

# Metabolic Acidosis

By Candace McNaughton, ND

Bodycenter Studios, 126 NW Canal Drive, Suite #320, Seattle, Washington 98107

(206) 633-4800 ext.6 docmnaughton@cs.com

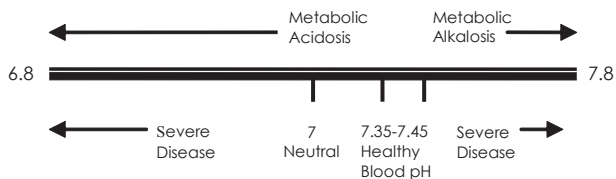
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## BACKGROUND:

Metabolism is the process by which the body converts food into energy. Acidic and basic substances are created in this process. Acidic substances have a low pH, and basic substances have a high pH. The pH scale runs from 1 to 14, with 7 being neutral. A person's health depends in part on a proper ratio of acid and base in the body, known as "**pH balance**". The body typically keeps the blood in a pH range of 7.35-7.45 (See figure 1). If pH levels become imbalanced toward too acidic, "**acidosis**" results. If pH levels are too basic (also known as alkaline), "**alkalosis**" results.

Metabolic acidosis, an imbalance associated with excess acidity in the blood, can occur as a result of numerous diseases and conditions. These include high protein diets, excess coffee and alcohol consumption, chronic disease, toxic exposure, vigorous exercise, dehydration, kidney disease, poisoning, shock, poor digestion, and the normal process of aging. Acidosis does not refer to "acid reflux" or heartburn, which has different causes.

Figure 1: The pH of Blood



## HOW IS ACID-BASE BALANCE MAINTAINED IN THE BODY?

The process of converting food to energy (metabolism) produces heat, carbon dioxide, water, and waste products. The waste products that result from the consumption of food are generally acidic, and they must be removed or neutralized to sustain a normal pH balance in the blood. In a healthy adult, blood pH levels range narrowly from 7.35 to 7.45, which is slightly alkaline (see figure 1). If blood pH falls below or rises above this range and remains at that level for more than a short time, serious health problems, and potentially death, can result.

The body maintains a proper pH balance in various ways. Excess acid is bound to other molecules or expelled from the body. The organs responsible for maintaining proper body pH balance are predominantly the kidneys, lungs and, to a lesser degree, the skin and lower intestines. The **kidneys** filter the blood and remove excess acids and other substances. They excrete ammonia into the urine when the blood is acidic. They also return needed substances such as sugars, amino acids, and water to the blood. The **lungs** vent carbon dioxide,

which is acidic. The **lower intestines** expel excess acid or base through the feces. The **skin** secretes acid through perspiration.

Another mechanism the body uses to balance pH is the chemical buffers in the fluids and bone. **Protein** from muscle can be released to bind with acids in the blood. This can contribute to loss of lean muscle mass. **Calcium and phosphorus** in the bones can even become a buffer source because they can bind to acidic substances to neutralize them. This would exist in a more long term or serious condition, and can contribute to bone mineral loss. Other buffer systems include **bicarbonate**, **hemoglobin**, and the **phosphate cycle**. These are present in the blood and tissues and help to neutralize pH imbalance.

When the capacity of these buffering systems is exceeded, it changes the pH balance and results in acidosis or alkalosis. Acidosis and alkalosis are disturbances indicating a pH imbalance in the blood. Although they are not diseases themselves, they can be signs of an underlying disease or condition. Even with our buffering systems working to maintain blood pH, we may have slightly more acidic blood than is healthy. This is because the buffering systems may not be working at their best. They can get overloaded and age just like we do. These buffering systems are critical to maintaining a healthy blood pH. They will maintain healthy blood pH at all costs. **This means that measuring saliva or urine pH as normal or near normal will not tell you if the body is maintaining this pH by taking calcium from the bones or protein from the muscles.** So, a slightly acidic blood can mean that the body is relying heavily upon buffering systems to maintain a near-normal pH at the expense of those organs and buffering systems.

