

The Acid / Alkaline Mystery Solved

by Stephen Cherniske, M.Sc.

Acid/alkaline balance has got to be the most puzzling concept in the area of nutritional health. The terms "acid", "acidifying" and "alkalinizing" have been misused in health food literature so often, that by now, most everyone is hopelessly confused. Scores of books and articles have been written, in most cases by people with no training or understanding of human physiology. I do not believe there is another health topic that has been so badly mangled in the popular press.

How bad is it?

First of all, if you collect a number of books, brochures, pamphlets and health guides from a variety of sources, you'll find that *they contradict each other*. The same foods will be called acid by one author and alkaline by another. Some devise entire charts based upon invented terminology, such as sub-acid, acid, and acidifying, all the while forgetting that these foods will be swallowed into a stomach that is hundreds of times more acid than the most acid food on their list.

Then there are the blatant contradictions in books that warn sternly against eating acid foods, but recommend that one take HCL (hydrochloric acid) as a digestive aid or consume apple cider vinegar (acetic and malic acid) for just about any ailment known to man.

Does that mean these acid / alkaline lists are useless? Yes. If you have such a list on your refrigerator and you've been trying to reconcile the contradictions between different health gurus, you can now throw the list away and relax.

Separating the facts from the fads

The widespread confusion is due primarily to the fact that there are four distinct acid/alkaline factors in human health and nutrition. Following is a careful discussion of each: a mini-course in biochemistry which you can refer to the next time someone says to you, "Oh, I never eat oranges; they're too acid."

First of all, what is an acid? An acid is any substance which, in solution with water, will turn litmus paper red, taste sour, and chemically release hydrogen ions. Acids are referred to as strong or weak, depending on their concentration of hydrogen ions, and this factor is measured on a pH scale which uses pure water as a neutral point of 7.0 . Values less than 7.0 are acid, and the stronger the acid, the lower the pH. Common acids include acetic acid (vinegar), and hydrochloric acid, the digestive fluid secreted by the lining of your stomach.

Alkaline (also called base) substances, in water solution will turn litmus paper blue, taste bitter, and chemically accept hydrogen ions. Alkali, or bases, are measured on the pH scale in numbers greater than 7.0, and the stronger the base, the higher the pH, up to 14. Common bases are sodium hydroxide (lye), and sodium bicarbonate (baking soda).

NOTE: Acid and alkaline are *value neutral* terms. Neither is good nor bad, but both have definite properties and essential activities in the human organism. The four factors of acid/alkaline balance related to nutrition are:

1. The acid/alkaline balance of the blood and body fluids.
2. The acid/alkaline quality of certain foods before they are eaten.
3. The acid and alkaline chemistry of digestion.
4. The effect of foods AFTER they are digested and metabolized, often referred to as acid/alkaline "residue" or "ash".

1. ACID/ALKALINE "BALANCE"

In medical terminology, when one speaks of the acid/alkaline BALANCE, or the acid/alkaline equilibrium, it refers to the relative pH of the blood, which must be kept within a narrow range around 7.4 (slightly alkaline). This vital function is accomplished most efficiently by a number mechanisms, including automatic buffer systems in the blood, and the pH regulating action of the lungs and kidneys.

In ACIDOSIS, or acidemia, the pH of the blood is too acid (less than 7.35). In this case, blood buffer systems will adjust towards alkaline, and the rate of breathing will increase to remove carbonic acid via the exhalation of carbon dioxide (CO₂). Next, the kidneys increase the acidity of the urine, and balance is quickly restored.

NOTE: Acidosis is NOT caused by eating acidic foods such as lemons and oranges. It is most often the result of impaired metabolism, such as in diabetes or starvation, kidney disease, or respiratory disorders that limit the release of CO₂ from the lungs.

ALKALOSIS or alkalemia, is less common than acidosis, but can result from hyperventilation (too rapid breathing), loss of stomach acid due to excessive vomiting, or over-use of antacids and/or ulcer medications. In this case, blood buffer systems adjust toward acid, and breathing becomes more shallow to conserve CO₂ and raise carbonic acid levels in the blood. Once again, the kidneys contribute to the "balancing act" by excreting more alkaline urine.

