
Impact of pH Balance on Environment

Ramandeep Kaur,

Department of chemistry,

S.U.S. Government College, Sunam, distt.Sangrur, Punjab

ABSTRACT: *The balance between acidity and alkalinity in the body is referred to as pH, or potential of hydrogen. Excess body acidity is prevalent today because poor diet, insufficient exercise, over-exercising (especially too much cardio, which contributes to stress) and chronic stress can lead to excess acid in our internal environment. When our body becomes acidic, minerals such as potassium, sodium, magnesium and calcium may be stolen from our vital organs and bones to combat or buffer the acid. Similarly, when soil acidity changes, the solubility of a number of metal ions also change. Plant growth is really affected by the varying concentration of these metals in solution rather than by the acidity itself.*

Keywords: *pH, acidity, alkalinity*

INTRODUCTION

What is pH? It is actually a figure expressing the acidity or alkalinity of a solution on a logarithmic scale on which 7 is neutral, lower values are acidic and higher are alkaline in nature.

The pH scale is logarithmic so every one unit change in pH actually represents a ten-fold change in acidity. In other words, pH 6.0 is ten times more acidic than pH 7.0, pH 5 is one hundred times more acidic than pH 7.0.

How does pH balance relate to environment:

) Plants depend on proper pH balance so as to produce essential minerals and nutrients, if not, they might die [1]

) The pH of a body of water is affected by several factors. [2,3]. One of the most important factors is the bedrock and soil composition through which the water moves. Some rock types such as limestone can, to an extent, neutralize the acid while others, such as granite, have virtually no effect on pH.

Another factor which affects the pH is the amount of plant growth and organic material within a body of water. When this material decomposes carbon dioxide is released. The carbon dioxide combines with water to form carbonic acid. Although this is a weak acid, large amounts of it will lower the pH.

A third factor which determines the pH of a body of water is the dumping of chemicals into the water by individuals, industries, and communities. Remember - something as "harmless" as shampoo rinse water is actually a chemical brew and can affect the pH along with other chemical parameters of water. Many industrial processes require water of exact pH readings and thus add chemicals to change the pH to meet their needs. After use, this altered pH water is discharged as an effluent, either directly into a body of water or through the local sewage treatment plant.

A fourth factor which affects pH is the amount of acid precipitation that falls in the watershed. Acid rain is caused by nitrogen oxides (NO_x) and sulfur dioxide (SO₂) in the air combining with water vapor. These pollutants are primarily from automobile and coal-fired power plant emissions.

A fifth factor stems from coal mine drainage. Iron sulfide, a mineral found in and around coal seams, combines with water to form sulfuric acid. This acid, ferrous oxide (known as "yellow boy"), and huge

quantities of silt are the major pollutants from coal mining. Combined with the problem of acid rain, the pH of some stream waters can be drastically lowered.

) It affects the functioning of fish gills. Some species tolerate acidic water better than others. Even if the acidity does not kill fish, the additional stress can stunt growth and make them less able to compete for food. Acidic water also poisons fish eggs, as they will not hatch if water pH is too low. The U.S. Environmental Protection Agency has found that most eggs will not hatch in water with a pH level of 5.0 or less.

) For humans also, body pH level must be properly balanced. Keeping your body at a healthy pH level may help prevent unhealthy microbes and organisms from flourishing, tissues and organs from becoming damaged, minerals from being depleted, your immune system from being compromised. It is generally accepted that agricultural humans today have a diet poor in magnesium and potassium as well as fiber, and rich in saturated fat, simple sugars, sodium, and chloride as compared to the preagricultural period. This results in a diet that may induce metabolic acidosis which is mismatched to our genetically determined nutritional requirements[4]

CAUSES OF PH IMBALANCE & ACIDITY:

The Merck Manual's definition of acidosis is "An overproduction of acid in the blood or an excessive loss of bicarbonate from the blood (metabolic acidosis), or a buildup of carbon dioxide in the blood that results from poor lung function or depressed breathing (respiratory acidosis)."