## SO WHAT DOES pH IMBALANCE DO TO THE BODY?

Imbalances in blood pH are classified in two main ways. These are metabolic and respiratory. **Metabolic** imbalances occur because of breakdowns in kidney function, ingestion or loss of imbalanced fluids, or other problems within the organs. **Respiratory** imbalances occur because of problems with oxygenation of blood: hyperventilation, stagnated blood flow, etc. So, the four main categories are Metabolic Acidosis, Metabolic Alkalosis, Respiratory Acidosis, and Respiratory Alkalosis.

The dominant type of pH imbalance in western culture is **metabolic acidosis**. Metabolic acidosis is not a cause of heartburn, or acid reflux. Evidence indicates that metabolic acidosis is associated with kidney stones, gout, fibromyalgia,

interstitial cystitis, loss of muscle mass, osteoporosis, thyroid problems, cystic fibrosis, progression of HIV to AIDS, stunted growth of infants and children, irritable bowel syndrome, and even some forms of cancer, such as prostate cancer. Acidosis can also reduce **enzyme activity**, since enzymes function in narrow pH ranges in the body. Enzymes are very important proteins which are critical in almost all body processes, such as the breakdown of food. They are like tools. Running the body without enzymes is like trying to get a nail in a wall without a hammer. Metabolic acidosis is likely related to the excess amounts of protein, fat, refined flour, and sugar that are commonly consumed in the western world. These dietary patterns result in acidic metabolism. Other contributing factors are normal nutrient processing, toxic exposure, chronic disease, dehydration, severe diarrhea, and excess acid produced during exercise. Aging can contribute to metabolic acidosis as the function of the lungs and kidneys becomes less efficient.

**Other pH imbalances** are less common. Respiratory acidosis and alkalosis are caused by lung malfunction (i.e., from smoking, altitude, or disease). Metabolic alkalosis is even less common because it is almost always caused by an abnormal condition such as bulimia or the consumption of an excessive amount of antacids.

#### SUMMARY:

Conditions such as high protein diets, chronic disease, toxic exposure, vigorous exercise, dehydration, and aging make the blood more acidic, which stresses the various buffer systems in the body. It is the overuse of the body's buffer systems, not the actual blood pH, which is the primary area of concern. The body works so hard to maintain a normal blood pH that it may result in damage to other areas of the body (such as the bone) in the process. So, a slightly acidic blood can mean that the body is relying heavily upon buffering systems to maintain a near-normal pH at the expense of those organs and buffering systems. Conditions associated with metabolic acidosis can result directly from acidic blood. They can also result from overuse of the body's buffer systems. With some correlated conditions, the connection is still being investigated. These conditions include kidney stones, fibromyalgia, interstitial cystitis, loss of muscle mass, osteoporosis, thyroid problems, cystic fibrosis, progression of HIV to AIDS, stunted growth of infants and children, irritable bowel syndrome, gout, the inactivation of body enzymes, and even some forms of cancer.

#### REFERENCES:

1. Abelow, Benjamin, Understanding Acid-Base, Williams and Wilkins, 1998
2. Aihara, Herman, Acid and Alkaline, George Ohsawa Macrobiotic Foundation, 1986
3. Arieff, Allen I., Hypoxia, Metabolic Acidosis, and the Circulation, Oxford University Press, 1992
4. Baroody, Theodore A., Alkalize or Die, Holographic Health Press, 1991
5. Brandis, Kerry, Acid-Base Physiology <http://www.qldanaesthesia.com/AcidBaseBook>, 2003
6. Klimet, Felicia Drury, The Acid Alkaline Balance Diet: an innovative program for ridding your body of acidic wastes, Contemporary Books, 2002
7. Merck, The Merck Manual of Medical Information, Merck Research Laboratories, 1997
8. Rhoades, R & Pflanzer, R., Human Physiology, Third Ed. San Diego: Saunders College Publishing, 1996
9. Vasey, Christopher, The Acid-Alkaline Diet for Optimum Health: restore your health by creating balance in your diet, Healing Arts Press, 1999
10. Whang, Sang, Reverse Aging, JSP Publishing, 1990
11. Wiley, Rudolf A., BioBalance - The Acid/Alkaline Solution to the Food-Mood-Health Puzzle, Essential Science Publishing, 1989
12. Young, Robert O. & Shelley R., The pH Miracle - Balance your diet, reclaim your health, Warner Books, 2002