2. ACID FRUITS Fruits are sometimes classified as either acid, sub-acid, or sweet. This differentiation has nothing to do with the acid/alkaline balance in the blood, which is not affected *at all* by the acid content of a food. In fact, as you will see, the metabolism of most all types of fruit results in an alkaline ash, with the exception of cranberries and some varieties of plums.

Once again, acidosis is not caused by eating "acid" fruits. Whatever negative effects individuals may experience from eating citrus fruits, are most likely due to food allergy, fermentation in the gastrointestinal tract due to maldigestion, or localized irritation from the citric acid in the fruit; all of which are common.

The only reason to classify fruits this way, other than the dubious practice of "food combining" may be to help in the botanical description of the food. For example, oranges, grapefruit, lemons, limes, tangerines and kumquats are citrus fruits containing citric acid. Apples, sometimes classified "sub-acid", contain malic acid. Cranberries contain benzoic acid, etc.

3. THE ACID/ALKALINE CHEMISTRY OF DIGESTION

The words "stomach acid" have a negative connotation for many because of the continual barrage of media advertising for products that "neutralize excess stomach acid" that supposedly causes "acid indigestion" and "heartburn". The image that these phrases conjure up is that the vast majority of mankind is in imminent danger from acids in their stomach, and should run, not walk, to the nearest drug store for Tums, Rolaids, Alkaseltzer, Bromoseltzer, Mylanta, Brioschi, Digel, or any of a dozen other brands of antacid. This billion dollar industry is based on myth, and outright distortion of facts. It has done a great disservice to Americans by confusing the important issue of proper digestion. In addition, the ads do not state that there are significant health risks involved with long term use of such products. The advertising message, stated or implied, is that when we have an upset stomach, it is due to excess acid production in the stomach.

This is false. In most cases, the characteristic "sourness" is due to fermentation of foods in the stomach due to maldigestion, a common result of poor food selection, overeating, eating too fast, or *insufficient* hydrochloric acid production. In fact, research has shown that where abnormal acid production exists, it is far more often *too little* than too much, especially in elderly individuals!¹ Antacids then, can help with the acidic by-products of fermentation, but may actually increase the problem in the long run. They may also create new problems such as malnutrition. Most minerals, vitamins B12 and folic acid all require adequate stomach acid for absorption, and chronic antacid use can dramatically reduce the availability of these nutrients.²

The facts: Cells in the lining of the stomach secrete hydrochloric acid (HCL). This acid is strong enough to cause a slight burning sensation if placed on your skin, but your stomach is protected by mucus secreted by other cells. HCL has two important functions. It acts directly upon the food (primarily protein), beginning the breakdown process called hydrolysis, and it facilitates the activity of another important enzyme called pepsin. Without sufficient HCL, pepsin is inactive, and maldigestion results.

The normal pH (acid level) of the stomach is between 1.5 and 2.5 (very acid). This is neutralized, to a certain extent, by the food we eat; but the stomach is able to re-acidify during the meal to complete its digestive function. By the time our food has been reduced to a semi-liquid mass called chyme, its pH is far less acidic (in the range of 3.5 to 5.0) and it is ready to pass into the small intestine.

Digestion continues in the small intestine by the action of enzymes secreted by the pancreas, gallbladder, and intestinal wall. But a fundamental difference exists here. Whereas the initial stages of digestion in the stomach required a highly acidic medium, the latter stages require an alkaline environment. This is because 90% of all *absorption* takes place in the small intestine, and absorptive tissue is extremely sensitive. This rapid and dramatic change in pH to alkaline is accomplished by the pancreas, which secretes the necessary quantity of bicarbonate. In fact, the pancreas may secrete, on a daily basis, the equivalent of 6 Alkaseltzer tablets, or half a roll of Tums. Digestion is thus a complex and delicate process, involving feedback mechanisms between stomach and pancreas, to maintain optimal acid/alkaline levels.

