Acid-Alkaline Balance & Health: An Examination of the Data

By Gene Bruno, MS, MHS

If you work within the natural products industry, you have certainly heard or read about acid/alkaline balance in relation to disease. Simply put, eating a diet that produces a more acidic pH systemically is conducive to promoting a disease state, while eating a diet that produces a more alkaline or base pH is more likely to help prevent disease. Advocates of eating a more alkaline diet espouse its health-promoting virtues, while critics have called it nonsense. So, where does the truth lie?

Defining pH

Chemically speaking, pH is a measure of hydrogen ions in a solution, so the "H" in pH refers to hydrogen.[1] There is debate about what the "p" refers to; possibilities include "potential" and "power." In any case, the pH scale measures how acidic or alkaline (also known as *base* or *basic*) a substance is. The scale ranges from 0 to 14, with pH of 7 considered neutral, a pH less than 7 considered acidic and a pH greater than 7 considered alkaline. An important concept in pH is that each whole pH value below 7 is 10 times more acidic than the next higher value, and a pH value above 7 is 10 time more alkaline. For example, a pH of 4 is 10 times more acidic than a pH of 5 and 100 times more acidic than a pH of 6. Consequently, even small changes in pH can be significant.

Acid-Alkaline Balance

The pH value is highly controlled in all biological fluids and tissues within a narrow range. Moreover, each cell-, tissue- or organ-type (such as the stomach, muscles or blood) has its own optimal pH level.[2] The normal pH range of arterial blood is between 7.38 and 7.42.[3] This process of keeping pH within a narrow range is referred to as acid-alkaline balance or acid-alkaline homeostasis. Several natural buffer systems in the human body contribute to this homeostasis, which is maintained via metabolic and respiratory pathways mainly in the kidneys, lungs and other tissues. The buffering agents bind to hydrogen ions and reduce the likelihood of change in pH. It has been reported that acidification of bio-fluids in the human body may result in a number of detrimental effects.[4,5]

Ramifications of Significant pH Variation

The reason that the body takes great effort to maintain pH homeostasis is that any significant change outside the acceptable range may cause proteins to break down, enzymes to lose their ability to function, as well as other negative ramifications. For example, research has shown that interleukin 8 (IL-8, an inflammatory chemical produced in the body) correlates directly with the progression of ovarian cancer. It is also known that the extracellular pH in solid tumors is generally acidic because of elevated acid production and impaired clearance of acidic metabolic wastes. Laboratory research using human ovarian cancer cells found that it is the acidic pH that increases IL-8 in those cells.[6] In other research in human esophageal epithelial cells, exposure to a more acidic pH increased IL-8 and interlukin 6 (IL-6). This led researchers to the conclusion that "IL-6 and IL-8 expression by acid may contribute to the pathobiology of mucosal injury in GERD [gastroesophageal reflux disease]…"[7]

In addition, research has identified that bone is sensitive to changes in pH, with slightly more acidity promoting mineral loss. This was shown in laboratory research in which a model of metabolic acidosis was shown to inhibit the activity of osteoblasts (cells that build bone) and stimulate the activity of osteoclasts (cells that break down bone).[8] Other studies using rat osteo-

clasts found that an acidic pH stimulated bone resorption (i.e., breakdown).[9,10] Likewise, in a study of healthy women ages 18 to 26 years, research found a direct effect of acidosis (i.e., too much acid) in stimulating calcium release from bone during short-term fasting (four days), suggesting that acidosis may increase mineral dissolution.[11]

Examining Diet & Acid-Alkaline Balance

Research published in the *European Journal of Nutrition*[12] suggests that, from an evolutionary standpoint, humans are better adapted to our ancestors' diet than to the diet we have been eating since the agricultural revolution (10,000 years ago) and since industrialization (200 years ago); and further that many of our health problems may result from this mismatch between our genetically determined nutritional requirements and our current diet. Specifically, the researchers suggest that the difference between the two diets may partially be due to the exchange of potassium-rich foods (present in the plant foods that our ancestors ate in abundance) for sodium chloride (salt), which we have an over-abundance of in the contemporary diet, and which is also meager in potassium-rich plant foods. The bottom line is that this deficiency of potassium in the diet increases the net systemic acid load.

In examining the U.S. diet, researchers found that contemporary net acid-producing diets (i.e., high in animal protein with a relatively low intake of fruits and vegetables) characteristically produce a low-grade systemic metabolic acidosis in otherwise healthy adult subjects, and that the degree of acidosis increases with age, in relation to the normally occurring age-related decline in renal functional capacity. They also found that plant food intake tended to be protective against hip fracture, and that hip fracture incidence among countries correlated inversely with the ratio of plant-to-animal food intake. It is of interest to note that while plant foods are also rich in antioxidants, other research suggests that an acidic pH can reduce the effectiveness of antioxidants' ability to fight free radicals[13,14] and an alkaline pH can improve it.[15]

Another study from the *Journal of Environmental and Public Health*[16] reviewed published medical literature examining the role of an alkaline diet in health. As with the research from *European Journal of Nutrition*, the current study also found that the ratio of potassium to sodium has reversed from a previous 10:1 intake to that of the modern diet with a ratio of 1:3. The research indicated that our current diet may induce metabolic acidosis, which has a relationship with bone disease. Furthermore, the researchers showed data indicating that an alkaline diet may benefit muscle mass, growth hormone, back pain and chemotherapy.

