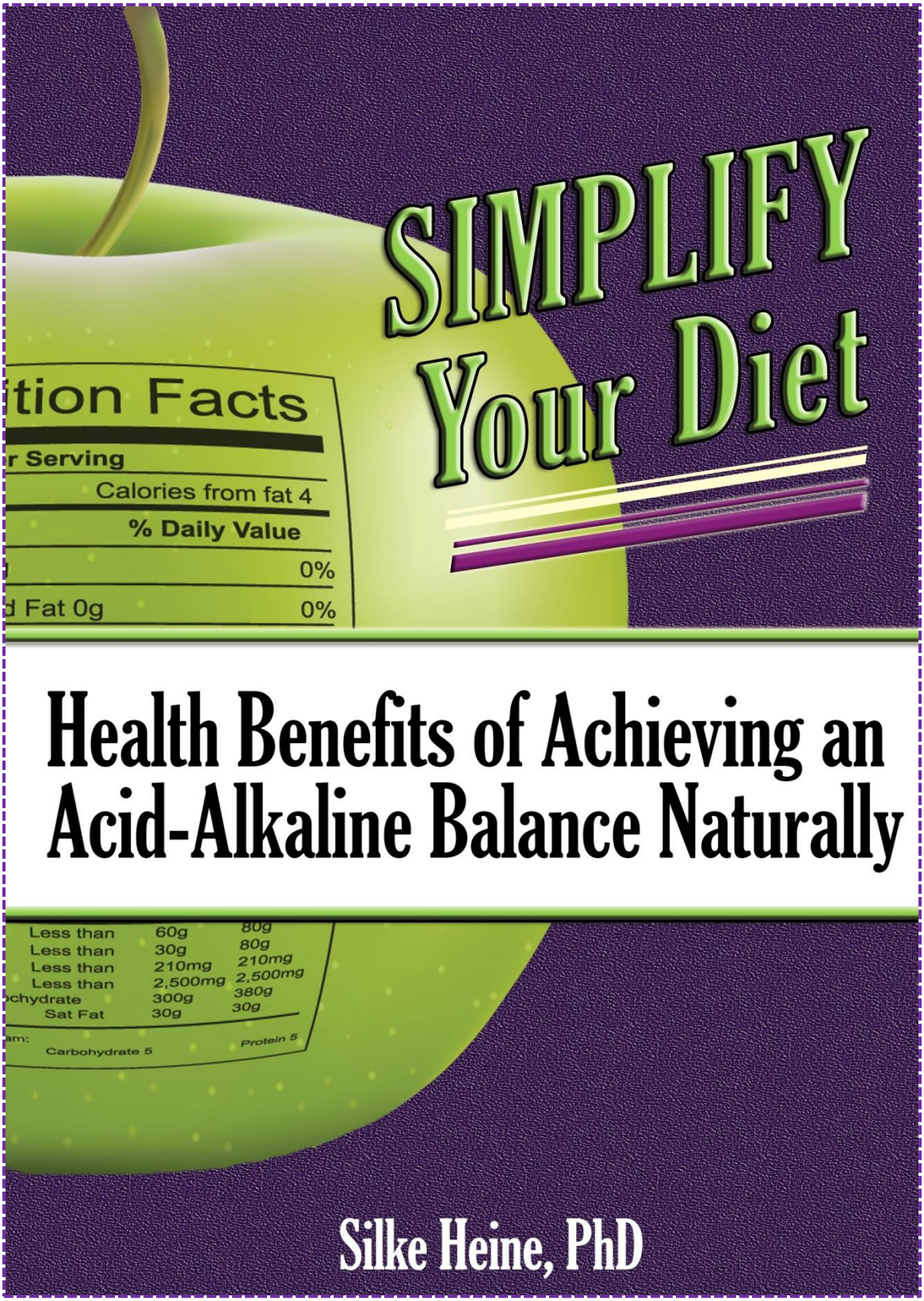

Health Benefits of Achieving an Acid-Alkaline Balance Naturally

Silke Heine, PhD

SIMPLIFY Your Diet

Health Benefits of Achieving an Acid/Alkaline Balance Naturally

Silke Heine, PhD

SIMPLIFY

Holistic Nutrition Consulting

www.SimplifyHolisticNutrition.com

Dedication

“I would like to dedicate this book

Simplify Your Diet

to my beautiful children,

Lisa and Daniel.

May you never stop searching

for knowledge on the path to

your own Health and

Happiness!”

SIMPLIFY Your Diet
Health Benefits of Achieving an Acid/Alkaline Balance Naturally

Silke Heine (781-883-5951)

Disclaimer

(1) Introduction

This disclaimer governs the use of this material. By using this material, you accept this disclaimer in full.

(2) Credit

This disclaimer was created using an SEQ Legal template, and was modified in accordance with rules of usage.

(3) No advice

This material contains information about the many health benefits from achieving an acid/alkaline balance naturally. The information is not advice, and should not be treated as such.

You must not rely on the information in the material as an alternative to medical advice from an appropriately qualified professional. If you have any specific questions about any medical matter, you should consult a physician. If you think you may be suffering from any medical condition, you should seek immediate medical attention. You should never delay seeking medical advice, disregard medical advice, or discontinue medical treatment because of information in the material.

Disclaimer

(4) No representations or warranties

To the maximum extent permitted by applicable law, we exclude all representations, warranties, undertakings and guarantees relating to the material.

Without prejudice to the generality of the foregoing paragraph, we do not represent, warrant, undertake or guarantee:

- that the information in the material is correct, accurate, complete or non-misleading;
- that the use of the guidance in the material will lead to any particular outcome or result; or
- in particular, that by using the guidance in the material, you will be aware of the many health benefits you can get from achieving an acid/alkaline balance naturally.

(5) Our details

In this disclaimer, "we" means (and "us" and "our" refer to) *Silke Heine* doing business as *Simplify Holistic Nutrition Consulting*, which has its principal place of business at N*orwell, MA 02061*.

About the Author

Silke Heine is the owner of Simplify Holistic Nutrition Consulting. She is a lifelong holistic health, nutrition, and fitness advocate and has helped many people with nutrition and wellness over the last 15 years.

You will be able to see Silke for one-on-one consultations to talk about your personal health and nutrition goals, and learn about better food-choices that match your bio individuality.

Silke is looking forward to help many of you while combining her nutrition knowledge and holistic health beliefs with the “whole health concept” of Simplify.

She is very open for recommendations and is looking forward to your input, how to best use her knowledge to improve your health and well-being.

Silke spent 11 years working in fashion retail in Germany, culminating her fashion career as a head buyer for one of the largest German retailers.

About the Author

While raising two children, Silke and her family moved from Germany to the U.S. in 1999 and started her own business teaching yoga and meditation. This led her to study Bioenergetic-Nutrition with Mark Mincolla, followed by obtaining her bachelors and masters degree in Holistic Nutrition at various colleges /universities.

Silke finished her doctoral degree in Holistic Nutrition with Summa cum Laude.

She also holds a Certification as a Natural Health Practitioner, and a Holistic Nutrition Practitioner.

Silke played competitive tennis in her childhood years and keeps herself fit with personal training sessions, Zumba, Yoga and Pilates, and various other fitness classes.

To contact Silke, please call:
(781) 883-5951.

Let us help you change
your health and life...

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Acknowledgment

I would like to thank my husband Bernhard for his patience, love and advice and for supporting me in my path!

A big thank you to my children for giving me a reason to search for more knowledge.

A huge Thank You to Mark Mincolla for sharing his spark and compassion to learn about health and nutrition.

I would also like to thank my assistant Evelyn for her support.

A big Thank You to my mom for educating me at home on a fresh, wholesome diet from little on.

Foreword

Moving to the United States from Germany and raising my 2 children in a home, away from my German family gave me so many reasons to get myself educated about the culture, the regulations and traditions of this amazing country that I now call my home.

Adjusting to a new lifestyle, trying all that everybody else did, did not really agree with our health. I do not know if it was because we ate so differently, we changed the water, which causes a lot of stress on the human body, or a faster way of living, with longer distances.

In order to regain our health and strength, recover from newly developed allergies and sensitivities, I studied deeper and deeper Holistic Nutrition, researched so many different aspects of the big Health Puzzle, in order to keep my family and myself healthy.

I am clearly not at the end of it!
Along the way I tried to find convincing concepts that I now use in my practice to help my clients. One of these concepts that I find helpful is if people alkalize themselves, to get rid of many health issues caused by a too acid diet.

Foreword

Studying a year with Mark Mincolla really sparked my passion to find more answers. I collected data about this topic over the last years, and now came up with the idea, that there is a need to share all the research I have done on an Acid / Alkaline Balance.

This is the foundation of my book ***Simplify Your Diet***.

Is this all it takes to stay healthy? NO!!!
It is a piece of the puzzle, that helps my clients get convinced and reminded, that we need huge amounts of nutrient dense vegetables, plus some fruits daily in order to keep our bodies in a more balanced, healthy state.

This piece of knowledge does help to move away from being too acidic from overeating processed foods, too many grains, too many dairy products, and too many saturated fats from animal products in general.

My clients are having wonderful results, from weight loss, to clearer minds, a strengthened immunity to an overall healthier feeling of wellbeing. Food cravings will fall away, because our bodies will be satisfied with nutrients!

Here's to a happier and healthier you.

Foreword

May I be able to convince you all to SIMPLIFY YOUR DIET by adding healthier choices to your daily meal plan!

In Health and Happiness,

Silke

Chapter 1

Acid / Alkaline Balance: Overview

Achieving Optimum Health and Well-being

Why is it that every creature on this planet eats its biologically correct and suitable diet, a diet of unprocessed foods found in each species natural environment, sustaining diets which are congruent with each given physiological apparatus and needs, ones which do not produce diseases, but not all humans in every part of the world?

Have you ever wondered if many diseases raging through our society have a common cause? Our Western diet seems very destructive because the "biochemical composition of the staples of . . . [the Standard American Diet, the S.A.D.], are (sic) inherently acid-forming" (Klein).

By delivering the necessary scientific data to understand our natural biological diet that will provide the best fuel for optimum nutrition, health, peak athletic performance, endurance, and will generate maximum power and strength, I would like to empower and educate every health-seeker to be able to make better choices to either strengthen health or regain it.

For those seeking to attain peak, physiological health, it is critical to understand the principles and effects of an Acid/Alkaline Balance in relation to the health preservation of their blood and body tissue!

Diet as a Healing System

According to *The Acid-Alkaline Food Guide*, a perennial bestseller designed to guide in reaching your health and dietary goals:
The importance of diet has been a basic tenet of traditional healing systems around the world for many centuries. A wholesome diet not only helps to maintain health, but can also play a vital role in recovery from disease. On the other hand, it is safe to say that unhealthy dietary patterns are a major contributing factor in most disease conditions.

Our understanding of how and why certain foods can significantly help to improve health, while other foods can accelerate the disease process, continues to grow each year as scientists continue their quest to uncover Nature's secrets. In recent years, one of the most exciting nutritional discoveries has concerned the effect that different foods have on the body's pH levels once they are consumed. Simply put, some foods, once digested, create an acidic effect within the body, while others act as alkalizing agents that can neutralize harmful acids. To be healthy, it is necessary to be in a state of acid-alkaline balance. Humans have, in fact, a genetically encoded requirement for a dietary balance of acid-forming and alkaline-

forming foods. Because of our early ancestors' abundant intake of fruits, vegetables, nuts, and seeds, we evolved on diets high in organic mineral compounds -- particularly potassium, magnesium, and calcium. We still need these compounds in order to maintain our internal acid-base balance. But as you will discover, contemporary eating patterns are at odds with our ancient biological machinery, much to the detriment of our health. (Brown and Trivieri)

Frassetto et al. suggest that most of today's health problems stem from the deficiency of potassium alkali (bicarbonate) salts in today's food, compared to the food of our ancestors. They feel there is substantial evidence that most contemporary human suffering comes from the "[p]athophysiologic consequences of diet-induced, age-amplified chronic low-grade metabolic acidosis" (207). The researchers proved that modern nutrition produces a low-grade metabolic acidosis in otherwise healthy people. They found that neutralization of this acid-load with bicarbonate salts improves calcium and phosphorous balances, reduces bone loss, reduces muscle loss and prevents the age-related decline in human growth-hormone levels. They conclude that "a low-grade metabolic alkalosis may be the optimal acid-base state for humans" (201).

Modern diets contain much more acidic foods and fewer bicarbonate

alkaline salts than our ancestral pre-agricultural diets. Researchers found that this imbalance between acid and alkaline foods is due to the "displacement of high-bicarbonate-yielding plant foods in the ancestral diet by cereal grains and energy-dense, nutrient-poor foods in the contemporary diet" (Sebastian et al. 1308).

Healthy Cells

It has been precisely said that both health and disease start in the cells, for it is at the cellular level that the huge majority of the body's multitude of interactions happen. For example, in place for the body's cells to function accurately, they have to accept life-giving nutrients and oxygen from the bloodstream, then, they have to release cellular wastes at the same time. As it turns out, both of these interactions can ideally happen just when the body is in a marginally alkaline state, which takes into consideration an easy flow of oxygen and nutrients into the cell walls and a similarly quick disposal of cellular waste. At the point when the body gets to be chronically acidic, however, these and numerous other cellular processes begin to get impeded. In the end, if acidity proceeds unchecked, the blend of a decreased oxygen and nutrient supply to the cells and the buildup of wastes inside the cells sets into motion both fatigue and disease (Brown and Trivieri).

Chapter 2

Acid / Alkaline Balance and the Human Body

Acid-Alkaline Balance and Overall Health

Almost all foods we take into our system, after being digested, absorbed, and metabolized release either an acid or alkaline base into the blood. Some of the acid-producing foods are: grains, fish, meat, poultry, shellfish, cheese, milk, and salt. The mass consumption of these food groups has turned our bodies to become overly acidic.

