

Green Alkalizing pH Powders: pHysiology or pHooey?

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“For the cells of the body to continue living, there is one major requirement: the composition of the body fluids that bathe the outside of the cells must be controlled very exactly”-Guyton, Function of the Human Body

Healthy life requires balance: sympathetic / parasympathetic, yin / yang, too much tone / too little tone, insulin / glucagon, Th1 / Th2, acid /base balance. Today, the importance of alkaline / acid balance is a familiar notion to many health professionals who pay attention to nutrition because of the book by Robert Young, PhD., The pH Miracle, and related associated network marketing efforts. Our own M.T. Morter, Jr., B.S., M.A., D.C. had earlier done much to present science based pH testing methods to help patients establish a balanced pH.¹ Scientific investigation of the pH of foods goes back at least 100 years.²

As the pH idea became more popular, I noticed that many marketers of “greens products” made various claims about the ability of their formulas to make the body more alkaline. However, being a co-formulator of powdered greens formulas for almost 10 years myself, it is apparent that for many of these products, if not most of them, such claims have no scientific basis that I can discern. My purpose in this article is to equip you with enough of a basic understanding of the human physiology of pH balance so you can figure for yourself the difference between physiology and phooey.

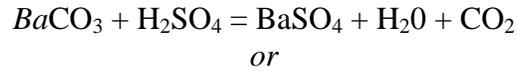
pH pHysiology

pH stands for “potential hydrogen”. (For you fellow science geeks, pH represents the negative logarithm of the hydrogen concentration.³) Certainly pH balance is integral to health. Although different bodily fluids and alimentary contents can have widely different pH levels, when speaking of acid / base balance we are most especially speaking of the blood and the interstitial fluids, both of which are alkaline in pH.⁴ In the office setting, urine and saliva pH are used for measurements. Dr Morter’s work, pH Your Potential for Health, is a most excellent introduction and guide to such clinical testing.⁵

Acids are chemical compounds containing the element hydrogen that have the ability to supply positively charged hydrogen ions to a chemical reaction. Hydrogen ions stimulate our tongues and cause the sour taste. Conversely, alkalies, also called bases, form the ion -OH in solution. Most metabolic processes incur some kind of acid production. Exercise produces lactic acid and carbonic acid. Protein digestion produces sulfuric and phosphoric acid. Carbohydrate and fat digestion produce acetic and lactic acid.⁶

These acids are buffered by our “alkaline reserve”. The macro-minerals involved are sodium (Na), calcium (Ca), potassium (K), and magnesium (Mg). This family of alkaline minerals are called the *carbonic salts*.⁷ Any of these carbonic salts can be symbolized as a

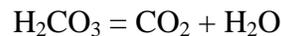
group by $BaCO_3$. When carbonic salts meet with the sulfuric, phosphoric, acetic or lactic acids, they are buffered to make new salts as follows:



Carbonic salt + sulfuric acid = sulfuric salt + water + carbon dioxide

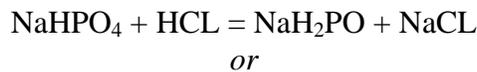
The sulfuric salt, unlike the sulfuric acid, is only slightly acidic and can be excreted without harm to the kidneys or colon. The CO_2 is exhaled and the water is recycled or excreted.⁸

Several buffering compounds are dissolved in our plasma, $NaHCO_3$ and Na_2HPO_4 (alkaline sodium bicarbonate and phosphate) and H_2CO_3 (volatile carbonic acid). In exercise, which produces acids, we breathe deeply to expel CO_2 . Increased respiration, thus depleting CO_2 , allows the blood to release more CO_2 .



Basically (pun intended) we use breath to expel *volatile* carbonic acids already present in our blood (H_2CO_3) to balance out the lactate and carbonic acids produced by exercise.⁹

However, other reactions produce *non-volatile* acids.