Measuring Acid-Alkaline Balance

Although blood tests can measure pH, it is not a very convenient method for most people. pH strips, however, are readily available and can be used to measure urinary pH. But is urinary pH an accurate way to measure the effects of diet on acid-alkaline balance? This was investigated in a study examining relationship between urine pH and dietary acid-alkaline balance with regard to food groups (fruit and vegetables, meats, cereal and dairy foods). There were 22,034 men and women aged 39 to 78 years who participated. The results showed that a more alkaline diet (high fruit and vegetable intake and lower consumption of meat) was significantly associated with a more alkaline urine pH.[17]

Alkalizing Dietary Supplements?

In addition to increasing fruit and vegetable intake, are there any dietary supplements that can increase alkaline pH? Certainly there are quite a few products on the market with claims for doing just that, although there generally seems to be a lack of any human clinical data offered to substantiate that they have the desired effect. One exception is a concentrate of vegetables, sprouts and nutraceuticals called pH7.5™. In a small human clinical trial[18], generally healthy study participants were asked to measure pH value of their initial morning urine using high electronic pH-meters for three consecutive days prior to treatment. These results were considered the baseline values. Establishing baseline value was necessary in order to ensure that average pH did not vary more than 25 percent on a daily basis. Subsequently, all volunteers were asked to ingest 3 g of pH7.5 at bedtime with a full glass of pure water. The next morning all subjects measured pH value during first urination. The results were that *all participants* responded to treatment with an increase in alkaline pH in the morning after the first dose. Compared to the average urinary baseline pH of 5.555 for three days, the average urinary pH after ingestion of pH7.5 was 5.978 for three days. The percentage change for pH between baseline and ingestion of pH7.5 was 7.615 percent increase.

Putting It All Together

So, will an alkaline diet play a role in the prevention and treatment of various disease states? The answer seems to be in some cases yes, in other cases, we don't know. Certainly there seems to be a relationship between an alkaline diet and reducing bone loss. Although touted a prevention or treatment diet for cancer, there is not currently specific data to support this. On the other hand,

(Continued on page 39)

nal support as well. The adrenals store the highest concentration of vitamin C in the body. The more cortisol that is produced by the body equates to a need for increased vitamin C. And the more stress one has, the more vitamin C they need. Vitamin C is water-soluble and gets used up quickly by the body. Dietary vitamin C is vital. However, most people do not consume enough. To bridge this gap, it is critical to supplement, especially if one lives a stressful life.

• **DMAE:** Dimethylaminoethanol can boost energy levels, which can be beneficial for those suffering from adrenal burnout.

• **Fish Oil:** The important fatty acids in fish oil support the fight against inflammation associated with adrenal fatigue and also significantly impact blood sugar.

• **Pantothenic Acid:** An essential B vitamin needed to release energy from carbohydrates, protein and fat in food, pantothenic acid provides vitamin B5, a key nutrient utilized by the adrenal glands.

Additionally, traditional healing systems, both Eastern and Western, advise the use of adaptogenic herbs that help the body to relax and rebuild. These herbs help the body to adapt to stress and are often referred to as adaptogens. Examples of adaptogens include, but are not limited to:

- Eleuthero root
- Gingko biloba
- Ginseng
- Astragalus
- Licorice root
- Rhodiola

Conclusion

Today's world is full of hassles, deadlines, frustrations and demands on a wide range of fronts, and these challenges seem to increase as life becomes more complex. For many of us, stress is so commonplace that it has become a way of life. However, it is important to remember that stress isn't always bad. In small doses, it can help you perform under pressure and motivate you. But when stress is a constant, the mind and body pay a huge price.

If your customers are constantly asking about solutions for stress, it's time to take action! Help your customers protect themselves by advising them on nutrition and on how to recognize specific signs and symptoms of stress as it relates to adrenal health. Take steps to feature this very important area of health in your store. Your customers will love you for it! **VR**

Sources:

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Mark Becker has worked as a natural products sales and marketing executive for 15 years. He has written more than 250 articles and has hosted or been a guest on more than 500 radio shows. For almost 30 years he has participated in numerous endurance events, including more than 150 triathlons of Olympic distance or longer, 100 marathons and numerous other events including ultramarathons and rough water swims from Alcatraz to the mainland. He has relied on a comprehensive dietary supplement and homeopathic regimen to support his athletic, professional and personal endeavors. Follow Becker on Facebook at www.facebook.com/marklbecker/energyatlast, or follow him on Twitter at www.twitter.com/becker_mark. For more information, visit www.energyatlast.com.

SupplementScience

(Continued from page 35)

an alkaline diet is also rich in fruit and vegetables. Clearly there is a plethora of data showing that a diet rich in fruit and vegetables can help in cancer prevention—which may be a function of alkalinity. In any case, we do know there is no harm associated with consumption of an alkaline diet, and there is likely to be benefits. **VR**

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Gene Bruno, MS, MHS, the dean of academics for Huntington College of Health Sciences, is a nutritionist, herbalist, writer and educator. For more than 30 years he has educated and trained natural product retailers and health care professionals, has researched and formulated natural products for dozens of dietary supplement companies, and has written articles on nutrition, herbal medicine, nutraceuticals and integrative health issues for trade, consumer magazines and peer-reviewed publications.