Over-acidity, which can become a perilous condition that deteriorates all body systems, is very common nowadays. It gives way to an internal environment favorable to illness, as opposed to a pH-balanced environment which permits normal body function essential for the body to defy illness. A healthy body upholds sufficient alkaline reserves to meet emergency demands. When excess acids must be neutralized, our alkaline reserves are depleted leaving the body in a weakened condition. A pH-balanced diet, according to numerous experts, is a fundamental key to health maintenance.

Acid-Alkaline Balance and Overall Health

Dr. Theodore A. Baroody, the author of the remarkable book *Alkalize or Die*, says basically the same thing that "[t]he countless names of illnesses do not really matter. What does matter is that they all come from the same root cause...***too much tissue acid waste in the body!***" (15).

Acidic food is normally deficient in fiber, which aids to manage blood sugar and improves bowel health. The friendly bacteria in the gut need fiber to function. Without them, not only does the digestive system suffer, but also the immune function of the body.

Understanding pH

pH (potential Hydrogen) is a measure of the acidity or alkalinity of a solution. It is measured on a scale of 0 to 14 - the lower the pH the more acidic the solution, the higher the pH the more alkaline (base) the solution. When a solution is neither acid nor alkaline, it has a pH of 7 which is neutral.

Webster's defines pH as "a symbol for the degree of acidity or alkalinity of a solution" ("pH"). Dorland defines a pH of 7 as neutral, above it is an alkaline pH, and below it as an acidic pH ("pH of 7"). The pH in our body may vary considerably from one area to another with the highest acidity in the stomach (pH of 1.35 to 3.5) to assist in digestion and defend against unscrupulous microbial organisms. Pancreatic excretions are very high in pH value, which range from 8.0 to 8.3. The normal pH of arterial blood (oxygenated blood) is 7.4, whereas the pH of venous blood (deoxygenated blood) is about 7.35 because of the extra amounts of carbon dioxides (CO_2) released from body tissue. The skin is quite acidic (pH 4-6.5) to provide an acid shield as a protective barrier to the environment against microbial overgrowth. There is a gradient from the outer horny layer (pH 4) to the basal layer (pH 6.9).

Understanding pH

"The normal pH of arterial blood is 7.4." A person is considered to have acidosis when the pH falls below this value and alkalosis when the pH rises above 7.4. The lower limit of the pH value at which a person can live is about 6.8 more than a few hours and the upper limit, on the other hand, is about 8.0 (Hall and Guyton 716).

Water is the most bounteous compound in the human body, comprising 70 % of the body. The body has an acid-alkaline (or acid-base) degree called the pH, which is a balance between positively-charged ions (acid-forming) and negatively-charged ions (alkaline-forming). The body persistently strives to balance the pH. When the balance is traded off, numerous health issues take place.

Most individuals who experience the ill effects of an unbalanced pH are acidic. This condition forces the body to acquire minerals - including calcium, sodium, potassium and magnesium - from vital organs and bones to cradle (neutralize) the acid and securely eliminate it from the body. Due to this strain, the body can endure extreme and prolonged harm due to high acidity - a condition that may go concealed for years.

The reason acidosis is more common in our society is mainly due to the typical American Diet, which is far too high in acid-producing

animal products such as meat, eggs and dairy, and far too low in alkaline-producing foods such as fresh vegetables and fruits. Moreover, we consume acid-producing processed foods like white flour and sugar and drink acid-producing beverages like coffee and soft drinks. We utilize lots of drugs, which are acid-forming; and we utilize artificial chemical sweeteners, which are intensely acid-forming (Barzel and Massey 1051).

An important point to remember is, that "[e]nzymes, especially food enzymes, are greatly affected by the pH balance levels in the human blood and body tissue." Their resulting effects could be healthy or unhealthy depending on whether they are able to complete their enzymatic functions ("Acid Alkaline Balance Diet").

The pH of Foods

In food chemistry textbooks that take a Western science approach to foods, every food has a value that is called its "pH value."

For example, limes have a very low pH of 2.0 and are highly acidic according to the pH scale. Lemons are slightly less acidic at a pH of 2.2. Most vegetables are at somewhere in the middle of the pH range. The pH of asparagus, for example, is 5.6; of sweet potatoes, 5.4; of cucumbers, 5.1; of carrots, 5.0; of green peas, 6.2; of corn, 6.3. Tomatoes fit on the pH scale toward the more acidic end as compared to other vegetables. Their pH ranges from 4.0 to 4.6. On the other hand, this range is still higher (less acidic) than fruits like pears with a pH of 3.9, or peaches with a pH of 3.5, or strawberries with a pH of 3.4, or plums with a pH of 2.9 ("Visitor Questions: What Do You Think about an Acid/alkaline Balance?").

Acid-forming Foods

A different way to discuss about food acidity is not to gauge the acidity of the food itself, but to gauge changes in the acidity of body fluids once the food has been consumed. That is to say, from this second viewpoint, a food is not tagged as "acidic," but instead as "acid-forming."

Even though the idea of acid-forming foods goes back almost a hundred years in the research world, there has been very slight research published in this area until fairly recently. In earlier publications, acid-forming foods were often discussed about as key components of an "acid-ash diet." The term "ash" was used a lot more frequently in those days to point out the inorganic components of a diet (mineral elements or molecules not containing carbon) that remained after the digestion and metabolism of food had occurred. This ash was also generally referred to as a "residue" of the diet. Diets chiefly devoid of meat, fish, eggs, cheese, and grains were described as "alkaline-ash diets." These diets centered on consumption of fruits and vegetables and incorporated cow's milk. By distinction, diets consisting vast amounts of meat, fish, eggs, cheese and grains were described as "acid-ash diets" (Barzel and Massey 1051-53).

What Does PRAL Mean?

While the term "ash" is rarely used in recent research studies on diet, the idea of acid-forming foods has remained a topic of research interest. A new term has been produced in the research world to point out the potential impact of particular foods on the kidneys and urine acid levels. This term is called "potential renal acid load" or PRAL. For meats, a PRAL value of 9.5 has been reported by researchers. Aside from meats, cheeses are in, in terms of high PRAL value, which scores 8.0, 7.9 for fish, 7.0 for flour, and 6.7 for noodles. In contrast with these high PRAL values are the values such as - 3.1 for fruits, - 2.8 for vegetables, and 1.0 for cow's milk (see table 1).

Table 1

Food Group	PRAL	Higher or Lower
Meats [1]	9.5	Higher
Cheeses [2]	8.0	Higher
Fish	7.9	Higher
Flour	7.0	Higher
Noodles [3]	6.7	Higher
Fruits [4]	-3.1	Lower
Vegetables [5]	- 2.8	Lower
Cows Milk [6]	1.0	Lower

Source: Uriel S. Barzel, and Linda K. Massey; "Excess Dietary Protein Can Adversely Affect Bone"; Journal of Nutrition 128.6 (1998): 1052; Web; 10 Feb. 2014; table 1.

What Does PRAL Mean?

a. Note: Data presented here are just a summary of primary food groups and combined foods with their average PRAL values using the basis mEq/100g edible portion for calculation.

Barzel and Massey have been apprehensive about one specific aspect of high -PRAL food intake, and that apprehension engages bone health. It is at all times essential for our bloodstream to keep acidity under control. Our kidneys, lungs, and other organ systems function vigorously to maintain our blood pH very close to 7.4. However, when presented with lots of acids from the digestion and metabolism of food, our body will strive to neutralize those acids by means of a process called buffering. To buffer an acid, our body needs to connect the acid with another chemical called a "base." Sodium, potassium, calcium, and magnesium are minerals that readily form bases for our body to utilize as acid buffers. One readily available source for calcium is bone, and researchers have wondered whether a diet that is overly acid-forming will situate too heavy demands on our bone for calcium buffers (1051-53).

One of the factors that high-PRAL foods have in common (with the exception of grains) is their high protein content. Meat, fish, and cheese are all high-protein foods. Because protein is composed of amino acids, and because amino acids can be easily converted in the body to organic acids, it makes sense for high-protein foods to be treated as foods that can boost potential renal acid load.

What Does PRAL Mean?

When present-day researchers aim to model the potential acid-forming nature of a diet (meaning the potential for a diet to boost the acidity of our urine and acid load upon our kidneys), they constantly factor in the protein density of the diet. Potassium content, calcium content, and magnesium content are as well typically factored in since these minerals readily form bases that can be utilized to aid buffer acids. Occasionally, researchers also look at the ratio of a potentially acid-forming component like protein to an available buffering mineral like potassium (1051-52).

Understanding the Importance of an Acid-Alkaline Balance

According to *The Merck Manual Home Health Handbook,* the bestselling, world's most widely used medical manual reference that no home should be without:

An essential property of blood is its degree of acidity or alkalinity. Blood acidity increases when the level of acidic compounds in the body rises (through increased intake or production, or decreased elimination) or when the level of basic (alkaline) compounds in the body drops (through decreased intake or production, or increased elimination). Blood alkalinity increases with the reverse processes. The body's balance between acidity and alkalinity is pertained as acid-base balance. The acidity or alkalinity of any solution, including blood, is indicated on the pH scale.

The blood's acid-base balance is precisely controlled because even a minor deviation from the normal range can severely affect many organs. The body uses different mechanisms to control the blood's acid-base balance.

Role of the Lungs

One mechanism the body uses to control blood pH involves the release of carbon dioxide from the lungs. Carbon dioxide, which is mildly acidic, is a waste product of the metabolism of oxygen (which all cells need) and, as such, is constantly produced by cells. As with all waste products, carbon dioxide gets excreted into the blood.

The blood then carries the carbon dioxide to the lungs, where it is exhaled. As carbon dioxide accumulates in the blood, the pH of the blood decreases. The brain regulates the amount of carbon dioxide that is exhaled, by controlling the speed and depth of breathing. The amount of carbon dioxide exhaled, and consequently the pH of the blood, increases as breathing becomes faster and deeper. By adjusting the speed and depth of breathing, the brain and lungs are able to regulate the blood pH, minute by minute.

Role of Kidneys

The kidneys are also able to affect blood pH by excreting excess acids or bases. The kidneys have some ability to alter the amount of acid or base that is excreted, but because the kidneys make these adjustments more slowly than do the lungs, this compensation generally takes several days.

Buffer Systems

Yet another mechanism for controlling blood pH involves the use of buffer systems, which guard against sudden shifts in acidity and alkalinity. The pH buffer systems are combinations of the body's own naturally occurring weak acids and weak bases. These weak acids and bases exist in balance under normal pH conditions.

The pH buffer systems work chemically to minimize changes in the pH of a solution by adjusting the proportion of acid and base. The most important pH buffer system in the blood involves carbonic acid (a weak acid formed from the carbon dioxide dissolved in blood), and bicarbonate ions (the corresponding weak base).

Chapter 3

Acidosis and Alkalosis: The Abnormalities of Acid-Base Balance

Acidosis and Alkalosis

There are two abnormalities of acid-base balance.

- **Acidosis:** The blood has too much acid (or too little base), resulting in a decrease in blood pH.
- **Alkalosis:** The blood has too much base (or too little acid), resulting in an increase in blood pH.

Acidosis and alkalosis are not diseases, but rather the result of a variety of disorders. The presence of acidosis or alkalosis provides an important clue to doctors that a serious problem exists.

Acidosis and alkalosis are categorized as metabolic or respiratory, depending on their primary cause. Metabolic acidosis and metabolic alkalosis are caused by an imbalance in the production of acids or bases and their excretion by the kidneys. Respiratory acidosis and respiratory alkalosis are caused by changes in carbon dioxide exhalation, due to lung or breathing disorders.

Acidosis

Acidosis is excessive blood acidity caused by an overabundance of acid in the blood, or a loss of bicarbonate from the blood (metabolic acidosis), or by a buildup of carbon dioxide in the blood that ensues from poor lung function or slow breathing (respiratory acidosis).

- Blood acidity increases when people ingest substances that contain or produce acid, or when the lungs do not expel enough carbon dioxide.
- People with metabolic acidosis experience nausea, vomiting, and fatigue, and may breath faster and deeper than normal.
- People with respiratory acidosis suffer from headaches and confusion, and breathing may appear shallow, slow, or both.
- Tests on blood samples show there is too much acid.
- Doctors treat the cause of acidosis.

If an increase in acid overwhelms the body's pH buffering systems, the blood will become acidic. As blood pH drops, the parts of the brain that regulate breathing are stimulated to produce faster and

deeper breathing. Breathing faster and deeper increases the amount of carbon dioxide exhaled.

The kidneys also try to compensate by excreting more acid in the urine. However, both mechanisms can be overwhelmed if the body continues to produce too much acid, leading to severe acidosis and eventually, coma.

Diagnosis

The diagnosis of acidosis generally requires the measurement of blood pH in a sample of arterial blood, usually taken from the radial artery in the wrist. Arterial blood is used because venous blood contains high levels of bicarbonate and thus is generally not as accurate a measure of the body's pH status.

To learn more about the cause of the acidosis, doctors also measure the levels of carbon dioxide and bicarbonate in the blood. Additional blood tests may be done to help determine the cause.

Treatment

Acidosis may also be treated directly. If the acidosis is mild, the administration of intravenous fluids may be all that is needed. When acidosis is severe, bicarbonate may be given intravenously. However, bicarbonate provides only temporary relief and may cause harm—for instance, by overloading the body with sodium and water.

