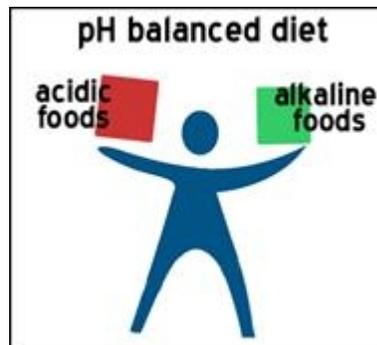


The Body's Acid / Alkaline Balance

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Introduction

"We are facing the largest health crisis in recorded history"

- Dr. Theodore Baroody, author of "[Alkalize or Die](#)"

- ◆ This health crisis is **OVER-ACIDITY** - which is linked to all kinds of illness and disease. Acidosis in the body is the result of the typical Western diet and lifestyle. (Alkalosis is usually only seen in someone with kidney disease, or one taking too many alkalizing supplements or drugs intended to have an alkalizing effect). Chronic acidosis is dealt with by employing the body's alkalizing mechanisms, which will eventually deplete the body's stores of alkaline minerals (e.g. sodium, potassium, magnesium and calcium), *paving the way for chronic and degenerative disease.*

[Acidity Health Problems - What happens when the body is too acidic?](#)

- ◆ What does pH mean? - Water (H_2O) ionizes into hydrogen (H^+) and hydroxyl (OH^-) ions, which when in equal proportion have a neutral pH value of 7.

If there are more H^+ ions than OH^- ions then the water is said to be acid.

If OH⁻ ions outnumber the H⁺ ions then the water is alkaline.

The **pH** value represents a fluid's acidity or alkalinity level - by indicating its concentration of hydrogen ions (H⁺). The most acid pH value is 1, and the most alkaline pH is 14.

For more detail:

[What does pH Mean?](#)

For health, we need an appropriate balance between acids and bases in blood plasma and body tissues

- ◆ Chronically imbalanced pH levels in your body will lead to any of the now commonly observed degenerative diseases - Any slight decrease in pH will result in lower oxygen levels in the blood and, therefore, in the cells. A healthy Acid-Alkaline Balance is decisive to the structure and function of proteins, the permeability of membranes, the distribution of electrolytes (charged particles) and the functioning of connective tissue.

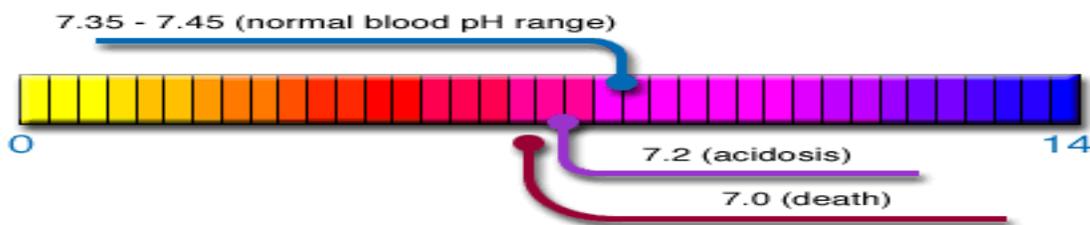
- Examples of physiological processes affected by pH:

- √ **Cleansing and healing processes**
 - √ **Beating of heart**
 - √ **Firing of nerves**
 - √ **Ability to absorb nutrients**
 - √ **Ability of muscles to contract decreases as body becomes more acidic, while hormones like adrenaline increase.**
 - √ **Metabolic enzyme activity and chemical reactions**
 - √ **Oxidation rate in ATP cellular energy production**
 - √ **Transport proteins that move substances across cell membranes**
 - √ **Signaling systems that transmit messages between cells or intracellular compartments**
 - √ **DNA-RNA synthesis**
- ◆ **Body processes tend to produce a slightly acid pH - due to acidic end-products, i.e. CO₂ and metabolic acids (e.g. sulfuric acids from protein consumption):**
 - √ **Digestion/Cellular respiration process - which creates energy for a**

cell to perform its specific task, creates acid end products (waste), which must not be allowed to build up. E.g. lactic acid is created through exercise and can cause pain.

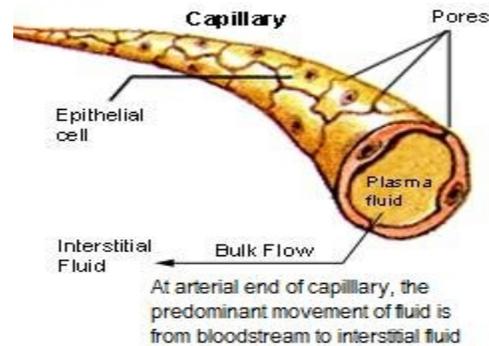
- √ **Breathing;**
- √ **Circulation;**
- √ **Hormone production**

- ◆ The pH level of the blood plasma and of the external and internal cellular fluids must be kept within a small range of fluctuation under all circumstances – the body is ~70% water-based, and the pH level of the various body fluids inside and outside of cells must be kept within narrow limits in order for many different body processes to be carried out in a controlled way. (E.g. to sustain life, blood plasma pH must be 7.35 – 7.45).



