer Society. Cancer myths and controversies. An alkaline diet and cancer:  
<http://www.cancer.ca/en/prevention-and-screening/be-aware/cancer-myths-and-controversies/an-alkaline-diet-and-cancer/?region=on>

American Institute for Cancer Research Blog: <http://blog.aicr.org/2010/07/08/another-cancer-and-diet-claim-the-alkaline-diet/>



Provincial Health Services Authority

American Institute for Cancer Research:

<http://preventcancer.aicr.org/site/News2?page=NewsArticle&id=13441>

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