Metabolic Acidosis

Metabolic acidosis develops when the amount of acid in the body is increased through ingestion of a substance that is, or can be broken down (metabolized) to, an acid—such as wood alcohol (methanol), antifreeze (ethylene glycol), or large doses of aspirin (acetylsalicylic acid). Metabolic acidosis can also occur as a result of abnormal metabolism. The body produces excess acid in the advanced stages of shock and in poorly controlled type 1 diabetes mellitus. Even the production of normal amounts of acid may lead to acidosis when the kidneys are not functioning normally and are therefore not able to excrete sufficient amounts of acid in the urine.

Major Causes of Metabolic Acidosis

- Diabetic ketoacidosis (buildup of ketones)
- Drugs and substances such as acetazolamide, alcohol, aspirin, and iron
- Lactic acidosis (buildup of lactic acid as occurs as a result of shock)
- Loss of bases, such as bicarbonate, through the digestive tract due to diarrhea, an ileostomy, or a colostomy
- Advanced kidney disease
- Poisons such as carbon monoxide, cyanide, ethylene glycol, and methanol
- Renal tubular acidosis (a form of kidney malfunction)

Symptoms of Metabolic Acidosis

People with mild metabolic acidosis may have no symptoms but usually experience nausea, vomiting, and fatigue. Breathing becomes deeper and slightly faster (as the body tries to correct the acidosis by expelling more carbon dioxide). As the acidosis worsens, people begin to feel extremely weak and drowsy and may feel confused and increasingly nauseated. Eventually, blood pressure can fall, leading to shock, coma, and death.

Harmful Effects of a Low-Grade Metabolic Acidosis

Severe metabolic acidosis is a serious, even life-threatening condition, the symptoms of which can include chest pain, palpitations, vomiting, abdominal pain, coma, and death. I am describing a milder form of a chronic low-grade acidosis. There are two reasons why this can be harmful to health. First, it can lead to the depletion of the body's alkaline mineral reserves, which is the result of the body's defense mechanism, and natural approach to keep a healthy acid/alkaline balance. Mineral depletion can become a serious, long-term problem, but acidosis is an immediate threat to survival. Some of these minerals are continually circulated in the blood but the majority is found in the teeth and bones. In addition, the minerals in the blood need to perform many vital functions and cannot be depleted too much without leading to serious problems. In the absence of a proper alkaline diet, the body's only option for staving off acidosis is to draw minerals from bones (pH Life).

Results of Mild Acidosis

Mild acidosis can cause such problems as:

- *Cardiovascular damage, including the constriction of blood vessels and the reduction of oxygen*

  Morris et al. found that men, supplementing with potassium bicarbonate, had a 50 % reduction in urinary calcium-loss (losing calcium in the urine means that more calcium is pulled from the bone to keep the blood calcium normal). They also prevented any increases in blood pressure from salt intake in any of the "salt-sensitive" men (18-23).

- *Joint pain, aching muscles, and lactic acid buildup, muscle loss*

  The following is a remarkable study entitled "Alkaline Diets Favor Lean Tissue Mass in Older Adults" by Dawson-Hughes, Harris, and Ceglia:

  Background: Maintaining muscle mass while aging is

important to prevent falls and fractures. Metabolic acidosis promotes muscle wasting, and the net acid load from diets that are rich in net acid– producing protein and cereal grains relative to their content of net alkali–producing fruit and vegetables may therefore contribute to a reduction in lean tissue mass in older adults.

Objective: We aimed to determine whether there was an association of 24-h urinary potassium and an index of fruit and vegetable content of the diet with the percentage lean body mass (%LBM) or change in %LBM in older subjects.

Design: Subjects were 384 men and women >65 y old who participated in a 3-y trial comparing calcium and vitamin D with placebo. Potassium was measured in 24-h urine collections at baseline. The %LBM, defined as total body nonfat, nonbone tissue weight weight X 100, was measured by using dual-energy X-ray absorptiometry at baseline and at 3 y. Physical activity, height, and weight were assessed at baseline and at 3 y.

Results: At baseline, the mean urinary potassium excretion was 67.0 ± 21.1 mmol/d. Urinary potassium (mmol/d) was

significantly positively associated with %LBM at baseline (f3 = 0.033, P = 0.006; adjusted for sex, weight, and nitrogen excretion) but not with 3-Y change in %LBM. Over the 3-y study, %LBM increased by 2.6 ± 3.6%.

Conclusion: Higher intake of foods rich in potassium, such as fruit and vegetables, may favor the preservation of muscle mass in older men and women. (662)

The chronic, progressive metabolic acidosis of aging men and women has been shown to cause muscle breakdown and then loss of protein in the urine (Garibotto et al. 58-61).

Journal of Clinical Investigations February 1986, *Clinical Science* May 1991 and *American Journal of Physiology* June 1986 have all concluded that "[t]he body breaks down the muscle in an attempt to help it excrete acid from the kidney " (qtd. in Emerson).

Researchers found that "low grade chronic metabolic acidosis exists normally in humans eating ordinary diets . . . and that the degree of acidosis increases with age." They gave oral potassium bicarbonate to 14 healthy postmenopausal women

which corrected the acidosis and normalized their bicarbonate levels. They found that by doing so, they prevented the loss of urinary nitrogen (from the breakdown of muscle), prevented further muscle loss and restored any previous loss of muscle (Frassetto, Morris, and Sebastian 254-59).

- *Low energy and chronic fatigue*

- *Weight gain, obesity and diabetes*

  Stene et al. found that children who drank water with a pH between 6.2 and 6.9, were 3.7 times more prone to develop type 1 diabetes, as compared to those children drinking more alkaline water (1534-38).

- *Bladder and kidney conditions, including kidney stones*

  Morris et al. state that compared to our traditional diet, the modern diet is deficient in potassium bicarbonate, giving rise to a progressive metabolic acidosis which increases with age. Vegetables and fruits are the main source of potassium bicarbonate. Supplementing with potassium bicarbonate can prevent and treat high blood pressure, prevent kidney stones,

prevent osteoporosis and prevent stroke (487-93).

The study of Sebastian et al. showed that the administration of potassium bicarbonate "at a dose sufficient to neutralize endogenous acid improves calcium and phosphorus balance, reduces bone resorption, and increases the rate of bone formation" (1776-81). Similar findings by Lemann, Gray, and Pleuss showed that "[p]otassium bicarbonate, but not sodium bicarbonate, reduces urinary calcium excretion and improves calcium balance in healthy men" (688-95). Simply stated, this study proves that metabolic acids cause osteoporosis and the use of alkaline bicarbonate salts reverses the osteoporosis. The corresponding reduction in calcium excretion in the urine by the use of alkaline bicarbonate salts to buffer acidity has been shown to reduce the formation of kidney stones (Sebastian et al. 1776-81).

- *Immune deficiency*

- *Acceleration of free radical damage, possibly contributing to cancerous mutations*

  Cancers have been found by Raghunand et al. to be

significantly more acidic than normal tissues and that manipulation of pH with intravenous bicarbonate enhances some chemotherapy (1005-11).

International Journal of Integrative Medicine suggests that supplementing with minerals is essential because deficits, specifically magnesium are a principal contributor to cellular acidosis (qtd. in Emerson). In the proposed paper on toxic metals by the American Board of Clinical Metal Toxicology, American Association of Environmental Medicine, and International College of Integrative Medicine, "[a]n alkalinizing diet is recommended as to correct . . . cellular acidosis, thereby enhancing toxic mineral mobilization. A high-fiber diet with 80% of food intake that is alkaline-forming when metabolized. Check first morning urine pH to assess net acid excess (NAE) and clinically evaluate metabolic acidosis."

- *Hormone concerns*

  Chronic acidosis has been shown to induce resistance to growth hormone (Brüngger, Hulter, and Krapf 216-21). It also worsens thyroid function and induces thyroxine resistance (an increase in reverse T3 levels) (Kemp and Taylor E809-16).

A study by Frassetto, Morris, and Sebastian found that postmenopausal women who corrected their net acid load with potassium bicarbonate had an increase in their 24 hour urine growth hormone levels (254-59).

- *Premature aging*

Alpern and Sakhaee wrote that excessive meat ingestion is a common cause of chronic metabolic acidosis which results to accelerated aging. They state that the acidosis can occur despite normal blood pH and bicarbonate levels (termed eubicarbonatemic metabolic acidosis). They emphasized that it was still important to treat the acidosis despite these normal levels due to the deleterious effects of the acidosis on bone, muscle and kidneys. This is why it is always suggested to monitor the pH of the urine, a better guide to the pH of the tissues than the blood pH (291-302).

Researchers found that adding bicarbonate to the diet reduced acid in the urine to zero and increased plasma bicarbonate. Plasma bicarbonate is one of the bodies' main buffers of metabolic acids. They also found that age was a significant determinant of blood acid/alkaline balance.

As age increases, there is a "progressive increase in blood acidity and decrease in plasma bicarbonate, indicative of an increasingly worsening low-grade metabolic acidosis." Further they state that "[i]ncreasing age, therefore, greatly amplifies the chronic low· grade metabolic acidosis induced by the diet " and that "long term increases in acid loads have been shown to affect multiple systems" (Frassetto, Morris, and Sebastian F1114-22).

Frassetto et al. suggest that the modern diet lacks bicarbonate salts that make alkaline buffers. This means that the net acid-load (metabolic and dietary acids, minus dietary and metabolic alkaline buffers) is higher than it should be. This, therefore, produces the latent tissue acidosis that, clinicians at the Emerson Health and Wellness Centre, believe is the root cause of most chronic degenerative disease and aging. The same article states that animal products and cereal grains contain very little or no alkaline salts (200-13).

- *Osteoporosis; weak brittle bones, hip fractures and bone spurs*

  Studies showed that metabolic acidosis causes loss of bone

substance (Barzel 1431-36; Kraut et al. 694-700). Further studies conducted by the Journal of Clinical Investigation and American Journal of Physiology came up with the same conclusion that this is because bone is a large reservoir of alkaline buffers (calcium phosphate and carbonate) and they are released into the blood to buffer acidity. These studies also showed that the calcium released from bone to buffer metabolic acids is lost in the urine without a compensatory increase in gastrointestinal absorption. This process ultimately results in osteoporosis (Goodman et al. 495-506; Lemann, Litzow, and Lennon 1608-14; Litzow, Lemann, and Lennon 280-86; Bushinsky et al. F813-19).

Szulc et al. found that when dietary acid consumption was calculated, the highest levels corresponded to the weakest bones and highest loss of bone markers in the urine (1642-50).

A study by Abelow, Holford, and Insogna found that hip-fracture incidents in older women correlate to the acid intake from animal protein. Plant food intake tended to be protective against hip fracture (14-18).

Frassetto et al. found that the higher the acid in the diet, the

higher the risk factor for hip fractures. They also found that countries with the lowest ratio of vegetable-to-animal protein intake have the highest incidents of hip fracture and vice versa. They concluded that deficiency in dietary bicarbonate relative to acid load is a factor in the pathogenesis of the decline in bone mass which occurs with age (M585-92). Sellmeyer et al. gathered similar results from their study suggesting that "an increase in vegetable protein intake and a decrease in animal protein intake may decrease bone loss and the risk of hip fracture" (118-22).

- *Low energy and chronic fatigue*
- *Slow digestion and elimination*
- *Yeast/fungal overgrowth*

Treatment of Metabolic Acidosis

The treatment of metabolic acidosis depends primarily on the cause. For instance, treatment may be needed to control diabetes with insulin or to remove the toxic substance from the blood in cases of poisoning.

Respiratory Acidosis

Respiratory acidosis develops when the lungs do not expel carbon dioxide adequately, a problem that can occur in disorders that severely affect the lungs (such as emphysema, chronic bronchitis, severe pneumonia, pulmonary edema, and asthma). Respiratory acidosis can also develop when disorders of the brain or of the nerves or muscles of the chest impair breathing. In addition, people can develop respiratory acidosis when their breathing is slowed due to over sedation from opioids (narcotics) or strong drugs that induce sleep (sedatives).

Major Causes of Respiratory Acidosis

- Lung disorders, such as emphysema, chronic bronchitis, severe asthma, pneumonia, or pulmonary edema
- Sleep-disordered breathing
- Diseases of the nerves, or muscles of the chest that impair breathing, such as Guillian-Barre syndrome or amyotrophic lateral sclerosis
- Overdose of drugs such as alcohol, opioids, and strong sedatives

Symptoms of Respiratory Acidosis

The first symptoms of respiratory acidosis may be headache and drowsiness. Drowsiness may progress to stupor and coma. Stupor and coma can develop within moments if breathing stops or is severely impaired, or over hours if breathing is less dramatically impaired.

Treatment of Respiratory Acidosis

The treatment of respiratory acidosis aims at improving the function of the lungs. Drugs that open the airways (bronchodilators, such as albuterol) may help people who have lung diseases such as asthma and emphysema. People who have severely impaired breathing or lung function, for whatever reason, may need mechanical ventilation to aid breathing (see see Acute Respiratory Distress Syndrome (ARDS).

Alkalosis

Alkalosis is excessive blood alkalinity caused by an overabundance of bicarbonate in the blood or a loss of acid from the blood (metabolic alkalosis), or by a low level of carbon dioxide in the blood that results from rapid or deep breathing (respiratory alkalosis).

- People may have irritability, muscle twitching, muscle cramps, or muscle spasms.
- Blood is tested to diagnose alkalosis.
- Metabolic alkalosis is treated by replacing water and electrolytes or correcting the underlying cause.
- Respiratory alkalosis is treated by slowing breathing.

Symptoms and Diagnosis

Alkalosis may cause irritability, muscle twitching, muscle cramps, or no symptoms at all. If the alkalosis is severe, prolonged contraction and spasms of muscles (tetany) can develop.

A sample of blood usually taken from an artery shows that the blood is alkaline.