Excessive use of *any medicine* which alters this balance is potentially harmful. I am not only speaking about the multitude of antacids that are literally a household item in America, but also the variety of hydrochloric acid products found in health food stores.

ACID FORMING AND ALKALINE FORMING FOODS

Ready? The intricate process of metabolism is the story of what ultimately happens to food after it's digested and absorbed. In the final stages of energy production, you have to realize that the mineral content of food is not oxidized (you can't burn rocks, right?). This, therefore, leaves a residue, or ash that is either alkaline, acid, or neutral, depending on the mix of minerals found in the food. Hang in there. Sulfur, phosphorus and iron form acid ions in the body. These minerals are found primarily in *proteins*, such as meat, fish, poultry, eggs, grains, and most nuts. These foods are therefore called ACID FORMING FOODS. Soft drinks, the bane of the American diet, contain no protein, but lots of phosphate and thus are very acid forming.

Potassium, calcium, magnesium and sodium form alkaline reactions in the body. These minerals are found primarily in fruits and vegetables, and so these foods are called ALKALINE FORMING FOODS.

It's all a matter of balance. For example, milk is a high protein food, rich in sulfur and phosphorus, so you would expect it to be acid forming. But it contains enough calcium (alkaline) to balance out to about neutral. To complete the picture, we find that the simple sugars and fats don't count, because they don't contain minerals of either category. Ta Da!

How to use this information

For decades, the alkaline or acid-forming properties of one's diet was thought to be important only for kidney stone patients. An alkaline ash diet, emphasizing fruits and vegetables, produces more alkaline urine, and was used to treat uric acid stones. The acid ash diet, emphasizing meat, fish and grains, was used with oxalate stones.

We now know, however, that there are significant adverse consequences to anyone consuming the Standard American Diet (abbreviated SAD) because it is extremely acid-forming. Food consumption surveys reveal that Americans are now consuming more soft drinks than any other beverage including water. Add coffee to that (including decaf) and you have a metabolic disaster in the making. And that's only the beginning. Americans consume meat and poultry products at an average of two meals a day every day, and the grains we consume have all had the alkaline minerals refined away.

At the same time, consumption of alkaline-forming vegetables and fruit is at an all-time low. The result is widespread acidosis that accelerates catabolic damage and impairs anabolic repair processes. Perhaps the best example of this is the effect of acid / alkaline factors on bone health. It has long been known that high protein diets increase risk for osteoporosis. Numerous theories have been proposed to explain this, but it now appears that a high intake of acid-forming foods (primarily meat, poultry, and eggs) over the course of a lifetime, may accelerate the loss of alkaline minerals (calcium, magnesium, potassium) from the bones. In other words, the body may deplete one system (the skeleton) in order to maintain balance in another more sensitive system (the blood).

In support of this theory, the *New England Journal of Medicine* reported a study in which postmenopausal women were given an alkalinizing agent (potassium bicarbonate) to neutralize the acid produced by a high protein diet. Researchers were able to see significant improvements in the bone retention of calcium and phosphorus in a little over two weeks.³ Does this mean that we should all be taking potassium bicarbonate supplements? Not at all; many of the women in the study had digestive problems as a result of the bicarbonate therapy, and antacids have been shown to seriously reduce nutrient bioavailability.^{4,5} A more sensible conclusion is that we should *eat less meat and more fruits and vegetables*.

In support of this important dietary shift, Oasis has created MetaGreens™. MetaGreens contains an extraordinary mix of land and sea vegetables, all of which are rich in alkaline minerals. Importantly, these greens are pesticide-free, grown on high-nutrient soil that has never been chemically fertilized. Harvested at the peak of nutrient value, these ingredients are processed by low-temperature dehydration to retain all the raw food goodness and manufactured in small batches to maximize freshness.

The result is a comprehensive, high-potency vegetable powder that mixes easily in water to produce a health tonic with remarkable anabolic properties. As part of a sensible diet and a lifestyle that includes regular exercise, MetaGreens can help restore the alkaline balance that is essential for optimum health and longevity.

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