Alkaline Sodium Phosphate + Hydrochloric Acid = Acid (dihydrogen) Sodium Phosphate + table salt

Acid phosphate is *non-volatile* and cannot be exhaled away. Although it is a weak acid compared to HCL, it cannot be allowed to accumulate. This weak acid is safely excreted by the kidneys, leading to the normal acid pH of the urine.¹⁰

If there is insufficient alkaline reserve, more alkaline minerals are provided by bone catabolism. Also, muscle minerals may become sub-optimal leading to subjective stiffness and discomfort. Shortage of extracellular Na and Ca lead to sub-optimal intracellular K and Mg, leading to muscle and nerve dysfunction. Severe acidosis will lead to coma and death.¹¹ (Conversely, severe alkalosis leads to titanic convulsions and death.¹²) To retard such a process, the body will use the abundant nitrogen from a high protein, acid ash diet to make ammonia, which is highly alkaline.¹³

pH of PHoods

A food is considered acid or alkaline by the ash it leaves after it is burned.¹⁴ Generally, meats, fish and eggs leave the most acidic ash, grains less so. Most dairy products are more or less neutral, while fruits and vegetables tend to leave an alkaline ash.¹⁵ A diet rich in acid ash foods must be buffered with alkaline minerals. Any relatively weak non-volatile acids produced by such buffering are then safely excreted via the kidneys or

bowels. If the alkaline reserve, mostly sodium and potassium, is depleted, calcium and magnesium are released from bone and muscle. If those efforts fail, nitrogen rich ammonia is generated via the kidneys to neutralize the acids.¹⁶

Therefore, the main reason that fruits, vegetables and greens are alkalizing is because they are rich in alkaline macro minerals (Na, K, Ca, Mg) and relatively low in protein. The daily value (DV) for Na is 2400mg, K is 3500mg, Ca is 1000mg and Mg is 400mg.¹⁷ However, have you ever studied closely the levels of these minerals in greens formulas? Rarely will you even find the levels of all four of these macro minerals on the label. You may be able to find them on the internet certificate of analysis.¹⁸ If you are able to garner amounts per serving on all four, you will likely see that the alkaline mineral content is a small fraction of the daily value. If so, how can such a product be significantly “alkalizing?”

How much of each of the four macro-minerals are present will have a lot to do with the focus of the greens product. If the focus of the formula is to supplement phytonutrients, then the more important measure will be antioxidant capacity tests (ORAC, NORAC, HORAC, Electro OxTM).¹⁹ The only way to get the phytonutrition based antioxidant power of 5 to 10 servings of fruits and vegetables of all the colors in 8 to 12 grams of powder is to use high antioxidant phytonutrient extracts and concentrates from fruits, vegetables, herbs, teas and spices from all the colors. By definition, one concentrates a group of compounds by excluding others. In most high antioxidant greens and super fruit and vegetable juice powders what is excluded is all the water and most of the fiber, sugar, vitamins and *minerals*. (This is why responsible companies should not claim that their greens and super fruits powders per serving are equal to 5 -10 servings of vegetables, but rather state they provide the *phytonutrient based antioxidant power* of up to 5-10 servings; and then prove it with current invivo antioxidant analysis!) If you can garner the data you will find that most greens and super-fruit and vegetable powders are very low in alkalizing minerals. This doesn't mean that they are bad products. It just means that if they are being promoted as “alkalizing” you are being asked to sell products to your patients from a company that is either dishonest about or ignorant of human acid/base physiology.

If one wants to make an alkalizing greens then one could use a lot of sea vegetables, being high in salts, grasses, herbs, leaves, bark, roots, some vegetables, little or no fruits and no algae, the latter having too much protein. It would likely taste very bad, as the higher mineral concentration is hard to mask. Several serving a day, with lots of water, will often be indicated until the pH is determined to be balanced. It would not likely supply the balanced phytonutrition of fruits and vegetables of all the colors and its antioxidant score are not likely to be very high. This does not in any way mean it is a bad product. It just means that such a green formula has a different focus.

Best of Both Worlds?

For those desiring both a broad and balanced spectrum of high antioxidant capacity phytonutrients *and* a strongly alkalizing drink, the key is to consider that with which you

mix the greens powder. Mixing in whey protein concentrates/isolates would be acidifying. (You may have heard that whey is more or less neutral as concerns pH. Unprocessed whey straight from the cow is more or less neutral, like milk, but whey protein *concentrates* and *isolates* are not, having much higher protein content and much fewer minerals than whole whey.) This does not mean whey is “bad”. It does mean that a breakfast shake made with a greens product containing low amounts of alkalizing minerals, combined with whey protein and taken with fish oil essential fatty acids, as nutritious as it is, is not an “alkalizing shake”!