Metabolic Alkalosis

Metabolic alkalosis develops when the body loses too much acid or gains too much base. For example, stomach acid is lost during periods of prolonged vomiting or when stomach acids are suctioned with a stomach tube (as is sometimes done in hospitals). In rare cases, metabolic alkalosis develops in a person who has ingested too much base from substances such as baking soda (bicarbonate of soda). In addition, metabolic alkalosis can develop when excessive loss of sodium or potassium affects the kidneys' ability to control the blood's acid-base balance. For instance, loss of potassium sufficient to cause metabolic alkalosis may result from an overactive adrenal gland or the use of diuretics.

Major Causes of Metabolic Alkalosis

- Loss of acid from vomiting or drainage of the stomach
- Overactive adrenal gland (Cushing syndrome and some adrenal tumors)
- Use of diuretics (thiazides, furosemide, ethacrynic acid)

Treatment of Metabolic Alkalosis

Doctors usually treat metabolic alkalosis by replacing water and electrolytes (sodium and potassium) while treating the cause. Occasionally, when metabolic alkalosis is very severe, dilute acid is given intravenously.

Respiratory Alkalosis

Respiratory alkalosis develops when rapid, deep breathing (hyperventilation) causes too much carbon dioxide to be expelled from the bloodstream. The most common cause of hyperventilation, and thus respiratory alkalosis, is anxiety. Other causes of hyperventilation and consequent respiratory alkalosis include pain, low levels of oxygen in the blood, fever, and aspirin overdose (which can also cause metabolic acidosis . . .).

Major Causes of Respiratory Alkalosis

- Anxiety
- Aspirin overdose (early stages)
- Fever
- Low levels of oxygen in the blood
- Pain

Treatment of Respiratory Alkalosis

With respiratory alkalosis, usually the only treatment needed is slowing down the rate of breathing. When respiratory alkalosis is caused by anxiety, a conscious effort to slow breathing may make the condition disappear. If pain is causing the person to breathe rapidly, relieving the pain usually suffices. When respiratory alkalosis is due to anxiety alone, breathing into a paper (not a plastic) bag may help raise the carbon dioxide level in the blood as the person breathes carbon dioxide back in after breathing it out. (Porter and Kaplan)

Chapter 4

pH Balance in the Body

pH Balance and Immunity

The body's immune defense and repair mechanisms operate best in an exquisitely narrow pH range. Acid-alkaline imbalances can weaken the body's ability to ward off infectious microorganisms, such as bacteria, fungi, and viruses (Brown, "What is Chronic Low-Grade Metabolic Acidosis?").

When the blood pH becomes unbalanced, the cells of the body are unable to efficiently receive vital nutrients and oxygen from the blood supply. On top of that, the cells start to experience difficulties in eliminating wastes. In both cases, these responses are caused by the decreased permeability of cellular membranes, now hardened by acid-alkaline imbalance. As the cell walls harden, not only are oxygen and nutrients unable to enter the cells, but waste products are unable to be excreted as well. Combination of these factors leads to weakened cells that are no longer able to act as nature intended. The second factor that leads to diminished immunity concerns the way in which acid-alkaline imbalances make it possible for infectious agents to thrive and reproduce inside the body, as mentioned earlier. Contrary to popular belief, we do not become sick simply from exposure to infectious pathogens. The truth is that we are all

exposed daily to microorganisms. Moreover, literally tens of thousands of different types of potentially harmful bacteria live within the gastrointestinal tracts each and every day. To a large extent, the factor that determines whether microorganisms cause illness is the pH of the body's internal environment. When the body maintains an acid-alkaline balance, the bloodstream is rich with oxygen, in which state the body is able to guard itself against potentially harmful pathogens, as it has been found that pathogens cannot thrive or survive in oxygen-rich environments (Brown, "Acidosis & Energy Production").

In the "Foreword to the Contributions of the Second International Acid-Base Symposium" by Vormann and Remer:

> The role of nutrition in human acid-base homeostasis has gained increasing attention in recent years. Although in healthy humans, homeostatic mechanisms and the kidneys' capacity to excrete acid equivalents can prevent strong diet-induced alterations in blood pH, even moderate increases in blood hydrogen ion levels as a result of unfavorable diet composition can have long-term consequences for the occurrence and progression of a number of diseases. (413S-14S)

Restoring pH Balance in the Body

The best things we can do to correct an overly acidic body is to clean up the diet and lifestyle.

According to the excerpt from the circulating file “Acidity-Alkalinity” of *Venture Inward magazine:*

> Any discourse on the+ subject of the alkaline-acid balance can be either relatively simple or endlessly complicated. This ranges from the simple advice of eating foods that are "20 percent acid-producing to 80 percent alkaline-producing" in order to keep an equilibrium in the body, . . . to the opinion presently held by some physicians that alkaline-acid imbalance may be associated with degenerative disease.
>
> All life is composed of this duality, which must have started with creation itself, and with the solar systems attracting and repelling each other on the basis of positive and negative electrical charges. As the Chinese might say, everything is "Yin or Yang," positive or negative, masculine or feminine, day or night; and these are the creative forces that produce life itself.

Restoring ph balance in the body

The brain, as the positive pole, sends out energy to various parts of the body, which are negative, but which step up energy to positive and thus send impulses back to the brain. There are various positive-negative relationships between organs; and most significantly . . . we are told that "[i]n the body we have two poles acting to the living body, the kidneys and the liver; the active principles are the same as two poles of electricity in the body, those which give life to the body. The liver is the stronger, excretive and secretive. The kidneys secreting, taking from the system the impurities. That is the use of these organs . . . " (qtd. in Haller)

There is a disease potential when there is an in-coordination between these organs. The human body, being a bi-polar electro-chemical mechanism, the individual cells keep the flame of life burning. This continual energy conversion (oxidation) supplies the electricity, the vital force of the organism (qtd. in Haller).

Recommendations for Keeping Balance

"A normal diet is about twenty percent acid to eighty percent alkaline-producing." This is a good advice, from the Edgar Cayce readings, and the consensus of many nutritionists (qtd. in Haller). To provide this percentage, it is suggested that "[t]he best diet, over a period of a day, is two different fruit [sic], at least four to six vegetables, one protein and one starch, with fruit or vegetable juices between meals (Jensen).

What are Acid Foods or Alkaline Foods?

Unluckily, foods do not react in the body as they do in a test tube. In reality, it is not at all times the foods consumed that determine the alkalinity or acidity, but how the body utilizes them. One example is, when citrus fruits containing citric acid are oxidized in the body, they react as alkaline producers rather than acid. The same process goes with the tomato which is also non-acid forming. Some are acid-forming in the body such as: dried prunes, plums, cranberries, and canned pineapple. Particular foods such as oatmeal, rice and whole wheat (alkaline foods) when consume are oxidized by the body into acids. On the other hand, the acid of vinegar and hydrochloric acid are considered end products, and are not modified by the body (qtd. in Haller).

Responsible for this creation of acids and alkalines in the body, is the process of electrolytic combustion or oxidation taking place in the intercellular fluids. Its purpose is to burn up poisons, which may come from starches, sweets, fats and proteins that have been partially digested. As they pass into the bloodstream, they become

a part of the intercellular fluids. In such particular state they clog intercellular spaces resulting to stases, the forerunner of disease (qtd. in Haller).

Information on Checking the pH Balance of the Body

A common task for a body in much of a typical condition is to maintain proper balance of both acidity and alkalinity. The best approach to point out this is to test the alkalinity or acidity of the body either through the salivary gland membranes, or by taking litmus paper in the mouth. This also may be gauged through the urine (qtd. in Haller).

The body is capable to incorporate minerals and nutrients accurately only when it is pH-balanced. It is therefore likely to be consuming healthy nutrients and yet cannot afford to absorb or utilize them. By far, the most widespread imbalance observed in our society is over acidity.

Long-term health and longevity are undoubtedly related with acid-alkaline balance.

The Inuit (Eskimos), who do not have access to many fruits and vegetables, who are a robust group, with healthy hearts, have

prematurely brittle bones. They have the worst longevity statistics in America. Their diets consist mainly of seal meat, fish, and whale blubber, and some grains. Their diet is highly acidic (Domenico)!

Chapter 5

Let's Balance Our pH with an Alkaline Diet

What is an Alkaline Diet?

The alkaline diet has varying names, including the acid alkaline diet, the acid alkaline balance diet, and the alkaline ash diet. Regardless of the diverse terminologies, all of these particularly refer to the alkaline diet; as the name suggests, it emphasizes foods that are believed to cause the human body to become more alkaline ("Alkaline Diet").

Of the various names for this diet, the alkaline diet is the most popular. Since the goal of this diet is not to produce extreme alkalinity, but rather to achieve optimal balance between acid-forming and alkaline-forming elements in the diet, it is probably appropriate to call it the **acid alkaline balance diet** ("Acid Alkaline Balance Diet").

What are the Benefits of an Alkaline Diet?

In *The pH Miracle for Weight Loss* , Dr. Robert O. Young and Shelley Redford Young suggest that obesity is caused by excessive acidity. They explain that the body reacts to over acidity by increasing fat storage, in order to buffer the excess acid. Accordingly, when you follow an alkaline diet, the excess fat will no longer be needed, and you will effortlessly lose weight without the need to reduce your caloric intake.

The alkaline diet emphasizes whole fruits and vegetables and certain whole grains, which are low in caloric density ("Acid Alkaline Balance Diet"). At the same time, this diet requires adherents to reduce consumption of many foods that are convenient, calorie-dense, and compulsively edible, including corn and potato chips, candies, and desserts.

Very important to understand: any kind of processing will raise acidity in food. Cooking, baking, freezing, processing,...

The most alkalizing form of alkaline foods is, eating food in its raw form...

Does the Acid-Alkaline Diet Mean to Give Up All Acidifying Food?

A common misconception is that while on the alkaline diet, there should not be any acidifying foods consumed. A healthy diet involves an ideal balance between those two types of foods. A diet that consistently is alkaline forming would be very restrictive, because most foods are at least somewhat acid forming (Barrera).

Acidifying foods sometimes contain valuable nutrients, which would be difficult to obtain from alkalizing foods (Barrera). For example, tomatoes are a rich source of lycopene, an antioxidant photochemical that has been shown to help prevent prostate cancer ("Lycopene"). Walnuts have been shown to improve cardiovascular health. Both foods are acidifying ("Walnuts"). The healthiest approach is to not eliminate these foods, but to consume them in moderation. Finally, it is also important to consume some acidifying foods to not consume an over alkalizing diet, to avoid alkalosis.

It is Not Necessary to be a Vegan or Vegetarian While Eating an Alkalizing Diet

Fruits and vegetables are the most alkalizing foods and medical research continues to demonstrate that it is the ideal environment for achieving and maintaining optimal health (Brown and Trivieri).

Chapter 6

Let's Measure Our Body's pH

How Can pH Be Measured?

Doctors assess the health of critically ill patients by measuring the pH of arterial blood, blood gases, and blood uric and lactic acid. However, these tests are not of much use to those who are following the alkaline diet, since they are too inconvenient, expensive, and uncomfortable to perform regularly.

Acid-alkaline balance can also be assessed by measuring the pH of other bodily fluids, including saliva and urine. Both methods have been used by alkaline diet adherents.

Which is the Most Accurate Method to Measure Body's pH Levels?

Dr. Robert O. Young and Shelley Redford Young consider blood testing to be the most accurate method of measuring pH (*The pH Miracle: Balance Your Diet, Reclaim Your Health*).

Since the kidneys are responsible for the handling of metabolic acids, the best test for low-level acidosis is a particular urine sample. By specific, this refers to the first morning urine, taken at least six hours after the previous urination. Saliva testing can be a useful alternative for an alkaline diet follower who will find it difficult to go six hours without urinating (Whiting, Bell, and Brown).

What Should the pH Be Like in a Healthy Body?

A normal pH varies among different organ systems and bodily fluids. For example, normal blood has a slightly alkaline pH of between 7.34 and 7.43. The normal pH of saliva ranges from 5.5 to 7.5. Urine pH varies from 5.0 to 8.0 with the healthiest range between 6.4 to 6.8. With a pH of between 4.5 and 6.0, our skin is on the acidic side. The skin's "acid mantle" functions as an important barrier against bacterial infection. Gastric juices are even more acidic, with a pH of around 2.5. Like the skin's acid mantle, stomach acid helps to destroy microbial invaders. It also helps to digest the food we eat, especially protein (Brown and Trivieri).

Is the Importance of an Acid-Alkaline Balance a New Concept?

No, it is not a new concept. In fact, it has been written about in medical textbooks for more than a century. Only in the last few years, however, has the concept of chronic, low-grade acidosis started to make its way to the public at large, primarily through infomercials and selected books.

In the ground-breaking book, *A New Health Era*, by William Howard Hay, in which he maintains that all disease is caused by auto-toxication due to acid accumulation in the body, he states:

> Now we depart from health in just the proportion to which we have allowed our alkalies to be dissipated by introduction of acid-forming food in too great amount... It may seem strange to say that all disease is the same thing, no matter what its myriad modes of expression, but it is verily so.

Brilliant scientists around the world have been studying the phenomenon of chronic, low-grade metabolic acidosis. Dr. Lynda Frassetto at the University of California, San Francisco, and

Is the importance of an acid-alkaline Balance a new concept?

Dr. Russell Jaffe of ELISA/ACT Biotechnologies, Inc., have documented that on the whole, the average western diet is acid-producing, and that it actually creates a low-grade metabolic acidosis in otherwise healthy people. Dozens of such studies have further documented the negative impact that low-grade metabolic acidosis has on health. Osteoporosis, age-related muscle loss, kidney stone formation, gout and other joint diseases, and back pain are among the conditions associated with the move towards an even slightly state. While not life threatening, this low-level acid condition compromises our health (Frassetto et al. 200-13; Brown and Jaffe).

