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The Acid-Alkaline Myth: Part 2

on June 28, 2013 by [Chris Kresser](#) [757 comments](#)

In [Part 1](#) of this series, I talked about why the basic premise of the acid-alkaline theory is flawed, and I showed that the evidence doesn't support the idea that a net acid-forming diet is harmful to bone health. Now I want to look at the effect of dietary acid load on other health conditions.

Can the acidity or alkalinity of your diet affect your risk for muscle loss, cancer, and more?

Muscle Wasting

There is some research claiming that acid-forming diets cause muscle wasting, and the proposed mechanism is similar to that of the acid-ash hypothesis of osteoporosis. Some researchers hypothesize that in order to eliminate excess acid and maintain homeostasis, the kidneys must steal amino acids from muscle tissue. ([1](#), [2](#)) Just as a higher acid load increases calcium in the urine, it also increases nitrogen in the urine, leading some to believe that an acid-forming diet causes net nitrogen loss. However, some of these studies neglect to measure nitrogen balance, so this is not necessarily true. ([3](#), [4](#)) In fact, one study showed that a higher acid diet improved nitrogen balance! ([5](#)) This theory also does not acknowledge that protein, although it's acid forming, actually increases the body's ability to excrete acid. ([6](#)) Finally, the one observational study concluding that alkaline diets improve lean muscle mass didn't even measure the overall acid load of the diet. ([7](#)) Instead, they used potassium intake as an approximate measure, and just assumed that the observed improvement in muscle mass was due to the diet being more alkaline. This, in addition to the limitations that always accompany observational data, makes the evidence less than convincing, especially since the clinical trials have conflicting results.

Cancer

One of the more popular claims of the alkaline diet is that it can cure cancer. Proponents say that because cancer can only grow in an acidic environment, a net-alkaline diet can prevent cancer cells from growing, and can eliminate existing cancer cells. This theory is incorrect for a few reasons. First of all, the hypothesis depends on the ability of food to substantially change the pH of the blood and extracellular fluid, which I've already shown is not the case. ([8](#), [9](#), [10](#)) Second, cancer is perfectly capable of growing in an alkaline environment. The pH of normal body tissue is 7.4, which is slightly alkaline, and in almost every experiment done with cancer cells, they are grown in an environment at that pH. ([11](#))

Now, cancer cells do tend to grow better in an acidic environment, but the causality is reversed. Once a tumor develops, it creates its own acidic environment through up-regulated glycolysis and reduced circulation, so the pH of the patient's blood no longer determines the pH of the cancer. ([12](#)) It's not the acidic environment that causes the cancer; it's the cancer that causes the

acidic environment. To top it all off, the only comprehensive review on ‘diet-induced’ acidosis and cancer did not even acknowledge this as a valid mechanism by which an acid-forming diet could increase cancer risk. They discuss a few biological pathways that could potentially link dietary acid load and cancer, but they admit that it’s mostly speculation and there’s no direct link. (13)

Other Effects

There are a few observational studies attempting to link acid-forming diets with hypertension, but the results are mixed. (14, 15) There’s also limited observational data associating higher acid loads with things like high cholesterol, obesity, and insulin resistance, but there are no proposed mechanisms or clinical studies to validate the hypotheses. (16, 17)

There are a few review papers examining the effect of acid-forming diets and health, but as you’ve seen above, the evidence they have to review is sparse. (18, 19, 20, 21, 22) If you read these papers, you’ll notice that whenever they cite trials showing the deleterious effects of acidosis, those trials were done on patients with chronic kidney disease or diabetes-induced acidosis. In the studies done on healthy people, they’re given ammonium chloride to induce acidosis. What you won’t see are clinical trials showing health consequences from purely ‘diet-induced’ acidosis. (Perhaps because ‘diet-induced’ acidosis doesn’t exist!) You’ll also notice that the strongest two hypotheses deal with osteoporosis and muscle wasting, and that links with other diseases are speculative or based on observational data. And although conflicts of interest don’t necessarily mean their conclusion can’t be trusted, it’s interesting to note that one of these reviews was funded by “pH Sciences®,” which “develops and manufactures patent-protected ingredients that safely and effectively manage biological pH levels.” (23)

In sum, I am not convinced that an acid-forming diet has negative effects on healthy people, based on the science. But just to be sure, it’s always a good idea to observe healthy cultures to see if there’s any anthropological evidence to support or refute the hypothesis.

Evolutionary Data

There are a few studies where researchers attempted to approximate the net acid load of Paleolithic diets. One estimated that 87% of pre-agricultural people ate net-alkaline diets, and proposed this discrepancy with our modern diets as a possible reason for our declining health. (24) However, a more recent study estimated that only half of the world’s hunter-gatherer societies eat net-alkaline diets, while the other half are net acid-forming. (25) They reason that the other estimate is likely accurate for our earlier ancestors, because their tropical habitat would’ve provided ample fruits and vegetables. This idea is confirmed by another analysis that showed increasing acid load with increasing latitude. (26) Even without the study, it stands to reason that as humans moved into less hospitable environments, the animal content (and acid load) of their diet increased.

Given the subpar clinical science on this topic, I think the evolutionary argument is far more convincing. If half of the world’s hunter-gatherer populations avoid the ‘diseases of civilization’ on an acid-forming diet, it would seem that acid load has little to no bearing on overall health.

For some case studies, we can always look to Weston Price's work to see quite clearly that acid-forming diets are not detrimental to health. Based on Price's descriptions, many of the traditional diets he studied would have been primarily acid-forming, including the Swiss, the Masai, and the Inuit. Yet despite their high intake of animal foods or grains and their comparatively low intake of fruits and vegetables, they maintained excellent health.

Conclusion

I don't deny that many people have seen significant health improvements when switching to an alkaline diet, but there are many possible reasons for this not having to do with pH balance. Eating more fresh produce is [rarely](#) a bad idea, especially when it displaces nutrient poor processed foods. A person switching to an alkaline diet would significantly reduce their consumption of [grains](#), which could cause dramatic health improvements for somebody with a leaky gut or [gluten sensitivity](#). Dairy would also be minimized, which would help those with dairy sensitivities. And although pure sugar isn't an acid-forming nutrient, many laypeople claim that it is, so alkaline diets tend to contain far less sugar than a standard Western diet.

Between the scientific evidence (or lack thereof) and the anthropological research, I think we can be confident that the acid load of our diets doesn't negatively impact healthy people. For those with renal failure or similar conditions that affect kidney function, it's a different story—there's certainly room for manipulation of urine pH in the treatment of those conditions. But for someone with functioning kidneys, there should be no concern that an acid-forming diet will harm health.