These are some of ill effects that too much acidity can contribute to Allergies, asthma and congestion, Fatigue Frequent colds , Headaches, Inflammation, Joint and muscle pain, Skin problems, Ulcers, Weight gain, Nausea and vomiting (due to metabolic acidosis)

When it becomes more severe, or over the long term, acidosis can lead to more serious health problems, including Arthritis, Cancer, Diabetes, Heart disease, Multiple Sclerosis, Osteoporosis, Stroke

Synergistic effects of pH

Synergy is the process whereby two or more substances combine and produce effects greater than their sum. For example, $2 + 2 = 4$ (mathematically). But synergistically, $2 + 2 = \text{much more than } 4!$ Synergy is a mathematical impossibility, but it is a chemical reality. Here's how it works.

When acid waters (waters with low pH values) come into contact with certain chemicals and metals, this often makes them more poisonous than normal. As an example: fish that usually can withstand pH values as low as 4.8 will die at pH 5.5 if the water they're swimming in contains as little as 0.9 mg/L of iron. Mix an acid water with small amounts of aluminum, lead, or mercury, and you have a similar problem - one that far exceeds the usual dangers of these substances. Heavy metals can accumulate on the gills of fish or cause deformities in young fish, reducing their chance of survival.

Factors that contribute to acidity (acidosis) and pH imbalance in your body:

-) Alcohol and drug use (including acetazolamide, opioids, sedatives and aspirin)
-) Antibiotic overuse
-) Kidney disease or kidney malfunction
-) Poor digestion and gut health
-) Eating lots of processed and refined foods that are high in sodium, added sugar, refined grains, preservatives, etc.
-) Low intake of potassium, calcium and other minerals
-) High consumption of artificial sweeteners, food coloring and preservatives

-
-) Pesticides and herbicides that can remain on non-organic foods
 -) Chronic stress
 -) Sleep disorders, such as sleep apnea
 -) Declining nutrient levels in foods due to industrial farming and poor quality topsoil
 -) Low levels of fiber in the diet
 -) Lack of exercise/sedentary lifestyle
 -) Excess animal meats in the diet (from non-grass fed sources)
 -) Excess hormones from processed foods, health and beauty products, and plastics
 -) Exposure to chemicals and radiation from household cleansers, building materials, computers, cell phones and microwaves
 -) Overexercising
 -) Pollution
 -) Poor chewing and eating habits
 -) Lung diseases or damage, including emphysema, chronic bronchitis, severe pneumonia, pulmonary edema and asthma

FACTORS WHICH HELP TO RESTORE PH BALANCE:

Many of the membranes in our body require an acid pH to protect us and to help us digest food. It has been suggested that an alkaline diet may prevent a number of diseases and result in significant health benefits.

1. Reduce Intake of Acidic Foods

Acidic foods to limit or eliminate from your diet include:

-) Foods high in sodium
-) Added sugar
-) Processed cereal grains, such as corn flakes, etc.
-) Conventional meats: beef, chicken and pork
-) Fried foods
-) Milk and dairy products
-) Peanuts
-) Refined grains including white rice, white bread, pasta, cereals, etc.
-) Caffeine and alcohol

There are also some otherwise healthy foods that contribute to acidity, but still don't need to be completely avoided. These foods can still contribute many nutrients to your diet, so continue to eat them in moderation as part of an overall balanced diet.

-) Most high-protein foods, such as meat and eggs
-) Lentils and other legumes
-) Oats
-) Brown rice
-) Whole grain bread (I recommend sprouted bread)

) Walnuts

2. *Eat an Alkaline Diet*

Here are foods that are included in a well-rounded alkaline diet:

-) Leafy green vegetables — for example, kale, dandelion, spinach, wheat grass, alfalfa grass, etc.
-) Other non-starchy veggies — including mushrooms, tomatoes, avocado, radishes, cucumber, broccoli, oregano, garlic, ginger, green beans, cabbage, celery and asparagus.
-) Raw foods — Uncooked fruits and vegetables are said to be biogenic or “life-giving.” Cooking foods depletes alkalizing minerals. Increase your intake of raw foods, and try juicing or lightly steaming fruits and vegetables. Superfoods — for example, sea veggies, bone broth and green powder mixes that contain chlorophyll.
-) Healthy fats — these include coconut oil, MCT oil or virgin olive oil (fats found in wild-caught fish, grass-fed beef, cage-free eggs, nuts, seeds and organic grass-fed butter are also good additions to your diet, even if they aren’t necessarily alkalizing).
-) Starchy plants — like sweet potato, turnips and beets.
-) Plant proteins — such as almonds, and most other beans are good choices.
-) Most fruits — Strangely enough, acidic fruits such as grapefruit and tomatoes don’t create acidity in the body. They do just the opposite and contribute to an alkaline environment. Citrus fruits, dates and raisins are all very alkalizing and may help prevent acidosis.
-) Green drinks (vegetable juices) — Drinks made from green vegetables and grasses in powder form are loaded with alkaline-forming foods and chlorophyll. Chlorophyll is structurally similar to our own blood and alkalizes the blood.
-) Apple cider vinegar — ACV tastes acidic but actually may help restore pH balance.

3. *Drink Alkaline Water*

According to the Water Research Center’s website, “The normal range for pH in surface water systems is 6.5 to 8.5 and for groundwater systems is 6 to 8.5.” This means that there is a lot of variation when it comes to pH levels between different sources of water. When water has a pH level less than 6.5, it is considered “acidic, soft, and corrosive,” which means it may potentially leach metal ions such as iron, manganese, copper, lead, and zinc from aquifers, plumbing fixtures, and piping, plus contain certain toxic metals and have a sour taste.

Adding pH drops, lemon or lime, or baking soda to your water also boosts alkalinity. Distilled water is neutral, with a pH of 7.

Water filtered using a reverse osmosis filter is slightly acidic, with a pH level slightly lower than 7. Distilled water and filtered water may not be too alkaline, but as far as pH balance is concerned they are still a better option than tap water or purified bottled water that are more acidic.

4. *Reduce Exposure to Drugs, Toxins & Chemicals*

Many different drugs, chemicals, pollutants and toxins can disturb pH balance and contribute to acidity — such as alcohol, products containing caffeine, acetazolamide, opioids, sedatives, carbonic anhydrase inhibitors, non-steroidal anti-inflammatory drugs and aspirin. Other types of poisoning and chemical exposure can also cause acidosis, which can be very dangerous when it becomes severe.

It’s important to address any underlying health conditions that might be causing you to rely on these drugs regularly. For example, might a lack of sleep, stress, sedentary lifestyle or even allergies be contributing to your health problems? try to determine what types of steps you can take to naturally reduce your need for medications and drugs. If you live or work in an environment with lots of air pollution take steps to protect yourself as much as possible.

REFERENCES

1. Dam-ampai S.O.J., Nilnond C. Effect of cattle manure and dolomite on soil properties and plant growth in acid upland soils. *Songklanakarin Journal of Science and Technolgh*. 2005;27(supplement 3):727–737.
2. University, Birmingham oAa. Oceans reveal further impacts of climate change. ScienceDaily, 2010.
3. Hoegh-Guldberg O, Mumby P.J, Hooten A. , et al. Coral reefs under rapid climate change and ocean acidification. *Science*. 2007;318(5857):1737–1742. [[PubMed](#)]
4. Ströhle A, Hahn A, Sebastian A. Estimation of the diet-dependent net acid load in 229 worldwide historically studied hunter-gatherer societies. *American Journal of Clinical Nutrition*. 2010; 91(2):406–412. [[PubMed](#)]
5. [Gerry K. Schwalfenberg](#) *,A 2012 review, , The Alkaline Diet: Is There Evidence That an Alkaline pH Diet Benefits Health?, *Journal of Environmental and Public Health* states, 2012; 2012: 727630.
6. Dutton, J. A., , Effects of Acid Rain on Materials, Visibility and Human Health, PennState College of Earth and mineral sciences