Frassetto and Sebastian found that with increasing age there is a progressive increase in acidity, and a progressive decrease in serum bicarbonate levels-indicative of a "progressively worsening low-level metabolic acidosis" (B91-99).

Frassetto et al. write that "the stability of the blood acid-alkaline equilibrium is de facto evidence of the existence of an internal reservoir of base that continually delivers alkaline buffers into the systemic circulation in an amount equal to the fraction of the net-acid-load that the body fails to excrete. Bone is the major such internal reservoir of alkaline buffers known to exist" (200-13).

How Does the Body Maintain an Acid-Alkaline Balance?

The body's metabolic processes result in the constant creation of acid. For life to continue, those acids must be eliminated from the body, so that proper acid-alkaline balance can be maintained. Fortunately, the human body comes equipped with several mechanisms that work together to keep pH at an optimal level (Kim).

Firstly, the body's bicarbonate, phosphate, and protein buffer systems neutralize acids within the blood and cells by combining them with alkaline minerals. If these systems did not exist, strong acids would build up in the body's tissues, quickly leading to serious harm, and even death (Robinson).

Secondly there are several organs that work to eliminate acid from the body. The kidneys neutralize acids by combining them with bicarbonate and other alkalis before assimilating them with urine. Various metabolic processes create carbon dioxide, which combines with water in the blood to form carbonic acid. This acid is transported to your lungs, which expels it each time you exhale.

How does the body maintain an Acid-alkaline balance?

Finally, the skin eliminates it through sweat (Robinson).

When it comes to eliminating the acids created by acid-forming foods, the kidneys are the most important ("Acid-Base Balance by the Kidneys").

According to many experts, an acid/alkaline balanced diet is the key to staying healthy. Incorporate in your lifestyle a diet consisting of 80 % alkaline-forming and 20 % acid-forming foods. Having a healthy digestive system and following a diet of whole, raw, live foods, then it's next to impossible to gain weight (Brown, "Natural Bone Health with the Alkaline for Life® Diet")!

Recognizing that your body is a complex system, you need to strike a delicate balance between acidity and alkalinity. Proper acid/alkaline balance can vary from individual to individual. For instance, decisions about whether or not to consume alcohol or tobacco products impact the alkaline balance. These products are very acidic.

Chapter 7

The Alkalizing Foods

Health Benefits of Alkalizing Foods

According to Mincolla, traveling back in time, our ancestors had no choice but to develop systems of eating and healing, utilizing whatever natural resources were available to them. Bounded by the dictates of the season, climate, weather, and indigenous availability, they managed to thrive, nurture, and cure expertly. The earliest birth of modern civilization, some 4,000 to 5,000 years way back, witnessed the most outmoded systems of structured recorded medicine. Ancient Chinese, Ayurvedic, Babylonian, Egyptian, Greek, Native American, Persian, and Roman systems of natural medicine all hunted first to food and herbs to invoke cure (161).

Food was the First Medicine

Way back 4,000 years ago, asparagus was used by the Egyptians as a diuretic. Papaya fruit was used by the Maya to aid digestion. The Egyptians, Romans, Greeks, Hindus, and Mesopotamians utilized more than 500 "vegetable drugs" (161).

Approximately 75 percent of the world population relies on food as medicine. Garlic, walnuts, flaxseeds, onions, avocados, grapes, green vegetables, and hot peppers help to reverse heart disease by triggering anti-inflammatory hormones (163).

Citrus fruits, berries, tomatoes, cabbage, carrots, scallions, broccoli, celery, cucumber, green peppers, beans aid in preventing cancer. Bananas, beans, cabbage, licorice, help cure ulcers, while celery, garlic and potassium-rich fruits such as figs, dates, raisins, bananas and avocados assist in lowering blood pressure (163-64).

In other words, an additional health benefit of an alkalizing diet are the medicinal properties in food, from the phytochemicals in fruits and vegetables!

What are Phytochemicals?

There are thousands of natural chemicals plant foods contain. These are known as phytonutrients or phytochemicals. "Phyto" is a Greek word for plant. These chemicals aid in protecting plants from germs, fungi, bugs, and other threats ("Phytonutrients").

Fruits and vegetables both contain phytonutrients. There are other plant-based foods that contain phytonutrients as well, such as whole grains, nuts, beans, and tea ("Phytonutrients").

Phytonutrients aren't necessary to keep you alive, unlike the vitamins and minerals that plant foods contain. However, when you eat or drink phytonutrients, they may help ward off diseases and keep your body functioning properly ("Phytonutrients").

Researchers estimate that there are 30,000 to 50,000 of phytonutrients found in plant foods; 1,000 of which have been isolated, and a mere 100 analyzed and tested. These figures are more likely to change on a daily basis, since there is so much focus and research interest on phytonutrients (Graci).

6 Important Phytonutrients and Their Potential Health Effects

- Carotenoids
- Ellagic acid
- Flavonoids
- Resveratrol
- Glucosinolates
- Phytoestrogens

Carotenoids

Carotenoids can be found in: red, green, yellow and orange vegetables and fruits, such as pumpkin, carrots, sweet potato, squash, broccoli, dark leafy greens, tomatoes, corn, peppers, mango, guava, apricots, peaches, cantaloupe, watermelon, red grapefruit, oranges, tangerines (Chiavacci).

Carotenoids have been associated with the prevention of colon, prostate, breast and lung cancer. Two large Harvard studies of more than 124,000 people manifested a 32% decrease in risk of lung cancer for those who consumed a variety of carotenoid-rich foods. On the other hand, carotenoid supplements in pill form have not expressed the similar protective benefits. In fact, two studies found beta-carotene supplements to be linked with higher risk of lung cancer and death in smokers (qtd. in Chiavacci).

The Women's Healthy Eating and Living (WHEL) study assessed the concentration of total carotenoids in the blood of more than 1,500 women who had completed treatment for early-stage breast cancer.

Women with the highest carotenoid concentration had a 43% decrease in risk of cancer recurrence as compared with those who had the lowest level of blood carotenoids (qtd. in Chiavacci).

More than 600 carotenoids provide yellow, orange, and red colors in fruits and vegetables (see table 2). They act as antioxidants in our body by dealing with harmful free radicals that injure tissues throughout our body ("Phytonutrients").

Table 2

Most Common Food Sources of Carotenoid

Carotenoid	Common Food Source
alpha-carotene	carrots
beta-carotene	leafy green and yellow vegetables (eg broccoli, sweet potato, pumpkin, carrots)
beta-cryptoxanthin	citrus, peaches, apricots
lutein	leafy greens such as kale, spinach, turnip greens
lycopene	tomato products, pink grapefruit, watermelon, guava
zeaxanthin	green vegetables, eggs, citrus

Table 2 - Most common food sources of carotenoid

Source: "Phytonutrient FAQs"; *Ars.usda.gov*; USDA; ARS, 8 Apr. 2005; Web; 25 Jan. 2014.

a. Note: Data presented here are solely for the purpose of presenting the most common food sources of carotenoids; thus, including the serving size and equivalent mg of carotenoid content is not necessary at all.

Types of Carotenoids That May Have Other Health Benefits

- **Alpha-carotene, beta-carotene, and beta-cryptoxanthin**

  The body can convert all of these to vitamin A. This vitamin assists in keeping the immune system functioning accurately, and it's essential for eye health. Yellow and orange foods like pumpkins and carrots are good sources of alpha- and beta-carotene. These also contain beta-cryptoxanthin, as do sweet red peppers ("Phytonutrients").

- **Lycopene**

  This gives red or pink color to: tomatoes, watermelon, and pink grapefruit ("Phytonutrients"). This is one of the thousands of phytonutrients found in tomatoes, which is considered as cancer-preventing antioxidant due to its ability to impede the production of nitrosamines, implicated in the development of stomach cancer. Moreover, lycopene has been associated to a lower risk of prostate cancer (Valentine).

- **Lutein and zeaxanthin**

  Good sources of lutein and zeaxanthin are greens such as: spinach, kale, and collards ("Phytonutrients").

  Lutein and zeaxanthin are the two primary carotenoid pigments in the eyes that protect the macula and retina from photo damage (Chiavacci). These may help defend from cataracts and age-related macular degeneration, which are two types of eye problems ("Phytonutrients").

  Studies suggest that approximately 10 milligrams of dietary lutein on a daily basis may decrease the risk of developing age-related macular degeneration and cataracts. One cup of cooked kale or spinach has three to four times this recommended dose (Chiavacci).

Ellagic Acid

Ellagic acid is found in a number of berries and other plant foods, especially: strawberries, raspberries, and pomegranates. Ellagic acid may help guard against cancer through several different ways. For example, it may cause apoptosis , a process where cancer cells die. It interferes with steps that allow cancer cells to keep multiplying. It may also help your liver neutralize cancer-causing chemicals in your system and stimulates the detoxification enzymes in the liver. Most of the studies to date by those researchers who believe in ellagic acid as a potential cancer-fighting agent have been performed in test tubes and animals. ("Phytonutrients;" Chiavacci).

Flavonoids

Most of the phytonutrients fall into the flavonoid category which are found in a variety of plant foods such as: berries, cherries, red and purple grapes, currants, pomegranates, walnuts, apples with skin, citrus, red onions, tomatoes, bell peppers, red wine, and grape juice (Chiavacci).

Types of Flavonoids

- **Catechins**

  Green tea is an especially good source of catechins. The drink may help prevent certain types of cancer.

- **Hesperidin**

  Found in citrus fruits, this flavonoid works as an antioxidant. It can reduce inflammation in the body. It may also help reduce the risk of cancer.

- **Flavonols**

  Quercetin is a well-studied type of flavonol. It is found in: apples, berries, grapes, and onions. It might help reduce people's risk of asthma, certain types of cancer, and coronary heart disease. ("Phytonutrients"). Quercetin may provide protection against heart disease by reducing inflammation, delaying the clumping of platelets, and defending cholesterol from being modified to unsafe oxide compounds (Chiavacci).

- **Anthocyanins**

  It obstructs the enzyme in the liver that produces cholesterol. This flavonoid also has antitumor actions (Chiavacci).

  Among flavonoid-rich foods, apple consumption appears to be linked with reduced risk of diabetes in a Harvard-based study of 40,000 women. Those who consumed at least one apple daily demonstrated a significant 28% decreased risk of type 2 diabetes as compared with those who did not eat apples (qtd. in Chiavacci).

Resveratrol

Resveratrol is found in: grapes and purple grape juice. It acts as an antioxidant and anti-inflammatory. Some research suggests that resveratrol might reduce the risk of heart disease, and it may help extend people's life span ("Phytonutrients"). This phytonutrient has been researched extensively by the University of Chicago, and is said to contain powerful cancer inhibiting qualities as well (Alzheimer's Disease Cooperative Study).

What is so Exceptional About Fruits and Vegetables?

Fruits, vegetables, whole grains and spices are the exclusive sources of phytonutrients. "Phytonutrients are the immune system of a plant." There are approximately 2,000 recognized phytonutrients. Just a single serving of vegetable or fruit may contain more than 100 different kinds. These phytonutrients guard plants away from disease and they can provide us the same benefit (Chiavacci).

Modern science now attests that phytonutrients guard and shield our trillions of cells away from disease. The number of phytonutrients in a single, unprocessed, plant food is remarkable. When we consume these plants, the phytonutrients defend the bloodstream, cells, tissues, membranes, mitochondria, skin, organs and immune system functions from the attack of synthetic chemicals, toxins, automobile or factory emissions, bacteria, pesticides, viruses, fungi, yeast, microbes, mutagens, food additives, free radicals and carcinogens (Millis).

Nature has created plants with thriving defense mechanisms. For example, the sulfur in onions and garlic ward off bugs, and deep

orange colored foods like carrots, apricots and squash contain beta-carotene to protect them from strong sunlight. This wonderful natural system is our advantage as well (Millis).

Famous phytonutrients indole-3-carbinol (I3C) (converted to diindolylmethane in the stomach), and another phytonutrient sulforaphane, both found in cruciferous vegetables such as: cabbage, broccoli, kale, cauliflower, Brussels sprouts, bok choy, dark leafy greens, and watercress, possess properties that could reduce a woman's risk of developing breast cancer. Test tube and animal studies have shown I3C to impede with prostate cancer cell growth. It also may be effective against growth of tumors of the lung and colon. I3C and sulforaphane, assist the liver to "detoxify." This means that they put into action the cleaning agents in the liver, called enzymes, to modify harmful, cancer-causing chemicals to forms that the body can get rid of (Chiavacci).

Another example is turmeric, a potent carcinogenic inhibitor due to its naturally occurring curcumin. Joining the list as well are garlic and onions, containing allylic sulfides, which have been exposed in the lab to hinder tumor production (Millis).

Common Foods and Phytonutrients

Naturallysavvy.com listed some common food sources of phytonutrients such as:

Onions, garlic, leeks, chives: allium and organosulphur compounds.

Broccoli, cauliflower, kale: indoles, and isothiocyanates such as sulforaphane.

Blueberries, plums, dark beans: anthocyanins.

Carrots, yam, cantaloupe, winter squash: carotenoids.

Citrus fruits, tomatoes: coumarins.

Anise and licorice: glyceritinic acid.

Beans and other legumes: isoflavones, protease inhibitors, saponins.

Common foods and phytonutrients

Whole grains; brown rice, oats, wheat, rye: lignans, phenolic acids, inositols.

Nuts and seeds: lignans.

Citrus fruit: limonene.

Tomatoes and red grapefruit: lycopene.