BODY FLUIDS (at the cellular level)		
- There are 3 <u>main</u> compartments of body fluids, each separated by selectively permeable cell membranes:		
Internal Cellular Fluid - 2/3 of body fluid is INSIDE cells	(1) Intracellular fluid	
	<i>Plasma membranes of individual body cells separate intracellular fluid from interstitial fluid</i>	
Extracellular Cellular Fluid (ECF) 1/3 of body fluids is outside cells	(2) Interstitial fluid (also called <u>inter</u> cellular fluid)	Bathes outside of cells; ~ 80% of ECF;
	<i>Endothelial cells separate interstitial fluid from plasma</i>	
	(3) Plasma (yellow-	~ 20% of ECF

	colored liquid component of blood, in which blood cells are suspended)	
	Other ECF fluids	Include lymph, CSF, synovial fluid, humors of the eye, endolymph, perilymph, serous fluids, and glomerular filtrate



PH LEVELS OF SOME BODY AREAS		
BODY AREA	PH	COMMENT
Tissues that deal with the external environment	Acidic	Colon, skin, vagina, stomach, lymph node fluid need an acid pH for proper function
Extracellular fluid (Blood plasma and interstitial fluid)	Alkaline	Venous blood; Interstitial pH is ~7.35 ($H^+ = 40$ nmol/l)
Intracellular fluid	Slightly alkaline	~7.0 ($H^+ = 100$ nmol/l);
Urine	Acidic	Ideal morning urine pH should be 6.4 - 6.8
Saliva	~Neutral	First morning saliva pH should be 6.8 - 7.2

- ◆ All other organs and fluids will fluctuate in their range in order to keep the blood at a strict pH between 7.35 and 7.45 (slightly alkaline) - This process is called homeostasis. The body makes constant adjustments

in tissue and fluid pH to maintain this very narrow pH range in the blood. A normal pH of all tissues and fluids of the body (except the stomach) is slightly alkaline. The stomach pH is much more acid than the intestinal pH because the stomach needs an acid environment (hydrochloric acid) to break down food for digestion. Whereas, the flora (good bacteria) of the intestine need a more alkaline environment to assimilate and process the nutrients from the foods digested by the stomach.

Measuring Body pH

Using pH paper - We can get a pretty good idea of the pH of our body tissues and internal fluids by using pH paper in saliva and urine.

- ◆ Saliva pH *reflects your success* in creating an alkaline condition within your body – it should be 6.5-7.5 all day for someone in a healthy state. pH readings should be taken one hour before or two hours after a meal. A pH below 6.0 indicates that you should pay immediate attention to alkalizing your diet.
- ◆ Urine pH *reflects the pH corrections by the kidney buffer systems* - E.g. An alkaline urine simply shows that some alkaline minerals are being discarded by the body.

People in North America tend to consume too much calcium and sodium and insufficient magnesium and potassium - *This is often reflected in urine tests which show calcium and sodium being excreted while magnesium and potassium are being retained.*

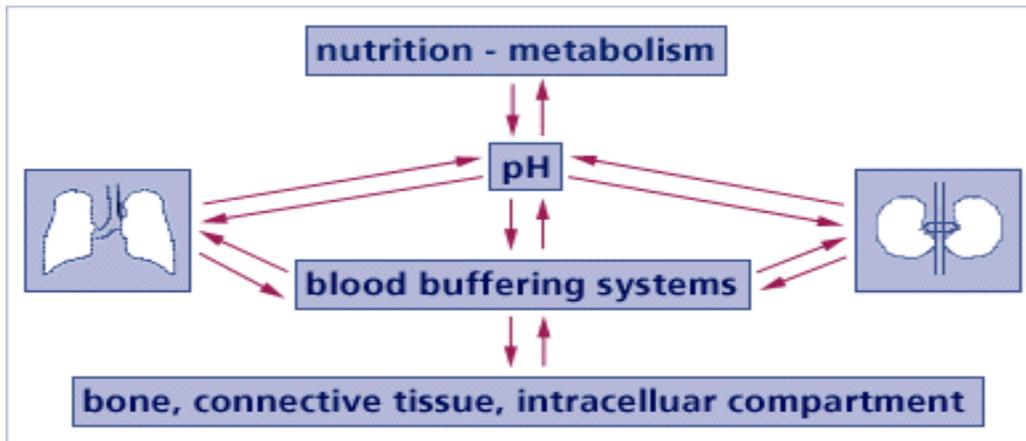
Buffering Systems

(regulatory systems which compensate for the excess acid or base)

- ◆ These are the main systems that buffer acids and bases by functioning in equilibrium with each other:
 - Chemical buffer systems – act within seconds
 - Respiratory compensation - respiratory center in the brain stem acts

within 1-3 minutes; This system is in play when you become “out of breath “after exercise - your muscles produce lactic acid, which is breathed out in the form of CO₂ with a stepped up breathing rate.