Mixing with naturally “high mineral content water” will add alkalizing minerals, especially sodium and calcium.²⁰ A squeeze of potassium rich lemon or lime will make it even more alkaline.²¹ Another solution is to use orange juice. Many persons mistakenly feel that OJ or tomato juice is “too acid”. Indeed most fruits are rich in organic acids, like ellagic acid in raspberry and citric acid in citrus fruits. These organic acids are very good for us for a variety of reasons. We are concerned rather with the “ash” left behind after metabolism, and the ash of OJ is rich in potassium and calcium, especially if fortified with calcium and Vitamin D.²² For those desiring less calories, half high mineral water and half OJ is a tasty option. To accurately monitor the results I recommend, “pH Your Potential For Health, *A Complete Guide to Monitoring and Controlling pH*” by M.T. Morter, Jr., DC.

Don't be PHooled!

Doctor, when it comes to purchasing nutritional supplements your patients depend on you to filter out the “sizzle from the steak”. Otherwise, why should they pay the premium price? Just because an ad appears in a professional journal does not mean that it is scientifically accurate. You cannot expect the editors and staff in the advertorial department to determine what products are promoted with accurate science. And just because the person representing the company is a doctor of some kind is no guarantee either. (I just heard a tape on pH where the doctor, a DC, claims that the pH of fish is 2, which is about the same as vinegar!) One doctor-represented company mixes their supposedly alkalizing greens with MSM, which is of course rich in acidifying sulfur!

You on the other hand are to be commended for indeed doing your due diligence by reading this article.²³ So should the publication in which it is found, as this article may upset some potential advertiser. But you know what they say, “if the shoe fits...”

References

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- 3) Anonymous, What is pH? *General Chemistry Online* <http://antoine.frostburg.edu/chem/senese/101/acidbase/faq/what-is-pH.shtml>
- 4) Ibid. 1, page 4
- 5) Ibid. 1, pp. 1- 43
- 6) Aihara H. Acid Alkaline. *George Ohsawa Macrobiotic Foundation*. 1986, pp.14-15
- 7) Ibid. 6, pp. 9-10
- 8) Ibid. 6, page 10
- 9) Ibid. 6, page 18
- 10) Ibid. 6, page 19

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- 12) Anderson AK, Pritham GH. Anderson's Essentials of Biochemistry, C. V. Mosby Co., 1968 p. 532
- 13) Ibid. 6, page 19-20
- 14) Ibid. 2, page 323
- 15) Ibid. 2, page 327-330
- 16) Ibid. 1, page 11
- 17) Anonymous. A Food Labeling Guide, *U.S. Food and Drug Admin.*, June 1999
www.cfsan.fda.gov/~dms/flg-7a.html
- 18) For an example nutritional analysis see: <http://www.biopharmasci.com/downloads/NutritionalAnalysis.pdf> .
- 19) For an example report see: http://www.biopharmasci.com/downloads/MicroNG10_61647.pdf
- 20) Bottled water containing not less than 250 parts per million total dissolved solids may be labeled as mineral water. Mineral water is distinguished from other types of bottled water by its constant level and relative proportions of mineral and trace elements at the point of emergence from the source. No minerals can be added to this product. If the total dissolved solids (TDS) content of mineral water is below 500 ppm, or it is greater than 1,500 ppm, the statement "low mineral content" or "high mineral content," respectively, must appear on the principal display panel. If the TDS of mineral water is between 500 and 1,500 ppm, no additional statements are needed. Note: this contrasts to the European definition, where all Natural Spring Waters with a TDS of 0 to 500 mg/liter are considered Mineral with Low Mineral Content (or just mineral waters).
- 21) Murray, MT. The Healing Power of Foods. Prima Pub., 1993, p. 367
- 22) Ibid. 2, pp 327-328
- 23) For deeper study see: The Chemical Buffers, <http://scifun.chem.wisc.edu/CHEMWEEK/BioBuff/BioBuffers.html>