Cocoa, tea, and most fruits and veggies: phenols. (Millis)]

These foods supply the basic nutritional benefits of vitamins and minerals. Additionally, these foods have a secondary health benefit gained through phytochemicals, which have been tested to provide a protective barrier against cellular damage. Studies have demonstrated that isoflavones, saponins and phytoesterols, found in soybeans and legumes for example, might delay the development of tumors (Mundorff).

Ways to Get More Phytochemicals

It has been reported that only 25% of Americans ate the recommended 5–9 servings per day of fruits and vegetables (*Fruits and Vegetables: Enhanced Federal Efforts).*

Some suggestions to increase your intake of foods rich in phytochemicals:

- Be creative when preparing a salad. Replace iceberg lettuce with a variety of greens such as romaine, bib, arugula, endive and spinach.
- Incorporate lettuce, tomatoes and cucumbers to your meals.
- Consume fruit as snacks during mid-morning and mid-afternoon.
- Eat nuts for your protein source (Mundorff).

Some More of the Common Classes of Phytonutrients

- Inositol Phosphates (Phytates)
- Lignans (Phytoestrogens)
- Isothiocyanates and Indoles
- Phenols and Cyclic Compounds
- Saponins
- Sulfides and Thiols
- Terpenes

  Examples: Citrus fruits

  D-limonene, limonin and nomilin are among about 40 limonoids found in the peel, membranes, seeds, flesh and juice of citrus fruits. These powerful compounds have anticancer activity and turn on the liver's detoxification processes to rid the body of cancer-causing agents (Chiavacci).

About Polyphenols

Polyphenolic compounds are natural components of a wide variety of plants, and also known as secondary plant metabolites. Food sources rich in polyphenols include onion, apple, tea, red wine, red grapes, grape juice, strawberries, raspberries, blueberries, cranberries, and certain nuts. The average polyphenol / flavonoid consumption in the U.S. has not been resolved with precision, mainly because there is currently no U.S. national food database for these compounds ("Phytonutrient FAQs").[7] It has been calculated that in the Dutch diet, a subset of flavonoids (flavonols and flavones) provide 23 mg per day. Earlier estimates of dietary intake that was roughly 650 mg per day are generally considered to be too high as the estimate was based on the data generated by "old" (less specific) methodology (Kühnau 117-91). Scientists at the Food Composition Laboratory, Beltsville Human Nutrition Research Center are currently developing new methodology for the accurate measurement of polyphenols in foods ("Phytonutrient FAQs").

Polyphenols can be classified as non-flavonoids and flavonoids (see table 3). The flavonoids quercetin and catechins are the most comprehensively studied polyphenols as far as absorption and

About polyphenols

metabolism are concerned ("Phytonutrient FAQs").

Table 3

Nonflavonoids/Flavonoids Classification and Food Sources

Nonflavonoids	Sources
ellagic acid	strawberries, blueberries, raspberries
coumarins	
Flavonoids	**Sources**
anthocyanins	Fruits
catechins	tea, wine
flavanones	Citrus
flavones	fruits and vegetables
flavonols	fruits, vegetables, tea, wine
isoflavones	soybeans

Table 3 – Nonflavonoids / Flavonoids Classification and Food Sources

Source: "Phytonutrient FAQs"; *Ars.usda.gov*; USDA; ARS, 8 Apr. 2005; Web; 25 Jan. 2014.

a. Note: Data presented here are solely for the purpose of presenting the most common food sources of nonflavonoids and flavonoids; thus, including the serving size and equivalent mg of the said phytonutrient's content is not necessary at all.

Chapter 8

The Human Health "Protectors"

How Do Phytonutrients Protect Against Disease?

From the "Phytonutrient FAQs" of *Ars.usda.gov*, commonly proposed mechanisms by which phytonutrients may defend human health are as follows:

Phytonutrients may:

- serve as antioxidants
- enhance immune response
- enhance cell-to-cell communication
- alter estrogen metabolism
- convert to vitamin A (beta-carotene is metabolized to vitamin A)
- cause cancer cells to die (apoptosis)

How do phytonutrients protect Against disease?

- repair DNA damage caused by smoking and other toxic exposures

- detoxify carcinogens through the activation of the cytocrome P450 and Phase II enzyme systems

More research is required to strongly establish the action mechanisms of the various phytochemicals ("Phytonutrient FAQs").

Evidences That Fruit and Vegetable Consumption Protects Human Health

Fruit and vegetable intake shelters human health. Evidence is accumulated from the huge population (epidemiological) studies, human feeding studies, and cell culture studies ("Phytonutrient FAQs").

In the excellent review concerning vegetables, fruit and cancer prevention by Steinmetz and Potter:

> In a review of the scientific literature on the relationship between vegetable and fruit consumption and risk of cancer, results from 206 human epidemiologic studies and 22 animal studies are summarized. The evidence for a protective effect of greater vegetable and fruit consumption is consistent for cancers of the stomach, esophagus, lung, oral cavity and pharynx, endometrium, pancreas, and colon. The types of vegetables or fruit that most often appear to be protective against cancer are raw vegetables, followed by allium vegetables, carrots, green vegetables, cruciferous vegetables,

and tomatoes. Substances present in vegetables and fruit that may help protect against cancer, and their mechanisms, are also briefly reviewed; these include dithiolthiones, isothiocyanates, indole-3-carbinol, allium compounds, isoflavones, protease inhibitors, saponins, phytosterols, inositol hexaphosphate, vitamin C, D-limonene, lutein, folic acid, beta carotene, lycopene, selenium, vitamin E, flavonoids, and dietary fiber. Current US vegetable and fruit intake, which averages about 3.4 servings per day, is discussed, as are possible noncancer-related effects of increased vegetable and fruit consumption, including benefits against cardiovascular disease, diabetes, stroke, obesity, diverticulosis, and cataracts. Suggestions for dietitians to use in counseling persons toward increasing vegetable and fruit intake are presented. (1027-39)

Evidence That Carotenoids are Protective

Fruit and vegetable intake has been associated to reduced risk of stroke – both hemorrhagic and ischemic stroke. Each increment of three daily servings of fruits and vegetables equated to a 22% reduction in risk of stroke, including transient ischemic attack (Gillman et al. 1113-17).

Elderly men whose consumption of dark green and deep yellow vegetable place them in the highest quartile for intake of these vegetables had about a 46% reduced risk of heart disease relative to men who ranked in the lowest quartile. Men in the highest quintile had about a 70% reduction in risk of cancer than did their counterparts in the lowest quintile. The discrepancies in vegetable intake between high and low intake rankings was not remarkable. Men in the highest quartile or quintile consumed more than two (>2.05 and >2.2) servings of dark green or deep yellow vegetable daily; those in the lowest quartile or quintile consumed less than one serving daily (<0.8 and <0.7). This implies that small, constant changes in vegetable consumption can formulate significant changes in health results (Gaziano et al. 255-60; Colditz et al. 32-36).

Evidence that carotenoids are protective

Consumption of tomato products has been associated to reduced risk of prostate cancer. Men in the highest quintile for consumption of tomato products (10 or more servings weekly) had about a 35% reduction in risk of prostate cancer as compared to counterparts whose consumption put them in the lowest quintile (1.5 or fewer servings of tomato products weekly) (Giovannucci et al. 1767-76).

People in the highest quintile for intake of spinach or collard greens, plants high in the carotenoid lutein, had a 46% reduction in risk of age-related macular degeneration as compared to those in the lowest quintile who consumed these vegetables less than once monthly (Seddon et al. 1413-20).

Evidence That Polyphenols are Protective

Flavonoid consumption has been associated to lower risk of heart disease in some, but not all, studies. Elderly Dutch men in the highest tertile of flavonoid consumption had a risk of heart disease that was about 58% lower than that of counterparts in the lowest tertile of consumption. Those in the lowest tertile consumed 19 mg or less of flavonoids daily, whereas those in the highest tertile consumed approximately 30 mg daily or more (Hertog et al. 1007-11). Likewise, Finnish subjects with the highest quartile of flavonoid consumption had a risk of mortality from heart disease that was about 27% (for women) and 33% (form men) lower than that of those in the lowest quartile (Knekt et al. 478-81).

On the other hand, in other studies, the defensive effect of flavonoids could not be verified. For Welch men, flavonol consumption did not forecast a lower rate of ischemic heart disease and was inadequately positively related with ischemic heart disease mortality (Hertog et al. 1489-94). For U.S. male health professionals, data did not hold up a strong link between consumption of flavonoids and coronary heart disease (Rimm et al. 384- 89).

Are Americans Eating Enough Fruits and Vegetables?

An excellent source of information on fruit, vegetable and grain consumption of Americans is USDA's 1994/96 Continuing Survey of Food Intakes by Individuals performed by the Food Surveys Research Group, Beltsville Human Nutrition Research Center. From that survey, they provide information about American's vegetable and fruit intake.

About Vegetable Intake

On average, Americans consume 3.3 servings of vegetables a day. However, dark green vegetables and deep yellow vegetables each represent only 0.2 daily servings.

On any given day, about 49% of the population consumes at least the minimum number of servings of vegetables recommended (3 servings per day); 41% consume the number of servings recommended based on caloric intake (3 servings per day for those consuming less than 2200 calories, 4 servings per day for those consuming 2200-2800 calories, 5 servings per day for those consuming 2800 calories or more). About 10% of the population consumes less than one serving of vegetable per day.

About Fruit Intake

On any given day about 29% of the population consumes at least the minimum number of servings of fruit recommended (2 servings per day); 24% consume the number of servings recommended based on caloric intake (2 servings per day for those consuming less than 2200 calories, 3 for those consuming 2800 calories, 4 for those consuming 2800 calories or more). About 48% consume less than one serving of fruit a day. (qtd. in "Phytonutrient FAQs")

Chapter 9

What's In Your Food?

What is the Present Status of the Art of Phytonutrients Research?

Population studies have associated fruit and vegetable intake with reducing the risk for chronic diseases including specific cancers and heart disease. However, media and consumer's interest in phytonutrients and functional foods is far ahead of recognized evidence that documents the health benefits of these foods or food components for humans. Research for phytonutrients is experiencing notable development. Optimistically, more precise information on phytonutrient consumption and human health will be approaching soon. For the time being, it seems that a successful approach for lowering the risk of cancer and heart disease is to boost the intake of phytonutrient-rich foods such as fruits, vegetables, grains and teas ("Phytonutrient FAQs").

Food and its Antioxidant Content

According to the study of the antioxidant content of foods commonly eaten in the U.S. by Halvorsen et al., plants and pure plant-derived products (see table 4) are the ones that contain the most antioxidants and considered as the world's healthiest foods (99).

Table 4

World's Healthiest Foods Highest in Antioxidant Phytonutrients

Food	Antioxidant Content measured in mmol/100g serving (100g=3.5 oz)
Blackberries	5.75
Walnuts	3.72
Strawberries	3.58
Artichokes, cooked	3.56
Cranberries	3.13
Raspberries	2.87
Blueberries	2.68
Cloves, ground	2.64

Grape juice	2.56
Cranberry juice	2.47
Pineapple juice	1.86
Prunes	1.72
Cabbage, red, cooked	1.61
Orange juice	1.51
Pineapple	1.28
Oranges	1.26
Plums, black	1.21
Pinto beans, dried	1.14
Spinach, frozen	1.05
Kiwi fruit	0.99
Molasses	0.98
Potatoes, red, cooked	0.96
Potatoes, white, cooked	0.92
Sweet potatoes, baked	0.90
Tea, brewed, iced, unsweetened	0.88
Potatoes, russet, cooked	0.86
Peppers, red, cooked	0.82
Broccoli, cooked	0.78

Table 4 - World's Healthiest Foods Highest in Antioxidant

Source: Bente L Halvorsen, et al; "Content of Redox-active Compounds (ie, Antioxidants) in Foods Consumed in the United States"; *American Journal of Clinical Nutrition* 84.1 (1996): 99; Web; 2 Feb. 2014; table 4.

a. Note: Data presented here are selected entries only from the original source, and not a representation of the complete antioxidant food list.

Effects of Processing on the Antioxidant Contents of Foods

Halvorsen et al. also investigated the effect of processing (peeling, cooking via steaming, boiling) on some of the foods and concluded that the way a food is processed certainly influences its antioxidant content (see table 5).

Surprisingly, they found out that the antioxidant content increased in the following foods when they were cooked through microwave, steaming, or boiling: carrots, spinach, mushrooms, asparagus, broccoli, cabbage, red cabbage, green and red peppers, potatoes, and tomatoes (98-99).

Steaming appeared to be as the preferred method of cooking since it clearly resulted in the biggest increase in antioxidant content (98).

As expected, peeling apples and cucumber reduced their antioxidant content to 33-66% and 50% of the amount in the unpeeled foods, respectively (98).

Table 5

Effects of Processing on the Antioxidant Contents of Foods

Food	Type of Processing	Antioxidant Content % Compared to Non-Processed Food
Apples	Peeling	(-)33-66%
Carrots	Steaming	(+)291%
Carrots	Boiling	(+)121-159%
Cucumbers	Peeling	(-)50%
Asparagus	Steaming	(+)205%
Broccoli	Steaming	(+)122-654%
Cabbage, green	Steaming	(+)448%
Cabbage, red	Steaming	(+)270%
Green pepper	Steaming	(+)467
Red pepper	Steaming	(+)180%
Potatoes	Steaming	(+)105-242%
Tomatoes	Steaming	(+)112-164%
Spinach	Boiling	(+)84-114%
Sweet potatoes	Steaming	(+)413%
Table 5 - Effects of Processing on the Antioxidant Contents of Foods		

Source: Bente L Halvorsen, et al; "Content of Redox-active Compounds (ie, Antioxidants) in Foods Consumed in the United States"; *American Journal of Clinical Nutrition* 84.1 (1996): 99; Web; 2 Feb. 2014; table 5.

a. Note: Data presented here are selected entries only from the original source, and not a representation of the complete food processing list.