- **Renal mechanisms** – require hours to days to effect pH changes



- ◆ The body’s pH-regulating organs, **LUNGS**, **LIVER** and **KIDNEYS**, remove acidic end products - which would otherwise “corrode” tissues and disrupt cellular activities and functions. For more technical information on how the body buffers excess acid so prevalent today:

The body’s acid buffering systems

What Causes Our Bodies to Become Over-Acidified?

(1) **METABOLIC ACIDOSIS**

- ◆ Metabolic acidosis may be caused by:
 - √ **Ingestion of highly acidic foods**
 - √ **Production of excessive amounts of acid (H⁺ ions) in the body**
 - √ **A deficiency of buffering alkaline minerals** - metabolic imbalances require chemical buffering in the blood plasma, lymph, and intra/extracellular fluids.

◆ The following factors have a role in metabolic acidosis:

- **Body Processes** - tend to produce acid as an end-product. Most H⁺ ions originate from cellular metabolism:
 - √ **Breakdown of sulfur-containing proteins** (E.g. muscles) - releases sulfuric acid into the ECF;
 - √ **Anaerobic respiration of glucose** - produces lactic acid (E.g. cancer cells); can be caused by *lack of physical activity*, which leads to a lack of oxygen through insufficient muscular circulation, activating anaerobic metabolism;
 - √ **Fat metabolism** - yields organic acids and ketone bodies; *dieting or fasting* increases fat metabolism as a source of energy;
 - √ **Transporting carbon dioxide** - as bicarbonate releases H⁺ ions
- **Diet** – is probably the main contributor to the body’s acid levels today. When foods are broken down, they leave certain chemical /metallic residues (sometimes called a noncombustible "ash"), which when combined with body fluids, yields either acid or alkaline solutions. Some foods are "acid-forming" and some are "alkaline-forming."

Acid-forming foods,
such as protein,
sodas, sugar, grains,
caffeine, dairy,
processed foods

**Should be Balanced
With**
▲

Alkaline mineral-containing
fruits and vegetables

Contrary to what you might expect, citrus fruits and apple cider vinegar actually alkalize the body because they contain alkalizing minerals. The general recommendation is to consume about 75% alkaline-forming foods and 25% acid-forming foods.

[Acid/Alkaline Food Charts](#)



MAJOR DIETARY CAUSES OF ACIDOSIS

- **Under / Imbalanced Consumption of alkalizing minerals** – Western diets tend to contain **too much calcium** (from consuming too many dairy products or Calcium supplements) **and sodium** (in prepared foods loaded with salt), and **insufficient magnesium and potassium** (that would come from eating fruits and vegetables). A diet based on fruits and vegetables, grains and legumes, with a small amount of dairy, would give the body all four of the alkaline minerals in better balance.
- **Over-Consumption of Protein** (*often the MAIN cause of acidosis*) - after proteins are broken down in the body, they leave an "acid ash", such as the negatively charged ions SO_4^{2-} (sulfate), PO_4^{3-} (phosphate), NO_3^- (nitrate), all part of strong acids (sulfuric, phosphoric and nitric acids). *Alkaline bicarbonates of sodium, potassium, calcium or magnesium are used to buffer these acids* (The kidneys try to increase the pH by the exchange of hydrogen ions for sodium ions. *When acid and alkaline molecules combine they form neutral, bicarbonate salts*, which are able to pass through the blood stream to be eliminated through the kidneys, without affecting blood plasma pH.)

We need 1½ - 3 oz. of daily protein (Examples of protein content in foods: 3oz. cooked cod = $\frac{3}{4}$ oz. ; 3oz. cooked beef sirloin/no fat = ~ 1oz; 1 lg. fried egg = $\frac{1}{4}$ oz), yet the average American diet contains up to 7 oz. of protein. Today's average protein-rich, Western diet overloads the body with a daily acid excess of 50-100 mmol.

- **High sugar consumption** - provides the "favorite" meal for bacteria and yeast, promoting their uncontrollable growth and multiplication. The immune system uses its precious oxygen supplies in an attempt to eliminate these "invaders" and their toxic waste products, again creating an even more acidic environment – a vicious circle made worse by too much dietary sugar;
- **Drinking too many sodas** - so called "soft" drinks, which often contain phosphoric acid and a lot of sugar;

- **Drugs/ Pollution** - extensive use of many drugs E.g antibiotics and steroids (cortisone) and pollution alter pH; Breathing polluted air; Drinking

contaminated water.

- **Turbulent emotions / thoughts** – being angry, worrying, feeling hateful, lack of spirituality, emotional stress - makes body more acidic.
- **Lifestyle** – acid rock music (wonder why they call it that?), hectic living, physical/ emotional/mental stress, immorality, lack of exercise, trauma - all induce acidity;

(2) RESPIRATORY ACIDOSIS

- ◆ Respiratory acidosis results from failure to exhale carbon dioxide from the lungs as quickly as it forms in respiring tissues - such that carbon dioxide accumulates in the blood plasma and tissues, where it forms carbonic acids.

(3) ACIDOSIS DUE TO KIDNEY OR LIVER DISEASE

- ◆ Kidney or liver impairment can impede the natural excretion of excess acids