Studies on the Health Benefits of Phytonutrients

According to the study "Grape Juice, Berries, and Walnuts Affect Brain Aging and Behavior" by Joseph, Shukitt-Hale, and Willis:

> Numerous studies have indicated that individuals consuming a diet containing high amounts of fruits and vegetables exhibit fewer age-related diseases such as Alzheimer's disease. Research from our laboratory has suggested that dietary supplementation with fruit or vegetable extracts high in antioxidants (e.g. blueberries, strawberries, walnuts, and Concord grape juice) can decrease the enhanced vulnerability to oxidative stress that occurs in aging and these reductions are expressed as improvements in behavior. Additional mechanisms involved in the beneficial effects of fruits and vegetables include enhancement of neuronal communication via increases in neuronal signaling and decreases in stress signals induced by oxidative/inflammatory stressors (e.g. nuclear factor kappaB). Moreover, collaborative findings indicate that blueberry or Concord grape juice supplementation in humans with mild cognitive impairment increased verbal

> memory performance, thus translating our animal findings to humans. Taken together, these results suggest that a greater intake of high-antioxidant foods such as berries, Concord grapes, and walnuts may increase "health span" and enhance cognitive and motor function in aging. (1813S-17S)

Liu suggests in his study "Potential Synergy of Phytochemicals in Cancer Prevention: Mechanism of Action":

> Epidemiological studies have consistently shown that regular consumption of fruits and vegetables is strongly associated with reduced risk of developing chronic diseases, such as cancer and cardiovascular disease. It is now widely believed that the actions of the antioxidant nutrients alone do not explain the observed health benefits of diets rich in fruits and vegetables, because taken alone, the individual antioxidants studied in clinical trials do not appear to have consistent preventive effects. Work performed by our group and others has shown that fruits and vegetable phytochemical extracts exhibit strong antioxidant and antiproliferative activities and that the major part of total antioxidant activity is from the combination of phytochemicals. We proposed that the additive and synergistic effects of phytochemicals in fruits and

> vegetables are responsible for these potent antioxidant and anticancer activities and that the benefit of a diet rich in fruits and vegetables is attributed to the complex mixture of phytochemicals present in whole foods. This explains why no single antioxidant can replace the combination of natural phytochemicals in fruits and vegetables to achieve the health benefits. The evidence suggests that antioxidants or bioactive compounds are best acquired through whole-food consumption, not from expensive dietary supplements. We believe that a recommendation that consumers eat 5 to 10 servings of a wide variety of fruits and vegetables daily is an appropriate strategy for significantly reducing the risk of chronic diseases and to meet their nutrient requirements for optimum health. (3479S-85S)

Intelihealth.com, a provider of credible information from the most trusted sources, recommends "Phytonutrients: Revisiting These Nutritional Giants":

> For generations our parents have said, "An apple a day keeps the doctor away." Compelling scientific research during the last several decades suggests that they may be right. The simple message, "Eat 5 to 10 servings of fruits and vegetables daily"

has been shown to pack a powerful payoff for disease prevention.

In two large Harvard-based studies of about 110,000 people, those who averaged 8 or more servings of fruits and vegetables a day were 30% less likely to have a heart attack or stroke than those who ate less than 1.5 servings daily.

Eating fruits and vegetables has been shown to lower cholesterol and blood pressure, improve bowel regularity and colon health, aid in weight and blood sugar control, reduce the risk of developing macular degeneration, and may guard against certain cancers.

Despite the resounding benefits of consuming plant foods, Americans eat only about 1.5 servings of vegetables and less than 1 serving of fruit per day, on average. Americans spend billions of dollars each year on dietary supplements such as antioxidants despite inconclusive scientific backup for their effectiveness in disease prevention and treatment. (Chiavacci)

The Bottom Line

The Bottom Line

Studies show that the benefits of an acid/alkaline balanced diet combined with the health benefits and the medicinal properties of phytonutrients give proof that eating a diet consisting of 80% alkalizing phytonutrient-rich vegetables and fruits for optimum health and nutrition are the diet we were meant to eat!!!!

Also stay alert for more research on the medicinal properties of phytonutrients!

The Conclusion

The Conclusion

I consider myself pretty athletic. Writing this thesis, I was so much aware of what I eat, how much I work out, and how this altogether affects my overall energy level and well being. Starting a new very intense workout regiment, I realized by eating an acid/alkaline balanced diet, I am the only person by far, working out as hard as I do (not to mention I am almost 50 years old!), who does not get sore. I am stunned...!

I have always worked out and I have always been eating a vegetable-based, very healthy diet. These results make me want to shout it so everybody can hear! I feel great, I am so full of energy from all the amazing nutrients that I take in every day. I feel so alive from the oxygen in my system and I believe there should be more research on this topic and studies to come, especially so that

The Conclusion

professional athletes can benefit from these experiences, as well as recovering patients from any kind of diseases, for health seekers and for the developing or aging population. A diet consisting of 80 % alkalizing foods and 20 % acidifying foods provides me a lifestyle of no limitations, which I absolutely love.

More Studies on pH Balance

More Studies on pH Balance

Sellmeyer et al., in their study on 9,704 women performed at the University of California, San Francisco, demonstrate that those who have chronic acidosis are at higher risk for bone loss as compared to those who have normal pH levels. The scientists who conducted the experiment believe that many of the hip fractures common among middle-aged women are associated to high acidity caused by a diet rich in animal foods and low in vegetables. This is because the body borrows calcium from the bones in order to balance the pH (118-22).

Malov and Kulikov suggest that reduced gastric lining secretions of bicarbonates and a reduction in the acid/alkaline secretion in duodenal ulcer patients may play a substantial role in duodenal ulcers (28-32).

Dawson-Hughes, Harris, and Ceglia point out that as we age, there is

More studies on ph balance

a loss of muscle mass, and this makes us susceptible to falls and fractures. Their study involving implementation of a diet rich in potassium, such as fruits and vegetables, as well as a reduced acid-load, resulted in the preservation of muscle mass both in older men and women (662-65).

Minich and Bland, in their study aiming to determine the role of an acid/alkaline balance in chronic disease and detoxification, concludes that the increasing dietary acid load in the contemporary diet can lead to a disruption in acid-alkaline homeostasis in different body sections, and in due course, may result in chronic disease through repeated borrowing of the body's alkaline reserves. Adjustment of tissue alkalinity, specifically within the kidney proximal tubes, can lead to the more effective excretion of toxins from the body. Metabolic toxification using a rich vegetable diet may alter the body's reserve to become more alkaline (62-65).

Notes

Notes

1. Includes meat products.
2. Cheeses with lower protein content, less than 15g protein/100g.
3. Includes spaghetti.
4. Includes fruit juices, and with the exception of dried fruits.
5. Without asparagus (very low alkali excess) and spinach (very high skeleton from the negative effects of a low calcium diet. More alkali excess).
6. Includes non-cheese products, primarily whey based.
7. USDA scientists together with their colleagues are in the process of developing a database for foods rich in polyphenols.

Works Cited

Works Cited

Abelow, Benjamin J., Theodore R. Holford, and Karl L. Insogna. "Cross-cultural Association between Dietary Animal Protein and Hip Fracture: A Hypothesis." *Calcified Tissue International* 50.1 (1992): 14-18. *Springer Link*. Springer-Verlag. Web. 26 Jan. 2014.

"Acid Alkaline Balance Diet." *Acidalkalinediet.net*. N.p., 2014. Web. 6 Feb. 2014.

"Acid-Base Balance by the Kidneys." *Boundless*. Boundless Learning, n.d. Web. 22 Jan. 2014.

"Alkaline Diet." *Wikipedia*. Wikimedia Foundation, 5 Mar. 2014. Web. 1 Feb. 2014.

Alpern, Robert J., and Khashayar Sakhaee. "The Clinical Spectrum of Chronic Metabolic Acidosis: Homeostatic Mechanisms Produce Significant Morbidity." Abstract. *American Journal of Kidney Diseases* 29.2 (1997): 291-302. *Ajkd.org*. NKF. Web. 27 Jan. 2014.

Works Cited

Alzheimer's Disease Cooperative Study, sponsor. *Phase II Study to Evaluate the Impact on Biomarkers of Resveratrol Treatment in Patients with Mild to Moderate Alzheimer's Disease*. Collaborated by National Institute on Aging.

Study directed by Raymond S. Turner. *ClinicalTrials.gov*. NLM, 30 Apr 2014. Web. 24 Jan. 2013. This study is ongoing and no study results posted yet.

American Board of Clinical Metal Toxicology, American Association of Environmental Medicine, and International College of Integrative Medicine. "Integrative/Environmental Medicine Standard of Care Guidelines for Increased Total Body Burden of Toxic Metals." Proposed Guidelines. Ed. Sica Robban. ABCMT, 2004. Web. 25 Feb. 2014

Baroody, Theodore A. "Chapter 1: What Exactly Is Alkaline and Acid?" *Alkalize or Die: Superior Health through Proper Alkaline-acid Balance*. 1st ed. Waynesville, NC: Eclectic, 1991. 15. *Openlibrary.org*. Internet Archive. Web. 10 Feb. 2014.

Works Cited

Barrera, Tatiana. "What Are Alkaline Foods?" *Eat Alkaline Foods*. N.p., 12 Sept. 2012. Web. 31 Jan. 2014.

Barzel, Uriel S. "The Skeleton as an Ion Exchange System: Implications for the Role of Acid-base Imbalance in the Genesis of Osteoporosis." Abstract. *Journal of Bone and Mineral Research* 10.10 (1995): 1431-36. *Online Library*. Wiley, 3 Dec. 2009. Web. 15 Feb. 2014.

Barzel, Uriel S., and Linda K. Massey. "Excess Dietary Protein Can Adversely Affect Bone." *Journal of Nutrition* 128.6 (1998): 1051-53. Web. 10 Feb. 2014.

Brown, Susan E. "Acidosis & Energy Production." *Alkaline For Life*. N.p., 5 June 2013. Web. 28 Jan. 2014.

---. "Natural Bone Health with the Alkaline for Life® Diet." *Better Bones*. Center for Better Bones, 24 Oct. 2013. Web. 23 Jan. 2014.

---. "What is Chronic Low-Grade Metabolic Acidosis?" *Alkaline For Life*. N.p., 5 June 2013. Web. 28 Jan. 2014.

Works Cited

Brown, Susan E., and Russell Jaffe. "Acid-Alkaline Balance and Its Effect on Bone Health." *International Journal of Integrative Medicine* 2.6 (2000): n. pag. *Alkaline-alkaline.com*. Web. 25 Jan. 2014.

Brown, Susan E., and Larry Trivieri, Jr. *The Acid-Alkaline Food Guide: A Quick Reference to Foods & their Efffect on pH Levels*. 2nd ed. Garden City Park, NY: Square One, 2013. PDF eBook.

Brüngger, Marco, Henry N. Hulter, and Reto Krapf. "Effect of Chronic Metabolic Acidosis on the Growth Hormone/IGF-1 Endocrine Axis: New Cause of Growth Hormone Insensitivity in Humans." *Kidney International* 51.1 (1997): 216-21. *Nature.com*. NPG. Web. 30 Jan. 2014.

Bushinsky, David A., et al. "Effects of in Vivo Metabolic Acidosis on Midcortical Bone Ion Composition." *American Journal of Physiology - Renal Physiology* 277.5 (1999): F813-19. *American Physiological Society Journals*. APS. Web. 24 Jan. 2014.

Works Cited

Colditz, G A, et al. "Increased Green and Yellow Vegetable Intake and Lowered Cancer Deaths in an Elderly Population." *American Journal of Clinical Nutrition* 41.1 (1985): 32-36. Web. 27 Jan. 2014.

Dawson-Hughes, Bess, Susan S. Harris, and Lisa Ceglia. "Alkaline Diets Favor Lean Tissue Mass in Older Adults." *American Journal of Clinical Nutrition* 87.3 (2008): 662-65. Web. 10 Jan. 2014.

Domenico, Phil. "Easy Ways to Balance an Acidic Diet." *Naturalnews.com*. Truth, 5 Aug. 2009. Web. 30 Jan. 2014.

Dorland, W A Newman. "pH of 7." *Dorland's Illustrated Medical Dictionary.* 32nd ed. Philadelphia, PA: Saunders, 2011. Print.

Emerson, Greg. "Acid:alkaline Balance Evidence." *Dr. Greg Emerson Health & Wellness*. Greg Emerson, 25 July 2009. Web. 14 Apr. 2014.

Frassetto, L., et al. "Diet, Evolution and Aging–The Pathophysiologic Effects of the Post-agricultural Inversion of the Potassium-to-sodium and Base-to- chloride Ratios in the Human Diet."

Works Cited

European Journal of Nutrition 40.5 (2001): 200-13. *Alkalizeforhealth.net Library.* Web. 5 Jan. 2014.

Frassetto, L. A., R. C. Morris, Jr., and A. Sebastian. "Effect of Age on Blood Acid-base Composition in Adult Humans: Role of Age-related Renal Functional Decline." *American Journal of Physiology - Renal Physiology* 271.6 (1996): F1114-22. *American Physiological Society Journals*. APS. Web. 5 Feb. 2014.

Frassetto, L., R. Curtis Morris, Jr., and A. Sebastian. "Potassium Bicarbonate Reduces Urinary Nitrogen Excretion in Postmenopausal Women." *Journal of Clinical Endocrinology & Metabolism* 82.1 (1997): 254-59. Web. 25 Jan. 2014.

Frassetto, Lynda A., et al. "Worldwide Incidence of Hip Fracture in Elderly Women: Relation to Consumption of Animal and Vegetable Foods." *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 55.10 (2000): M585-92. *Oxford Journals*. Oxford UP. Web. 26 Jan. 2014.

Works Cited

Garibotto, G., et al. "Muscle Protein Turnover in Chronic Renal Failure Patients with Metabolic Acidosis or Normal Acid-base Balance." Abstract. *Mineral and Electrolyte Metabolism* 22.1-3 (1996): 58-61. *PubMed*. Web. 23 Jan. 2014.

Gaziano, J. Michael, et al. "A Prospective Study of Consumption of Carotenoids in Fruits and Vegetables and Decreased Cardiovascular Mortality in the Elderly." Abstract. *Annals of Epidemiology* 5.4 (1995): 255-60. *Annalsofepidemiology.org*. Elsevier. Web. 25 Jan. 2014.

Gillman, Matthew W., et al. "Protective Effect of Fruits and Vegetables on Development of Stroke in Men." Abstract. *Journal of the American Medical Association* 273.14 (1995): 1113-17. *JAMA*. American Medical Assn. Web. 27 Jan. 2014.

Giovannucci, Edward, et al. "Intake of Carotenoids and Retino in Relation to Risk of Prostate Cancer." Abstract. *Journal of the National Cancer Institute* 87.23 (1995): 1767-76. *Oxford Journals*. Oxford UP. Web. 27 Jan. 2014.

Works Cited

Goodman, A. David, et al. "Production, Excretion, and Net Balance of Fixed Acid in Patients with Renal Acidosis." *Journal of Clinical Investigation* 44.4 (1965): 495-506. *Jci.org*. American Soc. for Clinical Investigation. Web. 21 Jan. 2014.

Graci, Sam. "Phytonutrients." *Alive.com*. Alive, Feb. 2002. Web. 24 Jan. 2014.

Hall, John E., and Arthur C. Guyton. *Guyton and Hall Textbook of Medical Physiology.* 12th ed. Philadelphia, PA: Saunders, 2011. PDF eBook.

Haller, Genevieve M. "Understanding Alkaline-Acid Balance." Web blog post. *Edgar Cayce's A.R.E.* Ed. Alison. Edgar Cayce Foundation, 5 July 2013. Web. 31 Jan. 2014.

Halvorsen, Bente L, et al. "Content of Redox-active Compounds (ie, Antioxidants) in Foods Consumed in the United States." *American Journal of Clinical Nutrition* 84.1 (1996): 95-135. Web. 2 Feb. 2014.

Works Cited

Hay, William Howard. *A New Health Era*. 1st ed. Mount Pocono, PA: Pocono Hay-ven Plan, 1933. *Openlibrary.org.* Internet Archive. Web. 31 Jan. 2014.

Hertog, M G, et al. "Antioxidant Flavonols and Ischemic Heart Disease in a Welsh Population of Men: The Caerphilly Study." *American Journal of Clinical Nutrition* 65.5 (1997): 1489-94. Web. 30 Jan. 2014.

Hertog, M.G.L, et al. "Dietary Antioxidant Flavonoids and Risk of Coronary Heart Disease: The Zutphen Elderly Study." Abstract. *Lancet* 342.8878 (1993): 1007-11. *Thelancet.com*. Elsevier. Web. 29 Jan. 2014.

Jensen, Bernard. "Tissue Cleansing through Bowel Management." *Curezone.org.* CureZone Assn., n.d. Web. 26 Jan. 2014.

Joseph, James A., Barbara Shukitt-Hale, and Lauren M. Willis. "Grape Juice, Berries, and Walnuts Affect Brain Aging and Behavior." *Journal of Nutrition* 139.9 (2009): 1813S-17S. *Jn.nutrition.org*. American Society for Nutrition, 29 July 2009. Web. 1 Feb. 2014.

Works Cited

Kemp, H. F., and P. M. Taylor. "Interactions between Thyroid Hormone and Tryptophan Transport in Rat Liver Are Modulated by Thyroid Status." Abstract. *American Journal of Physiology - Endocrinology and Metabolism* 272.5 (1997): E809-16. *American Physiological Society Journals*. APS. Web. 15 Feb. 2014.

Kim, Ben. "The Truth About Alkalizing Your Blood." *Drbenkim.com*. Dr. Ben Kim Natural Health Solutions, n.d. Web. 21 Jan. 2014.

Klein, David. "Acid Alkaline Diet Courses." *Vibrant Health & Wealth*. David Klein, n.d. Web. 25 Jan. 2014.

Knekt, Paul, et al. "Flavonoid Intake and Coronary Mortality in Finland: A Cohort Study." *British Medical Journal* 312.7029 (1996): 478-81. *Bmj.com*. BMJ. Web. 30 Jan. 2014.

Kraut, Jeffrey A., et al. "The Effects of Metabolic Acidosis on Bone Formation and Bone Resorption in the Rat." *Kidney International* 30.5 (1986): 694-700. *Nature.com*. NPG. Web. 25 Jan. 2014.

Kühnau, J. "The Flavonoids. A Class of Semi-essential Food Components: Their Role in Human Nutrition." Abstract. *World*

Works Cited

Review of Nutrition and Dietetics 24 (1976): 117-91. *PubMed*. Web. 26 Jan. 2014.

Lemann, Jacob, Richard W. Gray, and Joan A. Pleuss. "Potassium Bicarbonate, but Not Sodium Bicarbonate, Reduces Urinary Calcium Excretion and Improves Calcium Balance in Healthy Men." *Kidney International* 35.2 (1989): 688-95. *Nature.com*. NPG. Web. 26 Feb. 2014.

Lemann, J., Jr., J R Litzow, and E J Lennon. "The Effects of Chronic Acid Loads in Normal Man: Further Evidence for the Participation of Bone Mineral in the Defense against Chronic Metabolic Acidosis." *Journal of Clinical Investigation* 45.10 (1966): 1608-14. *Jci.org*. American Soc. for Clinical Investigation. Web. 22 Jan. 2014.

Litzow, John R., Jacob Lemann, Jr., and Edward J. Lennon. "The Effect of Treatment of Acidosis on Calcium Balance in Patients with Chronic Azotemic Renal Disease." *Journal of Clinical Investigation* 46.2 (1967): 280-86. *Jci.org*. American Soc. for

Works Cited

Clinical Investigation. Web. 23 Jan. 2014.

Liu, Rui Hai. "Potential Synergy of Phytochemicals in Cancer Prevention: Mechanism of Action." *Journal of Nutrition* 134.12 (2004): 3479S-85S. *Jn.nutrition.org*. American Society for Nutrition. Web. 2 Feb. 2014.

"Lycopene." *Cancer.org*. American Cancer Soc, 13 May 2010. Web. 30 Jan. 2014.

Malov, IuS, and AN Kulikov. "Bicarbonate Deficiency and Duodenal Peptic Ulcer." Abstract. *Terapevticheskii Arkhiv* 70.2 (1998): 28-32. *PubMed*. Web. 5 Feb. 2014. Original article in Russian.

Millis, Paulette. "Phytonutrients: The Healing Power of Plants." *Naturally Savvy*. Healthy Shopper U.S.A., 17 June 2013. Web. 26 Jan. 2014.

Mincolla, Mark. "Chapter 6 - Whole Health Nutritional Balancing: Food as Medicine." *Whole Health: A Holistic Approach to Healing for the 21st Century*. New York, NY: Penguin Group, 2013. 160-82. PDF eBook.

Works Cited

Minich, Deanna M., and Jeffrey S. Bland. "Acid-alkaline Balance: Role in Chronic Disease and Detoxification." *Alternative Therapies in Health And Medicine* 13.4 (2007): 62-65. *Metagenics.com.* Metagenics, n.d. Web. 6 Feb. 2014.

Morris, RC, Jr., et al. "Differing Effects of Supplemental KCl and KHCO3: Pathophysiological and Clinical Implications." *Seminars in Nephrology* 19.5 (1999): 487-93. *Seminarsinnephrology.org*. Elsevier. Web. 27 Feb. 2014.

Morris, R. Curtis, Jr., et al. "Normotensive Salt Sensitivity: Effects of Race and Dietary Potassium." *Hypertension* 33 (1999): 18-23. *AHA Journals*. AHA. Web. 25 Jan. 2014.

Mundorff, Linda. "Phytochemicals: Healthy Compounds." *Naturally Savvy*. Healthy Shopper U.S.A., 17 Apr. 2009. Web. 26 Jan. 2014.

pH Life. "Low Grade, Chronic Acidosis...What in the CELL Is Going On?" *American Nutrition Association*. ANA, 1 May 2012. Web. 18 Feb. 2014.

Works Cited

"Phytonutrient FAQs." *Ars.usda.gov*. USDA; ARS, 8 Apr. 2005. Web. 25 Jan. 2014.

Porter, Robert S., and Justin L. Kaplan, eds., "Acid-Base Balance." Ed. James L. Lewis, III. *The Merck Manual Home Health Handbook*. Merck, Apr. 2013. Web. 23 Jan. 2014.

"Phytonutrients." *Webmd.com*. WebMD, n.d. Web. 23 Jan. 2014.

Raghunand, N., et al. "Enhancement of Chemotherapy by Manipulation of Tumour pH." *British Journal of Cancer* 80.7 (1999): 1005-11. *Nature.com*. NPG. Web. 31 Jan. 2014.

Rimm, Eric B, et al. "Relation between Intake of Flavonoids and Risk for Coronary Heart Disease in Male Health Professionals." Abstract. *Annals of Internal Medicine* 125.5 (1996): 384-89. *Annals.org*. American College of Physicians. Web. 31 Jan. 2014.

Robinson, Shirley. "Acid Buffering Systems." *Heal Yourself At Home*. N.p., 2014. Web. 022 Jan. 2014.

Sebastian, Anthony, et al. "Estimation of the Net Acid Load of the Diet of Ancestral Preagricultural Homo Sapiens and Their Hominid

Works Cited

Ancestors." *American Journal of Clinical Nutrition* 76.6 (2002): 1308-16. Web. 15 Jan. 2014.

Sebastian, Anthony, et al. "Improved Mineral Balance and Skeletal Metabolism in Postmenopausal Women Treated with Potassium Bicarbonate." *New England Journal of Medicine* 330.25 (1994): 1776-81. *Nejm.org*. Massachusetts Medical Soc., 23 June 1994. Web. 18 Feb. 2014.

Seddon, Johanna M., et al. "Dietary Carotenoids, Vitamins A, C, and E, and Advanced Age-Related Macular Degeneration." Abstract. *Journal of the American Medical Association* 272.18 (1994): 1413-20. *JAMA*. American Medical Assn. Web. 29 Jan. 2014.

Sellmeyer, Deborah E., et al. "A High Ratio of Dietary Animal to Vegetable Protein Increases the Rate of Bone Loss and the Risk of Fracture in Postmenopausal Women." *American Journal of Clinical Nutrition* 73.1 (2001): 118-22. Web. 27 Jan. 2014. For the Study of Osteoporotic Fractures Research Group.

Works Cited

Steinmetz, Kristi A., and John D. Potter. "Vegetables, Fruit, and Cancer Prevention: A Review." Abstact. *Journal of the American Dietetic Association* 96.10 (1996): 1027-39. *PubMed*. Web. 25 Jan. 2014.

Stene, Lars C., et al. "Acidic Drinking Water and Risk of Childhood-Onset Type 1 Diabetes." *Diabetes Care* 25.9 (2002): 1534-38. *DiabetesJournals.org*. ADA. Web. 15 Jan. 2014.

Szulc, P., et al. "Cross-Sectional Evaluation of Bone Metabolism in Men." *Journal of Bone and Mineral Research* 16.9 (2001): 1642-50. *Wiley Online Library*. Wiley, 1 Sept. 2001. Web. 25 Jan. 2014.

United States. Dept. of Agriculture. Dept. of Health and Human Services. *Fruits and Vegetables: Enhanced Federal Efforts to Increase Consumption Could Yield Health Benefits for Americans.* Report to Congressional Requesters. Report GAO-02-657. Washington: GAO, 2002. *GAO.* U.S. Government Accountability Office. Web. 28 Jan. 2009.

Valentine, Gail. "Tomato Nutrient Lycopene Helps Fight Prostate Cancer." *Life Enhancement Magazine*. Life Enhancement

Works Cited

Products, June 1999. Web. 24 Jan. 2014.

"Visitor Questions: What Do You Think about an Acid/alkaline Balance?" *The World's Healthiest Foods*. George Mateljan Foundation, n.d. Web. 12 Jan. 2014.

Vormann, Juergen, and Thomas Remer. "Dietary, Metabolic, Physiologic, and Disease-Related Aspects of Acid-Base Balance: Foreword to the Contributions of the Second International Acid-Base Symposium." *Journal of Nutrition* 138.2 (2008): 413S-14S. Web. 29 Jan. 2014.

"Walnuts." *The World's Healthiest Foods*. George Mateljan Foundation, n.d. Web. 30 Jan. 2014.

Webster's. "pH." *Webster's New Universal Unabridged Dictionary*. New York, NY: Barnes & Noble, 2003. Print

Whiting, Susan J., Janet Bell, and Susan E. Brown. "First Morning Urine Measured with pH Paper Strips Reflects Acid Excretion." Abstract. *Asbmr.org*. ASBMR, 2002. Web. 19 Jan. 2014. Research abstract presented at the American Society of Bone

Works Cited

and Mineral Research (ASBMR) 2002 Annual Meeting in San Antonio, Texas.

Young, Robert O., and Shelley Redford. Young. *The pH Miracle for Weight Loss: Balance your Body Chemistry, Achieve your Ideal Weight*. New York, NY: Grand Central, 2008. PDF eBook.

---. *The pH Miracle: Balance Your Diet, Reclaim Your Health*. New York, NY: Grand Central, 2008. PDF eBook.